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An Analysis of Public and Private Sector Earnings in Ireland 2008-2013

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Table of Contents

Executive Summary 4

1. Introduction 6

2. Economic Context & Institutional Background 6

3. Data & Methodology 10

4. Employment Earnings Inequality in Ireland 2008-2013 14

    4.1 Employment earnings - the public and private sector 15

    4.2 Earnings inequality in Ireland 25

    4.3 Note on Taxation 26

5. Conclusion 27

References 29

Appendix 1: The Gini Coefficient 31

Appendix 2: Example of Tax Changes 2008 - 2013 32

List of Tables

Table 1: Numbers employed in private and public sector 8

Table 2: Summary statistics of sample 15

Table 3: Earnings (€) by Public and Private Sector 2008-2013..... 18

Table 4: Descriptive Statistics of Earnings (€) by Quartiles – All Sectors..... 20

Table 5: Descriptive Statistics of Earnings (€) by Quartiles – Private Sector 21

Table 6: Descriptive Statistics of Earnings (€) by Quartiles – Public Sector 23

Table 7: Movement Across Quartiles 24

Table 8: Gini Coefficient by Quartile 26

List of Figures

Figure 1: GDP at Constant Factor Costs (Seasonally Adjusted) 6

Figure 2: Seasonally Adjusted Monthly Unemployment Rate (%) 7

Figure 3: Private Sector Earnings and Hours Worked..... 9

Figure 4: Public Sector Earnings and Hours Worked..... 10

Figure 5: Summary of Data Handling Process 13

Figure 6: Gini Coefficient 2008-2013..... 25

Executive Summary

This report examines nominal employment earnings[1] and earnings inequality in the public and private sectors in Ireland over the period 2008-2013. This period coincides with a significant change in economic conditions in the Irish economy. The issue of how earnings have been impacted has received much attention in recent years. Specifically, we use P35L data sourced from the Revenue Commissioners through the Central Statistics Office (CSO). This contains a record for each registered employment in a given year. Earnings[2] and the number of weeks worked are obtained from the P35L. This data is used to analyse earnings over the 2008-2013 period. Data is used only for individuals who are in employment for the full period 2008 to 2013, work a minimum of 48 weeks a year, and earn at least €10,000 a year.

The key results of the report suggest that earnings of employees in the study fell during the 2008 to 2010 period with the exception of the bottom quartile (Q1) where earnings remained almost constant. The period 2010 to 2013 was characterised by increases in earnings in both the public and private sectors. In all quartiles in the private sector average earnings in 2013 were higher than in 2008, with the highest earners (Q4) experiencing the largest increase over this time period. This contrasts with the public sector where the highest earners in the public sector actually experienced a fall in average earnings over the 2008 to 2013 period while those with the lowest earnings (Q1) experienced the largest increase in earnings.

Over the period there has also been a marginal increase in inequality in the sample considered. However, there is divergence between the public and private sector. While the private sector experienced rising inequality over the full period the public sector actually experienced falling inequality, with earnings converging during the 2008 to 2013 period. There was relatively higher growth in earnings in the highest earnings quartile in the private sector. In the public sector a fall in earnings in the highest quartile and increases in earnings in the lowest quartile are evident.

[1] Nominal employment earnings are hereafter referred to as 'earnings.'

[2] Earnings are total taxable earnings. It is gross pay less employee contributions to Health Insurance, Superannuation (including Pension Levy, Spouse's scheme, AVC, Purchased Notional Service), Union subscriptions, and Travel Pass Scheme.

Caution must be exercised when interpreting the findings of this report for several reasons. Firstly, the data used does not allow a distinction to be made between full-time and part-time employees. Secondly, explanatory variables such as education and occupation are not available in the dataset used here. These variables could aid the analysis of the earnings differences between the public and private sector. Therefore, efforts to draw direct comparisons between sectors must be avoided bearing these factors in mind.

1. Introduction

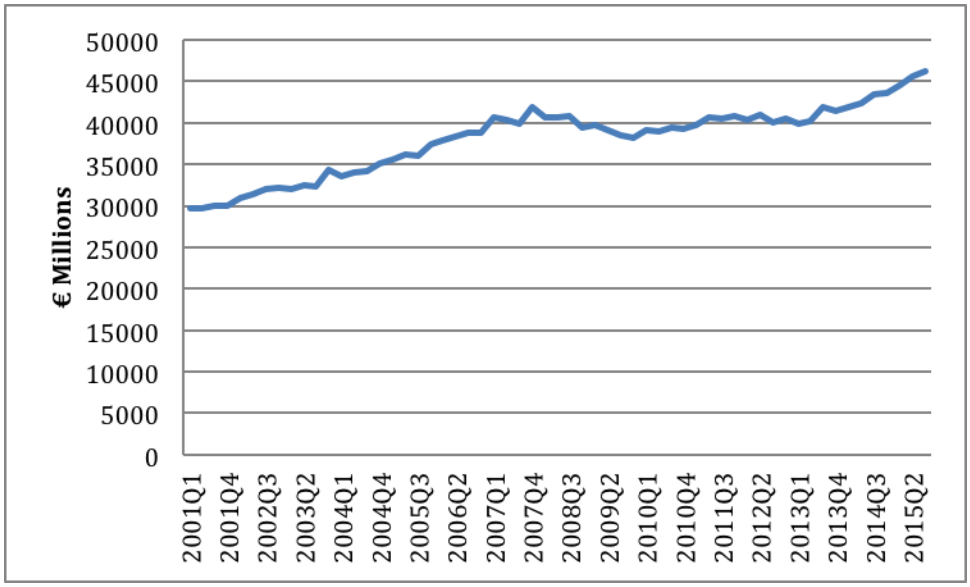
This report analyses changes in employment earnings in Ireland over the period 2008-2013. Over this period, the country has experienced a significant rise in unemployment and a decline in Gross National Product (GNP). This report aims to establish the impact this period of economic turmoil has had on the distribution of individuals' employment earnings. Using an administrative data source from the Central Statistics Office (CSO), based on information collected by the Revenue Commissioners, we analyse the changes in employment earnings of those who were in constant employment for the 2008-2013 period. The report analyses inequality across the private and public sectors in Ireland. This allows for new insights to be gained as to how different groups in employment in Ireland have been affected over this period.

The remainder of this report is structured as follows. Section 2 provides an overview of the economic conditions and institutional background prevalent during the period analysed. Section 3 describes the data and methodology employed in this report. The results of our analysis are presented in Section 4. Section 5 provides a conclusion.

2. Economic Context & Institutional Background

This section provides a brief overview of the economic context and institutional background of the time period studied. Two distinct periods are considered; the first a period of economic contraction and crisis, 2008 to 2010: the second a period of recovery, 2011 to 2013. Ireland's economy is currently recovering from a period of economic turmoil following the economic crisis. Figure 1 presents Ireland's Gross Domestic Product (GDP) figures over the recent period. It is evident that post 2008 there was a fall in economic output as measured by GDP. In 2009 GDP fell year-on-year by 5.6%. However, we see that after 2010 economic growth accelerated and the economy experienced sustained economic growth in the quarters that followed.

