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A Recessionary Debate: Who suffered more? A study of sectoral well-being and economic insecurity in Ireland

By

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PhD Dissertation

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Declaration

This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the content. I have read and understand the regulations of University College Cork concerning plagiarism.

Signed: _____ **Date:** _____

Anna O'Donnell

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Abstract

The aim of this thesis is to identify the relationship between subjective well-being and economic insecurity for public and private sector workers in Ireland using the European Social Survey 2010-2012. Life satisfaction and job satisfaction are the indicators used to measure subjective well-being. Economic insecurity is approximated by regional unemployment rates and self-perceived job insecurity. Potential sample selection bias and endogeneity bias are accounted for.

It is traditionally believed that public sector workers are relatively more protected against insecurity due to very institution of public sector employment. The institution of public sector employment is made up of stricter dismissal practices (Luechinger *et al.,* 2010a) and less volatile employment (Freeman, 1987) where workers are subsequently less likely to be affected by business cycle downturns (Clark and Postal-Vinay, 2009). It is found in the literature that economic insecurity depresses the well-being of public sector workers to a lesser degree than private sector workers (Luechinger *et al.,* 2010a; Artz and Kaya, 2014). These studies provide the rationale for this thesis in testing for similar relationships in an Irish context.

Sample selection bias arises when a selection into a particular category is not random (Heckman, 1979). An example of this is non-random selection into public sector employment based on personal characteristics (Heckman, 1979; Luechinger *et al.,* 2010b). If selection into public sector employment is not corrected for this can lead to biased and inconsistent estimators (Gujarati, 2009). Selection bias of public sector employment is corrected for by using a standard Two-Step Heckman Probit OLS estimation method. Following Luechinger *et al.* (2010b), the propensity for individuals to select into public sector employment is estimated by a binomial probit model with the inclusion of the additional regressor Irish citizenship. Job satisfaction is then estimated by Ordinary Least Squares (OLS) with the inclusion of a sample correction term similar as is done in Clark (1997).

Endogeneity is where an independent variable included in the model is determined within in the context of the model (Chenhall and Moers, 2007). The econometric definition states that an endogenous independent variable is one that is

correlated with the error term (Wooldridge, 2010). Endogeneity is expected to be present due to a simultaneous relationship between job insecurity and job satisfaction whereby both variables are jointly determined (Theodossiou and Vasileiou, 2007). Simultaneity, as an instigator of endogeneity, is corrected for using Instrumental Variables (IV) techniques. Limited Information Methods and Full Information Methods of estimation of simultaneous equations models are assed and compared.

The general results show that job insecurity depresses the subjective well-being of all workers in both the public and private sectors in Ireland. The magnitude of this effect differs among sectoral workers. The subjective well-being of private sector workers is more adversely affected by job insecurity than the subjective well-being of public sector workers. This is observed in basic ordered probit estimations of both a life satisfaction equation and a job satisfaction equation. The marginal effects from the ordered probit estimation of a basic job satisfaction equation show that as job insecurity increases the probability of reporting a 9 on a 10-point job satisfaction scale significantly decreases by 3.4% for the whole sample of workers, 2.8% for public sector workers and 4.0% for private sector workers. Artz and Kaya (2014) explain that as a result of many austerity policies implemented to reduce government expenditure during the economic recession, workers in the public sector may for the first time face worsening perceptions of job security which can have significant implications for their well-being (Artz and Kaya, 2014). This can be observed in the marginal effects where job insecurity negatively impacts the well-being of public sector workers in Ireland. However, in accordance with Luechinger *et al.* (2010a) the results show that private sector workers are more adversely impacted by economic insecurity than public sector workers. This suggests that in a time of high economic volatility, the institution of public sector employment held and was able to protect workers against some of the well-being consequences of rising insecurity.

In estimating the relationship between subjective well-being and economic insecurity advanced econometric issues arise. The results show that when selection bias is corrected for, any statistically significant relationship between job insecurity and job satisfaction disappears for public sector workers. Additionally, in order to correct for endogeneity bias the simultaneous equations model for job satisfaction

and job insecurity is estimated by Limited Information and Full Information Methods. The results from two different estimators classified as Limited Information Methods support the general findings of this research. Moreover, the magnitude of the endogeneity-corrected estimates are twice as large as those not corrected for endogeneity bias which is similarly found in Geishecker (2010, 2012).

As part of the analysis into the effect of economic insecurity on subjective well-being, the effects of other socioeconomic variables and work-related variables are examined for public and private sector workers in Ireland.

CHAPTER 1
INTRODUCTION

1.1: Study Design

The aim of this thesis is to identify the relationship between subjective well-being and economic insecurity for public and private sector workers in Ireland using data from the 2010 and 2012 European Social Survey. Potential endogeneity and selection bias are accounted for.

Subjective well-being measures quality of life as the various types of evaluations both positive and negative that people make of their own lives (Diener, 2006). Subjective well-being is believed to be a valid measurement of individual latent utility (Frey and Stutzer, 2002a) and is useful for providing a more comprehensive picture of social progress and national well-being (New Economic Foundation, 2009). This thesis uses life satisfaction and job satisfaction as indicators of subjective well-being. Job satisfaction is believed to be an appropriate approximation of utility from work (Clark, 1997). Economic insecurity is defined as the anxiety produced by perceived economic threat or the anticipatory feelings that are evoked by potential future hazards, specifically potential job loss (Luechinger *et al.,* 2010a). Economic insecurity is approximated primarily by a measure of self-perceived job insecurity and secondarily by regional unemployment rates. Many other terms and definitions used throughout this thesis are provided in a glossary in Appendix A.

The effect of regional unemployment on the subjective well-being of public and private sector workers in Ireland is examined. Subjective well-being is approximated by a life satisfaction indicator. Similar studies have identified the adverse effects on well-being of personal unemployment (Clark and Oswald, 1994; Di Tella *et al.,* 2003; Frey and Stutzer, 2002a, Lelkes, 2006) and general unemployment measured as regional unemployment rates (Clark, 2003; Di Tella *et al.,* 2001; Luechinger *et al.,* 2010a; Wolfers, 2003). Luechinger *et al.* (2010a) further identifies this relationship for public and private sector workers using German panel data. They find that regional unemployment rates decrease the life satisfaction of private sector workers to a greater degree than public sector workers. Well-being differences of public and private sector workers are attributed to differences in the

institutions of public and private sector employment. More specifically, the institution of public sector employment which is made up of stricter dismissal practices (Luechinger *et al.,* 2010a) and less volatile employment (Freeman, 1987) where subsequently workers are less likely to be affected by business cycle downturns (Clark and Postal-Vinay, 2009).

In addition to approximating economic insecurity as regional unemployment rates as is done in Luechinger *et al.* (2010a) this thesis also uses a self-perceived job insecurity variable. This is included in the estimation of a life satisfaction equation. Previous studies have found job insecurity to significantly decrease life satisfaction and subjective mental health (Cheng *et al.,* 2005; De Witte, 1999; Green 2011; Silla *et al.,* 2009).

In existing literature only a small number of studies identify the effect of job insecurity on life satisfaction. A majority of studies analyse job insecurity with respect to job satisfaction which is termed a measure of well-being from work (Jones, 2007). It is consistently found that job insecurity significantly decreases job satisfaction (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Geishecker, 2010, 2012; Origo and Pagani, 2008, 2009; Theodossiou and Vasileiou, 2007; Sousa-Poza and Sousa-Poza, 2000). The negative effect of perceived job insecurity is greatest among private sector workers compared to public sector workers (Artz and Kaya 2014; Luechinger *et al.,* 2010a).

Sample selection bias arises when selection into a particular category is not random (Heckman, 1979). An example of this is selecting into public sector employment based on personal characteristics (Heckman, 1979; Luechinger *et al.,* 2010b). If non-random selection into public sector employment is not corrected for this can lead to biased and inconsistent estimators (Gujarati, 2009). The most common way to account for potential sample selection bias is to use the standard two-step estimation method proposed by Heckman (1979).

Similar to Luechinger *et al.* (2010b) this thesis corrects for non-random selection into public sector employment by using the Two-Step Heckman Probit OLS estimation method. The propensity for individuals to select into public sector employment is estimated by a binomial probit model with the inclusion of the additional regressor, Irish citizenship. A similar analysis is conducted by Luechinger

et al., (2010b). The rationale being that Irish citizenship will help determine public sector employment but is not a determinant of job satisfaction. This allows for the sample selection term, the Inverse Mills Ratio, to be calculated and included in the second step of the Heckman estimation method. In the second step a job satisfaction equation is estimated by the OLS estimator with the inclusion of the correction term. This two-step process is performed twice for two separate job satisfaction equations truncated into a public sector subsample and private sector subsample. A similar analysis is performed in McCausland *et al.* (2005) for individuals on various employment compensation schemes. The Two-Step Heckman Probit OLS method is applied in Clark (1997) where similarly the dependent variable is job satisfaction.

Endogeneity is a term used to describe the presence of an endogenous explanatory variable (Wooldridge, 2010). An endogenous explanatory variable is commonly known as one that is determined in the context of an economic model, however, the econometric definition states an endogenous variable is one that is correlated with the error term (Wooldridge, 2010; Chenhall and Moers, 2007). It is commonly assumed that causality runs from job insecurity to job satisfaction however it may also be the case that dissatisfied workers face increased job insecurity where causality then runs in the reverse (Theodossiou and Vasileiou, 2007). This implies that job satisfaction and job insecurity are simultaneously determined which is an instigator of endogeneity bias (Wooldridge, 2010). If the simultaneous relationship between job satisfaction and job insecurity is not accounted for this can produce biased and inconsistent estimators (Wooldridge, 2010).

The most frequently used methods for estimating parameters in simultaneous equations models are classified as Instrumental Variables (IV) techniques (Gujarati, 2009; Wooldridge, 2013). When estimating simultaneous equations models a problem arises in that there are a variety of IV techniques all with different statistical properties (Gujarati, 2009). This thesis estimates the job satisfaction – job insecurity simultaneous equations model using IV techniques classified as either Limited Information or Full Information Methods. Each method has associated costs and benefits which are assessed and compared.

When using instrumental variables techniques it is often difficult to find a suitable instrument (Maddala, 2001). The instrumental variables used in this thesis are similar to those used in Theodossiou and Vasileiou (2007), Geishecker (2010, 2012), and Artz and Kaya (2014). The literature has shown that estimates that have been corrected for endogeneity can be up to twice as large as estimates that suffer from the bias (Geishecker, 2010, 2012). Therefore it is imperative to test for and correct any potential endogeneity bias in order to isolate the true effect of job insecurity on job satisfaction.

This research has not previously been conducted using Irish data. It contributes to the literature in the area of what variables influence one's subjective well-being with a particular focus on employment related well-being. Another contribution is the analysis into effects of economic insecurity on the subjective well-being of public and private sector workers while focusing on the theoretical and econometric issues. Explicit emphasis is made to not uniformly categorizing workers due to potential differences in well-being among public and private sector workers. Unlike previous literature that has largely ignored the possibility of a reciprocal relationship between economic insecurity and subjective well-being (Dolan *et al.*, 2008; McCausland *et al.* 2005; Theodossiou and Vasileious, 2007) this thesis addresses the presence of endogeneity bias resulting from this reciprocal relationship where remedial methods are discussed and applied. If endogeneity bias is not addressed this can produce downward biased estimates (Geishecker, 2010, 2012) which can result in unintended effects resulting from policy change (Helliwell, 2003).

1.2: Purpose of the Study

The purpose of this thesis is to identify an endogenous-free relationship between subjective well-being and economic insecurity among public and private sector workers in Ireland. This relationship is identified using the subjective well-being indicators life satisfaction and job satisfaction and the economic insecurity indicators regional unemployment and job insecurity. In general, looking at determinants of life satisfaction and job satisfaction is of interest because both are considered adequate measures of individual well-being which many social scientists would consider a principal concern (Clark, 1996). By studying individual well-being the ability to quantify and predict social and economic intervention outcomes is a powerful tool sought after by economists and policy makers (Islam and Clarke, 2002).

In identifying a relationship between job satisfaction and job insecurity, this thesis sets out to ensure it is endogenous-free. Not correcting for endogeneity bias would allow explanatory variables to correlate with the disturbance term resulting in biased and inconsistent estimators (Gujarati, 2009). It is also acknowledged that public sector employment is likely to not be random based on individual characteristics. For example individuals who are more risk adverse tend to select into public sector employment (Pfeifer, 2011). The bias produced from this non-random selection must therefore be accounted for. The issues of endogeneity and sample selection can generate biased and inconsistent estimates whereby they do not converge on their true (population) values yielding a distorted picture of the population which may lead to incorrect inferences and conclusions (Gujarati, 2007; Studenmund, 2006).

Responses to a life satisfaction survey question and a job satisfaction survey question are selected as the subjective well-being indicators chosen to approximate the latent dependent variable individual well-being. The life satisfaction and job satisfaction variables are categorical and ordinal in nature which renders the ordered probit model an appropriate estimation method (Borooah, 2002). In order to identify sectoral differences in well-being two interaction term are generated as follows: the product of public sector employment and regional unemployment rates; the product of public sector employment and job insecurity. This is modelled after the empirical

analysis of Luechiner *et al.* (2010a) and Artz and Kaya (2014). This will enable a direct comparison of well-being differences between public and private sector workers in Ireland.

The issues identified in Ai and Norton (2003) and Norton *et al.* (2004) regarding the inclusion of interaction terms in nonlinear models are addressed. The above assessment is further carried out using a binomial probit model. This enables the use of a user written post-estimation command in the statistical program STATA 12 that calculates the interaction effects in a way that is dissimilar to marginal effects calculated in linear models (Norton *et al.,* 2004).

This thesis further identifies the effect of job insecurity on a well-being from work indicator, job satisfaction. This is identified for public and private sector workers. Many studies have found a statistically negative relationship indicating that job insecurity decreases subjective well-being (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Clark, 1998; Gazioglu and Tansel, 2006; Geishecker, 2010, 2012; Origo and Pagani, 2008, 2009; Theodossiou and Vasileiou, 2007; Sousa-Poza and Sousa-Poza, 2000; Poliakas and Theodossiou, 2010). The magnitude of the relationship between job satisfaction and job insecurity is shown to differ among public and private sector workers (Artz and Kaya, 2014). This analysis of the relationship between job satisfaction and job insecurity is estimated by the ordered probit model for the two subsamples of sectoral workers. Calculated marginal effects allows for the comparison of well-being outcomes among public and private sector workers. Estimating ordered probit equations for subsamples of individuals is also performed in Artz and Kaya (2014), Clark (1997), McCuasland *et al.* (2005).

The analysis continues on to correct for sample selection bias and endogeneity bias. Sample selection is corrected for using the Two-Step Heckman Probit OLS estimation method. The additional regressor included in the selection equation (Step 1) is Irish citizenship similar to that used in Luechinger *et al.* (2010b). To account for a potential endogenous relationship between job satisfaction and job insecurity, Instrumental Variables techniques are used which are classified as either a Full Information Method or a Limited Information Method. This study uses one full information method called the Full Information Maximum Likelihood (FIML) and two limited information methods called the Limited Information Maximum

Likelihood (LIML) and the Two-Stage Ordered Probit Least Squares (2SOPLS). The method of significant interest in this study is the Two-Stage Ordered Probit Least Squares for the following reasons: it is a limited information method whereby equations in the model are estimated individually limiting the effect of potential measurement error; it preserves the ordered nature of the endogenous variable job insecurity (Daregot *et al.*, 2013); it estimates the job satisfaction equation by Ordinary Least Squares similar to McCausland *et al.* (2005) and Clark (1997).

Results from this thesis have the potential to provide an insight into the determinants of subjective well-being among Irish individuals with a particular focus on the effect of economic insecurity. This information can then be used in a well-being approach to aid policy formation in recessionary conditions as to how insecurity measures affect public and private sector workers in Ireland.

1.3: Rationale

The report *Well-Being Matters: A Social Report for Ireland,* published by the National Economic and Social Council set out to identify social trends that impact social policy and well-being in Ireland (NESC, 2009). The NESC calls for a need to move beyond one dimensional indicators of well-being such as Gross Domestic Product (GDP) to acknowledge 6 domains of life deemed important for well-being as follows: economic resources, work and participation, relationships and care, community and environment, health, democracy and values. A combination of income based indicators such as GDP with measures of individual well-being will yield a more comprehensive picture of societal progress and national well-being (New Economic Foundation, 2009).

The report defines well-being as a positive physical, social and mental state that requires that basic needs are met, individuals have a sense of purpose, they feel they can achieve important goals, are able to participate in society in order to live the lives they value (NESC, 2009). Individuals' well-being is enhanced by conditions that promote financial and personal security (NESC, 2009). It is clear that when people are in paid and rewarding work they display trust in each other and in the government and are productive citizens which not only contributes to the well-being of each other but the well-being of the economy as a whole (NESC, 2009).

Beginning in 2008 the Irish economy suffered a severe banking crisis and successive widespread recession. With the onslaught of the recession brought a rapid rise in average unemployment from 4.7% in 2007 to 14.6% in 2011 (CSO, 2014). As a result, recessionary risks to well-being have become ever apparent in Ireland. These risks include: unexpected reductions in income, job loss or fear of job loss, the worry of financial stress and impact on relationships, tensions in communities and the impact of all of these risks and many others on physical and mental health (NESC, 2009). This research focuses on well-being implications of fear of job loss which is categorized under the work and participation domain that makes up well-being.

Economic insecurity is understood as the anxiety produced by perceived economic threat or the anticipatory feelings that are evoked by potential future hazards, specifically potential job loss (Luechinger *et al.,* 2010a). Economic crises

like that experienced in Ireland, could be expected to lead to greater anxiety about job loss (ESS, 2013). Two measures commonly used in the literature to capture these anticipatory feelings of potential job loss are unemployment rates and perceived job insecurity (Luechinger *et al.,* 2010a).

It is traditionally believed that public sector workers are relatively protected against economic downturns due to the institution of public sector employment. The institution of public sector employment is made up of stricter dismissal practices (Luechinger *et al.,* 2010a) and less volatile employment (Freeman, 1987) where workers are subsequently less likely to be affected by business cycle downturns (Clark and Postal-Vinay, 2009). Therefore, it is found in the literature that economic insecurity depresses the well-being of public sector workers to a lesser degree than private sector workers (Luechinger *et al.,* 2010a; Artz and Kaya, 2014). These studies in conjunction with increasing trends in overall insecurity provide the rationale for this thesis in testing for similar relationships in an Irish context.

Due to the dire fiscal states of government institutions in the economic recession and austerity policies, the public sector was mandated to continue operations with fewer public employees (Artz and Kaya, 2014). An example of this was the Croke Park Agreement that was signed by the Irish Congress of Trade Unions (ICTU) (Implementation Body, 2014). In an agreement between the Government and public sector institutions it was agreed that there would be widespread public sector reforms aimed at increasing efficiency, flexibility, and redeployment by reducing costs and headcount (Department of Public Expenditure & Reform, 2012). As a result of many austerity policies workers in the public sector may for the first time face worsening perceptions of job security with ramifications for individual well-being (Artz and Kaya, 2014). If there was ever a time where the institution of public sector employment could be challenged it is in Ireland in the recent economic crisis that catapulted economic insecurities to unprecedented levels.

The NESC defines the fear of job loss as a major recessionary risk to well-being where the strength of these consequences merit further research. This is the void in the literature that this thesis aims to fill. Moreover, subjective perceptions of risk of job loss and well-being can have important motivational effects on the

workforce which in turn have consequences on productivity, efficiency, wages and employment (Theodossiou and Vasileiou, 2007).

Many policy implications arise from this study. According to the report *Well-Being Matters: A Social Report for Ireland* (2009) it is public policy's role to bring about well-being enhancing conditions by placing the individual at the centre of policy development and delivery, by assessing the risk facing them and ensuring that supports are available to address such risks. Among the list of well-being enhancing conditions is financial and personal security and involvement in meaningful or rewarding work. Public policy and institutions have a vital role to provide these conditions to support individual and collective well-being in making available tailored supports to people experiencing risks or vulnerabilities (NESC, 2009). Therefore it is the role of the Government and public policy to understand the well-being of Irish citizens and acknowledge the importance of recessionary risks like perceptions of potential job loss. Further research is even more imperative if these well-being consequences differ among sectoral workers.

1.4: Data Description

The data used in this research is taken from the European Social Survey (ESS). This study estimates subjective well-being equations using the two indicators life satisfaction and job satisfaction. Life satisfaction equations are estimated using data from Rounds 5 and 6 of the ESS (2010 & 2012) while job satisfaction equations are estimated using data only from Round 5 (2010). This is due to limited availability of many work-specific variables outside of Round 5 (2010).

The European Social Survey (ESS) is a multinational biennial cross sectional survey that is used by those interested in understanding patterns in public attitudes and behaviour over time and across countries (ESS, 2013). The ESS currently consists of 6 Rounds spanning 27 different countries in 2012. The central aim of the ESS is to develop and conduct a systematic study of changing values, attitudes, and behavioural patterns within European politics (ESS, 2013).

The Irish component of the European Social Survey in 2010 and 2012 was funded by the Irish Research Council for the Humanities & Social Sciences (IRCHSS) while the Economic Social Research Institute (ESRI) was commissioned to carry out the survey (ESS, 2010; 2012). Ireland has participated in all six rounds of the survey. In 2010 Ireland recorded 2,576 interviews with a response rate of 65.2% and a total of 2,628 interviews in 2012 with a response rate of 67.9% (ESS, 2012).

The ESS is divided into two parts: a core section and a rotating module. In order to achieve the central aim, the ESS questionnaire has a core component that does not change from year to year and consists of the most comprehensive set of 'socio-structural' or background variables currently available in any cross-national survey (ESS, 2013). This will enable researchers to observe changes in values, attitudes and behaviour over time. The purpose of a rotating module is to enable the ESS to cover a wide range of topics and adapt to changing demands (ESS, 2013). The rotating module for Round 5 (2010) is titled *Family, Work and Well-being* which provides many of the work related variables used in this thesis. The rotating module describes individuals' work experiences and work-family conflicts (ESS, 2014).

The economic and social situation of many EU-member states was dramatically transformed by the economic recession resulting from the financial crisis that began in 2008 (ESS, 2015). This rotating model set out to provide insight into the extent to which different types of employment and welfare regimes were able to mediate the impact of the economic crisis (ESS, 2015). A feature of the recession captured by the data from the rotating model is the prevalence and distribution of insecurity (ESS, 2015). This research sets out to identify the potential impact increased insecurity[1] has on individual well-being in Ireland. The ESS asks respondents to rank their satisfaction with life as a whole and their satisfaction with their jobs both on an 11-point scale ranging from "extremely dissatisfied" to "extremely satisfied." These are the measures of subjective well-being used in this thesis.

[1] The primary measure of insecurity used in this research comes from a self-perceived job insecurity question in the ESS (2010). A secondary measure of insecurity is included in the estimation of life satisfaction that comes from the Quarterly National Household Survey (QNHS) published by the Central Statistics Office in Ireland. This is explained in detail in Chapter 3.

1.5: Methods and Techniques:

Empirical analysis is used to estimate the relationship between economic insecurity and subjective well-being of public and private sector workers in Ireland. Multiple regression analysis is used because it identifies the intended relationship while controlling for other factors which simultaneously affect the dependent variable (Wooldridge, 2013). The variable of interest is individual well-being which is *latent* (Blanchflower and Oswald, 2001; Frey and Stutzer, 2002a), which while conceptually useful is unobservable in either principal or practice (Stewart, 2004). Individual life satisfaction and individual job satisfaction are the subjective well-being variables selected to approximate the latent dependent variable. These indicators are taken from responses to a life satisfaction and a job satisfaction question that are inherently ordered in that outcomes associated with subjective well-being are ranked higher than the outcomes associated with lower subjective well-being (Borooah, 2002). An ordered dependent variable like life satisfaction and job satisfaction calls for the use of the maximum likelihood estimation method of an ordered probit model (Borooah, 2002).

In this research a life satisfaction equation is estimated twice by the ordered probit model where both regional unemployment rates and self-perceived job insecurity are used as measures of economic insecurity. Following Luechinger *et al.* (2010a) these measures of economic insecurity are each interacted with a dummy variable identifying if the individual works in the public sector or not. Including a slope dummy variable like public sector employment will allow the relationship between the dependent variable and independent variable to be different depending on whether the condition of the dummy variable is satisfied (Studenmund, 2006). The interaction terms consisting of the product of the public sector dummy variable and the appropriate economic insecurity indicator capture different well-being effects among these sectoral workers (Luechinger *et al.,* 2010a). This will enable us to directly compare the effects for public and private sector workers in Ireland.

Following Ai and Norton (2003), as a robustness check, a binomial probit model is used to estimate the life satisfaction equation where a user-written post-estimation command is used to calculate interaction effects in non-linear models. This requires that the dependent variable be transformed into a dichotomous measure

taking on a value equal to 1 representing "high life satisfaction" and 0 representing "otherwise." According to Norton *et al.* (2004) interpretations of interaction effects from linear models do not transfer to non-linear models such as the ordered probit model.

Job insecurity is included as a measure of economic insecurity in the estimation of life satisfaction equations however it is more commonly found in job satisfaction equations. Job insecurity is well-documented as having an adverse effect on individual job satisfaction (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Geishecker, 2010, 2012; Origo and Pagani, 2008, 2009; Theodossiou and Vasileiou, 2007; Sousa-Poza and Sousa-Poza, 2000). Due to the ambiguity presented in Puhani (2012) regarding the true effect of interaction terms in non-linear models this research estimates job satisfaction equations separately for truncated samples of public and private sector workers rather than using interaction terms. This is modelled after the methodologies presented in Clark (1997), Luechinger *et al.* (2010a) and McCausland *et al.* (2005). Many studies continue to use interaction terms in the estimation of non-linear models (Artz and Kaya, 2014; Bjørnskov *et al.*, 2008; Cornelißen and Sonderhof, 2009; Luechinger *et al.*, 2010a; Origo and Pagani, 2008, 2009). The ordered probit model is used to estimate job satisfaction equations in order to preserve the ordered nature of the dependent variable.

The relationship between job insecurity and job satisfaction is estimated for public and private sector workers while accounting for endogeneity and selection bias. Correction of non-random selection into public sector employment is carried out using a standard Two-Step Heckman Probit OLS estimation method. This method is also performed in a study of job satisfaction in the context of non-random selection into employment status (Clark, 1997). The propensity to select into public sector employment is estimated by the binomial probit model. A correction term is then calculated and included in the second step estimation of the job satisfaction equation. This process allows for the identification and correction of any inherent non-random selection into public sector employment which if left untreated can produce biased and inconsistent estimators (Gujarati, 2009).

It is commonly assumed in the job satisfaction literature that perceived risk of job loss affects workers' job satisfaction, however, it may also be the case that

dissatisfied workers face an increased risk of losing their jobs (Theodossiou and Vasileiou, 2007). This describes a simultaneous equations model whereby job satisfaction and job insecurity are jointly determined (Wooldridge, 2013). This research uses Limited Information Methods and Full Information Methods to correct for the endogeneity present in the job insecurity explanatory variable which is believed to be a product of a simultaneous relationship. These methods differ in their choice of instruments and in whether the equations are estimated one at a time or jointly (Gujarati, 2009). Two estimators are classified as limited information methods which are the Limited Information Maximum Likelihood (LIML) and the Two-Stage Ordered Probit Least Squares estimator (2SOPLS). The full information method employed is the Full Information Maximum Likelihood estimator (FIML). When estimating simultaneous equations models, the problem is rather complex because there are a variety of estimation techniques all with varying statistical properties (Gujarati, 2009). This reaffirms the importance of not relying on one estimation method in correcting for potential endogeneity present in job insecurity.

1.6: Organization of Study

The goal of this research is to be able to include findings in public policy monitoring and evaluation through greater understanding of the determinants of subjective well-being but more specifically economic insecurity. The literature suggests a need to not treat all workers uniformly in a well-being context but rather treat public sector and private sector workers as distinct units. The intent is to ultimately bring about well-being enhancing conditions for all workers in Ireland. It is important that in combination with traditionally used income based indicators that measures of well-being also be taken into account in order to provide a more comprehensive picture of social progress and national well-being (New Economics Foundation, 2009).

Chapter 2 reviews previous studies in the area of subjective well-being and economic insecurity along with the literature in relation to the econometric issues and possible remedial techniques. Section 2.1 reviews the theoretical foundation of well-being research. The determinants and validity of subjective well-being indicators are discussed with a concluding subsection on the appropriate estimation techniques used for estimating subjective well-being equations. Section 2.2 reviews the literature on job-specific measures of well-being, particularly job satisfaction. Among a host of determinants this review focuses on the effect of self-perceived job insecurity. A particular focus is made on the literature that identifies job satisfaction differences among sectoral workers. Section 2.3 looks at different methods for estimating simultaneous equations models. Limited Information and Full Information Methods of estimation are compared. The econometric issue of sample selection bias is reviewed and the remedial procedure the Two-Stage Heckman Probit OLS method is outlined. Conclusions are presented in Section 2.4.

Chapter 3 explains the sources of data used in the analysis of subjective well-being in Ireland. The primary data source, the European Social Survey (ESS), is extensively explained in Chapter 3. Section 3.1 briefly discusses The Quarterly National Household Survey (QNHS) published by the Central Statistics in Ireland. The QNHS is the source of the variable regional unemployment rates which is used in a secondary estimation of a life satisfaction equation. The European Social Survey is the source of a range of social, economic and environmental variables used in the estimation of subjective well-being equations. A detailed description of the

dependent variables life satisfaction and job satisfaction is provided along with descriptive statistics of all variables used in this research.

Chapter 4 presents a study of the effect of economic insecurity on the subjective well-being of public and private sector workers in Ireland. Economic insecurity is approximated by two indicators, regional unemployment rates and self-perceived job insecurity. Subjective well-being is approximated by a categorical and ordered dependent variable, life satisfaction. In order to identify well-being differences among public and private sector workers in Ireland interaction terms are generated that are the product of a public sector dummy variable and each of the economic insecurity measures. This will allow us to compare the well-being of public and private sector workers.

Chapter 5 considers the relationship between job satisfaction and job insecurity of public and private sector workers. Job satisfaction is an indicator of subjective well-being and believed to be an appropriate approximation of utility from work. Job satisfaction is the only dependent variable considered in this chapter due to the well-documented link to job insecurity in the literature. The ordered probit model is used to estimate basic and extended job satisfaction equations. Basic job satisfaction equations consist primarily of individual characteristics and a limited number of job-specific variables. The extended job satisfaction equations consist of a much larger vector of job-specific variables taking into account those like individual work-related values. The extended job satisfaction equation is estimated at the expense of statistical significance for many explanatory variables.

Chapter 6 presents an empirical study of the effects of job insecurity on job satisfaction of public and private sector workers while accounting for selection bias and endogeneity bias. Limited and full information methods are used to estimate the simultaneous relationship between job satisfaction and job insecurity. This simultaneous relationship is shown to be an instigator of endogeneity in the job insecurity variable suggesting it is correlated with the error term. If left uncorrected this will produce biased and inconsistent estimators. The econometric issue of sample selection bias is also addressed using the remedial estimation method the Two Step Heckman Probit OLS method. This corrects for non-random selection into public sector employment. Lastly, conclusions and policy implications are discussed in Chapter 7.

CHAPTER 2
THEORETICAL ISSUES AND PREVIOUS RESEARCH

This thesis presents an empirical study of the effect of economic insecurity on the subjective well-being of public and private sector workers in Ireland. This relationship is identified using cross-sectional data from the European Social Survey. Section 2.1 identifies the factors that influence subjective well-being with a particular focus on measures of economic insecurity. Subjective well-being is measured by a life satisfaction indicator which is reported categorically on an ordered scale. Estimation techniques are discussed that account for this ordered nature. Moreover, the relationship between life satisfaction and economic insecurity is identified for public and private sector workers in Ireland. Section 2.2 discusses the literature on job satisfaction, a second indicator of subjective well-being used in this thesis. The relationship between job satisfaction and job insecurity is supported by the literature and identified for public and private sector workers in Ireland. Section 2.3 discusses the issue of endogeneity bias and how it relates to the job satisfaction – job insecurity relationship. Sample selection bias and simultaneity bias are discussed as potential instigators of endogeneity in this thesis. To account for endogeneity, limited information estimation methods and full information estimation methods are discussed and compared. Conclusions are presented in section 2.4.

2.1: An Introduction: Subjective Well-Being and Economic Insecurity

One thing that is agreed upon amongst social scientists is the need to understand what influences people's well-being (Blanchflower and Oswald, 2004). However, therein ends any absolute consensus regarding channels, outcomes, and determinants of individual well-being. The very nature of human well-being is an ambiguous concept lacking a universal definition resulting in numerous interpretations (McGillivary and Clark, 2006). The economics of happiness assesses welfare by combining economists' and psychologists' techniques and relies on more contemporary definitions of utility than conventional economics (Graham, 2008). This section reviews literature which focuses on utility theory and well-being. Subjective measures of well-being are used in this thesis and discussed in the following section. Life satisfaction is selected as the indicator for subjective well-

being. Economic insecurity is represented by two indicators: regional unemployment rates and job insecurity. Economic insecurity is regressed on the dependent variable life satisfaction. Techniques used to estimate the life satisfaction equation are discussed in detail.

2.1.1: Utility Theories

Philosophers J.S. Mill and Jeremy Bentham laid the framework for modern economics in their theory of utilitarianism: The best societies are those where the greatest number of citizens experience the most happiness (Diener *et al.*, 2009). As quoted by Jeremy Bentham (1979):

> *"it is the greatest happiness of the greatest number that is the measure of right and wrong"*

Classical Utility Theory

For the last century, neoclassical economists have derived latent utility from goods and services based on decisions individuals make or the preferences they reveal as attributed by their market behaviour (Dolan *et al.*, 2008). This is based on the acceptance that utility or well-being is determined by the extent an individual can satisfy their preferences given a monetary constraint (Dolan *et al.*, 2008). These preferences are revealed through choices and market behaviour (Kahneman and Thaler, 2006) and therefore depend on the absolute level of an individual's economic conditions (Rayo and Becker, 2007). It is assumed that observed choices provide all of the information required to infer utility of an outcome (Frey and Stutzer, 2002b). One reason for this objectivist approach lies in the belief that choices are the only aspect of human behaviour that can be observed (Sen, 1986) which explains the disciplinary reluctance to look at individual intentions or subjective states (Kahneman & Krueger, 2006; Dolan & White, 2007). The benefit of such an approach is that utility theory provides a framework that can be used to compare alternative choices and decisions (Frey & Stutzer, 2000).

The utilitarian derivation of well-being is centred on the notion that higher incomes allow for higher consumption and therefore provide greater utility (McGillivray and Clarke, 2006). Utility is based on the satisfaction derived from

each choice and therefore it stands to reason that individuals will make choices based on their own self-interest or utility maximization (Aleskerov *et al.*, 2002). According to utility maximization theory the best choice is always the one that provides the highest level of utility to the decision maker (Frey and Stutzer, 2000).

Traditional neoclassical economics suggests that the revealed preference approach provides all information required to derive individual utility outcomes (Frey and Stutzer, 2002b). However, there exists literature from behavioural economics and psychology showing that individuals are not rational economic agents (Kahneman and Krueger, 2006). Individuals have been shown to make inconsistent choices, do not learn from past experience, exhibit hesitancy to trade, and relate their own satisfaction to perceived satisfaction of people around them (Kahneman and Krueger, 2006). If people do not act in a rational utility maximizing manner then their choices do not infer true preferences**.** The argument that traditional preference theory may not be an adequate measure of individual utility is intensified by observed inconsistencies between income and self-reported well-being measures.

Classical utility functions assume that higher levels of personal income correlate with higher levels of utility (Di Tella and MacCulloch, 2006). However, in 1974 Richard Easterlin introduced happiness data into economics as a proxy for individual utility. Puzzling relationships emerged between income and happiness. Easterlin (1974) discovered that within countries happiness responses were correlated with individual income. Wealther individuals reported higher levels of happiness than poor individuals within a given year in the United States (Easterlin, 1995, 2001). In other words, 'money buys happiness' (Frey and Stutzer, 2002a; Blanchflower & Oswald, 2004). However, after World War II many western industrialized nations underwent rampant economic growth suggesting from Easterlin's (1974) within-country findings, that across-country average happiness levels would also increase. However, this was not observed. Conversely average reported happiness levels remained relatively constant despite real income growth over the previous 50 years (Easterlin, 1974; Clark *et al.*, 2008). In other words, average happiness levels across countries were not systematically associated with higher income levels (Easterlin, 1974; Blanchflower & Oswald, 2004). This phenomenon continued to persist and in a study of 12 European countries between 1975 and 1991 when it was concluded that there was no correlation between real

GDP per capita and life satisfaction once individual characteristics and aggregate indicators were accounted for (Alesina et al., 2004). Counteracting happiness conclusions drawn from "within country" findings compared to "across country" findings were later identified as the phenomenon known as The Easterlin Paradox.

One explanation for this paradox lies in the restrictive definition of utility and the growing need to acknowledge the importance of nonfinancial variables in determining subjective well-being (Frey & Stutzer, 2002). In absolute terms, it is not the level of income that matters most but rather one's relative position to other individuals (Stutzer, 2004). The exclusive reliance on an objectivist approach to utility restricts the possibility of understanding and influencing human well-being. This led the way to resurgence of experienced utility literature.

Experienced Utility Theory

Experienced utility more closely matches the notion of happiness defined as the hedonic experience associated with an outcome (Kahneman and Thaler, 2006). According to Kahneman and Thaler (2006) this is the meaning of utility first brought forth by Jeremy Bentham and was retained by economists of the nineteenth century. Benthiam utility was defined as a continuous flow of pleasure or pain, positive or negative affect or life satisfaction (Kahneman *et al.,* 1997; Kahneman and Kruger, 2006). The next sections take a closer look at individual and social well-being followed by measures of well-being believed to capture a more expansive concept of utility. These measures of well-being are explained in Section 2.1.3 and fall under the concept of experienced utility theory.

2.1.2: Definitions of Well-Being

Achieving a state of well-being has been a focal point of philosophical thinkers since the time of Aristotle and considered to be the very core of human ethos (The New Economics Foundation, 2009). This focus has only recently crossed over into the sciences yielding an expansive body of literature on what constitutes the good life. Academic debate continues as to how to define well-being particularly regarding the distinction between fundamental factors of the concept and those that

are necessary, but external to, well-being (The New Economics Foundation, 2009). This section describes literature that focuses on individual and social well-being.

Individual Well-Being

The New Economics Foundation (NEF) (2009) reiterates the unimportance of identifying every facet of well-being and simply defines it as a dynamic process that gives people a sense of how their lives are going. More specifically well-being is defined as a positive physical, social and mental state that requires that basic needs are met, individuals have a sense of purpose, they feel they can achieve important goals, are able to participate in society and live the lives they value (NESC, 2009). There are six domains that make up the fundamental elements of individual well-being. These six elements are economic resources, work/participation, relationships/care, community/environment, health and democracy/values (NESC, 2009). The research of this thesis explicitly addresses the work/participation well-being domain.

In psychology well-being is dynamically characterized as an 'umbrella term' that incorporates all the valuations people make of their lives, events experienced, their state of mind and body and surrounding circumstances (Diener, 2006). Alternatively, in policy, well-being is typically viewed in terms of improved objective circumstances such as health and education (Sen, 1999).

While well-being and ill-being are subjective in nature, situated in a person's experiences, manifestations can be observed in verbal and nonverbal behaviour (Diener, 2006). Other definitions of well-being identify a baseline or subsistence level that when surpassed, individuals move to a post-materialistic phase where well-being is less influenced by income and more influenced by friends and family life (Inglehart, 1990). The recognition that nonfinancial factors influence well-being deviates from the traditionally held definition of well-being in economics as being able to fulfil desires or satisfy preferences (Harsanyi, 1982).

Many terms are used throughout the literature to define well-being and its many dimensions. Terms such as quality of life, welfare, living standards, utility, life satisfaction, prosperity, needs fulfilment, human development, and most recently

happiness are all used interchangeably (McGillivray and Clarke, 2006). Many times the term well-being is used over other subjective accounts to avoid the notion that there is something arbitrary or unknown about concepts involved (Diener, 2006).

Social Well-Being

Well-being can be measured in one of three ways: objective lists, preference satisfaction, and mental states or subjective well-being (Parfit, 1984). Objective list and preference satisfaction accounts are primarily based on basic human needs and rights (Dolan, *et al.*, 2011). These two measures have greater influence on policy as depicted in the conventional use of Gross Domestic Poduct (GDP) as a proxy for social welfare (Dolan and White, 2007; Dolan *et al.*, 2011).

Well-being Matters: A Social Report for Ireland (NESC, 2009) states that well-being relates to a person's physical, social and mental states. The report goes on to say it is the duty of public policy to bring about conditions that place individuals and their well-being at the centre of policy development and delivery by assessing risk and ensuring support systems are in place (NESC, 2009). The goal of public policy is not to maximize measured GDP (Kahneman *et al*., 2004). People only indirectly care about economic indicators like GDP and therefore they matter only in so far as to make people happier (Oswald, 1997).

Internationally there is increasing interest in human well-being and the economic, social, environmental and psychological factors that contribute to it (NESC, 2009). The key purpose of the NESC report is to identify and interpret social trends that impact social policy and well-being in Ireland. In doing so, the NESC calls for the need to move beyond one dimensional well-being indicators such as GDP and acknowledge previously ignored factors such as economic resources, work and participation, relationships and care, community and environment, health, and democracy and values.

The measurement of social welfare has long been controversial (Islam and Clarke, 2001). The ability to quantify and predict social and economic intervention outcomes is a powerful tool sought after by economists and policy makers (Islam and Clarke, 2002). The purpose of new social indicators is to provide information on

well-being beyond that which is conveyed in conventional economic measures like GDP (OECD, 2006).

Under assumptions of classical economics, national indicators such as GDP have been the primary measures of well-being. Governments rely on economic indicators like GDP to describe a country's success or failure in supporting the good life for its citizens (NEF, 2009). According to Islam and Clarke (2002) GDP and real national income are based on a calculation of prices and quantities as explained in the following equation:

$$GDP = Q * P \qquad \textbf{(2.1.1)}$$

where:

Q a vector of final quantity output (n x 1), $[Q^1, Q^2, \ldots, Q^n]$

P a vector of prices (1 x n), $[P^1, P^2, \ldots, P^N]$

Despite anomalies found in the relationship between economic growth and happiness, economists and policy makers still assume that an increase in GDP corresponds to increases in social welfare (McGillivray and Clarke, 2006). It is assumed that GDP is an adequate measure of social well-being under the rationale that all individuals would benefit from an increase in their country's total wealth (Soubbotina and Sheram, 2000). It is true that by increasing a nation's total wealth, it is more equipped to combat poverty and other social problems (Soubbotina and Sheram, 2000). However, economic growth has been achieved at social costs such as higher inequity and unemployment, weakened democracy, loss of cultural identity and overconsumption of finite resources (Soubbotina and Sheram, 2000). Moreover, economic growth measured by GDP has long been known to ignore factors such as wealth variation, international income flows, household production services, destruction of the natural environment and many determinants of individual well-being such as quality of social relationships, economic security, personal safety, health and longevity (Fleurbaey, 2009).

In other words, economic growth does not always lead to increased well-being (Easterlin, 1974). In a paramount study of well-being and economic growth, it was found that within countries at a specific time, individual happiness correlates with income levels (Easterlin, 1974). In relative terms the rich reported higher levels of happiness than the poor within a given year in the United States (Easterlin, 1995, 2001; Blanchflower and Oswald, 2000; Di Tella and MacCulloch, 2006). When looking at cross-country comparisons, it was paradoxically observed that despite rampant economic growth among many industrialized countries, real income levels did not systematically correlate with average national happiness levels (Easterlin, 1974; Clark, *et al.* 2008; Blanchflower & Oswald, 2004).

The mixed relationships between income and well-being have prompted many initiatives to move beyond single aggregate indicators of social well-being (CMEPSP, 2008). The New Economics Foundation (2009) emphasizes the combination of income based indicators like GDP with measures of individuals' well-being to yield a more comprehensive picture of social progress and national well-being. Reasons for a shift towards a well-being approach are described in the following Table:

Table 2.1.1 NESC Reasons for Adopting a Well-Being Approach

• A measure of social progress is needed beyond that of GDP • Because of the essential role of people in measuring economic and social progress • Because people care about their well-being and are increasingly becoming aware of what impacts it. • To monitor the impact of policy implementations and outcomes.

Source: NESC (2009)

The differences between an economic approach and a well-being approach when addressing social progress lies in the questions being asked and are outlined in the following Table:

Table 2.1.2 Examples of Well-Being Questions

Domain	Economic Approach	Well-Being Approach
Society	How can the government stimulate economic growth?	How dies economic growth influence well-being?
Income	How does income inequality influence economic growth?	Does income inequality influence well-being?
Work	How does pay influence productivity?	What makes a job enjoyable and engaging?
	What are the causes of unemployment?	Are happy workers more or less productive than unhappy workers?
Physical Health	How much is productivity reduced by illness?	Do individuals who report high well-being have better health than those who report low well-being?
Mental Disorders	How do mental disorders interfere with productivity?	How much misery does mental disorder cause?
Social Relationships	How are resources distributed within a household?	Why are married people on average happier than unmarried people?

Source: Diener and Seligman (2004)

2.1.3: Measures of Well-Being

Quality of life refers to the degree to which a person's life is desirable or undesirable (Diener, 2006) and falls under the umbrella of general well-being along with other concepts such as subjective well-being or happiness. Quality of life is objectively expressed and emphasizes external components such as environmental factors and income while subjective well-being is based on subjective experience (Diener, 2006). Well-being is a multifaceted concept and can be measured objectively or subjectively. This thesis uses life satisfaction as the indicator for subjective well-being.

2.1.3.1: Objective Well-Being

Standard economic theory measures well-being objectively by observing individuals' choices (Frey & Stutzer, 2002). This type of well-being falls under classical utility theory outlined in Section 2.1.1. One reason for the popularity of the objectivist method is rooted in the belief that choices are the only aspect of human behaviour that can be observed (Sen, 1986). Objective quality of life measures the degree to which life meets specified standards, as assessed by an outsider (Veenhoven, 2000). In psychology well-being can be divided into three general accounts according to Parfitt (1984):

- Mental-state accounts (subjective accounts)
- Desire-fulfilment accounts
- Objective-list accounts

According to Angner (2010) well-being is a state of mind. By definition, these accounts all see welfare as having to enter personal experience (Griffin, 1986). Subjectively felt experiences are both necessary and sufficient for personal well-being (Angner, 2010). In the desire fulfilment account a person's well-being is determined by the extent that their desires are fulfilled or their preferences are satisfied (Angner, 2010). These type of accounts most closely resemble traditional economic welfare measures like classical utility theory (Angner, 2010; Harsanyi, 1982). Desire-fulfilment accounts do not require the individual to experience any feelings of happiness or satisfaction (Angner, 2010). The ability to satisfy preferences is not the same thing as happiness or satisfaction. However, even preference list accounts are at least partially subjective in that they describe a person's desires or preferences (Angner, 2010). In contrast, according to objective-list accounts a person's well-being does not depend on any subjective factors. These accounts identify a list of things that are good or bad for people regardless of their wants (Chappell and Crisp, 1998). A list is provided by Parfit (1984) to include: moral goodness, rational activity, the development of personal abilities, having children and being a good parent, knowledge and the awareness of true beauty (Parfit, 1984). At the end of Parfit's discussion it is acknowledged that well-being

has multiple components and does not necessarily fit into the taxonomy presented. Rather it is possible to form a more comprehensive view of well-being by taking aspects of all three accounts.

2.1.3.2: Subjective Well-Being

Subjective well-being is an attitude referring to a person's cognitive and affective evaluations of their own lives (Lucas *et al.,* 1996; Diener, 2000). Specifically Diener (2006) defines subjective well-being as all the various types of evaluations, both positive and negative, that people make of their own lives. The field of subjective well-being is built on the presumption that to understand individuals' experienced well-being a direct examination of how a person feels about their life is appropriate (Diener and Suh, 1997). The underlying assumption is that well-being can be defined by conscious experiences in terms of hedonic experiences or cognitive evaluations (Diener and Suh, 1997). Cognitive evaluations are those such as life satisfaction, interest and social engagement; the components that refer to rational or intellectual aspects of subjective well-being (Lucas *et al.,* 1996). It has been shown that pleasant affect, unpleasant affect and life satisfaction are separate constructs (Lucas, *et al.,* 1996; Diener *et al*., 1999). Since the former two are responsive to short-term circumstances much of the literature focuses on measures of life satisfaction (Helliwell, 2003). Diener *et al*. (1999) further describes the constructs of subjective well-being as:

- People's emotional responses
- Domain satisfactions
- Global judgments of life satisfaction.

Domain satisfactions express individual satisfactions as different domains of life such as life, health, financial situation and job (Van Praag *et al.,* 2003; Diener, 2006). The notion that domain satisfactions aggregate to equal an overall satisfaction measure is still debatable in the literature (Van Praag *et al.,* 2003). The three constructs of subjective well-being are further explained in Table 2.1.3:

Table 2.1.3: Components of Subjective Well-Being

Emotional Response		Life Satisfaction Examples	Domain Satisfaction
Pleasant Affect	**Unpleasant Affect**		
Joy	Guilt and shame	Desire to change life	Work
Elation	Sadness	Satisfaction with current life	Family
Contentment	Anxiety Worry	Satisfaction with past	Leisure
Pride	Anger	Satisfaction with future	Health
Affection	Stress	Significant other's views of one's life	Finances
Happiness	Depression	-	Self
Ecstasy	Envy	-	One's group

Source: Diener *et al*. (1999)

Life satisfaction is defined as an all-encompassing global cognitive judgment of one's life and supported as being one of the most frequently used indicators of subjective well-being (Kahneman and Krueger, 2006). Similarly, this thesis uses responses taken from a life satisfaction survey question. Subjective well-being indicators like life satisfaction are believed to employ a more expansive concept of utility and welfare. These indicators include interdependent utility functions (Clark and Oswald, 1998) and account for the interconnectivity between rational and non-rational influences in economic behaviour (Graham, 2008).

Another indicator commonly used instead of life satisfaction is happiness. Happiness is thought of as being a relatively short-term measurement of subjective well-being that is very dependent on situational expressions of mood (Helliwell and Putnam, 2004). Happiness responses can capture brief periods of joy responsive to short-term circumstances (Helliwell, 2003). For this reason, much of the economic literature focuses on life satisfaction (Helliwell, 2003).

Contrary to objective well-being typically measured by an external party, subjective well-being is self-reported. Self-reported measures compose of four

factors: circumstances, aspiration, comparisons with others and a person's baseline happiness or dispositional outlook (Blanchflower and Oswald, 2004). A subjective approach to utility recognizes that each individual has their own definition of happiness based on implicit criteria (Frey and Stutzer, 2002a). Therefore solely observing market behaviour is an incomplete indicator of well-being (Veenhoven, 2000).

2.1.4: Validity and Limitations of Subjective Well-Being

According to Frey and Stutzer (2002a), people are believed to be the best judges of the quality of their own lives. A straightforward way of assessing well-being is to ask survey questions on self-reports of individual happiness or life satisfaction (Frey and Stutzer, 2002a). Behind the selected scores lie a cognitive assessment as to the extent that individuals measure the quality of their life in a favourable way (Veenhoven, 1993). Furthermore, subjective well-being is believed to be a valid measurement of individual latent utility (Frey and Stutzer, 2002a). The validity of life satisfaction data is exemplified in the literature where positive correlates emerge with other variables that plausibility capture (dis)utility such as unemployment (Clark and Oswald, 1994), absolute income level (Easterlin, 1974), inheritances or lottery winnings (Gardner and Oswald, 2001) or more outcome based analyses such as suicide (Daly & Wilson, 2009; Di Tella and MacCulloch, 2006).

External validity checks of well-being responses have been analysed in life science disciplines such as neurology and physiology where there is a strong positive correlation between emotional expressions like smiling and frowning to answers of well-being questions (Shizgal, 1999; Fernandez-Dols and Ruiz-Belda, 1995). Validity checks have been conducted on individuals' responses to well-being questions via a third party evaluation from a friend or family member (Diener and Lucas, 1999). When the third party was asked how happy they think the respondent is, their judgments tended to correlate with the original respondents answers. Table 2.1.4 provides a list of correlates to high life satisfaction and happiness responses.

Table 2.1.4: Correlates of High Life Satisfaction and Happiness

- Smiling Frequency
- Smiling with the eyes
- Ratings of one's happiness made by friends
- Frequent verbal expressions of positive emotions
- Sociability and extraversion
- Sleep quality
- Happiness of close relatives
- Self-reported health
- High income, high income rank in a reference group
- Active involvement in religion
- Recent positive changes of circumstances (increased income, marriage).

Source: Summary of Diener and Suh (1999), Layard (2005), and Frey and Stutzer (2002a). Found in Kahneman and Krueger, (2006)

Despite these new ideas not all are convinced as to the inclusion of subjective well-being research into contemporary economics. Graham (2008) urges a bit of caution is necessary because of potential biases that lie in survey data and the limitations to control for individual personality traits. A major criticism is that self-reported survey questions are prone to reporting errors in areas such as placement of well-being questions or the number of possible answers available (Schwarz and Strack, 1999). Bertrand and Mullainathan (2001) expand these concerns by saying these measurement errors may be correlated with other variables making it hard to distinguish something affecting happiness or a product of the error. Another concern lies in the comparability of ordered survey answers across individuals. Is person A's selection of 5 on a 10 point life satisfaction scale the same as person B's selection of 5? However, when the analysis moves beyond comparing two individuals at a time to analysing groups of individuals the problem of comparing well-being scores is greatly diminished (Di Tella and MacCulloch, 2006). In well-being equations an error term is included that absorbs, among other factors, the inability of humans to communicate accurately their happiness level (Blanchflower and Oswald, 2004). It is often assumed that when measured in groups, the combination of individual

happiness scores do reveal information regarding well-being (Di Tella and MacCulloch, 2006). Often the purpose of using self-reported well-being data is not to compare scores in an absolute sense but rather to identify the determinants of well-being measured as either happiness or life-satisfaction (Frey and Stutzer, 2002a). Therefore, the relevance of these issues lie in the intended use of the data. Di Tella and MacCulloch (2006) take into account all of these issues and conclude that self-reported well-being scores are believed to be a sufficient proxy for utility with some noise. However, they go on to say that the signal-to-noise ratio is high enough to make valid empirical use of the data.

2.1.5: Subjective Well-Being and Relativity Theory

The subjective well-being literature makes particular reference to the importance of relativities or interpersonal comparisons. People make assessments of their subjective well-being with regards to their circumstances and comparisons to others, past experiences, and expectations of the future (Frey and Stutzer, 2002a). The need to acknowledge relativities is apparent in the seminal works of Richard Easterlin (1974) who pioneered happiness economic research. The paradoxical findings of Easterlin are as follows:

Table 2.1.5: Easterlin's Income and Happiness Findings

1) Happiness levels across individuals within a specific country fluctuate directly with income.
2) The average level of reported happiness, within a given country, are constant over time despite significant economic growth
3) Although average reported happiness levels vary significantly across countries, they do not have a strong correlation with average national income.

(*Source*: Easterlin 1974)

Table 2.1.5 shows that average happiness levels across countries were not systematically associated with higher income levels (Easterlin, 1974; Blanchflower & Oswald, 2004). Easterlin (1974) concluded that economic growth will not advance the human lot; despite society's absolute prosperity it is society's constant relative deprivation that remains the dominant phenomenon.

This conclusion has been supported by numerous studies of Western industrialized countries that underwent rapid increases in per capita growth and subsequent constant or declining changes in happiness levels (Blanchflower and Oswald 2004, Alesina *et al.,* 2004). After the fall of the Berlin Wall, countries formally behind the Iron Curtain underwent rapid economic growth due to increased openness (Blanchflower and Oswald, 2004). However, in the following decade things went from bad to worse according to World Value Survey. It was shown that materialistic standards and well-being were actually at lower levels than they were in 1990 (Helliwell, 2003). In a study of 12 European countries, between 1975 and 1991 there appeared to be no correlation between real GDP per capita and life satisfaction when a variety of individual characteristics and aggregate indicators such as inflation rate and unemployment rates were controlled for (Alesina *et al.,* 2004)

One explanation of these inconsistent findings lies in the need to account for relativities. In other words it's not one's absolute level of income that influences well-being but rather a person's relative position to other individuals (Stutzer, 2004). Acknowledging the importance of relativity becomes apparent in the recent literature with the inclusion of relative income variables, albeit defined in various ways with various reference groups (Ferrer-i-Carbonell, 2005; Luttmer, 2005). This suggests that even with increases in income, well-being will not reciprocate these benefits if the income of reference groups also increase at similar rates (Dolan *et al.,* 2008). Moreover, for a given income level individuals with high aspirations and expectations exhibit lower levels of well-being due to adaption (Stutzer, 2004; Di Tella *et al.,* 2003). A common explanation for the Easterlin Paradox is that individuals are on a 'hedonic treadmill,' in that as absolute income increases, aspirations also increase until a level where basic needs are met. At this point it is relative income rather than absolute income that becomes the dominating factor in well-being (Graham, 2008). This conclusion spurred a host of published literature pertaining to relative income in the forms of income inequality (Alesina *et al.,* 2004),

one's relative position within the income distribution to neighbours (Luttmer, 2004), relative position to other socioeconomic groups (Dynan & Ravina, 2007) or reference groups and unemployment (Clark, 2003). This is not to say that absolute income does not increase happiness, but rather it does not raise happiness infinitely (Frey & Stutzer, 2002a).

While the conclusions made by Easterlin were solely income based, his work has elicited a host of literature pertaining to the importance of relativity. Relativities and unemployment are well-documented in the subjective well-being literature. Clark and Oswald (1994) and Oswald (1997) find that that the subjective cost of unemployment rather than the absolute loss of money income is most detrimental to subjective well-being. Clark (2003) concludes that personal unemployment always hurts, however it hurts less when there is more of it around. Unemployed individuals were less affected by increasing unemployment rates when compared to employed individuals. The reason being that unemployed individuals are closer to the social norm of unemployment therefore their well-being is less affected. Conversely, employed individuals were furthest away from the social norm of high unemployment and therefore significantly worse off by increasing unemployment rates. Employed individuals with unemployed partners reported significantly lower well-being scores than unemployed individuals with similarly unemployed partners (Clark, 2003). These findings emphasized the importance of relativities in unemployment with regional and partner reference groups (Clark, 2003).

2.1.6: Subjective Well-Being and Policy Implications

It is assumed that a goal of policy makers is to improve social welfare. Social welfare is defined as a function of health, education, security, individual freedom, culture, social relationships, level of contentment, control over other resources, satisfying wants, the environment, leisure, and housing (Islam and Clarke, 2002). The ability to quantify and predict social and economic welfare outcomes via various interventions is a powerful tool sought after by economists and policy makers (Islam and Clarke, 2002). At the macro-level policies are typically targeted towards reduction in poverty, unemployment or violent crimes as well as trying to increase the choices people have through a trickle-down effect of raising average incomes

(Dolan and White, 2007). It is believed that by increasing average incomes people are able to satisfy more of their material preferences, hence why wealth is seen as a dominating indicator of well-being (Dolan and White, 2007).

Subjective well-being has recently been integrated into policy analyses, being viewed as a complimentary aid in assessing costs and benefits of policies that have traditionally been difficult to quantify (Dolan and White, 2007). The innovation of subjective well-being into policy evaluation is particularly due to the acknowledgment that policies at the organizational, corporate and government levels should be centred on issues relating to well-being but more specifically people's evaluations and feelings about their lives (Diener and Seligman, 2004).

At the micro-level happiness outcomes are particularly important, considering it is impossible for policies to propose a Pareto-improving alternative (Frey and Stutzer, 2002a). In other words, any social action involves trade-offs and therefore imposes costs for some individuals. Moreover, public policies have effects that can run through income, productivity and other channels (Helliwell, 2003). These effects have the possibility of being positive via one channel and negative via another. Therefore, subjective assessments of welfare can be used to measure the offsetting net effects of various policy outcomes (Helliwell, 2003).

In economics it is recognized that there are a number of ways to measure how policies affect social welfare. The first is to look at how policies affect individual behaviour (Di Tella and MacCulloch, 2006). An example of the disconnect between policy intention and welfare outcomes is shown in a study of unemployment benefits and the well-being of the unemployed versus employed individuals. In Europe the 'happiness gap' between the employed and the unemployed did not secularly shrink with the increase of unemployment benefits during the period 1975-1992 as theory would suggest (Di Tella, *et al.,* 2003; Oswald, 1997). Some generous welfare states have been criticized for making life too easy for the unemployed. If this was the case then self-reported happiness levels of the unemployed would be expected to mirror those of the employed, or a narrowing of the gap (Di Tella *et al.,* 2003).

A second way to measure policy impacts on social welfare is to take predictions on behavioural changes and connect these to welfare through some theoretical model (Di Tella and MacCulloch, 2006). Clearly, even if there is a

consensus as to how policy will affect behaviour, there is usually little agreement as to how policy will impact welfare (Di Tella and MacCulloch, 2006). By combining subjective well-being research into policy analysis some of these offsetting factors can be accounted for.

2.1.7: Subjective Well-Being Determinants

Subjective well-being (SWB) equations are extensions of general well-being equations which are known to have a stable structure (Blanchflower and Oswald, 2004). Gardner and Oswald (2001) explain a well-being function as follows:

$$r = h\big(u(y, z, t)\big) + e \qquad \textbf{(2.1.2)}$$

where:

r	some self-reported number on an ordered well-being scale
u(…)	individual's true level of well-being
h(.)	non-differential function that relates actual to reported well-being
y	real income
z	set of demographic and personal characteristics
t	time period
e	error term

Subjective well-being is determined by a range of social, economic and environmental factors (Dolan *et al.,* 2008). This next section provides a literature review of the most common determinants of subjective well-being. Reported well-being is typically highest among those who are married, of high income, women, white, well-educated, retired and those looking after the home (Oswald, 1997). Blanchflower and Oswald (2004) support this in saying reported well-being is highest among women, married people, the highly educated and those whose parents did not divorce. Determinants of subjective well-being (SWB) are taken from the generic equation outlined in Dolan *et al.* (2008) as follows:

$$SWB_{report} = r(h) \quad \textbf{(2.1.3)}$$

Self-reported subjective well-being is often a response to a single life satisfaction or happiness question where *(r)* is a function of true SWB *(h)*. Subjective well-being is determined by a variation of social, economic and environment factors yielding the following additive empirical model for individual (*i*) in time period *(t)*:

$$SWB_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \varepsilon_{it} \quad \textbf{(2.1.4)}$$

where:

SWB	subjective well-being of individual (i) in time period (t)
α	the intercept
$\beta_1$and β_2	unknown parameters to be estimated
X_1 and X_2	observations of individual/national explanatory variables
ε_{it}	stochastic (random) error term allowing for individual differences in survey question responses

Subjective well-being for each individual will be hypothesized to depend on a vector of unknown parameters. This vector of parameters consists of personal, economic and social factors commonly associated with SWB (Dolan *et al.*, 2008). It is common in SWB regressions to include a vector of personal characteristics despite some studies claiming demographic variables only account for 15% of the variance in well-being (Argyle, 1999). In Blanchflower and Oswald (2004) subjective well-being equations are estimated with only socioeconomic and demographic characteristics and then estimated a second time with a full set of controls to account for income and other economic variables. The purpose of doing this is to identify the well-being of an unchanging representative citizen (Blanchflower and Oswald, 2004). This thesis uses a range of economic, social and demographic variables commonly found in the literature to estimate subjective well-being equations.

The measure of subjective well-being allows people's experienced utility to be captured including hard-to-quantify aspects such as general concerns about the economy and anxiety about job loss (Luechinger *et al.,* 2010a). Using this kind of measurement, people report their subjective well-being unaware of the researcher's intentions or knowing aspects of a specific study (Luechinger *et al.*, 2010a).

2.1.7.1: Subjective Well-Being and Unemployment Measures

Studies have consistently shown the negative effects of unemployment on well-being (Di Tella *et al.*, 2001, 2003; Frey and Stutzer, 2000, 2002a; Helliwell, 2003; Clark and Oswald, 1994; Clark 2003; Lelkes, 2006; Winkelmann and Winkelmann 1998). Some of these studies focus on well-being effects of becoming personally unemployed while others look at the effect of general unemployment typically measured as unemployment rates.

The negative implications of unemployment on well-being are especially pertinent to Ireland as the NESC (2009) states participation in meaningful activity contributes to human flourishing and well-being. One of the greatest expressions of participation is paid employment which underwent rampant growth during the boom years followed by a recession and mass unemployment (NESC, 2009).

Personal Unemployment

In the subjective well-being literature it is commonly found that the unemployed have on average between 5-15% lower life satisfaction scores than the employed (Frey and Stutzer, 2002a). Lelkes (2006) found that being unemployed reduces the probability of reporting high life satisfaction by 19%. The effect of becoming personally unemployed is consistent and always large. It is equivalent to dropping from the top to the bottom of an income quartile (Di Tella *et al.*, 2003). This finding supports the conclusions by Clark and Oswald (1994) that the relationship between becoming personally unemployed and subjective well-being is negative and the effect is quantifiably large. Becoming jobless depresses well-being more than any other personal characteristic even the negative ones like divorce or spousal separation (Clark and Oswald, 1994). The relationship between

unemployment and well-being is so pronounced that to compensate men for becoming unemployed it would take a rise in income of approximately $60,000 per annum to maintain the same level of well-being (Blanchflower and Oswald, 2004).

Joblessness can have non-pecuniary costs due to employment being more than a source of income but also a provider of social relationships, identity in society and individual self-esteem (Winkelmann and Winkelmann, 1988). Unemployment is a major economic source for psychiatric stress where individuals rate the subjective cost of unemployment far higher than the corresponding loss of money (Clark and Oswald, 1994) which is also supported by suicide data (Oswald, 1997).

The possibility that individual's with low levels of life satisfaction fall into unemployment more often is a common limitation cited in cross-section studies (Clark and Oswald, 1994). In a study that looks at the voluntariness of unemployment, the data indicates that the unemployed appear to be less happy than those who have jobs and therefore can be inherently less desirable as employees (Clark and Oswald, 1994). However, with repeated observations for the same individuals it becomes possible to control for unobserved time-invariant individual specific effects, such as personality traits, that are correlated with unemployment (Winkelmann and Winkelmann, 1998; Ferrer-i-Carbonell and Frijters, 2004). Using a large panel dataset Winkelmann and Winkelmann (1998) conclude unemployment *causes* dissatisfaction. Some studies have found the magnitude of unemployment and other economic variables may be smaller than initially suspected when fixed effects were accounted for (Ferrer-i-Carbonell and Frijters, 2004; Luttmer 2005).

Relative Unemployment

The harmful effects of unemployment to individual well-being can vary significantly based on the degree of social norms, or social acceptance of being unemployed in society (Clark, 2003). Social norms refer to beliefs held by society members or more generally relative others (Akerlof, 1980). The main implication of unemployment as a social norm is that the psychological impact of an individual's own unemployment situation will be reduced by a higher rate of unemployment among relative others (Clark, 2003). The relevant groups used to test this employment norm are the unemployment rates of those in the same region, partner

unemployment status and household unemployment. In general unemployment is a depressant of individual well-being but interesting findings emerge upon closer examination of subsamples of individuals. The well-being of the employed subsample is often lower if the unemployment rate of others is high (Clark, 2003). On the contrary, unemployed individuals report higher levels of well-being as others' unemployment rises. In other words, people care about relative unemployment even if they themselves are employed. With regards to partner unemployment, a partner's joblessness reduces the well-being of employed individuals but raises the well-being of unemployed individuals (Clark, 2003). Individual well-being is directly affected by relative unemployment of a spouse. A higher household unemployment rate is negatively correlated with the well-being of employed individuals and positively correlated with the well-being of unemployed respondents (Clark, 2003).

When an OLS regression is run on the well-being gap of the employed and unemployed it is found that regional unemployment yields coefficients of -0.033 and 0.094 respectively (Clark, 2003). These estimates indicate that regional unemployment affects the well-being of employed individuals negatively and the well-being of unemployed individuals positively. This gives way to the macroeconomic implication that unemployment hurts less the more there is of it around (Clark, 2003).

Aggregate variables such as income inequality and regional unemployment have also been introduced as potential determinants of individual well-being (Helliwell 2003, Di Tella *et al.*, 2001; Alesina *et al.*, 2001).These studies have used these aggregate indicators to look at the notion of relativity inspired by Easterlin's (1974) conclusions on relative income.

General Unemployment

Unemployment can be measured regionally across countries (Wolfers, 2003; Di Tella *et al.*, 2001) or at the state level (Di Tella *et al.*, 2001*;* Leuchinger *et al.*, 2010a). In a study across 12 European countries the inflation-unemployment trade-off is applied to subjective well-being equations (Di Tella *et al.*, 2001). Unemployment is calculated as a three year average of each country's national unemployment rate from the OECD Centre for Economic Performance dataset. It is

concluded that unemployment depresses well-being more than inflation. The estimates suggest that people would trade off a 1-percentage-point increase in unemployment for a 1.7-perentage-point increase in inflation (Di Tella *et al.*, 2001). Wolfers (2003) reports similar findings that high inflation and high unemployment both decrease individual well-being but the latter does so to a greater extent. Moreover, a 1-percentage-point increase in the unemployment rate from its mean (from 9 percent to 10 percent), reduces self-reported life satisfaction by 0.028 units on a four-point scale (Di Tella *et al.,* 2001). This small rise in unemployment is equivalent to more than two percent of the population dropping from one life satisfaction category to the next (Frey and Stutzer, 2002a).

High unemployment rates can have detrimental effects on people who are not personally affected by unemployment (Clark, 2003; Leuchinger *et al.*, 2010a; Di Tella *et al.*, 2003). In a study of European Union member countries, aggregate unemployment decreases average reported life satisfaction even if personal employment status is held constant (Di Tella *et al.*, 2003). The effect of regional unemployment on well-being is so substantial that according to estimates the average working individual in the population would have to be compensated by approximately $200 to offset the loss in life satisfaction caused by a typical US-sized recession which is defined as a minimum of a 1.5 percentage point increase in the unemployment rate (Di Tella *et al.,* 2003).

Luechinger *et al.* (2010a) use regional unemployment rates to act as a proxy for what they term economic insecurity. Economic insecurity is understood as the anxiety produced by perceived economic threat or the anticipatory feelings that are evoked by potential future hazards, specifically potential job loss (Luechinger *et al.,* 2010a). Unemployment rates are selected as the economic insecurity indicator because unemployment in general has effects on individuals' current and future economic situations (Luechinger *et al.,* 2010a). High unemployment rates can have workplace implications such as changes in working hours, salaries and most importantly the exposure to job loss making it so even individuals with jobs are affected (Luechinger *et al.,* 2010a). Due to pressure on salaries in times of economic shock, a worker who is employed in an area of high unemployment earns less than an identical individual who works in a region with less joblessness (Blanchflower and Oswald, 1994). However, these are realized consequences of unemployment

whereas similar to Luechinger *et al.,* (2010a) this thesis focuses on feelings of anticipated economic distress brought on by high unemployment rates. These feelings of distress are the product of an individual facing a greater probability of becoming unemployed and are expected to manifest in in individual well-being. An individual's well-being may be affected by unemployment rates, even if they themselves have a job, through the information conveyed about potential hazards. Luechinger *et al.,* (2010a) use unemployment rates to measure economic insecurity or act as an instigator of these feeling of distress caused by potential job loss.

