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POLICY PAPER

COVID-19: How Important is Education for Social Distancing and Remote Work

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Abstract: Public health interventions such as occupational social distancing and remote working, while critical to slow the spread of the coronavirus, are severely disrupting labour markets. We examine the impact of educational attainment on a worker's potential to engage in both occupational social distancing in the workplace and working from home requirements for the Irish case. We identify that remote working has a more significant economic effect on labour market inequalities than occupational social distancing. In fact, the results indicate the relationship between occupational social distancing and differences in worker demographics are small. Remote working inequalities are primarily related to differences in individual education levels and a worker's gender.

I INTRODUCTION

The COVID-19 pandemic represents an unprecedented shock to the global economy and the scale of its impact in the short and long term is difficult to predict. Even with effective vaccines, the World Health Organisation (2021) emphasises that there will be a continued need to implement public health measures

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such as wearing masks, physical distancing, frequent hand washing, and avoiding crowds. These measures, while successful at slowing the spread of the virus (Gollwitzer *et al*., 2020), are disrupting labour markets and the economy (Baldwin and Weder di Mauro, 2020; Blundell *et al*., 2020; Goodell, 2020; Koren and Pető, 2020). Like most countries, the pandemic has had a profound effect on the Irish economy and labour market with a drastic reduction in the size and scope of economic activity (Donohoe, 2021). As business owners, managers and employees look for ways to operate within the new COVID-19 workplace realities, we examine whether differences in education between workers will affect their ability to return to work or work from home.

Academic research, government reports and the press frequently report wage gaps between those who leave school early and college graduates (Abel and Deitz, 2014; Carnevale *et al*., 2011). Whether measured in hourly wages, annual earnings, or projected lifetime income, most authors conclude that an education premium exists (Bhuller *et al*., 2017; Black *et al*., 2006; Blundell *et al*., 2016; Tamborini *et al*., 2015). Irlacher and Koch (2020) suggest that the working from home measures introduced in response to the pandemic may increase this premium. Examining survey data for Germany, they find that those whose jobs allowed them to work from home prior to the crisis were, on average, paid more than those who could not work from home. Similar results have been found in Italy (Pigini and Staffolani, 2019) and for some sectors in the US (Chiou and Tucker, 2020). Since highly educated, high-income and White workers were more likely to shift to remote work and to maintain employment following the virus outbreak (Bick *et al*., 2020),[1] many argue that those with lower levels of education, along with younger workers and minority workers, will experience the greatest inequalities due to the pandemic (Pouliakas and Branka, 2020; Yasenov, 2020).

Many studies examining the role of education during the COVID-19 pandemic focus on employment loss (Béland *et al*., 2020; Montenovo *et al*., 2020) and working from home (Adams-Prassl *et al*., 2020; Delaporte and Peña, 2020; Dingel and Neiman, 2020; Mongey *et al*., 2020). Fewer studies look at the relationship between education and occupational social distancing (Pouliakas and Branka, 2020). We go further than other studies in the COVID-19 literature by examining the role of education on both occupational social distancing and remote working potential, whilst controlling for other individual characteristics. It is important to examine both remote working and social distancing potential as these indicators may collide or diverge at the individual occupation level (Avdiu and Nayyar, 2020). The social distancing measure used here follows Koren and Pető (2020), who use questions from the Occupational Information Network (O*Net) which assess the degree to which face-to-face contact is required for tasks within an occupation. The

[1] In the US 50 per cent of workers with a Bachelor's degree or higher worked entirely from home in May 2020 compared to only 15 per cent of workers with a high school degree or less (Bick *et al.*, 2020).

remote working measure follows the approach of Dingel and Neiman (2020), who again use questions from O*Net that encompass many different job dimensions, including the susceptibility to use email as a substitute for face-to-face communication, and the need to use specialised equipment and protective equipment for occupational tasks. Whilst there is an inherent overlap between the two indices as confirmed by Crowley and Doran (2020), some jobs which cannot be conducted remotely such as in the case of dentists, doctors, builders, farmers, fishermen and policemen, are at the same time likely to have varying social distancing potential e.g. doctors are less likely to be able to social distance in the workplace than farmers. For the analysis, we use the annual data from the 2018 Labour Force Survey for Ireland which contains information on 115 three-digit occupations.