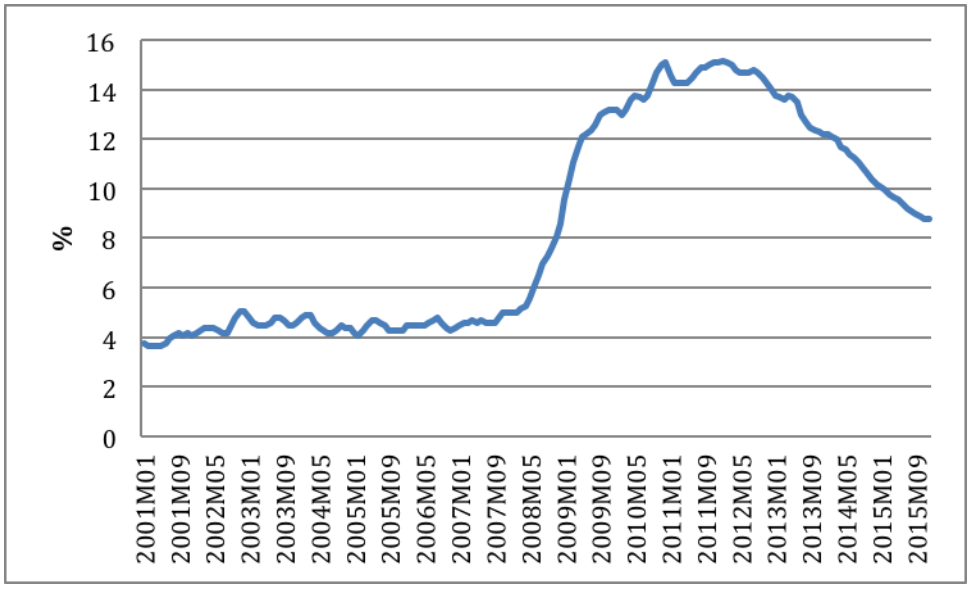
Figure 1: GDP at Constant Factor Costs (Seasonally Adjusted)



Source: CSO (2016a)

Figure 2 displays the evolution of unemployment over the period. Unemployment increased substantially from 4.4% in 2006 to a peak of 15.1 % in December, 2010. However, post 2010 unemployment levels initially stabilised and subsequently started to fall.

Figure 2: Seasonally Adjusted Monthly Unemployment Rate (%)



Source: CSO (2016b)

In this report we are solely considering those in employment and are therefore considering the impact of the 2008 shock going forward on employment earnings. We make no inference or comment on the impact on the welfare of those who are unemployed; the unemployment figures are provided merely as an economic backdrop.

According to the Earnings Hours and Employment Costs (EHECS) survey conducted by the CSO, the numbers employed in both the public and private sectors have decreased since 2008. This data is publically available from the CSO and is presented here to provide an insight into what has occurred over the period under study, it is not the actual data used in the later sections of this report. Table 1 shows that the numbers employed in the private sector have decreased by 17% while employment in the public sector has decreased by about 7% from quarter 1 of 2008 to quarter 1 of 2012. However we can see an increase in private sector employment between quarter 1 of 2011 and quarter 1 of 2012.

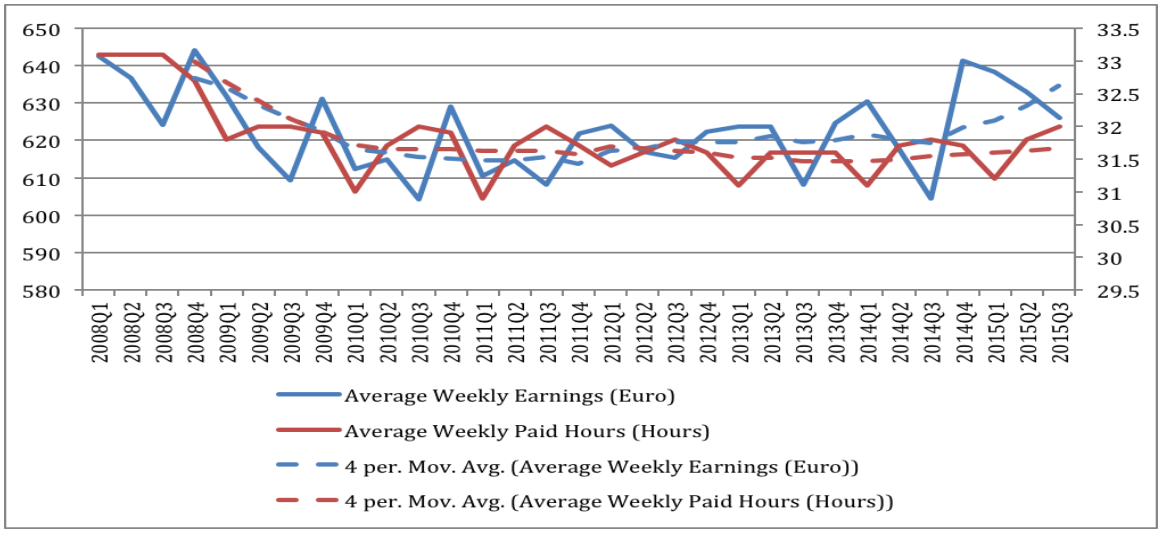
Table 1: Numbers employed in private and public sector[3]

Year	Q1 2008	Q1 2009	Q1 2010	Q1 2011	Q1 2012
Private Sector	1,350,200	1,209,100	1,148,000	1,105,700	1,116,700
Public Sector	417,000	421,200	406,800	409,400	389,200

While this downward trend in employment figures across both the public and private sector is worthy of detailed analysis, the focus of this report is employment earnings. Figures 3 and 4 below also use EHECS data and highlight how the 2008 downturn has impacted average earnings and hours worked. The data is presented in quarterly format and is volatile, showing substantial seasonal variation. Therefore, we focus on the discussion of a 4-period moving average for average weekly earnings and average weekly paid hours. We note that for the private sector there was a fall in average weekly earnings and paid hours following 2008. This signifies that individuals were earning less and working less hours. However, the effect on earnings seems to have started to dissipate and earnings have started to trend upwards from the end of 2012. Hours worked seems to have maintained a lower threshold since 2010.