Unemployment and Alternative Findings

In a minority of literature unemployment has been found to be less detrimental to well-being than commonly cited in the literature. Social comparisons are a prevalent issue in the research of the economics of happiness (Luechinger *et al.*, 2010a). Clark (2003) found that regional unemployment increased the well-being of unemployed individuals due to individual comparisons to social norms. Unemployed individuals were closer to the social norm in areas of greater unemployment whereas employed individuals were further away from the norm and therefore worse off. Luechinger *et al.,* (2010a) state that the effect of regional unemployment rates run through the channel of potential hazards and not through a channel of social comparisons. If the effect of regional unemployment is a result of social comparisons this could counteract some of the general negative consequences on society (Luechinger *et al.*, 2010a).

Unemployment and Sectoral Workers

Workers in the private and public sector differ fundamentally in their exposure to potential unemployment. Employment in the public sector is traditionally seen to be less volatile than the private sector (Freeman, 1987). Historically public sector workers have not been as affected by business cycles and economic downturns and therefore they are less likely to perceive economic insecurity (Clark and Postel-Vinay, 2009). A lower sensitivity to economic shocks in the public sector is due to employment contracts and stricter dismissal practices

(Luechinger *et al.,* 2010a). During times of high unemployment people tend to search for more secure jobs and this is apparent in Kruger's (1988) findings where queues for government jobs lengthen during times of economic downturns. Due to these institutional differences the well-being of private sector workers is affected by general externalities and economic insecurity caused by increasing unemployment whereas public sector workers are only affected by general externalities (Luechinger *et al.,* 2010a). Therefore any difference in the well-being of private and public sector workers is the result of increased economic insecurity (Luechinger *et al.,* 2010a).

2.1.7.2: Other Determinants of Subjective Well-Being

Type of Work

At the societal level, once materialistic basic human needs are met differences in well-being are less affiliated with income and more a product of factors such as social relationships and enjoyment at work (Diener and Seligman, 2004). There is very little supporting evidence to make definitive conclusions about the relationship between types of work and well-being (Dolan *et al.,* 2008). Given the amount of time people spend at work it's reasonable that expanding employment status beyond a simple yes/no response is needed in further well-being research (Dolan *et al.,* 2008). The existing well-being literature that addresses specific types of employment is in its infancy with incongruent conclusions that are largely limited to the self-employed. The relationship between self-employment and well-being is reported as being positive in Blanchflower and Oswald (1998) due to rents attributed to self-employment. Other studies find conflicting results where a negative relationship exists between self-employment and individual well-being (Clark, 2003). One study draws on a combination of both extremes finding a positive relationship only exists among the rich when capital constraints are no longer a major concern (Alesina *et al.,* 2004).

Studies identifying well-being outcomes for various sectoral workers are even fewer. Luchinger *et al.* (2010a) look at the effects of regional unemployment on the subjective well-being of public and private sector workers. This article is often cited in other studies referring to their approach as a way to exploit inherent institutional differences among sectoral workers in an attempt to correct for issues of

endogeneity (Artz and Kaya, 2014). The only other study to identify well-being implications of economic insecurity for public and private sector workers is Artz and Kaya (2014). By looking at well-being in relation to various types of employment, an expansion beyond simple yes/no indicators of employment will broaden existing literature (Dolan *et al.* ,2008).

Inflation

The impact inflation has on subjective well-being is studied across countries and across time. Some subjective well-being literature has included macroeconomic variables as potential determinants. These studies have found a consistent negative relationship for inflation across countries and years (Alesina *et al.,* 2004; Di Tella *et al.,* 2001; Di Tella *et al.,* 2003; Wolfers 2003). In a study of 12 European countries short term implications of the unemployment-inflation trade-off are identified in subjective well-being movements (Di Tella *et al.,* 2001). Since reducing inflation can be costly in terms of excessive unemployment it is concluded that while both macroeconomic variables are harmful unemployment has a larger impact on subjective well-being. A single-point increase in inflation from it mean (from 8 percent to 9 percent) leads to a 0.012 reduction on the life satisfaction scale (Di Tella *et al.,* 2001). Similarly increasing the inflation rate by 5 percent which is historically common, reduces subjective well-being by 0.05 units (Frey and Stutzer, 2002a). This effect is large and means that 5% of the population moves down one category on the life satisfaction scale (Frey and Stutzer, 2002a).

In a study of 12 European countries from 1975-1992 the unemployment rate is not significantly related to self-reported happiness levels, however, the inflation rate does enter into the regression negatively and statistically significant at the 5% level (Alesina *et al.,* 2004). A one standard deviation increase in the inflation rate, equal to 0.058, leads to a fall in the proportion of poor people reporting themselves as *'very satisfied'* by 3.0 percentage points (Alesina *et al.,* 2004). This study then focuses on the effect inflation has on the subjective well-being of subgroups, those with left-wing or right-wing political views and those classified as rich or poor. It appears that inflation is worse for those with right-ring political views and for those who are classified as rich.

Wolfers (2003) expands the data used in Di Tella *et al.* (2001) to include 16 European countries from the original 12 countries and the years 1973-1998. This produces a panel of 504,581 individual responses to the life satisfaction question in 274 country-years. It is confirmed that high inflation lowers perceived well-being. Moreover, the effects of inflation volatility on well-being are small and not as easy to detect as the moderately adverse effects of unemployment volatility.

Age

Studies consistently find a U-shaped relationship between age and subjective well-being (Blanchflower and Oswald, 2004; Clark and Oswald, 1994). When age is regressed on happiness or life satisfaction the estimated relationship is negative but when age-squared is regressed on happiness or life satisfaction the estimated relationship is positive. The U-shape varies with regards to being a man or a woman with minima at 37-years-old and 41-year-old respectfully (Blanchflower and Oswald, 2004). Early studies characterized a happy person as being young (Wilson, 1967) however recent studies have separated age effects from those of income, health and other socioeconomic variables. This then renders no systematic relationship between age and well-being (Diener *et al.,* 1999).

Gender

Blanchflower and Owald (2004) discovered interesting patterns for gender in their subjective well-being regressions across the United States and Europe. Despite anti-discrimination policies for women, well-being across time did not systematically increase as to be expected. However, at a particular point in time women tend to report higher levels of subjective well-being (Blanchflower and Oswald, 2004; Alesina *et al.*, 2004). Conversely, mental distress, another measure of subjective well-being, was found disproportionally among women (Clark and Oswald, 1994). These contradictory findings suggest that other correlates may be more important in determining subjective well-being (Dolan *et al.,* 2008). It is found that being unemployed negatively affects both men and women, but the magnitude is more sever for men (Clark, 2003).

Race

Across time in the United States black individuals report greater subjective well-being (Blanchflower and Oswald, 2004). In the same study the well-being of white individuals displayed a negative association with subjective well-being. However, at a particular point in time black individuals are less happy than white individuals as shown in a regression where age, age squared, gender and race are the only explanatory variables (Blanchflower and Oswald, 2004).

Marital Status

It is consistently found that being alone is far worse for subjective well-being than being in a partnership (Helliwell, 2003; Blanchflower and Oswald, 2004). Being married contributes to the highest levels of subjective well-being and being separated is associated with the lowest levels (Helliwell, 2003). The single greatest depressant of subjective well-being is being separated followed by being widowed (Blanchflower and Oswald, 2004). To put a value on the extent of this association, a lasting marriage compared to being widowed is estimated to be worth approximately $100,000 per annum (Blanchflower and Oswald, 2004). However, both Blanchflower and Oswald (2004) and Frey and Stutzer (2002a) say these estimates are to be used cautiously as they are the only estimates of their kind in the literature.

Divorce can have effects on individuals not directly involved. Parental divorce negatively correlates with self-reported measures of well-being (Blanchflower and Oswald, 2004). Furthermore, a second marriage does display a positive relationship to subjective well-being however the magnitude of the coefficients are not as high as first time married individuals (Blanchflower and Oswald, 2004).

Lucas (2005) looks at adaption with regards to marital status and finds that well-being tends to drop in the time period just before divorce and widowhood. After such life events, subjective well-being can take years to stabilize and it may never reach baseline levels again. However, as is the case with all adaption literature, the rate and degree of adaption varies across individuals (Lucas, 2005). The fact that

separated individuals report lower levels of self-reported well-being than divorced individuals may reflect habituation and adaptions effects (Helliwell, 2003). The average divorced person has undergone longer states of either divorce or separation and therefore has had a longer time to adapt (Helliwell, 2003).

Religion

It is typically found that religious activities such as church attendance and personal prayer as well as religious beliefs are positively correlated with subjective well-being (Luttmer, 2005; Clark and Lelkes, 2005). Ellison (1991) states that a host of religious variables account for 5% to 7% of the variation in life satisfaction. Helliwell (2003) tries to identify if this relationship is caused by religious conviction and beliefs or the social connectedness that religious communities provide through participation in church activities. Both variables are shown to be positive and statistically significant and apply across all major faiths (Helliwell, 2003).

Religion can be measured a number of ways, for example, survey questions asking how important God is in individuals' lives (Helliwell, 2003) or on a scale of 1-10 indicating how religious the individual is (ESS, 2013). Sometimes a more objective approach is taken by looking at church attendance (Helliwell, 2003; Clark and Lelkes, 2005). Attending church at least once a month can have positive effects on subjective well-being (Clark and Lelkes, 2005). However since attendance of 'once a week or more' is lumped into the category of 'at least once a month' this relationship could be capturing the correlation of the former group. This is supported by Helliwell (2003) where individuals who attend church "weekly or more" display higher life satisfaction measures.

Religion has also been shown to protect individual well-being against the impact of certain stressful life events such as divorce and unemployment (Clark and Lelkes, 2005). All religious denominations suffer less psychological harm from unemployment than non-religious individuals (Clark and Lelkes, 2005). This degree of religious protection against negative life events depends on the combination of religious denomination and the type of life event. Both Catholics and Protestants are less hurt by marital separation however they fundamentally differ with regards to divorce. Catholics are punished for divorce while Protestants are protected against it

(Clark and Lelkes, 2005). These differences may be due to a violation of the assumption that religion is exogenous to the negative life events such as unemployment and divorce. It may also be the case that in an area of many religious individuals economic downturns such as unemployment may have a lesser impact. Clark and Lelkes (2005) identify this further by looking at policy implications of different well-being responses among religious individuals with regards to unemployment. If religious individuals are inherently protected against unemployment they might be less inclined to support unemployment benefits (Clark and Lelkes, 2005).

Education

The effect that education has on subjective well-being is not consistent throughout the literature and subject to other control variables (Helliwell, 2003) and alternative measures of well-being like mental health scores (Clark, 2003). Some studies have found that education has a positive effect on subjective well-being (Blanchflower and Oswald, 2004). Years of schooling are positively related to self-reported happiness levels as expected by economists considering years of schooling could act as a proxy for earnings (Blanchflower and Oswald, 2004). Alternatively, Stutzer (2004) finds that individuals located in middle education groups report the highest levels of happiness. In a study where well-being is approximated by mental health scores from the General Health Questionnaire (GHQ), self-reported well-being is lower among those with higher levels of education (Clark, 2003).

A major criticism of reported correlations between education and subjective well-being is the impact of other variables such as health status and income. Helliwell (2003) finds the partial effects of different levels of education on subjective well-being are found to be small and insignificant. The expected beneficial effects of education may be absorbed by other factors like income and health status (Helliwell, 2003). This notion that education may only be indirectly related to well-being is supported in an earlier study showing this relationship for the United States is small, not significant and at times is even negative (Diener *et al*., 1993). However, a finding of little to no relationship between education and subjective well-being is surprising since education is the strongest systematic

determinant of individual participation in many social activities (Putnam, 2000). These social connections have been linked to increased well-being.

Clark and Oswald (1994) introduce the theory of expectations and aspirations with regards to education and subjective well-being. They find that highly educated individuals became more distressed than less educated individuals with regards to negative life events like becoming personally unemployed. Being out of work was more detrimental to the well-being of highly educated individuals because of their higher expectations. Education may interfere with subjective well-being if it leads to expectations and aspirations that cannot be obtained (Clark and Oswald, 1994). This notion of expectations and aspirations might be present in the findings where education has been seen to be more correlated with the well-being of individuals from lower incomes (Diener et al., 1993) and poorer countries (Veenhoven, 1994).

Income

Some of the earliest economists to conduct subjective well-being research did so with with a particular focus on income and relative income (Easterlin, 1974; Clark and Lelkes, 2005). Income is a very complex area of subjective well-being research that has yielded mixed results (Dolan *et al.,* 2008). Overall the findings suggest a positive but diminishing relationship between income and subjective well-being (Dolan *et al.,* 2008). The positive effect of personal income on subjective well-being is extensively documented in the literature (Frey and Stutzer, 2002a; Frey and Stutzer, 2000; Blanchflower and Oswald, 2004; Di Tella and MacCulloch, 2006). Richer people have been found to report higher levels of subjective well-being (Frey and Stutzer, 2002a; Frey and Stutzer, 2000 Blanchflower and Oswald, 2004; Di Tella and MacCulloch, 2006). Higher well-being with increasing income at a particular point in time is due to greater purchasing power (Frey and Stutzer, 2002a). However, this relationship does not persist indefinitely (Frey and Stutzer, 2002a). At higher income levels, increases in income do not proportionally correspond to increases in well-being giving way to the diminishing marginal returns hypothesis (Frey and Stutzer, 2002a). Moreover, by controlling for individual fixed effects such as personality traits the observed relationship between subjective well-being and income can be reduced (Ferrer-i-Carbonell and Frijters, 2004). The commonly found

positive association between income and subjective well-being can also in part be explained by reverse causation where higher well-being can lead to higher future incomes (Diener *et al.*, 2002).

Subjective well-being literature suggests that relative income has a larger effect than a person's absolute income (Sousa-Poza and Sousa-Poza, 2000; Ferrer-i-Carbonell, 2005; Luttmer, 2005). This suggests additional income may not systematically increase well-being if the income of relative others proportionally increases (Dolan *et al.,* 2008). This finding supports the findings by Easterlin (1974) that it is not necessarily the absolute level of income that matters but rather one's relative position to others. Moreover, as income increases well-being does not proportionally increase over individuals' life spans (Frey and Stutzer, 2005). This supports the notion of adaption or habituation effects to individual circumstances as presented in Easterlin (1974).

Job Insecurity

Luechinger *et al.* (2010a) explain that their use of regional unemployment rates is linked to a small portion of well-being literature that also looks at job insecurity. Job insecurity is defined as an individual view as to how likely they are to lose their jobs (Blanchflower and Oswald, 1999). It is mainly seen as a stressor with probable unfavourable consequences for employees (Cheng *et al.,* 2005). Job insecurity is linked to feeling of powerlessness and a feeling of lack of control which are known to be depressants of well-being (De Witte, 1999).

Manski (2004) shows that expectation data, such as job insecurity, are reliable in that they help to predict future behaviour and outcomes. Stephens (2004) looks at how subjective expectations of future job loss affect household consumption. Job loss expectations are correlated with expectations of future income subsequently decreasing consumption. Job insecurity has also been identified for health outcomes (Bohle *et al.*, 2001). These correlations, known to associate with well-being, support the justification put forward by Luechinger *et al.,* (2010a) to look at insecurity measures in a subjective well-being context. Job insecurity has been found to significantly decrease life satisfaction and subjective mental health (Cheng *et al.*, 2005; De Witte, 1999; Greene 2011; Silla *et al.,* 2009). The negative

effect of job insecurity can be just as detrimental to life satisfaction as actually becoming unemployed (Wichert, 2002).

2.1.8: Definition and Estimation of Ordered Data

Empirical analysis is used to estimate the relationship between economic insecurity and subjective well-being of public and private sector workers in Ireland. Empirical analysis is a method of using data to test a theory or estimate a relationship (Wooldridge, 2013). Multiple regression analysis is used because it identifies the intended relationship while controlling for other factors which simultaneously affect the dependent variable (Wooldridge, 2013). The empirical analysis of this study follows Luechinger *et al.* (2010a) where the model is selected based on the ordered nature of the dependent variable life satisfaction.

Researchers have used subjective questions for over three decades to measure life satisfaction and happiness (Ferrer-i-Carbonell and Frijters, 2004). The answers to these questions are categorical and ordered. An ordered response is one kind of multinomial response where the values assigned to it are not arbitrary (Wooldridge, 2010). Individual responses taken from a life satisfaction question are inherently ordered in that outcomes associated with high subjective well-being are ranked higher than the outcomes associated with lower subjective well-being (Borooah, 2002). The end result taken from survey questions is invariably an ordered categorical evaluation of the quality of life of the individual (Ferrer-i-Carbonell and Frijters, 2004). These responses are classified as ordered data because they follow a strict ordering based on the value of the underlying latent variable, well-being (Hilmer, 2001). This ordered nature of the outcomes have no implication for differences in the strength of the outcomes in that individuals who report a life satisfaction of 2 are not twice as better off compared to those individuals who report 1 (Borooah, 2002). Consequently, the actual values taken by the ordered dependent variable are irrelevant so long as larger values are associated with greater subjective well-being (Borooah, 2002).

In Luechinger *et al.* (2010a) the dependent variable is life satisfaction and is measured on a 4-point scale consisting of the following options: very satisfied, fairly satisfied, not very satisfied, and not at all satisfied. The probit and logit models have

been successfully applied in numerous studies of the determinants of happiness and subjective well-being (Frey and Stutzer, 2002a). Many studies focusing on subjective well-being determinants have specifically used the ordered probit model in their econometric estimation of the subjective well-being equation (Blanchflower and Oswald, 2004; Clark and Oswald, 1994; Clark, 2003, Helliwell, 2003; Frey and Stutzer, 2002a).

In identifying sectoral differences in the relationship between life satisfaction and economic insecurity, an empirical model must be selected based on the dependent variable. An ordered dependent variable calls for the use of the maximum likelihood estimation method of an ordered probit model (Borooah, 2002). Sometimes there are instances where the variable of analysis is a code for some qualitative discrete outcome such as a 'yes' 'no' decision which are also called qualitative choice models (Borooah, 2002; Greene, 2000). In such instances the dependent variable takes a discrete number of mutually exclusive and exhaustive values (Borooah, 2002). When the dependent variable is measured categorically and on an ordered scale conventional linear regression models are no longer applicable and probit or logit models are the most appropriate econometric techniques (Borooah, 2002; Green, 1993).

Life satisfaction is the discrete dependent variable used in this thesis assed on a scale of 11 categories ranging from zero *'extremely dissatisfied'* to ten *'extremely satisfied'* (European Social Survey, 2010). Someone who reports they are 'extremely satisfied' has a higher subjective well-being than someone who reports they are 'extremely dissatisfied' on the life satisfaction scale however the exact difference cannot be quantified. Thus, standard ordinary least squares regression is less desirable and ordered logit or probit models more desirable because they accommodate this lower measurement level (Borooah, 2002).

Applying linear regression techniques to ordered data assumes that the difference between coded outcomes such as 3 and 4 is the same as the difference between coded outcomes such as 2 and 3 (Greene, 2000). However, these numbers are only rankings and have no cardinal significance (Borooah, 2002). The inherent ordered nature of outcomes have no implications for the differences in strength between the outcomes (Borooah, 2002). Regression techniques that fail to account

for the ordered nature of the dependent variable, such as linear regression techniques, may lead to less efficient estimates (Borooah, 2002).

A major assumption of the logit and probit model is that of parallel slopes. If there is a variable that affects the likelihood of a person being in a specific ordered category such as 'extremely satisfied' ($y_i = 10$), then it is assumed that the coefficient linking the variable to the different outcomes will be the same across outcomes (Borooah, 2002). In other words an explanatory variable will affect the likelihood of a person reporting a life satisfaction of 'extremely satisfied' exactly as it will affect the likelihood of them reporting 'extremely dissatisfied.'

A reasonable question is which model, the ordered logit or ordered probit, is preferred? The theoretical difference between these two models lies in the distribution of the error term, logistic versus normal respectively (Borooah, 2002). In the absence of knowing the probability distribution of the error term, we have to assume that the error follows a particular probability distribution (Borooah, 2002). This assumed distribution of the error term is the difference between the logit and probit model. The logistic distribution is similar to the normal distribution except the tails are substantially heavier (Greene, 2000). The normal distribution has been used in many analyses (Greene, 2000) which have given rise to the ordered probit model commonly used in analyses of discrete ordered responses (McKelvey and Zavoina, 1975). Most of the time it is difficult to justify the choice of one distribution over another on sheer theoretical grounds and in most applications it seems to not make much statistical difference (Greene, 2000). The cumulative distribution function of a logistic distribution (Borooah, 2002; Greene, 2000) is explained as follows:

$$\Pr(X \leq x) = \Lambda(x) = \frac{e^x}{[1+e^x]} = \frac{1}{(1+e^{-x})}$$

(2.1.5)

The cumulative distribution of a standard normal variate (SNV)[2] (Borooah, 2002; Greene, 2000) is explained as follows:

$$\Pr(\mathrm{X} < \mathrm{x}) = \Phi(\mathrm{x}) = \int_1^x \frac{1}{2\pi} e^{\frac{-X^2}{2}} dX$$

(2.1.6)

2.1.8.1: The Ordered Probit Model

The ordered probit model is based on a latent regression (Greene, 2000; Stewart, 2004) as follows:

$$y_i^* = \beta x_i' + \varepsilon_i \quad \text{For } i = 1, \ldots, \mathrm{N} \qquad \textbf{(2.1.7)}$$

where:

y_i^* unobserved underlying latent variable

x_i vector of observations on a set of explanatory variables

β vector of unknown parameters

ε_i random error tem with the distribution function presented in Equation 2.1.5 or 2.1.6

In well-being data individuals report a number on a scale from 0 to 10 that represents their closest feeling to true individual well-being (y^*). However, the exact degree of a person's well-being is difficult if not impossible to observe (Borooah, 2002). y_i^* itself is not observed, rather the observation variable y_i is discrete and takes on a value {0, 1, 2,…, J}. Individual well-being, is a *latent* variable

[2] Normally distributed with mean 0 and variance 1

(Blanchflower and Oswald, 2001; Frey and Stutzer, 2002a), which while conceptually useful is unobservable in either principal or practice (Stewart, 2004). The subjectivity of responses can be thought of as being swept into the error term (Blanchflower and Oswald, 2001). If y_i^* was observed for all observations, β could be estimated by ordinary least squares without imposing a distributional assumption on the error term (Stewart, 2004). While an individual's well-being cannot be directly observed, subjective well-being indicated by answers to a life satisfaction survey question can be.

According to Greene (2000) the observed dependent variable y_i relates to the latent dependent variable y_i^* as follows:

$$
\begin{aligned}
y_i &= 0 \quad \text{if} \quad y_i^* \leq 0 \\
y_i &= 1 \quad \text{if} \quad 0 < y_i^* \leq \mu_1 \\
y_i &= 2 \quad \text{if} \quad \mu_1 < y_i^* \leq \mu_2 \\
&\vdots \\
y_i &= J \quad \text{if} \quad \mu_{j-1} \leq y_i^*
\end{aligned}
\qquad \textbf{(2.1.8)}
$$

where:

y_i observed discrete dependent variable

y_i^* unobserved latent dependent variable

μ_j threshold parameters of cut-off points such that $\mu_1 < \mu_2 \cdots < \mu_{J-1}$

Thus, the range of y_i^* is portioned into *J* mutually exclusive and exhaustive intervals and the variable y_i indicates the interval into which a particular observation falls (Greene, 2000). With a normal distribution the following properties hold:

$$\Pr(y_i = \mathrm{j}) = \begin{cases} \mathrm{Prob}(\mathrm{y}=0|x) = \Phi(-x_i'\beta) \\ \mathrm{Prob}(\mathrm{y}=1|x) = \Phi(\mu_1 - x_i'\beta) - \Phi(-x_i'\beta) \\ \mathrm{Prob}(\mathrm{y}=2|x) = \Phi(\mu_2 - x_i'\beta) - \Phi(\mu_1 - x_i'\beta) \\ \cdot \\ \cdot \\ \cdot \\ \mathrm{Prob}(\mathrm{y}=\mathrm{J}|x) = 1 - \Phi(\mu_{j-1} - x_i'\beta) \end{cases}$$

(2.1.9)

where:

Φ cumulative normal distribution of ε_i

According to Stewart (2004) If the following notation is adopted where $\mu_0 = -\infty$ and $\mu_J = +\infty$ then these can be rewritten more compactly as:

$$\Pr[y_i = j] = \Phi(\mu_j - x_i'\beta) - \Phi(\mu_{j-1} - x_i'\beta) \qquad \textbf{(2.1.10)}$$

This applies for all *j*.

A natural estimator for the ordered probit model is log likelihood (Stewart, 2004) displayed as follows:

$$\log \mathrm{L} = \sum_{i=1}^{N}\sum_{j=1}^{J} y_{ij} \log[\Phi(\mu_j - x_i'\beta) - \Phi(\mu_{j-1} - x_i'\beta)]$$

(2.1.11)

where:

Φ cumulative distribution of ε_i

To date the most commonly used models for analysing discrete ordered dependent variables are the ordered logit and probit models which take the cumulative distribution of the error to be either normal or logistic respectively (Borooah, 2002; Stewart, 2004). Aitchison and Silvey (1957) introduced the probit

model that imposes the normal distribution assumption of $\varepsilon_i \sim N(0, \sigma^2)$ as a popular alternative to the logit model.

2.1.9: Estimation of the Life Satisfaction Equation Including Interaction Terms

Life satisfaction is the observed dependent variable used to approximate the latent variable subjective well-being. Life satisfaction is ordered in nature ranging from 0 to 10 and the ordered probit model is used to estimate the regression equation. Economic insecurity is measured by two indicators, regional unemployment rates and job insecurity. In order to identify sectoral differences in well-being an interaction term is included in the life satisfaction equation similar to Luechinger *et al.* (2010a). The following section discusses the literature on interaction terms and their use in nonlinear models. The life satisfaction equation is also explained.

2.1.9.1: General Interaction Terms

In applied econometrics researchers often estimate interaction terms to identify the partial effect, elasticity or semi-elasticity of a dependent variable with respect to one independent variable that depends on the magnitude of yet another independent variable (Norton *et al.*, 2004; Wooldridge, 2013). An interaction term is an independent variable that is the product or *multiple* of two or more other independent variables (Studenmund, 2006). Each interaction term has its own regression coefficient (Studenmund, 2006). Including a slope dummy variable will allow the relationship between the dependent variable and independent variable to be different depending on whether the condition of the dummy variable is satisfied (Studenmund, 2006). The dependent variable in this research is life satisfaction. Slope dummy variables are generated based firstly on the product of regional unemployment rates and a public sector dummy variable and secondly on the product of self-perceived job insecurity and a public sector dummy variable. The dummy variable public sector employment takes a value equal to 1 for public sector workers and a value equal to 0 for private sector workers following Luechinger *et al.* (2010a).

In order to observe sectoral differences in life satisfaction with regards to the effect of economic insecurity, an interaction term is necessary. These interaction terms capture different well-being allowing for a direct comparison among sector workers (Luechinger *et al.*, 2010a).

Interaction terms have extensively been used in nonlinear models such as ordered logit and ordered probit models (Ai and Norton, 2003; Norton *et al.*, 2004). However, the interpretation of these interaction terms from linear models does not extend to that of nonlinear models. The marginal effect of a change in both interacted variables is not equal to the marginal effect of a change in the whole interaction term (Norton *et al., 2004).* The interaction effect in nonlinear models can be of opposite sign and its significance can vary if not calculated by software specifically designed for this issue (Ai and Norton, 2003). The coefficient estimate of the interaction term is not equivalent to the marginal effect of both interacted variables. Most notably the sign and significance of the interaction effect can be different for different observations (Norton *et al.*, 2004). Differences in the interpretations of marginal effects and interaction terms are explained further in an example by Norton *et al.* (2004). This example consists of a binomial probit model with a dichotomous dependent variable.

The conditional mean of the dependent variable is:

$$\begin{aligned} E[y \mid x_1, x_2, X] &= \Phi(\beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 + X\beta) \\ &= \Phi(\mu) \end{aligned} \qquad \textbf{(2.1.12)}$$

where:

β unknown parameters

y dichotomous dependent variable

x_1 independent variable of interest

x_2 independent variable of interest

X vector of additional independent variables

Φ standard normal cumulative distribution

μ denotes the index $\beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 + X\beta$

If x_1 and x_2 are continuous then the marginal effect of just the interaction term x_1x_2 is as follows:

$$\frac{\partial \Phi(\mu)}{\partial(x_1x_2)} = \beta_{12}\,\Phi'(\mu) \qquad \textbf{(2.1.13)}$$

where:

Φ	standard normal cumulative distribution
μ	is the index for $\beta_1x_1 + \beta_2x_2 + \beta_{12}x_1x_2 + X\beta$
x_1	independent variable of interest
x_2	independent variable of interest
β_{12}	coefficient of the interaction term

This is where most researchers leave their interpretations. However the full interaction effect is the cross-partial derivative of the expected value of *y* explained in Equation 2.1.14. In other words the interaction effect is not equal to $\beta_{12}\,\Phi'(\mu)$ as presented in Equation 2.1.13.

$$\frac{\partial^2 \Phi\,(\mu)}{\partial x_1 \partial x_2} = \beta_{12}\Phi'(\mu) + (\beta_1 + \beta_{12}x_2)(\beta_2 + \beta_{12}x_1)\Phi''(\mu) \qquad \textbf{(2.1.14)}$$

There are four implications of Equation 2.1.13 explained in Ai and Norton (2003) and displayed in the following Table:

Table 2.1.6: Implications of Interaction Effects in Nonlinear Models

1) The interaction effect could be nonzero, even if $\beta_{12} = 0$. For the probit model with $\beta_{12} = 0$ the interaction effect is

$$\left(\frac{\partial^2 \Phi(\mu)}{\partial x^1 \partial x^2}\middle|_{\beta_{12}=0}\right) = \beta_1 \beta_2 \Phi''(\mu)$$

2) The statistical significance of the interaction effect cannot be tested with a simple t-test on the coefficient of the interaction term β_{12}

3) The interaction effect is conditional on the independent variables unlike the interaction effect in linear models.

4) The interaction effect may have different signs for different values of covariates. Therefore the sign of β_{12} does not necessarily indicate the sign of the interaction effect.

Source: Ai and Norton (2003)

When the interaction term consists of one continuous variable and one dummy variable, as is the case in this thesis, the interaction effect is the discrete difference (with respect to x_2) of the single derivative (with respect to x_1):

$$\frac{\Delta \frac{\partial F(\mu)}{\partial x_1}}{\Delta x_2} = \frac{\Delta\{(\beta_1 + \beta_{12} x_2)\, f(\mu)\}}{\Delta x_2} \qquad \textbf{(2.1.15)}$$

where:

F dependent variable of interest

Δ discrete difference operator

Equation 2.1.15 can be rewritten as follows:

$$(\beta_1 + \beta_{12}x_2)\, f\{(\beta_1 + \beta_{12})x_1 + \beta_2 + X\beta\} - \beta_1 f(\beta_1 x_1 + X\beta) \qquad \textbf{(2.1.16)}$$

where:

β_1 and β_2	unknown parameters
β_{12}	parameter of interaction term
x_1 and x_2	independent variables
X	vector of additional independent variables

In an attempt to address interaction terms in nonlinear models Norton *et al.* (2004) introduce a user written command –*inteff* that is designed to be used by the statistical program STATA. This command computes the correct interaction effect of a change in two interacted explanatory variables. However this command can only be applied to binomial probit and binomial logit nonlinear models. Therefore, in addition to estimating an ordered probit model for the life satisfaction equation a probit model is also used where life satisfaction is transformed into a dichotomous dependent variable representing high life satisfaction which is equal to 1 and all other responses equal to 0. High life satisfaction is defined as any score equal to 8 or more on the original life satisfaction scale (Luechinger *et al.*, 2010a). This is performed as a robustness check to the ordered probit results.

Puhani (2012) rejects the concerns put forth by Ai and Norton (2003) by demonstrating that they are irrelevant for the treatment effect in non-linear difference-in-difference models. In difference-in-difference estimation when a dependent variable is binary or censored a way to address this nonlinearity is to transform the difference-in-difference strategy to the latent variable in nonlinear models like probit and logit (Puhani, 2012). This strategy then includes an interaction term consisting of the product of group and time indicators (Puhani, 2012). The effect can be calculated as the incremental effect of the coefficient of the interaction term in the logit and probit estimation (Puhani, 2012; Bargin *et al.*, 2012). The use of interaction terms along with nonlinear estimation is still common in the

subjective well-being literature (Artz and Kaya, 2014; Bjørnskov *et al.*,2008; Cornelißen and Sonderhof, 2009; Luechinger *et al.,* 2010a; Origo and Pagani 2008, 2009).

2.1.9.2: The Life Satisfaction Regression Equation

This thesis examines the relationship between economic insecurity and life satisfaction for public and private sector workers in Ireland. By including an interaction term the results can be directly compared for public and private sector workers (Luechinger *et al.,* 2010a). Economic insecurity is measured as regional unemployment rates and self-perceived job insecurity. The life satisfaction equation is therefore estimated twice with the inclusion of both economic insecurity variables interacted with a public sector dummy variable. The life satisfaction equation comes from Luechinger *et al.* (2010a) and is displayed as follows:

$$LS_{its} = g[\beta_1 Sector_{it} + \beta_2 UR_{ir} + (\beta_3 Sector_{it} \times UR_{ir}) + \beta_4 \tilde{X}_{it} + \varepsilon_{it}] \quad \textbf{(2.1.17)}$$

where:

LS	individual *i*'s life satisfaction response in time *t* in region *r*.
$Sector_{it}$	dummy variable capturing whether people work in the public sector (=1) or the private sector (=0)
UR_{ir}	rate of unemployment in year *t* and region *r*. [3]
$Sector_{it} \times UR_{ir}$	the interaction term
$\tilde{X}_{it}$	a vector of personal characteristics
ε_{it}	robust standard errors
g	function of the regression determined by the ordered probit model

[3] Job insecurity *(I)* is included in a second analysis. This generates an interaction term equal to $(Sector_{it} \times I_i)$

The β coefficients are interpreted in terms of the underlying latent variable where a positive β means the corresponding independent variable increases the latent dependent variable and similarly a negative β means the corresponding independent variable decreases the latent dependent variable (Verbeek, 2004). This thesis uses life satisfaction as the indicator for subjective well-being. This is an approximation for the latent variable individual well-being. In estimating the life satisfaction equation a positive coefficient is interpreted as an increase in individual life satisfaction while a negative coefficient is a decrease in individual life satisfaction.

According to Luechinger *et al.* (2010a) the expected coefficients are interpreted as follows:

If $\beta_1 > 0$	public sector workers report higher life satisfaction at the mean unemployment rate.
If $\beta_2 < 0$	unemployment negatively affects all workers' life satisfaction
If $\beta_3 > 0$	people in the public sector are less hurt by unemployment than people in the private sector.

The interpretation of the β_3 coefficient is of particular interest in this thesis. The conclusions drawn in Luechinger *et al.* (2010a) based on β_3 are due to the fact that regional unemployment alone displays a negative relationship to life satisfaction.

2.1.10: Conclusion

This section reviews the literature on the effect of economic insecurity on subjective well-being. Subjective well-being is defined as all the various types of evaluations, both positive and negative, that people make of their own lives (Diener, 2006). This section reviews the social, economic and environmental factors that make up the determinants of subjective well-being (Dolan *et al.*, 2008). A particular focus is paid to measures of economic insecurity such as unemployment and job insecurity. Life satisfaction is selected to indicate subjective well-being since it is

less susceptible to short-term circumstances and therefore commonly used in the literature (Helliwell, 2003). The effect of economic insecurity on life satisfaction is further identified for public and private sector workers. This is done because the effect of economic insecurity on subjective well-being can vary between these two types of sectoral workers arising from institutional differences and exposure to potential job loss (Luechinger *et al.,* 2010a). In determining the effect of economic insecurity on subjective well-being for public and private sector workers in Ireland empirical analysis is used which is the method of using data to test a theory or estimate a relationship (Wooldridge, 2013). Responses to the life satisfaction question are ordered rendering ordered probit or logit models the most appropriate econometric techniques (Borooah, 2002). This thesis follows the vast number of studies that have estimated subjective well-being equations using a life satisfaction indicator and the ordered probit model as the estimation technique (Blanchflower and Oswald, 2004; Clark and Oswald, 1994; Clark, 2003, Helliwell, 2003; Frey and Stutzer, 2002a).

2.2: An Introduction: Job Satisfaction and Job Insecurity

This section reviews the literature focusing on job satisfaction as an appropriate approximation for utility from work (Clark 1997). The historical definitions and determinants of job satisfaction are reviewed. Job satisfaction is defined as a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences (Locke, 1976). Job insecurity is shown to be the most important determinant of job satisfaction (Clark, 1998). This section further identifies the effect of job insecurity on job satisfaction with a particular focus on public and private sector workers.

2.2.1: Utility Theories and Job Satisfaction

Recently, there has been increased interest among economists in the subject of subjective well-being which has been divided into two main research areas: the analysis of general (life) well-being or happiness and the analysis of well-being at work (Sousa-Poza and Sousa-Poza, 2000). Well-being from work is also known as job satisfaction. Neoclassical economists define utility as the extent to which an individual can satisfy their preferences given a monetary constraint (Dolan *et al.,* 2008). These preferences are revealed through choices and market behavior (Kahneman and Thaler, 2006) and are only influenced by the absolute level of an individual's economic conditions (Rayo and Becker, 2007). Utility is based on the satisfaction derived from each choice so it stands to reason that individuals will make choices based on their own self-interest or utility maximization (Aleskerov *et al.,* 2002). It is assumed that individuals are rational, fully informed and seek to maximize utility where their choices in turn maximize utility (Dolan *et al*., 2008). This view still dominates economic discourse (Sen, 1986).

Recent anomalies in the literature on rational decision making are identified which question whether utility can be observed from choices (Thaler, 1992) Studies have shown individuals are not rational economic agents (Kahneman and Krueger, 2006). In fact individuals make inconsistent choices, do not learn from past experience, exhibit hesitancy to trade, and relate their own satisfaction to perceived satisfaction of people around them (Kahneman and Krueger, 2006). This traditional concept of preference theory or decision theory has come under scrutiny by

economists (Sen, 1982, 1985) indicating that revealed preferences are not an adequate measures of well-being. This has stimulated a shift towards alternative measures of well-being (Dolan *et al.,* 2008). If people do not act in a rational utility maximizing manner then their choices do not infer their true preferences.

The contradictory findings for the relationship between income and happiness across countries (Easterlin, 1974; 1995) contribute to the recent move towards subjective measures of utility. Subjective measures of utility are seen as a complement to preference theory in analysing well-being. Subjective measures of well-being acknowledge the importance of non-financial variables (Frey and Stutzer, 2002a). Experienced utility was first brought forth by Bentham (1789) and refers to the experience of pleasure and pain. Bentham's notion of utility essentially disappeared from economic discourse at the beginning of the twentieth century when utility become defined as decision (preference) utility (Kahneman and Thaler, 2006). Benthiam utility was defined as a continuous flow of pleasure or pain, positive or negative affect or life satisfaction (Kahneman *et al.,* 1997; Kahneman and Kruger, 2006).

Utility from Work and Relative Deprivation Theory

Today, experienced utility more closely matches the notion of happiness (Kahneman and Thaler, 2006). Freeman (1978) states that job satisfaction measures have the potential to capture aspects of work not captured by standard objective measures traditionally found in preference utility theory. Job satisfaction acts as an adequate approximation for individual utility from work which falls under experienced utility theory (Clark, 1996, 1997; Benz and Frey, 2008). Job satisfaction may be the closest approximation for measuring utility at work (Clark, 1997). Job satisfaction data may therefore be used to structure universal utility functions (Clark, 1997). A subjective view of utility recognizes that everybody has their own ideas about happiness and the good life and that observed behavior is an incomplete indicator of individual well-being (Frey and Stutzer, 2002a).

As one of the early economists to study job satisfaction, Hamermesh (1977) uses job satisfaction data as a direct measure of utility from work. A model of

occupational choice is derived based on worker's maximization of their expected lifetime utility (Clark, 1996). Hamermesh (1977) defines job satisfaction as the difference in utilities between the sum of wages plus the value of amenities of one's job and the same sum of these in the next-best alternative job. There is little difficulty in measuring and predicting wages; the challenge lies in the unobservable aspects of many amenities which prevent reliable empirical measures of the differences in amenities of the individual's current job and the next best alternative (Hamermesh, 1977). These amenities are centred on the notion of uncertainty and occupation measured by occupation-specific training and experience (Hamermesh, 1977). This was one of the first attempts to apply the subjective measure job satisfaction to utility theory by acknowledging unobservable factors.

Traditional utility functions were assumed to depend only on the absolute level of current consumption with no reference to the past or peers (Rayo and Becker, 2007). However, a large body of research now shows that tastes are strongly influenced by relativities such as one's past or social environment (Frank, 1985).

To test the theory that satisfaction with work depends on relative income, Clark and Oswald (1996) acknowledge relative deprivation theory in their utility functions. Relative deprivation theory with regards to income states that when an individual's earnings fall relative to the comparison level, he or she feels relatively deprived and therefore less satisfied. Clark and Oswald (1996) begin with a traditional utility from work function as follows:

$$u = u(y, h, i, j) \qquad \textbf{(2.2.1)}$$

where:

y income

h hours of work

i set of individual parameters

j set of job specific parameters

Clark and Oswald (1996) expand this to include the following:

$$u = u(y, y^*, h, i, j) \quad \textbf{(2.2.2)}$$

where y^* is a comparison or reference income against which the individual compares themselves. It has long been suggested across social sciences that well-being or satisfaction may be partly determined by relative arguments rather than absolute arguments (Clark, 1997). The higher the level of y^* the lower is the individual's own income compared to y^* which therefore lowers the individual's utility (Clark, 1996). In job satisfaction when an individual's comparison level is below the level of outcomes experienced in their current job the individual is satisfied. Conversely, when the comparison level is greater than the outcomes experienced at work the individual becomes dissatisfied with their job (Hulin *et al.*, 1985).

Equation 2.2.1 is the standard economists' model whereas Equation 2.2.2 is closer to the theoretical models found in social psychology textbooks and is believed to capture relative deprivation (Clark and Oswald, 1996). Conventional economics states utility increases with income and decreases with hours worked. Social psychology assumes utility declines in comparison income y^* (Clark and Oswald, 1996). Similar to Equation 2.2.2, measures of relativity are found in other classical economic models such as Akerlof and Yellen (1990), Duesenberry (1949), Frank (1985).

One of the greatest challenges is empirically testing indicators of relative deprivation because it is unclear what y^* represents. It is not clear over which elements of the utility function comparisons take place (Clark, 1996). For example, Akerlof and Yellen (1990) state that individuals can compare themselves in three possible ways: to others in similar occupations in the same firm, to others in dissimilar occupations of the same firm or to others in other firms. The research almost never has information on how y^* is calculated (Clark, 1996). Comparison effects in a job satisfaction function consist of characteristics of the worker's job that are compared to the worker's own expectations about their job (Clark, 1996). In aspects of a job, comparisons can be made beyond income to include comparisons of

work, stress, autonomy and authority (Clark, 1997). A general relative utility from work function therefore includes a vector of comparison levels (E) as follows:

$$u = u(y, h, i, j, E) \quad \textbf{(2.2.3)}$$

The comparison levels in *E* may come from observations of others, from one's own past experiences, or from one's feelings of what they should receive (Clark, 1997). Clark and Oswald (1996) express utility from work in terms of a total utility function, *v,* as follows:

$$v = v(u(y, h, i, j)\mu) \quad \textbf{(2.2.4)}$$

Where, u is utility from work and μ is utility from other sources and spheres of life. Therefore $u(\cdot)$ is a kind of sub-utility function capturing the level of well-being that the person receives from all aspects of the job. Data used in job satisfaction literature can be thought of as statistics on $u(y, h, i, j)$ (Clark and Oswald, 1996).

While classical economist Hamermesh (1977) did not explicitly include a relativity variable, other authors have said including the residuals from wage equations as an additional explanatory variable could be seen as a comparison between the wage at an individual's current job and the wage at a 'next best option' job (Clark and Oswald, 1996). Hamermesh (2001) outlines four hypotheses for workers perceptions of their jobs with regards to earnings and are explained in the following Table:

Table 2.2.1: Individuals' Employment Perceptions and Earnings

Hypothesis		Explanation
H1	*Complete Forgetfulness and Complete Surprise*	Workers only care about their current earnings and make no comparisons based on their circumstances, their past histories, or on those of other workers.
H2	*Knowledge of Current Rates of Return*	If workers compare themselves to those who made the same investments at the same time, differences in job satisfaction will arise out of heterogeneity in the returns to those investments. Only supernormal returns and quasi-rents will generate higher job satisfaction.
H3	*Disappointing Returns*	Job satisfaction is determined by the worker comparing his/her earnings to what would have been expected upon entering the labour market at a specific time, having made the investments the worker made and with the returns to the worker's other characteristics.
H4	*Disappointing Returns with Learning*	Job satisfaction will be determined by the deviation of the returns to the worker's skills over what he/she forecasts, with the forecast being based on the worker's full earnings during his/her career thus far.

Source: Hamermesh (2001)

Hamermesh (1977) concludes job satisfaction is a relativistic concept. The correlations between job satisfaction, occupation-specific training and experience suggest that the workings of the market give the individual opportunities that they take as comparison for their current job. This ultimately defines satisfaction with the job.

Procedural Utility

The concept of procedural utility is especially relevant to satisfaction from work. Procedural utility means that people value not only outcomes but also the conditions and processes leading to outcomes (Frey *et al.*, 2004). People care not only about the 'what' but also about the 'how,' in other words they value the means and not necessarily only the ends (Benz and Frey, 2008). Procedural utility aims to integrate a human aspect into utility theory that has largely been neglected in economic theory (Benz and Frey, 2008). Psychology theory suggests that procedures providing individuals with autonomy don't matter as much, not because they lead to outcomes such as higher income, but because they provide the individual with a sense of control that satisfies a basic human psychological need (Benz and Frey, 2008). People may be satisfied with an unfavourable outcome if they feel pleased with the preceding procedure.

Benz and Frey (2008) find that self-employed individuals derive procedural utility from their jobs which allow them a higher measure of self-determination and freedom. Interesting work and autonomy have been found to be important values in the procedural utility framework (Benz and Frey, 2008). These findings contrast with traditional economic theories of work and employment. Traditional economic theory assumes work is a source of disutility because of the trade-off of foregone leisure (Benz and Frey, 2008). Additionally income is a source of utility because it enables more consumption and the satisfaction of preferences (Benz and Frey, 2008). In contrast to this, procedural utility assumes that work is not a source of disutility and in fact individuals can derive satisfaction from work (Benz and Frey, 2008).

Procedural utility emerges because individuals have a basic psychological need for self-determination (Benz and Frey, 2008). In psychology three aspects of self-determination have been identified as crucial elements of human well-being: autonomy, competence and relatedness (Benz and Frey, 2008). Autonomy refers to the experience to organize one's own actions, competence is the propensity to control the environment and relatedness refers to the desire to feel connected to others (Benz and Frey, 2008). All of these have been found to influence reported job satisfaction.

Procedural utility focuses on non-instrumental determinants of utility such as processes and institutions under which people live and act (Frey *et al.,* 2004). Benz and Frey (2008) compare the procedural utility, expressed as job satisfaction, for self-employed individuals versus employees. It is found that even when important instrumental outcomes like pay, working hours and many other aspects of the job are controlled for, self-employed individuals enjoy higher levels of utility from their work. The self-employed enjoy the autonomy or freedom from the institutional hierarchy that employees are subject to (Benz and Frey, 2008). Procedural utility is a concept that can help explain differences in job satisfaction across various groups of workers after instrumental outcomes are accounted for.

2.2.2: Definitions of Job Satisfaction

Social psychologists have been studying social behaviour at work since the early 1930's (Argyle, 1989). Job satisfaction or the assessment of employee attitudes, are the most frequently studied variables in organizational behaviour research in which management is concerned with the physical and psychological well-being of people (Spector, 1997). Job satisfaction remains a variable that has been studied very little in economics despite an abundance of literature in other social science disciplines such as psychology, sociology, and management science (Clark, 1996). The study of job satisfaction by economists is still in its infancy which may be because economists are superstitious of the usefulness of the data on self-reported well-being (Blanchflower and Oswald, 1999). Job satisfaction is one of the three most important predictors of overall well-being (Argyle, 1989; Judge and Watanabe, 1993) and the distribution of well-being is one of the primary concerns of social science (Clark, 1996; Clark, 1997). Job Satisfaction is accepted as an index of individual well-being (Veenhoven, 1991; Clark, 1996).

An array of definitions of job satisfaction by classical theorists appear in the literature (Locke, 1976; Argyle, 1989; Hamermesh, 1977, 2001; Borjas, 1979) in which the terms happiness, job satisfaction, worker's well-being, quality of work, utility from work are often used interchangeably (Hamermesh, 2001; Clark and Oswald, 1996; Blanchflower and Oswald, 2004; D'addio *et al.*, 2007; Pouliakas and Theodossiou, 2010).

Job satisfaction is defined in industrial psychology as a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences (Locke, 1976). This is the definition used throughout the thesis. According to different schools of thought, satisfaction depends on an individual's expectations, needs (physical and psychological) and values (Clark, 1996). It is believed that some degree of challenge and a measure of achievement are important for job satisfaction (Clark, 1996). Additionally, Locke (1976) highlights the link between personal interest, recognition and job satisfaction. Locke's appraisals of an individual's job are measured as the weighted sums of satisfaction with work sub-domains with weights being provided by the importance to which the worker attaches to each of them. Higher job satisfaction may come about from improvements in the following: the objective aspects of the job, from reduced expectations or desires regarding the job and lastly, from realignment of values so that dissatisfied aspects are downplayed (Clark, 1996). Locke's (1976) definition of job satisfaction is commonly referenced in other studies such as Freeman (1978), Clark (1996, 1997) and Spector (1997).

A similar psychological definition states job satisfaction, like happiness, can be defined in terms of (1) extent of positive rather than negative emotional experiences at work (2) as a reflective cognitive state of satisfaction with work, the pay and other aspects of the job (Argyle, 1989). In short job satisfaction is how people feel about their jobs and different aspects of their jobs (Spector, 1997). It is the extent to which people like or dislike their jobs (Spector, 1997).

As one of the first economists to study job satisfaction, Hamermesh (1977) takes a global approach in defining job satisfaction as an individual's response to a specific question designated to elicit high feelings about the job as a whole (Hamermesh, 1977) which is the product of the workers' weighting in their own mind of aspects of the job (Hamermesh, 2001). This is viewed as a single metric that allows the worker to compare the current job to other labor market opportunities (Hamermesh, 2001).

2.2.3: Historical Overview of Job Satisfaction

While systematic attempts to study nature and causes of job satisfaction did not begin until the 1930s, the importance of workers' attitudes and actions in a job were recognized long before (Locke, 1976). Psychologists have shown how people of different abilities and personalities can be placed in the most suitable jobs (Argyle, 1989). Industrial psychologists have constructed numerous theories of job satisfaction (Hamermesh, 1977) in which many of these theories of behaviour at work are now known to be incomplete and misleading (Argyle, 1989).

The Hawthorne Studies

The psychology of work began with the Hawthorne Studies in the 1930s (Argyle, 1989). The Hawthorne Studies began as a study of the effects of factors such as rest breaks and incentives on productivity but the emphasis soon switched to a study of attitudes when employees failed to respond to stimuli as predicted (Locke, 1976). The Hawthorne studies comprise of a long series of investigations into the importance of work behaviour and attitudes of a variety of physical, economic, and social variables (Carey, 1967). The primary investigations were carried out in 1927 and 1932. After 12 months of the study, which originally set out to test the effects of physical conditions on work behaviour, the researchers came to an unexpected conclusion, that social satisfaction arising out of human associations at work were greater determinants of work behaviour and output (Carey, 1967). Essentially, the Hawthorne researchers reaffirmed the notion that workers have minds and that the appraisals they make of their work situation affect their reactions to it (Locke, 1976). The importance of economic incentives was minimized on the basis that workers were more interested in social relationships than money and were too irrational or unintelligent to make meaningful economic calculations (Roethlisberger & Dickson, 1939). Interpretations of the Hawthorne studies stress the role of the informal work group and supervisory practices in influencing employee attitudes and performance (Roethlisberger & Dickson, 1939).

There are good reasons, however, to doubt the validity of the Hawthorne studies and the superior influence of social needs (Carey, 1967). Major deficiencies

were discussed in Carey (1967) ultimately stating a 'scientific experiment' consisting of 5 test subjects is far too small to draw any systematic conclusions. There are few disciplines that have been so markedly influenced by a single set of studies with a subsequent lack of evidence such as the Hawthorne studies (Carey, 1967). These studies and their remarkable claims about the unimportance of financial rewards compared to social rewards generated the 'Human Relations" movement and went on to shape the direction of research for the next two decades (Locke, 1976; Carey, 1967).

Herzberg's Two-Factor Theory

The Human Relations movement came to an end with the publication of Herzberg, Mausner, and Snyderman's monograph in 1959 which began a new trend of examining factors of work which had largely been ignored (Locke, 1976). The new emphasis suggested that satisfaction with the job could only be provided through individual responsibility and capacity for mental growth (Locke, 1976). In this study, workers were asked to describe the occasions when they felt exceptionally good or exceptionally bad. Essentially a framework of two sets of variables that influence employee job (dis)satisfaction emerged (Locke, 1976; Sousa-Poza and Sousa-Poza, 2000). These are defined as follows:

- Motivators: Psychological needs factors classified as involving the work itself, achievement, promotion, recognition, and responsibility (e.g. value of work, perceived importance of work, social aspects of work)

- Hygienes: Pain avoidance factors classified as involving the context in which work is performed, supervision, interpersonal relations, working conditions, company policies and salary (e.g. pay, safety, technical administration).

Motivators were frequently mentioned as sources of satisfaction with no effect on dissatisfaction. Conversely, hygienes were frequently mentioned as sources of dissatisfaction with no effect on satisfaction. Therefore the Two-Factor Theory

argues that job satisfaction and dissatisfaction result from different causes. Satisfaction depends on motivators and dissatisfaction depends on hygiene factors (Locke, 1976). The occasions that workers felt 'exceptionally good' about their work were mainly connected with achievement and recognition (Herzberg *et al.*, 1959). However Wall *et al.* (1971) found that if workers were asked similar questions in an informal and confidential interviews the patterns supported by Herzberg's Two-Factor Theory were not obtained. Instead their results would be supported by 'defensive attribution' or 'self-presentation theories;' good events are due to one's own achievements, bad events are the failings of others. As a result it is considered that the Herberg Two-Factor theory has failed (Griffin and Bateman; 1986).

Despite this conclusion, Herzberg's Two-Factor Theory is still referenced in many studies. Sousa-Poza and Sousa-Poza (2000) study job satisfaction as a product of work-role inputs (education, working time, effort) and work-role outputs (wages, fringe benefits, status, working conditions, extrinsic aspects). They propose if work-role outputs increase relative to work-role inputs then job satisfaction will increase.

2.2.4: Measuring Job Satisfaction

There are several types of job satisfaction measures. One basic distinction is between a measure of global job satisfaction and a measure of job facet satisfaction (Scarpello and Campbell, 1983). The global approach is used when the overall or the bottom line attitude is of interest (Spector, 1997). Overall job satisfaction is considered a summary measure of subjective well-being from all aspects of work (Clark, 1997). This is mentioned in Tett and Meyer (1993) when describing the concerns of the global and sum-of-facet approaches which measure job satisfaction differently. The facet approach is used to find out which parts of the job produce satisfaction or dissatisfaction (Spector, 1997). The facet approach has the potential to take a multitude of factor structures that depend on a number of situations such as the particular items that the researcher happens to include, the nature of the employee sample, the specific jobs involved, the environment which employees work, the methods of analysis used on the data and more (Locke, 1976). Both types of overall job satisfaction have their use. The facet approach is useful for organizations who wish to identify areas of dissatisfaction that they can improve on

(Spector, 1997). The global approach may be useful for policy makers who are interested in satisfaction in certain segments of the labour force or in the trend of overall satisfaction over time (Scarpello and Campbell, 1983).

When considering these different types of job satisfaction measurements, one question that regularly occurs is whether a measurement of global job satisfaction is "equivalent" to the sum of the facet satisfactions (Scarpello and Campbell, 1983). This stems from the finding that single-item measures of global satisfaction fail to correlate highly with facet job satisfaction measures (Highhouse and Becker, 1993). The low correlations between global satisfaction and specific facet satisfaction may be caused by omission of important variables in the facet structure (Scarpello and Campbell, 1983). Facet measures of satisfaction may also include components that are irrelevant to the individual (Tett and Meyer, 1993).

Assuming that job satisfaction is a function of the person and environment interaction, a global judgment of overall job satisfaction may account for variables that are typically not measured by job satisfaction facets (Scarpello and Campbell, 1983). In a study that incorporated employee-chosen facets, Highhouse and Becker (1993) found that facet satisfaction measurements only marginally correlated to overall satisfaction measures. The results support the argument found by Scarpello and Campbell (1983) that facet measures of job satisfaction do not incorporate all of the elements that go into making global judgments of job satisfaction. Moreover, facets such as company loyalty, enjoyment at work, and job significance were not captured by facet measurements but were reflected in the global judgments of overall job satisfaction (Highhouse and Becker, 1993). The "whole" appears to be more complex than the sum of the parts (Scarpello and Campbell, 1983).

The results found in Scarpello and Campbell (1983) argue against the common practice of using the sum-of-facet satisfaction measures to approximate overall satisfaction. Despite the conclusions of Scarpello and Campbell (1983) that a global rating of job satisfaction is a more inclusive measure, the preferred measurement is sum-of-the- facet approach. The very definition of job satisfaction proposed by Locke (1976) highlights the importance of job facets as the weighted sum of satisfaction with work subdomains. A job is not an entity but a complex interaction of tasks, roles, responsibilities interactions, incentives and rewards.

Therefore, a thorough understanding of job attitudes or job satisfaction requires that it be analysed in terms of all of it parts (Locke, 1979).

Due to the extensive list of job satisfaction variables included in many surveys, recent studies have analysed both the global measures of job satisfaction and individual facet satisfactions (Benz and Frey, 2008; Clark, 1997, 2001; Clark and Oswald, 1996; Clark, *et al.,* 1996; D'Addio, *et al.*, 2007; Gazioglu and Tansel, 2006; Pouliakas and Theodossiou, 2010; Ward and Sloane, 2000). Common job facets found in these studies are but not limited to: pay or wages, job security, type of work, working hours, working time or flexible working hours, working conditions, commuting time, sense of achievement respect from supervisors, opportunity or use of initiative, promotion prospects, and relationships with colleagues and superiors. Clark *et al.* (1996) claim that while multi-item measures like facet satisfaction is likely to be more reliable, most research with national samples use single indicators like global satisfaction in order to meet tight interview constraints. Moreover, there is enough evidence that the authors feel single-item measures like global satisfaction are acceptably reliable and valid.

The British Household Panel Survey (BHPS) is a popular national data source because of the extensive information provided on seven domain job satisfaction measures and one overall job satisfaction measure which are used in such studies as Clark (1997), Clark and Oswald (1996), and Clark (2001). Sousa-Poza and Sousa-Poza (2000). Clark (1998) analyse up to 18 different job characteristics and their effect on global satisfaction across nations using the BHPS. While Clark's (1998) main empirical analysis is on global satisfaction, a ranking of nine facet satisfactions is analysed in which surprisingly pay is ranked as one of the least important aspects of a job. The highest ranking aspects across all countries were job security and job interest.

2.2.4.1: Validity of Job Satisfaction Measures

Hamermesh (2001) states that it is important to understand workers' perceptions of their work because this can impact economic outcomes. Early economists noted the importance of job satisfaction as a significant predictor of future quits (Akerlof *et al.,* 1988; Feeman, 1978) which ultimately alters the overall level of labour market mobility (Freeman, 1978). Understanding individuals' subjective well-being adds an additional method for understanding labour market behaviours (Clark, 1996; Clark, 1997). Workers' decisions about their labour force participation such as whether to stay on at their job or to quit or how much effort they are willing to devote to their jobs at least partially depends on their subjective evaluations of their jobs (Clark, 1996).

Job satisfaction measures have been found to be strong predictors of labour market behaviour such as future quits and separations even after controlling for wages, hours, and standard demographic and job-specific variables (Akerlof *et al.,* 1988; Freeman, 1978; Clark, 2001; Clark *et al.,* 1998). Job satisfaction has also been found to be a good predictor of absenteeism in which a negative relationship exists (Vroom, 1964; Clegg, 1983). The fact that job satisfaction predicts quits even when wages and hours of work are controlled for suggests that utility from work depends on other potentially unmeasurable variables (Clark, 2001). A study of seven facet job satisfaction measures yielded a ranking of job characteristics important in equations predicting future quit behaviour. These characteristics were satisfaction with job security and satisfaction with pay and were among the more important predictors of future quits followed by satisfaction with use of initiative, satisfaction of the work itself and satisfaction of hours of work (Clark, 2001).

Due to the subjective nature of job satisfaction and the issues involved in making interpersonal comparisons, it may be difficult for researchers to appropriately interpret job satisfaction data (Millán *et al.,* 2013). The issue of interpersonal comparison is based on the fact that job satisfaction is subjective and therefore cannot be directly compared across individuals (Clark, 1996). The very definition proposed by Locke (1976) highlights the problem of interpreting subjective measures which depend on individuals' objective circumstances as well as

psychological states like aspirations, willingness to voice discontent, hypothetical alternatives to the individual's current job and many more (Freeman, 1978).

Harsanyi (1986, p. 957) states that economists have greatly exaggerated the issue of interpersonal utility comparison that are derived from not only commodities but also "the general pleasures and calamities of human life." Freeman (1978) states that subjective variables contain useful information about economic life and predicting or understanding behaviour should not be ignored. However, subjective variables do lead to complex interpretations due to their dependence on psychological states and therefore should be used with discretion (Freeman, 1978). It is largely agreed that measures of job satisfaction do contain useful information consisting of signal mixed in with noise (Clark, 1997). Moreover, if job satisfaction measures were purely idiosyncratic, then none of the correlations to labour market behaviour like absenteeism and quits would have been found (Clark, 1997).

2.2.5: Determinants of Job Satisfaction

The determinants of job satisfaction are of interest for two reasons. The first is that job satisfaction is considered an adequate measure of individual well-being which many social scientists would consider to be a principal concern (Clark, 1996). Second, the analysis of job satisfaction might provide information into certain aspects of the labour market (Clark, 1996). This second reason addresses the question as to whether job satisfaction contributes to explaining objective economic behaviour (Freeman, 1978). Clark (1996) claims that men, workers in their thirties, the highly-educated, those working longer hours, those in large establishments report lower levels of job satisfaction. Blanchflower and Oswald (1999) add to findings by stating job satisfaction is higher among the self-employed, the young and the old but not the middle aged, supervisors and those with secure jobs. In a study of job satisfaction the inclusion of 80 control variables highlighted the importance of including personal and occupational factors to isolate the relationship of interest (Clark *et al.*, 1996).

2.2.5.1: Individual Determinants

Sociodemographic factors such as gender, age, ethnic group, and geographical region can affect employee well-being through their impact on environmental and individual factors (Warr, 1999). Context-free general well-being is examined with respect to gender and age in Dierner and Suh (1997). The following section identifies individual factors that affect job satisfaction.

Gender

The relationship between gender and job satisfaction has been inconsistent across studies (Spector, 1997). Witt and Nye (1992), in a sample of over 12,000 individuals across different organizations, found there were no gender differences in the level of global job satisfaction or facet job satisfaction. Conversely, it has been stated that findings show that women report higher job satisfaction scores than men (Clark, 1997; Clark, 1998; Sloane and Williams, 2000; Sousa-Poza and Sousa-Poza, 2000). This second conclusion is puzzling considering women's jobs are typically considered worse than men's in terms of the following job characteristics: hiring and firing, job content, promotion opportunities, and sexual harassment (Clark, 1997). In other words, the satisfaction score reported by women represents real differences in utility from work, but objectively women's jobs are worse than men's (Clark, 1997). The gender satisfaction differences have been found to exist primarily in Anglo-Saxton countries (Sousa-Poza and Sousa-Poza, 2000).

Many reasons for this gender satisfaction differential have been put forth in the literature. Clark (1996) has two possible explanations. Firstly, because of sporadic participation in the labour market women are more likely to compare their work to the possibility of housework and report themselves as more satisfied simply because they are in the labour maket. However, this argument only applies to women who are either single or married and have dependents (Sloane and Williams, 2000). Second, less satisfied women may simply leave the labour force compared to less satisfied men and therefore the observed distribution of job satisfaction is biased creating a sample selection problem (Clark, 1996). There is also the possibility of a sample selection process for which women select themselves into jobs that provide

greater satisfaction. Sloane and Williams (2000) find that sample selection into certain types of jobs in order to maximize satisfaction is present and that if women were to be placed in jobs held by men their level of satisfaction would decrease to similar levels. Other explanations state gender differences in job satisfaction are the result of a lack of perfect labour market mobility or a lack of information about various job openings and differences in market power including participation in trade unions (Borjas, 1979; Hamermesh, 1977).

A final explanation for the gender satisfaction paradox is that men and women might have different values. Witt and Nye (1992) discuss how there can be gender differentials in satisfaction due to perceptions of equity. Men and women sometimes view fairness differently. Women could be perceiving fewer rewards as being fairer or at least equal and therefore they are satisfied with less (Witt and Nye, 1992). Hakim (1991) comes to similar conclusions that the differential can be attribute to values such as men and women having different life goals.

Clark (1997) states that in their study of British workers, neither the different jobs that men and women do, their different work values, nor sample selection accounts for gender satisfaction differentials. Theoretically, an identical man and women with the same job and expectations would report the same levels of job satisfaction. When individual and job-specific characteristics are held constant women have a 40 percent probability of reporting high job satisfaction compared to men who have a 31 percent probability (Clark, 1997). This study concludes that the explanation of the gender-satisfaction paradox lies in different expectations from work for men and women. Because of the historically worse working conditions for women, this has in turn lowered their expectations. Women will be more satisfied than men with the same objective job characteristics and work values if women initially expect less from their jobs (Clark, 1997). The gender satisfaction differential disappears for the young, the highly educated, professionals, those in male dominated workplaces, those in professional or managerial positions, and those whose mothers had a professional job because these groups are likely to have higher expectations of their jobs (Clark, 1997).

Age

Research has shown that a relationship does exist between age and job satisfaction, however, the exact nature of this relationship is unknown. This has yielded some studies that have typically found a curvilinear relationship and others that have found a linear relationship (Spector, 1997). Recent studies have found a U-shaped relationship between age and job satisfaction (Blanchflower and Oswald, 1994; Clark, 1996; Clark *et al.,* 1996). A U-shape indicates that the relationship between overall job satisfaction and age is declining from a moderate level in early years of employment to a point and then increasing steadily into retirement (Clark *et al.,* 1996). Early finings suggested that the declining portion of the U-shape was driven by new entrants into the labour market with their high morale or positive feelings about new employment prospects (Herzeberg *et al.,* 1957). The low point or minima is reached in the middle to late twenties or early thirties after this point job morale climbs steadily with age generating the increasing portion of the U-shape. It was also suggested that a person comes to terms with their occupational role for example by leaving unrewarding jobs and the product is an increase in job satisfaction of those in older age cohorts (Herzeberg *et al.,* 1957).

More recent studies have supported the older findings of a U-shape however explanations vary. In order to capture the nonlinearity of the relationship between age and satisfaction, two variables are typically included, age and age-squared with the latter representing the non-linear component (Clark *et al.,* 1996). A significant negative coefficient on age and a significant positive coefficient on age-squared was found in Clark (1996) implying a U-shaped relationship between age and job satisfaction. The minima of this U-shape was found to be 34 years old (Clark, 1996). The U-shape was also found in Clark *et al.,*(1996) when 80 occupational and personal control variables were included in order to separate the relationship between age and job satisfaction from personal characteristics, aspects of the job and individual work values. In this study the minima was found to be 36 which is thought of as being the most reliable estimate due to all of the included control variables. Overall the U-shape between age and job satisfaction was proven to be quite robust. Across five different specifications and varieties of control variables the age coefficients remained significant at the 1 percent level with the magnitude only marginally changing across specifications (Clark *et al.,* 1996). Most importantly,

Clark *et al.* (1996) concluded that the relationship between age and job satisfaction was not driven by other factors which was particularly notable considering many of the included control variables were themselves independently important in predicting job satisfaction.

A factor that might be important in the relationship between age and job satisfaction is gender (Spector, 1997). Clark *et al.* (1996) found a clear U-shaped relationship between overall job satisfaction and age for men but a curvilinear relationship displayed a much smaller magnitude for women. Furthermore, the curvilinear relationship for men would not have been so strong had the sample of the study not included individuals in their late-teens. In other words, the age distribution and gender composition of samples can affect whether the relationship between job satisfaction and age is detected (Clark *et al.,* 1996). The relationship between age and job satisfaction may also be influenced by statistical techniques used to identify nonlinear patterns which typically have lower explanatory power than techniques used to identify linear patterns. Failure to find a curvilinear relationship may be caused by relatively low statistical power or insufficient sample size rather than linearity (Bedeian *et al.,* 1992).

Two other possible explanations for stages of the U-shaped age and job satisfaction relationship is that firstly, it is the result of a participation effect and secondly, it is the result of changing expectations (Clark, 1996; Clark *et al.,* 1996). The participation effect has been applied to satisfaction differentials for age as well as satisfaction differentials for gender. Essentially individuals who are older and unsatisfied with their jobs find it easier to leave the labour force than do young unsatisfied individuals (Clark, 1996). However, early retirement only comes into effect in the fifties and sixties and therefore does not explain the initial increase in job satisfaction in the mid-thirties. This effect largely explains the increase in job satisfaction of those in their fifties and sixties until the age of retirement. The second explanation has to do with individuals' perceptions of their job in relation to their expectations (Clark *et al.,* 1996). Young workers may feel more satisfied with their jobs because of the novelty of joining the labour force. They have little information to effectively evaluate their work and formulate accurate expectations (Clark *et al.,* 1996). As these workers become older they are more informed and more able to

make these comparisons which may explain the drop in job satisfaction in the mid-thirties.

Education

The effect of education on labour market behaviour is extensively studied (Clark, 1996). Individuals with higher levels of education have been found to earn more, are promoted more quickly, and end up in better jobs (Blanchflower and Oswald, 1994; Clark, 1996). Therefore because of the benefits of education, the correlation to job satisfaction should be positive. This however is not the case where numerous studies have documented declining job satisfaction in education (Clark, 1996; Clark and Oswald, 1996; Sousa-Poza and Sousa-Poza 2000). The negative relationship between higher levels of education and job satisfaction is well-documented in early psychological literature among a large set of control variables (Warr, 1992). Clark (1996) found a strong negative relationship between education and job satisfaction where it was concluded that it was the rate of change in the explanatory variable that mattered and not the absolute level of education completed. Across three measures of job satisfaction, one overall measure and two facet measures, education was unambiguously negatively associated with all three satisfaction measures (Clark, 1996).

Clark and Oswald (1996) suggest that this relationship is the product of increasing workers' expectations. Even though individuals are better educated, job satisfaction is positively correlated to expectations of what kind of job they think they should have. The causal direction between education and expectations is unknown. Education could raise workers' expectations or individuals with higher expectations may simply obtain higher levels of education (Clark and Oswald, 1996). The expected relationship between education and job satisfaction becomes ambiguous because of the intervening comparison effect to workers' expectations. Thus, the comparison effect associated with education seems to outweigh the positive effects of the types of jobs typically obtained by higher educated individuals (Clark and Oswald, 1996).