In the next section we provide an overview of the related literature, before discussing the data in Section III. Section IV presents our empirical approach and discusses the results of our analysis. Section V concludes the study with a discussion on policy implications.

II RELATED LITERATURE

The current consensus is that COVID-19 spreads from person to person within a 0–6 feet radius through the transmission of respiratory droplets (Galbadage *et al*., 2020). Since workplace interactions constitute most social contacts among people of working age (Lewandowski, 2020), businesses are required to enforce social distancing rules. As some occupations require more face-to-face interaction than others do, this inevitably has a greater impact on some sectors, especially those that cannot accommodate remote working. Looking at real-time survey data for the first four months of 2020, researchers are seeing trends in the characteristics of those who lost their jobs due to the pandemic and those who can work remotely. Using real-time survey data, Foucault and Galasso (2020) and Adams-Prassl *et al*. (2020), amongst others, note that worker characteristics such as age, gender, occupation and education explain why some workers have lost their jobs while others are working from home. Using O*Net data for the US, Béland *et al*. (2020) noted that COVID-19 increased the unemployment rate and decreased labour force participation and working hours. They found that men, younger workers, Hispanics, less educated workers, and those working close to co-workers and unable to work remotely were the most impacted by the initial changes in labour market conditions.

By classifying the feasibility of working at home from two O*NET surveys and merging it with occupational employment data in two-digit NAICS industries, Dingel and Neiman (2020) were among the first to build an index which identified the share of jobs that can be done from home. Examining US data, they noted that 37 per cent of jobs can be performed from home and that some occupations

(e.g. those in the Information Technology sector) are more conducive to remote working than others (e.g. those in the Accommodation and Food Services sector). A number of authors have adopted the Dingel and Neiman (2020) approach to measure the feasibility of remote working (see for example Gallacher and Hossain, 2020; Gottlieb *et al*., 2020; Mongey *et al*., 2020; Montenovo *et al*., 2020), while others have extended their analysis by adding social distancing measures (Mongey *et al*., 2020; Mongey and Weinberg, 2020).

For many workers, remote working and occupational social distancing are intrinsically linked. Often those that cannot work remotely also find it difficult to practice social distancing in the workplace. Many businesses rely on daily face-to-face communication where teamwork and interacting with colleagues is essential (e.g. the healthcare industry), for others interaction with customers is important (retail and social work), while some businesses require workers to work physically close to each other (e.g. those operating machinery, on production lines). Using O*Net data, Koren and Pető (2020) developed an index to measure which sectors will be particularly hurt by social distancing and the extent to which occupational social distancing is possible. They noted that retail business, hotels and restaurants, the arts and entertainment sector, and schools are the most affected sectors in the US.

Using a version of the Dingel and Neiman (2020) remote working index and a measure of low personal proximity in the workplace, Mongey and Weinberg (2020) using sectoral data for the US found that those who cannot work from home are more likely to have been born outside the US, are single, non-White and have a lower income. They also rent their home, lack a college degree, lack employer-provided health insurance, and are likely to have an unstable job. They note that while females are more likely to work from home, they are also more likely to have occupations requiring high physical proximity, suggesting that this group of workers may have difficulty returning to the workplace as restrictions ease. Using working-from-home and face-to-face communication indices constructed from O*Net, Montenovo *et al*. (2020) noted that women, Hispanics and younger workers were more likely to have lost their jobs between February and April 2020 in the US. They noted that these workers were more likely to be in jobs that required face-to-face interaction and offered fewer remote working prospects.

Similar results are observed across the globe. Using the Dingel and Neiman (2020) methodology, Gallacher and Hossain (2020) construct a remote working index for Canada. They find that female workers and immigrants have occupations that allow for a greater possibility of remote working, while younger workers, part-time workers, small firm workers, seasonal/contractual workers, single workers and workers without a college degree are less likely to be able to work from home. In Europe, Lewandowski (2020), using six indicators from O*NET and the European Working Condition Survey (EWCS) to measure the spread of COVID-19, found that female workers, younger workers, and less educated workers are more likely

to be exposed to the virus. Pouliakas and Branka (2020) argue that 23 per cent of total EU27 employment (about 45 million jobs) will face some disruption due to COVID-19. They argue that the burden of social distancing will fall disproportionately on women, older employees, non-natives, the less educated, those working longer hours and those employed in micro-sized workplaces. This work demonstrates that the labour market impacts of COVID-19 differ significantly across countries and employee characteristics.