[3] Source: CSO EHECS data available at http://www.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=EHQ08 accessed 15/6/2016

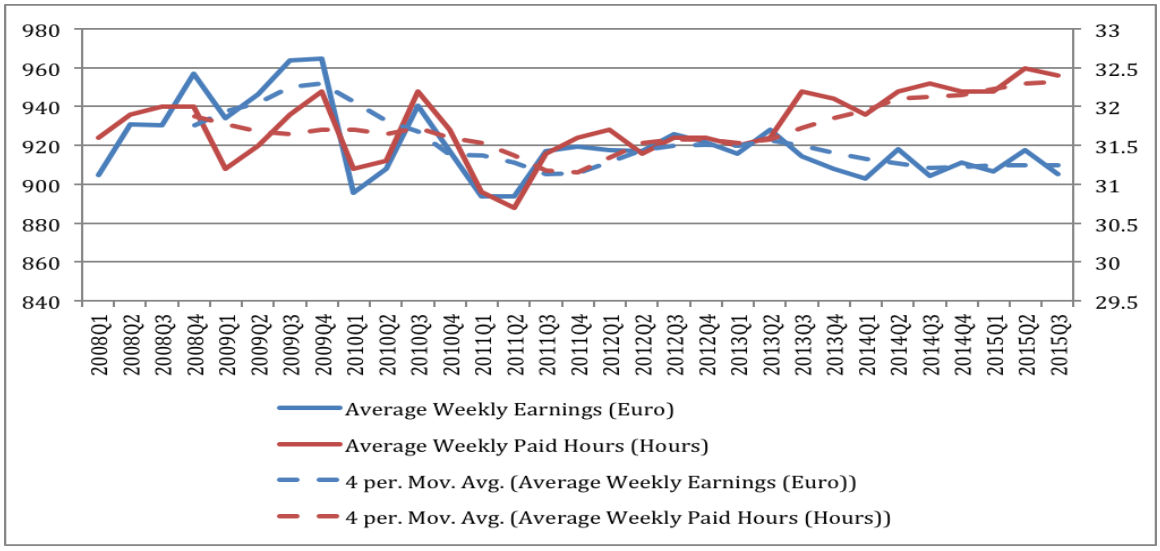
Figure 3: Private Sector Earnings and Hours Worked



Source: CSO (2016c)

The pattern in public sector earnings is notably different. Average weekly earnings were slower to fall in the public sector than in the private sector, starting to decline in 2009. However, there appears to be no recovery in average weekly earnings post-2009. Average weekly paid hours on the other hand, while initially declining, began to rise in 2011 and have continued to increase since then.

Figure 4: Public Sector Earnings and Hours Worked



Source: CSO (2016c)

3. Data & Methodology

The data used are compiled by the Central Statistics Office (CSO). The data provide information on earnings of individuals in Ireland from 2008 to 2013. The main source of data for this analysis is the P35L data sourced from the Revenue Commissioners. This contains a record for each registered employment in a given year. Earnings and the number of weeks worked are obtained from the P35L. Earnings are defined as total taxable earnings. It is gross earnings less employee contributions to Health Insurance, Superannuation (including contributions to Spouse's scheme, AVC, Purchased Notional Service), Pension Levy, Union subscriptions, and Travel Pass Scheme. This is merged with the CSO's Central Business Register (CBR) to assign business attributes such as legal form and activity breakdown of the enterprise by NACE Rev. 1 and Rev. 2.[4] The data is also merged with the Central Record System from the Department of Social Protection to assign individual characteristics such as gender, age and nationality.

[4] The regulation establishing NACE Rev. 2 was adopted in December 2006 and has been used for statistics referring to economic activities performed from 1 January 2008 onwards. The major distinction between NACE Rev. 1 and NACE Rev. 2 is the latter is a more detailed description of economic activities but the codification used under both classifications is quite similar (Eurostat, 2008).

There are a number of factors to consider before progressing to analysing the data. It is possible that an individual may have been in employment in one year of the sample but not in another. Therefore, the data can be thought of as an unbalanced panel with individuals entering and leaving. Individuals may also move workplace from year to year. In order to construct a balanced panel which is not influenced by individuals dropping in and out of the dataset we limit the analysis to individuals who are in employment for the full period 2008-2013. This means that we are only considering those who were employed for the full six years. While doing so reduces the sample size it removes issues associated with individuals entering and leaving the sample repeatedly.

Further to this it is possible that one individual may have had a number of jobs within one year resulting in a number of employment records for the individual. In this case we aggregate the individual's earnings and weeks worked to provide only one observation for the individual. While in the majority of cases this is straightforward there are a number of instances where individuals may have their primary source of earnings from the public sector but also have engaged in work in the private sector and *vice versa*. This raises issues for the categorisation of individuals into public and private groupings (but has no implication on the total figures). In this instance we assign a person as public or private based on their majority engagement. Majority engagement can be measured in terms of earnings or weeks worked. We use weeks worked.

Also we do not have a part-time/full-time indicator so we are unable to control for this. It is not possible to identify the number of hours an individual has worked. In an attempt to avoid bias introduced from part-time or seasonal workers we limit our sample to those who work in excess of 48 weeks and who earn more than €10,000. Figure 5 presents a flow chart summarising the data handling process which was used to create the final dataset.

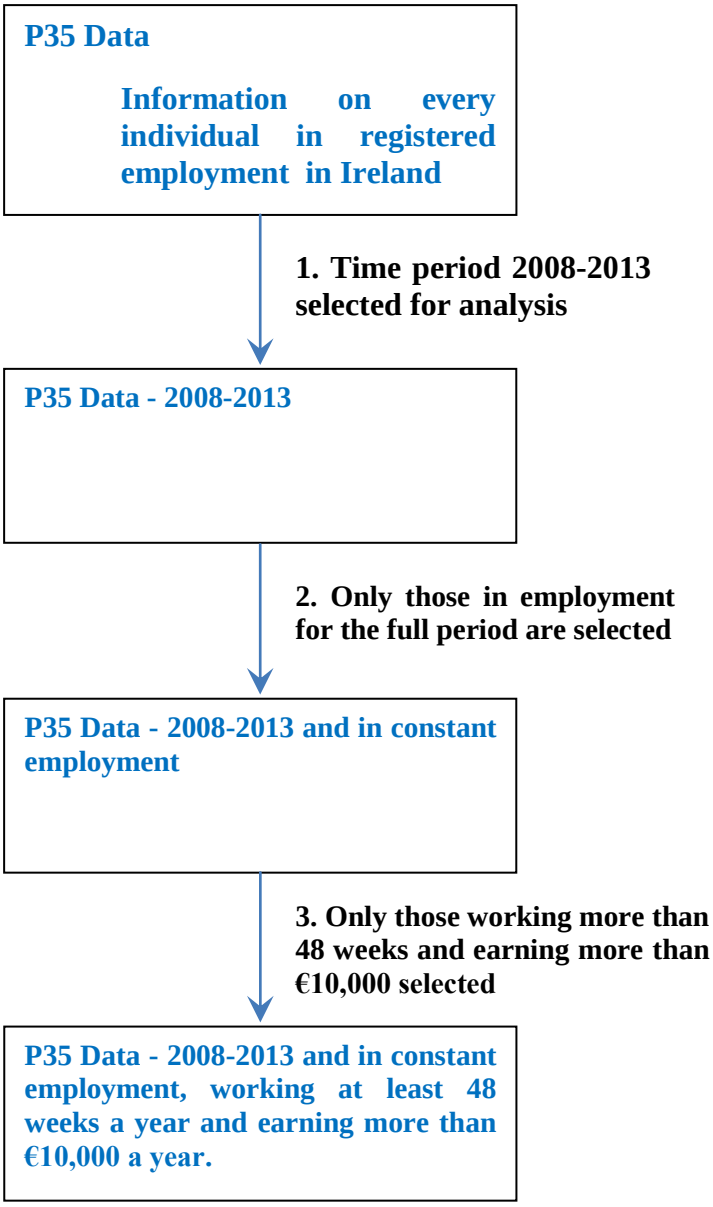
We split our data by public and private sector. To do this we make reference to the legal form of the business. The data provides information on the following types of legal form: (i) Individual Proprietorship, (ii) Partnership, (iii) Co-operative Society, (iv) Public Limited Company, (v) Private Unlimited Company, (vi) Private Limited Company, (vii) Statutory Body, (viii) Branch of a Foreign Company and (ix) Other. We define statutory bodies as public sector and the other legal forms as private sector. However, there is a possibility that some public sector firms may

be classified under different forms of legal ownership. This is a limitation of the data; since we do not know the identity of the firm, if the firm is not classified as a statutory body, we cannot tell with certainty that it is not a public sector enterprise.