In some studies education has not been identified as a personal characteristic but rather as an input to work. Sousa-Poza and Sousa-Poza (2000) state that job

satisfaction is the combination of work-role inputs (education, training, working time, effort) and work-role outputs (wages, fringe benefits, status and working conditions) with the former being considered "pains" and the latter "pleasures." Therefore if work-role inputs such as education increase then job satisfaction should decrease (Sousa-Poza and Sousa-Poza, 2000).

The effect of education on job satisfaction can vary when examined among subsamples of individuals. In Clark (1997) education had a consistently negative effect on job satisfaction across both men and women. Alternatively, when looking at this relationship for self-employed individuals and paid employees a different conclusion emerges. Obtaining at least a secondary education increases job satisfaction for both self-employed individuals and paid employees when compared to those with no education or only a primary education (Millan *et al.,* 2013).

Health

Good health has consistently been found to have a large and positive effect on job satisfaction (Clark, 1996, 1997; D'Addio *et al.,* 2007). Literature has been conducted on the relationship between job satisfaction and both mental health and physical health (Clark, 1996; Kaiser, 2002; Oswald and Gardner, 2001). In Clark (1996) there is a strong significantly positive relationship between self-reported physical health and job satisfaction. Kaiser (2002) provides expected findings for individuals in poor physical health and corresponding low job satisfaction scores. Initially, this could be due to the fact that workers in poor health have a tendency to report low levels of satisfaction with all aspects of life and job satisfaction being just one facet (Clark, 1996). Secondly, individuals in poor health may only be able to select into unsatisfying jobs creating a sample selection effect (Clark, 1996).

The relationship between job satisfaction and mental health are so interlinked they are often used interchangeably as dependent variables in the same study to provide a more encompassing definition of well-being. Gardner and Oswald (2001) use panel data from the General Health Questionnaire (GHQ12) which is a widely used measure of subjective well-being with considerable weight put on mental health. A categorical variable for job satisfaction is also included that ranges from 1 to 6 based on answers to an overall job satisfaction question. Due to the strong

correlation, self-reported health status can be used as a determinant of job satisfaction or as a complementary dependent variable in overall well-being studies.

Marital Status

Marital status is strongly positively related to a global measure of job satisfaction as well as to the facet measure "satisfaction with work itself" (Clark, 1996). In many studies marital status is included as a control variable where the primary analysis of concern is based on a different explanatory variable as was the case in Clark *et al.* (1996). Married individuals report the highest level of overall job satisfaction (Clark, 1996). In Clark *et al.* (1996) being married was the only marital status to significantly influence job satisfaction. When the facet measure "satisfaction with work itself" is used, widowed individuals report the highest levels of satisfaction (Clark, 1996). This is believed to be because widowed individual may value the social contact that work provides which translates into higher job satisfaction (Clark, 1996).

2.2.5.2: Job Specific Determinants

Much literature has investigated the link between a person's work environment and their well-being (Warr, 1999). Warr (1994) addresses the main factors found in the literature and devises a classification system of job characteristics. The following Table lists the 10 key features of work by Warr (1994) that job-specific determinants of job satisfaction are believed to fall into:

Table 2.2.2: Examples of Job-Related Determinants of Job Satisfaction

Job Characteristic	Examples
Opportunity for personal control	Employee discretion, autonomy, self-determination, participation in decision making, freedom of choice.
Opportunity for skill use	Skill use, use of valued abilities, required skills.
Externally generated goals	Demands of the job, demands of individuals tasks, quantitative or qualitative workload, resource demand, role responsibility, role conflicts, work-family balance
Variety	Variation in job content and location, non-repetitive work, skill variety.
Environmental clarity	Clear information about behaviour expectations and consequences, task feedback,
Availability of money	Income level, wages, amount of pay, availability of financial resources
Physical security	Safe working conditions
Supportive supervision	Supportive management, effective leadership
Opportunity for interpersonal contact	Contact with others, adequate privacy, good relationships with others, effective communication.
Valued social position	Context of job's status in society, social rank, occupational rank, altruistic contributions.

Source: Warr (1994)

Job characteristics can be defined as extrinsic and intrinsic with the former referring to financial rewards, working time, work/life balance, job security and opportunities and the latter to features such as job content, work intensity, risk of ill health, and relationships with co-workers and managers (D'Addio *et al.,* 2007). Because of this multidimensionality the possibility of using just one measure to classify jobs according to their quality is often rejected (D'Addio *et al.,* 2007). The following section reviews the literature of job specific characteristics and job satisfaction.

Work Values

Clark (1996, 1997) uses data from the British Household Panel Survey (BHPS) which asks respondents to rank different values of work. In the regression analyses ranked work values turn out to be strong predictors of job satisfaction. Workers who highly rank extrinsic work values such as pay and promotion opportunities as the most important aspect of a job report substantially lower levels of job satisfaction (Clark, 1996). Conversely, those who choose hours of work or relationships at work as the most important aspect of a job report higher levels of job satisfaction (Clark, 1996).

Sousa-Poza and Sousa-Poza (2000) find extrinsic work values such as pay only increase job satisfaction for men. Moreover, in a rank of work values pay does not rank exceptionally high. Values such as having an interesting job and good relationships with management are two of the most important determinants of job satisfaction. Having an exhausting job is the single greatest depressant of job satisfaction. While pay ranks in the middle of the work values and only marginally impacts job satisfaction. Altruistic values surprisingly do not compensate for this. Altruistic values such as the need to help others and being useful to society have a much smaller effect on job satisfaction (Sousa-Poza and Sousa-Poza, 2000).

In a cross-national study work values were ranked yielding aggregate results across countries as well as within countries. The ability to work independently and promotion opportunities ranked among the highest aspects of a job across countries (Clark, 1998). Work values differed across countries where American workers are more interested in promotion opportunities than Western Europeans and less interested in job security and leisure time (Clark, 1998). In regression analysis the work value with the largest impact on overall job satisfaction comes from having good relations at work followed by good work content (Clark, 1998). The findings on extrinsic values across countries are consistent with the studies of individuals explained above. High income and good promotion opportunities have roughly the same effect of a positive albeit mediocre magnitude.

Income

Conclusions from the relationship between income and job satisfaction vary across studies. Recent literature has shown that income may not have the expected effect on job satisfaction that classical utility from work theories suggest (Clark and Oswald, 1996). Income has been shown to be at best weakly correlated with overall job satisfaction (Clark, 1996; Clark and Oswald, 1996). Rather, it is suggested that income is evaluated relative to a comparison level and not in an absolute sense. Absolute income may act as a poor measure of relative income which would explain the minimal explanatory power it has on predicting overall job satisfaction (Clark, 1996). Studies have found strong negative correlations between job satisfaction and comparison income measured as the going rate for a new job (Clark and Oswald, 1996), other workers' income in the same household (Clark, 1997) and income earned in the individual's past (Clark, 1997). Acknowledging the importance of the effect of comparison income on job satisfaction is essential in making accurate inferences. In Clark and Oswald (1996) when a comparison income measure is included an absolute income variable becomes positive which is supported by classical utility theory. This suggests that income is a multifaceted concept requiring relative and absolute measures.

Many times income is included as an explanatory variable but it is also used to study subsamples of individuals. In a cross-country study Pouliakas and Theodossiou (2010) identified that the cohort of low-paid individuals are significantly less satisfied with their jobs than high-paid workers in Greece, Ireland, Italy, Portugal, and Spain.

Public Sector Employment and Job Insecurity

It is assumed that differences in employment sectors are important in influencing work attitudes such as job satisfaction (Rainey, 1989). The job satisfaction literature that looks at the relationship between public and private sector employment has yielded inconsistent findings. In a study of two cohorts of British university graduates, Lydon and Chevalier (2002) found the relationship between public sector employment and job satisfaction to be negative and statistically significant. One explanation is that public organizations typically have missions that

appeal to workers' altruistic needs however the structure of these organizations are typically subject to greater bureaucratic barriers which hinders the fulfilment of these needs (Wright and Davis, 2003).

Much of the recent literature suggests the opposite is true that public sector workers report higher levels of job satisfaction when compared to their private sector counterparts (Blanchflower and Oswald, 1999; D'Addio *et al.*, 2007; Gardner and Oswald, 2001; Maidani, 1991; Steel and Warner, 1990) However, while a considerable amount of empirical research has been done on the job satisfaction of public versus private sector workers the strength and direction of the relationship has varied (Wright, 2001). D'Addio *et al.* (2007) found that being a public sector employee is important in explaining individual differences in job satisfaction. Moreover, female public sector employees report higher levels of job satisfaction than their private sector counterparts. In addition to gender differences there is a distinct declining time trend in job satisfaction that is particularly apparent for public sector workers. It is unclear if the declining job satisfaction for public sector workers is behind any of the overall declining trends in job satisfaction in the United States or the United Kingdom (Blanchflower and Oswald, 1999; Gardner and Oswald, 2001).

In identifying the relationship between public sector employment and job satisfaction the channel of job security is commonly addressed. Blanchflower and Oswald (1999) conclude that the positive relationship between public sector employment and job satisfaction could partly be due to higher job security among public sector occupations. Historically public sector jobs have not been as affected by business cycles and economic downturns and therefore government workers have been less likely to perceive job insecurity in that past (Clark and Postel-Vinay, 2009). Conversely, in economic contractions lay-offs are a common way to cut spending for businesses rendering increased job insecurity common among private sector workers (Artz and Kaya, 2014). These differences in job insecurity could partly explain differences in self-reported job satisfaction and sectoral workers. Public sector employment and job security are so interlinked that job satisfaction equations that omit job insecurity measures can produce upwardly biased coefficients on the public sector variable (Blanchflower and Oswald, 1999).

Job insecurity is well documented in the literature as being a depressant of individual job satisfaction (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Clark, 1998; Gazioglu and Tansel, 2006; Geishecker, 2010, 2012; Origo and Pagani, 2008, 2009; Theodossiou and Vasileiou, 2007; Sousa-Poza and Sousa-Poza, 2000; Poliakas and Theodossiou, 2010). Job insecurity is defined as an individual view as to how likely they are to lose their jobs (Blanchflower and Oswald, 1999). Using three different cross-section surveys Blanchflower and Oswald (1999) conclude that feelings of potential job loss have the single largest negative effect on job satisfaction. Kaiser (2002) confirms this by looking at job satisfaction of various contract workers. Workers in permanent full-time and part-time jobs report higher job satisfaction than those in riskier employment contracts. When estimating job satisfaction equations it is essential to account for job insecurity especially as it is the most often cited important aspect of a job (Clark, 1997, 1998, 2001). Geshecker (2010) indicates that perceived job insecurity is one of the most important determinants of employee well-being and can even be more harmful than job loss itself.

Traditionally, perceived job security is higher among older workers, supervisors, and those in public sector occupations because those workers are a lot less likely to lose their jobs (Blanchflower and Oswald, 1999). This inherent job security found in public sector employment supports the rationale for Artz and Kaya (2014) and Luechinger *et al.,* (2010a) to identify potential well-being consequences during time of economic instability.

Only a few studies to date specifically look at the job satisfaction and job insecurity relationship for public and private sector workers. Many studies follow Blanchflower and Oswald (1999) who look at job satisfaction in the United States. Job satisfaction equations are estimated with the inclusion of a public sector employment explanatory variable and a job insecurity explanatory variable. It is conjectured that part of the positive effect that public sector employment has on job satisfaction is due to increased job security within public sector employment. Moreover, public sector employment and job insecurity are so linked that job satisfaction equations that do not account for job insecurity can produce upwardly biased coefficients on any public sector employment variable (Blanchflower and Oswald, 1999).

Artz and Kaya (2014) examine job satisfaction equations estimated separately for a public sector subsample and a private sector subsample of workers in the United States. They find that their whole sample of individuals and private sector subsample report significantly lower job satisfaction scores. Alternatively increasing job insecurity has no impact on the job satisfaction of public sector workers. In a closer analysis public sector union workers are in fact negatively affected by increasing job insecurity because of a disparity between expectations and actual job characteristics (Artz and Kaya, 2014).

Luechinger *et al.* (2010a) are similarly concerned with well-being differences between public and private sector workers. However, this study uses a general measure of economic insecurity approximated by unemployment rates. Life satisfaction is also used as their well-being indicator instead of job satisfaction. The results are as expected: private sector workers are more adversely impacted by increasing unemployment rates. Luechinger *et al.* (2010a) justify their use of unemployment rates as a measure of economic insecurity based on strong correlations to job insecurity which is known to be an adequate measure of economic insecurity.

Union Membership

Two of the first economists to look at job satisfaction were Freeman (1978) and Borjas (1979). In both studies adverse effects were documented for unionization and job satisfaction. It was concluded that union members were more dissatisfied with their jobs for two reasons: polarization of the unionized labour force and the fact the union member faced more stagnant earnings (Borjas, 1977). Moreover, this relationship was most apparent for individuals of high job tenure which also coincided with older workers in the firm. An effect of unionization through polarization is caused by an "exit-voice" trade-off where union members are given the mechanism that gives voice to their concerns in order to reduce exit (Freeman, 1978). Thus a by-product of unionization is that union members can be expected to express less job satisfaction than non-union members (Borjas, 1977). The negative effect of unionization is also found in current economic literature (Blanchflower and Oswald, 1999; Clark, 2001; Drakopoulos and Theodossiou, 1997; Pouliakas and

Theodossiou, 2005). Despite the strong relationship between union membership and job satisfaction the decline in job satisfaction in Britain in the 1990s was not driven by unionization (Blanchflower and Oswald, 1999).

Establishment Size

It has been shown that people who work in small firms are more satisfied with their work (Frey and Benz, 2003; Clark and Oswald, 1996). Additionally, the effect of working in a large firm is a significant depressant of job satisfaction (McCausland *et al.*, 2005). In a descriptive statistics table the percentage of individuals reporting themselves as "very happy" with their job declines with increasing firm size (Clark and Oswald, 1996). Lower levels of job satisfaction in large establishments can be explained by the inflexibility of the work environment (Idson, 1990). Frey and Benz (2003) state that larger organizations have larger hierarchies that workers are subject to follow. The size of the hierarchy, approximated by the size of the establishment, is responsible for the decreased satisfaction among paid employees compared to self-employed individuals (Frey and Benz, 2003). The more individuals are subject to a hierarchy the more they lose their independence which is a common value of self-employed individuals.

Hours of Work

Hours of work are included in classical utility functions and believed to be of negative sign (Clark, 1996; Clark, 1997; D'Addio *et al.*, 2003; Sousa-Poza and Sousa-Poza, 2000). Hours of work have been shown to be negatively associated with overall satisfaction (Clark, 1996). However in a rank of work values, "hours of work" tends to place only moderately high behind other values such as security and job interest (Clark, 1998; Sousa-Poza and Sousa-Poza, 2000). The effect of hours of work has been shown to be only significant for female subsamples (D'Addio *et al.*, 2003; Sousa-Poza and Sousa-Poza, 2000). This once again supports the notion that women care more about intrinsic work values (Sousa-Poza and Sousa-Poza, 2000).

2.2.6: Job Satisfaction Equations

A common indicator of subjective well-being is job satisfaction which is one of the three most important predictors of overall well-being (Argyle, 1989; Judge and Watanabe, 1993). Overall job satisfaction is considered a summary measure of all aspects of work (Clark, 1997). General job satisfaction equations are explained in D'Addio *et al.*, (2007), Pouliakas and Theodossiou (2010)[4]:

$$JS_{it}^{*} = x_{it}'\beta + \varepsilon_{it} \quad \textbf{(2.2.5)}$$

$$JS_{it} = k \Leftrightarrow JS_{it}^{j^{*}} \in [\mu_k, \mu_{k+1}) \quad \textbf{(2.2.6)}$$

where:

JS^{*}	latent well-being from work
JS	observed job satisfaction level
μ	the *k*-th cut-off point (increasing in *k*) for the categories
x	observable individual characteristics
ε	random error term with $\mathrm{E}(\varepsilon_{it} = 0)$ and $\mathrm{Cov}(x_{it},\ \varepsilon_{it}) = 0$
i	individuals $i = 1,\ldots, n$
t	time period indexed by $t = 1,\ldots, t$

[4] D'Addio *et al.*, (2007) and Pouliakas and Theodossiou (2010) use panel data and panel data techniques such as fixed effects ordered logit and random effects. This thesis drops the notation for individual random characteristics fixed over time as it does not apply to the techniques used to estimate cross-sectional data.

The specific job satisfaction equation estimated in this thesis is outlined by Theodossiou and Vasileiou (2007) as the following:

$$JS_i = \theta X_i + \delta I_i + \varepsilon_i \quad \textbf{(2.2.7)}$$

where:

JS_i job satisfaction dependent variable

X_i matrix of explanatory variables

θ vector of parameters of explanatory variables

I_i perceived job insecurity explanatory variable

δ estimated parameter of job insecurity variable

ε_i stochastic error term

i individuals $i = 1,\ldots, n$

t time period indexed by $t = 1,\ldots, t$

Job satisfaction equations will be estimated for two different subgroups, public sector workers and private sector workers. Job satisfaction as a dependent variable is similarly analysed as a truncated sample by gender (Blanchflower and Oswald, 1999; Clark, *et al.,* 1996; D'Addio *et al.*, 2007; Sousa-Poza and Sousa-Poza, 2000; Ward and Sloane, 2000), self-employment (Millan *et al.*, 2013), public sector employment (Luechinger *et al.*, 2010b) and performance related pay schemes (McCausland *et al.*, 2005). This is further explained in the following section when applying job satisfaction equations illustrated in McCausland *et al.* (2005) to the sectoral subsamples of this thesis. It is not possible to compare the magnitude of the estimated coefficients across equations for various truncated samples as the underling distributions of the dependent variables are not the same (Clark, 1998). However the marginal effects, or the predicted probabilities of a job satisfaction outcome occurring can be compared between truncated samples (Clark, 1998).

2.2.7: Conclusion

This section reviews the literature on the effect of job insecurity on job satisfaction. Job satisfaction is believed to capture individual utility from work (Clark and Oswald, 1996). Job satisfaction is defined as a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences (Locke, 1976). This section examines the determinants of job satisfaction with a particular focus on job insecurity. Considering job insecurity consistently ranks highest in importance among various job characteristics it is imperative to include in the estimation of job satisfaction equations (Clark, 1998). Job insecurity is defined as an individual view as to how likely they are to lose their jobs (Blanchflower and Oswald, 1999). The adverse effects of job insecurity on job satisfaction are well-documented in the literature (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Gazioglu and Tansel, 2006; Sousa-Poza and Sousa-Poza, 2000; Theodossiou and Vasileiou, 2007).

In a study of the United States, Blanchflower and Oswald (1999) find that public sector workers report higher levels of job satisfaction than their private sector counterparts. They attribute this finding to more job security in public sector employment. Moreover, they state that job security and public sector employment are so connected that job satisfaction equations that do not account for this can produce upwardly biased estimates for the public sector explanatory variable. This thesis follows the methodology set out by Artz and Kaya (2014) to analyse job satisfaction consequences of perceived job insecurity for public and private sector workers in Ireland. Artz and Kaya (2014) include job insecurity as an independent variable and estimate job satisfaction equations for subsamples of sectoral workers. Identifying job insecurity as the explanatory variable of interest differs from Blanchflower and Oswald (1999) who identify public sector employment as the explanatory variable of interest and job insecurity as an intervening variable. Artz and Kaya (2014) find that their whole sample of individuals and private sector subsample of workers report significantly lower job satisfaction scores when job insecurity increases but no relationship is reported for public sector workers. This is supported by Luechinger *et al.* (2010a) where their economic insecurity measure decreases the well-being of public sector workers to a lesser extent than private sector workers.

2.3: The Issue of Endogeneity

A major assumption of the linear regression model is that the error terms are contemporaneously uncorrelated with the explanatory variables (Verbeek, 2004). As a result, the linear model can be interpreted as describing the conditional expectation of the dependent variable given a set of explanatory variables (Verbeek, 2004). Traditionally an endogenous variable was determined within the context of the economic model however the econometric definition states an endogenous variable is one that is correlated with the error term (Chenhall and Moers, 2007; Wooldridge, 2010). Conversely, if an explanatory variable is uncorrelated with the error term then it is defined as exogenous. Endogeneity is a term used to describe the presence of an endogenous explanatory variable (Wooldridge, 2010). Endogeneity of regression predictors is a common problem in many areas of applied economics especially health economics due to the field's heavy reliance on observational data (Terza *et al.,* 2008).

Endogeneity is likely to occur when a choice variable is placed on the right-hand-side of a regression equation and is expected to test the association with a specified outcome (Chenhall and Moers, 2007). In such instances, it is unrealistic to treat the explanatory variables as given or exogenous (Verbeek, 2004). Therefore, it is important to acknowledge the propensity of individuals to select into employment sectors in order to obtain utility premiums through matching (Luechinger *et al.,* 2010b). The following sections review the issue of endogeneity and non-random selection into public sector employment. Consequences of these issues are outlined and empirical techniques used to correct for these biases are discussed.

2.3.1: Three Forms of Endogeneity

The potential problems of endogeneity are well established in basic econometrics and are often recognized in applied economics (Chenhall and Moers, 2007). There are different reasons as to why error terms contemporaneously correlate with one or more explanatory variables but the most common reason is that the linear model no longer corresponds to the conditional expectation or a best linear approximation (Verbeek, 2004). According to Wooldridge (2010) in applied

econometrics endogeneity usually arises because of one of the following three reasons:

- Omitted Variables
- Measurement Error
- Simultaneity

Omitted Variables

Omitted variables arise when it would be preferential to control for one or more additional variables but usually because of data limitations they are not available (Wooldridge, 2010). The primary deciding factor in determining if an independent variable is essential in a regression model is based on economic theory (Studenmund, 2006). Omitting a relevant variable is likely to bias the calculated estimates but including an irrelevant variable leads to higher variances in the estimated coefficients away from the true value of the population coefficients (Studenmund, 2006). The bias caused by leaving a variable out of the regression model is called omitted variable bias. In theory based quantitative research the aim is to test a causal relationship between a dependent variable and explanatory variables (Chenhall and Moers, 2007). However, it is concerning to imply a causal relationship if there is the possibility that a modelled exogenous variable is in fact endogenous because of omitted variable bias (Chenhall and Moers, 2007). Woodridge (2010) illustrates the bias associated with omitting important variables and the possibility of endogeneity:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \gamma q + v \quad \textbf{(2.3.1)}$$

where:

y	dependent variable
x_1, x_2	observed explanatory variables or regressors
β_1, β_2	coefficients to be estimated
β_0	intercept
q	unobservable omitted factors or "omitted variable"
γ	parameter of unobservable omitted factor
v	structural error term

Assuming $\mathrm{E}(q) = 0$ and because the structural equation includes an intercept by putting q into the error term the structural equation above can be rewritten as:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_k x_k + u \quad \textbf{(2.3.2)}$$

$$u \equiv \gamma q + v$$

where:

u	error term

The new error term consists of two parts; v has zero mean and is uncorrelated with x_1, x_2, x_k (and q). By normalization, q also has zero mean. Therefore $\mathrm{E}(u) = 0$. However, u is uncorrelated with x_1, x_2, x_k if and only if q is uncorrelated with each and every observed regressor. If q is correlated with any of the regressors then so is u and endogeneity is present and OLS cannot consistently estimate any of the parameters (Wooldridge, 2010).

Correcting for omitted variable bias is complicated and it is difficult to detect (Studenmund, 2006). The problem is choosing what variable to add to an equation once you decide that is it suffering from omitted variable bias. Inevitably, there will

be secondary omitted variables that may be important in the model (Chenhall and Moers, 2007). The degree to which this is a problem is determined by β_2 and the $Cov(x_1, x_2)$. If either are sufficiently small, then endogeneity is not a problem (Chenhall and Moers, 2007). If either $\beta_2 = 0$ or $Cov(x_1, x_2) = 0$ then there is no endogeneity. If the omitted variable causes enough of a problem that it needs to be solved this can typically be done one of two ways: including a proxy variable in the analysis that is related to the unobserved omitted variable and using instrumental variables estimation techniques (Chenhall and Moers, 2007).

Measurement Error

In the presence of measurement error, the variable that is not observed, has a quantitative meaning but the analysis lacks an accurate measure of it (Wooldridge, 2010). Econometrically, measurement error is defined as the difference between the observed value and the actual value of either the dependent variable or explanatory variables (Wooldridge, 2013). Measurement error in the dependent variable increases its variability which decreases the overall statistical fit but remains unbiased in the estimated coefficients (Studenmund, 2006; Wooldridge, 2010). Measurement error in the explanatory variables can cause bias rendering the estimator no longer BLUE; Best-Linear-Unbiased-Estimates (Studenmund, 2006; Wooldridge, 2010). This causes explanatory variables to correlate with the error term (Verbeek, 2004; Studenmund, 2006). Therefore, measurement error in the explanatory variables is a more important problem.

A frequently used technique to rid a model of measurement error is to use an instrumental variable, similar to the omitted variable remedy. In the instance of measurement error, a substitute for the explanatory variable is chosen that highly correlates with the original explanatory variable that suffers from measurement error but is uncorrelated with the error term (Studenmund, 2006). However, this technique is only rarely applied because while it may be suspected that a variable contains measurement error it is impossible to be certain. Moreover, it is difficult to find an instrumental variable that meets both criteria (Studenmund, 2006).

Simultaneity

Typically, empirical work in business and economics assumes that relationships are of a single-equation type. In these equations an implicit assumption is that the cause-and-effect relationship is unidirectional; explanatory variables are the cause and the dependent variable is the effect (Gujarati, 2007). This assumption is present in the definitions of endogenous and exogenous variables. Endogenous variables are also called jointly determined variables while exogenous variables also called predetermined variables (Maddala, 2001). However, in some cases a unidirectional relationship is not meaningful such as when the dependent variable is determined by the explanatory variables and conversely, the explanatory variables are determined by the dependent variable (Gujarati, 2007). In other words there is a simultaneous relationship between the dependent variable and some of the independent variables that bring the validity of interpretations into question.

Simultaneity arises when one or more of the explanatory variables is jointly determined with the dependent variables typically through an equilibrium mechanism (Wooldridge, 2013). Simultaneity bias refers to the fact that in a simultaneous system, the expected values produced by the OLS-estimated structural equation are not equal to the true values (Studenmund, 2006). Simultaneity bias exists because in simultaneous equations systems the error terms tend to be correlational with the endogenous variables (Studenmund, 2006). In some cases the direction of the bias is difficult to identify similar to the bias caused by omitted variables (Wooldridge, 2013).

According to Verbeek (2004) a common example of simultaneity bias appears in the Keynsian Model where the consumption function is as follows:

$$C_t = \beta_0 + \beta_1 Y_t + \varepsilon_t \quad \textbf{(2.3.3)}$$

where;

C_t a country's real per capita consumption

Y_t real per capita income

β_1 coefficient to be estimated also known as the marginal propensity to consume ($0 < \beta_1 < 1$)

β_0 intercept

ε_t error term

This implies that there is a causal interpretation to β_1 describing the impact that income has on consumption; how much more will people consume if their income increases by one unit? (Verbeek, 2004). However, aggregate income is not exogenous but rather is determined by the following:

$$Y_t = C_t + I_t \quad \textbf{(2.3.4)}$$

where:

Y_t real per capita income

C_t a country's real per capita consumption

I_t real per capita investment

Even if it is assumed that I_t is exogenous and determined independent of the error term, both C_t and Y_t are endogenous, or simultaneously determined within the model (Verbeek, 2004). An increase in the error term of Equation 2.3.3 causes increases in the explanatory variables C_t and Y_t (Studenmund, 2006).

This simultaneity bias violates the assumption of independence between the error term and the explanatory variables, leading to endogeneity (Studenmund, 2006). OLS estimation of a regression model that suffers from simultaneity bias will typically provide inconsistent estimators for the behavioural parameters (Verbeek,

2004). Statistically, this means that the regression equation does not correspond to a conditional expectation and therefore the classical assumptions typically imposed on the error term are no longer valid (Verbeek, 2004).

Because the distinction between the three possible forms of endogeneity are not always apparent, an equation can actually have more than one source of endogeneity (Wooldridge, 2010). The following section outlines the overall consequences of endogeneity.

2.3.2: Consequences of Endogeneity

When OLS estimation is used on a regression equation that suffers from any of the three forms of endogeneity outlined by Wooldridge (2010), the estimator is biased and inconsistent. These terms are defined using the following regression equation:

$$Y = \hat{\beta}_0 + \hat{\beta}_1 X_1 + u \qquad \textbf{(2.3.5)}$$

where:

Y operationalized explained variable

X_1 operationalized explanatory variable

u error term

$\hat{\beta}_1$ coefficient represented estimated sign and magnitude of relationship between X_1 and *Y*.

$\hat{\beta}_0$ coefficient of the intercept

By definition an estimator ($\hat{\beta}_1$) will be unbiased if operational estimates are equally dispersed around the conceptual or true estimator (β_1) when a large (infinite) number of estimates are made (Chenhall and Moers, 2007). Consistency indicates that the distribution of the estimator ($\hat{\beta}_1$) becomes concentrated on the true value (β_1). A key assumption of OLS is to consistently estimate the parameters which is statistically known as the population orthogonality condition where $E(x'u) = 0$

(Wooldridge, 2010). Because *x* contains an intercept this assumption is equivalent to saying that *u* has zero mean and is uncorrelated with each regressor which is also known as the zero conditional mean assumption (Wooldridge, 2010).

Biasedness and inconsistency are of concern because they impact the extent that operational and conceptual variables link explanatory variables and dependent variables within the predictive validity framework (Chenhall and Moers, 2007). According to Milbourne *et al.* (2003) possible endogeneity of right hand side variables within the regression model have two implications, one econometric and one interpretive explained as follows:

- The parameter estimates will be biased and inconsistent making for a poor goodness of fit and the magnitude of the parameter estimates will be unreliable.
- The interpretation of the parameter estimates become difficult as in the case when a cause-and-effect is not discernible.

In these such instances, OLS can no longer be used and alternative methods must be employed to account for the issue of endogeneity.

2.3.3: Sample Selection Bias

A selected sample is a general term that describes a non-random sample (Wooldridge, 2010). Selection bias occurs when the selection of the sample systematically excludes or underrepresents a certain group (Studenmund, 2006). This non-randomness of the sample translates to a form of omitted variable bias known as sample selection bias (Greene, 2012). Heckman (1979) shows that selection bias can be considered a form of omitted variable bias where the omitted term is a function of the selection probability (Kenkel and Signorino, 2012). Selection bias can occur when we examine data for a group of people who have chosen to be in that group (Studenmund, 2006).

When studying subjective well-being and its indicators like job satisfaction, sample selection arises naturally since it is expected individuals choose their life circumstances with the purpose of maximizing well-being (Luechinger *et al.*,

2010b). Endogeneity occurs as a result of how a choice variable affects a desired outcome (Chenhall and Moers, 2007). This therefore calls for a degree of caution in interpreting previous economic research on people's happiness especially in situations where people have choice (Luechinger *et al.*, 2010b). Sample selection biases arise because it is only possible to observe individuals making optimal choices (Berger and Leigh, 1988). In such instances, selection into a particular category would not be random and the unobserved individual characteristics affecting the choice variables also influences subjective well-being (Heckman, 1979). Therefore, the choice variable must be treated as endogenous (Zhang, 2004) where appropriate econometric techniques can account for this. If selection bias is not taken into account then empirically estimating equations will lead to biased and inconsistent estimators (Gujarati, 2009; Heckman, 1979; Maddala, 1983; McCausland *et al.*, 2005).

The importance of acknowledging sample selection is illustrated in occupational choice literature that shows employees tend to work for organizations that they think will satisfy their most important needs (Lawler, 1971). Many studies have shown that individual characteristics such as individual values predict employment preferences (Wright, 2001). For example, individuals' attitudes for risk aversion have been shown to influence occupational choice (Frachs-Schündeln and Schundeln, 2005) and more specifically non-random selection into public sector employment (Pfeifer, 2011) and self-employment (Cramer *et al.*, 2002). Risk-averse individuals might choose occupations that are associated with less risk while risk loving individuals prefer occupations with higher risk (Frachs-Schündeln and Schündeln, 2005).

2.3.3.1: Public Sector Sample Selection Theory

Sorting of individuals in the labour market not only creates the most productive use of skills but also creates utility gains when an optimal match between job characteristics and individual preferences occur (Luechinger *et al.*, 2010b; Pfeifer, 2011). Roy's (1951) matching model states individuals match themselves to their occupation sector in order to receive a relative advantage. When individuals experience an optimal match between job characteristics and preferences they get a

rent or benefit from a utility premium; individuals receive more utility than what they require to stay in their current job (Luechinger *et al.*, 2010b). The extra benefit of matching individual preferences to job characteristics in public sector employment has been shown to be so profound it compensates for large wage differentials compared to private sector employees (Pfeifer, 2010). The well-being consequences of various environmental conditions can not merely be assessed by comparing individuals' well-being across environments or from changes in well-being of those who voluntarily change environments (Luechinger *et al.*, 2010b). If people select into employment sectors this could produce biased coefficients (Luechinger *et al.*, 2010a). Additionally, the selection into public and private sector employment should be most directly linked to job satisfaction (Luechinger *et al.*, 2010b).

Public sector employees tend to enjoy higher job security than private sector employees (Luechinger *et al.*, 2010a). In most countries public sector employees are better protected against job loss and the threat of bankruptcy is not as high compared to private sector employers (Luechinger *et al.*, 2010a). Employment as a whole has been traditionally thought of as being more stable in public sector occupations (Bellante and Link, 1981). Moreover, risk taking is rewarded with higher wages for private sector employees but not for public sector employees (Pfeifer, 2011). These higher wages in private sector occupations may reflect the compensating wage differential that is paid to account for higher labour market volatility (Pfeifer, 2010). Therefore, public sector occupations tend to attract workers with a strong preference for job security (Bellante and Link, 1981; Luechinger *et al.*, 2010b) even if this means forfeiting higher wages despite higher qualifications (Pfeifer, 2010). Risk aversion among public sector employees has been divided into a strong aversion to career-specific risk and a weaker aversion to general risk attitudes (Pfeifer, 2010).

2.3.3.2: Correcting for Sample Selection in the Job Satisfaction Equation

McCausland *et al.* (2005) outlines a job satisfaction model when self-selection occurs in samples that are truncated into cohorts. McCausland *et al.* (2005) uses a switching model to estimate the job satisfaction equations. The following displays the job satisfaction equations truncated for sectoral employment:

$$JS_{PS_i} = X_{PS_i}\beta + INSEC_{PS_i}\beta_k + u_{PS_i} \quad \textbf{(2.3.6)}$$

$$JS_{O_i} = X_{O_i}\gamma + INSEC_{O_i}\gamma_k + u_{O_i} \quad \textbf{(2.3.7)}$$

where:

JS	category of ordered job satisfaction outcomes
PS	public sector worker identifier
O	other type of worker identifier
i	indexed individuals where *i* = 1, . . . , *n*
n	sample observations
X_{ji}	$[1 \times (\mathrm{K} - 1)]$ vector of exogenous variables believed to influence job satisfaction
K	number of independent variables
INSEC	self-reported job insecurity of individual *i.*
$\beta \; and \; \gamma$	associated (K $\times$ 1) coefficients
u	random error terms with $E(u_{ji}) = 0 \; and \; Cov(X_{ji}, u_{ji}) = 0$

The selection equation which determines which sector individuals choose:

$$PS_i^* = Z_i\delta + v_i \quad \textbf{(2.3.8)}$$

where:

PS_i^*	latent variable which describes the agent's propensity for choosing public sector employment.
Z_i	(1$\times$ q) vector of all exogenous variables in the model (with at least one determining the employee's selection, but excluded from the structural JS equations, i.e. $q \geq K$)
δ	parameters to be estimated for all exogenous variables
q	number of independent variables
v	disturbance term with $Cov(Z_i, v) = 0$ and $v \sim N(0,1)$

PS_i^* is unobserved and explained as follows:

$$PS_i = 1 \; if \; PS_i^* > 0 \qquad \textbf{(2.3.9)}$$

$$PS_i = 0 \; if \; PS_i^* \leq 0 \qquad \textbf{(2.3.10)}$$

where:

PS_i	observed discrete dependent variable
PS_i^*	unobserved latent dependent variable

In order to consistently estimate β and γ a Heckman two-step procedure is required (McCausland *et al.*, 2005).

2.3.3.3: Estimation of the Job Satisfaction Equation using the Heckman Two-Step Probit OLS Method

One way of accounting for potential selection into public sector employment is to use the standard two step estimation method proposed by Heckman (Luechinger *et al.*, 2010b; Pfeifer, 2011). This model comes from choices of two outcomes (Berger and Leigh, 1988). The first step is to estimate a person's propensity to select into the choice outcome using the binomial probit model. The first step must have at least one variable in the vector of explanatory variables that is not included in the vector of explanatory variables in the second equation (Maddala, 1983). The probit equation then estimates predicted values used for the calculation of a correction term called the Inverse Mills Ratio. This is then inserted into the second step estimation of the outcome equation producing consistent and unbiased estimators (Heckman, 1979). The Two-Step Heckman Model begins with an original regression of interest. The original regression presented is explained by Greene (2000) and presented as follows:

$$y_i^* = \beta' x_i + \varepsilon \quad \textbf{(2.3.11)}$$

where:

y_i^* unobserved underlying latent variable

x_i vector of observations on a set of explanatory variables

β vector of unknown parameters

ε_i random error tem

The Heckman Two-Step Selection Model is outlined in the following two steps:

Step 1- Estimation of Selection Equation

The participation selection equation is explained in Green and Hensher (2010) where it is determined by a latent regression Equation 2.3.12. Here the random variable z_i takes on two values, one and zero, with probabilities described in Equation 2.3.13.

$$z_i^* = \alpha' w_i + u_i \quad \textbf{(2.3.12)}$$

$$\begin{aligned} \text{Prob}\,(z_i = 1|x_i) &= \text{Prob}(z_i^* > 0|x_i) \quad \textbf{(2.3.13)} \\ &= \text{Prob}(\alpha' x_i + u > 0) \\ &= \text{Prob}(u_i > -\alpha' x_i) \end{aligned}$$

where:

z_i^* latent binary choice dependent variable

α unknown vector of parameters

w observed independent variables

u standard normal shock

x_i vector of observations on a set of explanatory variables

i indexed individuals where $i = 1, \ldots, n$

The first step requires estimating α in the participation equation using the maximum likelihood estimation method of the binary probit model. There should be at least one variable in the selection equation that is not included in the equation of interest, the outcome equation (Chiburis and Lokshin, 2007). The general strategy proposed by Heckman (1979) is to overcome the sample selection through the inclusion of a correction term. From the participation selection equation an estimate of the Inverse Mills Ratio (λ_i) is calculated for each individual in the sample. The probit model is outlined in Equation 2.3.14 and 2.3.15 with the log likelihood estimator of the probit model in Equation 2.3.16 (Wooldridge, 2003; Greene, 2002).

$$\Pr(Y = 1|x) = \int_{-\infty}^{x'\beta} \phi\,(t)dt = \Phi(X'\beta) \qquad \textbf{(2.3.14)}$$

where:

Pr	probability of selecting into the choice outcome
$\phi(\cdot)$	standard normal density
Φ	Cumulative Distribution Function (CDF) of the standard normal distribution
β	unknown parameters
X	observed independent variables

Where the cumulative distribution function (CDF) of a standard normal variate (SNV)[5] (Borooah, 2002; Greene, 2000) is explained as follows:

$$\Pr(\mathrm{X} < \mathrm{x}) = \Phi(\mathrm{x}) = \int_{1}^{x} \frac{1}{2\pi} e^{\frac{-X^2}{2}}\, dX \qquad \textbf{(2.3.15)}$$

[5] Normally distributed with mean 0 and variance 1

and the log-likelihood estimator of the probit model:

$$\text{Log L} = \sum_{y_i=0}^{n} \ln[1 - \Phi(\alpha' x_i)] + \sum_{y_i=1}^{n} \ln\Phi(\alpha' x_i) \quad \textbf{(2.3.16)}$$

where:

Φ cumulative normal distribution of u_i

n sample observations

x_i a vector of observations on a set of explanatory variables

α an unknown vector of parameters

i indexed individuals where $i = 1, \ldots, n$

Once α is estimated, the Inverse Mills Ratio (λ_i) is calculated for each individual in the selected sample using the Equation 2.3.17. The Inverse Mills Ratio is a monotone decreasing function of the probability that an observation is selected into the sample (Hekman, 1979).

$$\widehat{\lambda_i} = \phi(\widehat{\beta}' x_i)/\Phi(\widehat{\beta}' x_i) \quad \textbf{(2.3.17)}$$

where:

ϕ probability density function

Φ cumulative normal distribution of u_i

β vector of unknown parameters

x_i vector of observations on a set of explanatory variables

Step 2 – Estimation of the Outcome Equation

Once the Inverse Mills Ratio is estimated from the probit selection equation in the first step, the OLS estimator becomes consistent for the n observations reporting values of y_i. This is done by including the estimated Inverse Mills Ratio (λ_i) as an additional regressor in the outcome equation. This is displayed in Equation 2.3.18 (Vella, 1998). A *t*-test on the null hypothesis $\mu = 0$ represents a test of sample selectivity bias (Vella, 1998).

$$y_i = x_i'\beta + \mu\widehat{\lambda_\iota} + \eta \quad \textbf{(2.3.18)}$$

where:

x_i	vector of observations on a set of explanatory variables
β and μ	consistent OLS obtained estimates
η	zero mean error uncorrelated with the regressors

This thesis corrects for non-random selection into public sector employment using the standard Two-Step Heckman Probit OLS Model. The underlying assumption is that potential job satisfaction is related to the probability of being a public sector employee (Clark, 1997) which has the potential to influence the effect of the explanatory variable job insecurity. Sample selection produces biased and inconsistent estimators therefore making it difficult to make true inferences about the relationship between job insecurity and job satisfaction.

The methodology of this thesis closely follows that laid out by Clark (1997) where selection bias produced by men and women selecting into general employment is corrected for. This is done by employing a maximum likelihood estimation of the Heckman sample selection probit model. The author initially estimates job satisfaction equations by the ordered probit model because of the ordered nature of the dependent variable. However, when employing a Heckman model to correct for sample selection bias the calculated Inverse Mills Ratio cannot thereafter be included in a non-linear model (Clark, 1997). Therefore, job satisfaction must be treated continuously rather than categorically in the second stage of the Heckman model and estimated by OLS. Many studies have incorrectly applied the Inverse Mills Ratio in attempts to correct for sample selection in nonlinear forms of the outcome equation (Greene and Hensher, 2010). The common approach of simply adding a selection correction term (λ_i) to a model of interest is not appropriate for nonlinear models (Greene, 2012). Therefore this study follows a traditional Two-Step Heckman Probit OLS Model.

In order to apply the Heckman model to the job satisfaction equation in this thesis, an additional variable must be selected that contributes to the propensity of

selecting into public sector employment but is excluded from the job satisfaction equation. Luechinger *et al.* (2010b) use the variable national citizenship in Step 1, estimation of the selection equation. The rationale being that employment in the public sector is generally reserved for national citizens of that country. This is especially applicable to the government sector. This is the exogenous independent variable that determines the employee's selection but is excluded from the structural job satisfaction equation (McCausland *et al.,* 2005) The propensity to select into public sector employment is estimated in a similar study which calculates the Inverse Mills Ratio but is then included a second step wage equation (Pfeifer, 2010).

2.3.4: The Simultaneous Equations Model

In the estimation of the effect of job insecurity on job satisfaction of public and private sector workers both endogeneity and selection bias are accounted for (Artz and Kaya, 2014; Luechinger *et al.,* 2010ab; Theodossiou and Vasileiou, 2007). Selection bias requires the estimation of the simultaneous equations model consisting of a job satisfaction outcome equation and a public sector selection equation. Endogeneity corrected estimates similarly require the estimation of a job satisfaction – job insecurity simultaneous equations model.

Basic economic models are typically those with a single equation. Single equation models rely on there being a single dependent variable (*Y*) and one or more explanatory variables (*X's*). In such models the emphasis is on estimating or predicting the average value of *Y* conditional upon the fixed values of the *X* variables (Gujarati, 2009). This generates an inherent cause-and-effect relationship that runs from the explanatory variables to the dependent variable (Gujarati, 2009). However, there are many economic applications where a one-way or unidirectional relationship is not meaningful, for example, when *Y* is determined by some of the *X's* and some of the *X's* are in turn determined by *Y* (Gujarati, 2009). Economic theory is largely based on sets or systems of relationships as opposed to single-equation models (Greene, 2002) where some of the most important models in economics are simultaneous in nature (Studenmund, 2006). This is important because the estimation of simultaneous equations models with OLS cause a host of difficulties that aren't present in single equation models (Studenmund, 2006). Estimating

simultaneous equations systems with OLS will produce biased estimates (Studenmund, 2006).

In simultaneous equations models there is more than one equation for each of the mutually dependent or endogenous variables (Gujarati, 2009). Unlike the single-equations model, in the simultaneous-equations model one may not estimate the parameters of one equation without taking into account information provided by other equations in the system (Gujarati, 2009). Two or more equations together is the structure of the model (Greene, 2002). Structural equations characterise the underlying economic theory behind each endogenous variable by expressing it in terms of both endogenous and exogenous variables (Studenmund, 2006). Researchers must view them as an entire system in order to see all of the feedback loops (Studenmund, 2006).

It is important to remember in using simultaneous equations models that each equation in the system should have a *ceteris paribus* clause or a causal interpretation. This is because only the outcomes in equilibrium are observed; counterfactual reasoning is reasoning in constructing the equations of a simultaneous equations model (Wooldridge, 2013). In building a model a researcher must be careful when classifying economic variables as endogenous or exogenous. A defence is required based on *a priori* or theoretical grounds (Gujarati, 2009). A general notation for linear simultaneous equations models beings with the structural form of the model and is outlined by Greene (2002) as follows:

$$\gamma_{11}\gamma_{t1} + \gamma_{21}y_{t2} + \cdots + \gamma_{M1}y_{tM} + \beta_{11}x_{t1} + \cdots + \beta_{K1}x_{tK} = \varepsilon_{t1}, \qquad \textbf{(2.3.19)}$$
$$\gamma_{12}\gamma_{t1} + \gamma_{22}y_{t2} + \cdots + \gamma_{M2}y_{tM} + \beta_{12}x_{t1} + \cdots + \beta_{K2}x_{tK} = \varepsilon_{t2},$$
$$\vdots$$
$$\gamma_{1M}y_{t1} + \gamma_{2M}y_{t2} + \cdots + \gamma_{MM}y_{tM} + \beta_{1M}x_{t1} + \cdots + \beta_{KM}x_{tK} = \varepsilon_{tM}.$$

There are M endogenous equations and M endogenous variables, denoted $y_1, \ldots, y_M$. There are K exogenous variables, $x_1, \ldots, x_K$, that may include predetermined values of $y_1, \ldots, y_M$. $\varepsilon_{t1}, \ldots, \varepsilon_{tM}$ are the structural disturbances. The subscript *t* will be used to index observations, $t = 1, \ldots, T$ (Greene, 2002). The γ's

and β's are structural coefficients and hypotheses should be about their signs (Studenmund, 2006). They are called structural equations because they portray the structure of an economy or the behaviour of an economic agent (Gujarati, 2009). Each equation has a *ceteris paribus* interpretation and stands on its own (Wooldridge, 2010). They become linked in econometric analysis.

A unique feature of a simultaneous equations model is that an endogenous dependent variable in one equation may appear as an explanatory variable in another equation of the system (Gujarati, 2007). As a consequence, such an endogenous explanatory variable becomes stochastic and is usually correlated with the disturbance terms of the equation which it appears as an explanatory variable (Gujarati, 2007).

According to Greene (2002) in matrix terms the system of equations can be written as:

$$[y_1\ y_2\ \dots\ y_M]_t \begin{bmatrix} \gamma_{11} & \gamma_{12} & \cdots & \gamma_{1M} \\ \gamma_{21} & \gamma_{22} & \cdots & \gamma_{2M} \\ & & \vdots & \\ \gamma_{M1} & \gamma_{M2} & \cdots & \gamma_{MM} \end{bmatrix} + [x_1\ x_2\ \dots\ x_K]_t \begin{bmatrix} \beta_{11} & \beta_{12} & \cdots & \beta_{1M} \\ \beta_{21} & \beta_{22} & \cdots & \beta_{2M} \\ & & \vdots & \\ \beta_{M1} & \beta_{M2} & \cdots & \beta_{MM} \end{bmatrix}$$

(2.3.20)

$$= [\varepsilon_1\ \varepsilon_2\ \dots\ \varepsilon_M]_t$$

In a system of equations to determine y_t in terms of x_t and ε_t the above matrix notation can be rewritten as:

$$y_t'\Gamma + x_t'B = \varepsilon_t' \qquad \textbf{(2.3.21)}$$

where:

y endogenous dependent variable

Γ KxM non singular matrix

x exogenous dependent variables

B KxK parameter matrix

ε structural disturbances

t index of observations $t = 1, \ldots, T$

There are M equations for M endogenous variables and K exogenous variables where every column is the vector of coefficients in a particular equation and each row applies to a specific variable (Greene, 2002). One of the variables in each equation is identified as the dependent variable so that it's coefficient in the model will be equal to 1. Thus there will be at least one "1" in each column of Γ (Greene, 2002). The joint determination of the variables in this model is recursive. The first equation is completely determined by the exogenous factors. Then given the first equation, the second equation is likewise determined and so on (Greene, 2002).

In a system of equations, determining y_t in terms of x_t and ε_t is done by using the reduced form of the model. Reduced form equations are those that express an endogenous variable solely in terms of the predetermined variables and the stochastic disturbances (Gujarati, 2009). Explained in Greene (2002) the reduced form of the model is written in matrix notation as follows:

$$y_t' = [x_1\ x_2\ \dots\ x_K]_t \begin{bmatrix} \pi_{11} & \pi_{12} & \cdots & \pi_{1M} \\ \pi_{21} & \pi_{22} & \cdots & \pi_{2M} \\ & & \vdots & \\ \pi_{K1} & \pi_{K2} & \cdots & \pi_{KM} \end{bmatrix} + [v_1\ \dots\ v_M]_t \qquad \textbf{(2.3.22)}$$

Also written as the following:

$$-x_t' B\Gamma^{-1} + \varepsilon_t'\Gamma^{-1} = x_t'\Pi + v_t' \qquad \textbf{(2.3.23)}$$

where:

x	exogenous dependent variables
B	KxK parameter matrix
Γ	KxM non singular matrix
Π	KxM reduced form coefficients matrix
v	reduced form disturbances which equals $\varepsilon_t'\Gamma^{-1}$
ε	error term
t	index of observations $t = 1, \dots, T$

A consequence of estimating an endogenous explanatory variable it that it becomes stochastic and is usually correlated with the disturbance term of the equation in which it appears as an explanatory variable (Gujarati, 2007). In these models a unilateral cause-and-effect relationship cannot be identified rendering the typical OLS estimation technique inappropriate to estimate a single equation in the context of simultaneous equations models (Gujarati, 2009). Therefore, estimating a simultaneous equations model by OLS produces a biased and inconsistent estimator (Gujarati, 2009). That is, as the sample size increases indefinitely, the estimators do not converge to their true population values (Gujarati, 2009). If we consider the general M equations model in M endogenous variables given in Equation 2.3.19 then two approaches may be used to estimate the structural equations, namely single-equation methods known as limited information methods and system methods

known as full information methods (Gujarati, 2009). These are discussed further in the following section.

2.3.4.1: Estimating Simultaneous Equations Models Using the Instrumental Variables Technique

Simultaneity is a major cause of endogeneity which typically arises when one or more of the explanatory variables is jointly determined with the dependent variable (Wooldridge, 2010). The bias emerges in the estimation of simultaneous equations models when the expected values of the structural equations are not the true values (Studenmund, 2006). Typically this simultaneity bias is caused by employing the OLS estimation method on a series of simultaneous equations resulting in a biased and inconsistent estimator (Gujarati, 2009). Therefore, this calls for alternative estimation methods to take into account the simultaneous nature of an economic model that can account for endogeneity in its regressors.

In estimating the parameters in simultaneous equation models, the problem is rather complex because there are a variety of estimation techniques with varying statistical properties (Gujarati, 2009). The list of choices available for estimating consistent and efficient estimators in simultaneous equations models is quite lengthy (Greene, 2002). A common method of obtaining estimates of the parameters in simultaneous equations models is the instrumental variables method (Greene, 2002; Maddala, 2001). In fact all of the various methods developed for simultaneous equations models fall under the umbrella of instrumental variables methods (Greene, 2002; Castineira and Nunes, 1999). These methods differ in their choice of instruments and in whether the equations are estimated one at a time or jointly. These methods are then divided into two approaches: Limited Information and Full Information (Greene, 2002). These estimation methods are discussed in the following sections.

Instrumental variable (IV) technique is the leading method used to consistently estimate parameters in simultaneous equations models (Gujarati, 2009; Wooldridge, 2013). The earliest application of IV estimation involved attempts to estimate supply and demand curves (Angrist and Krueger, 2001). IV method of

estimation is a general method of wide applicability in all instances where the explanatory variables are correlated with the errors (Maddala, 2001). An instrumental variable is a variable that is uncorrelated with the error term but is correlated with the endogenous explanatory variables in the equation (Maddala, 2001). Starting with a single regression model (Equation 2.3.24) it is believed that *x* and *u* are correlated

$$y = \beta x + u \qquad \textbf{(2.3.24)}$$

where:

y dependent variable

x independent variable

β coefficient to be estimated

u stochastic error term

We cannot estimate Equation 2.3.24 by ordinary least squares because the correlation between *x* and *u* will cause the estimator to be biased and inconsistent. However, if another variable (*z*) is found that is uncorrelated with *u*, a consistent estimator can be obtained (Maddala, 2001). According to Wooldridge (2013) this new variable *z* is an instrumental variable for *x* if it satisfies the following two assumptions:

- *z* is uncorrelated with *u* that is: $\text{Cov}(z, u) = 0$. This includes any unobservable factors lumped into *u*.
- *z* is correlated with *x* that is: $\text{Cov}(z, x) \neq 0$

According to Maddala (2001) if we find this variable *z* that is uncorrelated with *u* we can get a consistent estimator for β by replacing the condition $\text{Cov}(z, u) = 0$ by its sample counterpart:

$$\frac{1}{n}\sum z(y - \beta x) = 0 \qquad \textbf{(2.3.25)}$$

where:

n is the number of observations

Z the instrumental variable

This gives the following:

$$\hat{\beta} = \frac{\sum zy}{\sum zx} = \frac{\sum z(\beta x + u)}{\sum zx} = \beta + \frac{\sum zu}{\sum zx} \quad \textbf{(2.3.26)}$$

Because the first assumption involves the covariance between *z* and the unobserved *u*, in general this cannot be tested (Wooldridge, 2013). In order to maintain $\mathrm{Cov}(z, u) = 0$ a researcher must appeal to behaviour or introspection (Wooldridge, 2013).

The IV estimation method for the simple regression model can be applied to the multiple regression case. Beginning with the following structural equation Wooldridge (2013) derives the consistent instrumental variable estimators:

$$y_1 = \beta_0 + \beta_1 y_2 + \beta_2 z_1 + u_1 \quad \textbf{(2.3.27)}$$

where:

y_1, y_2 endogenous variables

z_1 exogenous variable

u_1 error term

β_j parameters to be estimated

The econometric definition of an endogenous variable is one that is correlated with the error term (Wooldridge, 2010; Chenhall and Moers, 2007). Conversely, if an explanatory variable is uncorrelated with the error term then it is defined as exogenous.

Following the strategy employed for the single regression model, an instrumental variable for y_2 is required. This instrumental variable is the exogenous variable labelled z_2. According to Wooldridge (2013) the variable z_2 is an appropriate instrument for y_2 if the following assumptions are satisfied:

- z_1 is uncorrelated with the error term that is: $Cov(z_1, u_1) = 0$
- z_2 is uncorrelated with the error term that is: $Cov(z_2, u_1) = 0$
- u_1 has zero expected value which is assumed in general when the equation contains an intercept that is: $E(u_1) = 0$

The methods of moment approach suggests obtaining consistent estimators by solving the sample counterparts of the three assumptions above (Wooldridge, 2013):

$$\sum_{i=1}^{n}(y_{i1} - \widehat{\beta_0} - \widehat{\beta_1}y_{i2} - \widehat{\beta_2}z_{i1}) = 0 \qquad \textbf{(2.3.28)}$$

$$\sum_{i=1}^{n} z_{i1}\left(y_{i1} - \widehat{\beta_0} - \widehat{\beta_1}y_{i2} - \widehat{\beta_2}z_{i1}\right) = 0$$

$$\sum_{i=1}^{n} z_{i2}\left(y_{i1} - \widehat{\beta_0} - \widehat{\beta_1}y_{i2} - \widehat{\beta_2}z_{i1}\right) = 0$$

This is a set of linear equations for the three unknown parameters $\hat{\beta}_0,\ \hat{\beta}_1,\ \hat{\beta}_2$. They are estimated easily given the data on y_1, y_2, z_1, z_2. Similar to the single regression model, z_2 must still be correlated with y_2 but the degree to which these variables need to be correlated is complicated by the presence of z_1 (Wooldridge, 2013). The assumption of correlation must be stated in terms of partial correlation beginning with the endogenous explanatory variable as a linear function of the exogenous variables and an error term as follows:

$$y_2 = \pi_0 + \pi_1 z_1 + \pi_2 z_2 + v_2 \qquad \textbf{(2.3.29)}$$

Where, $E(v_2) = 0, \text{Cov}(z_1, v_2) = 0, \text{and Cov}(z_2, v_2) = 0$ and the π_j are unknown parameters. In addition to the three assumptions the key identification condition is $\pi_2 \neq 0$ (Wooldridge, 2013). The identification condition determines whether numerical estimates of the parameters of a structural equation can be obtained from the estimated reduced-form coefficients (Gujarati, 2009). The ordered condition refers to the question of whether or not we have enough exogenous variables elsewhere in the system to use as instruments for endogenous variables in the equation with unknown parameters (Maddala, 2001). The equation is said to be under identified if there are not enough instrumental variables. If it is exactly identified we have just enough instrumental variables and if it is over identified we have more than enough instrumental variables (Gujarati, 2009).

An instrumental variable is a variable that is uncorrelated with the error term but highly correlated with the relevant endogenous variable (Wooldridge, 2010; Chenhall and Moers, 2007). In practice both of these assumptions are likely to be violated and the instrument is classified as poor (Maddala, 2001). The problem of poor instruments and testing for appropriate instruments has come under scrutiny leading to the acknowledgement that sometimes the cure (IV estimation) can be worse than the disease (endogenous explanatory variables) (Maddala, 2001). Bound, Jaeger and Baker (1996) state the following as two major problems associated with IV estimation:

- If the correlation between the IV and the endogenous explanatory variable is low, then even if the IV is weakly correlated with the error term there can be large inconsistencies.

- In finite samples the IV estimators are biased in the same direction as the OLS estimators. The bias in the IV estimators approaches the bias in the OLS estimators if the coefficient of determination (R^2) between the instrument and the potential endogenous variable is close to zero.

Recent studies that have focused on the issues interpreting of IV estimates (Angrist *et al.*, 1996, Bound *et al.*, 1996; Moers, 2006). However, the instrumental

variables technique is still the leading method used to consistently estimate parameters in simultaneous equations models (Gujarati, 2009; Wooldridge, 2013). Table 2.3.1. displays recent literature that have used instrumental variables estimation techniques.

Table 2.3.1: Examples of Studies That Use Instrumental Variables Techniques

Outcome Variable	Endogenous Variable	Source of Instrumental Variables(s)	Reference
Labour supply	Disability insurance replacement rates	Region and time variation in benefit rules	Gruber (2000)
Labour supply	Fertility	Sibling-Sex composition	Angrist and Evans (1998)
Education, Labour supply	Out-of-wedlock fertility	Occurrence of twin births	Bronars and Grogger (1994)
Wages	Unemployment insurance tax rate	State laws	Anderson and Meyer (2000)
Earnings	Years of schooling	Region and time variation in school construction	Duflo (2001)
Earnings	Years of schooling	Proximity to college	Card (1995)
Earnings	Years of schooling	Quarter of birth	Angrist and Krueger (1991)
Earnings	Veteran status	Cohort dummies	Imbens and van der Klaauw (1995)
Earnings	Veteran status	Draft lottery number	Angrist (1990)
Achievement test scores	Class size	Discontinuities in class size due to maximum class-size rule	Angrist and Lavy (1999)
College enrolment	Financial aid	Discontinuities in financial aid formula	van der Klaauw (1996)
Health	Heart attack surgery	Proximity to cardiac care centers	McClellan, McNeil and Newhouse (1994)
Crime	Police	Electoral cycles	Levitt (1997)
Employment and Earnings	Length of prison sentence	Randomly assigned federal judges	Kling (1999)
Birth weight	Maternal smoking	State cigarette taxes	Evans and Ringel (1999)

Source: Angrist and Krueger (2001)

2.3.5: Simultaneity in Subjective Well-Being Research

Heady *et al.,* (1991) state that previous subjective well-being research has assumed that variables such as domain satisfactions, social support, life events and levels of expectations or aspirations are *causes* of subjective well-being. However critics have pointed out that they could just as easily be considered consequences of subjective well-being (Costa and McCrae, 1980; Veenhoven, 1988). By estimating subjective well-being equations the interpretations of estimated coefficients reside on the assumption that causality runs from explanatory to dependent variable (Dolan *et al.,* 2007). The directionality assumption between dependent and independent variables falls under the dominant approach by economists to make inferences about causal effects rather than identify mere associations between variables (Angrist *et al.,* 1996). Correlates to subjective well-being are generally considered 'causes' yet these links can result from reversed effects as well (Veenhoven, 1991). Reversed effects fall under the simultaneity category mentioned previously as one of the three causes of endogeneity. Diener *et al.* (1999) suggests that a closer look it needed into the causal direction of subjective well-being where the application of more sophisticated methodologies are required.

Dolan *et al.* (2008) describes a range of problems in imposing causality assumptions in subjective well-being literature such as: contradictory evidence has and will continue to emerge, concerns about potentially unobservable variables and the lack of certainty on the direction of causality. Without a clear understanding of causality, well-being policy recommendations become difficult at best (Helliwell, 2003). Unless the causal chain does indeed run from the activity to well-being the policy change may have unintended consequences (Helliwell, 2003).

2.3.5.1: Simultaneity between Job Satisfaction and Job Insecurity

The empirical literature on job satisfaction has started to deal with potential endogeneity only quite recently by estimating simultaneously the job satisfaction equation and the endogenous variable equation (Origo and Pagani, 2008). It is commonly assumed in the job satisfaction literature that perceived risk of job loss affects workers' job satisfaction, however, it may also be the case that dissatisfied workers face an increased risk of losing their jobs (Theodossiou and Vasileiou,

2007). In fact most contributions to well-being literature suffer from simultaneity bias (Geishecker, 2010). It has been shown that job satisfaction decreases strong worries of potential job loss as well as some worries of potential job loss (De Bustillo and De Pedraza, 2010). It is essential in any job satisfaction research that the simultaneous nature to job insecurity is accounted for (Theososssiou and Vasileiou, 2007). This simultaneous relationship is a major instigator of endogeneity bias which can result in biased and inconsistent estimators (Wooldridge, 2010; Verbeek, 2004).

It is found that after controlling for endogeneity, the perceived risk of job loss has a strong and significant detrimental effect on well-being measured as job satisfaction (Geishecker, 2010, 2012; Theodossiou and Vasileiou, 2007). Geishecker (2010, 2012) find the true unbiased estimates of perceived job insecurity to be negative and more than twice the size of the estimates produced from non-endogeneity corrected estimators. As is commonly done in the literature, ignoring simultaneity between perceived job insecurity and job satisfaction drastically underestimates the relationship (Geishecker, 2010, 2012).

Artz and Kaya (2014) confirm that job insecurity is a significant determinant of job satisfaction but hypothesize that the magnitude of this relationship is subject to not only how likely it is that a worker loses their job but also how likely it is that a worker can find another upon becoming unemployed. Using a difference-in-difference methodology, the authors find that three different measures of job insecurity decrease the job satisfaction of private sector workers and increase their incentives to quit. This relationship exists more when job openings are relatively plentiful compared to when job openings are relative scarce. Job insecurity is found to be endogenous in explaining job satisfaction, but after correcting for the bias the negative relationship between job satisfaction and job insecurity remains (Artz and Kaya, 2014). Rather than using the more common instrumental variables techniques to correct for endogeneity, objective proxies are substituted for job insecurity by using industries and occupations that are more likely to offer secure jobs (Artz and Kaya, 2014).

Origo and Paani (2009) conduct a study where interaction terms consisting of variables measuring length of employment contract and perceived job insecurity are regressed on job satisfaction. Similar to Artz and Kaya (2014), Origo and Paani

(2009) believe the perceived job insecurity and job satisfaction relationship is contingent on a third factor, the length of employment contract. When these terms are interacted together this captures what the authors call *"flexicurity."* The aim of their paper is to identify the joint effect exerted by the objective variable "type of employment contract" and the subjective variable "perceived job insecurity" on job satisfaction. Following Linz (2003) and Bauer (2004) the authors exploit the richness of the data in terms of individual characteristics including a large set of information on workers' psychological attitudes towards work and life in order to account for potential endogeneity (Origo and Pagani, 2008, 2009). The data used provides information on job expectations, physical and psychological uneasiness due to work, individual motivation, importance and intensity of social relations and overall self-esteem that are all considered to be good measures of unobserved individual characteristics that can influence an individual's predisposition to job insecurity and job satisfaction simultaneously (Origo and Paani, 2009). After controlling for endogeneity, individuals who are considered insecure-temporary workers and those considered permanent-at-risk workers report the lowest job satisfaction scores compared to permanent workers and flexicure temporary workers (Origo and Pagani, 2009).

The empirical literature on job satisfaction has started to deal with potential endogeneity only quite recently by estimating simultaneously the job satisfaction equation and the endogenous variable equation (Origo and Pagani, 2008). This relationship, like so many others found in job satisfaction literature, is usually assumed to be a single-equation type; the cause-and-effect is believed to be unidirectional running from job insecurity to job satisfaction (Gujarati, 2007). However, it is possible for reverse-causation to exist where job satisfaction is partially determined by job insecurity but also the reverse is true, job insecurity is partially determined by job satisfaction (Theodossiou and Vasileiou, 2007). This explains a unidirectional relationship is not meaningful which requires the use of appropriate estimation techniques for this simultaneous equations model.

2.3.6: Full Information and Limited Information Methods

The various estimators that have been developed for simultaneous equations models are all IV estimators (Greene, 2002). They differ in their choice of instruments and in whether the equations are estimated one at a time or jointly. These estimators are divided into two methods called Limited Information and Full Information Methods (Greene, 2002).

Limited information methods also known as single-equation methods are where each equation in the system is estimated individually taking into account any restrictions placed on that equation without considering the restrictions on the other equations in the system (Gujarati, 2009). The restrictions on the other equations are used only to check identification, not for estimation (Maddala, 2001). In full information methods also known as system methods all of the equations in the system are estimated simultaneously taking into account all restrictions in all equations by the omission or absence of some variables (Gujarati, 2009). This method makes a stronger assumption because it assumes knowledge of the entire distribution of variables (Verbeek, 2008).

To preserve the nature of simultaneous-equations models ideally full information methods should be used (Gujarati, 2009). However in practice, such methods are rarely used for a number of reasons. According to Gujarati (2009) the following list describes why full information methods are not commonly used:

- The computational burden is enormous. Although such elaborate models may describe finer details of the economy, the computations are an enormous task even for modern statistical packages.

- Full information methods lead to solutions that are highly nonlinear in the parameters and are therefore often difficult to determine.

- If there is specification error in any of the equations in the system, that error is transmitted to all equations within the system.

While full information methods hold desirable properties, estimators that fall under this category suffer from a lack of robustness (Castineira and Nunes, 1999).

Full information methods are more susceptible to multicollinearity than limited information methods (Castineira and Nunes, 1999).

Table 2.3.2 displays estimators classified as either full information or limited information methods.

Table 2.3.2: Methods for Estimating Simultaneous Equations Models

Estimator	Limited Information Methods	Full Information Methods
Least Squares	Two-Stage Least Squares (2SLS) Indirect Least Squares (ILS)	Three-Stage Least Squares (3SLS)
Maximum Likelihood	Limited Information Maximum Likelihood (LIML) Two-Stage Probit Least Squares (2SPLS) Two-Stage Ordered Probit Least Squares (2SOPLS)	Full Information Maximum Likelihood (FIML)

(*Source:* Authors own)

2.3.6.1: Examples of Full Information Estimation

Full Information Maximum Likelihood (FIML)

Full information maximum likelihood (FIML) estimates simultaneous equation models using the joint distribution for the equations rather than estimating each equation separately (Jones, 2007). In this approach the likelihood function for the entire system is maximized by choice of all system parameters and subject to *a priori* identifying restrictions (Intriligator *et al.*, 1996). The resulting estimators are consistent and asymptotically efficient (Intrilligator *et al.*, 1996). FIML estimation allows for specifying the model without discarding observations that provide useful

information about the analysis and it is superior to many missing data strategies (Enders, 2010).

In some instances it is useful to obtain maximum likelihood estimates directly (Greene, 2002). FIML method is based on the entire system of equations with normally distributed differences. (Greene, 2002). FIML has all the desirable properties of maximum likelihood estimation and therefore is asymptotically efficient among all estimators of the simultaneous equations model (Greene, 2002). It is for this reason that FIML preserves the nature of simultaneous equations models and theoretically should be the method of choice (Gujarati, 2009). However, due to computational costs and difficulty other full information methods dominate the literature such as three-stage least squares (Greene, 2002).

Three-Stage Least Squares (3SLS)

Three-Stage Least Squares (3SLS) is a method developed by Zellner and Theil (1962). This estimator builds on the Two-Stage Least Squares (2SLS) estimator by adding a third step. While 3SLS is a full information method which exploits all information available in simultaneous equations models, 2SLS is a limited information method that estimates each equation within the system individually. 2SLS is discussed in detail later in this section.

The first two stages in the 3SLS method is the same as the 2SLS in that first the estimation of all the reduced form coefficients is performed by the least squares estimator. Second, is the estimation of all structural coefficients by applying 2SLS to each of the structural equations (Intriligator *et al.,* 1996). Third, the generalized least squares method is applied to all of the structural coefficients in the system, using a covariance matrix for stochastic disturbance terms of the structural equation that is estimated from the second stage residuals (Intrilligator *et al.,* 1996).

Since the covariance matrix for the FIML method is the same as that of the 3SLS method, with normal disturbances, 3SLS has the same asymptotic distribution as maximum likelihood (Greene, 2002). When comparing FIML and 3SLS, the latter is far easier to compute. However, because 3SLS is robust to non-normality the

estimates produced by both methods are usually quite numerically different (Greene, 2002).

Full-Information Maximum Likelihood (FIML) Estimation of a Bivariate Ordered Probit Model

In a regression model when the dependent variable is measured categorically and measured on an ordered scale, conventional regression models are no longer applicable and probit and logit methods become the most appropriate estimation techniques (Borooah, 2002; Green, 1993). In these models the dependent variable takes a discrete number of mutually exclusive and exhaustive values (Borooah, 2002). These models are also classified as univariate probability models because of the fact that only one variable takes on this categorically ordered form. When accounting for endogeneity many IV methods such as Two-Stage Least Squares, Two-Stage Probit Least Squares, and Two-Stage Probit Ordered Probit have all been used in the instance where only one endogenous variable is ordered (McCausland *et al.*, 2005; Theodossiou and Vasileiou, 2007; Geishecker 2010, 2012; Doucouliagos *et al.*,2008; Cole *et al.*,2009; Daregot *et al.*, 2013; Saridakis *et al.*, 2009).