Recent evidence indicates that the COVID-19 pandemic affected women's labour market prospects more than men (Adams-Prassl *et al*., 2020; Alon *et al*., 2020; Dang and Nguyen, 2021; Foucault and Galasso, 2020; Hupkau and Petrongolo, 2020). Adams-Prassl *et al*. (2020) noted that women who did not lose their job were no more likely than men to experience a wage cut, while Dang and Nguyen (2021) found that while there were no gender differences in temporary job losses across China, Italy, Japan, South Korea, the United Kingdom, and the United States, women were 24 per cent more likely to permanently lose their job compared to men. This crisis therefore contrasts greatly with previous downturns, where men accounted for more than three-quarters of the overall cyclical fluctuations in employment (Davis and Von Wachter, 2011).

To date, understandings around remote working and social distancing potential for workers in the Irish case are limited. However, there are a few studies that we can draw some guidance from. Prior to the COVID-19 pandemic, Fu *et al*. (2012) using Place of Work Census of Anonymised Records (POWCAR) 2006 data identified that better educated, males, older people, people from larger households, married individuals and lone parents with children are more likely to work from home, using actual work from home incidence data. More recently, Redmond and McGuinness (2020) examined the actual incidence of remote working in Ireland using pre-COVID Labour Force Survey data from 2017 to 2019. They identified that 14 per cent of the workforce worked remotely sometimes or usually in some formal capacity, which is slightly above the European average. In their study, the incidence of working from home varied considerably across sectors from highs in education at 37 per cent of workers to a low of 2 per cent of workers in accommodation and food. Males, Irish nationals, workers aged over 30, full-time employees and those working in higher paid occupations have a higher likelihood of working from home. Not surprisingly, they also identified that non-essential workers were more likely to work from home than essential workers. Since the onset of the COVID-19 crisis, Crowley and Doran (2020) examined social distancing and remote working potential from a spatial perspective, examining how the crisis may impact places in Ireland at a regional and town level. They used pre-COVID data from O*Net and from the 2016 Irish Census, and identified that more affluent, more highly populated and dense, better educated and better broadband provisioned towns contain workers that have a greater potential to accommodate social distancing and remote work. In related work, Crowley *et al*. (2021) used

2011 Census data relating to commuting behaviour to identify the potential emissions savings that could be achieved from increased remote working and occupational social distancing. They identified that car commuting individuals have a relatively high potential for remote work and are less likely to be able to engage in occupational social distancing which could have positive environmental implications in the short and long run. On the demographics side, they identify that females, older individuals and those with higher education have a greater potential to both engage in occupational social distancing and to work from home.

This contribution builds on this international and Irish literature by focusing more deeply on the demographic implications of the COVID-19 period and on the potential for occupational social distancing and remote working across the Irish workforce, using Labour Force Survey Data from 2018.

III DATA

We use two datasets for our analysis. Firstly, information is extrapolated that provides information on worker tasks, context and activities from O*Net which enables the formation of social distancing and remote working indices. Secondly, we exploit Irish Labour Force Survey (LFS) data from 2018 to examine what types of people are less (or more) exposed to social distancing restrictions and remote work opportunities. In this section, more detailed information is provided on the indices and individual data employed.