The data has some further limitations. Ideally, income would be measured on a post-tax and transfer basis according to Gottschalk and Smeeding (1997). It would also include cash and non-cash components. Our data source does not enable us to measure earnings on a post-tax basis; it is based on total taxable earnings. It does not allow us to look at transfer payments or non-cash components as this information is not required in the P35L return. However, given that wages and salaries account for approximately 75% of household income (OECD, 2011), this data is useful for shedding light on income inequality and its sources.

The data we use contains information on 658,710 individuals, in constant employment for the period 2008-2013, working at least 48 weeks a year, and earning €10,000 a year or more. This results in a sample of individuals who are, we deem, fully embedded in the labour force. We assume that if individuals are working at least 48 weeks per year and earning in excess of €10,000 they are not engaged in seasonal work. It is noteworthy that we consider only those in employment, we do not consider those who are not in employment or those who have lost a job and subsequently taken in excess of four weeks to find alternative employment (or have not found alternative employment). Therefore, our study is of embedded workers, not of the impact of the crisis on unemployment, those made unemployed, or displaced workers.

Figure 5: Summary of Data Handling Process



The methodology used in this analysis is descriptive in nature. It uses descriptive statistics such as the mean, median, standard deviation and the coefficient of variation to describe differences in employment earnings over time in Ireland. The mean and median are measures of central tendency of the earnings distribution. The mean is a simple average of earnings but can be affected by extreme values. The median is the middle value when all earnings are ordered from

highest to lowest and so is unaffected by extremely high or low values of earnings. The standard deviation is also included to indicate the extent to which the values are distributed around the mean. The coefficient of variation is the standard deviation divided by the mean and is used in existing literature to measure income convergence [see Sala-i-Martin (1996) for example]. Larger coefficients of variation indicate a larger spread of values around the mean while smaller coefficients of variation indicate that the values are more closely clustered around the mean. A falling coefficient of variation over time indicates that earnings values are becoming more closely clustered around the mean while an increasing coefficient of variation indicates that earnings are becoming increasingly spread from the mean.

The Gini coefficient is the most commonly used method of measuring income inequality (World Bank, 2012). It is used in this study to measure earnings inequality. The Gini coefficient lies between zero and one where zero indicates complete equality (i.e. everybody has the same income) and one represents complete inequality (i.e. one person has all the income). More detail on how to calculate the Gini coefficient is available in the Appendix 1.

The analysis progresses in two stages. In the first stage we present the mean, median, standard deviation, and the coefficient of variation of earnings for individuals. We distinguish between the public and private sector as defined earlier. We subsequently divide the data by quartiles to present these statistics by differing earnings levels. Quartiles involve dividing the data into four sections. The first quartile (Q1) contains individuals in the lowest 25^{th} percentile of earnings. The second quartile (Q2) contains individuals whose earnings lie between the 25^{th} and 50^{th} percentile. The third quartile (Q3) contains individuals whose earnings lie between the 50^{th} and 75^{th} percentile. The fourth quartile (Q4) contains individuals whose earnings lie above the 75^{th} percentile. Following the discussion on earnings levels we present a discussion of earnings inequality.

4. Employment Earnings Inequality in Ireland 2008-2013

This section describes employment earnings inequality in Ireland over the time period 2008-2013 with a specific focus on those working in the public and private sectors. Section 4.1 examines the evolution of earnings in the public and private sectors. Section 4.2 focuses on investigating

earnings inequality. It is important to note that this analysis is performed on the subsample of the P35 data outlined in Section 3 which indicates that the data is based on what is deemed embedded employment and does not consider the impact of the crisis on those who lost their jobs during the crisis.

4.1 Employment earnings - the public and private sector

As this report distinguishes between public and private sector earnings, Table 2 provides the breakdown of employment records in the public and private sectors. The percentage of males employed in the public sector varies from 42% in the period prior to 2010 to 40% in the period post 2010, while in the private sector the sample is made up of between 55% and 57% males. The median age is 42 at the start of the period in the public sector and 37 in the private sector. These two factors highlight that our samples for the public and private sectors vary in terms of gender and age profiles. It is also likely that they would vary by other characteristics (such as education and experience); however the types of data available in the P35 dataset are limited to basic descriptive variables. In general our public sector sample is characterised by a higher proportion of female employees and an older demographic than our private sector sample.

Table 2: Summary statistics of sample

Year	2008	2009	2010	2011	2012	2013	% Change 2008-2010	% Change 2010-2013	% Change 2008-2013

Public Sector									
% in sample	27.65	27.98	30.35	30.46	30.59	30.61	9.76%	0.86%	10.71%
Male (%)	42%	42%	40%	40%	40%	40%	-4.76%	0.00%	-4.76%
Age (Median)	42	43	44	45	46	47	4.76%	6.82%	11.90%
Earnings (median €)	851.58	840.49	796.5	811.9	826.37	838.27	-6.47%	5.24%	-1.56%
Private Sector									
% in sample	72.35	72.02	69.65	69.54	69.41	69.39	-3.73%	-0.37%	-4.09%
Male (%)	55%	55%	57%	57%	57%	57%	3.64%	0.00%	3.64%
Age (median)	37	38	39	40	41	42	5.41%	7.69%	13.51%
Earnings (median €)	688.56	684.15	681.54	688.26	694.08	705.52	-1.02%	3.52%	2.46%

When considering earnings we note that median public sector weekly earnings (in nominal terms) in 2008 was €851.58 while in 2008 in the private sector it was €688.56 weekly. By 2013 the median weekly earnings in the public and private sector was €838.27 and €705.52 respectively. Regarding the change over the time period, the period 2008-2010 saw a 6.47% decrease in public sector weekly earnings[5] while earnings in the private sector fell 1.02% in the corresponding period. In the period 2010 to 2013 public sector weekly earnings increased by 5.24% while in the private sector weekly earnings increased by 3.52% in the same period. Over the full period of 2008 to 2013 public sector earnings have fallen 1.56% while private sector earnings have increased 2.46%.