However, estimation of the joint probability distribution of two ordered categorical variables are less common in the literature (Sajaia, 2008). This is classified as a bivariate ordered probit model which is an extension of the bivariate probit model where the number of categories of the dependent variable are greater than two (Sajaia, 2008). Even less is known about these models in simultaneous specifications. Sajaia (2008) developed a Full Information Maximum Likelihood estimator (FIML) of these bivariate ordered probit models. Much of the literature on simultaneous equations models and ordered categorical variables rely on limited information methods, however these are incorrect because methods like 2SLS assumes that the values of categorical variables approximate those of latent continuous variables (Sanjaia, 2008; Cappellari and Jenkins, 2004). When the error terms are distributed as bivariate normal the FIML method produces more efficient unbiased estimates compared to alternative limited information methods (Sajaia, 2008). According to Sajaia the FIML method for a bivariate ordered probit model is based on a latent regression of y_1^* and y_2^* as follows:

$$y_{1i}^{*} = x_{1i}'\beta_1 + \varepsilon_{1i} \quad \textbf{(2.3.30)}$$

$$y_{2i}^{*} = x_{2i}'\beta_2 + \gamma y_{1i}^{*} + \varepsilon_{2i} \quad \textbf{(2.3.31)}$$

where:

β_1, β_2	vectors of unknown parameters
γ	unknown scalar
$\varepsilon_1, \varepsilon_2$	error terms
i	denotes an individual observation
y_1^* and y_2^*	unobserved latent dependent variables

Such that each explanatory variable satisfies the assumption that $E(x_{1i}\varepsilon_{1i}) = 0$ and $E(x_{2i}\varepsilon_{2i}) = 0$. The two observed categorical variables y_1 and y_2 are defined as follows:

$$y_{1i} = \begin{cases} 1 & if\ y_{1i}^{*} \le c_{11} \\ 2 & if\ c_{11} < y_{1i}^{*} \le c_{12} \\ \vdots & \\ J & if\ c_{1J-1} < y_{1i}^{*} \end{cases} \qquad y_{2i} = \begin{cases} 1 & if\ < y_{2i}^{*} \le c_{21} \\ 2 & if\ c_{21} < y_{2i}^{*} \le c_{22} \\ \vdots & \\ K & if\ c_{2K-1} < y_{2i}^{*} \end{cases}$$

(2.3.32)

Where the unknown cutoffs satisfy the condition that $c_{11} < c_{12} < \cdots < c_{1J-1}$ and $c_{21} < c_{22} < \cdots < c_{2K-1}$. The following is defined $c_{10} = c_{20} = -\infty$ and $c_{1J} = c_{2K} = \infty$ in order to avoid handling the boundary cases separately. The probability that $y_{1i} = j$ and $y_{2i} = k$ is:

$$\begin{aligned}\Pr(y_{1i}=j,y_{2i}=k) &= \Pr(c_{1j-1}<y_{1i}^{*}\le c_{1j},c_{2k-1}<y_{2i}^{*}\le c_{2k})\\ &= \Pr(y_{1i}^{*}\le c_{1j},y_{2i}^{*}\le c_{2k})\\ &-\Pr(y_{1i}^{*}\le c_{1j-1},y_{2i}^{*}\le c_{2k})\\ &-\Pr(y_{1i}^{*}\le c_{1j},y_{2i}^{*}\le c_{2k-1})\\ &+\Pr(y_{1i}^{*}\le c_{1j-1},y_{2i}^{*}\le c_{2k-1}) \qquad \textbf{(2.3.33)}\end{aligned}$$

If ε_{1i} and ε_{2i} are distributed as bivariate standard normal with correlation ρ the individual contribution to the likelihood function could be expressed as:

$$\begin{aligned}\Pr(y_{1i}=j,y_{2i}=k) &= \Phi_2(c_{1j}-x_{i1}'\beta_1,(c_{2k}-\gamma x_{1i}'\beta_1-x_{2i}'\beta_2)\zeta,\tilde{\rho}\\ &-\Phi_2(c_{1j-1}-x_{i1}'\beta_1,(c_{2k}-\gamma x_{1i}'\beta_1-x_{2i}'\beta_2)\zeta,\tilde{\rho}\\ &-\Phi_2(c_{1j}-x_{i1}'\beta_1,(c_{2k-1}-\gamma x_{1i}'\beta_1-x_{2i}'\beta_2)\zeta,\tilde{\rho}\\ &+\Phi_2(c_{1j-1}-x_{i1}'\beta_1,(c_{2k-1}-\gamma x_{1i}'\beta_1-x_{2i}'\beta_2)\zeta,\tilde{\rho} \qquad \textbf{(2.3.34)}\end{aligned}$$

where:

Φ_2 is the bivariate standard normal cumulative distribution function,

$$\zeta = \frac{1}{\sqrt{1+2\gamma\rho+2y^2}}$$

$$\tilde{\rho} = \zeta(\gamma+\rho)$$

This specification is the bivariate ordered probit model (Sajaia 2008). If $\gamma = 0$ the model simplifies in such a way that $\xi = 1$ and $\tilde{\rho} = \rho$. The logarithmic likelihood of an observation *i* is defined then as:

$$\ln L_i = \sum_{j=1}^{J}\sum_{k=1}^{K} I(y_{1i} = j, y_{2i} = k) \ln \Pr(y_{1i} = j, y_{2i} = k)$$

(2.3.35)

Under the assumptions that observations are independent, the sum of the previous equation across observations to get the log likelihood for the entire sample of size *N* is as follows:

$$\ln \mathcal{L} = \sum_{i=1}^{N}\sum_{j=1}^{J}\sum_{k=1}^{K} I(y_{1i} = j, y_{2i} = k) \ln \Pr(y_{1i} = j\,, y_{2i} = k)$$

(2.3.36)

For the condition of identification of the parameters in the simultaneous equations model (Equations 2.3.30 and 2.3.31) to be fulfilled, an exclusion restriction must be imposed on the vectors x_1 and x_2 such that at least one element of x_1 should not be present in x_2. An instrument is required that is believed to be correlated with y_1^* but is independent of ε_1. These variables could be included in x_1 to obtain the consistent estimates of γ, β_2 and ρ (Sajaia, 2008).

Once the FIML estimator for bivariate ordered probit models is derived, Monte Carlo studies are used to compare this method with three other limited information methods (Sajaia, 2008). One of the methods is a two-step procedure in which the first equation of a system is estimated by the univariate ordered probit model. The predicted values are calculated and included in the second stage equation which is also a univariate ordered probit model. This two-stage process clearly falls under the limited information methods where each equation is estimated individually. This two-stage method fails to provide a reasonable approximation for the true values of the parameters. It produces downward biased estimates regardless of the number of observations (Sajaia, 2008). Due to the unbiasedness and greater efficiency of the FIML method (Sajaia, 2008), it is important to not dismiss FIML estimation in the presence of simultaneity especially in models consisting of two ordered variables.

Job satisfaction literature supports the use of FIML estimation. Vandenberg and Lance (1992) look at the causal relationship between job satisfaction and organizational commitment by comparing the FIML estimation techniques to two other limited information methods. The commitment-causes-satisfaction relationship was reaffirmed once endogeneity was corrected for. Volmer *et al.* (2011) looks at the quality of relationships between employees and job satisfaction and used FIML to account for a possible reciprocal relationship. DeHart-Davis *et al.* (2014) looks at how organizational rules facilitate job satisfaction in the public sector work environment. They conclude that employees view written rules as more optimally controlling, more consistently applied, and more easily understood compared to unwritten rules. The appeal of FIML is that it does not allow researchers to replace or input values into the existing dataset because all of the equations within the system are estimated together (Enders and Bandalos, 2001).

2.3.6.2: Examples of Limited Information Estimation

Limited Information Maximum Likelihood (LIML)

The limited information maximum likelihood estimator was the first single-equations method suggested for simultaneous equations models (Maddala, 2001). It was suggested by Anderson and Rubin (1949) and was popular until the advent of the two-stage least squares method (2SLS) in the late 1950s (Maddala, 2001). Anderson and Rubin (1949) created the LIML method by deriving the asymptotic distribution of an approximating estimator. This approximate estimator later become known as Two-Stage Least Squares (2SLS). The LIML method is based on a single equation under the assumption of normally distributed disturbances (Greene, 2002). Therefore LIML is efficient among single-equation estimators.

The LIML method has the same asymptotic distribution as the 2SLS method while the latter does not rely on the assumption of normality (Greene, 2002). This raises the question as to why researchers would ever choose the LIML method given the availability of a more robust and computationally simpler alternative (Greene, 2002). The fact that LIML is invariant to the normalization equation unlike 2SLS explains the numerical differences among estimators (Greene, 2002). Due to the large number of computational issues, the LIML method is generally avoided in

favour of less efficient but more computationally simpler methods (Rivers and Vuong, 1988).

Indirect Least Squares (ILS)

Given a simultaneous equations model, the structural equations can be formed. From the structural equations, the M endogenous variables can be solved where the reduced-equations are derived (Gujarati, 2009). Reduced form equations are unique in that they express an endogenous variable solely in terms of the predetermined variables and the stochastic disturbances or error terms (Gujarati, 2009). Because an endogenous variable is regressed on a series of only exogenous variables and an error term, and since the exogenous variables are assumed to be uncorrelated with the error term, the OLS method may be applied to obtain reduced-form coefficients (Gujarati, 2009). From these reduced form coefficients it is possible to estimate the structural coefficients which is the object of primary concern (Gujarati, 2009). It is clear to see now how this method came to be known as ILS; the structural coefficients are estimated indirectly from the OLS reduced form estimates. A deterrent for using ILS as an estimation method is the fact that in over identified equations multiple estimates of parameters are calculated (Gujarati, 2009). Moreover, this method of estimating simultaneous equations models is very cumbersome especially if there are many equations in the system explaining why it is rarely used in the literature (Maddala, 2001).

Two-Stage Least Squares (2SLS)

The method of Two-Stage Least Squares (2SLS) was developed by Theil (1953) and Basmann (1957). 2SLS is the most frequently used method for estimating simultaneous equations models in an attempt to reduce the bias inherent in the application of OLS (Studenmund, 2006; Wooldridge, 2010). 2SLS uses the information available on a set of instruments and efficiently combines them into one single instrument (Angrist Krueger, 2001).

2SLS is a method of systematically creating instrumental variables to replace the endogenous variables where they appear as explanatory variables in simultaneous

equations models (Studenmund, 2006). In a simultaneous equations model there exists a correlation between the stochastic error term and an explanatory variable (Gujarati, 2009). Therefore an instrumental variable is required to calculate consistent estimates of the parameters. This instrumental variable needs to be highly correlated to the endogenous variable but also be uncorrelated with the error term (Gujarati, 2009; Studenmund, 2006). This instrumental variable can be used to estimate the structural equations by the OLS estimator (Gujarati, 2006; Verbeek, 2004). 2SLS is mainly applicable when equations are over identified, indicating that we have multiple possible instrumental variables to approximate an endogenous explanatory variable. If only one instrumental variable is selected from the list of possibilities valuable information will be lost (Studenmund, 2006). The method of 2SLS is explained in the following steps by Studnemund (2006):

Beginning with the following structural equations:

$$Y_{1t} = \beta_0 + \beta_1 Y_{2t} + \beta_2 X_{1t} + \varepsilon_{1t} \quad \textbf{(2.3.37)}$$

$$Y_{2t} = \alpha_0 + \alpha_1 Y_{1t} + \alpha_2 X_{2t} + \varepsilon_{2t} \quad \textbf{(2.3.38)}$$

where:

Y_1, Y_2	endogenous variables
X_1, X_2	exogenous variables
β_1, β_2, α_1, α_2	vector of parameters
ε_1, ε_2	stochastic error terms

The purpose of 2SLS is to help find a variable that is highly correlated with Y_2 on the right side of Equation 2.3.37 but is uncorrelated with the stochastic error term (ε_1). The steps for 2SLS are explained as follows:

Step 1- Estimate the Reduced Form Equations

In this step, the OLS method is used to estimate the reduced-form equations for each of the endogenous variables that appear as explanatory variables in the structural equations in the system (Equations 2.3.37 and 2.3.38) as follows:

$$\hat{Y}_{1t} = \hat{\pi}_0 + \hat{\pi}_1 X_{1t} + \hat{\pi}_2 X_{2t} \quad \textbf{(2.3.39)}$$

$$\hat{Y}_{2t} = \hat{\pi}_3 + \hat{\pi}_4 X_{1t} + \hat{\pi}_5 X_{2t} \quad \textbf{(2.3.40)}$$

where:

$\hat{Y}_1$, $\hat{Y}_2$	predicted values (fitted values) for Y_1 and Y_2
$\hat{\pi}$'s	consistent unbiased estimates of the reduced-form coefficients

$\hat{Y}_1$ and $\hat{Y}_2$ are estimates of the mean values of Y_1 and Y_2 (Gujarati, 2009). These are then used as instruments in the estimation of the structural equations in Stage 2. This stage gets rid of the likely correlation between the endogenous variable and the error term (Gujarati, 2009).

Step 2- Estimate Revised Structural Equations

In this step the reduced form fitted values ($\hat{Y}$'s) are substituted for the original endogenous variables found in the structural equations as follows:

$$Y_{1t} = \beta_0 + \beta_1 \hat{Y}_{2t} + \beta_2 X_{1t} + \varepsilon_{1t} \quad \textbf{(2.3.41)}$$

$$Y_{2t} = \alpha_0 + \alpha_1 \hat{Y}_{1t} + \alpha_2 X_{2t} + \varepsilon_{2t} \quad \textbf{(2.3.42)}$$

where:

Y_1, Y_2	endogenous variables
X_1, X_2	exogenous variables
β_1, β_2, α_1, α_2	vector of parameters
ε_1, ε_2	stochastic error terms
$\hat{Y}_1$, $\hat{Y}_2$	predicted values (fitted values) for Y_1 and Y_2

These new structural equations are then estimated by OLS. As this procedure illustrates the intention of 2SLS to purify the stochastic explanatory variables Y_1 and Y_2 of the influence of the stochastic error terms ε_1, ε_2 (Gujarati, 2009).

This procedure is consistent for large samples but biased for small samples (Studenmund, 2006). 2SLS produces consistent estimators in that they converge to their true values as the sample size increases (Gujarati, 2009). 2SLS is considered a consistent estimator but not unbiased because it involves a ratio of random quartiles for which expectations do not exist and are easily calculated (Angrist and Krueger, 2001).

From this depiction it is clear that 2SLS is the method of replacing endogenous variables on the right-hand side by their predicted values from their reduced form and estimating the equation by OLS (Maddala, 2001). The name arises from the fact that OLS is employed in two stages of this model.

According to Gujarati (2009) some benefits of this method are as follows:

- 2SLS provides one estimate per parameter unlike the ILS method
- 2SLS can be applied to the system without directly taking into account other equations in the system.
- It is relatively easy to apply because all one needs to know is the number of exogenous variables in the system – for identification purposes mainly.
- This method, while designed to handle over identified equations, can be applied to exactly identified equations yielding the same estimates as the ILS method.

It is for this reason that the method of 2SLS is second in popularity to OLS for estimating linear estimations in applied econometrics (Wooldridge, 2010). The formation of an instrumental variable via the 2SLS method uses a linear combination of all the exogenous variables (Studenmund, 2006) making it so that 2SLS only produces consistent estimates if the second stage regression is linear (Amemiya, 1985). In other examples where the endogenous variables are not all continuous alternative procedures are necessary to obtain consistent estimates (Keshk, 2003).

Two-Stage (Ordered) Probit Least Squares (2PLS) (2SOPLS)

In the literature on simultaneous equations models the main focus is largely on situations where all endogenous variables in question are of a continuous nature (Keshk, 2003). However, within the social science research there are a number of instances where phenomena can only take two values such as voting patterns where the following values are taken: yes the individual votes (=1) or no the individual did not vote (=0). Many models within political behaviour involve discrete or dichotomous dependent variables (Alvarez and Glasgow, 2000). While these dichotomies and other nonlinearities within a simultaneous equations model are a minority in econometric discussion, Heckman (1978), Amemiya (1978) and Maddala (1983) all discus various estimation techniques. The technique selected for estimating simultaneous equations models should be one that reflects how the endogenous variables are observed (Keshk, 2003).

The Two-Stage Probit Least Squares method is very similar to the 2SLS however the reduced-form equation of the binary endogenous variable is estimated by the probit model while the reduced-form equation of the continuous variable is estimated by the OLS estimator (Alvarez and Glasgow, 2000). This explains the first stage of the two stage procedure. The parameters from the reduced-form equations are then used to generate predicted values for each endogenous variable which are then substituted into the structural equations for their respective endogenous regressors as they appear on the right-hand side of the regression. These equations are then estimated a second time by OLS. This process renders the second stage estimator consistent (Amemiya, 1979).

Keshk (2003) shows that adapting two-stage estimation techniques to a model in which there is one continuous and one dichotomous endogenous variable is straightforward with the only difference being a need to correct the standard errors (Keshk, 2003). The basic simultaneous equations model is displayed as follows:

$$y_1 = \gamma_1 y_2^* + \beta_1' X_1 + \varepsilon_1 \quad \textbf{(2.3.43)}$$

$$y_2^{**} = \gamma_2 y_1 + \beta_2' X_2 + \varepsilon_2 \quad \textbf{(2.3.44)}$$

where:

y_1	continuous endogenous variable
y_2^{**}	dichotomous endogenous variable which is observed as a 1 if $y_2^* > 0$ and 0 otherwise
X_1, X_2	matrices of exogenous variables
β_1', β_2'	vectors of parameters
γ_1, γ_2	parameters of the endogenous variables y
$\varepsilon_1, \varepsilon_2$	the error terms

Because y_2^* is latent and observed only as a dichotomous variable, the structural equations can be written as the following:

$$y_1 = \gamma_1 \sigma_2 y_2^{**} + \beta_1' X_1 + \varepsilon_1 \quad \textbf{(2.3.45)}$$

$$y_2^{**} = \frac{\gamma_2}{\sigma_2} y_1 + \frac{\beta_2'}{\sigma_2} X_2 + \frac{\varepsilon_2}{\sigma_2} \quad \textbf{(2.3.46)}$$

where:

σ_2	variance of y_2

The estimation now follows the usual two-stage estimation process. In the first stage the following models are fitted using all of the exogenous variables:

$$y_1 = \Pi_1' \mathrm{X} + v_1 \quad \textbf{(2.3.47)}$$

$$y_2^{**} = \Pi_2' \mathrm{X} + v_2 \quad \textbf{(2.3.48)}$$

where:

X	a matrix of all exogenous variables
Π_1, Π_2	vectors of parameters to be estimated
v_1, v_2	error terms

Similar to the first stage in the standard 2SLS procedure, the structural equations must be estimated in order to estimate their fitted values for the second stage. However, because y_1 is continuous Equation 2.3.43 will be estimated via the OLS estimation method and because y_2^* is dichotomous in Equation 2.3.44 its structural equation will be estimated via the binomial probit model. From these reduced form estimates, the predicted values from each model are obtained for use in the second stage as follows:

$$\hat{y}_1 = \hat{\Pi}_1 \mathrm{X} \quad \textbf{(2.3.49)}$$

$$\hat{y}_2^{**} = \hat{\Pi}_2 \mathrm{X} \quad \textbf{(2.3.50)}$$

In the second stage, the original endogenous variables of Equations 2.3.43 and 2.3.44 are replaced by their respective fitted values calculated from Equations 2.3.49 and 2.3.50. In the second stage, the following two models are fitted as follows:

$$y_1 = \gamma_1 \hat{y}_2^{**} + \beta_1' X_1 + \varepsilon_1 \quad \textbf{(2.3.51)}$$

$$y_2^{**} = \gamma_2 \hat{y}_1 + \beta_2 X_2 + \varepsilon_2 \quad \textbf{(2.3.52)}$$

2SPLS differs from the 2SLS so by employing a nonlinear estimation method in one of the two stages, a final step is required to correct the standard errors (Keshk, 2003). In this additional step a correction for the covariance matrix is required (Doucouliagos *et al.*, 2008). The standard errors provided are based on $\hat{y}_2^{**}$ and $\hat{y}_1$ in Equations 2.3.51 and 2.3.52 instead of the appropriate variables y_2^{**} and y_1. According to Keshk (2003) the correction needs to be implemented on the variance-covariance matricies α_1 and α_2 which are the variance-covariance matrices of 2.3.51 and 2.3.52 as follows:

$$\alpha_1' = (\gamma_1\sigma_2, \beta_1')$$

$$\alpha_2' = (\frac{\gamma_2}{\sigma_2}, \frac{\beta_2'}{\sigma_2})$$

$$c = \sigma_1^2 - 2\gamma_1\sigma_{12}$$

$$d = \left(\frac{\gamma_2}{\sigma_2}\right)\sigma_1^2 - 2\left(\frac{\gamma_2}{\sigma_2}\right)\left(\frac{\sigma_{12}}{\sigma_2}\right)$$

$$H = (\Pi_2, J_1) \quad \textbf{(2.3.53)}$$

$$G = (\Pi_1, J_2) \quad \textbf{(2.3.54)}$$

$$V_0 = \mathrm{Var}(\widehat{\Pi}_2) \quad \textbf{(2.3.55)}$$

With these definitions and knowing that the probit model's variance of y_2 (σ_2) which normalizes to 1, the correlated variances of α_1 and α_2 can be obtained as follows:

$$V(\widehat{\alpha_1}) = c(H'X'XH^{-1}) + (\gamma_1\sigma_2)^2(H'X'XH)^{-1}H'X'V_0X'XH(H'X'XH)^{-1} \quad \textbf{(2.3.56)}$$

$$V(\widehat{\alpha_2}) = (G'V_o^{-1}G)^{-1} + d(G'V_0^{-1}G)^{-1}G'V_0^{-1}(X'X)^{-1}V_0^{-1}G(G'V_0^{-1}G)^{-1} \quad \textbf{(2.3.57)}$$

where:

σ_1^2 the variance of the residuals from Equation 2.3.49

V_0 variance covariance matrix of Equation 2.3.50

J_1, J_2 matricies with ones and zeros such that $XJ_1 = X_1$ and $XJ_2 = X_2$

All of the definitions above are easily obtainable in built-in procedures in standard statistical packages. Other studies have taken the fundamental structure of two-stage estimation outlined in Keshk (2003) and the required correction of variance-covariance matrices in order to obtain correct standard errors outlined by Maddala (1983). These have been applied to situations involving a variety of endogenous variables that are not measured continuously.

In Cole *et al.* (2009) a two-stage least squares type method is used in order to test the hypothesis of a simultaneous relationship between well-being and individuals' employment status. However, the method employed in this study more closely resembles a two-stage logit least squares estimator (2SLLS) by which the employment status equation is estimated by the logit model and the well-being equation is estimated by OLS. The logit estimator is selected over the probit estimator simply for mathematical simplicity. This study is particularly relevant to this thesis in that as part of a simultaneous equations model, the structural well-being equation is estimated by the OLS estimator.

McCausland *et al.* (2005) accounts for endogeneity in their study of the effect of wages on job satisfaction for individuals who receive performance-related pay (PRP) and those on alternative compensation plans. As predicted individuals on PRP report lower levels of job satisfaction than those on other pay schemes. To account for endogeneity between earnings and job satisfaction a 2SLS method is used. The

reason why a 2SPLS method was not employed is that the variable wage is measured as continuous rendering the use of any nonlinear estimation models inappropriate. The predicted values of the wage equation are then used in the second stage where the job satisfaction structural equation is estimated by the OLS estimator.

In a study of poverty and natural resource degradation Daregot *et al.* (2013) base their ordered probit specification on the work by Mooney and Duval (1993), Mooney (1996), Keshk (2003) and Doucouliagos *et al.* (2008). The authors proceed to run a two-stage ordered probit least squares (2SOPLS) estimator which is similar to the two-stage probit ordered probit (2SOPOP) estimator proposed by Doucouliagos *et al.* (2008). Both of these methods are extensions of the simplified Two-Stage Least Squares Method. While Doucouliagos *et al.* (2008) explain a method that would account for the ordered nature in both the job satisfaction variable and the job insecurity variable used in this thesis, to date this method has not been used in published literature. Therefore the method outlined in Daregot *et al.* (2013) is applied in the estimation of the job satisfaction – job insecurity simultaneous equations model. This method is the 2SOPLS estimator where the job insecurity equation is estimated by the ordered probit model, predicted values are calculated and then included in the estimation of the job satisfaction equation via the OLS estimator.

2.3.7: Establishing Endogeneity in a Model

In simultaneous equations models, IV estimation is the most common technique used to account for endogeneity (Gujarati, 2009; Wooldridge, 2013) which is a major instigator behind these simultaneous systems (Hausman, 1983). IV estimation consists of selecting an instrumental variable to approximate the endogenous explanatory variable (Gujarati, 2007; Studenmund, 2006; Verbeek, 2004). This variable must satisfy two conditions: It is uncorrelated with the error term and it is correlated with the endogenous explanatory variable. However, in practice these key exogeneity assumptions are not directly testable (Hausman, 1983). Instead, Hausman (1983) looks at exogeneity tests in reference to the simultaneous equations model. If there is a surplus of exogenous variables in the simultaneous equations model, then a subset may be tested for endogeneity but these tests depend

on the maintained assumption of exogeneity in other variables (Hausman, 1983). If OLS is run on a model containing an endogenous regressor then OLS will be a biased and inconsistent (Chenhall and Moers, 2007; Verbeek, 2004; Wooldridge, 2010). Therefore, testing for endogeneity bias is essential to ensure the correct estimation of estimates and subsequent inferences.

Hausman (1978) proposed directly comparing the OLS and IV estimator and determining whether the differences are statistically significant (Wooldridge, 2013). The Hausman test tests the null hypothesis that the OLS estimator is consistent and fully efficient (Griffiths, *et al.,* 1993). The test involves estimating the model via OLS and IV estimators and comparing the resulting vectors. Under the null hypothesis the OLS estimate is consistent in that there is no measurement error and the OLS and IV coefficients will not be systematically different (Griffiths *et al.,* 1993). For example if there are two estimators $\hat{\beta}_1$ and $\hat{\beta}_2$ that converge to the true value β under the null hypothesis but converge to different values under the alternative hypothesis then the null hypothesis can be tested by seeing if the probability limit of the difference of the two estimators $\hat{q} = \hat{\beta}_1$ and $\hat{\beta}_2$ is zero (Castineira and Nunes, 1999). Accepting the null hypothesis indicates there is a statistically significant difference between the two sets of estimates (Griffiths *et al.,* 1993). If the IV and OLS estimators differ significantly it is concluded that the variable of interest is indeed endogenous, maintaining that all the other variables are exogenous. To determine whether the differences are statistically significant, the easiest way is to use a regression test that is based on the reduced for of the variable suspected of endogeneity (Wooldridge, 2013). Beginning with a basic structural equation as follows:

$$y_1 = \beta_0 + \beta_1 y_2 + \beta_2 z_1 + \beta_3 z_2 + u_1 \qquad \textbf{(2.3.58)}$$

where:

y_1 dependent variable

y_2 endogenous independent variable

z_1, z_2 exogenous variables

$\beta's$ estimable parameters

u_1 error term

Suppose there are two exogenous variables (z_3, z_4) within the simultaneous equations model that are not determinants of y_1 but are determinants of y_2 such that the reduced form equation of y_2 is as follows according to Wooldridge (2013):

$$y_2 = \pi_0 + \pi_1 z_1 + \pi_2 z_2 + \pi_3 z_3 + \pi_4 z_4 + v_2 \qquad \textbf{(2.3.59)}$$

where:

$\pi's$ estimable structural parameters

v_2 structural error term

Because all of the *z*'s are exogenous variables and therefore uncorrelated with u_1, then y_2 is uncorrelated with u_1 only if v_2 is uncorrelated with u_1. This is what the Hausman test sets out to identify. The easiest way to test this is to include the calculated residuals from Equation 2.3.59 in Equation 2.3.58 which gives us the following equation:

$$y_1 = \beta_0 + \beta_1 y_2 + \beta_2 z_1 + \beta_3 z_2 + \delta_1 \hat{v}_2 + error \qquad \textbf{(2.3.60)}$$

The hypothesis $H_0: \delta = 0$ can then be tested using a *t*-statistic. If the null hypothesis is rejected at conventional statistical levels it can be concluded that y_2 is endogenous because v_2 and u_1 are correlated. The following Table summarizes these steps.

Table 2.3.3: Steps for Testing for Endogeneity

Steps	Procedures
Step 1	Estimate the reduced form equation for the suspected endogenous regressor (y_2) by regressing it on all exogenous variables included in the system including the additional IV's.
Step 2	Obtain the residuals
Step 3	Add the residuals to the original structural equation which includes y_2.
Step 4	Test for the significance of these residuals via OLS. If the coefficient is statistically different from zero it is concluded that y_2 is indeed endogenous

(*Source:* Wooldridge, 2013)

Nakamura and Nakamura (1998) describe alternative tests to Hausman (1983) in identifying the presence of endogeneity. In 1973 and 1974 Wu presented papers for his endogeneity test based on the test statistics, T_1, T_2, T_3, T_4. The Hausman test rose in popularity thereafter because of its more convenient approach. However, the two tests are very similar in that Hausman's (1978) statistics are shown to be identical to Wu's T-statistics. This later test is known as the Wu-Hausman statistic. The purpose of using these Wu-Hausman statistics is to try and heed Durbin's (1954) warning about using instrumental variables and the loss of efficiency. A subsequent Durbin-Wu-Hausman (DWH) test involves fitting the model by OLS and IV approaches and comparing the resulting coefficient vectors (Baum *et al.,* 2003). While there may be reason to suspect non-orthogonality between regressors and errors, the use of IV estimation must be balanced against the loss of efficiency compared to if OLS had been originally employed (Baum *et al.,* 2003). This is what the DWH identifies.

2.3.8: Accounting for Endogeneity in the Job Satisfaction Equation

Job satisfaction is considered a summary measure of the well-being derived from all aspects of work (Clark, 1997). Job insecurity has been widely documented

as having a negative effect on job satisfaction (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Clark, 1998; Gazioglu and Tansel, 2006; Poliakas and Theodossiou, 2010 Sousa-Poza and Sousa-Poza, 2000; Theodossiou and Vasileiou, 2007). The concept of job security has been threatened by market changes in European economies during the last quarter of the twentieth century, with an emphasis on technology and innovation which were accompanied by an increase in labour market flexibility (Harrison, 1998) creating a paradox between flexibility and job security.

The effect of job insecurity on job satisfaction can differ among public and private sector workers (Artz and Kaya, 2014; DeSantis and Durst, 1996; Leuchinger *et al.*, 2010a). An important issue that is largely ignored in the job satisfaction literature is that a reciprocal relationship to job insecurity may exist whereby dissatisfied workers face a higher risk of losing their jobs (McCausland *et al.*, 2005; Theodossiou and Vasileious, 2007). The following equations display the job satisfaction – job insecurity simultaneous equations model similar to that in McCausland *et al.* (2005).

$$JS_i = \theta X_i + \delta I_i + \varepsilon_i \quad \textbf{(2.3.61)}$$

$$I_i = \alpha X_i + \lambda Z_i + u_i \quad \textbf{(2.3.62)}$$

where:

JS_i ordered job satisfaction (endogenous variable)

I_i ordered perceived job insecurity (endogenous variable)

X_i matrix of exogenous variables

Z_i vector of *k* instrumental variables and exogenous variables

θ vector of parameters in (Eq. 2.3.61)

α vector of parameters in (Eq. 2.3.62)

δ parameters of the endogenous variables in (Eq. 2.3.61)

λ parameters of the instrumental variables and exogenous variables (in Eq. 2.3.62)

ε_i error term in (Eq. 2.3.61)

u_i error term in (Eq. 2.3.62)

Such that $k_2 \geq k_1$ and $E(X_i, \varepsilon_i) = 0,\ E(Z_i, u_i) = 0$

Since it is likely that reverse causality exists between job satisfaction and job insecurity, endogeneity is a likely result. This will therefore lead to a bias and inconsistent estimator (Gujarati, 2009). This model is displayed in Theodossiou and Vasileious (2007) and estimated by a general instrumental variable estimator (IV). The estimation strategy is implemented in three stages: In the first stage, appropriate instrumental variables are selected that are assumed to be correlated with the perceived job insecurity variable but are orthogonal to the measure of job satisfaction. This instrumental variable is then included in the perceived job insecurity equation (Eq. 2.3.62). The second stage consists of calculating the predicted values of the perceived job insecurity equation $\hat{I}$. In the third stage these predicted values ($\hat{I}$) are included in the job satisfaction equation (Eq. 2.3.61).

As Theodossiou and Vasileious, 2007 point out the issue of endogeneity is largely ignored in the job satisfaction literature. Studies have indirectly addressed endogeneity by exploiting institutional differences in the labour market (Luechinger *et al.,* 2010a) and by exploiting the "richness" of datasets to account for psychological attitudes towards work (Linz, 2003; Bauer, 2004; Origo and Paani, 2008, 2009). Artz and Kaya (2014) avoid traditional IV approaches to account for the reverse causality between job satisfaction and job insecurity by using a difference-in-difference approach to construct approximations for job insecurity based on industries and occupations that are the most likely to suffer from high job insecurity.

Estimation of the job satisfaction – job insecurity simultaneous equations model will build on the model proposed by Sajaia (2008) whereby the estimator, Full Information Maximum Likelihood (FIML) is applied specifically to the bivariate ordered probit model. This method will take into account the entire system of equations ensuring that the observed categorical variables approximate those of latent categorical variables instead of latent continuous variables. The Limited Information Maximum Likelihood (LIML) estimator is used as a comparison to the FIML estimator. The last instrumental variable technique used in this thesis is the

Two-Step Ordered Probit Least Squares (2SOPLS) which builds on the work by McCausland *et al.,* (2005), Cole *et al.* (2009) and Daregot, *et al.,* 2013. This method is very similar to the Two-Stage Least Squares method (2SLS) that is commonly used in the estimation of simultaneous equations models, however, 2SOPLS additionally accounts for the ordered nature of the job insecurity explanatory variable. The above methodologies are implemented separately for the whole sample and for each public sector and private sector subsample. A similar analysis is also performed in Theodossiou and Vasileiou (2007) by gender and in McCausland *et al.* (2005) for various pay schemes.

2.3.9: Conclusion

This section reviews the literature on endogeneity bias and the various differences in techniques used to correct for this bias. Heady *et al.,* (1991) state that well-being research has assumed variables such as domain satisfactions, social support, life events and levels of expectations and aspirations are *causes* of well-being. However critics have pointed out that they could just as easily be considered consequences of well-being (Costa and McCrae, 1980; Veenhoven, 1988). An econometric definition of an endogenous variable states that it is one that is correlated with the error term (Wooldridge, 2010; Chenhall and Moers, 2007). Conversely, if an explanatory variable is uncorrelated with the error term then it is defined as exogenous. Endogeneity is a term used to describe the presence of an endogenous explanatory variable (Wooldridge, 2010). Simultaneity is one of the three major causes of endogeneity and arises when one or more of the explanatory variables are jointly determined with the dependent variable typically through an equilibrium mechanism (Wooldridge, 2013). Simultaneity bias refers to the fact that in a simultaneous system the expected values of the OLS estimated structural equation are not equal to the true values (Studenmund, 2006).

In estimating the parameters in simultaneous equations models the problem is rather complex because there are a variety of estimation techniques with varying statistical properties (Gujarati, 2009; Wooldridge, 2010). The estimation techniques selected must reflect how the endogenous variables are observed (Keshk, 2003). To obtain estimates of the parameters in simultaneous equations models, instrumental

variables methods are used (Greene, 2002; Maddala, 2001). They differ in their choice of instruments and in whether the equations are estimated one at a time or jointly. These estimators are divided into two categories, Limited Information Methods and Full Information Methods (Greene, 2002).

It is well-documented in the literature that the relationship between job satisfaction and job insecurity is likely simultaneous in nature (Artz and Kaya, 2014; Geishecker, 2010, 2012; Origo and Paani, 2009; Theodossiou and Vasileiou, 2007). As Theodossiou and Vasileiou (2007) illustrate it is typically assumed that causality runs from job insecurity to job satisfaction but it is also possible that individuals who are dissatisfied with their jobs are more likely to be released from employment. This describes a simultaneous relationship where the dependent variable is determined by the explanatory variables, and conversely, the explanatory variables are determined by the dependent variable (Gujarati, 2007). If endogeneity arises because of simultaneity between job satisfaction and job insecurity verifying a causal relationship becomes very difficult.

This section explains estimation methods known as Instrumental Variables (IV) Techniques that are classified as full information or limited information estimation methods. This thesis employs one full information and two limited information methods as follows: Full Information Maximum Likelihood (FIML), Limited Information Maximum Likelihood (LIML) and Two-Stage Ordered Probit Least Squares (2SOPLS). The FIML method is taken from Sajaia (2008) where the user written command *–bioprobit* is used in the program Stata 12. This estimator preserves the ordered nature of the dependent variable job satisfaction and the explanatory variable job insecurity. A LIML estimator is also included for comparison however it has its limitations by imposing a normality assumption (Greene, 2002). The LIML estimator is the predecessor to the Two-Stage Least Squares estimator which does not impose such a strict assumption (Greene, 2002). Therefore an extension of the 2SLS estimator is also used to estimate the job satisfaction and job insecurity simultaneous equations model. This method is proposed by Daregot, *et al.* (2013) and is called the Two-Stage Ordered Probit Least Squares (2SOPLS) whereby the ordered nature of the job insecurity variable will be accounted for. These estimation methods vary in their assumptions and measurement of the job satisfaction and job insecurity variables.

2.4: Conclusion

This chapter reviews the well-being literature with a particular focus on subjective well-being and it's personal, economic and social determinants. Previous studies into the effect of economic insecurity and subjective well-being are looked at with a particular focus on individuals in sectoral employment. The relationship between job satisfaction and job insecurity is identified in existing literature where potential economic issues are introduced. Remedial estimation methods designed to overcome these econometric issues are assessed.

Subjective well-being is defined as the quality of one's life based on the evaluations both positive and negative that they make of their own lives (Diener, 2006). Life satisfaction is defined as an all-encompassing global cognitive judgement of one's life and supported as being of the most frequently used indicators of subjective well-being (Kahneman and Krueger, 2006). This indicator is taken from responses to a life satisfaction survey question that are inherently ordered in that outcomes associated with higher subjective well-being are ranked higher than the outcomes associated with lower subjective well-being (Borooah, 2002). An ordered dependent variable like life satisfaction calls for the use of the maximum likelihood estimation method of an ordered probit model (Borooah, 2002). The issue of including interaction terms in nonlinear models such as the ordered probit model is addressed along with a review of possible remedial measures to obtain correct interaction effects.

Similarly, job satisfaction is considered a subjective well-being measure derived from all aspects of work (Clark, 1997). Job satisfaction is defined as a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences (Locke, 1976). A review of the job satisfaction literature identifies a number of individual and work-specific determinants. A particular focus is made to the determinant job insecurity which is further identified for public and private sector workers. Job insecurity is well-documented as being a strong depressant of individual job satisfaction (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Geishecker, 2010, 2012; Origo and Pagani, 2008, 2009; Theodossiou and Vasileiou, 2007; Sousa-Poza and Sousa-Poza, 2000). In examining the relationship between job

satisfaction and job insecurity econometric issues such as sample selection bias and endogeneity bias are presented.

The literature suggests that a simultaneous relationship is likely to exist between job satisfaction and job insecurity giving way to the likelihood of endogeneity bias (Theodossiou and Vasileiou, 2007). In estimating general simultaneous equations models Instrumental Variables (IV) techniques are required that are further classified as limited or full information methods. These estimation methods vary across a host of statistical properties (Gujarati, 2009). Extensions of full and limited information methods that are designed to preserve the ordered nature of dependent and independent variables are discussed. Lastly, the econometric issue of sample selection bias is introduced with a particular focus on occupational choice literature. The possibility of non-random selection into public sector employment is addressed. Remedial measures for all endogeneity and sample selection issues are discussed and applied to the relationship between job satisfaction and job insecurity for public and private sector workers.

CHAPTER 3

DATA DESCRIPTION

The relationship between economic insecurity and the subjective well-being of public and private sector workers in Ireland is identified using data from the European Social Survey (ESS). Life satisfaction equations are estimated using data from Rounds 5 and 6 of the ESS (2010 & 2012) while job satisfaction equations are estimated using data only from Round 5 (2010). This chapter describes the European Social Survey as well as the availability of variables used in this thesis. These variables are described and descriptive statistics are provided.

3.1: Data Description

Data from the European Social Survey is used to identify the impact that job insecurity has on the job satisfaction of public and private sector workers in Ireland. The European Social Survey (ESS) is a biennial cross sectional survey that is widely used by academics, politicians, policymakers and journalists interested in understanding patterns in public attitudes and behaviour over time and across countries (ESS, 2013).[6] The central aim of the ESS is to develop and conduct a systematic study of changing values, attitudes, and behaviour patterns within European politics. The objectives of the ESS were updated after Round 5 and are as follows:

- To chart stability and change in social structure, conditions and attitudes in Europe and to interpret how Europe's social, political and moral fabric is changing.
- To achieve and spread higher standards of rigor in cross-national social science research. This includes sampling, data collection, reduction of bias and reliability of questions.
- To introduce valid indicators of national progress, based on citizens' perceptions and judgments of key aspects of society.

[6] A review of general cross-sectional data analysis is provided in Appendix B

- To undertake and facilitate the training of European social researchers in comparative quantitative measurement analysis
- To improve the visibility and outreach of data on social change among academics, policymakers, and the wider public.

Currently more than 30 nations participate in the survey including all EU Member States apart from Malta, as well as nine countries outside of the EU (Albania, Kosovo, Iceland, Israel, Norway, Russia, Switzerland, Turkey and Ukraine). The European Social Survey is an individual response survey compared to many alternatives such as the British Household Panel Survey (BHPS) and the General Social Survey (GSS) in which the household is the unit of measurement. Since it's induction in 2001 the European Social Survey has won many awards of excellence contributing to the recent legal status of European Research Institute Consortium (ERIC) which ensures long-term sustainability of the survey.

The European Social Survey currently consists of 6 Rounds. In 2002 the first round included 22 participating countries. This has since increased to 26 countries in Round 5 (2010) and the most recent Round 6 (2012) spanning 27 different countries. Table 3.1.1 displays participating countries in Rounds 5 and 6 (2010 & 2012) compared to those in Round 1 (2002).

Table 3.1.1: Participating Countries by Round in the European Social Survey

ESS Round	ESS-1	ESS-5	ESS-6
	2002	2010	2012
Austria	✓		
Belgium	✓	✓	✓
Bulgaria		✓	✓
Croatia		✓	
Cyprus		✓	✓
Czech Republic	✓	✓	✓
Denmark	✓	✓	✓
Estonia		✓	✓
Finland	✓	✓	✓
France	✓	✓	
Germany	✓	✓	✓
Greece	✓	✓	
Hungary	✓	✓	✓
Iceland			✓
Ireland	✓	✓	✓
Israel	✓	✓	✓
Italy	✓		
Kosovo			✓
Luxembourg	✓		
Netherlands	✓	✓	✓
Norway	✓	✓	✓
Poland	✓	✓	✓
Portugal	✓	✓	✓
Russian Federation		✓	✓
Slovakia		✓	✓
Slovenia	✓	✓	✓
Spain	✓	✓	✓
Sweden	✓	✓	✓
Switzerland	✓	✓	✓
Ukraine		✓	
United Kingdom	✓	✓	✓

Source: The European Social Survey (2013)

The European Social Survey is funded by a combination of sources who are all dedicated to discovering more about changes in Europe's social, political and cultural fabric (ESS, 2013). These sources are listed as follows:

- The European Commission which funds the project's overall design, coordination and control.
- The European Science Foundation which meets the cost of its academic and scientific liaison.
- National academic funding bodies which provide funding for their own country's fieldwork and coordination.

The Irish component of the European Social Survey in 2010 & 2012 was funded by the Irish Research Council for the Humanities & Social Sciences (IRCHSS) while the Economic Social Research Institute (ESRI) was commissioned to carry out the survey (ESS, 2010, 2012). Ireland has participated in all six rounds of the survey. In 2010 Ireland recorded 2,576 interviews with a response rate of 65.2% (ESS, 2010). 2,628 interviews were reported in 2012 with an increase in the response rate to 67.9% just missing the goal set out by the European Social Survey of a response rate equal to 70% (ESS, 2012)

The Core Component of the ESS

The ESS is divided into two parts: a core section and a rotating module. One of the primary goals of the European Social Survey is to monitor changing attitudes, beliefs and values across time. For this reason the questionnaire has a core component that does not change from year to year and consists of the most comprehensive set of 'socio-structural' or background variables currently available in any cross-national survey (ESS, 2013).

The purpose of the core component is to measure and explain continuity and change in the following three broad domains:

- People's value and ideological orientations such as their world views, including their religiosity, their socio-political values, and their moral standpoints.
- People's cultural/national orientations like their sense of national and cultural attachment and their relative feelings towards other groups and cross-national governance
- The underlying social structure of society such as people's social positions, including class, education, degree of social exclusion, plus standard background sociodemographic variables.

In designing the questionnaire, academic specialists within each domain were brought in to recommend any sub-areas which they considered to be essential. As noted by many specialists, the adopted questions themselves would serve to produce data for both potential dependent and independent variables (ESS, 2013). This core component provides many of the sociodemographic variables such as marital status, age, education, income, and gender used in this thesis.

The Rotating Module of the ESS

The purpose of a rotating module is to enable the ESS to cover a wide range of topics and adapt to changing demands (ESS, 2013). The following table displays the rotating modules from each year the ESS has been commissioned.

Table 3.1.2: Rotating Module of the European Social Survey

ESS Round	Rotating Module Topics
Round 1 – 2002	Citizenship Inequalities
Round 2 – 2004	Work, family and well-being Health care seeking Economic morality
Round 3 – 2006	Personal and social well-being The timing of life
Round 4 – 2008	Attitudes to age Ageism
Round 5 – 2010	Work, family and well-being, recession Trust in justice
Round 6 – 2012	Personal and social well-being Understanding evaluations of democracy
Round 7 – 2014 (forthcoming)	Health inequalities Immigration

Source: The European Social Survey (2013)

The rotating module for Round 5 titled *Family, Work and Well-being* provides many of the work related variables used in this thesis. The rotating module describes individuals' work experiences and work-family conflicts (ESS, 2014). Additional indicators were included in the rotating module including household activity, labour market trajectories, and work-life balance (ESS, 2014).

The economic and social situation of many EU-member states was dramatically transformed by the economic recession resulting from the financial crisis beginning in 2008. This provides a unique opportunity to examine major theoretical claims about facets affecting work, family experience, and welfare while simultaneously providing a framework for policy makers (ESS, 2015). This rotating model set out to provide insight into the extent to which different types of employment and welfare regimes were able to mediate the impact of the economic crisis (ESS, 2015). There is no previous period for which data is collected that captures the transition from a period of prolonged economic growth to economic downturn (ESS, 2015). In

particular the rotating module will enable researchers to look at implications of economic change regarding:

- The experience of work and the labour market
- Work-family reconciliation
- Social integration and social cohesion

Even during times of economic growth there were changes in the nature of work that were both detrimental and beneficial for well-being. For example insecurity, while restricted to cohorts of the workforce, had damaging implications for not only the individual but for the family as well (ESS, 2015). Therefore, it seems logical that the shift from economic growth to economic recession would sharply accentuate the negative consequences of work experience. A feature of the recession captured by the data from the rotating model is the prevalence and distribution of insecurity (ESS, 2015). In earlier recessions the manufacturing and less skilled sectors were hit disproportionally whereas in the most recent recession service and manufacturing industries were most affected consisting of employees across the skill spectrum (ESS, 2015)

The Quarterly National Household Survey

One of the economic insecurity variables included in the life satisfaction equation comes from an additional data source, The Quarterly National Household Survey published by the Central Statistics Office (CSO) in Ireland. Economic insecurity is approximated by average regional unemployment rates in Ireland for years 2010 and 2012 in Ireland.

The Quarterly National Household Survey is a nationwide survey of households in Ireland conducted by the Central Statistics Office (CSO). Labour force estimates are produced quarterly which include official employment and unemployment figures for the state. The unemployment rates reported by the CSO are the same as the International Labour Organization (ILO) measure of unemployment which allows for consistent comparisons to be made between

countries (ILO, 2013). The ILO defines unemployment as the number of jobless people who want to work, are available to work and are actively seeking employment (ILO, 2013). The Quarterly National Household Survey calculates ILO unemployment rates according to the NUTS-3 classification across 8 standardized regions in Ireland. These regional unemployment rates are then matched to individuals within the Irish component of the ESS according an administrative variable titled REGION that classifies the residence of the respondent according to one of these 8 regions. Matching individuals in one survey to data in another survey according to a standardized classification eliminates ambiguous matching.

3.2: Variables Used in the Estimation of Life Satisfaction

The social, economic and environmental factors that make up subjective well-being are taken from the European Social Survey. Subjective well-being determinants and measures are discussed in detail. The subjective well-being indicators used in this thesis are life satisfaction and job satisfaction. Summary measures of all variables are explained in the following section.

The sample is restricted to only individuals in paid work. The European Social Survey asks respondents what they have been doing over the past seven days. Possible responses are as follows:

a. in paid work
b. in education
c. unemployed and actively seeking a job
d. unemployed and wanting a job but not actively looking
e. permanently sick or disabled, retired, in community military service
f. doing housework
g. "other"

A dummy variable for paid work is generated for those who responded with "in paid work" which takes a value equal to 1. All other responses taken on a value equal to 0. Luechinger *et al.* (2010a) similarly limit their sample to working individuals.

Dependent Variable

Life Satisfaction

The subjective well-being indicator life satisfaction is determined by individual responses to the following survey question:

'*All things considered, how satisfied are you with your life as a whole nowadays?'*

The variable is ordered and ranges from 0 to 10 from *'extremely dissatisfied'* to *'extremely satisfied.'* A common assumption is that individuals share a common opinion of what satisfaction is (Ferrer-i-Carbonell and Frijters, 2004). The ordered nature of responses has no implication for the differences in strength between the two outcomes (Borooah, 2002). The actual values taken by the dependent variable are irrelevant as long as larger values correspond to stronger outcomes (Borooah, 2002). The distribution of the life satisfaction variable for individuals in paid work is displayed as follows:

Figure 3.2.1: Histogram of Life Satisfaction 2010 & 2012

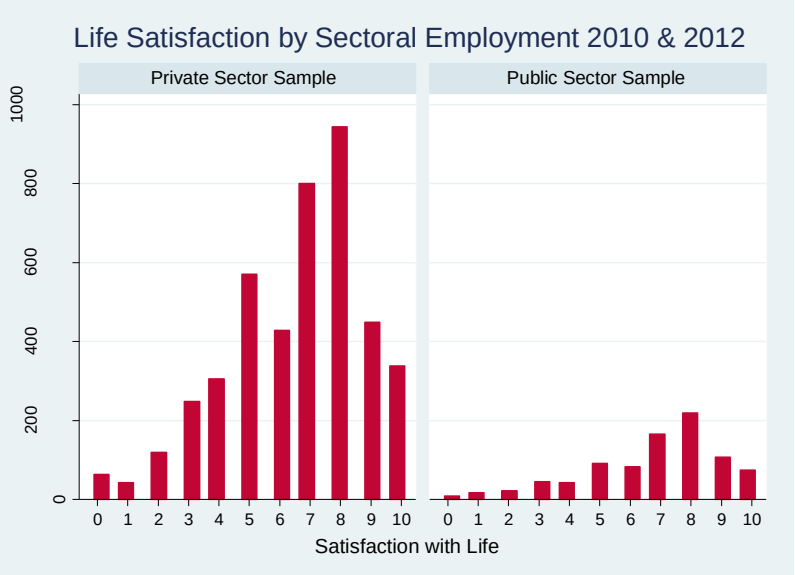


Source: European Social Survey 2010-2012
Note: Obs: 2041. Mean: 6.77. Std dev: 2.013. Skewness: -.742

The frequency distribution shows that 8 is the most common response. According to Luechinger *et al.* (2010a) a score of 8 or greater is classified as *'high life satisfaction.'* The average life satisfaction score is equal to 6.77 which is lower than that reported in Luechinger *et al.* (2010a) using German data. The negative skewness indicates that the distribution is skewed to the right. Of the 2041 observations 24.84% reported a life satisfaction equal to 8, 10.63% reported a life satisfaction equal to 9 and 6.27% reported a life satisfaction equal to 10. The distribution of the life satisfaction variable for only year 2010 is presented in Appendix C.

Figure 3.2.2 displays the life satisfaction of public and private sector subsamples of workers in Ireland.

Figure 3.2.2: Histograms of Life Satisfaction by Sectoral Employment 2010 & 2012



Source: European Social Survey 2010-2012
Note: (Public Sector): Obs: 464. Mean: 7.01. Std dev: 2.018. Skewness: -.988
Note: (Private Sector): Obs: 1577. Mean: 6.701. Std dev: 2.006. Skewness: -.676

Figure 3.2.2 shows that for both public and private sector workers the most common response is 8 on the life satisfaction scale. However the averages show that public sector workers report higher life satisfaction than private sector workers. This

is consistent with the findings in Luechinger *et al.* (2010a). Blanchflower and Oswald (1999) attribute greater average job satisfaction among public sector workers to higher job insecurity in public sector occupations. In total 2041 individuals are classified as being in paid work and employed in either the public or the private sector. The distribution of the variable life satisfaction by sector employment for the year 2010 is displayed in Appendix C. Explanatory variables used in the estimation of the life satisfaction equation are further discussed.

Independent Variables

In addition to self-reported responses to the life satisfaction question, the European Social Survey provides a long list of explanatory variables used in this thesis. Many tables and figures used to describe these independent variables are included in Appendix C. An additional variable selected to represent economic insecurity comes from The Quarterly National Household Survey (QNHS) and is subsequently matched to respondents in the European Social Survey.

Unemployment rates come from the QNHS and use the International Labour Organization's definition of an unemployed person. Unemployed individuals are those without work but who are able to work, want to work and are actively seeking employment (ILO, 2013). Regional unemployment rates are reported according to the statistical classification NUTS-3 and then matched to individuals in the European Social Survey according to a regional identifier that is similarly reported in NUTS-3. These Nomenclature Units of Territorial Statistics are listed in the following table: [7]

[7] Frequency percentage of Life Satisfaction by each NUTS-3 region classification is included in Appendix C

Table 3.2.1: List of Nomenclature Units of Territorial Statistics – Level 3

	Region	Territories
1	Border Region	Cavan, Donegal, Leitrim, Louth, Monaghan, Sligo
2	West Region	Mayo, Roscommon, Galway, Galway City
3	Midlands Region	Laois, Longford, Offaly, Westmeath
4	Mid-East Region	Kildare, Meath, Wicklow
5	Dublin Region	Dún Laoghaire – Rathdown, Fingal, South Dublin, Dublin City
6	South-East Region	Carlow, Kilkenny, South Tipperary, Wexford, Waterford City & County
7	South-West Region	Kerry, Cork, Cork City
8	Mid-West Region	Clare, North Tipperary, Limerick City & County

Source: The Irish Regions Office (2015)

Quarterly unemployment rates are reported by region for 2010 and 2012. These quarterly unemployment rates are averaged together to obtain average annual figures for 2010 and 2012 as is similarly done in Luechinger *et al.* (2010a). These averages are then matched to individuals in the European Social Survey according the same NUTS-3 regional classifier. In 2010 and 2012 the European Social Survey used an address based sampling strategy to conduct interviews. Therefore the region classification recorded by the European Social Survey records where the individual lives. These average unemployment rates are reported according to their regions for 2010 and 2012 in the following Table:

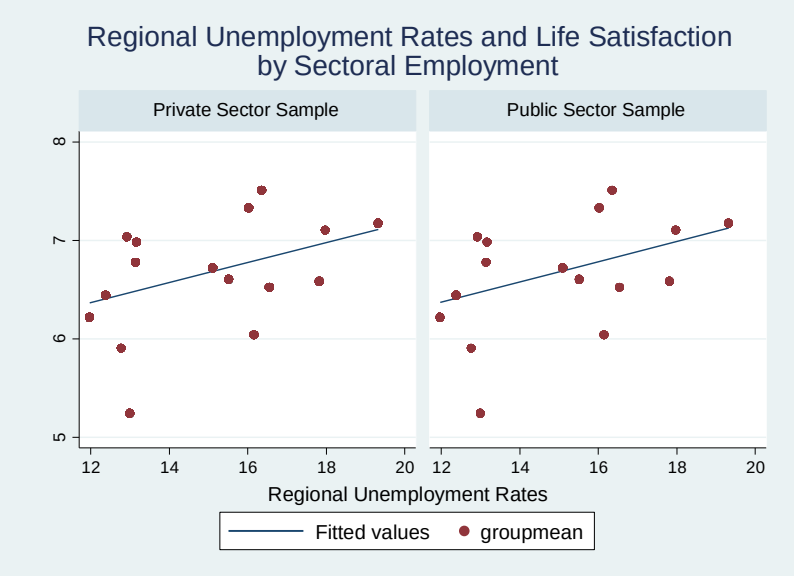
Table 3.2.2: Breakdown of Average Unemployment Rates by Region 2010 & 2012

Region	Unemployment Rate 2010	Unemployment Rate 2012
Border	13.00	12.38
Midland	16.15	17.83
West	15.10	15.53
Dublin	11.96	12.38
Mid-East	12.76	13.18
Mid-West	16.35	16.03
South-East	17.98	19.33
South-West	12.95	13.15

Source: Author's own

Figure 3.2.3 displays the correlation between life satisfaction and regional unemployment rates for public and private sector subsamples of workers. There is a clear upward trend where average life satisfaction increases with increasing unemployment rates. This contradicts findings in Luechinger *et al.* (2010a) and is addressed in later sections using empirical analysis.

Figure 3.2.3: Scatterplot of Regional Unemployment and Life Satisfaction by Sectoral Employment 2010 & 2012



Source: European Social Survey 2010-2012

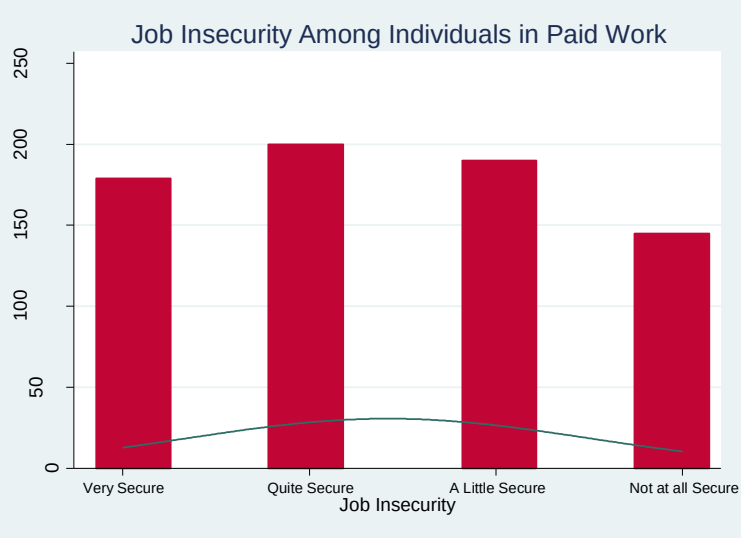
In addition to regional unemployment rates another indicator is used to approximate economic insecurity. The explanatory variable job insecurity comes from affirmations of the following statement in the European Social Survey (2010):

My job is secure

Respondents can select one of the following options: Not at all true, a little true, quite true, very true. This variable is coded into a job insecurity scale where not at all true equals 4, a little true equals 3, quite true equals 2 and very true equals 1 in such a way that the variable is increasing in job insecurity. This creates an ordered categorical independent variable where the actual numbers don't matter only in so far as the greatest degree of job insecurity is associated with the highest outcome. This variable is ordered because it follows a strict order based on the values of the underlying latent variable (Hilmer, 2001). The risk of perceived job loss is similarly measured on a similar 4-point ordered scale in Theodossiou and Vasileiou (2007).

The variable job insecurity comes from the rotating module of the European Social Survey and therefore is only available in Round 5 (2010). The following Table displays the distribution of the job insecurity variable.

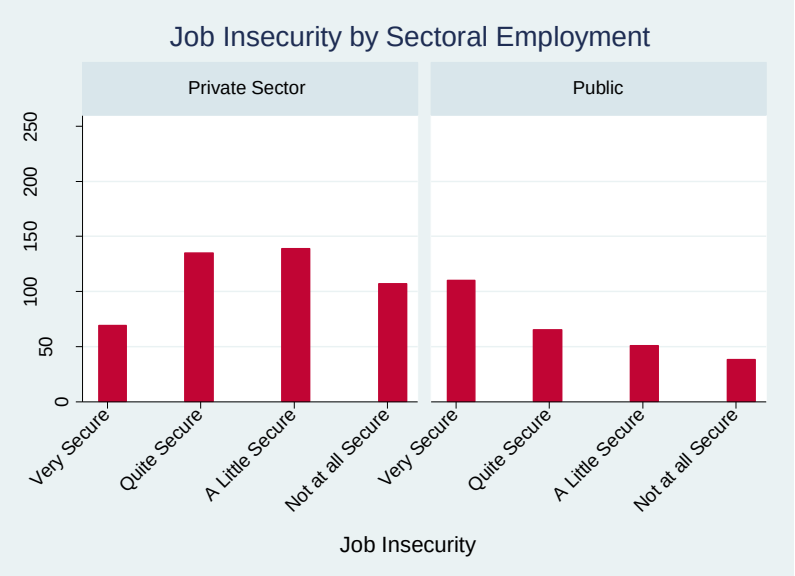
Figure: 3.2.4: Histogram of Job Insecurity among Individuals in Paid Work



Source: European Social Survey 2010
Note: Obs: 714. Mean: 2.423. Std dev: 1.074. Skewness: .088

The greatest number of respondents report their jobs as being quite secure (28.01%) while the lowest number of respondents report their jobs as being not at all secure (20.31%). A major caveat of Luechinger *et al.* (2010a) is that public sector workers enjoy greater job security which translates into higher well-being measures. The following graph explains the job insecurity distribution of public and private sector workers in Ireland.

Figure 3.2.5: Histograms of Job Insecurity by Sectoral Employment 2010



Source: European Social Survey 2010
Note: (Public Sector): Obs: 264. Mean: 2.064. Std dev: 1.089. Skewness: .546
Note: (Private Sector): Obs: 450. Mean: 2.631. Std dev: 1.009. Skewness: -.113

This graph shows that more public sector workers report their jobs as being very secure compared to those in the private sector. Conversely, more private sector workers report their jobs as being not at all secure. In total 264 workers make up the public sector sample and 450 workers make up the private sector sample.

In addition to the two economic insecurity measures a personal unemployment indicator is included as an explanatory variable. This variable comes from the following question in the European Social Survey:

'Any period of unemployment and work seeking within the past 5 years?'

The responses to this question form a dummy variable where Yes = 1 and No = 0. Out of 2,045 individuals currently in paid work, 1782 of them report "No" whereas 263 individuals report "Yes". 87.14% of individuals employed in 2010 had not faced being personally unemployed during the past five years. Many studies include an identifier for personal unemployment due to the lasting effects found long after the

individual had found work (Clark and Oswald, 1994). Those who report being unemployed within the past five years also report some of the lowest levels of life satisfaction. Of those unemployed within the past five years 2.49% and 1.80% reported life satisfaction scores of 0 and 1 respectively. Conversely, of those who were not personally unemployed in the past five years only 1.09% and 0.97% reported life satisfaction scores of 0 and 1 respectively. When looking at the other end of the spectrum individuals who reported the highest degree of life satisfaction equal to a score of 10 tended to be those who were not unemployed within the past five years.

A public sector dummy variable is generated from the following question:

‘

Which of the types of organization on this card do/did you work for?’

The 7 response categories are:

a. Central or local government
b. Other public sector (such as education and health)
c. A state owned enterprise
d. A private firm
e. Self-employed
f. Other
g. Refusal

The public sector dummy variable is equal to 1 for all individuals who chose the first three types of organizations and is equal to 0 for those who chose any of the remaining categories. Following Luechinger *et al.* (2010a) all those assigned a value equal to zero are henceforward referenced to as private sector workers. Public sector workers are classified as those employed in a central or local government, other public sector and a state owned enterprise as is done in Marx (2014). In 2010 and

2012 a total of 2,045 respondents answered this question. 72.52% of respondents are classified as private sector workers and 27.48% of respondents are classified as public sector workers.

The highest percentage of people reporting high life satisfaction equal to 9 are those who are the highest earners as well. For example, 25% of those classified in the highest earnings scale also report a life satisfaction equal to 9. In many cross-section surveys income is reported in bands (Layard *et al.,* 2008). In the European Social Survey, the annual household total net income is recorded. The question asks respondents to take into account income from all sources when answering this question. These income bands are then converted into numerical values using the midpoint of each band as explained in Layard *et al.* (2008). For respondents located in the lower income band an income of two thirds the upper limit of the band is calculated and for individuals in the highest income band an income of 1.5 times the lower limit of that band is calculated. Table 3.2.3 displays the annual household income from all sources as reported by the European Social Survey as well as the converted numerical values for each band using the formula presented in Layard *et al.* 2008. For the econometric analysis the log of the numerical income values was taken in order to normalize the distribution making it less sensitive to outlying or extreme observations (Wooldridge, 2003). This is common practice for wages and salaries where these variables consist of large integer values (Wooldridge, 2003).

Table 3.2.3: Breakdown of Total Net Household Income, European Social Survey 2010 & 2012

ESS Bands 2010	ESS Bands 2012	Calculated Numerical Values 2010	Calculated Numerical Values 2012
Less than €14173	Less than €13607	€9,495.91	€9071.33
€14173 to €20775	€13607 to €17881	€17,474.00	€15744.00
€20775 to €25577	€17881 to €24610	€23,176.00	€21245.50
€25577 to €32777	€24610 to €30042	€29,177.00	€27326.00
€32777 to €38174	€30042 to €35717	€35,475.50	€32879.50
€38174 to €45636	€35717 to €42399	€41,905.00	€39058.00
€45630 to €54851	€42399 to €51830	€50,240.50	€47114.50
€54851 to €64951	€51830 to €62818	€59,901.00	€57325.00
€64951 to €85526	€62818 to €83877	€75,238.50	€73347.50
More than €85526	More than €83877	€128,289.00	€125815.50

Source: European Social Survey (2010, 2012)

7 dummy variables are generated to represent 7 possible categories of education attainment. In 2010 and 2012 the European Social Survey reported country specific levels of education attainment. The ESS provided 18 possible education levels specific to Ireland. These 18 options were then dummied out into the following seven categories according to their National Framework Classifications (NFC) also reported by the European Social Survey: Less than secondary, lower secondary, upper secondary, non-tertiary, tertiary, postgraduate, and other. Of those with less than a secondary education, 21.36% reported a 10 on the life satisfaction scale. This compared to only 12.75% who similarly reported a 10 on the life satisfaction scale but who had completed a post-graduate degree. A higher percentage of respondents with tertiary education completed was reported in higher life satisfaction categories. 23.56%, 19.75%, and 18.69% of those with a tertiary education reported 8, 9 and 10 on the life satisfaction scale respectively.

8 dummy variables are created for age spanning 10 years in each category. The first variable represents 17 to 25 years, 26 to 35 years and so forth until 86 years and over. Dummying out an age variable according to ten year ranges is also done in Frey and Stutzer (2002b). Of those aged 26 to 35, 12.62% report 10 on the life

satisfaction scale. This corresponds to 11.17% for those aged 36 to 45 and 9.22% for those aged 46 to 55.

A dichotomous gender variable is generated where male equals 1 and female equals 0. A greater percentage of men report both high and low life satisfaction. Of those who report a 0 on the life satisfaction scale 53.42% of them are men. Similarly of those who report a 10 on the life satisfaction scale 51.46% of them are men.

A self-reported level of religiosity variable is taken from the following question in the European Social Survey:

How religious are you?

Respondents are asked to report their answers on a scale of 0 (not at all religious) to 10 (very religious). Religion has been shown to influence subjective well-being through both religious conviction channels and social connectedness channels (Helliwell, 2003). In addition to the self-reported level of religiosity, specific religious affiliation is accounted for. The European Social Survey asks which religion or denomination the respondent belongs to at present. The response categories available are specific to Ireland and consist of the following: Roman Catholic, Orthodox, Other Christian denomination, Jewish, Islamic, Eastern religions (Buddhist, Hindu etc.), other non-Christian religions, Church of Ireland, and other Protestant. A total of 9 religion dummy variables are created capturing all 9 possible responses in the European Social Survey.

In addition to a variable capturing the degree of religiosity another variable is included that is a direct measure of social connectedness. Respondents were asked how often they meet socially with friends. 7 dummy variables were generated from the following possible responses: Never, less than once a month, once a month, several times a month, once a week, several times a week and every day. The need to feel connected to others is very apparent in the subjective well-being literature (Frey and Stutzer, 2008). The highest percentage of high life satisfaction was recorded by those who meet with friends once a week, several times a week and every day. 23.79% of respondents who meet with friends once a week reported a 10 on the life

satisfaction scale. Likewise, of those who met with friends many times per week, 28.99% reported a 10 on the life satisfaction scale. Conversely, of those who reported never meeting friends only 1.94% reported a life satisfaction score of 10. These stark differences are supported by the literature where social connectivity is a major determinant of well-being.

Marital status has consistently been shown to contribute to the greatest degrees of subjective well-being (Helliwell, 2003; Blanchflower and Oswald, 2004). 6 dummy variables are generated representing the 6 possible marital statuses put forward by the European Social Survey: Legally married, in a legally registered civil union, legally separated, legally divorced, widowed, none of these (never married or in a legally registered civil union).

3.2.1: Descriptive Statistics

This section includes a more detailed description of the variables from the European Social Survey used in the estimation life satisfaction equations. This is set out in Table 3.2.4. Summary statistics for all variables have been calculated using the statistical program STATA 12. Most of the variables are dummy variables taking on the values 0 or 1. Those assigned the value 1 represent the presence of the characteristic.