3.1 O*NET Data

O*NET is the primary source of occupational information in the United States and is used to understand the changing world of work and how it affects the workforce and the economy. It provides standardised definitions and detailed data on the mix of knowledge, skills, abilities, tasks and activities for almost a thousand occupations. We draw on the O*NET data related to work activities and work context for the construction of our indices. Alongside this, it is necessary to conduct a crosswalk so that O*NET occupational codes can be matched to the ISCO classification present in the Irish LFS. O*NET provides 968 occupational codes that can be matched to the 2010 US standard occupational classifications. As the US SOCs (Standard Occupational Classifications) do not directly match to the ISCO codes we use a crosswalk from the US Bureau of Labour Statistics.[2] In O*NET, the occupational codes are at 6-digit level, which is a more granular disaggregation than ISOC. Consequently, for some ISCO codes that contain two or more US SOC codes we have averaged data to provide a single value. This process provides occupational level data originally sourced from O*NET for 115 detailed occupations for application in the Irish case.

[2] The crosswalk used can be accessed from the following sites https://www.bls.gov/soc/ISCO_SOC_Crosswalk_process.pdf and https://www.bls.gov/soc/soccrosswalks.htm

3.2 Constructing a Social Distancing Index

The social distancing index is constructed based on work by Koren and Pető (2020) who, as discussed above, constructed a social distancing index for the US. This index has previously been transitioned with adjustments to the Irish context by Crowley and Doran (2020) and Crowley *et al*. (2021). The index is comprised of information from 15 different questions using O*Net data.[3] The underlying questions relate to three broad categories including teamwork requirements, customer orientation and physical presence. A further underlying commonality of the questions is how they relate to the degree to which face-to-face interaction is required for each occupational role and, in turn, the ability of workers with the associated occupation to engage in social distancing in a workplace. Each variable takes a value ranging from 0 to 100 and an unweighted average of the social distancing indicator is used as a measure of social distancing potential for each occupation. The higher the value of this index then the less teamwork intensive, customer contact-intensive or physical presence intensive the job is.[4] Jobs identified to have the least social distancing potential include customs and border inspectors, dentists, fire-fighters, messengers, package deliverers, motor vehicle mechanics and repairers and precision instrument makers and repairers. Jobs identified to have the most social distancing potential include accounting and bookkeeping clerks, crop farm labourers, economists, general office clerks, legal and related associate professionals, life science technicians and secretarial and related occupations.

3.3 Constructing a Remote Working Index

The remote working index is based on work by Dingel and Neiman (2020) which has previously been transitioned to the Irish context by Crowley and Doran (2020) and Crowley *et al*. (2021). The construction of the index exploits O*Net data using information from 17 questions.[5] The questions contain data that relate to workers being able to use remote communications such as e-mail, whether the job requires the operation of specialised equipment, the degree to which workers need to use protective equipment and whether the worker performs for people or directly serves customers. Again, the values range for each indicator from 0 to 100 and the unweighted average of the 17 indicators is used as the indicator for remote working potential value for each occupation. The higher the value of this index then the greater the potential to be able to work from home. Jobs identified to have the least remote working potential include fire-fighters, garbage and recycling collectors, mining and quarrying labourers, mixed crop and animal producers, farm and forestry plant operators, roofers and ships deck crews and related workers. Jobs

[3] The precise questions and coding are presented in Appendix 1.

[4] This is the inverted form of the social distancing measure presented by Koren and Pető (2020), where the potential to social distance in a job ranges from low to high.

[5] The precise questions and coding are presented in Appendix 2.

identified to have the most remote working potential include accountants, advertising and marketing professionals, economists, education methods specialists, finance managers, lawyers and legal and related associate professionals, sales and marketing managers, and university and higher education teachers.

3.4 Irish Labour Force Survey (LFS) 2018

Next, we obtain data from the Irish Labour Force Survey (LFS) from 2018. The Irish LFS replaced the Quarterly National Household Survey (QNHS) from the third quarter of 2017. It is designed to be a large-scale, nationwide survey of households in Ireland from which official measures of employment and unemployment are derived. The anonymised microdata are obtained from Eurostat and contain observations on approximately 144,000 individuals. Of these, approximately 58,000 were employed and approximately 57,000 have a corresponding three-digit ISCO code which was merged with our social distancing and remote working index. When all control variables are cleaned, our sample is reduced to approximately 52,000 observations.

Of critical importance for our research is that the LFS provides information at the three-digit occupational code level for the employment of each individual. This three-digit code allows us to merge the indices created and outlined in the previous section with the individual level data.