Descriptive statistics for average weekly earnings are presented in Table 3. While median earnings are presented in Table 2, Table 3 presents additional information relating to the mean, median, standard deviation, and the coefficient of variation of earnings in the overall sample and by public and private sector. Average (mean) weekly earnings was €845.81 in 2008 rising to €858.37 in 2013 having fallen as low as €816.13 in 2010 for all individuals in the sample. Overall, mean earnings fell 3.51% from 2008 to 2010 but recovered by 5.18% in the subsequent 2010-2013 period to finish 1.48% higher in 2013 than the initial 2008 level.

A similar pattern is observed for median earnings, with a fall from 2008 through to 2010 of 2.38%, and a recovery between 2010 and 2013 of 4.08% resulting in median earnings for our full

[5] In interpreting the trends in public sector earnings, it should be noted that reductions in pay under the Financial Emergency Measures in the Public Interest (FEMPI) legislation did not apply to employees in Commercial State Bodies.

sample being 1.61% higher in 2013 than the initial level in 2008. The coefficient of variation of the average weekly earnings has fluctuated between 2008 and 2013 falling in the 2008 to 2010 period but rising in the 2010 to 2013 period. By 2013 the coefficient of variation of earnings has increased by 0.27% since 2008 suggesting that earnings have diverged slightly over the full time period.

Table 3: Earnings (€) by Public and Private Sector 2008-2013

	2008	2009	2010	2011	2012	2013	% Change 2008-2010	% Change 2010-2013	% Change 2008-2013
All Sectors									
Mean (€)	845.81	830.79	816.13	830.1	844.83	858.37	-3.51%	5.18%	1.48%
Median (€)	738.56	733.69	721	729.67	738.42	750.44	-2.38%	4.08%	1.61%
Standard Deviation	492.9	461.72	452.15	471.32	488.17	501.57	-8.27%	10.93%	1.76%
Coefficient of Variation	0.5828	0.5558	0.5540	0.5678	0.5778	0.5843	-4.93%	5.47%	0.27%
Public Sector									
Mean (€)	926.47	913.37	855.52	864.73	875.44	878.87	-7.66%	2.73%	-5.14%
Median (€)	851.58	840.49	796.5	811.9	826.37	838.27	-6.47%	5.24%	-1.56%
Standard Deviation	429.62	412.22	368.02	363.32	365.3	355.91	-14.34%	-3.29%	-17.16%
Coefficient of Variation	0.4637	0.4513	0.4302	0.4202	0.4173	0.4050	-7.23%	-5.86%	-12.67%
Private Sector									
Mean (€)	814.98	798.71	798.96	814.94	831.35	849.32	-1.97%	6.30%	4.21%
Median (€)	688.56	684.15	681.54	688.26	694.08	705.52	-1.02%	3.52%	2.46%
Standard Deviation	511.69	475.73	483.26	510.75	532.85	553.53	-5.56%	14.54%	8.18%
Coefficient of Variation	0.6279	0.5956	0.6049	0.6267	0.6409	0.6517	-3.66%	7.75%	3.80%

Mean earnings in the public and private sector follow similar patterns to the median earnings statistics discussed in Table 2. We observe decreases of 7.66% and 1.97% in the public and private sector respectively in the 2008 to 2010 period and increases of 2.73% and 6.30% in the period 2010-2013. Thus mean earnings fell by 5.14% in the public sector and rose 4.21% in the private sector between 2008 and 2013 overall. The coefficient of variation in the public sector has fallen in both periods (-7.23% and -5.86% in the 2008 to 2010 and 2010 to 2013 period respectively) resulting in an overall fall in the coefficient of variation of -12.67% in the public sector between 2008 and 2013. This suggests that earnings in the public sector have been mean reverting, i.e. converging to the mean over this period. In the private sector while the coefficient of variation fell by -3.66% in the 2008-2010 period in the 2010-2013 period it increased by

7.75% resulting in an overall increase in the 2008 to 2013 period of 3.80%. This suggests that over the full period earnings in the private sector have diverged.

In order to provide further insight into earnings distributions we now consider earnings quartiles. It may be that different patterns emerge within and across the private and public sectors when earnings are examined by quartile. The dataset is divided into quartiles (quarters) from poorest to richest based on median earnings. The bottom quartile contains the quarter of the population with the lowest earnings while the top quartile contains the quarter of the population with the highest earnings. This analysis is presented in tables 4-6 below.

The mean, median, standard deviation, and coefficient of variation are displayed by quartile for our full sample in Table 4. We can see that mean and median earnings in 2008 vary substantially across quartiles. Mean (median) earnings in Q1 in 2008 is €402.59 (€417.92) while in Q4 it is €1,483 (€1,301.12). We note that mean (median) earnings in Q1 remained almost constant over the period 2008-2010 increasing by 0.25% (0.07%) and increasing in the 2010-2013 period by 2.52% (2.39%) to leave earnings in 2013 2.78% (2.46%) higher than 2008. This is in contrast to the remaining three quartiles where mean (median) earnings fell in the 2008-2010 period by 1.59% (1.50%), 3.24% (3.05%), and 5.50% (5.22%) respectively. All quartiles experienced an increase in earnings in the 2010-2013 period with increases of 3.72% (3.48%), 4.93% (5.21%), and 6.74% (4.92%) in quartiles Q2, Q3, and Q4 respectively. Over the full period 2008 to 2013 mean (median) earnings has increased by 2.78% (2.46%), 2.07% (1.92%), 1.52%, (2.00%), and 0.86% (-0.56%), in Q1 through Q4 respectively. We note that the overall percentage increases in earnings over the 2008 to 2013 period are greater for the lower quartiles relative to the higher quartiles, with Q1 experiencing the highest increase and Q4 the lowest increase (and an actual decrease in Q4 median earnings). The coefficients of variation in Q1 and Q4 increased from 2008 to 2013 while in Q2 and Q3 it has decreased.

Table 4: Descriptive Statistics of Earnings (€) by Quartiles – All Sectors

Year	2008	2009	2010	2011	2012	2013	% Change 2008-2010	% Change 2010-2013	% Change 2008-2013
All Sectors - Q1									
Mean (€)	402.59	405.4	403.6	406.58	410.6	413.79	0.25%	2.52%	2.78%
Median (€)	417.92	420	418.2	420.12	424.15	428.19	0.07%	2.39%	2.46%
Standard Deviation	88.54	86.74	85.56	87.21	89.48	92.24	-3.37%	7.81%	4.18%
Coefficient of Variation	0.2199	0.2140	0.2120	0.2145	0.2179	0.2229	-3.61%	5.15%	1.36%
All Sectors – Q2									
Mean (€)	632.68	630.67	622.64	629.29	637	645.78	-1.59%	3.72%	2.07%
Median (€)	631.35	629.19	621.87	628.85	635.31	643.48	-1.50%	3.48%	1.92%
Standard Deviation	60.48	58.63	56.26	56.74	56.83	58.28	-6.98%	3.59%	-3.64%
Coefficient of Variation	0.0956	0.0930	0.0904	0.0902	0.0892	0.0902	-5.48%	-0.12%	-5.59%
All Sectors - Q3									
Mean (€)	864.99	855.76	836.93	849.13	862.81	878.15	-3.24%	4.93%	1.52%
Median (€)	856.94	849.06	830.83	843.37	858.34	874.12	-3.05%	5.21%	2.00%
Standard Deviation	80.73	77.5	73.48	75.29	77.36	78.74	-8.98%	7.15%	-2.47%
Coefficient of Variation	0.0933	0.0906	0.0878	0.0887	0.0897	0.0897	-5.93%	2.12%	-3.93%
All Sectors - Q4									
Mean (€)	1483	1431.38	1401.37	1435.44	1468.96	1495.76	-5.50%	6.74%	0.86%
Median (€)	1301.12	1266.08	1233.16	1253.81	1277.31	1293.89	-5.22%	4.92%	-0.56%
Standard Deviation	552.76	503.43	501.33	534.41	560.72	581.95	-9.30%	16.08%	5.28%
Coefficient of Variation	0.3727	0.3517	0.3577	0.3723	0.3817	0.3891	-4.02%	8.76%	4.38%