Table 3.2.4: Descriptive Statistics from European Social Survey 2010 & 2012

Variable	Variable Description	Mean	Std. Dev	Min	Max
Life Satisfaction	Individual satisfaction with work on a scale between 0-10 (0 = extremely dissatisfied; 10 = extremely satisfied)	6.771	2.013	0	10
Regional Unemployment	The average unemployment rate reported according to NUTS-3 classification	14.422	2.197	11.975	19.325
Job Insecurity	Self-assessed job insecurity measured on a scale from 1-4 (1 = very secure; 4 = not at all secure)	2.422	1.074	1	4
public_dummy	= 1 if individual works in the public sector; 0 = otherwise	2.421	.420	0	1
lnincome	log of household annual income in Euro	10.317	.549	9.112	11.726
domicile_village	= 1 if individual lives in a country village; 0 = otherwise	.108	.311	0	1
domicile_farm	= 1 if individual lives on a farm or home in the country; 0 = otherwise	.287	.452	0	1
domicile_town	= 1 if individual lives in a town or small city; 0 = otherwise	.269	.444	0	1
domicile_city	= 1 if individual lives in a big city; 0 = otherwise	.077	.267	0	1
domicile_suburbs	=1 if individual lives in the suburbs or outskirts of a big city; 0 = otherwise	.258	.437	0	1
educ_lseccond	= 1 if individual has less than a secondary education completed; 0 = otherwise	.060	.237	0	1
educ_lowsecond	=1 if individual has lower secondary education completed; 0 = otherwise	.152	.359	0	1
educ_uppersecond	= 1 if individual has upper secondary education completed; 0 = otherwise	.251	.434	0	1
educ_nontertiary	= 1 if individual has non-tertiary education completed; 0 = otherwise	.117	.321	0	1
educ_tertiary	= 1 if individual has tertiary education completed; 0 = otherwise	.269	.444	0	1

Table 3.2.4 Cont.: Descriptive Statistics from European Social Survey 2010 & 2012

Variable	Variable Description	Mean	Std. Dev	Min	Max
educ_postgrad	= 1 if individual has postgraduate education completed; 0 = otherwise	.145	.352	0	1
educ_other	= 1 if individual has other education completed; 0 = otherwise	0	0	0	0
gender	= 1 if individual is male; 0 = female	.512	.500	0	1
unemp5yr	= 1 if individual has been unemployed within the past 5 years; 0 = otherwise	.129	.127	0	1
marit_married	= 1 if individual is married; 0 = otherwise	.510	.500	0	1
marit_civilunion	= 1 if individual is in a civil union; 0 = otherwise	.010	.101	0	1
marit_separated	= 1 if individual is separated; 0 = otherwise	.033	.179	0	1
marit_divorced	= 1 if individual is divorced; 0 = otherwise	.037	.189	0	1
marit_widowed	= 1 if individual is widowed; 0 = otherwise	.037	.189	0	1
marit_never	= 1 if individual is never married; 0 = otherwise	.025	.156	0	1
wrkhrs_ 1to10	= 1 if individual works 1 to 10 hours per week; 0 = otherwise	.024	.154	0	1
wrkhrs_11to20	= 1 if individual works 11 to 20 hours per week; 0 = otherwise	.116	.320	0	1
wrkhrs_21to30	= 1 if individual works 21 to 30 hours per week; 0 = otherwise	.156	.362	0	1
wrkhrs_31to40	= 1 if individual works 31 to 40 hours per week; 0 = otherwise	.389	.488	0	1
wrkhrs_41to50	= 1 if individual works 41 to 50 hours per week; 0 = otherwise	.214	.410	0	1
wrkhrs_51to60	= 1 if individual works 51 to 60 hours per week; 0 = otherwise	.071	.257	0	1
wrkhrs_61to70	= 1 if individual works 61 to 70 hours per week; 0 = otherwise	.020	.140	0	1
workhrs_71to80	= 1 if individual works 71 to 80 hours per week; 0 = otherwise	.007	.085	0	1

Table 3.2.4 Cont.: Descriptive Statistics from European Social Survey 2010 & 2012

Variable	Variable Description	Mean	Std. Dev	Min	Max
wrkhrs_81to90	= 1 if individual works 81 to 90 hours per week; 0 = otherwise	.001	.031	0	1
wrkhrs_other	= 1 if individual workers an 'other' amount of hours per week; 0 = otherwise	.002	.044	0	1
religiosity	Individual level of religiousness on a scale between 0-10 (0 = not at all religious; 10 = very religious)	4.667	2.567	0	10
rel_catholic	= 1 if individual belongs to the Catholic religion; 0 = otherwise	.696	.460	0	1
rel_protestant	= 1 if individual belongs to the Protestant religion; 0 = otherwise	.026	.160	0	1
rel_Eorthodox	= 1 if individual belongs to the Eastern Orthodox religion; 0 = otherwise	.006	.079	0	1
rel_otherchristian	= 1 if individual belongs to an other Christian religion; 0 = otherwise	.014	.116	0	1
rel_jewish	= 1 if individual belongs to the Jewish religion; 0 = otherwise	.000	.022	0	1
rel_Islamic	= 1 if individual belongs to the Islamic religion; 0 = otherwise	.008	.088	0	1
rel_Ereligious	= 1 if individual belongs to other Eastern European religions; 0 = otherwise	.006	.079	0	1
rel_otherchristian	= 1 if individual belongs to other Christian religion; 0 = otherwise	.001	.038	0	1
social_never	= 1 if individual socially meets with friends never; 0 = otherwise	.011	.105	0	1
social_lessm	= 1 if individual socially meets with friends less than once a month; 0 = otherwise	.105	.306	0	1
social_1m	= 1 if individual socially meets with friends once a month; 0 = otherwise	.155	.362	0	1
social_severalm	= 1 if individual socially meets with friends several times per month; 0 = otherwise	.185	.388	0	1
social_1w	= 1 if individual socially meets with friends once per week; 0 = otherwise	.268	.443	0	1

Table 3.2.4 Cont.: Descriptive Statistics from European Social Survey 2010 & 2012

Variable	Variable Description	Mean	Std. Dev	Min	Max
social_severalw	= 1 if individual socially meets with friends several times per week; 0 = otherwise	.2111	.408	0	1
social_everyday	= 1 if individual socially meets with friends every day; 0 = otherwise	.065	.247	0	1
age17to25	= 1 if individual is aged 17 to 25 years; 0 = otherwise	.077	.267	0	1
age26to35	= 1 if individual is aged 26 to 35; 0 = otherwise	.268	.443	0	1
age36to45	= 1 if individual is aged 36 to 45; 0 = otherwise	.266	.442	0	1
age46to55	= 1 if individual is aged 46 to 55; 0 = otherwise	.206	.405	0	1
age56to65	= 1 if individual is aged 56 to 65; 0 = otherwise	.141	.348	0	1
age66to75	= 1 if individual is aged 66 to 75; 0 = otherwise	.034	.182	0	1
age76to85	= if individual is aged 76 to 85; 0 = otherwise	.005	.073	0	1
age85plus	= if individual is aged 85 or over; 0 = otherwise	.001	.032	0	1

Source: Author's own

3.3: Variables Used in the Estimation of Job Satisfaction

There are many sociodemographic variables and work-related characteristics that affect both job satisfaction and job insecurity. Instrumental variables that are correlated with job insecurity or public sector employment but are orthogonal to job satisfaction are also discussed in this section. All variables used in the estimation of job satisfaction equations are explained. Due to limited availability of many job-specific variables, job satisfaction equations are estimated using only Round 5 (2010) data.

Dependent Variable

Job Satisfaction

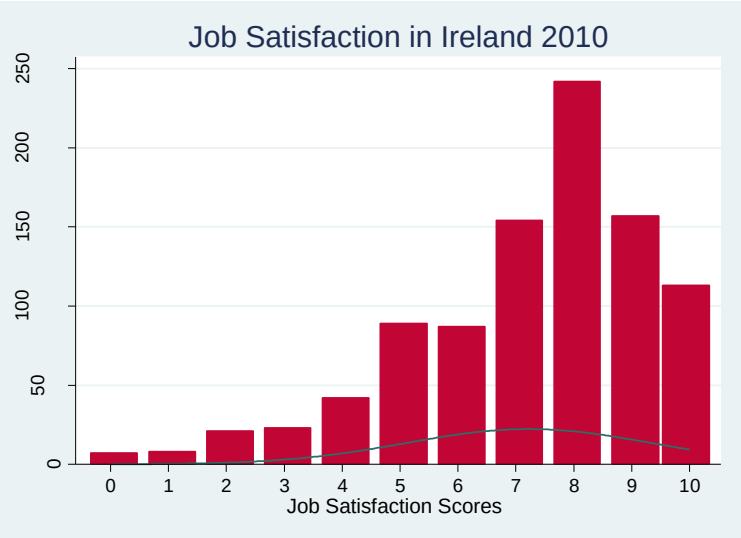
The dependent variable used in this thesis is job satisfaction. Job satisfaction is considered a summary measure of subjective well-being from work (Clark, 1997). Job satisfaction is obtained from the core module of the European Social Survey Questionnaire. Job satisfaction is measured on an eleven point scale ranging from 0 to 10. Individuals are asked to express their overall job satisfaction in a response to the following question:

"How satisfied are you in your main job?"

Respondents rank their answers on the scale 0 "Extremely Dissatisfied" to 10 "Extremely Satisfied." A common assumption is that individuals share a common opinion of what satisfaction is (Ferrer-i-Carbonell and Frijters, 2004). Individual responses to this question make up the subjective well-being indicator job satisfaction which is believed to be a measure of the latent variable well-being from work (Jones, 2007). The ordered nature of responses has no implication for the differences in strength between the two outcomes (Borooah, 2002). The actual values taken by the dependent variable are irrelevant as long as larger values correspond to stronger outcomes (Borooah, 2002). The following figures describe

the distribution of job satisfaction for the whole sample of workers in Ireland in 2010.

Figure 3.3.1: Histogram of Job Satisfaction in Ireland 2010

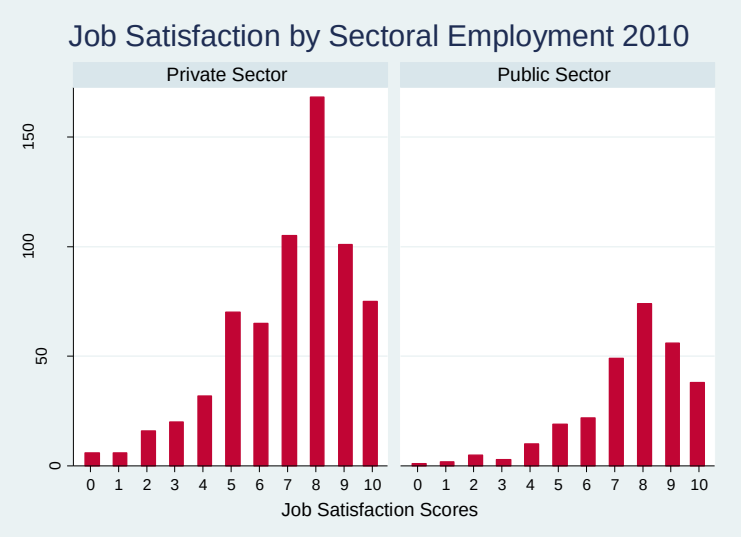


Source: European Social Survey 2010
Note: Obs: 943. Mean: 7.223. Std dev: 2.108. Skewness: -.955

The average response is a 7.2 and the most common response is an 8. High subjective well-being is defined as a reported 8 or higher on the job satisfaction scale (Luechinger, Meier and Stutzer, 2010). The average for the entire sample is less than what is considered high subjective well-being but the most common response (mode) satisfies this definition. A normal distribution is also included which shows a skewness to the left. The greatest percentage of responses reported an 8 (25.66%) followed by those who reported a 9 (16.65%). The lowest percentage of respondents reported a 0 on the job satisfaction scale (0.74%).

The following figure describes the distribution of job satisfaction for public and private sector workers in Ireland in 2010.

Figure 3.3.2: Histogram of Job Satisfaction in Ireland by Sectoral Employment 2010



Source: European Social Survey 2010
Note: (Public Sector): Obs: 279. Mean: 7.552. Std dev: 1.931. Skewness: -1.126
Note: (Private Sector): Obs: 664. Mean: 7.084. Std dev: 2.164. Skewness: -.880

The two graphs display similar shape and structure with the largest difference being the number of respondents in each subsample. The most common job satisfaction response is an 8 for public and private sector workers at 26.52% and 25.30% respectively. The average job satisfaction is 7.552 for public sector workers and 7.084 for private sector workers. The following Table displays the percentage breakdown of all job satisfaction categories for public and private sector workers.

Table 3.3.1: Breakdown of Job Satisfaction by Sectoral Employment in Ireland

Job Satisfaction	Public Sector	Private Sector	Total
Extremely dissatisfied	1 (0.36%)	6 (0.90%)	7
1	2 (0.72%)	6 (0.90)	8
2	5 (1.79)	16 (2.41%)	21
3	3 (1.08%)	20 (3.01%)	23
4	10 (3.58%)	32 (4.82%)	42
5	19 (6.81%)	70 (10.54%)	89
6	22 (7.89%)	65 (9.79%)	87
7	49 (17.56%)	105 (15.81%)	154
8	74 (26.52%)	168 (25.30%)	242
9	56 (20.07%)	101 (15.21%)	157
Extremely Satisfied	43 (15.41%)	75 (11.30%)	113
Total	279	664	943

Source: European Social Survey 2010

It is clear from this table that a higher percentage of public sector workers report job satisfaction scores of 8, 9, and 10. This is supported by the literature that finds public sector workers tend to report higher levels of job satisfaction compared to private sector workers (Blanchflower and Oswald, 1999; D'Addio *et al.*, 2007; Gardner and Oswald, 2001; Maidani, 1991; Steel and Warner, 1990).

Independent Variables

The independent variable of interest is job insecurity. This variable is also included in the previous section in the estimation of the life satisfaction equation. Job insecurity is taken from the responses to the following statement in the European Social Survey (2010):

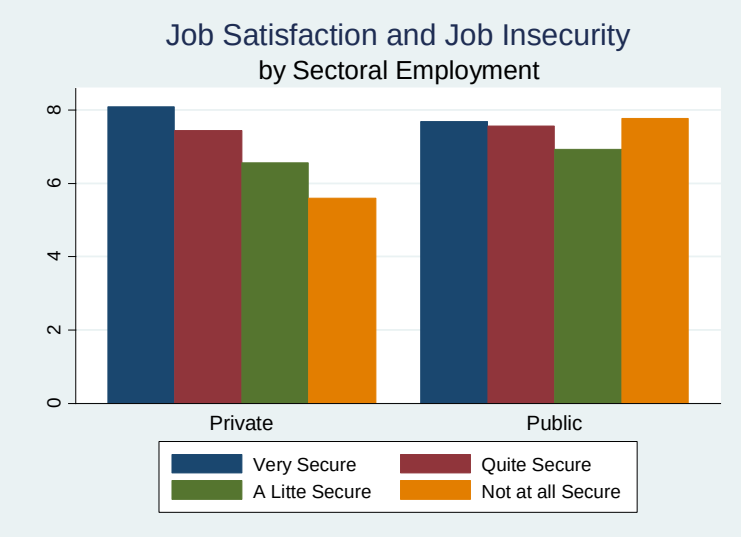
My job is secure

Respondents can select one of the following options: Not at all true, a little true, quite true, and very true. This variable is coded into a job insecurity scale where not

at all true equals 4, a little true equals 3, quite true equals 2 and very true equals 1. This variable categorical and increasing in job insecurity. Job insecurity is an ordered independent variable similar to the one generated in Theodossiou and Vasileiou (2007). This variable is a part of the rotating module of the European Social Survey therefore limiting the empirical analysis to 2010.

The following figure shows the relationship between job insecurity and job satisfaction for public and private sector workers.

Figure 3.3.3: Average Job Satisfaction and Job Insecurity by Sectoral Employment 2010



Source: European Social Survey 2010

For private sector workers, as job insecurity increases job satisfaction simultaneously decreases. A less clear relationship is displayed for public sector workers. Those who are in not at all secure jobs, their job satisfaction is still quite high, at levels of those who report their job is very secure. Despite being in very insecure jobs, public sector workers could be less exposed to the fears of potential job loss thus resulting in higher satisfaction (Luechinger *et al.*, 2010a).

For many of the following independent variables additional summary figures and tables are available in Appendix C. This is because of the overlap between

graphs from the previous section using 2010 and 2012 data. All figures are generated using the statistical program STATA 12.

In the European Social Survey income bands are available for the annual household total net income. For the purpose of econometric analysis these income bands were converted into numerical values using the mid-point of each band similar to Layard *et al.* (2008). For individuals located in the lowest income band an income was calculated of two thirds of the upper limit of that band and for individuals located in the top income band an income was calculated using 1.5 times the lower limit of that band (Layard *et al.*, 2008). The income bands reported by the European Social Survey and the calculated values according to Layard *et al.* (2008) are presented in the following Table:

Table 3.3.2: Breakdown of Total Net Household Income, European Social Survey 2010

ESS Bands 2010	Calculated Numerical Values 2010
Less than €14173	€9,495.91
€14173 to €20775	€17,474.00
€20775 to €25577	€23,176.00
€25577 to €32777	€29,177.00
€32777 to €38174	€35,475.50
€38174 to €45636	€41,905.00
€45630 to €54851	€50,240.50
€54851 to €64951	€59,901.00
€64951 to €85526	€75,238.50
More than €85526	€128,289.00

Source: European Social Survey (2010)

Summary figures of job satisfaction and annual household income are provided in Appendix C.

A gender variable is generated that equals 1 for male and 0 for female. Of those who are male, 14.0% reported a 10 on the job satisfaction scale. Of those who are women 15.23% reported a 10 on the job satisfaction scale. This is consistent with the findings by Clark (1997, 1998) where women tend to report higher job satisfaction then men.

Respondents in the European Social Survey are asked their year of birth where age is then calculated. Ages are grouped together in 10 year intervals as is also done in Frey and Stutzer (2002b). In total 8 age categories are generated 15-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80+. Because of the well-documented U-shape between age and job satisfaction (Clark and Oswald, 1994; Helliwell, 2003; Blanchflower, 2004) all with varying minimums, the age group 20-29 is selected as the reference group in the empirical analysis as is done in Frey and Stutzer (2010).

A variable representing self-reported health status is included in this thesis. The European Social Survey asks individuals to rank their subjective general health by answering the following question:

How is your health?

Possible answers were *Very Good, Good, Fair, Bad, Very Bad.* 5 dummy variables are generated for each health status. Of those individuals who report their health as being very good, 16.48% report a 10 on the job satisfaction scale. There is an apparent decreasing trend in the relationship between job satisfaction and self-reported health status. This is displayed in the Appendix C.

In Round 5 of the European Social Survey the following question is asked regarding individuals' education attainment:

What is the highest level of education you have successfully completed?

This question is asked in all participating countries where 27 different possible responses of education attainment are available. These are classified by the standardized International Standard Classification of Education (ISCED). This is a statistical framework for organizing information on education which is maintained by the United Nations Educational, Scientific and Cultural Organization (UNESCO). In addition to this group of standardized responses the European Social Survey asks this question again with country-specific response options. For Ireland, there are 18 various education attainment options in which the Irish standardized levels of the

National Framework of Qualifications (NFQ) are applied. Each level is based on a nationally agreed standard of knowledge, skill and competence. In this study, the 18 available answers translated into the following response categories according to the NFQ:

a. Less than secondary education
b. Lower secondary education
c. Upper secondary education
d. Non-tertiary education
e. Tertiary education
f. Post-graduate education
g. Other education

Each one of these possible responses are converted to binary variables indicating the presence of the condition. Of those who have a tertiary education 14.02% report a 10 on the job satisfaction scale. Of those with a postgraduate degree 14.29% report a 10 on the job satisfaction scale. Of those with lower secondary and upper secondary education, 14.60% and 15.94% reported a 10 on the job satisfaction scale respectively. Theoretically, individuals with higher education have been found to earn more money, are promoted quicker, and end up in better jobs indicating they should report higher well-being (Blanchflower and Oswald, 1994; Clark, 1994). However, the job satisfaction literature has documented a declining trend in satisfaction with increasing education attainment (Clark, 1996; Clark and Oswald, 1996; Sousa-Poza and Sousa-Poza, 2000). Tertiary education is selected as the reference group in the empirical analysis.

Dummy variables are generated for marital status. The European Social Survey asks asks the following question:

What is your legal marital status?

The response options to this question are specific to Ireland. The possible responses categories are:

a. Legally Married
b. In a legally registered civil partnership
c. Legally separated
d. Legally divorced
e. Widowed
f. None of these (never married)
g. Marriage/civil partnership annulled

Of those who are married 14.89% of them report a 10 on the job satisfaction scale. This compares to only 13.51% who similarly report a 10 on the job satisfaction scale but are divorced. The literature has shown that being separated or widowed are the two greatest depressants of subjective well-being (Blanchflower, 2004). Married individuals on average report the highest levels of job satisfaction (Clark *et al.*, 1996).

Dummy variables are generated for domiciles or areas of residence. These variables come from the following question with possible response categories:

What phrase on this card best describes the area where you live?

a. A big city
b. The suburbs
c. A town or small city
d. A country village
e. A farm

5 dummy variables are generated for each area of residence. In a comparison of those who live in a big city and those who live in a country village 14.55% of village residents report a 10 on the job satisfaction scale compared to 19.23% of big city residents. However this difference does not carry across all high job satisfaction scores. Of those who are village residents 16.36% report a 9 on the job satisfaction scale compared to 12.18% of big city residents.

The literature on types of employment contracts and job satisfaction yield various conclusions. Fixed-term contracts are associated with lower levels of job satisfaction (Kaiser, 2002) however another study found this relationship to be insignificant for public and private sector workers (Garner and Oswald, 2001). The European Social Survey asked individuals if they are an employee on one of the following types of contracts:

a. Unlimited duration
b. Limited duration
c. No contract

The following table breaks down the three types of employment contracts according to the 11 job satisfaction categories.

Table 3.3.3: Breakdown of Type of Employment Contract and Job Satisfaction 2010

Job Satisfaction	Unlimited Contract	Limited Contract	No Contract
Very Dissatisfied	6 (0.61%)	0 (0.00%)	4 (0.96%)
1	5 (0.51%)	1 (0.45%)	2 (0.48%)
2	8 (0.81%)	3 (1.35%)	3 (0.72%)
3	34 (2.43%)	6 (2.70%)	6 (1.44%)
4	44 (4.46%)	9 (4.05%)	18 (4.31%)
5	91 (9.22%)	24 (10.81%)	55 (13.16%)
6	115 (11.65%)	21 (9.46%)	48 (11.48%)
7	194 (19.66%)	34 (15.32%)	58 (13.88%)
8	232 (23.51%)	51 (22.97)	95 (22.73%)
9	137 (13.88%)	32 (14.41%)	69 (16.51%)
Very Satisfied	131 (13.27%)	41 (18.47%)	60 (14.35%)
Total	987	222	418
Average Job Satisfaction Score	7.265	7.437	7.292

Source: European Social Survey

The largest number of individuals are located in unlimited contracts followed by no contracts and lastly limited contracts. Individuals in a limited employment contract report the highest average job satisfaction score.

Hours of work are included in the basic utility from work function. Hours of work has been well documented as a work-related input that according to traditional utility from work theory is believed to decrease well-being due to the trade-off to leisure (Islam and Clark, 2002). The European Social Survey asks individuals about their work week hours:

How many hours do/did you normally work in a week (in your main job) including any paid or unpaid overtime?

Hours are grouped together in the following ten hour segments: 0-9, 10-19, 20-29, 30-39, 40-49, 50+. Of those who report working 20 to 29 hours of work per week, 16.41% report a 10 on the job satisfaction scale. Conversely, of those who work 40

to 49 hours per week only 13.08% of them report a 10 on the job satisfaction scale. Interestingly of those who work 50 hours or more per week, 19.28% report high life satisfaction. There is not a clear decreasing trend between job satisfaction and hours of work that traditional utility from work theory suggests.

Becoming personally unemployed has been shown to have lasting impacts on well-being long after the individual finds work (Clark and Oswald, 1994). The European Social Survey identifies previous unemployment in the following question:

Any period of unemployment and work seeking within the last 5 years?

A dummy variable is created that takes on the value 1 for "Yes" and 0 for "No." Of those who have been unemployed within the past five years only 12.84% reported a job satisfaction score equal to 10. This compares to 14.60% for individuals who have not been personally unemployed within the past five years and report a 10 on the job satisfaction scale. These job satisfaction differentials with regards to personal unemployment continue throughout the two remaining high job satisfaction scores of 8 and 9.

Interest in job satisfaction by early economists was largely based on the effect of union membership (Freeman, 1978; Borjas, 1977). In the job satisfaction literature a strong negative relationship has been found between job satisfaction and belonging to a union. Three dummy variables are created in this thesis that capture various degrees of union membership. As a part of the core module of the European Social Survey individuals were asked about their union membership in the following question:

Are you or have you ever been a member of a trade union or similar organization?

The three possible response categories are as follows:

a. Yes, previously

b. Yes, currently

c. No

Table 3.3.4: Average Job Satisfaction Scores by Union Membership

Average Job Satisfaction by Union Membership	
Yes, previously	7.485
Yes, currently	7.348
No	7.308

Source: European Social Survey (2010)

From Table 3.3.4 only marginal differences exist in the average job satisfaction scores of various union membership groups. Of those who are members of a union the greatest percentage of them report a 9 on the job satisfaction scale. The second most common job satisfaction score among union members is an 8. Both of these job satisfaction scores are classified as high job satisfaction (Luechinger *et al.*, 2010a). Conversely, of those who are not members of trade unions the greatest percentage report an 8 on the job satisfaction scale at 22.50% followed by a 7 on the job satisfaction scale at 16.61%.

In the rotating module of Round 5 of the European Social Survey (2010) individuals are asked about the size of the establishment in which they work. The question is as follows:

Including yourself, about how many people are/were employed at the place where you usually work/worked?

With the following being possible answers:

a. Under 10
b. 10 to 24
c. 25 to 99
d. 100 to 499
e. 500 or more

Five dummy variables are created representing the five options of establishement sizes listed above. Of those who work in an establishment of less than 10 workers 18.06% report a job satisfaction score equal to 10. This compares to 14.83% who similarly report a 10 on the job satisfaction scale but work in an establishment of more than 500 workers. These differences in job satisfaction among those in a small establishment sizes and those in a large establishment sizes continue for the other two high job satisfaction scores equal to 8 and 9.

Other work-specific variables are included in this thesis. Examples of these variables are opportunities for advancement, health and safety risk at work, support from co-workers and variety in work activities. A full list of work-specific variables and descriptive statistics are presented in Section 3.3.1.

Selection and Instrumental Variables

It is important that there is at least once variable in the public sector employment selection equation that is not in the job satisfaction outcome equation when accounting for sample selection bias. This variable is included in the selection equation which identifies the propensity to select into public sector employment. Similar to Luechinger *et al.* (2010b) the variable "citizenship" is used in the estimation of the public sector selection equation. The rationale being that that employment in the public sector is generally reserved for national citizens of that specific country. This particularly applies to jobs in the government sector. The European Social Survey asks individuals the following question:

Are you a citizen of Ireland?

A dummy variable is calculated equal to 1 if the individual is a citizen of Ireland and equal to 0 if the individual is not a citizen of Ireland. Citizenship and public sector employment are positively correlated with a coefficient equal to .0915. This is significant at the 1% level indicating that citizenship is a good variable for determining the propensity to select into public sector employment.

To account for endogeneity bias in the relationship between job satisfaction and job insecurity three instrumental variables are used to estimate the simultaneous equations model. In selecting appropriate instruments for the endogenous independent regressor job insecurity, a variable must be selected that is assumed for be highly correlated with the perceived risk of job loss but is orthogonal to the measure of job satisfaction (Theodossiou and Vasileiou, 2007). The three selected instruments in this thesis come from literature that specifically corrects for the simultaneous relationship between job satisfaction and job insecurity (Geishecker, 2010, 2012; Nikolaou *et al.*, 2005; Theodossiou and Vasileiou, 2007; Artz and Kaya, 2014; Clark and Postel-Vinay, 2009).

In Geishecker (2010, 2012) the simultaneity between job satisfaction and job insecurity is accounted for using an instrumental variable derived from information on individual perceived chance of finding a new job if the current one is lost. This

instrumental variable is believed to capture the subjective costs of job insecurity (Geishecker, 2010, 2012). These subjective costs of job insecurity are based on socioeconomic characteristics and subjective perceptions of the labour market. A similar instrumental variable is constructed in this paper derived from the following question in the European Social Survey:

"How easy/difficult is it to get a similar or better job if you had to leave you current employer?"

The responses are ordered and range from 0 "Extremely Difficult" to 10 "Extremely Easy". The following figure describes the distribution of responses to this question:

Figure 3.3.4: Histogram of Ease of Finding Similar or Better Job



Source: European Social Survey (2010)
Note: Obs: 714 Mean: 3.688. Std dev: 2.561. Skewness: .434

The answers to this question are used to create a dummy variable so that a high degree of difficulty takes on the value equal to 1 and all other responses equal

zero. High degree of difficulty is defined as a response equal to 0, 1, 2 or 3 (Geishecker, 2012).

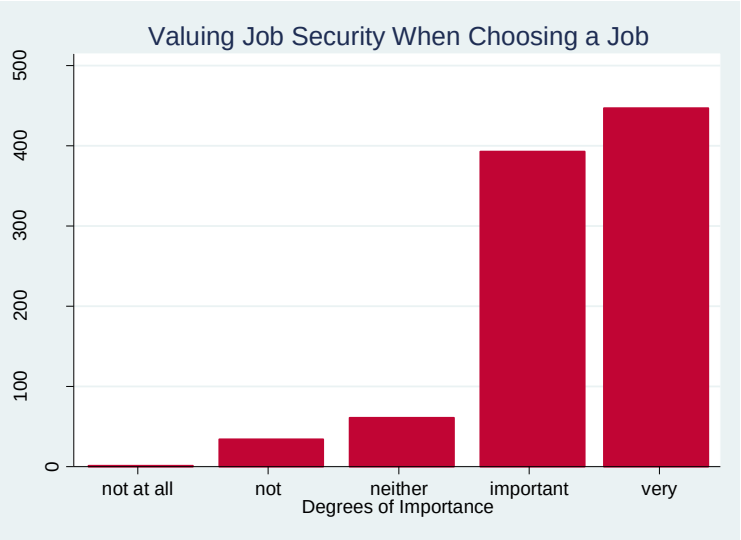
Theodossiou and Vasileiou (2007) present an argument in which it is possible that perceived risk of job loss might affect workers' job satisfaction but the reverse may also be true that dissatisfied workers may face an increased risk of losing their job. This simultaneous equations model is estimated using a general instrumental variable estimator. Instrumental variables are generated using responses to a question regarding the degree the individual values job security when initially choosing a job (Theodossiou and Vasileiou, 2007; Nikolaou, Theodossiou, and Vasileiou, 2005). The European Social Survey offers a similar question as follows:

How important do you think job security would be if you were choosing a job?

The answers provided are: not at all important, not important, neither important nor unimportant, important, very important. This five-point scale ranks the importance of this preference for a secure job and collapsed into a binary variable indicating when the individual considers a secure job as being "very important." This variable is attitudinal and most importantly does not refer to the respondent's current job (Theodossiou and Vasileiou, 2007, Nikolaou, Theodossiou, and Vasileiou, 2005). It is reasonable to assume that it is exogenous in the model (Theodossiou and Vasileiou, 2007).

The greatest percentage of respondents who fall into job satisfaction categories 8, 9 and 10 are those who consider job security to be very important. Of those who report job security as being very important, 16.59% of them report a 10 on the job satisfaction scale. This compares to only 14.04% of individuals with other job security values who report a 10 on the job satisfaction scale. The following figure displays the distribution of individuals and the degree they value job security when choosing a job. It is clear that most individuals rank job security as being important or very important.

Figure 3.3.5: Histogram of the Individual Job Security Value



Source: European Social Survey (2010)
Note: Obs: 936. Mean: 4.337. Std dev: .765. Skewness: -1.197

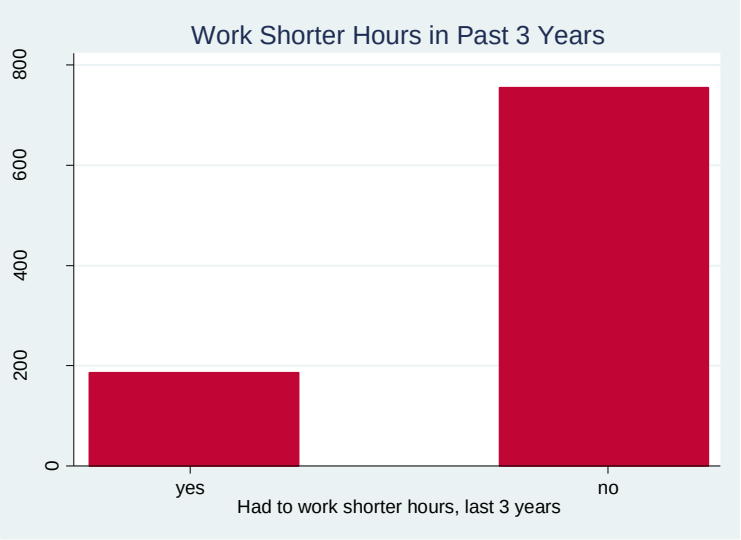
Artz and Kaya (2014) acknowledge there exists a strong possibility that job insecurity is endogenous in the estimation of job satisfaction. In detecting endogeneity, an instrument is derived from a question asking about the frequency of reduced work hours or temporary layoffs when work is slow Intuitively, the instrument suggests that if workers are experiencing frequent reduction in hours, they are more likely to expect job loss in the future (Artz and Kaya, 2014). The European Social Survey asks respondents the following question:

Have you had to work shorter hours in the last three years?

Responses are similarly coded 1 for "Yes" and 0 for "No." A lesser percentage of individuals who have experienced shorter hours of work report high job satisfaction than those who have not faced this reduction in hours. Of the workers who have had a reduction in hours of work, 8.60% report a job satisfaction score of 10 followed by 10.75% reporting a job satisfaction score of 9. This compares to the percentage of workers who have not faced a reduction in work week hours whereby 12.90% report

a job satisfaction of 10 and 18.09% report a job satisfaction of 9. The following Figure displays the number of people who fall into each category.

Figure 3.3.6: Histogram of Working Shorter Hours in Past Three Years



Source: European Social Survey (2010)
Note: Obs: 940. Mean: .198 Std dev: .399 Skewness: 1.517

3.3.1: Descriptive Statistics

This section includes a more detailed description of the dependent and independent variables from the European Social Survey. This is set out in Table 3.2.5. Summary statistics for all variables have been calculated using the statistical program STATA 12. Most of the variables are dummy variables taking on the values equal to 0 or 1. Those assigned the value 1 represent the presence of the characteristic.

Table 3.3.5: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
Job Satisfaction	Individual satisfaction with work on a scale between 0-10 (0 = extremely dissatisfied; 10 = extremely satisfied)	7.363	2.018	0	10
Job Insecurity	Individual perceived job insecurity on a sale 1-4 (1 = very secure, 2 = Quite secure, 3 = A little secure, 4 = Not at all secure)	2.421	1.074	1	4
Public Sector	= 1 if individual works in the public sector; 0 = private sector	.291	.455	0	1
Paid Work	= 1 if individual is in paid work; 0 = otherwise	.373	.484	0	1
lnincome	log of household annual income	10.075	.485	9.113	11.762
gender	= 1 if individual is male; 0 = otherwise	.469	.499	0	1
unemp_5yr	= 1 if individual has been unemployed and work seeking within the past 5 years; 0 = otherwise	.224	.417	0	1
wkhrs_0to9	= 1 if individual works 0 to 9 total hours normally worked per week in main job; 0 = otherwise	.014	.118	0	1
wkhrs_10to19	= 1 if individual works 10 to 19 total hours normally worked per week in main job; 0 = otherwise	.053	.225	0	1
wkhrs_20to29	= 1 if individual works 20 to 29 total hours normally worked per week in main job; 0 = otherwise	.120	.324	0	1
wkhrs_30to39	= 1 if individual works 30 to 39 total hours normally worked per week in main job; 0 = otherwise	.220	.415	0	1
wkhrs_40to49	= 1 if individual works 40 to 49 total hours normally worked per week in main job; 0 = otherwise	.306	.461	0	1
wkhrs_50plus	= 1 if individual works 50+ total hours normally worked per week in main job; 0 = otherwise	.287	.452	0	1
educ_lsecond	=1 if individual's highest level of education achieved is less than secondary education; 0 = otherwise	.150	.357	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
educ_lowsecond	=1 if individual's highest level of education achieved is less than lower secondary education; 0 = otherwise	.222	.415	0	1
educ_uppersecond	=1 if individual's highest level of education achieved is less than upper secondary education; 0 = otherwise	.243	.249	0	1
educ_nontertiary	=1 if individual's highest level of education achieved is post-secondary (non-tertiary) education; 0 = otherwise	.101	.301	0	1
educ_tertiary	=1 if individual's highest level of education achieved is tertiary education; 0 = otherwise	.189	.392	0	1
educ_postgrad	=1 if individual's highest level of education achieved is postgraduate education; 0 = otherwise	.085	.279	0	1
educ_other	=1 if individual's highest level of education achieved is other education; 0 = otherwise	.002	.042	0	1
contract_unlimited	=1 if individual has employment contract of unlimited duration; 0 = otherwise	.376	.484	0	1
contract_limited	=1 if individual has employment contract of limited duration; 0 = otherwise	.105	.306	0	1
contract_no	=1 if individual has no employment contract; 0 = otherwise	.267	.442	0	1
estab_sizeU10	=1 if individual works/worked at establishment of less than 10 employees; 0 = otherwise	.357	.479	0	1
estab_size10to24	=1 if individual works/worked at establishment of 10 to 24 employees; 0 = otherwise	.156	.363	0	1
estab_size25to99	=1 if individual works/worked at establishment of 25 to 99 employees; 0 = otherwise	.149	.356	0	1
estab_size100to499	=1 if individual works/worked at establishment of 100 to 499 employees; 0 = otherwise	.112	.315	0	1
estab_size500plus	=1 if individual works/worked at establishment of 500+ employees; 0 = otherwise	.072	.258	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
marit_married	=1 if individual's legal marital status is married; 0 = otherwise	.026	.158	0	1
marit_civil	=1 if individual's legal marital status is in a civil union; 0 = otherwise	.003	.055	0	1
marit_separated	=1 if individual's legal marital status is separated; 0 = otherwise	.034	.181	0	1
marit_divorced	=1 if individual's legal marital status is divorced; 0 = otherwise	.035	.183	0	1
marit_widowed	=1 if individual's legal marital status is widowed; 0 = otherwise	.078	.268	0	1
marit_never	=1 if individual's legal marital status is never married; 0 = otherwise	.379	.485	0	1
marit_annulled	=1 if individual's legal marital status is annulled; 0 = otherwise	.002	.039	0	1
hlth_vgood	=1 if individual's self-reported health status is very good; 0 = otherwise	.391	.488	0	1
hlth_good	=1 if individual's self-reported health status is good; 0 = otherwise	.415	.493	0	1
hlth_fair	=1 if individual's self-reported health status is fair; 0 = otherwise	.161	.368	0	1
hlth_bad	=1 if individual's self-reported health status is bad; 0 = otherwise	.028	.165	0	1
hlth_vbad	=1 if individual's self-reported health status is very bad; 0 = otherwise	.005	.069	0	1
age15_19	=1 if individual's age is 15 to 19 years old; 0 = otherwise	.050	.218	0	1
age20_29	=1 if individual's age is 20 to 29 years old; 0 = otherwise	.156	.363	0	1
age30_39	=1 if individual's age is 30 to 39 years old; 0 = otherwise	.190	.392	0	1
age40_49	=1 if individual's age is 40 to 49 years old; 0 = otherwise	.179	.383	0	1
age50_59	=1 if individual's age is 50 to 59 years old; 0 = otherwise	.147	.354	0	1
age60_69	=1 if individual's age is 60 to 69 years old; 0 = otherwise	.143	.350	0	1
age70_79	=1 if individual's age is 70 to 79 years old; 0 = otherwise	.096	.295	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
age80_89	=1 if individual's age is 80 to 89 years old; 0 = otherwise	.036	.185	0	1
age90_101	=1 if individual's age is 90 to 101 years old; 0 = otherwise	.003	.054	0	1
union_current	=1 if individual is currently a member of a trade union; 0 = otherwise	.129	.336	0	1
union_previous	=1 if individual is previously a member of a trade union; 0 = otherwise	.192	.394	0	1
union_no	=1 if individual is not a member of a trade union; 0 = otherwise	.675	.468	0	1
domicil_city	= 1 if individual lives in a big city; 0 = otherwise	.054	.226	0	1
domicil_suburbs	= 1 if individual lives in the suburbs or outside a big city; 0 = otherwise	.267	.443	0	1
domicil_town	=1 if individual lives in a small town; 0 = otherwise	.261	.440	0	1
domicil_village	= 1 if individual lives in a village; 0 = otherwise	.096	.294	0	1
domicil_farm	= 1 if individual lives on a farm; 0 = otherwise	.320	.467	0	1
Job Specific Variables					
wrkadvance_strongagree	= 1 if individual states they strongly agree that opportunities for advancement are good; 0 = otherwise	.288	.453	0	1
wrkadvance_agree	= 1 if individual states they agree that opportunities for advancement are good; 0 = otherwise	.252	.434	0	1
wrkadvance_neither	= 1 if individual states they neither agree nor disagree that opportunities for advancement are good; 0 = otherwise	.231	.422	0	1
wrkadcance_disagree	= 1 if individual states they disagree that opportunities for advancement are good; 0 = otherwise	0	0	0	0
wrkadvance_strongdisagree	= 1 if individual states they strongly disagree that opportunities for advancement are good; 0 = otherwise	.077	.266	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
wrkhard_stronagree	= 1 if individual states they strongly agree that their job requires that they work hard; 0 = otherwise	.241	.428	0	1
wrkhard_agree	= 1 if individual states they agree that their job requires that they work hard; 0 = otherwise	.401	.490	0	1
wrkhard_neither	= 1 if individual states they neither agree nor disagree that their job requires that they work hard; 0 = otherwise	.108	.311	0	1
wrkhard_disagree	= 1 if individual states they disagree that their job requires that they work hard; 0 = otherwise	.035	.185	0	1
wrkhard_strongdisagree	= 1 if individual states they strongly disagree that their job requires that they work hard; 0 = otherwise	.002	.056	0	1
wrkhealth_not	= 1 if individual states not at all true to the statement "health or safety is at risk at work"; 0 = otherwise	.462	.499	0	1
wrkhealth_little	= 1 if individual states a little true to the statement "health or safety is at risk at work"; 0 = otherwise	.201	.401	0	1
wrkhealth_quite	= 1 if individual states quite true to the statement "health or safety is at risk at work"; 0 = otherwise	.086	.281	0	1
wrkhealth_very	= 1 if individual states very true to the statement "health or safety is at risk at work"; 0 = otherwise	.033	.180	0	1
wrkhelp_not	= 1 if individual states not at all true to the statement "can get support from co-workers"; 0 = otherwise	.039	.193	0	1
wrkhelp_little	= 1 if individual states a little true to the statement "can get support from co-workers"; 0 = otherwise	.198	.398	0	1
wrkhelp_quite	= 1 if individual states quite true to the statement "can get support from co-workers"; 0 = otherwise	.241	.428	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
wrkhelp_very	= 1 if individual states very true to the statement "can get support from co-workers"; 0 = otherwise	.305	.460	0	1
wrkdepend_not	= 1 if individual states not at all true to the statement "my income depends on the effort I put in at work"; 0 = otherwise	.507	.500	0	1
wrkdepend_little	= 1 if individual states a little true to the statement "my income depends on the effort I put in at work"; 0 = otherwise	.148	.355	0	1
wrkdepend_quite	= 1 if individual states quite true to the statement "my income depends on the effort I put in at work"; 0 = otherwise	.100	.300	0	1
wrkdepend_very	= 1 if individual states very true to the statement "my income depends on the effort I put in at work"; 0 = otherwise	.031	.173	0	1
wrklearn_not	= 1 if individual states not at all true to the statement "my job requires that I learn new things"; 0 = otherwise	.116	.320	0	1
wrklearn_little	= 1 if individual states a little true to the statement "my job requires that I learn new things"; 0 = otherwise	.223	.412	0	1
wrklearn_quite	= 1 if individual states quite true to the statement "my job requires that I learn new things"; 0 = otherwise	.230	.414	0	1
wrklear_very	= 1 if individual states very true to the statement "my job requires that I learn new things"; 0 = otherwise	.227	.419	0	1
wrkvariety_not	= 1 if individual states not at all true to the statement "There is a lot of variety at work"; 0 = otherwise	.079	.270	0	1
wrkvariety_little	= 1 if individual states a little true to the statement "There is a lot of variety at work"; 0 = otherwise	.264	.441	0	1
wrkvariety_quite	= 1 if individual states quite true to the statement "There is a lot of variety at work"; 0 = otherwise	.214	.410	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
wrkvariety_very	= 1 if individual states very true to the statement "There is a lot of variety at work"; 0 = otherwise	.229	.420	0	1
wrkbalance_0	= 1 if individual reports a satisfaction score of 0 on the work/life balance scale; 0 = otherwise	.010	.102	0	1
wrkbalance_1	= 1 if individual reports a satisfaction score of 1 on the work/life balance scale; 0 = otherwise	.005	.017	0	1
wrkbalance_2	= 1 if individual reports a satisfaction score of 2 on the work/life balance scale; 0 = otherwise	.021	.143	0	1
wrkbalance_3	= 1 if individual reports a satisfaction score of 3 on the work/life balance scale; 0 = otherwise	.060	.238	0	1
wrkbalance_4	= 1 if individual reports a satisfaction score of 4 on the work/life balance scale; 0 = otherwise	.074	.262	0	1
wrkbalance_5	= 1 if individual reports a satisfaction score of 5 on the work/life balance scale; 0 = otherwise	.162	.368	0	1
wrkbalance_6	= 1 if individual reports a satisfaction score of 6 on the work/life balance scale; 0 = otherwise	.097	.296	0	1
wrkbalance_7	= 1 if individual reports a satisfaction score of 7 on the work/life balance scale; 0 = otherwise	.170	.375	0	1
wrkbalance_8	= 1 if individual reports a satisfaction score of 8 on the work/life balance scale; 0 = otherwise	.207	.405	0	1
wrkbalance_9	= 1 if individual reports a satisfaction score of 9 on the work/life balance scale; 0 = otherwise	.102	.303	0	1
wrkbalance_10	= 1 if individual reports a satisfaction score of 10 on the work/life balance scale; 0 = otherwise	.071	.257	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
industry_1	= 1 if individual works in agriculture, forestry, fishing industry; 0 = otherwise	.081	.273	0	1
industry_2	= 1 if individual works in mining and quarrying industry; 0 = otherwise	.003	.056	0	1
industry_3	= 1 if individual works in manufacturing industry; 0 = otherwise	.105	.307	0	1
industry_4	= 1 if individual works in gas, steam, and air conditioning supply industry; 0 = otherwise	.009	.096	0	1
industry_5	= 1 if individual works in water supply, sewerage waste, management, remediation activities industry; 0 = otherwise	.004	.064	0	1
industry_6	= 1 if individual works in construction industry; 0 = otherwise	.061	.240	0	1
industry_7	= 1 if individual works in wholesale retail trade, repair of motor vehicles and motorcycles industry; 0 = otherwise	.128	.334	0	1
industry_8	= 1 if individual works in transportation and storage industry; 0 = otherwise	.045	.2067	0	1
industry_9	= 1 if individual works in accommodation and food service activities industry; 0 = otherwise	.063	.244	0	1
industry_10	= 1 if individual works in information and communication industry; 0 = otherwise	.035	.185	0	1
industry_11	= 1 if individual works in financial and insurance industry; 0 = otherwise	.034	.182	0	1
industry_12	= 1 if individual works in estate activities industry; 0 = otherwise	.001	.032	0	1
industry_13	= 1 if individual works in professional, scientific and technical industry; 0 = otherwise	.031	.174	0	1
industry_14	= 1 if individual works in administrative and support service activities; 0 = otherwise	.055	.228	0	1
industry_15	= 1 if individual works in public administration and defence industry; 0 = otherwise	.030	.171	0	1

Table 3.3.5 Cont.: Descriptive Statistics from European Social Survey 2010

Variable	Variable Description	Mean	Std. Dev	Min	Max
industry_16	= 1 if individual works in education industry; 0 = otherwise	.086	.281	0	1
industry_17	= 1 if individual works in human health and social work activities; 0 = otherwise	.168	.374	0	1
industry_18	= 1 if individual works in arts and entertainment industry; 0 = otherwise	.017	.128	0	1
industry_19	= 1 if individual works in other service industry; 0 = otherwise	.035	.185	0	1
industry_20	= 1 if individual works in activities of households as employers; 0 = otherwise	.001	.032	0	1
industry_21	= 1 if individual work in activities of extra territorial organizations and bodies	0	0	0	0
Selection Variable					
citizen	=1 if individuals is a citizen of Ireland; 0 = otherwise	.853	.354	0	1
Instrumental Variables					
wkshr3y	= 1 if individual had to work shorter hours in the past 3 years; 0 = otherwise	.198	.399	0	1
value_security	= 1 if individual states job security is very important when choosing a job; 0 = otherwise	.465	.499	0	1
difficultdummy	= 1 if individuals reported it being highly difficult to find a similar or better job; 0 = otherwise (responses 1, 2, 3 = high difficulty on a 10-point scale)	.009	.300	0	1

Source: Author's own

3.4: Conclusion

The European Social Survey is a biennial cross section survey that aims to conduct a systematic study of changing values, attributes, and behaviour patterns within European politics (ESS, 2013). The 2010 and 2012 European Social Survey for Ireland represents a respective random sample of 2,576 and 2,628 respondents. It provides a large amount of data used in this thesis to identify social, economic and environmental determinants of subjective well-being with a particular focus on public and private sector workers in Ireland.

CHAPTER 4

THE EFFECT OF ECONOMIC INSECUIRTY ON SECTORAL DIFFERENCES IN LIFE SATISFACTION AND THE ESTIMATION OF INTERACTION EFFECTS IN NON-LINEAR MODELS

This chapter presents an empirical study of the effect of economic insecurity on life satisfaction in Ireland using data from the 2010 and 2012 European Social Survey (ESS). The variable life satisfaction is a measure of subjective well-being and considered an appropriate indicator of the latent variable individual well-being. Economic insecurity is approximated by average regional unemployment rates provided by the Quarterly National Household Survey (QNHS) conducted by the Central Statistics Office (CSO) for Ireland. Job insecurity is also used as an indicator of economic insecurity and comes from the rotating module in Round 5 (2010) of the European Social Survey. Job insecurity is self-reported and categorical on a four-point scale. The effects of economic insecurity on life satisfaction is further identified for public and private sector workers.

The relationship between life satisfaction and many socioeconomic variables such as age, marital status, education, gender, and social connectedness is examined. This chapter identifies social, economic and environmental factors that influence the subjective well-being of Irish individuals. Particular attention is paid to the subjective well-being determinant economic insecurity. Economic insecurity is defined as the anticipatory feelings caused by exposure to potential job loss (Luechinger *et al.,* 2010a). Following Luechinger *et al.* (2010a), Artz and Kaya (2014) and Theodossiou and Vasileiou (2007) economic insecurity is approximated by two separate indicators: Irish regional unemployment rates and perceived job insecurity. It is found in the literature that various measures of economic insecurity adversely impact the well-being of private sector workers to a greater extent (Artz and Kaya, 2014; Luechinger *et al.,* 2010a). This is attributed to the varying degrees of exposure to potential job loss that exists among the institutions of public and private sector employment.

Multiple regression analysis is used to estimate the life satisfaction equation because it controls for other factors which may simultaneously affect the dependent variable (Wooldridge, 2013). The ordered probit model is used to estimate the life

satisfaction equation in order to preserve the ordered nature of the dependent variable. This will render the calculated estimates more efficient than had they been estimated by linear regression techniques (Borooah, 2002). These ordered non-linear regression techniques have been successfully applied in numerous studies of subjective well-being determinants (Frey and Stutzer, 2002a).

4.1: Empirical Techniques

The ordered probit model is used to estimate the life satisfaction equation as is commonly found in many previous studies on the determinants of subjective well-being (Blanchflower and Oswald, 2004; Clark and Oswald, 1994; Clark, 2003, Helliwell, 2003; Frey and Stutzer, 2002a). A binary probit model is also used to estimate the life satisfaction equation in an attempt to correctly estimate interaction effects in non-linear models in accordance with Norton *et al.* (2004). The ordered probit model and the binary probit model are based on a latent regression (Stewart, 2004). In this study the observed dependent variable is subjective well-being indicated by responses to a life satisfaction question. This variable is both discrete and ordered and considered an accurate approximation for individual well-being.

In the life satisfaction equation a dummy variable is generated that takes on the value equal to 1 for public sector workers and 0 for private sector workers as is done in Luechinger *et al.* (2010a). The public sector dummy variable is also used in the formation of two interaction terms that are the product of the public sector dummy variable and either average regional unemployment rates or the categorical variable job insecurity ($UR \times Sector$) and ($I \times Sector$). This will identify partial effects of life satisfaction with respect to the corresponding economic insecurity measure which also depends on the condition of public sector employment. These interaction terms allow for differences in life satisfaction of public and private sector workers to be identified with respect to increasing economic insecurity. This will enable a direct comparison of the life satisfaction of public and private sector workers (Luechinger *et al.*, 2010a).

4.1.1: Estimation of the Life Satisfaction Equation Using the Ordered Probit Model and the Binary Probit Model

In the ordered probit model individuals *I* are sorted into *J* categories of life satisfaction 0, 1, 2, …, 10. In the binary probit model individuals are sorted into *J* categories of life satisfaction equal to 1 for "high life satisfaction" and 0 for "otherwise." The regression approach to the probit and ordered probit model begins with the probability of the event occurring (Borooah, 2002). These models are used to estimate the following life satisfaction equations.

$$LS_{it} = g(\beta_1 Sector_{it} + \beta_2 UR_i + \boldsymbol{\beta_3 Sector_{it}} \times \boldsymbol{UR_i} + \beta_4 \tilde{X}_{it} + \varepsilon_{it})$$

$$LS_{it} = g(\beta_1 Sector_{it} + \beta_2 I_i + \boldsymbol{\beta_3 Sector_{it}} \times \boldsymbol{I_i} + \beta_4 \tilde{X}_{it} + \varepsilon_{it}) \quad \textbf{(4.1.1)}$$

where:

LS	individual *i*'s life satisfaction responses in time period *t.*
$Sector_{it}$	public sector dummy variable
I_i	economic insecurity measured as a categorical job insecurity indicator.
UR_i	economic insecurity measured as continuous regional unemployment rates
$Sector_{it} \times UR_i$	interaction term #1
$Sector_{it} \times I_i$	interaction term #2
$\tilde{X}_{it}$	a vector of personal characteristics
ε_{it}	robust standard errors
g	function of the regression determined by the ordered probit model or the binary probit model
β's	parameters to be estimated

Using the ordered probit model and the binary probit model the parameters to be estimated are β_1, β_2, β_3, and β_4. The β coefficients are interpreted in terms of the underlying latent variable. A positive β means the corresponding independent variable increases the latent dependent variable and similarly a negative β means the

corresponding independent variable decreases the latent dependent variable (Verbeek, 2002). The latent dependent variable is individual well-being and is approximated by the subjective well-being indicator life satisfaction.

4.1.2: Interaction Effects from the Binary Probit Estimation of the Life Satisfaction Equation

Following Norton *et al.* (2004) a probit model is used to estimate the life satisfaction equation where the dependent variable is dichotomous taking on a value equal to 1 for high life satisfaction and a value equal to 0 for all other life satisfaction responses. This is done in order to use the post-estimation command *–inteff* in the statistical program STATA 12. This will allow for the calculation of marginal effects of the interaction term included in a non-linear model.

4.2: Results from Estimation of the Life Satisfaction Equation

The ordered probit model is used to estimate the life satisfaction equation. This will account for the ordered nature in the dependent variable (Borooah, 2002) which is based on a latent well-being regression.

4.2.1: Results from the Ordered Probit Model Using Two Economic Insecurity Indicators

The life satisfaction equation that includes average regional unemployment rates as the economic insecurity indicator uses data from the Quarterly National Household Survey and the European Social Survey (2010 & 2012). The life satisfaction equations that include job insecurity as the indicator of economic insecurity use data from the 2010 European Social Survey only. This is due to data availability of the job insecurity variable. The coefficients from the ordered probit model are listed in Table 4.2.1. Z-statistics are the ratio of the coefficient to the standard error. The p-value is used to determine statistical significance of each coefficient under the null hypothesis that the regression coefficient is zero.

Table 4.2.1: Results from the Ordered Probit Estimation of the Life Satisfaction Equations

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction*** ***(Ordered Scale 0-10)***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Private Sector	Reference Group				
Public Sector *(Sector)*	-0.178	-1.35		-0.430*	-1.71
Unemployment Rate *(UR)*	0.055***	3.54		–	–
Job Insecurity *(I)*	–	–		-0.156**	-2.75
Interaction Term	0.022**	2.24		0.205**	2.16
Job Seeking within the last 5 years	-0.078	0.96		-0.089	-0.53
Marital Status Married	Reference Group				
Marital Status Separated	-0.432***	-3.07		-0.571**	-2.04
Marital Status Divorced	-0.163	-1.22		-0.327	-1.59
Marital Status Civil Union	-0.038	-0.14		0.252	0.20
Marital Status Widowed	omitted	omitted		omitted	omitted
Marital Status Never	-0.376*	-1.77		0.234	0.74
Ln(Income)	0.480***	7.96		0.623***	5.76
Domicile City	Reference Group				
Domicile Suburbs	-0.355***	-3.41		-0.520***	-3.25
Domicile Town	-0.444***	-3.96		-0.601***	-3.87
Domicile Village	-0.306**	-2.37		-0.468**	-2.32
Domicile Farm	-0.175	-1.46		-0.009	-0.05

Table 4.2.1 cont.: Results from the Ordered Probit Estimation of the Life Satisfaction Equations

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Education Tertiary	Reference Group				
Education Less than Secondary	-0.264*	-1.95		-0.458**	-2.01
Education Lower Secondary	-0.190*	-1.92		-0.117	-0.68
Education Upper Secondary	-0.040	-0.50		-0.109	-0.73
Education Non-Tertiary, Post-secondary	-0.113	-1.20		-0.168	-1.05
Education Post-Grad	0.040	0.43		-0.058	-0.37
Education Other	omitted	omitted		omitted	omitted
Female	Reference Group				
Male	0.040	0.43		0.104	0.96
Religion Catholic	Reference Group				
Religion Protestant	-0.124	-0.66		-0.297	-0.96
Religion Eastern Orthodox	-0.022	-0.07		0.361	0.93
Religion Other Christian	0.133	0.61		-0.141	0.597
Religion Jewish	-0.749***	-4.80		omitted	omitted
Religion Islamic	-0.605**	-2.17		-0.081	-0.26
Religion Other Eastern European Religions	-0.907***	-3.40		-0.924**	-2.60
Religion Other Non-Christian	-0.095	-0.16		-1.122***	-3.44
Level of Religiosity	0.048***	3.95		0.074***	3.44

Table 4.2.1 cont.: Results from the Ordered Probit Estimation of the Life Satisfaction Equations

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Work Week 31 to 40 hours	Reference Group				
Work Week 1 to 10 hours	0.727***	3.57		0.470**	2.06
Work Week 11 to 20 hours	0.110	1.21		0.070	0.47
Work Week 21 to 30 hours	0.039	0.49		0.077	0.54
Work Week 41 to 50 hours	0.038	0.49		0.101	0.71
Work Week 51 to 60 hours	0.214*	1.72		0.315	1.02
Work Week 61 to 70 hours	0.046	0.21		1.829**	2.09
Work Week 71 to 80 hours	0.789*	2.04		-0.799**	-2.05
Work Week 81 to 90 hours	6.347***	24.84		omitted	omitted
Work Week 'other' hours	0.060	0.20		omitted	omitted
Meet with friends many times per month	Reference Group				
Meet with friends_ Never	-0.918***	-3.36		-1.295	-2.45
Meet with friends_Less1m	-0.280**	-2.68		-0.081	-0.42
Meet with friends_1m	0.008	0.09		-0.060	-0.39
Meet with friends_1w	0.108	1.33		0.170	1.09
Meet with friends_several per week	0.255**	2.84		0.395**	2.23
Social_every day	0.423**	2.98		0.523**	2.07
Age 26 to 35	Reference Group				
Age 17 to 25	-0.096	-0.78		-0.181	-0.88
Age 36 to 45	-0.192**	-2.63		-0.074	-0.60
Age 46 to 55	-0.263***	-3.18		-0.378	-2.64
Age 56 to 65	0.074	0.70		0.162	0.86

Table 4.2.1 cont.: Results from the Ordered Probit Estimation of the Life Satisfaction Equations

	Interaction Term (1) $UR \times Sector$			Interaction Term (2) $I \times Sector$	
Dependent Variable ***Life Satisfaction***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Age 66 to 75	0.386**	1.99		0.760	0.95
Age 76 to 85	0.769*	1.69		0.734**	2.21
Age 86+	6.305***	23.72		5.878***	15.85
cut_1	2.748			2.478	
cut_2	3.228			3.287	
cut_3	3.602			3.762	
cut_4	4.090			4.45	
cut_5	4.461			4.905	
cut_6	4.999			5.455	
cut_7	5.340			5.768	
cut_8	5.967			6.440	
cut_9	6.761			7.238	
cut_10	7.380			7.939	

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Unemployment Rate Interaction Term
No. Obs: 1433
Psuedo R^2: 0.0579

Job Insecurity Interaction Term
No Obs: 499
Psuedo R^2: 0.1056

Following Luechinger *et al.* (2010a) the results above are for individuals in paid work only. Unemployed individuals are not included in this study. Marginal effects are included in Appendix D and made reference to explaining the various determinants of life satisfaction. Marginal effects are calculated for a life satisfaction outcome equal to 8 because a score equal to 8 is the threshold for what is considered high life satisfaction (Luechinger *et al.* 2010a).

The first independent variable considered is public sector employment. The results indicate that when including the interaction term $UR \times Sector$, public sector employment is not a significant determinant of individual life satisfaction. This lack of statistical significance is similarly found in Luechinger *et al.* (2010a). In the second life satisfaction equation that includes the interaction term $I \times Sector$, public sector employment statistically decreases individual life satisfaction albeit at the 10% significance level.

The explanatory variable average regional unemployment is positive and statistically significant. This contradicts the findings in Luechinger *et al.* (2010a) and the subjective well-being literature where unemployment has been shown to decrease subjective well-being (Clark, 2003; Di Tella, MacCulloch and Oswald, 2001; Di Tella, MacCulloch and Oswald, 2003; Frey and Stutzer, 1999; Winkelmann and Winkelmann, 1998). The results here suggest that as regional unemployment increases life satisfaction also increases. The marginal effect displayed in Appendix D suggest that as regional unemployment increases the probability of reporting a life satisfaction score of at least 8 is .9%. The literature in macroeconomics looking at well-being implications of higher unemployment rates is heavily critiqued and questioned particularly regarding the range of magnitudes produced across studies (Di Tella and MacCulloch, 2006).

Finding a positive and statistically significant relationship between general unemployment and life satisfaction undermines the ability to isolate effects due to general negative externalities of unemployment and feelings of economic insecurity as outlined in Luechinger, *et al.* (2010a). Regional unemployment acts as a proxy for economic insecurity which is defined as the anticipatory feelings evoked by potential hazards (Luechinger, Meier and Stutzer, 2010). If unemployment rates exhibit a positive relationship to well-being this approximation no longer holds.

Existing research shows that individuals' well-being is affected by comparisons between one's own situation and the situations of others around them. Layard (2005) reviews evidence of social comparisons and finds that individual happiness depends only on personal income relative to that of the income of people living in the same community. Social comparisons can increase well-being, when it provides information on the prospects for one's own improvement (Senik, 2005).

Luechinger *et al.* (2010a) mention that a countervailing effect from social comparisons might influence the coefficient on regional unemployment rates in that working individuals may feel better off when their relative standing increases. This could explain in part the reason for a positive coefficient produced in this study. While social comparisons are prevalent in subjective well-being research, there is limited work on social comparison in the unemployment domain (Clark, 2003).

Despite these conjectures there is a clear need to move beyond regional unemployment rates as a proxy for economic insecurity. Luechinger *et al.* (2010a) use correlations to job insecurity as justification for using regional unemployment rates as a measure of economic insecurity. Therefore, this thesis also uses job insecurity as a viable measure of economic insecurity. The variable job insecurity is negative and statistically significant which coincides with economic expectation. The marginal effect located in Appendix D suggests that as individuals increase in their self-reported job insecurity the probability of reporting high life satisfaction decreases by 2.8%. This is substantially larger than the marginal effect calculated for regional unemployment rates.

Interaction term (1) consisting of the product of the explanatory variables regional unemployment rates and the public sector dummy variable. The coefficient is positive and statistically significant. This indicates that regional unemployment increases the well-being of public sector workers to a greater extent than private sector workers. This finding is driven by the inherent positive relationship between regional unemployment rates and life satisfaction before it is included in an interaction term.

Interaction term (2) consisting of the product of the categorical explanatory variable job insecurity and the public sector dummy variable. The coefficient is positive and statistically significant. Due to the initial relationship between job insecurity and life satisfaction being negative the interaction term is interpreted is not as straightforward. According to Luechinger *et al.* (2010a) when an initial negative relationship exists between economic insecurity and subjective well-being, a positive coefficient on the interaction term would indicate that the adverse implications of this insecurity is less for public sector workers. In other words job insecurity more adversely impacts the well-being of private sector workers than public sector workers. Luechinger *et al.* (2010a) attribute this to the institution of public sector

employment and less exposure to potential job loss. It would appear that during a time of rising insecurities among all workers in Ireland, the institution of public sector employment was able to hedge some of the expected well-being consequences.

Becoming unemployed has been shown to have lasting well-being consequences even after finding a new job (Clark, 2003). For individuals who have been unemployed and job seeking within the past 5 years the results above display negative coefficients in line with economic theory however the relationships are not statistically significant.

Individuals who are separated on average report lower levels of life satisfaction than those who are married. According to the marginal effects in Appendix D being separated decreases the probability of reporting high life satisfaction by 7.6%. This is supported by Blanchflower and Oswald (2004) where it is shown that one of the single greatest depressants of subjective well-being is becoming separated or widowed. This finding is supported by the general conclusion that being alone is worse for subjective well-being than being part of a partnership (Helliwell, 2003; Blanchflower and Oswald, 2004). Being divorced displays no statistical relationship to life satisfaction which is similarly found in Helliwell (2003) where being separated was a far greater depressant of subjective well-being.

The natural log of income is a positive and statistically significant determinant of subjective well-being. This indicates that as income increases life satisfaction also increases. This coincides with the extensive literature displaying a positive effect of personal income on subjective well-being (Frey and Stutzer, 2002; Frey and Stutzer, 2000 Blanchflower and Oswald, 2004; Di Tella and MacCulloch, 2006). One explanation is that individuals with higher income have more opportunities to achieve what they desire, specifically more material goods and services (Frey and Stutzer, 2002a).

It is important to note that not controlling for individual fixed effects, such as personality traits, can affect the relationship between income and subjective well-being (Ferrer-i-Carbonell and Frijters, 2004). Furthermore when these individual specific unobservables are accounted for, the income effect is reduced. In studies that use panel data, unobserved fixed effects are controlled for and still conclude that

changes in real income are positively correlated with changes in happiness (Winkelmann and Winkelmann, 1998; Ferrer-i-Carbonell and Frijters, 2004)

Three out of four of the domicile variables are significant determinants of life satisfaction. Those who live in the suburbs, a town, or a village all report lower life satisfaction than those who live in a city. According to the marginal effects of those who live in these domiciles, the probabilities of reporting high life satisfaction decrease by 6%, 7.5% and 5.3% respectively. The link between living in a city and high life satisfaction usually runs through the channel of greater economic growth (Ek *et al.,* 2008). However, some of the coefficients are insignificant supported by Rehdanz and Maddison (2005) where population density is not found to be a determinant of subjective well-being.

Individuals who have completed less than lower secondary education report lower life satisfaction than those who have completed tertiary education. The first life satisfaction equation also displays a significantly negative relationship for individuals with a lower secondary education compared to those with a tertiary education. The general lack of statistical significance is supported by Flouri (2004) who similarly finds no relationship between education and subjective well-being. Clark and Oswald (1996) state that any association is the product of increasing expectations and that it is the rate of change in education that matters not the absolute level acquired. The coefficient on education is often responsive to the inclusion of other variables within the model (Dolan *et al.,* 2008) which can impact its sign and significance.

Gender does not appear as a significant determinant of life satisfaction. Similarly Louis and Zhao (2002) report no gender differences in subjective well-being. The relationship between gender and life satisfaction has been shown to be influenced by other control variables indicating that other factors may be more important in determining subjective well-being (Dolan *et al.,* 2008).

Various religion variables display statistically sporadic relationships to life satisfaction. Most notably individuals in Islamic religions or other Eastern European religions report significantly lower life satisfaction scores than those who identify with the Catholic religion. It is interesting that being Protestant compared to being Catholic does not statistically influence individual well-being in Ireland. It is

unknown if the effects of religion on well-being travel via the support system religion provides or the strength of the religious beliefs (Helliwell, 2003). Therefore, a variable asking individuals to rank their perceived level of religious adherence is also included. This variable titled "Religiosity" is positive and significant at the 1% level. This indicates that the more devout an individual is the greater is their life satisfaction.

The hours of work per week is a variable commonly included in job-specific measures of subjective well-being research (Clark and Oswald, 1994). It is understood that hours of work are included in traditional utility from work equations and a negative relationship to subjective well-being is commonly found (Clark and Oswald, 1994). This is due to the inherent trade-off between work and leisure. The results suggest that individuals who work 1 to 10 hours per week report greater life satisfaction than those in the base category who work 31 to 40 hours per week. All other coefficients are positive however insignificant. Finding a positive relationship between hours of work and subjective well-being is supported by the procedural utility theories put forward by Benz and Frey (2008) who states that work is not always a source of disutility.

Social connectivity has been show to provide individuals with feelings of trust and resources that allow them to be more resilient in the event of shocks which ultimately enhances individual well-being (Commission of the European Communities, 2009). A variable indicating how often individuals meet with friends is included to capture this social connectedness. It is clear that well-being significantly increases as individuals meet with friends more often. Those who never meet with friends or meet with friends less than once a month report significantly lower life satisfaction than those in the base category who meet with friends many times per month. Conversely, those who meet with friends several times per week or everyday report significantly higher life satisfaction than those who only meet friends many times per month. The marginal effects show that individuals who never meet with friends report the greatest decrease in the probability of reporting high life satisfaction equal to a reduction of 16%. Conversely, individuals who meet with friends everyday have a 5.5% higher probability of reporting high life satisfaction. These findings support the strong link between individual well-being and social indicators.

The variable age appears to display a U-shaped relationship to life satisfaction. Those who are 36 to 45 and 46 to 55 report significantly lower life satisfaction than those who are aged 26 to 35. Conversely, those who are older displays greater life satisfaction after the age of 66. A U-shape between age and well-being is commonly found in subjective well-being literature (Blanchflower and Oswald, 2004).

4.2.2: Post-Estimation Diagnostics

A test of model specification is performed. The RESET test or Regression Specification Error Test is proposed by Ramsey (1969). This is a general test for problems of the assumed functional form of the model, in particular the assumptions of linearity (Jones, 2007). It is also a test of omitted variables in only the instance that these omitted variables lead to nonlinearity in the relationship between *x* and *y*. The choice of a functional form may have important implications for subsequent statistical tests (Godfey, 1988). The RESET test predicts the values from the regression function, takes the square of those values and re-estimates the model with this new variable added as an explanatory variable (Jones, 2007). If the model is well specified the test variable should not be significant indicating the null hypothesis cannot be rejected. The following table presents the hypothesis and the results from the RESET test.

Table 4.2.2: RESET Test of Model Specification – Ordered Probit Model

H_0: Model is correctly specified **H_1: Model is not correctly specified**		
	Interaction Term (1) $\boldsymbol{UR \times Sector}$	**Interaction Term (2)** $\boldsymbol{I \times Sector}$
Chi^2	0.00	1.85
RESET Test Prob > Chi^2	0.9783	0.1739

Source: Author's own

The results in Table 4.2.2 show that both life satisfaction models are correctly specified. The p-values of the Chi^2 (χ^2) statistics are not less than conventional

statistical thresholds indicating the null hypothesis cannot be rejected for either model.

Robust standard errors used to account for heteroscedasticity

4.2.3: Results from the Binomial Probit Model

The binomial probit model is used to estimate the life satisfaction equations. This is performed in order to calculate correct marginal effects of the interaction term in non-linear models as outlined in Norton *et al.* (2004). Using the statistical software STATA 12, the post-estimation command *–inteff* is used to calculate the marginal effects of the included interaction terms.