Turning to the private sector in Table 5, mean (median) earnings fell by 0.47% (0.79%), 1.44% (1.43%), 3.36% (3.17%), and 4.81% (3.83%) over the 2008 to 2010 period for Q1 through Q4 respectively.

Table 5: Descriptive Statistics of Earnings (€) by Quartiles – Private Sector

Year	2008	2009	2010	2011	2012	2013	% Change 2008-2010	% Change 2010-2013	% Change 2008-2013
Private Sector - Q1									
Mean (€)	401.66	403.61	399.78	402.29	406.26	409.27	-0.47%	2.37%	1.89%
Median (€)	415.87	417.1	412.57	414.9	418.35	422.21	-0.79%	2.34%	1.52%
Standard Deviation	88.17	86.64	85.5	87	89.1	91.65	-3.03%	7.19%	3.95%
Coefficient of Variation	0.2195	0.2147	0.2139	0.2163	0.2193	0.2239	-2.57%	4.71%	2.01%
Private Sector - Q2									
Mean (€)	629.8	627.74	620.74	627.59	635.45	644.27	-1.44%	3.79%	2.30%
Median (€)	627.36	624.98	618.38	625.94	633.04	641.58	-1.43%	3.75%	2.27%
Standard Deviation	60.25	58.55	56.21	56.87	57.2	58.68	-6.71%	4.39%	-2.61%
Coefficient of Variation	0.0957	0.0933	0.0906	0.0906	0.0900	0.0911	-5.34%	0.58%	-4.79%
Private Sector - Q3									
Mean (€)	863.26	854.1	834.25	844.76	856.37	870.96	-3.36%	4.40%	0.89%
Median (€)	854.1	846.71	827.04	836.56	848.77	863.88	-3.17%	4.45%	1.15%
Standard Deviation	80.66	77.29	72.97	74.62	76.52	78.28	-9.53%	7.28%	-2.95%
Coefficient of Variation	0.0934	0.0905	0.0875	0.0883	0.0894	0.0899	-6.39%	2.76%	-3.81%
Private Sector - Q4									
Mean (€)	1540.27	1478.45	1466.21	1513.35	1551.86	1588.03	-4.81%	8.31%	3.10%
Median (€)	1333.67	1295.54	1282.58	1312.67	1342.12	1369.58	-3.83%	6.78%	2.69%
Standard Deviation	607.26	537.83	545.75	589.17	617.62	642.5	-10.13%	17.73%	5.80%
Coefficient of Variation	0.3943	0.3638	0.3722	0.3893	0.3980	0.4046	-5.59%	8.70%	2.62%

We again see the pattern that individuals in Q1 (lowest earnings levels) experienced the smallest relative fall in earnings. From 2010 to 2013, mean (median) earnings increased by 2.37% (2.34%), 3.79% (3.75%), 4.40% (4.45%), and 8.31% (6.78%) respectively in Q1 through Q4. In this instance the greatest increases in earnings are observed in the higher quartiles relative to the lower quartiles. These changes resulted in an overall change between 2008 and 2013 of 1.89%

(1.52%), 2.30% (2.27%), 0.89% (1.15%), and 3.10% (2.69%) in Q1 through Q4 respectively. Q4 experienced the largest increase in earnings over the full period with Q3 experiencing the lowest increase. Regarding the coefficient of variation of earnings this decreased in all quartiles in the period 2008-2010 and increased in the period 2010 to 2013. Over the full period, the coefficient of variation for earnings has fallen in Q2 and Q3 but increased in Q1 and Q4.

Table 6 presents the earnings quartile analysis for public sector workers in our sample. We note that in the 2008-2010 period mean (median) public sector earnings in Q1 increased by 3.60% (3.91%) and in Q2 through Q4 it fell 2.27% (2.25%), 3.11% (2.84%), and 7.36% (7.31%) respectively. In the period 2010 to 2013, mean (median) earnings increased in Q1 through Q4 by 3.55% (3.39%), 3.53% (2.79%), 5.58% (6.34%), and 1.94% (2.60%) respectively. This has resulted in an overall increase in Q1 through Q3 of 7.27% (7.44%), 1.18% (0.48%), and 2.29% (3.32%). However, Q4 has seen an overall decrease in earnings over the full period of 5.56% (4.91%).

In the public sector the lower quartiles have seen earnings increase the most over the full time period while earnings levels in the highest quartile have actually decreased. The coefficient of variation decreased across all quartiles between 2008 and 2010. It also fell in Q2 and Q4 from 2010 to 2013 and increased in quartile Q1 and Q3 during the period. Over the full period, the coefficient of variation has decreased for all quartiles from 2008 to 2013.

Table 6: Descriptive Statistics of Earnings (€) by Quartiles – Public Sector

Year	2008	2009	2010	2011	2012	2013	% Change 2008-2010	% Change 2010-2013	% Change 2008-2013
Public Sector - Q1									
Mean (€)	408.11	417.37	422.8	428.88	433.83	437.8	3.60%	3.55%	7.27%
Median (€)	431.48	440.69	448.37	454.57	459.73	463.58	3.91%	3.39%	7.44%
Standard Deviation	90.49	86.51	83.28	84.86	87.87	91.63	-7.97%	10.03%	1.26%
Coefficient of Variation	0.2217	0.2073	0.1970	0.1979	0.2025	0.2093	-11.17%	6.26%	-5.61%
Public Sector - Q2									
Mean (€)	641.46	638.76	626.88	633.04	640.37	649.02	-2.27%	3.53%	1.18%
Median (€)	644.04	641.75	629.54	634.02	640.02	647.13	-2.25%	2.79%	0.48%
Standard Deviation	60.35	58.07	56.12	56.25	55.88	57.29	-7.01%	2.08%	-5.07%
Coefficient of Variation	0.0941	0.0909	0.0895	0.0889	0.0873	0.0883	-4.85%	-1.40%	-6.18%
Public Sector - Q3									
Mean (€)	868.16	858.68	841.15	855.71	871.94	888.06	-3.11%	5.58%	2.29%
Median (€)	861.58	852.84	837.12	853.35	872.42	890.17	-2.84%	6.34%	3.32%
Standard Deviation	80.74	77.77	74.09	75.82	77.62	78.29	-8.24%	5.67%	-3.03%
Coefficient of Variation	0.0930	0.0906	0.0881	0.0886	0.0890	0.0882	-5.29%	0.09%	-5.21%
Public Sector - Q4									
Mean (€)	1382.3	1348.19	1280.55	1287.97	1305.89	1305.43	-7.36%	1.94%	-5.56%
Median (€)	1259.1	1223.94	1167.02	1177.39	1192.81	1197.33	-7.31%	2.60%	-4.91%
Standard Deviation	422.45	423.45	377.13	368.62	377.4	363.19	-10.73%	-3.70%	-14.03%
Coefficient of Variation	0.3056	0.3141	0.2945	0.2862	0.2890	0.2782	-3.63%	-5.53%	-8.97%

Table 7 below displays the movement of individuals across quartiles. This shows the percentage of individuals who have moved up or down in earnings quartiles (or remained unchanged). A plus value indicates an upward movement in quartiles (i.e. moving from Q1 up to Q2 or higher) while a negative value indicates that an individual has moved down earnings quartiles (i.e. from Q4 down to Q3 or lower). A value of zero indicates that an individual has not moved from their

previous quartile. We show movements based upon one year changes. Therefore, the table commences in 2009, showing the percentage of individuals who have moved, or failed to move, quartiles since 2008.

Table 7: Percentage Movement Across Quartiles

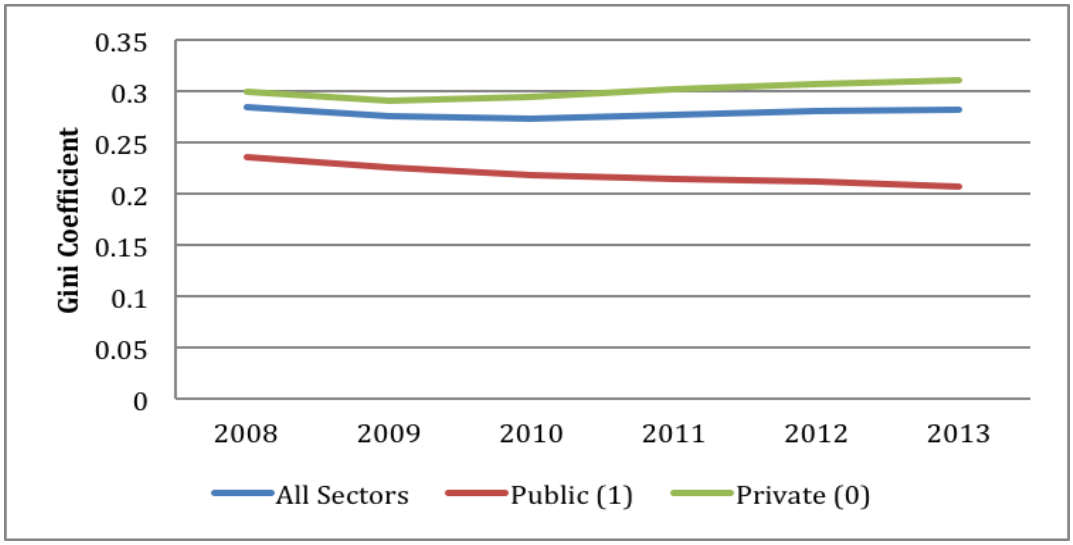
Year		2009	2010	2011	2012	2013
All Sectors	-3	0.05	0.04	0.05	0.04	0.04
	-2	0.45	0.36	0.3	0.29	0.28
	-1	8.31	7.86	6.91	6.41	6.25
	0	82.31	83.41	85.46	86.47	86.83
	+1	8.44	7.98	6.96	6.5	6.31
	+2	0.41	0.32	0.3	0.27	0.27
	+3	0.03	0.03	0.03	0.02	0.03
Public Sector	-3	0.01	0.01	0.01	0.01	0.02
	-2	0.24	0.25	0.18	0.21	0.22
	-1	7.95	12.42	6.85	6.68	7.25
	0	83	82.28	85.57	86.14	86.29
	+1	8.12	4.74	7.1	6.72	6
	+2	0.67	0.28	0.28	0.23	0.2
	+3	0.02	0.01	0.01	0.01	0.01
Private Sector	-3	0.07	0.05	0.06	0.05	0.05
	-2	0.53	0.4	0.35	0.33	0.3
	-1	8.45	5.87	6.93	6.29	5.81
	0	82.05	83.91	85.41	86.61	87.06
	+1	8.56	9.39	6.9	6.41	6.44
	+2	0.31	0.34	0.31	0.29	0.3
	+3	0.04	0.03	0.03	0.03	0.03

In general there is little movement across quartiles with the likelihood of changing quartiles decreasing over time. While in our overall sample 82.31% of individuals did not move quartile between 2008/2009, by 2012/2013 this had risen to 86.83%. This pattern is prevalent across both the public and private sector. In all cases, where a movement across quartiles does occur, it is typically a movement of one quartile, either upward or downward, suggesting relatively modest changes in earnings. A very small proportion of individuals have moved across more than one quartile in a given year. The impact of the reductions in public sector pay is reflected in the unusually large number of 12.42 percent who fell into a lower quartile in 2010.

4.2 Earnings inequality in Ireland

Figure 6 displays the Gini coefficients for the total sample and for the public and private sector. The Gini coefficient, as previously discussed, is a widely used measure of income inequality. It is used in this instance to analyse earnings inequality. As workers are fully engaged in the labour market and have earnings in excess of €10,000, it is to be expected that the Gini coefficient in our sample may be lower than the general economy. However, it is still of interest to assess the patterns of inequality observed across the public and private sector for these embedded workers.

Figure 6: Gini Coefficient 2008-2013



The Gini coefficient for the full sample of individuals in 2008 was 0.275; it has marginally increased to 0.282 in 2013. It has declined from 2008 to 2010 which indicates decreasing earnings inequality and increased year-on-year through to 2013.

The line representing private sector weekly earnings inequality in Figure 6 follows an almost identical path to the overall data. We observe that earnings inequality fell from 2008 to 2010 and then increased subsequently. This may be reflected in the previous tables which show for the private sector that earnings has increased more rapidly in the fourth quartile relative to those in lower quartiles, accelerating the increasing inequality. We also see evidence of this in Table 8 which examines the Gini coefficient by quartile. We observe that it has increased by 4.22% over the period 2008-2013 in the private sector. However in Figure 6, the line representing the public

sector has continually decreased from 2008. This may be due to the continued decline of earnings for those in the fourth quartile of the public sector, which would have the effect of reducing the overall Gini coefficient. This is supported by the evidence in Table 8 which shows a decline of 11.84% in the Gini coefficient for those in quartile 4 of the public sector from 2008-2013.