Table 4.2.3: Results from the Binomial Probit Estimation of the Life Satisfaction Equations

Dependent Variable ***Life Satisfaction*** **(high life satisfaction = 1; otherwise = 0)**	**Interaction Term (1)** $\boldsymbol{UR \times Sector}$			**Interaction Term (2)** $\boldsymbol{I \times Sector}$	
	Coefficient	Z-Stat		Coefficient	Z-Stat
Private Sector	Reference Group				
Public Sector *(Sector)*	-0.292*	-1.72		-0.593*	-1.83
Unemployment Rate *(UR)*	0.069***	3.56		–	–
Job Insecurity *(I)*	–	–		-0.272**	-3.13
Interaction Term	0.028**	2.31		0.265**	2.01
Job Seeking within the last 5 years	-0.062	-0.58		-0.095	-0.42
Marital Status Married	Reference Group				
Marital Status Separated	-0.473**	-2.33		-0.906*	-1.71
Marital Status Divorced	-0.240	-1.32		-0.483	-1.53
Marital Status Civil Union	0.169	0.54		0.428	0.43
Marital Status Widowed	omitted	omitted		omitted	omitted
Marital Status Never	-0.290	-1.18		0.013	0.03
Ln(Income)	0.473***	6.07		0.683***	4.40
Domicile City	Reference Group				
Domicile Suburbs	-0.373**	-2.70		-0.394	-1.51
Domicile Town	-0.432**	-3.03		-0.361	-1.38
Domicile Village	-0.310*	-1.85		-0.332	-1.07
Domicile Farm	-0.179	-1.18		0.037	0.14

Table 4.2.3 cont.: Results from the Binomial Probit Estimation of the Life Satisfaction Equations

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction***	Coefficients	Z-Stat		Coefficients	Z-Stat
Education Tertiary	Reference Group				
Education Less than Secondary	-0.255	-1.44		-0.397	-1.19
Education Lower Secondary	-0.249**	-2.01		-0.090	-0.38
Education Upper Secondary	-0.115	-1.15		-0.100	-0.53
Education Non-Tertiary, Post-secondary	-0.245	-1.95		-0.229	-0.97
Education Post-Grad	0.034	0.28		0.077	0.37
Education Other	omitted	omitted		omitted	omitted
Female	Reference Group				
Male	0.114	1.40		0.179	1.22
Religion Catholic	Reference Group				
Religion Protestant	0.030	0.13		0.115	0.33
Religion Eastern Orthodox	0.251	0.63		0.656	1.07
Religion Other Christian	-0.158	-0.57		-0.249	-0.63
Religion Jewish	omitted	omitted		omitted	omitted
Religion Islamic	-0.675	-1.57		0.139	0.25
Religion Other Eastern European Religions	-1.214**	-2.03		omitted	omitted
Religion Other Non-Christian	0.337	0.41		omitted	omitted
Level of Religiosity	0.049***	3.31		0.062**	2.23
Work Week 31 to 40 hours	Reference Group				
Work Week 1 to 10 hours	0.359	1.43		0.216	0.49

Table 4.2.3 cont: Results from the Binomial Probit Estimation of the Life Satisfaction Equations

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction***	Coefficients	Z-Stat		Coefficients	Z-Stat
Work Week 11 to 20 hours	0.132	1.07		0.179	0.86
Work Week 21 to 30 hours	0.132	1.24		0.149	0.80
Work Week 41 to 50 hours	-0.020	-0.20		-0.088	-0.48
Work Week 51 to 60 hours	0.226	1.46		0.045	0.13
Work Week 61 to 70 hours	-0.140	-0.50		omitted	omitted
Work Week 71 to 80 hours	0.883**	2.14		omitted	omitted
Work Week 81 to 90 hours	omitted	omitted		omitted	omitted
Work Week 'other' hours	0.041	0.05		omitted	omitted
Meet with friends many times per month	Reference Group				
Meet with friends_ Never	-0.775*	-1.85		omitted	omitted
Meet with friends_Less1m	-0.135	-0.96		-0.194	-0.70
Meet with friends_1m	0.177	.120		-0.093	-0.45
Meet with friends_1w	0.214**	2.01		0.064	0.33
Meet with friends_several per week	0.242**	2.06		0.069	0.30
Meet with friends_every day	0.538***	3.24		0.468	1.60
Age 26 to 35	Reference Group				
Age 17 to 25	-0.236	-1.54		-0.206	-0.82
Age 36 to 45	-0.182	-1.87		-0.040	-0.23
Age 46 to 55	-0.218	-1.99		-0.256	-1.27
Age 56 to 65	0.120	0.95		0.107	0.45
Age 66 to 75	0.319	1.29		0.602	0.68
Age 76 to 85	1.049	1.55		omitted	omitted
Age 86+	omitted	omitted		omitted	omitted

Table 4.2.3 cont: Results from the Binomial Probit Estimation of the Life Satisfaction Equations

_constant	-6.132***	-6.96		-6.766	1.663

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Unemployment Rate Interaction Term Term
Obs: 1433
Wald chi2 (46) = 186.66
Prob>chi2 = 0.000
Psuedo R^2 = 0.1049

Job Insecurity Interaction

Obs: 483
Wald chi2 (39) = 100.05
Prob>chi2 = 0.000
Psuedo R^2 = 0.1710

The binomial probit model is used to estimate the life satisfaction equation. A dummy dependent variable is generated representing high life satisfaction or any score of 8 or higher on the original life satisfaction scale. Marginal effects of the interaction terms are provided in the following table:

Table 4.2.4: Interaction Effects from the Probit Model

Interaction Term (1) $\boldsymbol{UR \times Sector}$		**Interaction Term (2)** $\boldsymbol{I \times Sector}$	
Interaction Effect	Z-Stat	Interaction Effect	Z-stat
0.010**	2.184	0.079*	1.729

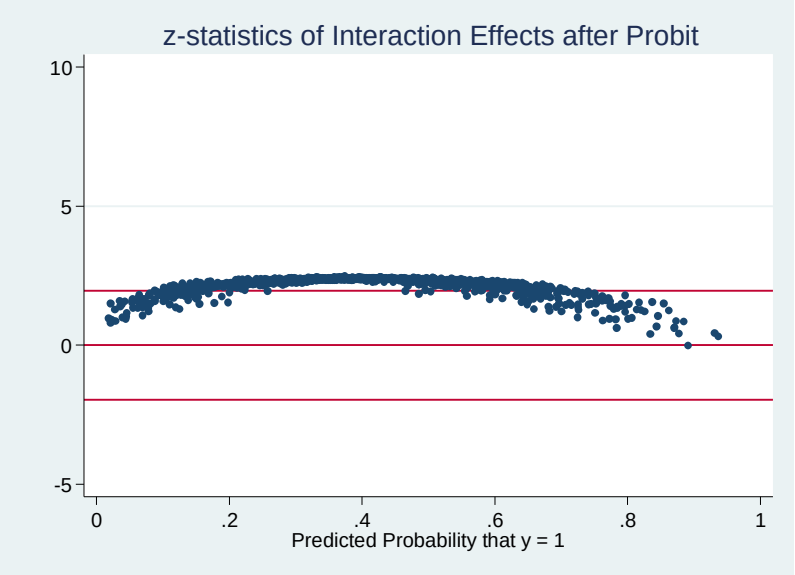
Source: Author's own

These interaction effects are estimated as is proposed in Norton *et al.* (2004). The following graphs display the significance of these interaction effects across observations. As Ai and Norton (2003) explain the sign and the significance of the interaction effects can change across observations which is why a linear calculation of the marginal effects is insufficient. The interaction effect for $UR \times Sector$ is

equal to .010 compared to the linear marginal effect of .004 displayed in Appendix D. The interaction effect for $I \times Sector$ is equal to .079 compared to the linear marginal effect of .037 displayed in Appendix D. The Z-statistics in Table 4.2.4 show that Interaction Term 1 consisting of regional unemployment rates is statistically significant at the 5% level where interaction term 2 consisting of job insecurity is statistically significant at the 10% level.

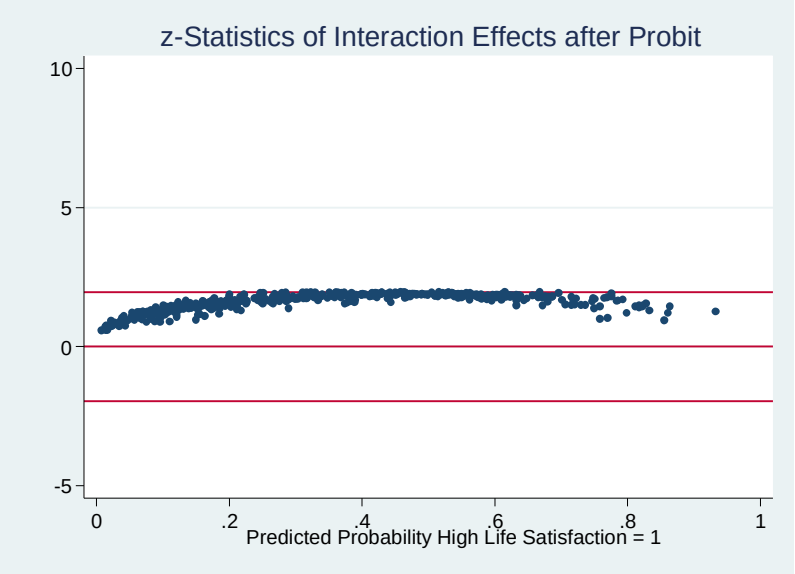
The Z-stats calculated across observations from the *–inteff* command are explained in the following figures.

Figure 4.2.5: Z-statistics of Interaction Effects from Probit Model: ($UR \times Sector$)



Source: Author's own

Figure 4.2.6: Z-Statistics of Interaction Effects from Probit Model: ($I \times Sector$)



Source: Author's own

According to the plots above the interaction effects of both interaction terms appear insignificant for some observations when calculated according to Norton *et al.* (2004). All of the observations represented by blue dots that reside below the red line at Z-statistic equal to 2 are insignificant.

4.2.4: Post-Estimation Diagnostics

The following table displays the results from the RESET test for the binomial probit estimation of the life satisfaction equation. The Chi^2 statistics from the model with Interaction Term 1 is statistically significant at the 10% level. Therefore, the null hypothesis is rejected of correct specification leading us to accept the alternative. Conversely, the Chi^2 statistic from the model with Interaction Term 2 cannot be rejected at any conventional statistical level indicating that this model is correctly specified. Based on these findings it is suggested that any further research into the well-being effects of economic insecurity use the indicator job insecurity.

Table 4.2.5: RESET Test of Model Specification – Binomial Probit Model

H_0: Model is correctly specified **H_1: Model is not correctly specified**		
	Interaction Term (1) $\boldsymbol{UR \times Sector}$	**Interaction Term (2)** $\boldsymbol{I \times Sector}$
Chi^2	3.08	0.15
RESET Test Prob > Chi^2	0.079	0.6964

Source: Author's own

Robust standard errors are used to account for heteroscedasticity

The Wald Test shows that the models are statistically significant and reject the null hypothesis at the 1% significance level that the coefficients of the variables are simultaneously equal to zero.

4.3: Conclusion

This chapter presents an empirical study of the effect of economic insecurity on the subjective well-being of public and private sector workers in Ireland. This is estimated by the ordered probit model and the binomial probit model. A post-estimation analysis is performed after the binomial probit model in order to obtain non-linear marginal effects of the interaction terms. Regional unemployment rates and perceived job insecurity are each used to measure economic insecurity. Subjective well-being is approximated by a life satisfaction indicator.

The ordered probit results show that regional unemployment significantly increases individual subjective well-being. This is contrary to the assumptions in Luechinger *et al.* (2010a) that regional unemployment rates act as a proxy for economic insecurity or distressful feelings caused by fears of potential job loss. One possible explanation lies in social comparison acting as a countervailing effect (Luechinger *et al.* 2010a). Implications of these findings suggest that unemployment rates do not decrease subjective well-being as anticipated in the context of Ireland. Therefore, policies that are be interested in well-being implications of increased insecurities during the economic recession should be wary of the use of regional unemployment rates.

The interaction term consisting of regional unemployment rates and public sector employment is positive and statistically significant indicating that regional unemployment increases life satisfaction to a greater extent for public sector workers than private sector workers. This finding is primarily driven by the inherent positive relationship between regional unemployment rates and life satisfaction and call for a need to select an alternative measure of economic insecurity.

When perceived job insecurity is included in the life satisfaction equation estimated via the ordered probit model a clear negative and statistically significant relationship appears. This is to be expected that increasing job insecurity would decrease life satisfaction among workers in Ireland. When job insecurity is interacted with the public sector dummy variable a positive and statistically significant relationship emerges. Luechinger *et al*. (2010a) state that a positive coefficient on this interaction term indicates that job insecurity depresses the well-being of public

sector workers to a lesser degree than private sector workers. This finding is consisting with that of Leuchinger *et al.* (2010a).

Using the post estimation command *–inteff* after the binomial probit model, the nonlinear marginal effects are very similar to the uncorrected coefficients produced by the standard ordered probit model. The corrected interaction effects calculated from the binomial probit model indicate that that interaction term including regional unemployment rates again displays a positive relationship. More importantly however the interaction effect on the interaction term including job insecurity is positive supporting the conclusion that economic insecurity adversely impacts the well-being of public sector workers to a lesser degree than their private sector counterparts. The RESET tests conducted after the binomial probit models show that only the model containing job insecurity is correctly specified. This suggests that further research into the effect of economic insecurity on the subjective well-being of Irish individuals should only use the job insecurity measure.

Implications of the findings of this research suggest that despite increasing insecurities across workers in Ireland, the institution of public sector employment was able to hedge some of the adverse well-being implications. From a policy perspective these findings highlight the need to not treat all workers uniformly in studies of well-being and that differentiation between public and private sector workers is essential.

Of the current subjective well-being literature only a minority look at economic insecurity in relation to the specific subjective well-being indicator life satisfaction (Luechinger *et al.,* 2010; Green 2011; Silla *et al.,* 2009). Job insecurity had shown to be a more reliable indicator of economic insecurity. The impact of job insecurity on subjective well-being is more commonly found in the job satisfaction literature which is addressed in the following chapter.

CHAPTER 5

THE EFFECT OF JOB INSECUIRTY ON THE JOB SATISFACTION OF PUBLIC AND PRIVATE SECTOR WORKERS

This chapter presents an empirical study of the impact of job insecurity on the job satisfaction of public and private sector workers in Ireland using data from the 2010 European Social Survey. Job satisfaction is an indicator of subjective well-being and believed to be an appropriate approximation of utility from work (Clark, 1997; Clark and Oswald 1996).

Similar to the literature, the relationship between job satisfaction and different socioeconomic variables such as age, gender, self-reported health status, and education is examined (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Clark, 1996, 1997; Clark and Oswald, 1996). Following Clark (1996, 1997, 1998), Sousa-Poza and Sousa-Poza (2000), and Wright and Davis (2003), job-specific variables are also included such as the number of hours worked, work establishment size, and union membership.

Job satisfaction equations are estimated separately for public and private sector workers in Ireland. The estimation of separate job satisfaction equations by a given subsample is also performed in Clark (1997) by gender and in McCausland *et al.* (2005) for workers on various pay schemes. The ordered probit model is used to estimate a basic job satisfaction equation consisting of mainly socioeconomic variables as well as an extended job satisfaction equation consisting of socioeconomic variables and a host of job-specific variables. The quantitative effects are explained using marginal effects which are the predicted probabilities of a job satisfaction outcome occurring (Clark, 1998). These can then be compared for the public sector and private sector subsample of workers.

5.1: Empirical Techniques

Similar to the techniques set out in Chapter 2 the job satisfaction equation is estimated by an ordered probit model in order to preserve the ordered nature of the dependent variable. Job satisfaction equations are estimated separately for public and

private sector subsamples of workers across a range of socioeconomic and job-specific variables.

5.1.1: Job Satisfaction Estimation

The job satisfaction equation is estimated for each individual *i* by the ordered probit model. The job satisfaction variable is categorical and ordered ranging from 0 "extremely dissatisfied" to 10 "extremely satisfied." The job satisfaction equation is illustrated as follows:

$$JS_{is} = \theta X_i + \delta I_i + \varepsilon_i \qquad \textbf{(5.1.2)}$$

where:

JS_i job satisfaction dependent variable

X_i matrix of explanatory variables

θ vector of parameters of explanatory variables

I_i perceived job insecurity explanatory variable

δ estimated parameter of job insecurity variable

ε_i stochastic error term

i individuals $i = 1,\ldots, N$

s sector employment of individual (1 = public sector ; 0 = private sector)

5.2: Ordered Probit Estimation of the Job Satisfaction Equation

Results from the examination of the effect of job insecurity on the job satisfaction of public and private sector workers in Ireland are presented in the following sections. Section 5.2.1 presents the results from the ordered probit estimation of a basic job satisfaction equation consisting primarily of individual socioeconomic variables. Estimated marginal effects are also included. Section 5.2.2

presents the results from the ordered probit estimation of an extended job satisfaction equation which includes a vector of job specific explanatory variables. Marginal effects for high satisfaction are included. Section 5.2.3 presents results from the post estimation diagnostics of the basic job satisfaction equation and the extended job satisfaction equation.

5.2.1: Results from the Estimation of the Basic Job Satisfaction Equation

This study estimates the effect of job insecurity on job satisfaction for public and private sector workers in Ireland. Job satisfaction equations are estimated separately for a public sector and private sector subsample of individuals. The variables used in the basic job satisfaction equation are those commonly found in job satisfaction literature (Blanchflower and Oswald, 1994, 1998, 2004; Clark, 1996, 1997; Clark and Oswald, 1996; Clark *et al.,* 1996; D'Addio *et al.,* 2007; Sousa-Poza and Sousa-Poza, 2000). Variables included in the basic job satisfaction equation consist of sociodemographic variables such as gender, education and self-reported health status along with general work variables such as hours of work each week and the type of employment contract. Table 5.2.1 displays the results of the ordered probit estimation of the job satisfaction equation for each subsample of sectoral workers and the whole sample of workers using data from the 2010 European Social Survey.

The interpretations of the coefficients are in terms of the underlying latent variable, the individual's 'true' well-being from work (Jones, 2007). In the ordered probit model a positive coefficient means that the corresponding variable increases the latent dependent variable and a negative coefficient decreases the latent dependent variable (Verbeek, 2002). The sign of the coefficient describes the qualitative effect of the explanatory variable and is limited to such (Jones, 2007; Maddala, 1983). The coefficient estimates in this paper should be interpreted as those with a positive coefficient increase an individual's self-reported job satisfaction while explanatory variables with a negative coefficient decrease an individual's self-reported job satisfaction. The corresponding Z-statistics are included which test the null hypothesis that the corresponding independent variable has no effect on individual job satisfaction ($H_0: \beta = 0$). The p-values are used for statistical inferences at conventional statistical levels of 1%, 5% and 10%.

Table 5.2.1. Results from the Basic Job Satisfaction Equation – Model 1

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Job Insecurity *(ordered scale 1-4)*	-0.242***	-5.98	-0.172**	-2.47	-0.306***	-5.64
Ln(income)	0.296**	2.92	0.547**	3.04	0.259**	2.01
Gender	-0.069	-0.78	0.112	0.69	-0.186*	-1.67
Unemployed Last 5 Years	-0.352**	-2.69	-0.105	-0.32	-0.372**	-2.51
Work Week Hours 20-29	Reference Group					
Work Week Hours 0-9	-0.559	-1.41	0.035	0.05	-0.282	-0.52
Work Week Hours 10-19	-0.105	-0.64	0.037	0.14	-0.266	-1.19
Work Week Hours 30-39	-.0294**	-2.41	-0.209	-1.06	-0.266	-1.62
Work Week Hours 40-49	-0.340**	-2.65	-0.383*	-1.67	-0.255	-1.56
Work Week Hours 50+	-0.169	-0.98	-0.025	-0.08	-0.106	-0.49
Education Tertiary	Reference Group					
Education Less Secondary	0.157	0.82	0.440	1.11	0.117	0.50
Education Lower Secondary	-0.058	-0.43	0.165	0.58	-0.081	-0.49
Education Upper Secondary	0.088	0.77	-0.008	-0.04	0.182	1.24
Education Non-tertiary	-0.041	-0.29	-0.177	-0.75	0.082	0.46
Education Post Grad	0.027	0.22	0.165	0.90	-0.116	-0.65

Table 5.2.1. cont: Results from the Basic Job Satisfaction Equation – Model 1

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Contract None	Reference Group					
Contract Unlimited	-0.327***	-3.40	-0.193	-1.13	-0.413***	-3.41
Contract Limited	0.099	0.68	0.466*	1.86	-0.195	-1.03
Establishment Size Under 10	Reference Group					
Establishment Size 10-24	0.154	1.33	0.518**	2.35	-0.044	-0.31
Establishment Size 25-99	0.164	1.39	0.523**	2.37	0.001	0.01
Establishment Size 100-499	0.039	.126	0.080	0.39	0.084	0.49
Establishment Size 500+	0.301**	2.04	0.413*	1.85	0.306	1.40
Work Week Hrs 20-29	Reference Group					
Work Week Hrs 0-9	-0.559	-1.41	0.035	0.05	-0.282	.052
Work Week Hrs 10-19	-0.105	-0.64	0.037	0.14	-0.269	-1.19
Work Week Hrs 30-39	-0.294**	-2.41	-0.209	-1.06	-0.266	-1.62
Work Week Hrs 40-49	-0.340**	-2.65	-0.382	-1.67	-0.255	-1.56
Work Week Hrs 50+	-0.169	-0.98	-0.025	-0.08	-0.106	-0.49
Marital Status Married	Reference Group					
Marital Status Civil Union	-0.241	-0.33	Omitted	Omitted	-0.386	-0.52
Marital Status Separated	0.198	0.93	0.123	0.38	0.210	0.70
Marital Status Divorced	0.013	0.07	-0.080	-0.25	-0.079	-0.30

Table 5.2.1. cont: Results from the Basic Job Satisfaction Equation – Model 1

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Marital Status Widowed	0.562	1.90	0.783*	1.90	0.166	0.37
Marital Status Never	0.135	1.38	0.045	.025	0.170	1.38
Marital Status Annulled	-0.309	-0.42	Omitted	Omitted	-0.356	-0.47
Health Status Good	Reference Group					
Health Status Fair	-0.197	-1.43	-0.226	-0.87	-0.109	-0.65
Health Status Bad	-0.468	-1.36	0.238	-0.45	-0.905*	-1.88
Health Status Very Bad	-1.217	-1.19	Omitted	Omitted	-1.457	-1.41
Age 20-29	Reference Group					
Age 15-19	0.232	0.39	Omitted	Omitted	-0.204	-0.04
Age 30-39	0.151	1.30	0.065	0.27	0.228	1.64
Age 40-49	0.181	1.36	0.312	1.22	0.125	0.77
Age 50-59	0.370**	2.45	0.640**	2.26	0.145	0.76
Age 60-69	0.540**	2.45	0.951**	2.68	0.214	0.69
Age 70-79	1.595*	1.71	0.814	0.63	4.942	0.05
Age 80-89	1.076	1.04	Omitted	Omitted	0.823	0.79
Union No	Reference Group					
Union Currently	-0.029	-0.30	-0.165	-0.96	0.068	0.45
Union Previously	0.031	0.21	-0.221	-0.75	0.157	0.82

Table 5.2.1. cont: Results from the Basic Job Satisfaction Equation – Model 1

cut_1	-0.489		2.643		-1.356	
cut_2	-0.169		3.037		-1.042	
cut_3	0.326		3.320		-.407	
cut_4	0.804		3.822		0.089	
cut_5	1.359		4.310		0.696	
cut_6	1.738		4.698		1.088	
cut_7	2.211		5.296		1.524	
cut_8	2.935		6.069		2.257	
cut_9	3.546		6.807		2.814	

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level. Robust standard errors in parentheses.

Whole Sample	**Public Sector Sample**	**Private Sector Sample**
LR $\chi^2(38) = 130.53$	LR $\chi^2(33) = 69.20$	LR $\chi^2(38) = 95.29$
Prob > chi2 = 0.000	Prob > chi2 = 0.000	Prob > chi2 = 0.000
Obs = 713	Obs = 264	Obs = 449
Psuedo $R^2 = 0.046$	Psuedo $R^2 = 0.070$	Psuedo $R^2 = 0.053$

Calculated marginal effects are displayed in Table 5.2.2. These are calculated for the probability of reporting a minimum of an 8 on the job satisfaction scale.

Table 5.2.2: Marginal Effects from the Basic Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx (8)	Z-stat	dy/dx (8)	Z-stat	dy/dx (8)	Z-stat
Job Insecurity *(ordered scale 1-4)*	-0.017***	-4.08	-0.003	-0.74	-0.030*	-1.87
Ln(income)	0.021**	2.59	0.009	0.75	0.025	1.41
Gender	-0.005	-0.76	0.001	0.45	-0.018	-1.28
Unemployed Last 5 Years	-0.035**	-2.06	-0.003	-0.22	-0.045*	-1.75
Work Week Hours 20-29	Reference Group					
Work Week Hours 0-9	-0.068	-1.08	0.000	0.09	-0.035	-0.43
Work Week Hours 10-19	-0.008	-0.56	0.000	0.21	-0.032	-0.96
Work Week Hours 30-39	-0.024**	-2.02	-0.005	-0.66	-0.029	-1.26
Work Week Hours 40-49	-0.028**	-2.18	-0.017	-0.94	-0.027	-1.23
Work Week Hours 50+	-0.014	-0.82	-0.000	-0.07	-0.011	-0.45
Education Tertiary	Reference Group					
Education Less Secondary	0.008	1.21	-0.018	-0.46	0.010	0.55
Education Lower Secondary	-0.004	-0.40	-0.001	-0.07	-0.008	-0.46
Education Upper Secondary	0.006	0.84	-0.000	-0.04	0.016	1.09
Education Non-tertiary	-0.003	-0.28	-0.006	-0.47	0.007	0.48
Education Post Grad	0.002	0.23	0.001	0.18	-0.012	-0.58

Table 5.2.2: cont: Marginal Effects of the Basic Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx (8)	Z-stat	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat
Contract None	Reference Group					
Contract Unlimited	-0.019***	-3.18	-0.001	-0.36	-0.036	-1.57
Contract Limited	0.006	0.81	-0.016	-0.70	-0.022	-0.86
Establishment Size Under 10	Reference Group					
Establishment Size 10-24	0.009	1.59	-0.016	-0.83	-0.004	-0.30
Establishment Size 25-99	0.009*	1.68	-0.017	-0.85	0.000	0.01
Establishment Size 100-499	0.003	0.32	0.001	0.43	0.008	0.51
Establishment Size 500+	0.012**	3.12	-0.008	-0.56	0.020	1.11
Work Week Hrs 20-29	Reference Group					
Work Week Hrs 0-9	-0.068	-1.08	0.000	0.09	-0.035	0.43
Work Week Hrs 10-19	-0.008	-0.56	0.000	0.21	-0.032	-0.96
Work Week Hrs 30-39	-0.024**	-2.02	-0.005	-0.66	-0.029	-1.26
Work Week Hrs 40-49	-0.028**	-2.18	-0.017	-0.94	-0.027	-1.23
Work Week Hrs 50+	-0.014	-0.82	-0.000	-0.07	-0.011	-0.45
Marital Status Married	Reference Group					
Marital Status Civil Union	-0.023	-0.26	omitted	omitted	-0.051	-0.43
Marital Status Separated	0.009*	1.74	0.000	0.01	0.016	0.83
Marital Status Divorced	0.001	0.07	-0.002	0.18	-0.008	-0.28

Table 5.2.2: cont: Marginal Effects of the Basic Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat
Marital Status Widowed	-0.001	-0.03	-0.062	-0.95	0.013	0.46
Marital Status Never	0.009	1.40	0.001	0.27	0.016	1.14
Marital Status Annulled	-0.032	-0.33	omitted	omitted	-0.046	-0.40
Health Status Good	Reference Group					
Health Status Fair	-0.017	-1.18	-0.010	-0.52	-0.018	-0.58
Health Status Bad	-0.054	-1.03	-0.011	-0.27	-0.137*	-1.73
Health Status Very Bad	-0.174	-1.21	omitted	omitted	-0.210**	-2.00
Age 20-29	Reference Group					
Age 15-19	0.009	1.48	omitted	omitted	-0.002	-0.04
Age 30-39	0.009	1.42	0.001	0.34	0.020	1.26
Age 40-49	0.011	1.60	-0.001	-0.10	0.011	0.76
Age 50-59	0.014	3.10**	-0.022	-0.84	0.012	0.78
Age 60-69	0.003	0.21	-0.081	-1.38	0.016	0.83
Age 70-79	-0.151	-1.04	-0.071	-0.33	-0.265***	-11.73
Age 80-89	-0.067	-0.40	omitted	omitted	-0.005	-0.04

Table 5.2.2: cont: Marginal Effects of the Basic Job Satisfaction Equation – Model 1

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat
Union No	Reference Group					
Union Currently	-0.002	-0.30	-0.001	-0.43	0.006	0.46
Union Previously	0.002	0.22	-0.009	-0.46	0.013	0.85

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Whole Sample $y = \Pr(\text{jobsatisfaction} == 8)(\text{predict}) = .273$

Public Sector Sample $y = \Pr(\text{jobsatisfaction} == 8)(\text{predict}) = .301$

Private Sector Sample $y = \Pr(\text{jobsatisfaction} == 8)(\text{predict}) = .266$

The coefficient of the job insecurity variable is negative and statistically significant for all samples of workers. As individuals move along the job insecurity scale, from very secure to quite secure to a little secure to not at all secure, self-reported job satisfaction declines. The marginal effects in Table 5.2.2 show that as job insecurity increases the probability of reporting an 8 on the job satisfaction scale decreases by 1.7% for the whole sample and 3.0% for the private sector subsample. The marginal effects coefficient is insignificant for the public sector sample. Marginal effects are calculated for job satisfaction outcomes equal to 9 and 10 and included in Appendix E. In general greater well-being differences exist among public and private sector workers among these higher levels of job satisfaction. As job insecurity increases, the probability of reporting a 9 on the job satisfaction scale decreases by 2.8% for public sector workers and 4.0% for private sector workers. Similar magnitudes are reported for public and private sector workers for the probability of reporting a 10 on the job satisfaction scale. This finding suggests that

job insecurity negatively impacts the job satisfaction of private sector workers to a larger degree.

Blanchflower and Oswald (1999) support these findings in their study of public sector employment and job satisfaction. They attribute higher job satisfaction scores among public sector workers to the propensity of higher job security in public sector occupations. Job security is well documented in the literature as being a positive contributor to job satisfaction (Blanchflower and Oswald, 1999; Clark, 1998; Gazioglu and Tansel, 2006; Sousa-Poza and Sousa-Poza, 2000; Poliakas and Theodossiou, 2010) therefore it would be expected that any degree of job insecurity would yield negative coefficients. Artz and Kaya (2014) similarly find a negative relationship between job satisfaction and job insecurity for their whole sample of workers, private sector workers and public sector union workers in the United States.

The coefficients on income appear positive and statistically significant for all samples of workers in Ireland. The marginal effects in Table 5.2.2 show that as income increases the probability of reporting an 8 on the job satisfaction scale increases by 2.1% for the whole sample. The marginal effects coefficients are insignificant for the public and private sector subsamples. Similar to the job insecurity variable, statistically significant marginal effects emerge in the higher job satisfaction scores 9 and 10. The marginal effects show that the probability of reporting a 9 on the job satisfaction scale increases by 8.9% as income increases for public sector workers and 3.4% for private sector workers. Similar differences are found among public and private sector works when the marginal effects are calculated for a job satisfaction outcome equal to 10. The general positive association between income and job satisfaction is supported by the classical economics view of utility from work outlined in Clark and Oswald (1996). Despite being a pivotal component of traditional utility from work functions, income has been documented in the literature as having at best a weak correlation to overall job satisfaction (Clark, 1996; and Clark and Oswald, 1996).

The coefficients on the variable gender are not statistically significant for the whole sample and the public sector subsample of workers. The lack of significance is not surprising given inconsistent findings across studies (Spector, 1997). Finding no gender differences in job satisfaction is supported by Witt and Nye (1992). However,

the coefficient on the variable gender is negative and statistically significant for private sector workers indicating men on average report lower levels of job satisfaction than women. This finding is supported by Clark (1997) who shows women on average report higher levels of job satisfaction despite worse working conditions.

Becoming personally unemployed within the past five years is a significant determinant of lower job satisfaction for the whole sample and the private sector subsample of workers in Ireland. Being personally unemployed within the past five years significantly reduces the probability of reporting an 8 on the job satisfaction scale by 3.5% for the whole sample and 4.5% for the private sector subsample. Becoming personally unemployed has been shown to have long lasting consequences on individual subjective well-being (Clark and Oswald, 1994). Given that jobs in the private sector have been found to be more volatile and individual's more subject to economic insecurity (Luechinger *et al.,* 2010a) the lasting subjective effects of personal unemployment would be expected

The variable hours of work per week displays negative coefficients for all samples of workers albeit only significant for the whole sample. For the whole sample of workers those who work either 30-39 hours per week or 40-49 hours per week both report lower job satisfaction scores than the reference group, those who work 20-29 hours per week. The marginal effects suggest that for individuals who work 30-39 hours per week or 40-49 hours per week, the probability of reporting an 8 on the job satisfaction scale declines by 2.4% and 2.8% respectively. These findings are consistent with the classical view of utility from work and the well-documented adverse impact hours of work has on job satisfaction (Clark, 1996; Clark, 1997; Clark and Oswald, 1996; D'Addio *et al.,* 2003; Sousa-Poza and Sousa-Poza),

Education does not appear as a significant determinant of job satisfaction for any sample of workers. Artz and Kaya (2014) find similar findings where education is not significant for their whole sample of workers and for their public sector subsample of workers. Clark and Oswald (1996) conclude that any observed association among education is the product of increasing expectations and that it is the rate of change in education that matters not the absolute level acquired. Due to

the ambiguous causal direction between expectations and education and their overall impact on job satisfaction (Clark and Oswald, 1996) the lack of an observed relationship is not surprising.

The results show that an unlimited contract is negatively associated with the job satisfaction of private sector workers whereas limited contracts increase the job satisfaction of public sector workers. Artz and Kaya (2014) use job tenure instead of contract type to represent employment security and find that tenure decreases the job satisfaction of public sector workers which is a similar finding to that of this study.

The size of the work establishment is a significant determinant of job satisfaction for public sector workers only. This indicates that those who have 10-24, 25-99 and 500+ co-workers report greater job satisfaction than those who only have 10 or less co-workers. The variable establishment size 100-499 is not a significant determinant of job satisfaction for any sample of workers. None of the marginal effects coefficients are significant for public sector workers when predicting the probability of a job satisfaction outcome equal to 8. The literature suggests that job satisfaction declines in increasing establishment size (Frey and Benz, 2003; Clark and Oswald, 1996). However (Clark, 1996) found that the benefit of working in a small establishment is only valid for individuals who highly value intrinsic rewards and does not translate across all samples.

Marital status has been well-documented in both subjective well-being and job satisfaction literature (Clark, 1996; Clark, 2007; Helliwell, 2003; Blanchflower and Oswald, 2004). In these studies marital status is included as a control variable in order to isolate the intended relationship of another explanatory variable. In this study only one coefficient on all marital status variables is significant and it is that of being widowed. Moreover, this coefficient is only significant for public sector workers. The general lack of significance shows that other variables are more important for determining job satisfaction than marital status.

The coefficients on the self-reported health status variables are negative however largely insignificant across samples of workers. Private sector workers who report their health as being bad report lower job satisfaction scores than those who report their health as being good. This coefficient is significant at the 10% level.

Poor physical and mental health in general corresponds to lower job satisfaction scores (Garner and Oswald, 2001; Kaiser, 2002).

Age is a variable that has been acknowledged as being a necessary regressor in job satisfaction equations but therein ends the consensus as to the nature of this relationship. For private sector workers, age is not a significant determinant of job satisfaction. For the whole sample and for public sector workers, respondents after the age of 50 tend to report higher job satisfaction scores than the reference group of those aged 20 to 29. A distinct U-shaped relationship between job satisfaction and age is documented in the literature (Blanchflower and Oswald, 2004; Clark, 1996; Clark *et al.,* 1996) where after the age of 36 job satisfaction tends to increase (Clark *et al.,* 1996).

The coefficients on all union membership variables are insignificant for all samples of workers. Early economic literature focused on the effect of union membership on job satisfaction where a general negative relationship was observed (Borjas, 1977; Freeman, 1978). Artz and Kaya (2014) similarly find union membership to be insignificant for their whole sample of individuals. Gardner and Oswald (2001) find that a general decline in the job satisfaction of public sector workers is irrespective of union membership.

5.2.2: Results from the Estimation of the Extended Job Satisfaction Equation

This study estimates the effect of job insecurity on job satisfaction for public and private sector workers in Ireland. This is identified using the ordered probit model to estimate extended job satisfaction equations for public and private sector workers. Independent variables consisting of job-specific characteristics and individual work-values are included. Additionally, these extended job satisfaction equations include employment industry variables and regional dummy variables.

Job characteristics that can be defined as extrinsic or intrinsic (D'Addio *et al.,* 2007). Extrinsic job characteristics pertain to the material aspects of work (Lyons *et al.,* 2006). The basic job satisfaction equation in the previous section included variables such as financial reward (income), working time, and job security. This is expanded to include work/life balance and opportunities for promotion/advancement

as classified by D'Addio *et al.* (2007). Intrinsic job characteristics pertain to the inherent psychological satisfaction of working (Lyons *et al.*, 2006). The inclusion of intrinsic job characteristics in the extended job satisfaction equation such as degree of hard work, job related risk to health, variety in tasks performed, and the requirement to learn new things, are some of the variables that differentiate the basic job satisfaction equation to the extended job satisfaction equation. The results from the ordered probit estimation of the extended job satisfaction equation are presented in Table 5.2.3. According to Luechinger *et al.* (2010a) high satisfaction is defined as any response equal to 8 or greater. The marginal effects are calculated for the probability of reporting an 8 on the job satisfaction scale and reported in Table 5.2.4.

Table 5.2.3: Results from Extended Job Satisfaction Equation – Model 2

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Job Insecurity *(ordered scale 1-4)*	-0.236**	-2.82	-0.125	-1.50	-0.149**	-2.41
Ln(income)	0.223*	1.88	0.450**	2.17	0.195	1.24
Gender	0.002	0.02	-0.017	-0.09	-0.004	-0.03
Unemployed Last 5 Years	-0.352**	-2.19	-0.331	-0.94	-0.348*	-1.83
Work Week Hours 20-29	Reference Group					
Work Week Hours 0-9	-0.481	-1.52	0.400	0.67	-0.215	-0.59
Work Week Hours 10-19	-0.198	-1.03	0.034	0.11	-0.532*	-1.90
Work Week Hours 30-39	-0.186	-1.42	-0.020	-0.09	-0.285	-1.53
Work Week Hours 40-49	-0.317**	-2.30	-0.151	-0.55	-0.419**	-2.28
Work Week Hours 50+	0.006	0.03	0.650*	1.89	-0.075	-0.31
Education Tertiary	Reference Group					
Education Less Secondary	0.653**	2.61	1.047	1.56	0.565**	1.99
Education Lower Secondary	0.304*	1.79	0.750	1.97	0.213	1.02
Education Upper Secondary	0.147	1.13	0.145	0.61	0.303*	1.81
Education Non-tertiary	0.010	0.07	0.010	0.04	0.103	0.60
Education Post Grad	-0.062	-0.49	0.076	0.36	-0.214	-1.14

Table 5.2.3 cont.: Results from Extended Job Satisfaction Equation – Model 2

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Contract None	Reference Group					
Contract Unlimited	-0.378***	-3.41	0.025	0.12	-0.557***	-3.84
Contract Limited	-0.149	-0.94	0.608**	2.14	-0.632***	-3.13
Establishment Size Under 10	Reference Group					
Establishment Size 10-24	0.157	1.27	0.463*	1.66	0.021	0.14
Establishment Size 25-99	0.138	1.09	0.409	1.54	0.049	0.30
Establishment Size 100-499	0.107	0.78	0.182	0.69	0.125	0.67
Establishment Size 500+	0.232	1.38	0.068	0.25	0.281	1.10
Work Week Hrs 20-29	Reference Group					
Work Week Hrs 0-9	-0.481	-1.52	0.400	0.67	-0.215	-0.59
Work Week Hrs 10-19	-0.198	-1.03	0.034	0.11	-0.532*	-1.90
Work Week Hrs 30-39	-0.186	-1.42	-0.020	-0.09	-0.284	-1.53
Work Week Hrs 40-49	-0.317**	-2.30	-0.151	-0.55	-0.419**	-2.28
Work Week Hrs 50+	0.006	0.03	0.650*	1.89	-0.075	-0.31
Marital Status Married	Reference Group					
Marital Status Civil Union	-0.218	-0.90	Omitted	Omitted	-0.646**	-2.22
Marital Status Separated	0.127	0.54	0.262	0.55	0.197	0.70
Marital Status Divorced	0.055	0.30	-0.224	-0.64	0.019	0.07
Marital Status Widowed	0.213	0.50	0.481	0.94	-0.505	-0.68

Table 5.2.3 cont.: Results from Extended Job Satisfaction Equation – Model 2

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Marital Status Never	0.168*	1.69	0.076	0.32	0.141	1.14
Marital Status Annulled	-0.702	-1.46	Omitted	Omitted	-1.320*	-1.66
Health Status Good	Reference Group					
Health Status Fair	0.030	0.19	-0.208	-0.66	0.026	0.13
Health Status Bad	-0.277	-0.63	1.353**	2.35	-1.147*	-1.83
Health Status Very Bad	-0.695**	-2.40	Omitted	Omitted	-0.696*	-1.80
Age 20-29	Reference Group					
Age 15-19	0.319	0.75	Omitted	Omitted	0.175	0.32
Age 30-39	0.123	1.04	0.149	0.59	0.246*	1.68
Age 40-49	0.033	0.24	0.111	0.39	-0.001	-0.00
Age 50-59	0.224	1.43	0.620*	1.82	-0.003	-0.02
Age 60-69	0.342	1.40	0.414	1.03	0.146	0.37
Age 70-79	0.545	1.24	0.380	0.43	2.799***	4.20
Age 80-89	0.612*	1.86	Omitted	Omitted	0.486	1.16
Union No	Reference Group					
Union Currently	-0.124	-1.18	-0.152	-0.80	-0.023	-0.15
Union Previously	-0.021	-0.12	-0.235	-0.61	0.207	1.01
Job Characteristics						
Manage Other Workers	0.138	1.36	0.006	0.04	0.279**	2.03

Table 5.2.3 cont.: Results from Extended Job Satisfaction Equation – Model 2

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Work Advancements _Agree	Reference Group					
Work Advancements _Strongly Agree	0.082	0.77	0.252	1.35	0.016	0.11
Work Advancements _Neither	-0.007	-0.07	0.093	0.47	-0.111	0.84
Work Advancements _Disagree	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Work Advancements _Strongly Disagree	-0.271	-1.51	-0.441	-1.30	-0.290	-1.27
Hard Work_ Agree	Reference Group					
Hard Work_ Strongly Agree	0.083	0.85	0.152	0.81	-0.046	-0.36
Hard Work_ Neither	0.207	1.59	0.138	0.51	0.298*	1.78
Hard Work_ Disagree	0.051	0.21	0.183	0.38	0.112	0.41
Hard Work_ Strongly Disagree	-1.070**	-2.91	-1.937***	-4.17	-0.256	-0.40
Risk Health_ Not True	Reference Group					
Risky Health_ Little True	-0.326**	-2.88	-0.168	-0.89	-0.431**	-2.72
Risky Health_ Quite True	-0.129	-0.73	-0.178	-0.54	-0.011	-0.05
Risky Health_ Very True	-0.081	-0.30	-0.453	-1.21	0.044	0.11

Table 5.2.3 cont.: Results from Extended Job Satisfaction Equation – Model 2

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Help from Co-Workers _ Not True	Reference Group					
Help from Co-Workers _ Little True	-0.077	-0.30	0.130	0.32	-0.064	-0.17
Help from Co-Workers _ Quite True	0.017	0.07	0.195	0.48	0.071	0.21
Help from Co-Workers _ Very True	0.309	1.26	0.606	1.49	0.247	0.72
Income Depend on Effort_ Not True	Reference Group					
Income Depend on Effort _ Little True	-0.106	-0.81	-0.050	-0.15	-0.212	-1.40
Income Depend on Effort_ Quite True	-0.112	-0.73	0.221	0.61	-0.281	-1.40
Income Depend on Effort_ Very True	-0.205	-0.87	0.614	1.40	-0.506*	-1.81
Learn New Things Required_ Not True	Reference Group					
Learn New Things Required_ Little True	0.142	0.92	0.483	1.42	0.212	1.13
Learn New Things Required_ Quite True	-0.086	-0.52	0.190	0.54	-0.178	-0.90
Learn New Things Required_ Very True	0.139	0.73	0.309	0.89	0.131	0.53
Variety in Tasks_ Not True	Reference Group					
Variety in Tasks_ Little True	-0.056	-0.28	0.124	0.41	-0.095	-0.35

Table 5.2.3 cont.: Results from Extended Job Satisfaction Equation – Model 2

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	Coefficient	Z-stat	Coefficient	Z-stat	Coefficient	Z-stat
Variety in Tasks_ Quite True	0.268	1.25	0.364	1.06	0.370	1.30
Variety in Tasks_ Very True	0.385*	1.68	0.529	1.50	0.514	1.51
Balance Family and Other_0	-1.680***	-3.88	-0.174	-0.26	-2.614***	-3.88
Balance Family and Other _1	-3.422***	-4.87	-4.301***	-6.53	Omitted	Omitted
Balance Family and Other _2	-0.621	-1.25	-0.935	-1.12	-0.548	-0.85
Balance Family and Other _3	-1.751***	-4.75	-2.537***	-4.35	-1.608***	-3.20
Balance Family and Other _4	-2.200***	-6.80	-2.495***	-4.95	-2.155***	-4.50
Balance Family and Other _5	-1.882***	-6.55	-2.019***	-4.78	-1.909***	-4.38
Balance Family and Other _6	-1.546***	-5.25	-1.758***	-3.76	-1.668***	-3.81
Balance Family and Other _7	-1.326***	-4.92	-1.015**	-2.60	-1.585***	-3.90
Balance Family and Other _8	-1.029***	-3.84	-0.770**	-2.00	-1.108**	-2.69
Balance Family and Other _9	-0.738**	-2.71	-0.581	-1.40	-0.683	-1.60
Industry Dummies	✓	✓	✓	✓	✓	✓
Region Dummies	✓	✓	✓	✓	✓	✓
cut_1	-2.423		.299		-3.469	
cut_2	-2.046		.786		-3.032	
cut_3	-1.461		1.186		-2.276	
cut_4	-.906		1.914		-1.703	
cut_5	-.226		2.645		-.956	
cut_6	.258		3.205		-.451	
cut_7	.858		4.012		-.129	

Table 5.2.3 cont.: Results from Extended Job Satisfaction Equation – Model 2

cut_8	1.760		5.031		1.086	
cut_9	2.515		5.971		1.798	

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Whole Sample	**Public Sector**	**Private Sector**
LR $\chi^2(94) = 426.14$	LR $\chi^2(85) = 211.37$	LR $\chi^2(93) = 306.31$
Prob > chi2 = 0.000	Prob > chi2 = 0.000	Prob > chi2 = 0.000
Obs = 713	Obs = 264	Obs = 449
Psuedo R^2 = 0.1509	Psuedo R^2 = 0.2122	Psuedo R^2 = 0.1694

Table 5.2.4: Marginal Effects from the Extended Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat
Job Insecurity *(ordered scale 1-4)*	-0.013	-2.56**	-0.004	-0.22	-0.022	-1.52
Ln(income)	0.022	1.88	0.014	0.22	0.029	1.10
Gender	0.000	0.02	-0.001	-0.08	-0.001	-0.03
Unemployed Last 5 Years	-0.047***	-2.00	-0.028	-0.40	-0.060	-1.62
Work Week Hours 20-29	Reference Group					
Work Week Hours 0-9	-0.074	-0.90	-0.014	-0.14	-0.037	-0.32
Work Week Hours 10-19	-0.024	-0.97	0.001	0.11	-0.100*	-1.73
Work Week Hours 30-39	-0.020	-1.31	-0.001	-0.08	-0.046	-1.28
Work Week Hours 40-49	-0.037**	-2.02	-0.007	-0.25	-0.067*	-1.66
Work Week Hours 50+	0.006	0.03	-0.040	-0.37	-0.012	-0.30
Education Tertiary	Reference Group					
Education Less Secondary	0.008	0.39	-0.121	-0.75	0.045	0.87
Education Lower Secondary	0.021***	2.96	-0.053	-0.45	0.028	1.04
Education Upper Secondary	0.013	1.28	0.003	0.12	0.039	1.31
Education Non-tertiary	0.001	0.06	0.000	0.04	0.014	0.54
Education Post Grad	-0.007	-0.45	0.002	0.16	-0.036	-0.94

Table 5.2.4 cont: Marginal Effects from the Extended Job Satisfaction

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat
Contract None	Reference Group					
Contract Unlimited	-0.032	-3.46***	0.001	0.10	-0.073	-1.62
Contract Limited	-0.017	-0.84	-0.028	-0.29	-0.119**	-2.30
Establishment Size Under 10	Reference Group					
Establishment Size 10-24	0.014	1.46	-0.009	-0.13	0.003	0.13
Establishment Size 25-99	0.012	1.20	-0.006	-0.09	0.007	0.30
Establishment Size 100-499	0.010	0.86	0.003	0.11	0.017	0.64
Establishment Size 500+	0.017**	2.02	0.002	0.15	0.033	1.05
Work Week Hrs 20-29	Reference Group					
Work Week Hrs 0-9	-0.074	-0.90	-0.014	-0.14	-0.037	-0.32
Work Week Hrs 10-19	-0.024	-0.97	0.001	0.11	-0.010*	-1.73
Work Week Hrs 30-39	-0.020	-1.31	-0.001	-0.08	-0.046	-1.28
Work Week Hrs 40-49	-0.037**	-2.02	-0.007	-0.25	-0.067*	-1.66
Work Week Hrs 50+	0.001	0.03	-0.040	-0.37	-0.012	-0.30
Marital Status Married	Reference Group					
Marital Status Civil Union	-0.028	-0.24	omitted	omitted	-0.127	-0.74
Marital Status Separated	0.011	0.71	-0.002	-0.04	0.025	0.68
Marital Status Divorced	0.005	0.29	-0.015	-0.30	0.003	0.07
Marital Status Widowed	0.015	1.17	-0.021	-0.23	-0.096	-0.87

Table 5.2.4 cont: Marginal Effects from the Extended Job Satisfaction

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat
Marital Status Never	0.016	1.63	0.002	0.17	0.021	0.94
Marital Status Annulled	-0.118	-0.75	omitted	omitted	-0.249**	-2.18
Health Status Good	Reference Group					
Health Status Fair	0.003	0.21	-0.013	-0.32	0.004	0.14
Health Status Bad	-0.037	-0.60	-0.193	-1.03	-0.223**	-2.55
Health Status Very Bad	-0.117	-0.54	omitted	omitted	-0.137	-0.59
Age 20-29	Reference Group					
Age 15-19	0.017***	3.24	omitted	omitted	0.022	0.32
Age 30-39	0.012	1.06	0.003	0.14	0.034	1.25
Age 40-49	0.003	0.23	0.003	0.16	-0.000	-0.00
Age 50-59	.0018*	1.81	-0.017	-0.18	-0.001	-0.02
Age 60-69	0.019***	3.47	-0.012	-0.16	0.019	0.47
Age 70-79	0.010	0.12	-0.012	-0.08	-0.297	-0.03
Age 80-89	0.004	0.04	omitted	omitted	0.039	0.87
Union No	Reference Group					
Union Currently	-0.013	-1.05	-0.004	-0.16	-0.003	-0.14
Union Previously	-0.002	-0.12	-0.016	-0.32	0.026	0.95
Job Characteristics						
Manage Other Workers	0.013	1.42	0.000	0.03	0.037	1.34

Table 5.2.4 cont: Marginal Effects from the Extended Job Satisfaction

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat	dy/dx(8)	Z-stat
Work Advancements _Agree	Reference Group					
Work Advancements _Strongly Agree	0.008	0.76	0.006	0.15	0.002	0.11
Work Advancements _Neither	-0.001	-0.06	0.003	0.17	-0.017	-0.70
Work Advancements _Disagree	omitted	omitted	omitted	omitted	omitted	omitted
Work Advancements _Strongly Disagree	-0.035	-1.43	-0.041	-0.54	-0.050	-1.17
Hard Work_ Agree	Reference Group					
Hard Work_ Strongly Agree	0.008	0.85	0.004	0.17	-0.007	-0.33
Hard Work_ Neither	0.016**	2.02	0.002	0.10	0.036	1.23
Hard Work_ Disagree	0.005	0.25	0.001	0.02	0.015	0.42
Hard Work_ Strongly Disagree	-0.191	-1.35	-0.329**	-2.43	-0.045	-0.19
Risk Health_ Not True	Reference Group					
Risky Health_ Little True	-0.039**	-2.48	-0.008	-0.29	-0.072*	-1.92
Risky Health_ Quite True	-0.015	-0.77	-0.011	-0.29	-0.002	-0.06
Risky Health_ Very True	-0.010	-0.32	-0.044	-0.53	0.006	0.13

Table 5.2.4 cont: Marginal Effects from the Extended Job Satisfaction

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx	Z-stat	dy/dx	Z-stat	dy/dx	Z-stat
Help from Co-Workers _ Not True	Reference Group					
Help from Co-Workers _ Little True	-0.008	-0.36	0.003	0.13	-0.010	-0.23
Help from Co-Workers _ Quite True	0.002	0.09	0.004	0.13	0.010	0.26
Help from Co-Workers _ Very True	0.028*	1.66	0.013	0.14	0.035	0.84
Income Depend on Effort_ Not True	Reference Group					
Income Depend on Effort _ Little True	-0.012	-0.78	-0.002	-0.13	-0.034	-1.15
Income Depend on Effort_ Quite True	-0.013	-0.70	-0.000	-0.00	-0.047	-1.29
Income Depend on Effort_ Very True	-0.026	-0.75	-0.041	-0.29	-0.095	-1.55
Learn New Things Required_ Not True	Reference Group					
Learn New Things Required_ Little True	0.013	1.01	-0.004	-0.06	0.029	1.00
Learn New Things Required_ Quite True	-0.010	-0.49	0.004	0.12	-0.028	-0.76
Learn New Things Required_ Very True	0.013	0.78	0.007	0.14	0.018	0.53

Table 5.2.4 cont: Marginal Effects from the Extended Job Satisfaction

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx	Z-stat	dy/dx	Z-stat	dy/dx	Z-stat
Variety in Tasks_ Not True	Reference Group					
Variety in Tasks_ Little True	-0.006	-0.31	0.003	0.15	-0.014	-0.40
Variety in Tasks_ Quite True	0.022	1.69	0.003	0.04	0.047	1.19
Variety in Tasks_ Very True	0.029**	2.35	0.004	0.05	0.058	1.21
Balance Family and Other_10	Reference Group					
Balance Family and Other_0	-0.278***	-5.85	-0.011	-0.16	-0.328***	-6.92
Balance Family and Other _1	-0.332***	-15.87	-0.389***	-9.81	omitted	omitted
Balance Family and Other _2	-0.101	-1.51	-0.144	-0.91	-0.105	-1.03
Balance Family and Other _3	-0.283***	-8.50	-0.369***	-7.44	-0.285***	-5.96
Balance Family and Other _4	-0.318***	-12.68	-0.364***	-6.57	-0.331***	-9.23
Balance Family and Other _5	-0.285***	-9.70	-0.300**	-2.86	-0.313***	-7.53
Balance Family and Other _6	-0.255***	-7.11	-0.278**	-2.54	-0.292***	-6.45
Balance Family and Other _7	-0.211***	-5.74	-0.125	-0.98	-0.279***	-5.51
Balance Family and Other _8	-0.156***	-4.18	-0.078	-0.70	-0.202**	-3.03
Balance Family and Other _9	-0.118**	-2.58	-0.061	-0.62	-0.131*	-1.71

Table 5.2.4 cont: Marginal Effects from the Extended Job Satisfaction

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx	Z-stat	dy/dx	Z-stat	dy/dx	Z-stat
Industry Dummies	✓	✓	✓	✓	✓	✓
Region Dummies	✓	✓	✓	✓	✓	✓

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Whole Sample $y = \Pr(\text{jobsatisfaction} == 8)(\text{predict}) = .331$

Public Sector Sample $y = \Pr(\text{jobsatisfaction} == 8)(\text{predict}) = .388$

Private Sector Sample $y = \Pr(\text{jobsatisfaction} == 8)(\text{predict}) = .329$

The ordered probit estimation of the extended job satisfaction produces some significant coefficients for the explanatory variable job insecurity. For the whole sample of workers and the private sector subsample job insecurity significantly reduces self-reported job satisfaction. Job insecurity does not appear to be a significant determinant of job satisfaction for public sector workers. The marginal effects suggest that as job insecurity increases for the whole sample of workers, the probability of reporting an 8 on the job satisfaction scale declines by 1.3%. The significance of the marginal effects does not carry over to the public and private sector subsamples of workers. Whereas the results from the basic job satisfaction equation produced significant coefficients for public sector job insecurity, the same is not true in the estimation of the extended job satisfaction equation. Sousa-Poza and Sousa-Poza (2000) similarly lose statistical significance on their job insecurity variable with the inclusion of more job-specific explanatory variables.

The natural log of income remains a significant determinant of job satisfaction for the whole sample of workers and the public sector subsample. As income increases, the probability of reporting an 8 on the job satisfaction scale increases by 2.2% for the whole sample and 1.4% for the public sector subsample.

With the inclusion of more independent variables, income is no longer a determinant of job satisfaction among private sector workers.

The results suggest gender is not a significant determinant of job satisfaction. This is supported by Spector (1997) who states a definitive relationship between gender and job satisfaction is not possible to ascertain due to the multitude of studies with conflicting conclusions.

Becoming personally unemployed displays the same relationship as that described by the estimation of the basic job satisfaction equation in the previous section. Being personally unemployed and job seeking within the past 5 years has lasting job satisfaction consequences for the whole sample of workers and the private sector subsample of workers. The marginal effects show a reduction in the probability of reporting an 8 on the job satisfaction scale by 4.7% for the whole sample and 6.0% for private sector workers.

The number of hours worked per week show a general negative relationship to job satisfaction supporting the classical utility from work functions (Clark and Oswald, 1996). Those who work 40-49 hours per week report significantly lower job satisfaction scores than those who work 20-29. This holds for the whole sample and the private sector subsample. Additionally those in the private sector who work 10-19 hours per week also report significantly lower job satisfaction than those in the reference group who work 20-29 hours per week. While many of the coefficients are negative supporting the classical utility from work theory (Clark and Oswald, 1996) the significance of these coefficients are sporadic across the samples of individuals.

Lower levels of education increase job satisfaction compared tertiary education. For the whole sample, those who have completed less than secondary education or lower secondary education report significantly higher job satisfaction scores than those who have completed a tertiary education. The marginal effects show that those who have completed lower secondary education have an increased probability of reporting an 8 on the job satisfaction scale by 2.1%. The marginal effects coefficient for a job satisfaction outcome equal to 8 is not significant for the less than secondary education explanatory variable. In general the significant coefficients on lower education attainment variables support Clark and Oswald's (1994) theory of expectations and aspirations where it is found that subjective well-

being decreases with increased education attainment. The coefficients on all education variables are not significant for the public sector subsample.

The self-reported poor health variables display many significant and negative coefficients. For the whole sample of workers those who report their health as being very bad report lower levels of job satisfaction than those who report their health as being good. For individuals in the public sector subsample, those who report their health status as being bad also report significantly lower levels of job satisfaction compared to those who have good personal health. Lastly, those in the private sector subsample who report their personal health as being bad or very bad both report lower levels of job satisfaction than those who report their health as being good.

The results from Table 5.2.3 show that many job specific characteristics are not statistically significant when estimated via the ordered probit model. Work advancements, the ability to receive help from co-workers, income depending on the effort put forward by the individual, the ability to learn new things and the variety of tasks performed are all variables that appear as insignificant determinants of job satisfaction for all samples of workers. Clark (1998) and Bradley and Wright (2001) similarly find insignificant relationships between job satisfaction and many job-specific characteristics.

A variable is included that indicates whether the individual is responsible for supervising the work of other employees. This variable is positive and statistically significant for private sector workers indicating that managing others increases self-reported job satisfaction. A statistical relationship does not appear for public sector workers. Variables that measure the worker's position in the organization's hierarchy have been shown to be strong predictors of job satisfaction (Clark, 1996). Individuals who supervise co-workers or hold managerial position, on average report higher levels of job satisfaction (Clark, 1997; D'Addio *et al.,* 2003).

The variable "hard work" is included in this study to provide a proxy for having an exhausting job. Many coefficients remained insignificant across both public and private sector workers. Public sector workers who reported they strongly disagreed with the statement that their jobs required them to work hard, reported significantly lower levels of job satisfaction than those who agreed with the statement. This is true for the whole sample of workers as well. For private sector

workers, those who were relatively ambivalent to the question and reported they neither agreed nor disagreed with the statement about hard work reported higher job satisfaction scores than those in the reference group who reported they agreed with the hard work statement. Sousa-Poza and Sousa-Poza (2000) conclude that having an exhausting job has the single largest negative effect on job satisfaction among all other work characteristics.

Physical security is listed as a main classification of job characteristics according to Warr (1994). The coefficients on the variable "job is a risk to personal health" reduces job satisfaction however the coefficients are not significant across the sectoral subsamples of workers. An exception is private sector workers who report a response of "a little true" to the statement about health and safety being at risk at work. These workers subsequently reported significantly lower levels of job satisfaction than those who answered "not at all true." This relationship is also apparent for the whole sample of workers. A physically demanding job and a dangerous job have both been classified as depressants of job satisfaction (Sousa-Poza and Sousa-Poza, 2000).

The variable the ability to learn more things is included to measure mental challenge required by the individual's current job. None of the coefficients on these variables are significant for any sample of workers. Work attributes that involve more mental challenge such as autonomy, complexity, the opportunity to use abilities and learn new things, responsibility of others, have all been shown to lead to higher job satisfaction (Clark, 1996).

The variable "income depends on the effort I put in" is similar to the incentive bonuses variable in Clark (1996). Marsden and Richardson (1994) find that many compensation systems thought to bring about employee satisfaction in fact have no effect. A similar finding is present in this study whereby a majority of the variables regarding income and effort are not significant determinants of job satisfaction

Social relationships at work have been shown to be strong contributors to high job satisfaction (Sousa-Poza and Sousa-Poza, 2000). Relationships at work significantly increases job satisfaction of women however no statistical relationship is found for men (Clark, 1997). The variable in this study "the ability to receive help

from co-workers" addresses this notion of social connectivity or a social network at work. The ability to receive help from co-workers is not a significant determinant of job satisfaction for any sample of workers.

Doing a variety of tasks that require the use of a variety of skills applied to various work challenges is typically a contributor to high job satisfaction (Stimson & Johnson, 1977). If individuals perceive their job to be routine, this will be reflected in lower job satisfaction scores than those with greater task variety (Wright and Davis, 2003). In this study the degree of variety in work is not a significant determinant of job satisfaction among public or private sector subsamples. However in accordance with the literature, individuals in the whole sample who responded "very true" to the statement "there is a lot of variety in my work" report significantly higher job satisfaction than those in the reference group who reported "not at all true." The marginal effects show that workers who responded "very true" have a 2.9% increased probability of reporting an 8 on the job satisfaction scale.

The inclusion of a satisfaction with work/family balance as an explanatory variable in the subjective well-being literature is only in its infancy. Higher satisfaction with work/family balance has been shown to greatly increase individuals' quality of life (Greenhaus *et al.,* 2003). A positive impact of satisfaction with work/family balance on job satisfaction is displayed in Saltzstein *et al.* (2001). This study supports the argument that satisfaction with the balance between work/family life is significantly important in determining job satisfaction. The balance of work/life variable is categorical where in the regression analysis the reference group is 10 (extremely satisfied). The results show public sector employees who reported lower work/family balance scores of 1, 3, 4, 5, and 6 all reported significantly lower job satisfaction scores than those in the reference group. A similar relationship exists for private sector workers who reported 0, 3, 4, 5, 6, 7, and 8. For the whole sample of workers, all work/family balance variables are statistically significant depressants of job satisfaction except for the balance category equal to 2. The marginal effects show that those who report a 1 on the work/family life satisfaction scale have a 33.2% lower probability of reporting an 8 on the job satisfaction scale. The second largest probability impact is for those who report a 4 on the work/family life satisfaction scale. These individuals have a 31.8% lower probability of reporting an 8 on the job satisfaction scale. In conclusion, these results

show that any work/life balance score less than the reference category of 10 displays significantly negative coefficients. This indicates an individual's work/life balance is a strong determinant of self-reported job satisfaction.

5.2.3: Post Estimation Diagnostics

Testing the Specification of the Model

A model specification test is performed for both ordered probit estimations of the basic job satisfaction equation (Model 1) and the extended job satisfaction equation (Model 2). The specification test is the RESET test or Regression Specification Error Test which is similarly explained in Section 4.2.2. If the model is appropriately specified the test variable should not be statistically significant. The test variable should not be able to reject the null hypothesis such that the model is correctly specified. The results from the RESET test are presented in Tables 5.2.5 and 5.2.6.

Table 5.2.5: RESET Test of Model Specification for Basic Job Satisfaction Equation

H_0: Model is correctly specified **H_1: Model is not correctly specified**			
	Whole Sample	**Public Sector Sample**	**Private Sector Sample**
Chi^2	0.79	0.86	0.24
RESET Test Prob>Chi^2	0.374	0.352	0.622

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Table 5.2.6: RESET Test of Model Specification for Extended Job Satisfaction Equation (Model 2)

H_0: Model is correctly specified H_1: Model is not correctly specified			
	Whole Sample	**Public Sector Sample**	**Private Sector Sample**
Chi^2	0.01	0.22	2.74
RESET Test Prob>Chi^2	0.928	0.640	0.098

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

The test statistics in Table 5.2.5 are all statistically insignificant indicating that the null hypothesis of correct model specification cannot be rejected at any conventional statistical level. The test statistics in Table 5.2.6 are insignificant for the whole sample of workers and for the public sector subsample of workers. However, the test statistic for the private sector subsample of workers is statistically significant at the 10% level indicating that the null hypothesis can be rejected. For the test statistics that are not significant it can be concluded that other non-linear combinations of the fitted values help explain the dependent variable (Ramsey, 1969).

A Wald test is performed on the cut-off points for joint significance. For the basic job satisfaction equation the null hypothesis that the cut-offs are jointly equal to zero is rejected at the 1% significance level for all samples of workers. Similar results are found when using the Wald test on the cut-off points of the extended job satisfaction equation. For all samples of workers the null hypothesis that the cut-off points jointly equal zero is rejected.

The significance of each variable is assed using the Z-statistics and their associated p-values to determine statistical significance at the conventional 1%, 5% and 10% levels. The Likelihood Ratio Test is used to evaluate the goodness of fit of the model. All of the Likelihood Ratio Test statistics are statistically significant for every subsample of workers in the basic job satisfaction equation (Model 1) and the extended job satisfaction equation (Model 2). This is determined by the probability

statistic (Prob > Chi2) which is the probability of obtaining the associated chi-squared statistic. This indicates that the model decently explains the variation in job satisfaction.

Robust standard errors are used in the ordered probit estimation of both the basic job satisfaction equation and the extended job satisfaction equation which tend to be more trustworthy if heteroscedasticity is present (Berry and Feldman, 1985).

5.3: Conclusion

This chapter presents an empirical study of the effect of job insecurity on the job satisfaction of public and private sector workers in Ireland. This is done using data from the European Social Survey (2010). The ordered probit model is used to estimate a basic job satisfaction equation consisting mainly of personal characteristics and an extended job satisfaction equation consisting of personal characteristics and a vector of job-specific characteristics.

Overall the findings show job insecurity depresses self-reported job satisfaction. This relationship exists for the whole sample of workers and the private sector subsample of workers. The variable job insecurity produces a significant coefficient only in the ordered probit estimation of the basic job satisfaction equation. Even with a significant relationship the marginal effects of the basic job satisfaction equation show that job insecurity depresses job satisfaction to a greater extent for private sector workers. Any observed relationship between job insecurity and job satisfaction for public sector workers disappears with the inclusion of a vector of job-specific characteristics in the estimation of the extended job satisfaction equation.

Other statistical determinants of job satisfaction emerge that are supported by the subjective well-being literature. Income appears as one of the most consistent determinants of job satisfaction. Income displays a consistently positive relationship for the whole sample of workers. This finding is supported by the classical economic view of utility from work outlined in Clark and Oswald (1996).

In general the hours of work variables display a negative relationship to job satisfaction however the significance of the coefficients vary across the samples of workers and the specification of the job satisfaction equation.

The lasting effects of becoming personally unemployed are observed in the ordered probit estimation of both the basic job satisfaction equation and extended job satisfaction equation. Clark and Oswald (1994) have extensively identified the lasting well-being consequences of personal unemployment. The results presented here show that individuals who have become personally unemployed within the past 5 years report significantly lower well-being scores. The ordered probit results of the basic job satisfaction equation show that becoming personally unemployed reduces the probability of reporting high life satisfaction by 3.5% for the whole sample of workers.

The most surprising relationship to emerge from the ordered probit estimation of the extended job satisfaction equation is for the variable balance of family and work life. This is dummied out across 10 satisfaction scores. The highest satisfaction score equal to 10 is selected as the reference category. Almost all other satisfaction scores less than 10 display highly significant negative coefficients. This indicates that any other satisfaction score less than 10 with regards to family/work life balance, significantly reduces job satisfaction. This is supported by Saltzstein *et al.* (2001).

The main finding of this chapter is that job insecurity significantly reduces the job satisfaction of both public and private sector workers in Ireland. This relationship is stronger for private sector workers. These findings suggest that despite an increase in insecurity across workers in Ireland, the well-being consequences were less for public sector workers. When addressing the recessionary debate of who suffered more, it appears that the institution of public sector employment outlined in Luechinger *et al.* (2010a) was able to hedge some of the negative well-being implications caused by the economic recession. These findings can be used in a well-being approach to policy analysis and further support the conclusion that well-being studies need to differentiate between public and private sector workers as opposed to universally categorizing them as general workers.

It is suggested throughout the subjective well-being literature that a closer look is needed with regards to directional causality between job satisfaction and job insecurity. Correlates to subjective well-being are generally considered 'causes' yet these links can result from reverse effects as well (Veenhoven, 1991). Dierner *et al.* (1999) suggests that a closer look it needed into the causal direction of subjective well-being where the application of more sophisticated methodologies are required.

The empirical literature on job satisfaction has only started to address this issue of potential reverse causality through simultaneous estimation of job satisfaction equations (Origo and Pagani, 2008). It is commonly assumed in the job satisfaction literature that perceived risk of job loss affects workers' job satisfaction, however, it may also be the case that dissatisfied workers face an increased risk of losing their jobs (Theodossiou and Vasileiou, 2007). This concept of simultaneity whereby both job satisfaction and job insecurity are simultaneously determined is an instigator of a much larger empirical issue, endogeneity. Endogeneity is likely to occur when a choice variable is placed on the right-hand-side of a regression equation and is expected to test the association with a specified outcome (Chenhall and Moers, 2007). Therefore, the inherent simultaneous nature between job satisfaction and job insecurity as well as non-random selection into public sector employment, as potential instigators of endogeneity bias, are addressed in the following chapter. This is performed using advanced empirical techniques designed to produce consistent and unbiased estimators (Heckman, 1979; Maddala, 1983; McCausland *et al.*, 2005).