Table 8: Gini Coefficient by Quartile

Year	2008	2009	2010	2011	2012	2013	% Change 2008-2010	% Change 2010-2013	% Change 2008-2013
All Sectors - Q1	0.1245	0.1212	0.12	0.1215	0.1236	0.1264	-3.61%	5.33%	1.53%
All Sectors - Q2	0.0552	0.0537	0.0522	0.052	0.0515	0.0521	-5.43%	-0.19%	-5.62%
All Sectors - Q3	0.0537	0.0521	0.0505	0.0511	0.0517	0.0517	-5.96%	2.38%	-3.72%
All Sectors - Q4	0.1704	0.162	0.1664	0.172	0.1763	0.1785	-2.35%	7.27%	4.75%
Public Sector - Q1	0.1245	0.1156	0.1086	0.109	0.1119	0.1157	-12.77%	6.54%	-7.07%
Public Sector - Q2	0.0543	0.0524	0.0517	0.0513	0.0503	0.0509	-4.79%	-1.55%	-6.26%
Public Sector - Q3	0.0536	0.0522	0.0508	0.0511	0.0514	0.0509	-5.22%	0.20%	-5.04%
Public Sector - Q4	0.136	0.1353	0.1288	0.1252	0.1265	0.1199	-5.29%	-6.91%	-11.84%
Private Sector - Q1	0.1244	0.1218	0.1214	0.1229	0.1247	0.1273	-2.41%	4.86%	2.33%
Private Sector - Q2	0.0552	0.0538	0.0523	0.0523	0.052	0.0526	-5.25%	0.57%	-4.71%
Private Sector - Q3	0.0537	0.052	0.0503	0.0507	0.0514	0.0517	-6.33%	2.78%	-3.72%
Private Sector - Q4	0.185	0.1732	0.1789	0.1865	0.1903	0.1928	-3.30%	7.77%	4.22%

4.3 Note on Taxation

The preceding sections analyse the changes in employment earnings in Ireland. At the outset of the report it was noted that employment earnings are used which do not include the effects of taxation changes introduced by the government in annual budgets over the 2008-2013 time

frame. As shown in Appendix 2 significant changes in net earnings were experienced over the 2008-2013 period after a series of contractionary budgets. A single person earning a gross salary of €25,000 in 2008 took home almost €23,000 that year but this fell to just over €21,000 in 2013 as a result of changes to taxation. This represents a fall in net income of 7.5% in a relatively short amount of time. The impact for a single person on higher incomes is greater with those earning €150,000 experiencing an almost 13% decrease in take home pay between 2008 and 2013. Similar patterns are evident for married couples with one income and no children and those with two children. The decline in net income is marginally less for a married couple with one income and two children compared to a married couple with one income and no children. While the previous sections highlight the changes in employment earnings of those who remained in employment from 2008-2013 the net income figures show a larger decline in the level of take home pay of individuals according to the government budget figures. This is to be expected given that employment earnings do not account for taxation and changes to taxation over a very difficult economic period.

5. Conclusion

In this report we have presented an analysis of the evolution of employment earnings of employees in the study over the period 2008 to 2013 for a sample of individuals from the P35 data available from the CSO. The analysis has focused on those who have been employed continuously for the 2008 to 2013 period and have worked at least 48 weeks a year with minimum earnings of €10,000. The results were presented for the public and private sector and by quartile. A discussion of earnings inequality has also been presented using the Gini coefficient.

The key findings of the report suggest that earnings of employees in the study fell during the 2008 to 2010 period with the exception of the bottom quartile (Q1) where earnings remained almost constant. The period 2010 to 2013 was characterised by increases in earnings in both the public and private sectors. In all quartiles in the private sector average earnings in 2013 were higher than in 2008, with the highest earners (Q4) experiencing the largest increase over this time period. This contrasts with the public sector where the highest earners in the public sector

actually experienced a fall in average earnings over the 2008 to 2013 period while those with the lowest earnings (Q1) experienced the largest increase in earnings.

Over the period there has also been a negligible increase in inequality in the sample considered. While the private sector experienced rising inequality over the full period the public sector actually experienced falling inequality, with earnings converging during the 2008 to 2013 period. In the private sector we saw relatively higher growth in earnings in the highest earnings quartile while in the case of the public sector we noted a fall in earnings in the highest quartile and increases in earnings in the lowest quartile.

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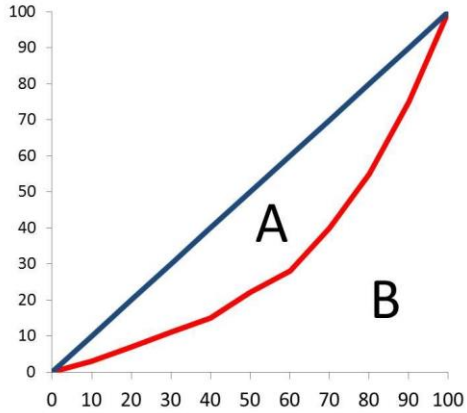
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Appendix 1: The Gini Coefficient

The Gini coefficient is the most commonly used measure of income inequality. The coefficient varies between 0 and 1, which reflect complete equality and complete inequality respectively.

Graphically, the Gini coefficient can be easily represented by the area between the Lorenz curve and the line of equality. In the figure to the right, the Lorenz curve maps the cumulative income share on the vertical axis against the distribution of the population on the horizontal axis. In this example, 40% of the population obtains around 15% of total income. If each individual had the same income, or total equality, the income distribution curve would be the straight line in the graph – representing total equality. The Gini coefficient is calculated as the area A divided by the sum of areas A and B. If income is distributed completely equally, then the Lorenz curve and the line of total equality are merged and the Gini coefficient is zero (area A would be zero). If one individual receives all the income, the Lorenz curve would pass through the points (0,0), (100,0) and (100,100), and the surfaces A and B would be similar, leading to a value of one for the Gini-coefficient.



The Gini coefficient formula for inequality in pay is:

$$\text{GINI(Pay)} = -2\ \text{Cov}\left(\frac{Pay}{mean(Pay)},\ (1 - F(Pay))\right)$$

where pay is a random variable of interest with mean μ(X), and F(X) is its cumulative distribution function. Cov is the covariance between pay and population share and F (pay) is the cumulative distribution function for pay.

Appendix 2: Example of Tax Changes 2008 - 2013

Net Income	2008	2013	Net Change 2008-2013 (%)
Single Person (PAYE)			
25,000	22,924	21,208	-7.5
35,000	29,824	27,557	-7.6
100,000	66,198	58,532	-11.6
150,000	94,408	82,352	-12.8
Married Couple One Income (PAYE)			
45,000	38,928	35,852	-7.9
55,000	44,380	40,607	-8.5
100,000	69,923	62,072	-11.2
Married Couple One Income (PAYE) plus 2 children			
45,000	39,828	37,083	-6.9
55,000	45,280	41,883	-7.5
100,000	70,823	63,483	-10.4

Source: Government Budget Statements http://budget.gov.ie/Budgets/2016/2016.aspx