CHAPTER 6

FURTHER EMPIRICAL ISSUES: SAMPLE SELECTION AND ENDOGENEITY CORRECTED RESULTS

This chapter presents an empirical study of the effect of job insecurity on the job satisfaction of public and private sector workers in Ireland while addressing the econometric issue of endogeneity bias that results from a simultaneous relationship between job satisfaction and job insecurity. Non-random selection into public sector employment is similarly treated as endogenous in order to obtain consistent and unbiased estimators for the estimation of the job satisfaction equation.

Job insecurity is well-documented in the literature as having a negative effect on individual well-being (Artz and Kaya, 2014; Clark, 1998; Gazioglu and Tansel, 2006; Geishecker, 2010, 2012 Theodossiou and Vasileiou, 2007). However the job satisfaction literature has largely ignored the possibility of a reciprocal relationship existing between job satisfaction and job insecurity (McCausland *et al.,* 2005). Theodossiou and Vasileiou (2007) explain it is typically assumed that causality runs from job insecurity to job satisfaction but it is also plausible that individuals who are dissatisfied with their jobs are more likely to be released from employment. This therefore creates a simultaneous equation model whereby job satisfaction is determined by job insecurity and simultaneously job insecurity is determined by job satisfaction. Simultaneity is an instigator of a much larger econometric issue, endogeneity, where if not corrected for can lead to biased and inconsistent estimators (Gujarati, 2007).

Instrumental variable (IV) technique is the leading method used to consistently estimate parameters in simultaneous equations models (Gujarati, 2009; Wooldridge, 2013). These techniques are classified as either Full Information Methods or Limited Information Methods with varying statistical properties (Gujarati, 2009; Wooldridge, 2010). Results are presented for the estimation of the job satisfaction equation using the Full Information Maximum Likelihood (FIML) estimator, the Limited Information Maximum Likelihood (LIML) estimator and the Two-Stage Ordered Probit Least Squares (2SOPLS) estimator. A comparison between the LIML estimator and the FIML is also conducted.

Endogeneity occurs as a result of how a choice variable affects a desired outcome (Chenhall and Moers, 2007). This choice also known as selection bias is accounted for via the Two-Stage Heckman Probit OLS method as is done in Clark (1997) and McCausland *et al.*, (2005). In this instance selection into public sector employment is treated as endogenous and the bias is corrected in order to obtain consistent estimates of the job satisfaction coefficients (Zhang, 2004).

6.1: Empirical Techniques

Sample Selection Bias

The Two-Step Heckman Probit OLS method is used to correct for selection bias resulting from non-random selection into public sector employment. A public sector equation is estimated via the probit model which is similar to Clark (1997). Variables that determine job satisfaction are included in a public sector selection equation with an additional explanatory variable. This estimation method treats public sector employment as endogenous and will result in consist and unbiased estimates of the job satisfaction equation (Zhang, 2004). In estimating the public sector employment equation there must be at least one instrumental variable that has no effect on job satisfaction except through its effect on public sector employment. Such a variable must be a significant determinant of public sector employment yet satisfy the exclusion restriction $Cov(w, \varepsilon_j) = 0$ for all of the selection categories (Chiburis and Lokshin, 2007). Following Luechinger *et al.* (2010b) the instrumental variable included in the public sector selection equation is Irish citizenship. The rationale being that public sector occupations are typically held for national citizens and therefore would help determine the public sector equation but should not impact individual job satisfaction.

The Two-Step Heckman Probit OLS method uses the predicted values from the selection equation to estimate the Inverse Mills Ratio (λ). The Inverse Mills Ratio is then included in a second stage estimation of the job satisfaction equation via the Ordinary Least Squares (OLS) estimator. The additional regressor Irish citizenship is included in the first stage estimation of the selection equation. If selection bias is not accounted for regressions using the public sector and private

sector subsamples will lead to inconsistent and biased estimators (Clark, 1997; Heckman 1979; Maddala, 1983; McCausland *et al.*, 2005).

Public Sector Selection Equation

In the public sector selection equation individuals i are sorted into j categories equal to 1 for those employed in the public sector and equal to 0 for those employed in the private sector as is done in Luechinger *et al.* (2010a). Equation 6.1.1 is estimated via the binomial probit model. A range of personal and socioeconomic independent variables are included that affect public sector employment.

$$PS_i = \delta Z_i + v_i \qquad \textbf{(6.1.1)}$$

where:

PS_i	dependent variable which describes the agent's propensity for choosing public sector employment.
δ	parameters to be estimated
Z_i	$(1\times q)$ vector of all exogenous variables in the model (with at least one determining the employee's selection, but excluded from the structural JS equations)
q	number of independent variables
v	disturbance term with $Cov(Z_i, v) = 0$ and $v \sim N(0,1)$

The independent variables (q) include all of the variables from the job satisfaction equation. In addition the variable Irish citizenship is included in the public sector employment equation but is excluded from the job satisfaction equation. Following McCausland *et al.* (2005) an estimation of the selection correction term λ_i is computed for each subsample of workers. This term, lambda, is then included in Equation 6.1.3 where job satisfaction is estimated by the Ordinary Least Squares estimator.

Endogeneity Bias

Existing literature that attempts to correct for an endogenous relationship between job satisfaction and job insecurity primarily use limited information estimation methods. The Two-Stage Least Squares estimator dominates the job satisfaction literature (Artz and Kaya, 2014; Theodossiou and Vasileiou, 2007; McCausland *et al.* 2005). This estimator however fails to account for the ordinal nature of both the dependent variable job satisfaction and the independent variable job insecurity. Therefore a limited information methods similar to 2SLS is selected, which is called the Two-Stage Ordered Probit Least Squares (2SOPLS) estimator. 2SOPLS estimates the job insecurity equation via the ordered probit model which preserves the ordered nature of this endogenous regressor. The job satisfaction equation is then estimated by OLS. The Full Information Maximum Likelihood (FIML) estimator is selected as the second method used to estimate the simultaneous equations model. This method is a full information method which by definition preserves the nature of the simultaneous equation model by estimating all of the equations simultaneously as opposed to individually (Gujarati, 2009). By employing the user written command *–bioprobit* the FIML estimator accounts for the ordered nature of both the dependent variable job satisfaction and the endogenous independent variable job insecurity. The simultaneous equations model consists of the job insecurity equation and the job satisfaction equation.

Job Insecurity Equation

$$I_i = \alpha X_i + \rho Z_i + u_i \quad \textbf{(6.1.2)}$$

where:

I_i perceived job insecurity (endogenous)
α vector of parameters
X_i matrix of exogenous variables
Z_i vector of *k* instrumental variables
ρ parameters of the instrumental variables
u_i error term

The perceived level of job insecurity is affected by a number of independent variables. All of the variables that are included in the job satisfaction equation are included in the job insecurity equation. Additionally, three instrumental variables are used to help identify the job insecurity equation that are not included in the job satisfaction equation. These variables are as follows:

- Ease of finding a similar or better job
- Value of how important job insecurity is when searching for employment
- Shortened hours worked in the past three years

Job Satisfaction Equation

The dependent variable job satisfaction is measured categorically on a scale from 0 “Extremely Dissatisfied” to 10 “Extremely Satisfied.” Job satisfaction is explained for individual *i* in Equation 6.1.3. Self-reported job satisfaction is believed to depend on a host of exogenous independent variables both individual and job-specific. Job insecurity is treated as endogenous where Instrumental Variables techniques are needed to estimate both equations 6.1.2 and 6.1.3.

$$JS_i = \theta X_i + \delta I_i + \varepsilon_i \quad \textbf{(6.1.3)}$$

where:

JS_i ordered job satisfaction variable (endogenous)

θ vector of parameters

X_i matrix of j exogenous variables

δ parameters of the endogenous variables

I_i ordered perceived job insecurity (endogenous)

ε_i error term

The job insecurity and job satisfaction equations are estimated for the whole sample of workers as well as the public sector and private sector subsamples of workers. This will enable comparisons to be made regarding well-being implications of job insecurity among both public and private sector workers.

6.1.1: Full Information Maximum Likelihood Estimation of the Job Satisfaction – Job Insecurity Simultaneous Equations Model

Full Information Maximum Likelihood (FIML) estimates a series of equations using the joint distribution of the equations rather than estimating each equation individually (Jones, 2007). Given that both the job insecurity and job satisfaction variables are inherently ordered, the ordered probit model is appropriate for the estimation of both equations. By accounting for the ordinality of these variables, more accurate results are produced (Greene, 2002). The FIML estimator is used to estimate the simultaneous bivariate ordered probit model similar to the one outlined in Sajaia (2008) and Roodman (2011). The user written command *–bioprobit* assumes job satisfaction and job insecurity are approximations of categorical latent variables rather than defaulting to a linear approximations.

The parameters to be estimated are:

$$\alpha_1, \alpha_2 \ldots \alpha_k, \rho_1, \rho_2, \rho_3, u_k \; ; \theta_1, \theta_2 \ldots \theta_j, \delta_j, \varepsilon_j$$

The simultaneous equations models will be estimated for the whole sample and for the public and private sector subsamples of individuals.

6.1.2: Limited Information Maximum Likelihood Estimation of the Job Satisfaction – Job Insecurity Simultaneous Equations Model.

The Limited Information Maximum Likelihood (LIML) method of estimation corrects for endogeneity by estimating the job insecurity and job satisfaction equations separately. For identification purposes there must be one more exogenous regressor in the job insecurity equation than there is in the job satisfaction equation. In the first step the job insecurity equation is estimated by OLS. The predicted values ($\hat{I}_i$) are calculated as displayed in Equation 6.1.4.

$$\hat{I}_1 = \widehat{\Pi}_1 \mathrm{X} \qquad \textbf{(6.1.4)}$$

where:

X_i a matrix of all exogenous variables

Π_1 vector of estimated parameters

The predicted values are then included in the second step OLS estimation of the job satisfaction equation (Equation 6.1.3). The addition of the predicted values allows the estimator to produce consistent and unbiased estimates.

6.1.3: Two Stage Ordered Probit Least Squares Estimation of the Job Satisfaction – Job Insecurity Simultaneous Equations Model

Using the Two Stage Ordered Probit Least Squares (2SOPLS) method to estimate the job satisfaction and job insecurity does so by estimating them individually. In the first stage the job insecurity equation is estimated by the ordered probit model. Predicted values ($\hat{I}_i$) are calculated and inserted into the second stage estimation of the job satisfaction equation. The second stage job satisfaction equation is estimated by OLS similar to as is done in Clark (1997).

6.1.4: Testing for Endogeneity

The Durbin-Wu-Hausman (DWH) test is a test of endogeneity (Baum *et al.*, 2003). This test involves fitting the model by OLS and IV approaches and comparing the resulting coefficient vectors (Baum *et al.*, 2003). This is largely used in repose to Durbin (1954) claiming that researchers should use instrumental variables cautiously as the loss of efficiency sometimes does not out weight the use of OLS (Baum *et al.*, 2003) despite producing biased and inconsistent estimators in the presence of endogeneity (Verbeek, 2004). As is done in Artz and Kaya (2014) a Durbin-Wu-Hausman test is performed for the presence of endogeneity in the whole sample and the public and private sector subsamples. The results from the DWH test are presented in the following Table:

Table 6.1.1: Testing for Endogeneity of Self-Perceived Job Insecurity

H_0: **Regressor is exogenous** H_a: **Regressor is endogenous**			
	Whole Sample	Public Sector	Private Sector
Durbin-Wu-Hausman χ^2 test:	$\chi^2(1) = 8.274$ p-value = 0.004	$\chi^2(1) = 5.27$ p-value = 0.0202	$\chi^2(1) = 6.668$ p-value = 0.010

Source: Author's own

According to the p-values the DWH statistics, the null hypothesis is rejected at the 5% level for the whole sample and both subsamples of workers. The alternative hypothesis is accepted that the job insecurity regressor is endogenous. It is contemporaneously correlated with the error term.

The appropriateness of chosen instrumental variables is assessed using a Straiger and Stock (1997) test for exogeneity which is similarly done in Theodossiou and Vasileiou (2007), McCausland *et al.,* 2005, and Artz and Kaya (2014). Weak endogeneity exists when the partial correlations between instruments and the included endogenous variable is low. When using limited information estimation methods it is necessary that the first-stage F-statistic be greater than 10 (Staiger and Stock, 1997). This tests the hypothesis that the instruments do not statistically determine the first stage regression $H_0: \rho_1 = \rho_2 = \rho_3 = 0$.

The job insecurity equation is described below with a corresponding F-statistic of joint significance for all Instrumental Variables.

$$\hat{I}_i = \alpha\hat{X}_i + \rho\hat{Z}_i + \hat{u}_i \qquad \textbf{(6.1.5)}$$

F statistic = 15.49

where:

I_i predicted values of job insecurity (endogenous)

X_i predicted values of independent variables

Z_i vector of *k* instrumental variables – probability of finding new job, personal values of job insecurity in choosing a job, reduction in hours worked

The F statistic is greater than the threshold value of 10 confirming the validity of the selected instruments according to Staiger and Stock (1997).

6.2: Results Corrected for Sample Selection Bias

The public sector selection equation is estimated by the binary probit model from which the Inverse Mills Ratio is calculated. The additional variable in the public sector employment equation is a dummy variable representing Irish citizenship. The Inverse Mills Ratio is included as an additional regressor in the Ordered Least Squares estimation of the job satisfaction equation. The results are discussed in Section 6.2.1. Post-estimation diagnostics are discussed in Section 6.2.2.

6.2.1: Results from the Two-Step Heckman Probit Estimation of the Basic Job Satisfaction Equation (Steps 1& 2)

When identifying the relationship between job insecurity and job satisfaction of individuals in employment sectors, it is important to account for non-random selection into these sectors when the natural tendency is to choose life circumstances that will maximize individual well-being (Luechinger *et al.*, 2010b). For this reason any observed relationship can be influenced by the strong connection between job satisfaction and individual selection into these jobs (Luechinger *et al.*, 2010b). It is important that any scenario that identifies the well-being of individuals who have choice, sample selection bias must be addressed (Heckman, 1979).

In looking at the effect of job insecurity on job satisfaction and accounting for selection into public sector employment, a Two-Step Heckman Probit OLS estimation method is used. All of the variables in the basic job satisfaction equation are included in the public sector employment equation with an additional explanatory variable Irish citizenship. This additional variable helps to determine the propensity of workers to select into public sector employment but cannot simultaneously determine job satisfaction. This is similarly done in Luechinger *et al.* (2010b) and Clark (1997).

Table 6.2.1 displays the coefficients for the binary probit estimation of the public sector selection equation. The coefficients listed in Table 6.2.1 explain the probability that each variable has on individuals choosing to work in the public sector. The Z-statistics are included which are calculated as the ratio of the coefficient to the standard error of the respective regressor. The associated p-values are used for statistical inference at the 1%, 5% and 10% levels.

Table 6.2.1: Binomial Probit Estimation of Public Sector Selection Equation (Step 1)

Dependent Variable *Public Sector Employment*	**Coefficient**	**Z-stat**
Job Insecurity *(ordered scale 1-4)*	-0.246***	-4.11
Citizen	0.401**	2.19
Ln(income)	-0.309**	-2.00
Gender	-0.434***	-3.28
Unemployed Last 5 Years	-0.418*	-1.90
Work Week Hours 20-29	Reference Group	
Work Week Hours 0-9	0.139	0.26
Work Week Hours 10-19	0.098	0.41
Work Week Hours 30-39	-0.249	-1.38
Work Week Hours 40-49	-0.526**	-2.72
Work Week Hours 50+	-0.409	-1.56
Education Tertiary	Reference Group	
Education Less Secondary	-0.599**	-2.06
Education Lower Secondary	-0.573**	-2.75
Education Upper Secondary	-0.265	-1.60
Education Non-tertiary	-0.286	-1.37
Education Post Grad	0.376**	2.04
Contract None	Reference Group	
Contract Unlimited	-0.042	-0.29
Contract Limited	0.317	1.51

Table 6.2.1 cont: Binomial Probit Estimation of Public Sector Selection Equation (Step 1)

Dependent Variable *Public Sector Employment*	**Coefficient**	**Z-stat**
Establishment Size Under 10	Reference Group	
Establishment Size 10-24	-0.117	-0.65
Establishment Size 25-99	-0.204	-1.11
Establishment Size 100-499	0.144	0.77
Establishment Size 500+	0.289	1.32
Work Week Hrs 20-29	Reference Group	
Work Week Hrs 0-9	0.139	0.26
Work Week Hrs 10-19	0.098	0.41
Work Week Hrs 30-39	-0.249	-1.38
Work Week Hrs 40-49	-0.526**	-2.72
Work Week Hrs 50+	-0.409	-1.56
Marital Status Married	Reference Group	
Marital Status Civil Union	Omitted	omitted
Marital Status Separated	0.628**	1.98
Marital Status Divorced	0.132	0.47
Marital Status Widowed	0.417	0.98
Marital Status Never	-0.003	-0.02
Marital Status Annulled	Omitted	omitted
Health Status Good	Reference Group	
Health Status Fair	-0.368*	-1.74
Health Status Bad	0.497	0.93
Health Status Very Bad	omitted	omitted
Age 20-29	Reference Group	
Age 15-19	Omitted	omitted

Table 6.2.1 cont: Binomial Probit Estimation of Public Sector Selection Equation (Step 1)

Dependent Variable *Public Sector Employment*	**Coefficient**	**Z-stat**
Age 30-39	0.095	0.52
Age 40-49	0.233	1.16
Age 50-59	0.263	1.16
Age 60-69	0.491	1.49
Age 70-79	1.510	1.39
Age 80-89	omitted	omitted
Union None	Reference Group	
Union Currently	1.415***	10.13
Union Previously	0.514**	2.34
_cons	2.970*	1.84

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

The variable citizenship is a positive and statistically significant determinant of public sector employment. The rationale presented in Luechinger *et al.* (2010b) suggests that many public sector jobs are reserved for national citizens therefore making it an appropriate determinant of public sector employment. Moreover, a Straiger and Stock test of endogeneity is performed on the variable citizenship. According to Straiger and Stock (1997) an additional explanatory variable must produce an F-statistic in the first stage regression that is greater than 9 to be included in the second stage estimation. Irish citizenship produces a significant F-statistic equal to 43.9 which exceeds the Straiger and Stock Test rendering this a valid determinant of public sector employment.

Following McCausland *et al.* (2005) the selection equation is estimated and separate Inverse Mills Ratios are calculated for each subsample of individuals in the study. These ratios are then include in Step 2 of the Two-Step Heckman Probit OLS

estimation method. The job satisfaction equation is estimated by OLS treating the job satisfaction values as continuous which relaxes the ordinality assumption. A similar analysis is performed using job satisfaction data in Clark (1997). The results from the OLS estimation of the job satisfaction equation are presented in Table 6.2.2.

Table 6.2.2: OLS estimation of Job Satisfaction Equation with Selection Corrected Coefficients (Step 2)

Dependent Variable *Job Satisfaction*	**Public Sector Subsample**		**Private Sector Subsample**	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Job Insecurity *(ordered scale 1-4)*	0.006	0.04	-0.385**	-2.28
Ln(income)	1.180***	3.72	0.593**	2.16
Gender	0.703**	2.11	-0.077	-0.25
Unemployed Last 5 Years	0.168	0.29	-0.392	-1.08
Work Week Hours 20-29	Reference Group			
Work Week Hours 0-9	-0.070	-0.06	-0.449	-0.44
Work Week Hours 10-19	0.015	0.03	-0.651	-1.57
Work Week Hours 30-39	-0.218	-0.66	-0.277	-0.83
Work Week Hours 40-49	-0.150	-0.35	-0.058	-0.14
Work Week Hours 50+	0.344	0.62	0.125	0.27
Education Tertiary	Reference Group			
Education Less Secondary	1.150	1.64	0.171	1.32
Education Lower Secondary	0.888*	1.67	0.235	0.56
Education Upper Secondary	0.361	1.02	0.455	1.52
Education Non-tertiary	0.140	0.34	0.376	1.08
Education Post Grad	-0.100	-0.29	-0.445	-1.21

Table 6.2.2 cont.: OLS Estimation of Job Satisfaction Equation with Selection Corrected Coefficients (Step 2)

Dependent Variable *Job Satisfaction*	**Public Sector Subsample**		**Private Sector Subsample**	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Contract None	Reference Group			
Contract Unlimited	-0.352	-1.26	-0.687**	-3.11
Contract Limited	0.197	0.44	-0.477	-1.22
Establishment Size Under 10	Reference Group			
Establishment Size 10-24	1.003**	2.77	0.086	0.32
Establishment Size 25-99	1.047**	2.83	0.235	0.32
Establishment Size 100-499	0.183	0.54	0.126	0.39
Establishment Size 500+	0.402	1.04	0.484	1.13
Work Week Hrs 20-29	Reference Group			
Work Week Hrs 0-9	-0.070	-0.06	-0.449	-0.44
Work Week Hrs 10-19	0.015	0.03	-0.651	-1.57
Work Week Hrs 30-39	-0.218	-0.66	-0.277	-0.83
Work Week Hrs 40-49	-0.150	-0.35	-0.058	-0.14
Work Week Hrs 50+	0.344	0.62	0.125	-0.14
Marital Status Married	Reference Group			
Marital Status Civil Union	omitted	omitted	omitted	omitted
Marital Status Separated	-0.493	-0.86	0.011	0.02
Marital Status Divorced	-0.190	-0.37	-0.204	-0.42
Marital Status Widowed	0.572	0.89	-0.124	-0.14
Marital Status Never	-0.134	-0.45	0.310	1.38
Marital Status Annulled	omitted	omitted	omitted	omitted

Table 6.2.2 cont.: OLS Estimation of Job Satisfaction Equation with Selection Corrected Coefficients (Step 2)

Dependent Variable *Job Satisfaction*	**Public Sector Subsample**		**Private Sector Subsample**	
	Coefficient	t-statistic	Coefficient	t-statistic
Health Status Good	Reference Group			
Health Status Fair	0.066	0.14	-0.015	-0.04
Health Status Bad	-1.215	-1.37	-2.297**	-2.55
Health Status Very Bad	omitted	omitted	omitted	omitted
Age 20-29	Reference Group			
Age 15-19	omitted	omitted	omitted	omitted
Age 30-39	-0.266	-0.66	0.299	1.13
Age 40-49	-0.076	-0.17	0.007	0.02
Age 50-59	0.289	0.57	-0.010	-0.02
Age 60-69	0.377	0.58	-0.008	-0.01
Age 70-79	-1.053	0.58	0.292	-0.01
Age 80-89	omitted	omitted	omitted	omitted
Union None	Reference Group			
Union Currently	-1.967**	-2.53	-0.774	-1.05
Union Previously	-0.906	-1.61	-0.059	-0.13
Inverse Mills (λ)	-2.133**	-2.45	-0.936	-1.39
_cons	-2.269	-0.73	3.758	1.40

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Public Sector Sample	**Private Sector Sample**
$F(34, 229) = 2.15$	$F(34, 405) = 3.12$
$Prob > F = 0.001$	$Prob > F = 0.000$
Obs = 264	Obs = 440

The first independent variable discussed is job insecurity. The coefficient for the public sector subsample is insignificant. However, the job insecurity coefficient for the private sector subsample is negative and statistically significant at the 5% level. This indicates that as job insecurity decreases self-reported job satisfaction of private sector workers. After accounting for selection into public sector employment, the coefficient on job insecurity for the public sector sample becomes insignificant. This is compared to the uncorrected estimates produced by the ordered probit estimation of the basic job satisfaction equation in Section 5.2.1. This study shows when sample selection bias is corrected, job insecurity decreases the well-being of private sector workers only. Similar results are found in ordered probit results in Artz and Kaya (2014) where job insecurity only influences the job satisfaction of private sector workers.

The coefficient on the Inverse Mills Ratio is equal to -2.133 for the public sector subsample and statistically significant at the 5% level. Therefore, the null hypothesis is rejected that no selection bias exists ($H_0: \lambda = 0$) and the alternative hypothesis, selection bias is present, is accepted ($H_a: \lambda \neq 0$). The negative sign of the selection term suggests that people who select into public sector employment tend to report lower levels of job satisfaction than those with similar characteristics who are randomly allocated to public sector employment. The Inverse Mills Ratio is statistically insignificant for the private sector subsample of workers. This implies that the unobserved characteristics which influence an individual's decision to opt for public or private sector employment have no effect on job satisfaction once they choose to work for that sector (McCausland, *et al.*, 2005). This is a similar finding to Clark (1997) in an analysis of non-random selection into employment by men and women.

The natural logarithm of income remains a positive determinant of job satisfaction for public and private sector workers. A positive coefficient is particularly expected for private sector workers where according to Lyons *et al.,* (2006) private sector workers value job security less because of the trade-off to higher wages as a compensating factor. Income also significantly increases job satisfaction of public sector workers and does so to a greater degree as observed from a larger coefficient magnitude. A similar result in found in Artz and Kaya (2014).

Gender is not a significant determinant of job satisfaction for private sector workers. The coefficient is positive and statistically significant at the 5% level for public sector workers. This indicates that men report significantly higher job satisfaction scores than women of equal characteristics and in similar employment scenarios.

Being personally unemployed within the past five years is no longer a statistical determinant of job satisfaction. The uncorrected results produced by the ordered probit estimation of the basic job satisfaction equation in Section 5.2.1 shows this variable significantly decreases job satisfaction of private sector workers. Once selection bias is accounted for, this variable no longer influences the job satisfaction of any subsample of workers.

The number of work week hours is an insignificant determinant of job satisfaction contrary to the theory of utility from work (Clark, 1997; Clark and Oswald, 1996). This changes substantially from the uncorrected results where a few of the work week coefficients were statistically significant particularly for the private sector subsample.

The education variables continue to be insignificant determinants of job satisfaction. Similar to the uncorrected estimates of Section 5.2.1 the education variable "Lower Secondary Education Completed" statistically increases the job satisfaction of public sector workers when compared to the base category of those who have completed a tertiary education. The mixed conclusions drawn from subjective well-being literature with regards to education are believed to be the product of an ambiguous causal direction between expectations and education and their intervening effects on job satisfaction (Clark and Oswald, 1996).

Private sector workers on an unlimited contract report significantly lower levels of job satisfaction than those in the reference group who have no employment contract. Some studies use tenure to approximate employment stability instead of employment contracts. Well-being decreases have been observed with regards to tenure. This is particularly observed for public sector workers (Artz and Kaya, 2014).

The size of work establishment displays two significant coefficients of for public sector workers. Individuals who work in establishments consisting of 10-24

workers and 25-99 workers report significantly higher job satisfaction scores than those who work in establishments of only 10 workers. It is typically observed that job satisfaction decreases in increasing establishment size (Frey and Benz, 2003; Clark and Oswald, 1996). This study shows that those who work in smaller firms report the highest levels of job satisfaction.

Marital status is an insignificant determinant of job satisfaction. This supports the conclusion to include marital status in the job satisfaction equation as a control variable in order to isolate the effect of another explanatory variable of interest.

The only self-reported health status variable to display a significant coefficient is for the private sector subsample. Those who report their health as being very bad report significantly lower job satisfaction scores compared to those in the reference group who have good health status. Self-reported health status does not significantly influence the job satisfaction of public sector workers.

All of the age variables report insignificant coefficients in the selection corrected estimates. This finding is also apparent in the uncorrected estimates explained in Chapter 5. The results suggest that age is not a consistent determinant of job satisfaction across model specifications.

Public sector workers who are members of unions report significantly lower job satisfaction than those who are not members of any union organization. This finding supports the “exit-voice” theory where union membership provides the mechanism to voice concerns about employers which subsequently reduces job satisfaction (Freeman, 1978; Borjas, 1977).

6.2.1.1: Post Estimation Diagnostics

A RESET test of model specification is performed on the model containing selection corrected coefficients. The RESET test is performed on the second stage model used to estimate the job satisfaction equation via the Heckman Probit OLS method. The results are presented in the following Table:

Table 6.2.3: RESET Test of Model Specification for Job Satisfaction Equation with Self-Selection Corrected Coefficients

H_0: Model is correctly specified **H_1: Model is not correctly specified**		
	Public Sector Sample	**Private Sector Sample**
Chi^2	1.24	0.07
RESET Test Prob>Chi^2	0.266	0.788

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

The p-values associated with the Chi-Squared test statistics fail to reject the null hypotheses for both samples of workers. This confirms that the models for both public and private sector workers are correctly specified.

The significance of individual coefficients estimated by the OLS estimator in Step 2 are assed using the p-values associated with calculated t-statistics. The F-statistic is used to evaluate the relevance of all variables in the model and ensure that they statistically contribute. The p-value associated with the F-statistic is statistically significant at the 1% level for both public and private sector workers indicating that the null hypotheses that all of the independent variables jointly equal zero can be rejected. This means that the independent variable statistically explain some of the variation in job satisfaction.

6.3: Results from FIML, LIML and 2SOPLS Estimation

One full information method and two limited information method are used to correct for the inherent endogeneity bias in the variable job insecurity. The full information method is the Full Information Maximum Likelihood (FIML) estimator. The limited information methods are the Two-Stage Ordered Probit Least Squares (2SOPLS) estimator and the Limited Information Maximum Likelihood (LIML) estimator. These methods are used to identify an endogenous free relationship between job insecurity and job satisfaction. This is further identified for public and private sector workers in Ireland. The FIML results are presented in Section 6.3.1. The LIML results are presented in Section 6.3.2. A comparison of the FIML and LIML results are conducted in Section 6.3.3. Lastly, the results from the 2SOPLS estimator are presented in Section 6.3.4.

6.3.1: Results from the FIML Estimation Method

The FIML estimator preserves the nature of simultaneous equations models (Gujarati, 2009). The ordered nature of the job satisfaction and job insecurity variables is preserved by using FIML to estimate the simultaneous bivariate ordered probit model (Sajaia, 2008). The results are presented in Table 6.3.1. Marginal effects are calculated for the probability of reporting high job satisfaction outcomes and are explained in Section 6.3.1.1.

Table 6.3.1: FIML Results from Job Satisfaction Equation

Dependent Variable *Job Satisfaction (Ordered Scale 0-10)*	**Whole Sample**	**Public Sector**	**Private Sector**
Job Insecurity *(ordered scale 1-4)*	-0.518** [-3.37]	-0.665*** [-3.82]	-0.530** [-2.04]
Ln(income)	0.267** [2.63]	0.465** [2.98]	0.245* [1.79]
Gender	-0.066 [-0.81]	0.080 [0.68]	-0.179 [-1.68]
Unemployed Last 5 Years	-0.301** [-2.18]	-0.091 [-0.38]	-0.340** [-2.03]
Work Week Hours 20-29	Reference Group		
Work Week Hours 0-9	-0.520** [-2.00]	0.255 [0.48]	-0.312 [-1.21]
Work Week Hours 10-19	-0.125 [-0.77]	0.014 [0.07]	-0.262 [-1.03]
Work Week Hours 30-39	-0.312** [-2.66]	-0.181 [-0.97]	-0.278* [-1.73]
Work Week Hours 40-49	-0.360** [-2.95]	-0.338 [-1.61]	-0.277 [-1.69]
Work Week Hours 50+	-0.206 [-1.23]	-0.040 [-0.16]	-0.137 [-0.63]
Education Tertiary	Reference Group		
Education Less Secondary	0.182 [.087]	0.538 [1.33]	0.113 [0.48]
Education Lower Secondary	-0.042 [-0.30]	0.214 [0.99]	-0.079 [-0.44]
Education Upper Secondary	0.093 [0.85]	-0.013 [-0.07]	0.187 [1.31]
Education Non-tertiary	-0.032 [-0.28]	-0.165 [-1.00]	0.093 [0.62]
Education Post Grad	0.016 [0.14]	0.131 [0.88]	-0.121 [.175]

Table 6.3.1 cont.: FIML Results from Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
Contract None	Reference Group		
Contract Unlimited	-0.326** [-3.44]	-0.159 [-1.01]	-0.417** [-3.27]
Contract Limited	0.073 [0.54]	0.360* [1.89]	-0.188 [-1.00]
Establishment Size Under 10	Reference Group		
Establishment Size 10-24	0.132 [1.19]	0.417* [1.95]	-0.056 [-0.42]
Establishment Size 25-99	0.140 [1.21]	0.382* [1.88]	-0.003 [-0.02]
Establishment Size 100-499	0.022 [0.19]	0.077 [0.45]	0.049 [0.29]
Establishment Size 500+	0.270 [1.96]	0.333* [1.74]	0.278 [1.32]
Marital Status Married	Reference Group		
Marital Status Civil Union	-0.152 [-0.58]	omitted	-0.308 [-1.06]
Marital Status Separated	0.181 [0.81]	0.055 [0.16]	0.198 [0.80]
Marital Status Divorced	-0.017 [-0.09]	-0.111 [-0.50]	-0.102 [-0.36]
Marital Status Widowed	0.524 [1.38]	0.566 [1.36]	0.181 [0.27]
Marital Status Never	0.116 [1.21]	-0.008 [-0.05]	0.164 [1.38]
Marital Status Annulled	-0.293 [-0.52]	omitted	-0.352 [-0.51]
Health Status Good	Reference Group		
Health Status Fair	-0.182 [-1.31]	-0.097 [-0.36]	-0.124 [.165]
Health Status Bad	-0.438 [-0.96]	-0.086 [-0.16]	-0.895 [-1.46]
Health Status Very Bad	-0.978*** [-4.61]	omitted	-1.260 [-3.94]

Table 6.3.1 cont.: FIML Results from Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
Age 20-29	Reference Group		
Age 15-19	0.272 [0.49]	omitted	-0.012 [-0.02]
Age 30-39	0.141 [1.28]	0.001 [0.01]	0.224 [1.64]
Age 40-49	0.171 [1.35]	0.226 [1.12]	0.129 [0.80]
Age 50-59	0.331** [2.23]	0.446* [1.74]	0.130 [0.445]
Age 60-69	0.517** [2.15]	0.787** [2.34]	0.215 [0.63]
Age 70-79	1.596*** [4.38]	0.608 [0.91]	5.998*** [12.89]
Age 80-89	1.029*** [5.86]	-0.097 [-0.36]	0.796*** [3.63]
Union No	Reference Group		
Union Currently	-0.044 [-0.50]	-0.178 [-1.28]	0.063 [0.51]
Union Previously	0.034 [0.22]	-0.192 [-0.87]	0.168 [0.82]
Dependent Variable *Job Security (ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
Wkshr3y	0.927*** [6.74]	0.517* [1.92]	0.977*** [6.58]
Value_Security	-0.175** [-2.07]	-0.339** [-2.84]	-0.030 [-0.26]
Difficulty	0.237* [1.80]	0.436* [1.88]	0.123 [0.71]
cut1_1	-1.369	1.159	-2.034
cut1_2	-1.066	1.469	-1.728
cut1_3	-0.599	1.698	-1.115
cut1_4	-0.143	2.115	-0.633
cut1_5	0.387	2.522	-0.039

Table 6.3.1 cont.: FIML Results from Job Satisfaction Equation

Dependent Variable *Job Security (ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
cut1_6	0.749	2.841	0.344
cut1_7	1.201	3.333	0.769
cut1_8	1.892	3.970	1.481
cut1_9	2.474	4.580	2.023
cut2_1	-0.611	-0.337	-0.878
cut2_2	0.181	0.303	0.079
cut2_3	0.986	0.980	0.980
atanhrho_12	0.356	0.757	0.268
rho_12	0.342	0.639	0.262

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Note: Z-statistics displayed in brackets under estimated coefficients

Full Sample	**Public Sector Sample**	**Private Sector Sample**
Obs = 714	Obs = 264	Obs = 450
Wald $\chi^2(41) = 1479.38$	Wald $\chi^2(36) = 284.49$	Wald $\chi^2(41) = 1987.60$
Prob > chi2 = 0.000	Prob > chi2 = 0.000	Prob > chi2 = 0.000

The FIML results show that job insecurity is a significant determinant of job satisfaction. A negative relationship exists for the whole sample and the public and private sector subsamples. As individuals move along the job insecurity scale from very secure, quite secure, little secure to not at all secure, reported job satisfaction decreases. This relationship is significant at the 5% level for all samples of workers. This general negative association is similar to the findings in Theodossiou and Vasileiou (2007), Geishecker (2012) Artz and Kaya (2014). Geishecker (2012) similarly found a statistically negative relationship after correcting for endogeneity that was a product of simultaneity bias.

The natural log of income is a positive determinant of job satisfaction for all samples of individuals. This relationship is supported by the classical theory of utility from work outlined by Clark and Oswald (1996).

Gender is not a significant determinant of job satisfactions across all three samples of workers. This is supported by Witt and Nye (1992) who found there were no gender differences with regards to a variety of measures of job satisfaction.

Becoming unemployed has been well-documented in the literature as having lasting negative effects on well-being (Clark and Oswald, 1994). Individuals in this study who have been unemployed and job searching in the past five years display a strong negative relationship to job satisfaction. This relationship is apparent for the whole sample of workers and private sector subsample of workers. Past unemployment has no significant effect on current job satisfaction for public sector workers supporting the notion that public sector workers are less concerned with the lasting effects of unemployment because of inherent institutional differences (Luechinger *et al.,* 2010a).

Classical utility from work theory outlines job satisfaction as a function of work hours (Clark and Oswald, 1996). A strong negative relationship is documented in the literature (Clark, 1996; Clark, 1997; Clark and Oswald, 1996; D'Addio *et al.,* 2003; Sousa-Poza and Sousa-Poza, 2000). The results of this study show a general negative association between work week hours and individual job satisfaction. This relationship is present for the whole sample of workers only. Work week hours display insignificant coefficients for the public sector subsample which is supported by the findings in Artz and Kaya (2014). No distinct conclusions can be made regarding the impact of work week hours for the sectoral subsamples of workers.

Education is not a significant determinant of job satisfaction when estimated by the FIML method. Artz and Kaya (2014) find similar results for their whole sample of workers and public sector subsample of workers. De Santis and Durst (1996) similarly find no statistical relationship between education and job satisfaction for public sector workers.

Being employed in any employment contract reduces job satisfaction compared to those not in any contract. This is similar to Kaiser (2002) who finds individuals in fixed-term contracts report lower levels of job satisfaction. Limited

employment contracts do not statistically determine job satisfaction for any sample of workers in this study. This differs from the uncorrected ordered probit results in Chapter 5. In the uncorrected results, public sector workers on limited employment contracts report significantly greater job satisfaction than those in no contracts. By correcting for the potential endogeneity of the variable job insecurity this has changed the estimates of employment contracts which is a variable sometimes used as an approximation for job insecurity (Origo and Pagani, 2008, 2009).

The size of the establishment in general does not significantly influence job satisfaction. Establishment size is a significant determinant of job satisfaction only for public sector workers who work in institutions with 10-24 employees and 500+ employees. Public sector workers in these establishments report greater job satisfaction than those who work in establishments consisting of less than 10 workers. Lang and Johnson (1995) find that firm size acts as a contingency variable only affecting job satisfaction as it interacts with other determinants resulting in inconsistent findings.

Marital status does not play a significant role in determining job satisfaction for any sample of individuals. The endogeneity corrected estimates show all marital status variables become statistically insignificant. Similar results occur in Theodossiou and Vasileiou (2007) where marital status produces significant uncorrected coefficients but in a separate analysis these coefficients become insignificant when endogeneity bias is corrected for.

Self-reported health status significantly decreases job satisfaction when individuals rate their health as very bad. This exists for the whole sample of individuals. The literature suggests that poor physical health and mental health greatly diminish job satisfaction (Kaiser, 2002; Gardner and Oswald, 2007).

The well-being literature extensively documents a U-shaped relationship between job satisfaction and age (Blanchflower and Oswald, 2004; Clark, 1996; Clark *et al.*, 1996). The results of this study support the increasing portion of the U-shape for ages 50 through 90 for the whole sample of workers. The increasing potion of the U-shape is only supported for private sector workers aged 70-89. Age has no impact on the job satisfaction of public sector workers except for those aged 60 to 69. All of the coefficients are positive indicating greater job satisfaction than those

located in the reference group aged 20-29. The insignificance of age on job satisfaction for public sector workers is also found in Artz and Kaya (2014) in their endogeneity corrected estimates.

Union status does not appear as a significant determinant of job satisfaction for any of the three samples of individuals in this study. Artz and Kaya (2014) find similar results for their whole sample of workers and the subsample of private sector workers, however union membership does significantly increase job satisfaction among public sector workers.

Because FIML estimates the series of equations jointly in the simultaneous equations model, three instrumental variables are included in the job insecurity equation that are not included in the job satisfaction equation. The results show workers who have experienced decreased work hours within the past three years report significantly higher levels of perceived job insecurity. This relationship statistically exists for the whole sample of workers as well as workers in the private sector. A decrease in work week hours does not affect perceived job insecurity for public sector workers. A decrease in work week hours has been shown to be a strong predictor of self-perceived job insecurity (Artz and Kaya, 2014).

The second instrumental variable for job insecurity is a value indicator derived from a question asking respondents how important job security is when choosing a job. The results show individuals who report that job security is very important in choosing a job tend to report lower levels of perceived job insecurity. This reaffirms basic theories concerning values and occupational choice which suggests that individuals seek occupations that fit with their individuals values (Lyons *et al.,* 2006).

The third instrumental variable for job insecurity is based on the degree of ease in finding an equivalent job. Public sector workers who report it would be very difficult to find a new job also report increased job insecurity. A similar relationship is found in Geishecker (2010, 2012). The significances of these instruments differ across samples therefore the importance of using all three when accounting for endogeneity is highlighted. The joint significance of these instruments are tested by the Staiger and Stock (1997) F-test concluding that they jointly contribute to the determination of job insecurity.

6.3.1.1: Marginal Effects from FIML Results

The marginal effects are calculated for all variables based on the job satisfaction outcome equal to 8 and are included in Appendix F. Marginal effects are used in order to accomplish any inference regarding the coefficients (Artz and Kaya, 2014). Marginal effects for all explanatory variables are included in Appendix F. Marginal effects are also calculated for the probability outcome 8, 9 and 10 for the explanatory variable of interest, job insecurity. These are presented in Table 6.3.2. Job satisfaction outcomes of 8, 9, and 10 are classified as high job satisfaction (Luechinger *et al.* 2010a).

Table 6.3.2: Marginal Effects of FIML Estimates

	Whole Sample	**Public Sector**			**Private Sector**		
	dy/dx(8)	**dy/dx(8)**	**dy/dx(9)**	**dy/dx(10)**	**dy/dx(8)**	**dy/dx(9)**	**dy/dx(10)**
Job insecurity	-0.033*** [-3.54]	-0.007 [-0.64]	-0.083*** [-5.71]	-0.165** [-2.36]	-0.050** [-2.31]	-0.068** [-2.22]	-0.094* [-1.70]

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Note: *Z*-statistics are included in brackets
Note: Marginal effects (dy/dx (8)) for remaining variables included in Appendix F

For job satisfaction outcomes 9 and 10, the adverse effect of job insecurity is greater for public sector workers than for private sector workers. The probability of reporting a 9 on the job satisfaction scale declines by 8.3% for public sector workers compared to 6.8% for private sector workers. The probability of reporting a 10 on the job satisfaction scale declines by 16.5% for public sector workers and 9.4% for private sector workers. For high job satisfaction outcomes equal to 9 and 10, job insecurity has a more adverse effect for public sector workers. This is the first finding of its kind in this research. This is supported by the theory proposed by Artz and Kaya (2014) that workers in the public sector typically have higher expectations of job security, therefore would be expected to respond more negatively to perceived

job insecurity. Artz and Kaya (2014) confirm this theory for public sector union workers. The FIML findings presented above contradict the rationale of Luechinger *et al.* (2010a) that public sector workers are relatively protected against potential job loss and therefore suffer smaller well-being consequences in the face of increasing insecurity. For the whole sample of workers, job insecurity reduces the probability of reporting an 8 on the job satisfaction scale by 3.3%.

6.3.2: Results from LIML Estimation Method

The LIML estimator is classified as a Limited Information Method where the equations in the simultaneous equations model are estimated individually. This method is conceptually less cumbersome than the FIML method (Greene, 2002). Moreover, any specification error is isolated to individual equations where it cannot perpetuate throughout the entire model (Gujarati, 2009). The LIML results are presented in Table 6.3.3.

Table 6.3.3: LIML Results from Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
Job Insecurity *(ordered scale 1-4)*	-1.087* [-1.78]	-2.530 [-1.16]	-0.965 [-1.63]
Ln(income)	0.413 [1.99]	0.353 [0.53]	0.429* [1.72]
Gender	-0.055 [-0.31]	0.325 [0.79]	-0.333* [-1.68]
Unemployed Last 5 Years	-0.370 [-0.83]	1.035 [0.66]	-0.504 [-1.11]
Work Week Hours 20-29	Reference Group		
Work Week Hours 0-9	-0.886 [-1.58]	-3.009 [-0.91]	-0.237 [-0.42]
Work Week Hours 10-19	-0.228 [-0.72]	0.136 [0.22]	-0.568 [-1.21]
Work Week Hours 30-39	-0.628** [-2.60]	-0.785 [-1.22]	-0.512* [-1.65]
Work Week Hours 40-49	-0.732** [-2.94]	-1.842 [-1.53]	-0.466 [-1.51]
Work Week Hours 50+	-0.449 [-1.43]	-1.468 [-0.98]	-0.274 [-0.72]
Education Tertiary	Reference Group		
Education Less Secondary	0.369 [0.90]	1.578 [1.02]	0.267 [0.62]
Education Lower Secondary	-0.056 [-0.21]	-0.017 [-0.02]	-0.130 [-0.39]
Education Upper Secondary	0.096 [0.45]	0.242 [0.44]	0.185 [0.67]
Education Non-tertiary	0.058 [0.24]	0.056 [0.09]	0.177 [0.63]
Education Post Grad	0.061 [0.27]	0.951 [1.23]	-0.293 [-0.87]

Table 6.3.3 cont.: LIML Results from Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
Contract None	Reference Group		
Contract Unlimited	-0.926** [-2.76]	-1.012 [-1.37]	-0.969** [-2.51]
Contract Limited	0.138 [0.48]	1.058 [1.29]	-0.386 [-0.95]
Establishment Size Under 10	Reference Group		
Establishment Size 10-24	0.305 [1.39]	0.610 [0.91]	0.003 [0.01]
Establishment Size 25-99	0.360 [1.64]	1.254* [1.89]	0.053 [0.20]
Establishment Size 100-499	0.021 [0.07]	-0.331 [-0.43]	0.201 [0.66]
Establishment Size 500+	0.521* [1.95]	0.949 [1.55]	0.510 [1.33]
Marital Status Married	Reference Group		
Marital Status Civil Union	0.137 [0.20]	omitted	-0.353 [-0.55]
Marital Status Separated	0.384 [0.87]	0.207 [0.20]	0.540 [1.15]
Marital Status Divorced	0.267 [0.63]	0.840 [0.81]	0.032 [0.05]
Marital Status Widowed	0.678 [1.10]	0.845 [1.10]	0.296 [0.24]
Marital Status Never	0.306 [1.54]	0.783 [0.90]	0.358* [1.65]
Marital Status Annulled	0.203 [0.14]	omitted	-0.070 [-0.05]
Health Status Good	Reference Group		
Health Status Fair	-0.276 [-1.01]	0.097 [0.11]	-0.208 [-0.69]
Health Status Bad	-0.951 [-1.03]	-0.076 [-0.05]	-1.951* [-1.72]
Health Status Very Bad	-1.808*** [-3.45)	omitted	-2.401*** [-4.44]

Table 6.2.3 cont.: LIML Results from Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
Age 20-29	Reference Group		
Age 15-19	0.646 [0.51]	omitted	0.221 [0.18]
Age 30-39	0.215 [1.01]	-0.585 [-0.72]	0.489* [1.88]
Age 40-49	0.338 [1.29]	0.370 [0.58]	0.305 [0.92]
Age 50-59	0.544* [1.88]	0.403 [0.48]	0.320 [0.98]
Age 60-69	0.692 [1.63]	0.964 [1.21]	0.345 [0.54]
Age 70-79	1.654 [1.54]	7.264 [1.22]	0.706 [0.65]
Age 80-89	1.072 [1.23]	omitted	0.977 [1.15]
Union No	Reference Group		
Union Currently	-0.192 [-0.87]	-0.884 [-1.03]	0.217 [0.81]
Union Previously	0.201 [0.64]	0.859 [0.70]	0.254 [0.64]
_constant	6.230	-2.865 [-0.60]	1.093 [0.44]

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Note: Z-statistics displayed in brackets under estimated coefficients

Full Sample	**Public Sector Sample**	**Private Sector Sample**
Wald $\chi^2(38) = 461.03$	Wald $\chi^2(33) = 39.66$	Wald $\chi^2(38) = 560.10$
Prob > chi2 = 0.000	Prob > chi2= 0.1972	Prob > chi2 = 0.000
Obs = 711	Obs = 264	Obs = 447
R^2 = 0.0769	R^2 = -	R^2 = .1808

Under the LIML estimator many well documented determinants of job satisfaction do not display statistically significant coefficients. This is particularly apparent for the public sector sample.

Job insecurity is a significant determinant of job satisfaction only for the whole sample of workers at the 10% significance level. Job insecurity does not statistically influence the job satisfaction pf public and private sector workers. However, with a Z-statistic equal to 1.63 job insecurity for private sector workers falls just shy of the 10% significance threshold and therefore should not be disregarded entirely. Artz and Kaya (2014) similarly found an insignificant relationship between job insecurity and job satisfaction of public sector workers. These findings could suggest why other Limited Information Methods such as the Two Stage Least Squares (2SLS) estimator and the general instrumental variables (IV) estimator dominate the job satisfaction literature (McCausland *et al.,* 2005; Theodossiou and Vasileiou and 2007; Artz and Kaya, 2014).

6.3.3: Comparison of FIML and LIML Results

The FIML and LIML estimators are used to account for the inherent endogenous nature in the job insecurity variable. There are advantages and disadvantages to both estimators. Most notably the FIML estimator is more efficient than the LIML estimator and it preserves the simultaneous nature of the model by estimating all equations simultaneously (Greene, 2002). However, this method is computationally challenging and can lead to nonlinearities in the parameters (Greene, 2002). Alternatively, LIML is an estimator described as less efficient but computationally much simpler because each equation is estimated individually in the model (Rivers and Vuong, 1998). Due to the differences in these estimators it is expected that varying magnitudes are observed for the job satisfaction – job insecurity relationship.

Most notably the FIML estimates show job insecurity is a statistically significant depressant of job satisfaction for all samples of workers. Conversely, the LIML estimator produces job insecurity estimates that are only significant for the whole sample of workers. However, the Z-statistic for private sector workers falls marginally shy of the 10% significance threshold so the negative coefficient cannot be completely disregarded.

The FIML estimator used in this study accounts for the ordered nature of both the job satisfaction and job insecurity variables by using a technique outlined in

Sajaia (2008). The LIML estimator is similar to the Two-Stage Least Squares estimator in that both the job satisfaction and job insecurity equations are estimated by OLS and therefore the variables are treated as cardinal. Differences among the magnitudes and statistical significances in the FIML estimates and the LIML estimates suggest a need to use an additional estimator to provide a comprehensive analysis. The LIML method has the same asymptotic distribution as the 2SLS method while the latter does not rely on the assumption of normality (Greene, 2002). This raises the question as to why researchers would ever choose the LIML method given the availability of a more robust and computationally simpler alternative (Greene, 2002). An extension of the 2SLS estimator is used in this thesis which is called the Two-Stage Ordered Probit Least Squares (2SOPLS) estimator. This is a limited information method that preserves the ordered nature of the job insecurity variable but does not impose the distributional assumption of normality.

6.3.4: Results from the Two-Stage Ordered Probit Least Squares Estimation

The 2SOPLS estimator is classified as a Limited Information Method which accounts for the ordered nature of the variable job insecurity by using the ordered probit model. The predicted values are obtained and included in the estimation of the job satisfaction equation by OLS. The Two-Stage Ordered Probit Least Squares estimation method is used to identify the relationship between job insecurity and job satisfaction for public and private sector workers in Ireland. Results from the first stage ordered probit estimation of the job insecurity equation are included in Appendix H.

Table 6.3.4: 2SOPLS Results from Basic Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
Job Insecurity	-0.431*** (-6.04)	-0.249** (-2.18)	-0.570*** (-5.87)
ln(income)	0.506** (2.80)	0.881** (2.98)	0.460* (1.95)
Gender	-0.142 (-0.89)	0.211 (0.78)	-0.371* (-1.82)
Unemployed Last 5 Years	-0.744** (-3.18)	-0.392 (-0.72)	-0.731** (-2.68)
Education Tertiary	Reference Group		
Education Less Secondary	0.274 (0.80)	0.367 (0.58)	0.269 (0.63)
Education Lower Secondary	-0.120 (-0.45)	0.227 (0.49)	-0.137 (-0.45)
Education Upper Secondary	0.148 (0.73)	0.059 (0.18)	0.263 (0.97)
Education Non-tertiary	0.022 (0.09)	-0.120 (-0.35)	0.201 (0.61)
Education Post Grad	0.065 (0.29)	0.310 (1.02)	-0.225 (-0.68)
Establishment Size Under 10	Reference Group		
Establishment Size 10-24	0.347* (1.68)	0.873** (2.41)	0.014 (0.05)
Establishment Size 25-99	0.342 (1.62)	0.838** (2.30)	0.068 (0.25)
Establishment Size 100-499	0.166 (0.73)	0.267 (0.78)	0.213 (0.68)
Establishment Size 500+	0.597** (2.27)	0.705* (1.91)	0.213 (0.68)

Table 6.3.4: 2SOPLS Results from Basic Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
Marital Status Married	Reference Group		
Marital Status Civil Union	-0.435 (-0.33)	omitted	-0.606 (-0.44)
Marital Status Separated	0.338 (0.89)	0.079 (0.15)	0.485 (0.87)
Marital Status Divorced	0.021 (0.06)	-0.099 (-0.17)	-0.117 (-0.24)
Marital Status Widowed	0.773 (1.52)	0.943 (1.49)	0.274 (0.33)
Marital Status Never	0.227 (1.29)	-0.041 (-0.14)	0.338 (1.50)
Marital Status Annulled	-0.444 (-0.33)	omitted	-0.436 (-0.31)
Age 20-29	Reference Group		
Age 15-19	0.502 (0.46)	omitted	0.121 (0.11)
Age 30-39	0.231 (1.10)	-0.044 (-0.11)	0.415 (1.63)
Age 40-49	0.265 (1.11)	0.342 (0.80)	0.232 (0.77)
Age 50-59	0.577** (2.13)	0.777* (1.66)	0.274 (0.78)
Age 60-69	0.790** (2.03)	1.128* (1.97)	0.404 (0.71)
Age 70-79	1.834 (1.32)	1.230 (0.57)	1.448 (0.76)
Age 80-89	1.950 (1.05)	omitted	1.465 (0.76)
Union No	Reference Group		
Union Currently	-0.028 (-0.16)	-0.191 (-0.68)	0.161 (0.58)
Union Previously	0.153 (0.55)	-0.211 (-0.43)	0.336 (0.95)

Table 6.3.4: 2SOPLS Results from Basic Job Satisfaction Equation

Dependent Variable *Job Satisfaction*	**Whole Sample**	**Public Sector**	**Private Sector**
_cons	3.445* (1.80)	-1.248 (-0.40)	4.443* (1.78)

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Note: t-statistics displayed in parentheses under estimated coefficients

Full Sample	**Public Sector Sample**	**Private Sector Sample**
Obs = 713	Obs = 264	Obs = 449
$F(38, 674) = 3.83$	$F(33, 230) = 1.99$	$F(38, 410) = 2.81$
$Prob > F = 0.000$	$Prob > F = 0.002$	$Prob > F = 0.000$
$R^2 = 0.1176$	$R^2 = 0.2218$	$R^2 = 0.2066$

The results from the 2SOPLS estimator show that job insecurity is a statistically significant determinant of job satisfaction for all samples of workers in Ireland. The statistical significances are similar to those produced by the FIML estimator. However, the marginal effects of the FIML estimator show that job insecurity decreased job satisfaction to a greater extend for public sector workers. Conversely, the coefficients produced by the 2SOPLS estimator show that job insecurity decreases job satisfaction to a greater extent for private sector workers. Because the second stage job satisfaction equation is estimated by OLS the magnitude of the coefficients can be interpreted without the aid of marginal effects. The coefficient for public sector workers is -.249 and for private sector workers is -.570. The larger coefficient for private sector workers indicates a larger reduction in job satisfaction with increasing job insecurity. This finding is consistent with the results from the LIML estimator, the ordered probit estimation of the basic job satisfaction equation in the previous chapter and the sample selection corrected estimates produced by the Two-Step Heckman Probit OLS estimator in Section 6.3.1. The LIML estimator, 2SOPLS estimator and Two-Step Heckman Probit OLS estimator are all three limited information methods which produce similar estimates and subsequent inferences. Job insecurity decreases the well-being of private sector

workers more severely than public sector workers. It is important to note that job insecurity still decreases the well-being of public sector workers.

6.4: Post-Estimation Diagnostics

Tests were performed for model specification on the models estimated by the FIML, LIML and 2SOPLS estimators.

Full Information Maximum Likelihood

The significance of each of the variables is assessed using Z-statistics and their associated p-values. The Wald Test shows that the models are statistically significant and rejects the null hypothesis that all coefficients jointly equal zero. This indicates that the included variables adequately explain the dependent variable job satisfaction. Robust standard errors are used to correct for potential heteroscedasticity.

The hypothesis that the cut-offs are jointly equal to zero is tested. The null hypothesis is rejected in all cases showing that the cut-offs are not equal to each other.

A RESET test is used for model specification. This tests for problems in the functional form (Godefy, 1988). This is particularly important for the FIML estimation method because as explained in Gujarati (2009) if there is a specification error in any of the equations in the system, that error is transmitted throughout the system. The RESET statistics are presented in Table 6.4.1.

Table 6.4.1: RESET Test of Model Specification – FIML Estimator

H_0: Model is correctly specified **H_1: Model is not correctly specified**			
	Whole Sample	Public Sector	Private Sector
Chi^2	1.90	0.41	0.28
RESET Test Prob > Chi^2	0.1677	0.5197	0.5999

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

All three samples display statistically insignificant Chi^2 statistics indicating that the null hypothesis of correct specification cannot be rejected.

Limited Information Maximum Likelihood

The significance of each of the variables is assessed using Z-statistics and their associated p-values. The Wald Test shows that the models for the whole sample and private sector subsample are statistically significant and rejects the null hypothesis that all coefficients equal zero. The Chi-squared statistic is not statistically significant for the public sector subsample and therefore the null hypothesis that all coefficients simultaneously equal zero cannot be rejected. Robust standard errors are used to correct for potential heteroscedasticity.

The results from a RESET model specification test are displayed in Table 6.4.2.

Table 6.4.2: RESET Test of Model Specification – LIML Estimator

H_0: Model is correctly specified **H_1: Model is not correctly specified**			
	Whole Sample	Public Sector	Private Sector
Chi^2	0.25	0.02	0.28
RESET Test Prob > Chi^2	0.6146	0.8905	0.5957

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

All three samples display statistically insignificant Chi-squared statistics indicating that the null hypothesis of correct specification cannot be rejected.

Two-Stage Ordered Probit Least Squares

The significance of each of the variables is assessed using *t*-statistics and their associated p-values. The F-test shows that all three models are statistically significant which rejects the null hypothesis that the coefficients jointly equal zero. Robust standard errors are used to correct for potential heteroscedasticity. The R^2 statistics show that for the whole sample of workers 11.76% percent of the variation in job satisfaction is explained by the model. The R^2 statistics for the public and private sector subsamples explain 22.18% and 20.66% of the job satisfaction variation respectively.

The results from a RESET model specification test are displayed in Table 6.4.3

Table 6.4.3: RESET Test of Model Specification – 2SOPLS Estimator

H_0: Model is correctly specified **H_1: Model is not correctly specified**			
	Whole Sample	Public Sector	Private Sector
Chi^2	5.47	2.98	2.52
RESET Test Prob > Chi^2	0.0193	0.0842	0.1122

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

The RESET test shows that for the whole sample and the public sector subsample the Chi-squared statistics reject the null hypothesis of correct model specification. The Chi-squared statistic is not significant for the private sector subsample.

6.5: Conclusion

This chapter presents an empirical study of the effect of job insecurity on job satisfaction of public and private sector workers in Ireland while accounting for potential sample selection and endogeneity bias. Any instance where a choice variable is placed on the right-hand-side of a regression equation whereby an association to a specified outcome is examined, endogeneity is likely to occur (Chenhall and Moers, 2007). Therefore, the incidence where workers select into public employment must be accounted for by treating the variable as endogenous (Zhang, 2004).

Non-random selection into public sector employment is accounted for by using the Two-Step Heckman Probit OLS estimation method. A correction term called the Inverse Mills Ratio is calculated from the residuals produced in the first stage estimation of a public sector selection equation. The Inverse Mills Ratio is then included in the second stage estimation of the job satisfaction equation. The coefficient of the inverse mills ratio is negative and statistically significant for the public sector subsample. This means that selection bias exists and that people who select into public sector employment tend to report lower levels of job satisfaction than those who are randomly allocated to it. With the inclusion of the Inverse Mills Ratio job insecurity is an insignificant determinant of job satisfaction for public sector workers. Selection bias is not present in the estimation of the private sector job satisfaction equation as exhibited by an insignificant Inverse Mills Ratio. Subsequently, the coefficient on the job insecurity variable remains negative and statistically significant at the 5% level for private sector workers only. These findings are similar to those in Luechinger *et al.* (2010a) and the basic ordered probit results in Artz and Kaya (2014).

This section also displays the estimated results corrected for endogeneity bias resulting from simultaneity between a dependent and independent variable (Wooldridge, 2010). It is acknowledged that not only is job insecurity a determinant of job satisfaction but the reverse may also be true, that job satisfaction is a determinant of job insecurity (Theodossiou and Vasileiou, 2007). A consequence of this simultaneous relationship is that the explanatory variable job insecurity contemporaneously correlates with the error term. Endogeneity bias is accounted for

by using three estimation methods: the Full Information Maximum Likelihood (FIML), the Limited Information Maximum Likelihood (LIML) and the Two-Stage Ordered Probit Least Squares (2SOPLS).

Results shows that when the simultaneous equations model is estimated by the FIML method, job insecurity significantly decreases job satisfaction for all sample of workers. Estimated marginal effects suggest that this relationship is greater for public sector workers. This is similar to the results in Artz and Kaya (2014) that are not corrected for endogeneity bias where public sector union workers display the greatest reduction in job satisfaction with increasing job insecurity. Results from the LIML estimation of the simultaneous equations model show job insecurity is a significant determinant of job satisfaction for the whole sample of workers only. The coefficients for the public and private sector subsamples do not display statistical significance at any conventional level. However, the Z-statistic for private sector workers is marginally shy of the 10% significance threshold and therefore the potential for an existing relationship cannot be disregarded.

The 2SOPLS estimator is selected as a compromise between the FIML and LIML estimators where its estimates are the primarily estimates used to explain an endogenous free relationship between job satisfaction and job insecurity in this thesis. The 2SOPLS is selected as an additional estimator to provide a more comprehensive analysis. The 2SOPLS results suggest that job insecurity reduces job satisfaction of all samples of workers. Moreover, job insecurity is a depressant of job satisfaction for both public and private sector workers. This relationship is greatest for private sector workers in accordance with the literature Luechinger *et al.* (2010a) and Artz and Kaya (2014). This finding is similarly found in this thesis in the ordered probit estimation of the basic job satisfaction equation and the selection-corrected estimates produced by the Two-Step Heckman Probit OLS estimation method.

From a policy perspective the results of this chapter address the need to understand causality between job satisfaction and job insecurity. Without a clear understanding of causality, well-being policy recommendations become difficult at best (Helliwell, 2003). Unless the causal chain does indeed run from the activity (job insecurity) to well-being (job satisfaction) any policy change may not have intended

effects (Helliwell, 2003). This is particularly important in the Irish context with regards to evaluating austerity policies that were aimed at restructuring the public sector during the economic recession. The results of this chapter support the NESC's reasoning for adopting a well-being approach in monitoring policy implementation and outcome.

CHAPTER 7
CONCLUSION

This chapter sets out the aim of this thesis and how the overall research is presented. This thesis contributes to the well-being literature focusing on inherent differences in public and private sector employment and by using advanced econometric estimation methods. This thesis identifies well-being implications of heightened economic insecurity in order to address the recent recessionary debate of "who suffered more?" To date this has not been done using Irish data. Therefore, the results are valuable to the Government and policy makers in Ireland concerned with the well-being of its citizens particularly in a time of economic uncertainty.

7.1: Chapter Summary

The first Chapter outlines the aim and rationale of this thesis followed by a review of the data and estimation techniques used. Major contributions of this research are explained.

The main aim of this thesis is to examine the effect of economic insecurity on the subjective well-being of public and private sector workers in Ireland. The rationale stems from the work of Luechinger *et al.* (2010a) that identifies various well-being consequences of economic insecurity for public and private sector workers using German panel data. This result is attributed to the institution of public sector employment which is made up of stricter dismissal practices (Luechinger *et al.*, 2010a) and less volatile employment (Freeman, 1987) where workers are subsequently less likely to be affected by business cycle downturns (Clark and Postal-Vinay, 2009). This thesis conducts a similar study for the Irish context in the recent economic recession.

Economic insecurity is defined as the anxiety produced by perceived economic threat or the anticipatory feelings that are evoked by potential future hazards, specifically potential job loss (Luechinger *et al.*, 2010a). The primary measure of economic insecurity is self-perceived job insecurity and a secondary measure is regional unemployment rates in Ireland. Subjective well-being is defined

as all the various types of evaluations, both positive and negative, that people make of their own lives (Diener, 2006). Subjective well-being is measured by a general life satisfaction measure and a specific job satisfaction measure with the latter capturing well-being from work which is considered more applicable when identifying feelings towards potential job loss.

In this research non-random selection into public sector employment is corrected for which would otherwise lead to biased and inconsistent estimators (Gujarati, 2009). The issue of selection bias is addressed by using the Two-Step Heckman Probit OLS estimation method. Potential endogeneity of job insecurity is also accounted for. This follows the rationale put forward by Theodossiou and Vasileiou (2007) and McCausland *et al.* (2005) that a possible reciprocal relationship exists between job satisfaction and job insecurity. It is typically assumed that causality runs from job insecurity to job satisfaction but it is also plausible that individuals who are dissatisfied with their jobs are more likely to be released from employment (Theodossiou and Vasileiou, 2007). This is a form of simultaneity bias which is an instigator of endogeneity bias and if not corrected for produces biased and inconsistent estimators (Wooldridge, 2010).

This research contributes to the literature in the area of what variables influence one's subjective well-being with a particular focus on employment related well-being in Ireland. Another contribution is the analysis into effects of economic insecurity on the subjective well-being of public and private sector workers while focusing on the theoretical and econometric issues. Explicit emphasis is made to not uniformly categorizing workers in well-being research due to potential differences among sectoral workers. This is especially apparent when studying the effects of economic insecurity measures.

Chapter 2 reviews previous literature on the relationship between economic insecurity and subjective well-being. A detailed review is conducted on the various definitions and measures of subjective well-being. A list of common subjective well-being determinants are discussed. A particular focus is made on the literature that identifies subjective well-being differences of public and private sector workers (Artz and Kaya, 2014; Luechinger *et al.,* 2010a). The issue of including interaction terms in nonlinear models is also addressed. This is done by comparing the

calculations of interaction effects in linear models to those in nonlinear models outlined by Norton *et al.* (2004). This chapter reviews the econometric issue of selection bias and the literature that addresses the propensity to select into public sector employment. Lastly, the econometric issues of endogeneity bias are addressed where the estimation methods Limited Information and Full Information are compared.

Chapter 3 describes the European Social Survey which is used in this study. The objectives of the ESS, funding streams, and composition of the questionnaire are all discussed. Variables used in this study come from individual responses to the ESS questionnaire from Round 5 (2010) and Round 6 (2012). Detailed descriptions are provided for the dependent variables life satisfaction and job satisfaction. Individual, socioeconomic and work-specific explanatory variables are described with accompanying descriptive statistics such as standard deviations and mean values.

Chapter 4 presents a study of the effect of economic insecurity on subjective well-being in Ireland. This effect is further identified for public and private sector workers. Subjective well-being is approximated by the indicator life satisfaction. Economic insecurity is approximated by two indicators regional unemployment rates and self-perceived job insecurity. Similar studies that use data for other countries are reviwed. The life satisfaction equation is estimated by an ordered probit model in order to preserve the inherent ordered nature of the dependent variable (Borooah, 2002). An interaction term is included which is the product of the economic insecurity indicator and a dummy variable that captures individuals who work in the public sector. This estimation allows for the identification of the effect of economic insecurity on subjective well-being when the condition of public sector employment is satisfied (Luechinger *et al.*, 2010a; Studenmund, 2006). Results show that any inferences drawn from the variable regional unemployment rates are inconclusive due to the possibility of capturing unintended individual comparisons. However the results from the economic insecurity variable job insecurity are in accordance with economic theory and literature. Job insecurity negatively impacts the life satisfaction of public sector workers to a lesser degree than private sector workers. It is important to note that job insecurity still negatively impacts the life satisfaction of public sector workers.

Chapter 5 considerers the effect of job insecurity on the subjective well-being indicator job satisfaction for public and private sector workers in Ireland. Following many subjective well-being studies the job satisfaction equations are estimated for a public sector and private sector subsample of workers instead of including an interaction term. Marginal effects are used to make inferential comparisons between sectoral workers. The ordered probit model is used to estimate these equations in order to preserve the inherent ordered nature of the dependent variable. The dependent variable changes from life satisfaction used in the previous chapter to job satisfaction in this chapter due to its common alignment in the literature to job insecurity measures. The results show that in general job insecurity depresses job satisfaction. Moreover, this relationship is stronger for private sector workers.

Other statistical determinants of job satisfaction emerge that are supported by the subjective well-being literature. Income appears as one of the most consistently positive determinants of job satisfaction. In general the hours of work variables display a negative relationship to job satisfaction however the significance of the coefficients vary across the samples of workers and the specification of the job satisfaction equation.

The lasting effects of becoming personally unemployed are observed in the ordered probit estimation of both the basic job satisfaction equation and extended job satisfaction equation. Clark and Oswald (1994) have extensively identified the lasting well-being consequences of personal unemployment. The results of Chapter 5 show that individuals who have become personally unemployed within the past 5 years report significantly lower well-being scores. The ordered probit results of the basic job satisfaction equation show that becoming personally unemployed reduces the probability of reporting high life satisfaction by 3.5% for the whole sample of workers.

A surprising relationship to emerge from the ordered probit estimation of the extended job satisfaction equation is for the variable balance of family to work life. This too is a satisfaction measure. It is shown that satisfaction with the balance of family to work life is a strong predictor of job satisfaction. All balance scores that were less than the highest score of 10 consistently reduced individual job satisfaction.

Chapter 6 presents an empirical study of effects of economic insecurity on the job satisfaction of public and private sector workers while accounting for potential sample selection bias. A Heckman Probit OLS estimation method is used to correct for the non-random selection into sectoral employment. The results show that selection bias exists and that people who self-select into public sector employment tend to report lower levels of job satisfaction than those who are randomly allocated to it.

Endogeneity bias is also addressed based on the possibility of an inherent simultaneous relationship between job satisfaction and job insecurity. In an attempt to preserve as much of the ordered nature of both the dependent variable job satisfaction and the independent variable job insecurity extensions of traditional Full Information Methods and Limited Information Methods are used in the estimation of this simultaneous equations model. The results display the importance of selecting a variety of estimation techniques as the inferences based on the relationship between job satisfaction and job insecurity for sectoral workers are subject to whether a Full Information or a Limited Information estimation method was used in the correction of endogeneity bias.

7.2: Empirical Results

The most common finding of this research is that economic insecurity reduces the subjective well-being of both public and private sector workers in Ireland. However, this relationship is stronger for private sector workers. Higher well-being scores among public sector workers suggests the institution of public sector employment persisted and was able to mitigate some of the adverse well-being consequences of heightened economic insecurity caused by the recent recession.

Estimating the effect of the interaction term consisting of the product of regional unemployment rates and a public sector dummy variable ($UR \times Sector$) on life satisfaction yields inconclusive findings. The relationship is positive and statistically significant which is attributed to the primary relationship between regional unemployment rates and life satisfaction before it is included in an interaction term. A possible explanation for this finding lies in the possibility of unintentionally captured individual comparison effects (Luechinger *et al.*, 2010a). In

other words despite increasing economic insecurity measured as unemployment rates, the well-being of Irish individuals also increased due to comparisons being made to others' economic situations. For example, a sense of gratitude towards having any job could be an intervening effect especially considering the sample used in this research is limited to only those in employment.

The relationship between the interaction term consisting of the product of self-perceived job insecurity and a public sector dummy variable ($I \times Sector$) displays a relationship in accordance with the literature and economic theory. When job insecurity is interacted with the public sector dummy variable a positive and statistically significant relationship emerges. Luechinger *et al*. (2010a) state that a positive coefficient on this interaction term indicates that job insecurity depresses the well-being of public sector workers to a lesser degree than private sector workers. This is based on the fact that job insecurity exhibits an inherent negative relationship to life satisfaction before it is included in an interaction term. Economic insecurity, as approximated by job insecurity, more adversely impacts the well-being of private sector workers than public sector workers. This finding is consistent with that of Artz and Kaya (2014) and Luechinger *et al.*, (2010a). Using the corrective analysis outlined in Norton *et al.* (2004) the interaction effects of a binomial probit model produce the same robust inferences as the uncorrected interaction effects from the ordered probit model.

Identifying the effect of job insecurity on the job satisfaction of public and private sector workers yields similar well-being conclusions. The findings show job insecurity depresses overall self-reported job satisfaction which is similar to findings of previous studies (Artz and Kaya, 2014; Blanchflower and Oswald, 1999; Geishecker, 2010, 2012; Origo and Pagani, 2008, 2009; Theodossiou and Vasileiou, 2007; Sousa-Poza and Sousa-Poza, 2000). This relationship exists for the whole sample of workers and the private sector subsample of workers. Any observed relationship between job insecurity and job satisfaction for public sector workers disappears with the inclusion of a vector of job-specific characteristics in an ordered probit estimation of an extended job satisfaction equation. While the estimation of a basic job satisfaction equation displays a significantly negative relationship for both public and private sector workers, the marginal effects show this negative relationship is stronger for private sector workers. This is similarly supported by

Luechinger *et al.* (2010a) and Artz and Kaya (2014) which suggests that on average public sector workers are traditionally less affected by business cycles and economic downturns (Clark and Postal-Vinay, 2009).

Taking into account the possibility of non-random selection into public sector employment, a Two-Step Heckman Probit OLS estimation method is used. The analysis is similar to Clark (1997) who similarly corrects for selection bias in a study of job satisfaction and selection into employment status. In the first step a selection equation is estimated that determines the propensity to select into public sector employment. In this equation Irish national citizenship is included as an additional exogenous independent variable that helps determine the individual's selection but is excluded from the structural job satisfaction equation (McCuasland *et al.*, 2005; Luechinger *et al.*, 2010b). This additional variable displays a statistically positive coefficient indicating that being an Irish national citizen increases the probability of being a public sector employee.

From the residuals produced in the selection equation, an Inverse Mills Ratio is calculated and included in the estimation of the second step estimation of the job satisfaction equation. This is the outcome equation and is estimated by OLS similar to Clark (1997). The results show that the coefficient of the Inverse Mills Ratio is negative and statistically significant for the public sector subsample. This means that sample selection bias exists and that individuals who select into public sector employment tend to report lower levels of job satisfaction than those who are randomly allocated to it. A similar finding is reported in Luechinger *et al.* (2010b). With the inclusion of the Inverse Mills Ratio which is a sample selection correction term, job insecurity becomes an insignificant determinant of job satisfaction for public sector workers.

It is commonly assumed in the job satisfaction literature that perceived risk of job loss affects workers' job satisfaction, however, it may also be the case that dissatisfied workers face an increased risk of losing their jobs (Theodossiou and Vasileiou, 2007). This inherent simultaneous relationship is addressed as a potential instigator of endogeneity bias that if not correct for can produce biased and inconsistent estimators. A Full Information Method and two Limited Information Methods are used to correct for the endogeneity present in the job insecurity

variable. The selected Full Information Method is the Full Information Maximum Likelihood estimator (FIML) that is adapted to estimate a bivariate ordered probit model which accounts for the ordered nature in both the dependent variable job satisfaction and the independent variable job insecurity. An adaption to a Limited Information Method is also employed whereby the Two-Stage Ordered Probit Least Squares (2SOPLS) estimator is used to account for endogeneity in the job insecurity variable. This method similarly accounts for the ordered nature of the job insecurity variable, however, treats job satisfaction as continuous. This method is also employed in Daregot *et al.* (2013).

The results for all estimation methods are presented in the following Table.

Table 7.2.1: Coefficients by Estimation Method

	Ordered Probit Estimation of Basic Job Satisfaction Equation Uncorrected for Endogeneity	FIML Both Job Satisfaction and Job Insecurity Treated as Ordered	LIML Both Job Satisfaction and Job Insecurity Treated as Continuous	2SOPLS Job Insecurity Treated as Ordered and Job Satisfaction as Continuous
Whole Sample	-0.242***	-0.518**	-1.087*	-0.431***
Public Sector	-0.172**	-0.665***	-2.530	-0.249**
Private Sector	-0.306***	-0.530**	-0.965	-0.570***

*** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level.

Overall it is clear that job insecurity depresses individual job satisfaction for all workers. Job insecurity identifies a statistically negative relationship for public and private sector workers. The marginal effects of the FIML estimates explained in Chapter 6 show that job insecurity negatively impacts the job satisfaction of public sector workers to a greater extent than private sector workers. This is the only finding of its kind in this research and supports the need to not rely on one estimation method when correcting for endogeneity bias. This is similar to Artz and Kaya (2014) when they interact public sector employment with union membership. Workers in the public sector typically have higher expectations of job security and will respond more negatively to perceived job insecurity (Artz and Kaya, 2014). However, the two Limited Information Methods show that job insecurity tends to negatively impact the job satisfaction of private sector workers to a greater extent. This again suggests that the institution of public sector employment held in the context of well-being protection against insecurity caused by the economic recession. All of these conclusions are drawn from endogeneity corrected estimates.

In a comparison between the 2SOPLS results and the ordered probit results of the basic job satisfaction equation presented in Chapter 5, the endogeneity-corrected 2SOPLS estimates are 30-50% larger than the estimates not corrected for endogeneity bias. A similar finding is presented in Geishecker (2010, 2012).

7.3: Policy Implications

Well-being Matters: A Social Report for Ireland (NESC, 2009) states that well-being relates to a person's physical, social and mental states. It requires that when primary basic needs are met, people have a sense of purpose, that they are able to achieve personal goals, are able to actively participate in society, and ultimately live the lives they value. Moreover, it is the role of public policy to bring about conditions that place individuals and their well-being at the centre of policy development and delivery by assessing risk and ensuring support systems are in place (NESC, 2009). There is a growing need to identify measures of individual well-being in conjunction with income-based measures to provide a comprehensive picture of social progress and national well-being (New Economics Foundation, 2009). In order to obtain an appropriate understanding of the consequences of the

recent economic recession in Ireland, a well-being approach must be adopted when addressing social progress. A well-being approach lies in the questions being asked (Diener and Seligman, 2004). The question asked throughout this research is *does economic insecurity influence well-being?* The innovation of undertaking this well-being research lies in the acknowledgment that policies at the organizational, corporate and government levels should be centred on issues related to well-being but more specifically individual subjective well-being evaluations (Diener and Seligman, 2004).

This thesis builds on the core well-being question by identifying different well-being effects for public and private sector workers in Ireland. An economic crisis like the one experienced in Ireland increased insecurity particularly with regards to fears of potential job loss (ESS, 2013). As a result of many austerity policies, workers in the public sector for first time faced worsening perceptions of job security (Artz and Kaya, 2014; Theodossiou and Vaseliou, 2007). However, in general this thesis finds that job insecurity reduces the subjective well-being of private sector workers to a greater extent than public sector workers in Ireland. This supports the conclusion in Luechinger *et al.* (2010a) that the institution of public sector employment traditionally protects workers against economic downturns and fears of potential job loss. This thesis uses a global measure of job satisfaction which may be useful for policy makers who are interested in satisfaction of certain segments of the labour force such as sectoral employees (Scarpello and Campbell, 1983)

The results also show that any observed relationship between job satisfaction and job insecurity statistically disappears for public sector workers once econometric issues such as sample selection bias and endogeneity bias are corrected for. It is shown that a probable instigator of endogeneity bias is the inherent simultaneous relationship between job satisfaction and job insecurity. Without a clear understanding of causality, well-being policy recommendations become difficult at best (Helliwell, 2003). Unless the causal chain does indeed run from the activity (job insecurity) to well-being (job satisfaction) any policy change may not have intended effects (Helliwell, 2003). Therefore, confidence intervals at the 95% significance level are constructed from the estimation of an endogenous-free relationship between

job satisfaction and job insecurity for sectoral workers. These are presented in Table 7.3.1.

Table 7.3.1: 95% Confidence Intervals Showing True Estimate of Job Insecurity for Sectoral Workers

95% Confidence Intervals of the True Estimate of Job Insecurity						
Job Insecurity of categories of workers:	**Ordered Probit Estimation**		**FIML Estimation**		**2SOPLS Estimation**	
Whole Sample	-.321	-.162	-.747	-.290	-.571	-.291
Public Sector	-.307	-.035	-.922	-.409	-.475	-.024
Private Sector	-.413	-.200	-.872	-.188	-.762	-.379

Source: Authors own

Note: Confidence intervals are also provided for estimates produced by the ordered probit estimation of the basic job satisfaction equation that have not been corrected for endogeneity bias.

The 2SOPLS confidence intervals show that it can be stated with 95% certainty that the true estimates of job insecurity lie between -.571 and -.291 for the whole sample, -.475 and -.024 for the public sector subsample and -.762 and -.379 for the private sector subsample. It is important the confidence intervals do not cross zero. This means that it can be stated with 95% certainty that the true value of job insecurity does not equal zero.

Job satisfaction research has major human resource management implications. Subjective perceptions of risk of job loss and job satisfaction can have motivational effects for the workforce which in turn have consequences for productivity, efficiency wages and employment (Theodossiou and Vasileiou, 2007). Therefore, the issue of perceived risk of job loss and its effects on job satisfaction are important for policy makers as low job satisfaction can imply lower productivity (Wright *et al.*, 2002; Theodossiou and Vasileiou, 2007).

Productivity implications are particularly important for Ireland where austerity policies were put in place in order to aid economic recovery through widespread public sector reforms aimed at increasing efficiency. For example, the Croke Park Agreement (2010) was an agreement between the Government and public sector institutions agreeing that public sector reforms would contribute to the return of economic growth in Ireland. This would be achieved by increasing efficiency, flexibility and redeployment aimed at reducing costs and headcount (Department of Public Expenditure & Reform, 2012). As a part of a multifaceted policy evaluation well-being outcomes must be considered especially when policies target subsamples of individuals.

It is recommended that a well-being approach to policy evaluation take particular notice of the importance of economic insecurity. Speaking as part of the Edward Phelan Lecture in Dublin in February 2015, President Higgins said that "large swaths of the active [Irish] population are finding themselves in chronic job insecurity" (Hade, 2015). He goes on to explain that responding to the needs and fears of these citizens who do not enjoy security is a high challenge; a task not just for those who claim to represent the most vulnerable in society (Wall, 2015).

7.4: Further Research

The European Social Survey is a cross-sectional survey which consists of a number of observations drawn on the same point in time (Greene, 2000). A cross-sectional study is one in which exposure and outcomes are determined simultaneously for each subject (Carlson and Morrison, 2009). They argue that cross-sectional studies are appropriate for screening hypotheses because they require relatively shorter time commitments and fewer resources but they also have their limitations. These limitations are three fold. First, because of cross-sectional study design, a researcher may determine that there is a relationship between exposure and outcome but there is generally no evidence to suggest that that exposure causes the outcome. Second, a cross-sectional study evaluates prevalent rather than incident outcomes. In other words, people who develop the outcome but die before the study is conducted are not included. This inherently measures the relationship between exposure and *having* the outcome as opposed to the relationship between exposure

and *developing* the outcome. This is particularly applicable to studies in palliative care services. Lastly, the researcher needs to asses if alternative explanations for study results have been appropriately ruled out. Given these limitations of cross-sectional studies, a possible avenue for future research is to use panel data and associated estimation techniques to test the same economic question as the one presented in this thesis. Using panel data will allow for the estimation of individual fixed effects such as personality traits which will help isolate any observed relationship between subjective well-being and the explanatory variable of interest (Ferrer-i-Carbonell and Frijters, 2004).

A second avenue for further research lies in acknowledging endogeneity bias in job satisfaction literature. The presence of endogeneity bias is relatively new to the job satisfaction literature (Origo and Pagani, 2008, 2009). The studies that do acknowledge endogeneity bias are in their infancy and rely on basic instrumental variables techniques. Subjective well-being literature as a whole would benefit from greater detailed analyses into reverse causality and endogeneity bias through the application of more sophisticated methodologies (Diener *et al.*, 1999).

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Appendix A: Glossary of Terms

Benthiam Utility: A continuous flow of pleasure or pain, positive or negative affect (Kahneman and Kruger, 2006; Kahneman *et al.,* 1997).

Biased Estimator: A statistical property where the operational estimates are not equally dispersed around the conceptual or true estimator (β_1) when a large (infinite) number of estimates are made (Chenhall and Moers, 2007).

Bivariate Ordered Probit Model: The model used to estimate the joint probability distribution of two ordered categorical variables (Sajaia, 2008).

Durbin-Wu-Hausman (DWH) Test: A test for endogeneity that involves fitting the model by OLS and IV approaches and comparing the resulting coefficient vectors (Baum *et al.,* 2003). This test compares the use of IV estimation against the loss of efficiency compared to if OLS estimation had been employed (Baum *et al.,* 2003).

Economic Insecurity: The anxiety produced by perceived economic threat or the anticipatory feelings that are evoked by potential future hazards, specifically potential job loss (Luechinger *et al.,*2010a). Economic insecurity is approximated by regional unemployment rates and job insecurity. Both are expected to be drivers of these anticipatory feelings.

Endogenous Variable: A variable that is correlated with the error term (Wooldridge, 2010)

Endogeneity: A term used to describe the presence of an endogenous variable (Wooldridge, 2010).

Estimator: is a mathematical technique that is applied to a sample of data to produce real-world numerical estimates of the true population regression coefficient (Studenmund, 2006).

Experienced Utility: Closely matches the notion of happiness defined as the hedonic experiences associated with an outcome (Kahneman and Thaler, 2006). Based on the concept of utility first brought forward by the philosopher Jeremy Bentham.

Full Information Methods: A simultaneous equations model estimation method where all of the equations in the system are estimated simultaneously taking into account all of the restrictions on all equations by the omission or absence of some variables (Gujarati, 2009).

Full Information Maximum Likelihood (FIML): A simultaneous equations model estimation method that estimates the likelihood function for the entire system is maximized by choice of all system parameters and subject to *a priori* identifying restrictions (Intriligator *et al.,* 1996).

Happiness: An indicator of subjective well-being defined as the hedonic experience associated with an outcome (Kahneman and Thaler, 2006). It is thought of as being a relatively short term measurement that varies with situational expressions of mood (Helliwell and Putnam, 2004).

Hausman Test: A test for identifying endogeneity by testing the tests the null hypothesis that the OLS estimator is consistent and fully efficient (Griffiths, *et al.*, 1993) when compared to an IV estimator (Wooldridge, 2013).

Identification: A condition that determines whether numerical estimates of the parameters of a structural equation can be obtained from the estimated reduced-form coefficients for IV estimation methods (Gujarati, 2009).

Inverse Mills Ratio: is a monotone decreasing function of the probability that an observation is selected into the sample (Heckman, 1979). It is the sample selection correction term calculated by the Two-Step Heckman Probit OLS estimation method.

Inconsistent Estimator: A statistical property where the distribution of the estimator $(\hat{\beta}_1)$ is not concentrated on the true value (β_1) (Chenhall and Moers, 2007).

Instrumental Variable: A Variable that is uncorrelated with the error term but is correlated with the endogenous variable in the equation (Maddala, 2001).

Job Insecurity: An individual view as to how likely they are to lose their jobs (Blanchflower and Oswald, 1999).

Job Satisfaction: Derived from industrial psychology as a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences (Locke, 1976).

Life Satisfaction: An all-encompassing global cognitive judgment of one's life and supported as being one of the most frequently used indicators of subjective well-being (Kahneman and Krueger, 2006).

Limited Information Maximum Likelihood (LIML): A simultaneous equations model estimation method based on a single equation under the assumption of normally distributed disturbances (Greene, 2002).

Limited Information Methods: A simultaneous equations model estimation method where each equation in the system is estimated individually taking into account any restrictions placed on that equation without considering the restrictions on the other equations in the system (Gujarati, 2009).

Objective Well-Being: Measures quality of life as the degree to which life meets specified standards as assessed by an outsider (Veenhoven, 2000).

Ordered Probit Model: is based on a latent regression where the dependent variable is ordered (Borooah, 2002; Greene, 2000; Stewart, 2004).

Ordered Response: One kind of multinomial response where the values assigned to it are not arbitrary (Wooldridge, 2010). Ordered data follows a strict ordering based on the value of the underlying latent variable (Hilmer, 2001).

Procedural Utility: People value not only outcomes but also the conditions and processes leading to outcomes (Frey *et al.*,2004). It is assumed that work is not a source of disutility and in fact individuals can derive satisfaction from work (Benz and Frey, 2008).

Quality of Life: The degree to which a life is deemed to be desirable or undesirable (Diener, 2006). Quality of life falls under the umbrella of general well-being along with other concepts.

Reduced Form Equations: are those that express an endogenous variable solely in terms of the predetermined variables and the stochastic disturbances (Gujarati, 2009).

Sample Selection Bias: The results when the selection into a particular category is not random (Heckman, 1979).

Simultaneity: A result of when one or more of the explanatory variables is jointly determined with the dependent variable through an equilibrium mechanism (Wooldridge, 2013).

Simultaneous Equations Model: A model where there is more than one equation for each of the mutually dependent or endogenous variables (Gujarati, 2009).

Structural Equations: characterize the underlying economic theory behind each endogenous variable by expressing it in terms of both endogenous and exogenous variables (Studenmund, 2006).

Subjective Well-Being: Measures quality of life as the various types of evaluations, both positive and negative, that people make of their own lives (Diener, 2006).

Utility: The satisfaction derived from the extent to which an individuals can satisfy preferences given a monetary constraint (Aleskerov *et al.,* 2002; Dolan *et al.*,2008). Preferences are revealed through choices and market behaviour (Kahneman and Thaler, 2006).

Two-Stage Least Squares (2SLS): A simultaneous equations model estimation method of systematically creating instrumental variables to replace the endogenous variables where they appear as explanatory variables in simultaneous equations models (Studenmund, 2006). This is classified as a limited information method.

Two-Stage Ordered Probit Least Squares (2SOPLS): A simultaneous equations model estimation method where reduced-form equation of the binary endogenous variable is estimated by the probit model while the reduced-form equation of the continuous variable is estimated by the OLS estimator (Alvarez and Glasgow, 2000). This is classified as a limited information method.

Two-Step Heckman Probit OLS: An estimation method used to correct for selection bias. This method calculates the Inverse Mills Ratio from a selection equation and includes it as an additional explanatory variable in an outcome equation (Green and Hensher, 2010).

Traditional Utility from Work Theory: It is assumed that work is a source of disutility, because the trade-off of foregone leisure. Moreover, income is a source of utility because it enables consumption and the satisfaction of preferences (Benz and Frey, 2008).

Well-Being as a positive physical, social and mental state that requires that basic needs are met, individuals have a sense of purpose, they feel they can achieve important goals, are able to participate in society and live the lives they value (NESC, 2009).

Appendix B: Cross-Sectional Data Analysis

A cross section is a sample consisting of a number of observations drawn on the same point in time (Greene, 2000). Cross sectional data can give information for many people, countries, firms or entities (Halcoussis, 2005). In a cross-section study either the entire population or a subset thereof is selected (Wooldridge, 2002). It is assumed they have been obtained by random sampling from the underlying population (Wooldridge, 2009)

Sometimes the data on all units does not correspond to precisely the same time period (Wooldridge, 2009) as is the case in this study where the data comes from two cross sections in 2010 and 2012. Many surveys of individuals, families, and firms are repeated at regular intervals and then pooled together into one data set. When samples are obtained from the population at different points in time this is called a pooled cross section (Wooldridge, 2002). In other words, during each year a new random sample is taken from the relevant population and subsequently pooled together into one data set (Wooldridge, 2002). Each year's survey represents a new random sample from the population.

These pooled cross section datasets have an important feature in that they consist of independently sampled observations (Wooldridge, 2009). It is unlikely that the same individual will be included in multiple years' survey responses which rules out correlation to the error terms across different observations (Wooldridge, 2009). Another benefit for using pooled cross section data is to increase the sample size which allows for more precise estimators and test statistics (Wooldridge, 2009). Moreover, the methods used in pure cross section analyses can be applied to pooled cross sections as well, such as correcting for heteroskedasticity, specification testing, and instrumental variables (Wooldridge, 2002).

Pure cross section analysis is widely used in economics and other social sciences (Wooldridge, 2009) and closely aligns with specified fields such as labour economics, demographics, and health economics (Wooldridge, 2003). An expansion of this is pooled cross section analysis which allows for inferences that are drawn from a more expansive sample of the population and time.

Appendix C: Additional Graphs and Figures of Dependent and Independent Variables

The following Tables and Figures explain the dependent and independent variables used in this thesis.

Dependent Variables

The following figure display the distribution of the dependent variable life satisfaction for individuals in paid work in the year 2010.

Figure 1C: Histogram of Life Satisfaction Frequency: 2010



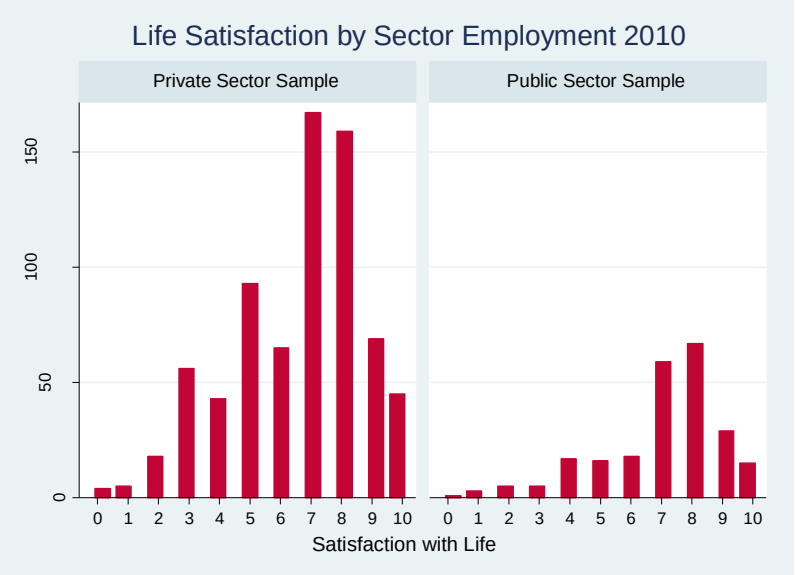
Source: European Social Survey 2010
Note: Obs: 959. Mean: 6.67. Std dev: 2.092. Skewness: -.675

The average life satisfaction score is 6.67 which is marginally smaller than the average calculated for years 2010 and 2010 in Section 3.2. The number of individuals reporting a 7 and an 8 on the life satisfaction scale are identical at 226 responses for each category. 23.57%, 10.22% and 6.26% of responses fall into life satisfaction categories of 8, 9 and 10 respectively. All three of these number are lower than the percentage of responses for corresponding life satisfaction categories

during years 2010 and 2012 presented in Section 3.2. The standard deviation is greater in data from 2010 and has a smaller skewness.

The following Table describes the distribution of the life satisfaction variable for public and private sector workers in paid work during the year 2010.

Figure 2C: Histrogram of Life Satisfaction Frequency by Sectoral Employment: 2010



Source: European Social Survey 2010
Note: (Public Sector): Obs: 235. Mean: 7.00. Std dev: 1.977. Skewness: -1.011
Note: (Private Sector): Obs: 724. Mean: 6.560. Std dev: 2.118. Skewness: -.577

Similar to Section 3.2 the average reported life satisfaction scores of public sector workers are greater than those reported by private sector workers. For public sector workers 28.51% of respondents classified their life satisfaction as an 8. Conversely, the greatest number of private sector respondents (23.07%) classified their life satisfaction as a 7. A greater percentage of public sector workers (12.34%) reported a 9 on the life satisfaction scale compared to private sector workers (9.53%).

The following Table displays frequency percentages of life satisfaction by each region NUTS-3 classification. It is shown that the greatest frequency percentage of reporting a high satisfaction score equal to 8 comes from individuals

located in the mid-west and midlands. The greatest percentage frequency of reporting a 10 on the life satisfaction scale is located in the regions mid-west and south-west at 12.42% and 9.52% respectively. Individuals who are extremely dissatisfied with their lives, reporting a 0 on the life satisfaction scale are mostly limited to the west of Ireland.

Table 1C: Frequency (%) Life Satisfaction in Each Region in Ireland, 2010 & 2012

	Border (IE011)	Midland (IE-012)	West (IE013)	Dublin (IE021)	Mid-East (IE022)	Mid-West (IE023)	South-East (IE024)	South-West (IE025)	Obs
Extremely Dissatisfied	0.00	0.69	2.58	0.40	0.00	0.65	0.00	0.63	**13**
1	0.00	1.38	0.37	1.39	0.90	1.31	0.48	0.63	**17**
2	2.26	3.45	0.37	2.18	1.80	0.00	2.39	1.27	**35**
3	13.12	4.83	3.32	3.37	5.41	1.96	2.87	3.81	**95**
4	15.38	7.59	4.43	3.56	4.95	1.96	3.83	3.81	**109**
5	14.93	14.48	9.96	17.03	10.81	3.92	5.74	13.02	**250**
6	9.95	8.28	9.96	12.67	10.36	11.11	6.70	12.38	**218**
7	15.38	17.93	26.20	26.53	20.27	18.95	29.19	16.51	**452**
8	19.46	28.97	26.94	20.79	27.48	30.72	26.32	25.71	**507**
9	5.43	10.34	10.33	8.12	11.71	16.99	13.88	12.70	**217**
Extremely Satisfied	4.07	2.07	5.54	3.96	6.31	12.42	8.61	9.52	**128**
Total	100	100	100	100	100	100	100	100	**2041**

Source: Author's own

Independent Variables

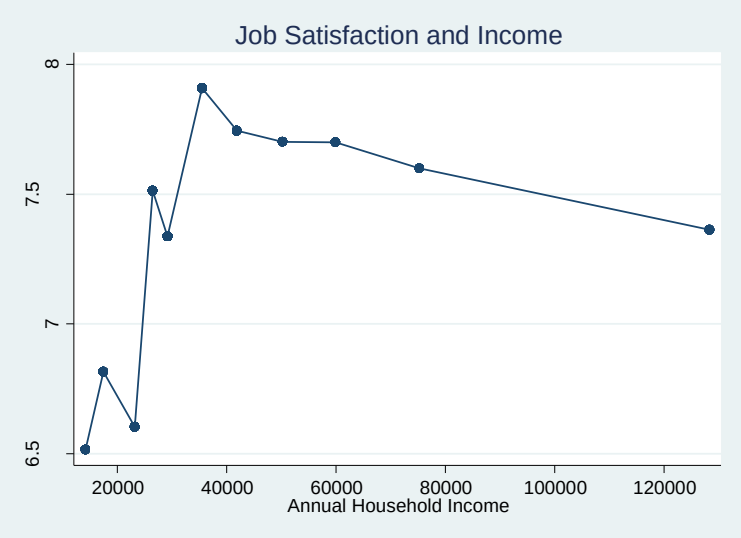
Figure Table 2C and Figure 3C present average job satisfaction by annual household income of individuals who participated in Round 5 of the European Social Survey (2010). Interestingly, an inverse U-shape emerges where job satisfaction increases in income up to a point and then sharply decreases. This finding conforms to the economic theory of diminishing marginal utility. The additional benefit a person derives from a given increase of his stock diminishes with every increase in that stock that the individual already has.

Table 2C: Summary of Job Satisfaction and Annual Household Income

	Summary of Annual Household Income		
Job Satisfaction	**Mean**	**Std. Dev**	**Freq.**
Extremely Dissatisfied	23245.36	6526.90	3
1	62102.7	43873.11	5
2	33937.30	13102.3	10
3	19185.29	5136.43	18
4	26244.37	14229.35	33
5	27157.66	14951.78	65
6	32705.4	19456.70	57
7	32423.48	14146.50	106
8	35551.03	21818.86	154
9	33313.08	17267.29	108
Extremely Satisfied	34024.70	19975.31	75
Total	**32496.89**	**18737.08**	**633**

Source: European Social Survey (2010)

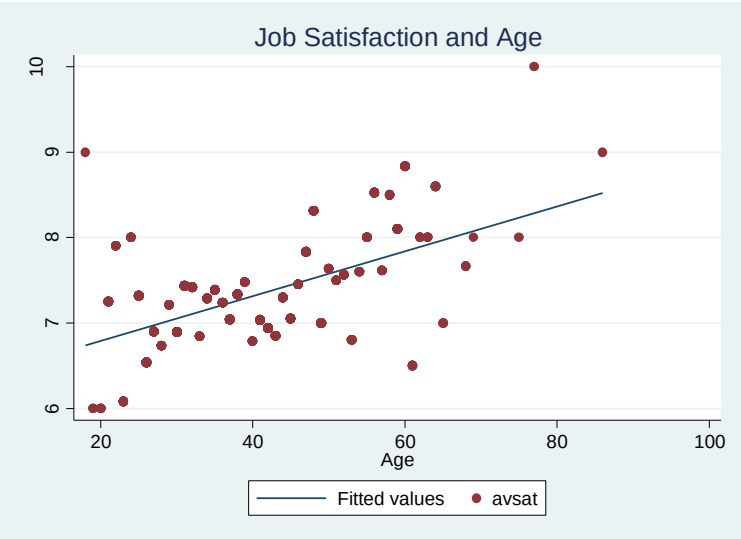
Figure 3C: Line Plot of Life Satisfaction and Income in Ireland 2010



Source: European Social Survey (2010)

The trend in figure 4C is upward sloping indicating that average job satisfaction increases with age. The U-shape relationship is difficult to determine from simple descriptive statistics and is usually identified in econometric analysis.

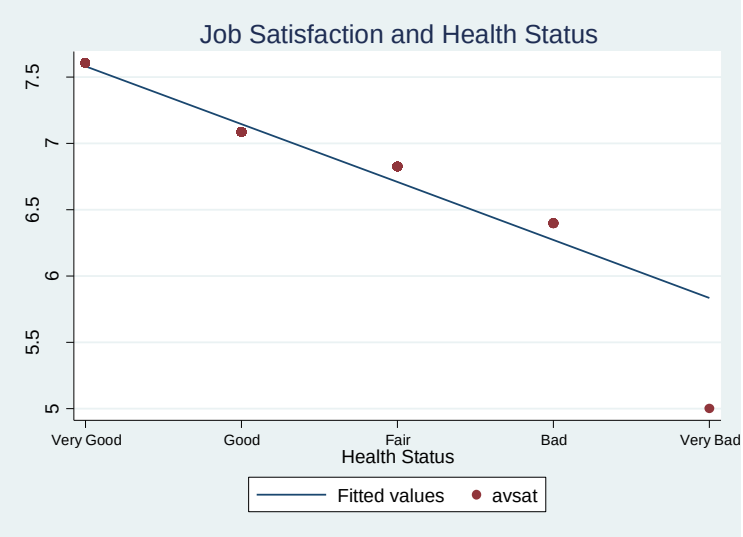
Figure 4C: Scatter Plot of Job Satisfaction and Age in Ireland 2010



Source: European Social Survey (2010)

A distinct pattern emerges between average job satisfaction and health status. As individuals move from *Very Good* health down to *Very Bad* health, job satisfaction markedly declines. The following Table identifies average job satisfaction and number of individuals in each health status category. Again, it is clear that average job satisfaction declines as subjective health worsens. The largest number of individuals are located in *Very Good*, *Good* and *Fair* groups and report high average job satisfaction scores.

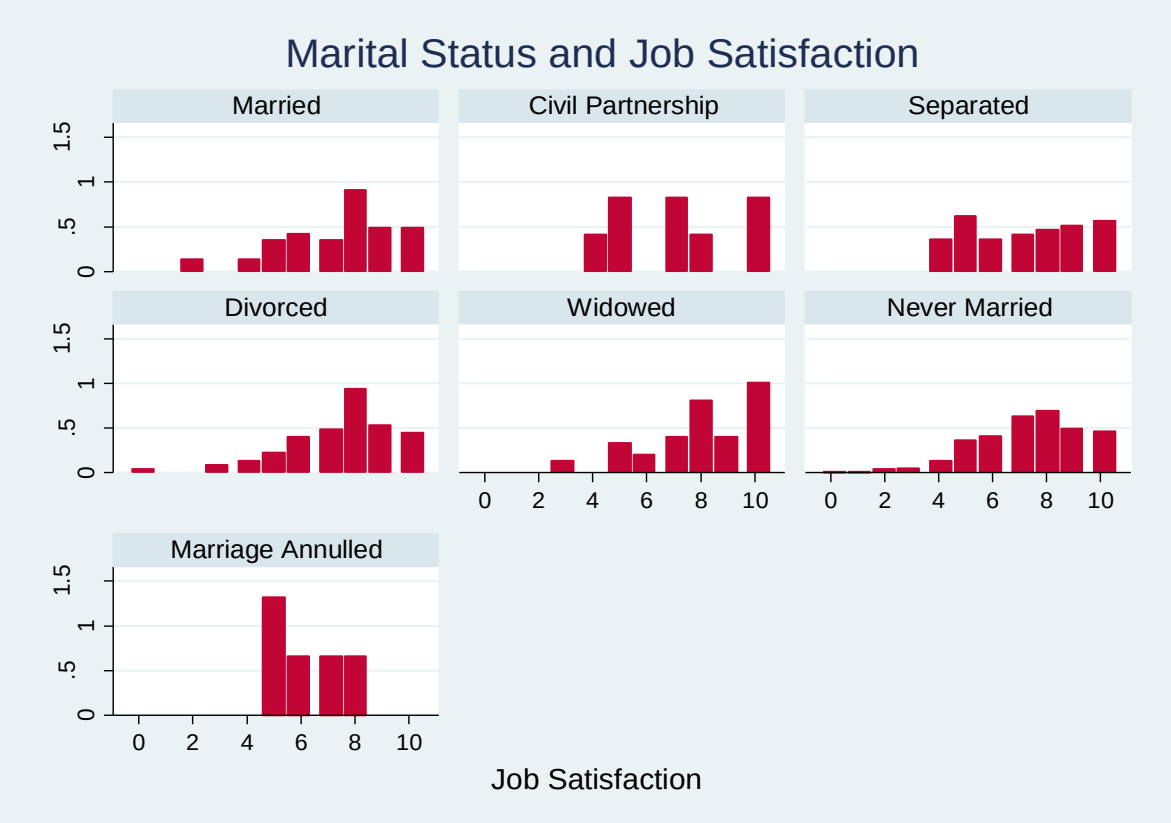
Figure 5C: Line of Best Fit Between Job Satisfaction and Health Status in Ireland 2010



Source: European Social Survey (2010)

In the European Social Survey the greatest number of respondents fall under the never married category. The two martial categories that report the most number of people in low job satisfaction are those who are divorced or never married. The following Figure displays distribution of job satisfaction by marital status

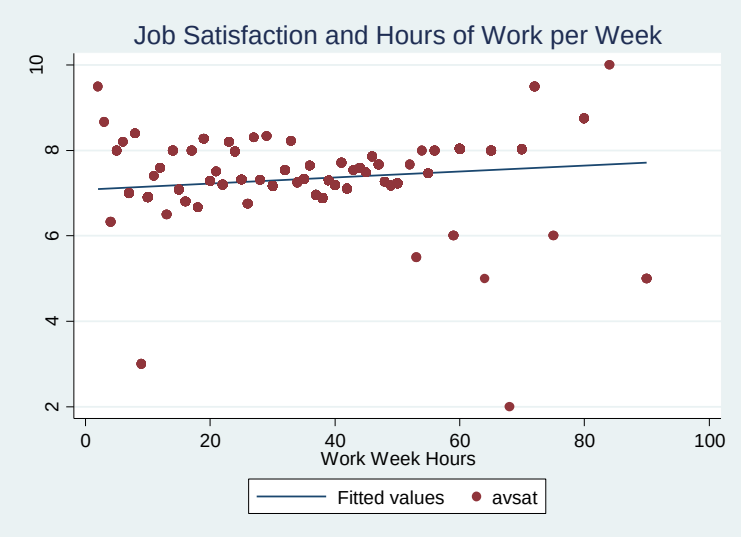
Figure 6C: Histograms of Marital Status and Job Satisfaction in Ireland 2010



Source: European Social Survey (2010)

The following graph displays average job satisfaction scores across hours of work each week. There appears to be a slight positive correlation between hours of work and average job satisfaction. Hours of work is often used as an example of diminishing marginal returns similar to that of income. This however is difficult to observe from simple scatter plots.

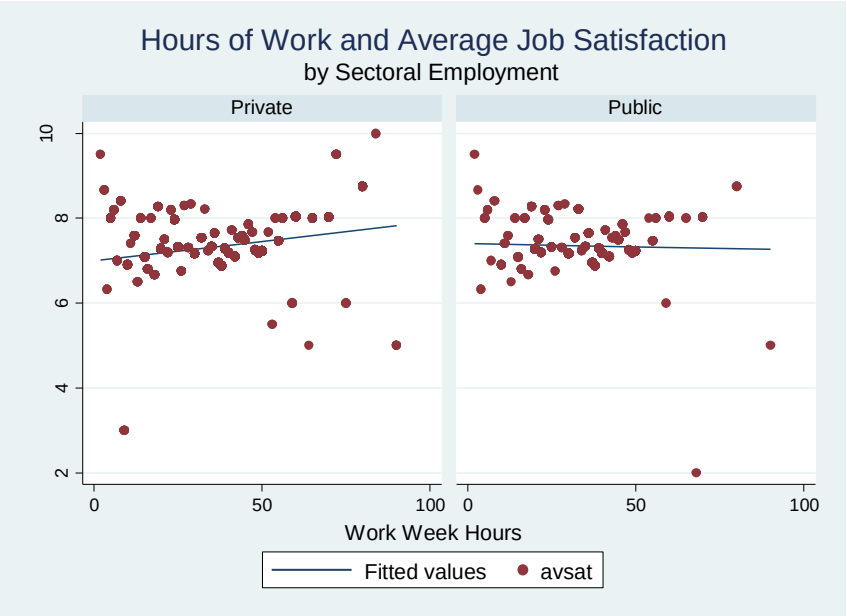
Figure 7C: Scatter Plot of Job Satisfaction and Hours of Work per Week in Ireland 2010



Source: European Social Survey (2010)

The following figure displays average job satisfaction scores across hours of work divided by public sector and private sector employment. While the overall correlation between job satisfaction and hours of work appears to be positive, a different relationship emerges when divided by sectoral employment. For private sector workers a positive correlation is still present however for public sector workers, as hours of work a week increase average job satisfaction scores decrease.

Figure 8C: Scatter Plot of Hours of Work per Week and Average Job Satisfaction by Sectoral Employment 2010



Source: European Social Survey (2010)

Appendix D1: Marginal Effects of the Ordered Probit Estimation of the Life Satisfaction Equations (Probability of Life Satisfaction = 8)

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction*** ***(Ordered Scale 0-10)***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Private Sector	Reference Group				
Public Sector	-.030	-1.31		-.077	-1.72*
Unemployment Rate	.009	3.42***		–	–
Job Insecurity	–	–		-.028	-2.67**
Interaction Term	.004	2.22**		.037	2.11**
Job Seeking within the last 5 years	-.013	-0.94		-.016	-0.52
Marital Status Married	Reference Group				
Marital Status Separated	-.076	-2.95**		-.101	-2.16**
Marital Status Divorced	-.028	-1.17		-.059	-1.59
Marital Status Civil Union	-.006	-0.14		.042	0.23
Marital Status Widowed	omitted	omitted		omitted	omitted
Marital Status Never	-.066	-1.71*		.039	0.80
Ln(Income)	.078	7.08***		.111	4.96***
Domicile City	Reference Group				
Domicile Suburbs	-.060	-3.30***		-.093	-3.23***
Domicile Town	-.075	-3.81***		-.107	-3.82***
Domicile Village	-.053	-2.27**		-.084	-2.37**
Domicile Farm	-.029	-1.42		-.002	-0.05

Appendix D1: Marginal Effects of the Ordered Probit Estimation of the Life Satisfaction Equations (Probability of Life Satisfaction = 8)

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Education Tertiary	Reference Group				
Education Less than Secondary	-.046	-1.86*		-.082	-2.05**
Education Lower Secondary	-.032	-1.85*		-.021	-0.67
Education Upper Secondary	-.007	-0.50		-.020	-0.72
Education Non-Tertiary, Post-secondary	-.019	-1.17		-.030	-1.05
Education Post-Grad	.006	0.43		-.010	-0.37
Education Other	omitted	omitted		omitted	omitted
Female	Reference Group				
Male	.017	1.61		.019	0.95
Religion Catholic	Reference Group				
Religion Protestant	-.021	-0.64		-.054	-0.96
Religion Eastern Orthodox	-.004	-0.07		.058	1.11
Religion Other Christian	.020	0.65		-.026	-0.52
Religion Jewish	-.131	-5.14***		omitted	omitted
Religion Islamic	-.107	-2.23		-.015	-0.26
Religion Other Eastern European Religions	-.154	-4.08***		-.150	-3.47***
Religion Other Non-Christian	-.016	-0.15		-.170	-5.23***
Level of Religiosity	.008	3.83***		-.013	3.24***

Appendix D1: Marginal Effects of the Ordered Probit Estimation of the Life Satisfaction Equations (Probability of Life Satisfaction = 8)

	Interaction Term (1) $UR \times Sector$			**Interaction Term (2)** $I \times Sector$	
Dependent Variable ***Life Satisfaction***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Work Week 31 to 40 hours	Reference Group				
Work Week 1 to 10 hours	.067	9.84***		.072	2.60**
Work Week 11 to 20 hours	.017	1.26		.012	0.47
Work Week 21 to 30 hours	.006	0.49		.014	0.55
Work Week 41 to 50 hours	.006	0.49		.018	0.72
Work Week 51 to 60 hours	.032	1.92*		.052	1.17
Work Week 61 to 70 hours	.007	0.21		-.012	-0.08
Work Week 71 to 80 hours	.064	5.48***		-.134	-2.49**
Work Week 81 to 90 hours	-.244	-20.61		omitted	omitted
Work Week 'other' hours	.010	0.21		omitted	omitted
Meet with friends many times per month	Reference Group				
Meet with friends_ Never	-.160	-4.03***		-.185	-4.48***
Meet with friends_Less1m	-.048	-2.57**		-.015	-0.42
Meet with friends_1m	.001	0.09		-.011	-0.38
Meet with friends_1w	.017	1.35		.030	1.11
Meet with friends_several per week	.038	3.06**		.065	2.45**
Social_every day	.055	4.11***		.079	2.72**
Age 26 to 35	Reference Group				
Age 17 to 25	-.016	-0.76		-.033	-0.86
Age 36 to 45	-.032	-2.55**		-.013	-0.56
Age 46 to 55	-.045	-3.04**		-.068	-2.61**
Age 56 to 65	.012	0.71		.028	0.89
Age 66 to 75	.051	2.76**		.092	3.10**
Age 76 to 85	.063	5.68***		.091	4.62***

Appendix D1: Marginal Effects of the Ordered Probit Estimation of the Life Satisfaction Equations (Probability of Life Satisfaction = 8)

	Interaction Term (1) $\boldsymbol{UR \times Sector}$			**Interaction Term (2)** $\boldsymbol{I \times Sector}$	
Dependent Variable ***Life Satisfaction***	**Coefficient**	**Z-Stat**		**Coefficient**	**Z-Stat**
Age 86+	-.244	-20.61***		-.215	–

Unemployment Rate Interaction Term
Y = probability(satisfaction = 8) = .245

Job Insecurity Interaction Term
Y= probability(satisfaction = 8) = .217

Appendix E: Marginal Effects of Ordered Probit Estimation of the Basic and Extended Job Satisfaction Equations (Probability of Job Satisfaction = 9, 10)

A basic job satisfaction equation and an extended job satisfaction equation are both estimated by the ordered probit model. In order to compare public sector and private sector workers marginal effects are used to make quantitative inferences. Marginal effects are calculated for the probability of reporting a 9 and a 10 on the job satisfaction scale. There are included in the following section. Many marginal effects coefficients are insignificant for the probability outcome equal to 8 which is why probability outcomes 9 and 10 are also considered. This especially applies to the public sector subsample. The renders the necessity to include the marginal effects for all "high job satisfaction" outcomes that according to Luechinger *et al.* (2010a) are outcomes equal to 8, 9 and 10.

Table E1: Marginal Effects from the Basic Job Satisfaction Equation

Pr(Job Satisfaction == 9)

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(9)	Z-stat	dy/dx(9)	Z-stat	dy/dx(9)	Z-stat
Job Insecurity *(ordered scale 1-4)*	-.034	-5.26***	-.028	-2.32**	-.040	-4.72***
Ln(income)	.042	2.83**	.089	2.79**	.034	1.96**
Gender	-.010	-0.78	.018	0.70	-.024	-1.65*
Unemployed Last 5 Years	-.050	-2.71**	-.017	-0.31	-.048	-2.52**
Work Week Hours 20-29	Reference Group					
Work Week Hours 0-9	-.076	-1.60	.006	0.05	-.036	-0.54
Work Week Hours 10-19	-.015	-0.64	.006	0.15	-.034	-1.22
Work Week Hours 30-39	-.042	-2.38**	-.034	-1.05	-.035	-1.62
Work Week Hours 40-49	-.048	-2.63**	-.064	-1.64	-.033	-1.55
Work Week Hours 50+	-.024	-0.98	-.004	-0.08	-.014	-0.50
Education Tertiary	Reference Group					
Education Less Secondary	.022	0.84	.061	1.44	.015	0.51
Education Lower Secondary	-.008	-0.43	.026	0.61	-.011	-0.49
Education Upper Secondary	.012	0.77	-.001	-0.04	.024	1.23
Education Non-tertiary	-.006	-0.29	-.030	-0.73	.011	0.46

Table E1 cont.: Marginal Effects from the Basic Job Satisfaction Equation

Pr(Job Satisfaction == 9)

	Whole Sample		**Public Sector Sample**		**Private Sector Sample**	
dy/dx(9)	Z-stat	dy/dx(9)	Z-stat	dy/dx(9)	Z-stat	dy/dx(9)
Education Post Grad	.004	0.22	.026	0.92	-.015	-0.65
Contract None	Reference Group					
Contract Unlimited	-.046	-3.34**	-.031	-1.14	-.053	-3.23***
Contract Limited	.014	0.69	.066	2.22**	-.025	-1.04
Establishment Size Under 10	Reference Group					
Establishment Size 10-24	.022	1.34	.073	2.71**	-.006	-0.31
Establishment Size 25-99	.023	1.40	.073	2.74**	.000	0.01
Establishment Size 100-499	.005	0.31	.013	0.40	.011	0.49
Establishment Size 500+	.041	2.15**	.061	2.04**	.039	1.44
Work Week Hrs 20-29	Reference Group					
Work Week Hrs 0-9	-.076	-1.60	.006	0.05	-.036	-0.54
Work Week Hrs 10-19	-.015	-0.64	.006	0.15	-.034	-1.22
Work Week Hrs 30-39	-.042	-2.38**	-.034	-1.05	-.035	-1.62
Work Week Hrs 40-49	-.048	-2.63**	-.064	-1.64	-.033	-1.55
Work Week Hrs 50+	-.024	-0.98	-.004	-0.08	-.014	-0.50
Marital Status Married	Reference Group					
Marital Status Civil Union	-.034	-0.34	omitted	omitted	-.048	-0.57
Marital Status Separated	.027	0.97	.019	0.40	.027	0.71
Marital Status Divorced	.002	0.07	-.013	-0.25	-.010	-0.30

Table E1 cont.: Marginal Effects from the Basic Job Satisfaction Equation

Pr(Job Satisfaction == 9)

	Whole Sample		Public Sector Sample		Private Sector Sample	
dy/dx(9)	Z-stat	dy/dx(9)	Z-stat	dy/dx(9)	Z-stat	dy/dx(9)
Marital Status Widowed	.068	2.62**	.082	4.36***	.022	0.37
Marital Status Never	.019	1.37	.007	0.25	.022	1.38
Marital Status Annulled	-.044	-0.43	omitted	omitted	-.045	-0.51
Health Status Good	Reference Group					
Health Status Fair	-.028	-1.43	-.038	-0.86	-.014	-0.66
Health Status Bad	-.065	-1.48	-.040	-0.44	-.096	-2.59**
Health Status Very Bad	-.132	-2.36**	omitted	omitted	-.120	-3.15**
Age 20-29	Reference Group					
Age 15-19	.032	0.41	omitted	omitted	-.003	-0.04
Age 30-39	.021	1.30	.011	0.27	.030	1.63
Age 40-49	.025	1.38	.049	1.27	.016	0.77
Age 50-59	.050	2.58**	.088	2.73**	.019	0.76
Age 60-69	.067	3.09**	.088	4.50***	.028	0.70
Age 70-79	.038	0.32	.078	4.52***	-.129	-2.53**
Age 80-89	.080	2.28**	omitted	omitted	.084	1.65*
Union No	Reference Group					
Union Currently	-.004	-0.30	-.026	-0.97	.009	0.45
Union Previously	.005	0.21	-.037	2.79**	.021	0.82

*** indicates significance at the 1% level, ** indicates significance at the 5% level,
* indicates significance at the 10% level.

Whole Sample	$y = \Pr(\text{jobsatisfaction} == 9)(\text{predict}) = .157$
Public Sector Sample	$y = \Pr(\text{jobsatisfaction} == 9)(\text{predict}) = .210$
Private Sector Sample	$y = \Pr(\text{jobsatisfaction} == 9)(\text{predict}) = .131$

Table E2: Marginal Effects from the Basic Job Satisfaction Equation

Pr(Job Satisfaction == 10)

Dependent Variable *Job Satisfaction*	**Whole Sample**		**Public Sector Sample**		**Private Sector Sample**	
	dy/dx(10)	Z-stat	dy/dx(10)	Z-stat	dy/dx(10)	Z-stat
Job Insecurity *(ordered scale 1-4)*	-.045	-5.62***	-.034	-2.41**	-.052	-2.91**
Ln(income)	.055	2.87**	.109	2.92**	.044	1.73*
Gender	-.013	-0.79	.023	0.67	-.031	-1.49
Unemployed Last 5 Years	-.055	-3.16**	-.020	-0.34	-.053	-2.17**
Work Week Hours 20-29	Reference Group					
Work Week Hours 0-9	-.072	-2.21**	.007	0.05	-.039	-0.63
Work Week Hours 10-19	-.018	-0.68	.007	.014	-.039	-1.28
Work Week Hours 30-39	-.051	-2.54**	-.040	-1.09	-.042	-1.54
Work Week Hours 40-49	-.058	-2.82**	-.067	-1.87*	-.041	-1.46
Work Week Hours 50+	-.029	-1.07	-.005	-0.08	-.017	-0.52
Education Tertiary	Reference Group					
Education Less Secondary	.032	0.76	.109	0.93	.021	0.47
Education Lower Secondary	-.011	-0.44	.035	0.54	-.013	-0.50
Education Upper Secondary	.017	0.75	-.002	-0.04	.033	1.11
Education Non-tertiary	-.007	-0.30	-.032	-0.82	.014	0.44

Table E2 cont.: Marginal Effects from the Basic Job Satisfaction Equation

Pr(Job Satisfaction == 10)

	Whole Sample		Public Sector Sample		Private Sector Sample	
	dy/dx(10)	Z-stat	dy/dx(10)	Z-stat	dy/dx(10)	Z-stat
Education Post Grad	.005	0.22	.034	0.86	-.018	-0.68
Contract None	Reference Group					
Contract Unlimited	-.064	-3.18**	-.040	-1.08	-.074	-2.39**
Contract Limited	.019	0.65	.113	1.57	-.030	-1.08
Establishment Size Under 10	Reference Group					
Establishment Size 10-24	.030	1.25	.124	1.99**	-.007	-0.31
Establishment Size 25-99	.032	1.30	.126	2.00**	.000	0.01
Establishment Size 100-499	.007	0.30	.095	1.62	.015	0.47
Establishment Size 500+	.064	1.80*	.007	0.05	.061	1.15
Work Week Hrs 20-29	Reference Group					
Work Week Hrs 0-9	-.072	-2.21**	.007	0.05	-.039	-0.63
Work Week Hrs 10-19	-.018	-0.68	.007	0.14	-.039	-1.28
Work Week Hrs 30-39	-.051	-2.54**	-.040	-1.09	-.042	-1.54
Work Week Hrs 40-49	-.058	-2.82**	-.067	-1.87	-.041	-1.46
Work Week Hrs 50+	-.029	-1.07	-.005	-0.08	-.017	-0.52
Marital Status Married	Reference Group					
Marital Status Civil Union	-.038	-0.39	omitted	omitted	-.050	-0.69
Marital Status Separated	.041	0.84	.026	0.36	.040	0.61
Marital Status Divorced	.002	0.07	-.015	-0.26	-.013	-0.31

Table E2 cont.: Marginal Effects from the Basic Job Satisfaction Equation

Pr(Job Satisfaction == 10)

	Whole Sample		Public Sector Sample		Private Sector Sample	
	dy/dx(10)	Z-stat	dy/dx(10)	Z-stat	dy/dx(10)	Z-stat
Marital Status Widowed	.140	1.52	.222	1.49	.031	0.33
Marital Status Never	.025	1.35	.009	0.24	.029	1.27
Marital Status Annulled	-.047	-0.53	omitted	omitted	-.047	-0.62
Health Status Good	Reference Group					
Health Status Fair	-.033	-1.59	-.040	-0.98	-.017	-0.68
Health Status Bad	-.065	-1.94*	-.041	-0.53	-.083	-2.32**
Health Status Very Bad	-.101	-4.44***	omitted	omitted	-.093	-2.44**
Age 20-29	Reference Group					
Age 15-19	.049	0.34	omitted	omitted	-.004	-0.04
Age 30-39	.029	1.25	.013	0.27	.041	1.42
Age 40-49	.035	1.29	.067	1.13	.022	0.72
Age 50-59	.080	2.14**	.155	1.92*	.026	0.70
Age 60-69	.131	1.98**	.277	2.12**	.041	0.61
Age 70-79	.531	1.52	.237	0.49	.097	16.04***
Age 80-89	.328	0.81	omitted	omitted	.218	0.59
Union No	Reference Group					
Union Currently	-.005	-0.31	-.034	-0.93	.012	0.44
Union Previously	.006	0.20	-.039	-0.85	.029	0.74

*** indicates significance at the 1% level, ** indicates significance at the 5% level,
* indicates significance at the 10% level.

Whole Sample	$y = \Pr(\text{jobsatisfaction} == 10)(\text{predict}) = .108$
Public Sector Sample	$y = \Pr(\text{jobsatisfaction} == 10)(\text{predict}) = .119$
Private Sector Sample	$y = \Pr(\text{jobsatisfaction} == 10)(\text{predict}) = .095$

Appendix F: Marginal Effects of the FIML Estimation of the Job Satisfaction Equation

Marginal effects for all the explanatory variables included in the job satisfaction equation are described in Table F1. Marginal effects are calculated for a job satisfaction outcome equal to 8. Any satisfaction score equal to 8 or greater is considered high life satisfaction (Luechinger *et al.* 2010a).

Table F1: Marginal Effects of the FIML Estimation of the Job Satisfaction Equation

	Whole Sample dy/dx(8)	**Public Sector dy/dx(8)**	**Private Sector dy/dx(8)**
Job security	-.033*** [-3.54]	-.007 [-0.64]	-.050** [-2.31]
Ln(income)	.017** [2.14]	-.005 [0.60]	.023 [1.58]
Gender	-.004 [-0.79]	.001 [0.38]	-.017 [-1.56]
Unemployed Last 5 yr	-.027 [-1.60]	-.002 [-0.25]	-.039 [-1.59]
Work Week Hours 20-29	Reference Group		
Work Week Hours 0-9	-.059 [-1.47]	-.005 [-0.19]	-.038 [-1.02]
Work Week Hours 10-19	-.009 [-0.66]	.000 [0.08]	-.030 [-0.86]
Work Week Hours 30-39	-.024** [-2.13]	.003 [-0.56]	-.029 [-1.54]
Work Week Hours 40-49	-.028** [-2.28]	-.011 [-0.82]	-.028 [-1.56]
Work Week Hours 50+	-.017 [-1.00]	-.001 [-0.12]	-.014 [-0.57]
Education Tertiary	Reference Group		
Education Less Secondary	.008 [.005]	-.025 [-0.60]	.009 [0.55]
Education Lower Secondary	-.003 [-0.29]	-.002 [-0.28]	-.008 [-0.42]
Education Upper Secondary	.005 [0.93]	-.000 [-0.07]	.016 [1.41]
Education Non-tertiary	-.002 [-0.27]	-.004 [-0.58]	.008 [0.66]

Table F1: Marginal Effects of the FIML Estimation of the Job Satisfaction Equation

	Whole Sample dy/dx(8)	Public Sector dy/dx(8)	Private Sector dy/dx(8)
Education Post Grad	.001 [0.14]	.000 [0.16]	-.013 [-0.64]
Contract None	Reference Group		
Contract Unlimited	-.017** [-2.82]	-.001 [-0.29]	-.034** [-2.76]
Contract Limited	.007 [1.33]	-.008 [-0.66]	-.020 [-0.87]
Establishment Size Under 10	Reference Group		
Establishment Size 10-24	.007 [1.33]	-.009 [-0.66]	-.005 [-0.41]
Establishment Size 25-99	.007 [1.37]	-.007 [-0.62]	-.000 [-0.02]
Establishment Size 100-499	.002 [0.19]	.000 [0.34]	.004 [0.30]
Establishment Size 500+	.010** [2.61]	-.005 [-0.51]	.018* [1.87]
Marital Status Married	Reference Group		
Marital Status Civil Union	-.012 [-0.48]	omitted	-.038 [-0.87]
Marital Status Separated	.008 [1.40]	.000 [0.27]	.014 [1.09]
Marital Status Divorced	-.001 [-0.09]	-.003 [-0.32]	-.010 [-0.33]
Marital Status Widowed	.000 [0.01]	-.028 [-0.61]	.013 [0.38]
Marital Status Never	.007 [1.18]	-.000 [-0.05]	.015 [1.30]
Marital Status Annulled	-.028 [-0.40]	omitted	-.044 [-0.43]
Health Status Good	Reference Group		
Health Status Fair	-.015 [-1.06]	-.002 [-0.24]	-.013 [-0.69]
Health Status Bad	-.047 [-0.72]	-.002 [-0.11]	-.131 [-1.33]
Health Status Very Bad	-.131** [-3.33]	omitted	-.183*** [-3.61]

Table F1: Marginal Effects of the FIML Estimation of the Job Satisfaction Equation

	Whole Sample dy/dx(8)	**Public Sector dy/dx(8)**	**Private Sector dy/dx(8)**
Age 20-29	Reference Group		
Age 15-19	.008** [1.98]	omitted	-.001 [-0.02]
Age 30-39	.008 [1.37]	.000 [0.01]	.019* [1.68]
Age 40-49	.009 [1.55]	-.000 [-0.02]	.011 [0.86]
Age 50-59	.012** [2.73]	-.008 [-0.57]	.011 [0.85]
Age 60-69	.003 [0.18]	-.049 [-1.08]	.015 [0.92]
Age 70-79	-.148** [-2.67]	-.035 [-0.44]	-.259*** [-10.23]
Age 80-89	-.059** [-2.26]	omitted	-.004 [-0.20]
Union No	Reference Group		
Union Currently	-.003 [-0.49]	-.001 [.003]	.006 [0.52]
Union Previously	.002 [0.24]	-.006 [-0.50]	.013 [1.03]

Source: Author's own

Note: Z-stats are included in brackets under coefficients. These in addition to their associated p-values are used to determine statistical significance.

Appendix G: Results of Limited Information Maximum Likelihood Estimation of Job Insecurity Equation

The following table presents the results from the first stage estimation of the job insecurity equation. The job insecurity variable is treated as continuous and estimated by OLS. The job insecurity equation includes three instrumental variables that are excluded from the job satisfaction equation.

Table G1: Results of LIML Estimation of Job Insecurity

Dependent Variable *Job Security (ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
Ln(income)	-.137 (0.163)	-.190 (0.257)	-.112 (0.365)
Gender	.118 (0.150)	.073 (0.649)	.062 (0.528)
Unemployed Last 5 Years	.476*** (0.000)	.593** (0.050)	.476 (0.000)
Work Week Hours 20-29	Reference Group		
Work Week Hours 0-9	-.224 (0.594)	-1.503** (0.002)	.440 (0.148)
Work Week Hours 10-19	.066 (0.670)	.088 (0.712)	.0166 (0.939)
Work Week Hours 30-39	-.024 (0.835)	-.107 (0.595)	-.028 (0.849)
Work Week Hours 40-49	-.055 (0.640)	-.472** (0.026)	.054 (0.709)
Work Week Hours 50+	-.065 (0.688)	-.544* (0.051)	.027 (0.892)
Education Tertiary	Reference Group		
Education Less Secondary	.132 0.428)	.375 (0.280)	.037 (0.838)
Education Lower Secondary	.069 (0.605)	-.195 (0.507	.058 (0.701)
Education Upper Secondary	-.092 (0.384)	.089 (0.645)	-.182 (0.173)

Table G1: Results of LIML Estimation of Job Insecurity

Dependent Variable *Job Security* *(ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
Education Non-tertiary	.045 (0.719)	.129 (0.517)	-.045 (0.787)
Education Post Grad	.039 (0.743)	.270 (0.119)	-.047 (0.775)
Contract None	Reference Group		
Contract Unlimited	-.414*** (0.000)	-.282 (0.107)	-.470*** (0.000)
Contract Limited	-.079 (0.616)	.248 (0.359)	-.327* (0.077)
Establishment Size Under 10	Reference Group		
Establishment Size 10-24	-.042 (0.711)	-.083 (0.695)	-.003 (0.983)
Establishment Size 25-99	.027 (0.807)	.253 (0.231)	-.072 (0.573)
Establishment Size 100-499	-.225* (0.062)	-.273 (0.155)	-.090 (0.563)
Establishment Size 500+	-.087 (0.552)	.118 (0.596)	-.139 (0.515)
Marital Status Married	Reference Group		
Marital Status Civil Union	.720** (0.004)	omitted	.513** (0.023)
Marital Status Separated	.052 (0.791)	.016 (0.960)	.158 (0.553)
Marital Status Divorced	.398** (0.025)	.420 (0.113)	.419* (0.067)
Marital Status Widowed	-.115 (0.650)	-.050 (0.855)	.013 (0.977)
Marital Status Never	.155 (0.101)	.437** (0.012)	.111 (0.310)
Marital Status Annulled	.928*** 0.000)	omitted	.931*** (0.000)
Health Status Good	Reference Group		
Health Status Fair	.142 (0.310)	.166 (0.589)	.141 (0.374)

Table G1: Results of LIML Estimation of Job Insecurity

Dependent Variable *Job Security* *(ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
Health Status Bad	.277 (0.467)	.114 (0.849)	.307 (0.494)
Health Status Very Bad	.331* (0.063)	omitted	.250 (0.230)
Age 20-29	Reference Group		
Age 15-19	.147 (0.779)	omitted	.224 (0.667)
Age 30-39	-.052 (0.645)	-.205 (0.373)	.094 (0.466)
Age 40-49	.120 (0.386)	.048 (0.850)	.164 (0.254)
Age 50-59	.020 (0.896)	-.026 (0.922)	.176 (0.321)
Age 60-69	-.153 (0.484)	-.106 (0.733)	-.140 (0.667)
Age 70-79	-.380 (0.691)	2.471** (0.000)	-1.562*** (0.000)
Age 80-89	-1.333*** (0.000)	omitted	-1.259*** (0.000)
Union No	Reference Group		
Union Currently	-.190** (0.049)	-.235 (0.179)	.198 (0.136)
Union Previously	.072 (0.603)	.449** (0.049)	-.187 (0.322)

Table G1: Results of LIML Estimation of Job Insecurity

Instrumental Variables	**Whole Sample**	**Public Sector**	**Private Sector**
Wkshr3y	.603*** (0.000)	.520** (0.018)	.615*** (0.000)
Value_Security	-.108 (0.182)	-.139 (0.315)	-.032 (0.757)
Difficulty	.027 (0.832)	.448 (0.190)	-.081 (0.334)
_constant	3.956	4.242	3.740

Note: p values displayed in parentheses under estimated coefficients

Full Sample	**Public Sector Sample**	**Private Sector Sample**
F(39, 670) = 557.96	F(35, 228) = 49.02	F(38, 408) = 59.28
p value = 0.000	p value = 0.000	prob > F = 0.000
Obs = 711	Obs = 264	Obs = 447
R^2 = 0.230	R^2 = 0.301	R^2 = 0.237

Appendix H: Results of Ordered Probit Estimation of Job Insecurity Equation – Step 1 of 2SOPLS Estimation

The Two-Stage Ordered probit Estimation Method is classified as a limited information method. The first stage estimates the job insecurity equation using the ordered probit model. This preserves the ordered nature of the variable which is measured on a 4-point categorical scale. The fitted values are calculated and included in the second stage estimation of the job satisfaction equation by OLS. These results are explained in Section 6.2.4. The ordered probit results of the job insecurity equation are presented in the following Table:

Table H1: Results of Ordered Probit Estimation of Job Insecurity

Dependent Variable *Job Security* *(ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
Ln(income)	-.145 [-1.33]	-.240 [-1.19]	-.127 [-0.91]
Gender	.140 [1.48]	.064 [0.36]	.087 [0.74]
Unemployed Last 5 Years	.576*** [4.02]	.727** [2.01]	.619*** [3.78]
Work Week Hours 20-29	Reference Group		
Work Week Hours 0-9	-.232 [-0.54]	-1.898** [-2.28]	.724 [1.11]
Work Week Hours 10-19	.048 [0.27]	.090 [0.32]	.008 [0.03]
Work Week Hours 30-39	-.027 [-0.21]	-.100 [-0.46]	-.046 [-0.26]
Work Week Hours 40-49	-.062 [-0.45]	-.558** [-2.18]	.052 [0.29]
Work Week Hours 50+	-0.62 [-0.33]	-.587* [-1.68]	.019 [0.08]
Education Tertiary	Reference Group		
Education Less Secondary	.131 [0.64]	.327 [0.81]	.033 [0.13]
Education Lower Secondary	.082 [0.57]	-.237 [-0.78]	.078 [0.43]
Education Upper Secondary	-.106 [-0.87]	.112 [0.50]	-.222 [-1.41]
Education Non-tertiary	.052 [0.35]	.199 [0.75]	-.068 [-0.36]
Education Post Grad	.052 [0.39]	.338* [1.67]	-.049 [-0.25]
Contract None	Reference Group		
Contract Unlimited	.468*** [-4.47]	-.314 [-1.64]	-.587*** [-4.45]
Contract Limited	-.086 [-0.55]	.310 [1.12]	-.403** [-1.96]

Table H1 cont.: Results of Ordered Probit Estimation of Job Insecurity

Dependent Variable *Job Security (ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
Establishment Size Under 10	Reference Group		
Establishment Size 10-24	-.047 [-0.38]	-.081 [-0.33]	.007 [0.05]
Establishment Size 25-99	.032 [0.25]	.319 [1.32]	-.100 [-0.64]
Establishment Size 100-499	-.252* [-1.85]	-.349 [-1.53]	-.092 [-0.49]
Establishment Size 500+	-.097 [-0.61]	.217 [0.89]	-.184 [-0.77]
Marital Status Married	Reference Group		
Marital Status Civil Union	.667 [0.89]	omitted	.484 [0.63]
Marital Status Separated	.059 [0.27]	.069 [0.21]	.159 [0.50]
Marital Status Divorced	.451** [2.18]	.565* [1.68]	.504* [1.79]
Marital Status Widowed	-.131 [-0.43]	.001 [0.00]	-.029 [-0.06]
Marital Status Never	.177* [1.68]	.570** [2.73]	.134 [1.02]
Marital Status Annulled	5.151 [0.02]	omitted	5.097 [0.03]
Health Status Good	Reference Group		
Health Status Fair	.152 [1.04]	.194 [0.69]	.165 [0.93]
Health Status Bad	.374 [0.99]	.181 [0.30]	.421 [0.81]
Health Status Very Bad	.203 [1.052]	omitted	.134 [0.12]
Age 20-29	Reference Group		
Age 15-19	.106 [0.17]	omitted	.216 [0.33]
Age 30-39	-.051 [-0.41]	-.127 [-0.81]	.122 [0.82]
Age 40-49	.133 [0.93]	.139 [0.49]	.195 [1.12]
Age 50-59	.018 [0.11]	.023 [0.07]	.208 [1.02]
Age 60-69	-.162 [-0.70]	-.001 [-0.00]	-.203 [-0.61]

Table H1 cont.: Results of Ordered Probit Estimation of Job Insecurity

Dependent Variable *Job Security (ordered scale 1-4)*	**Whole Sample**	**Public Sector**	**Private Sector**
Age 70-79	-.446 [-0.51]	6.537 [0.06]	-5.863 [-0.03]
Age 80-89	-5.637 [-0.02]	omitted	-5.477 [-0.03]
Union No	Reference Group		
Union Currently	-.225** [-2.20]	-.288 [-1.55]	.240 [1.51]
Union Previously	.082 [0.49]	.488 [-1.55]	-.232 [-1.12]
Instruments			
Wkshr3y	.723*** [6.08]	.708** [2.76]	.796*** [5.60]
Value_Security	.125 [-1.37]	-.166 [-1.03]	-.021 [-0.18]
Difficulty	-.038 [-0.25]	.590 [1.58]	-.098 [-0.54]
cut_1	-2.416	-2.899	-2.449
cut_2	-1.554	-2.123	-1.418
cut_3	-.662	-1.297	-.424

Note: Z-statistics displayed in brackets under estimated coefficients

Whole Sample	**Public Sector Sample**	**Private Sector Sample**
Obs = 712	Obs = 264	Obs = 448
LR Chi^2 (40) = 189.11	LR Chi^2 (35) = 91.17	LR Chi^2 (40) = 128.04
Prob > chi^2 = 0.000	Prob > chi^2 = 0.000	Prob > chi^2 = 0.000
Psuedo R^2 = 0.0963	Psuedo R^2 = 0.1322	Psuedo R^2 = 0.1057