In addition to this, the Irish LFS provides detailed information on a variety of socio-economic characteristics. Table 1 presents summary statistics of the dependent and explanatory variables used in this paper derived from the 2018 Irish LFS anonymised data. The average social distancing and remote working index recorded across individuals is 48.02 and 59.76, respectively.[6] In terms of education, 13.91 per cent of workers have reached, at most, a lower secondary level of education, 37.71 per cent have reached an upper secondary level, and 48.38 per cent have reached a third-level degree or higher.

The remaining statistics are as expected; 48 per cent of the sample are female, 34.21 per cent are single, 84.12 per cent are employees with the remainder being self-employed, 89.32 per cent are Irish, and age and regional distribution are indicated in Part B of Table 1.

[6] When considering the EU as a whole, the mean social distancing index derived from the EU LFS is 48.76 while the mean remote working index derived from the EU LFS is 58.98. The lowest average social distancing index was for Greece with a value of 47.2 while the highest social distancing index was for Luxembourg with a value of 50.6. The lowest remote working index was for Romania with a value of 54.60 while the highest remote working index was for Luxembourg with a value of 62.7.

Table 1: Descriptive Statistics for Sample

Dependent Variables				
Variable Name	*Mean*	*SD*	*Min*	*Max*
Social Distancing Index	48.02	9.54	28	79.8
Remote Work Index	59.76	10.78	31.4	79.5
Independent Variables				
Variable Name	*Percentages*	*Variable Name*	*Percentages*	
Highest Level of Education		*Age*		
Lower secondary	13.91%	<17	1.33%	
Upper secondary	37.71%	17-22	6.16%	
Third level	48.38%	22-27	8.37%	
Gender		27-32	9.85%	
Female	48.04%	32-37	12.99%	
Marital Status		37-42	13.86%	
Widowed, divorced or legally separated	6.20%	42-47	13.29%	
Single	34.21%	47-52	11.66%	
Married	59.59%	52-57	10.37%	
Work Class		57-62	7.47%	
Employee	84.12%	62-67	2.75%	
Self-employed	15.88%	67-72	1.03%	
NUTS2 Region		72-77	0.55%	
Northern and Western	17.49%	77-82	0.23%	
Southern	35.09%	82-87	0.09%	
East and Midlands	47.42%	87-92	0.01%	
Nationality				
Irish	89.32%			

Source: Authors' analysis based on LFS 2018.

IV EMPIRICAL MODEL AND RESULTS

When estimating the effect of individual level characteristics on an individual's ability to social distance or work from home we use the following model. We estimate this model twice, once for each index.

$$Index_i = \beta_0 + \beta_1 \, Education_i + \beta_2 \, Controls_i + \varepsilon_i \quad (1)$$

Where $Index_i$, the dependent variable, is the relevant index in each estimation (either the social distance index or the remote working index). $Education_i$ is a series of binary variables indicating the highest level of educational attainment of

individual *i*. $Controls_i$ is a vector of control variables that accounts for gender, marital status, age, region, nationality as per Table 1.[7] ε_i is the error term.

The model is estimated using ordinary least squares (OLS) with heteroskedastic robust standard errors. Variance of Inflation (VIF) tests for potential multi-collinearity are applied and, in all cases, report a mean VIF of below 5, suggesting that multicollinearity is not a problem within the model.

The results of our empirical analysis are presented in Table 2. Social distancing and remote working potential increase with education levels. The base category is lower secondary education or less. T-tests of each individual education coefficient indicate that there is a statistically significant difference between all coefficients. The predictions outlined in Table 3 show that those with lower levels of education are less likely to be able to practice social distancing in the workplace and less likely to be able to work remotely. These results are consistent with other studies identifying higher levels of education as important for remote working and social distancing (Blundell *et al*., 2020; Dingel and Neiman, 2020; Mongey *et al*., 2020; Pouliakas and Branka, 2020). However, notably, the coefficients associated with the education variables are considerably larger in the remote working index case and economically negligible in the social distancing case. This can also be identified more clearly in Table 3 and Table 4, where the differences in the predicted values are larger for the impact of education on the ability to work remotely. These smaller marginal correlations between education and social distancing also translate to other statistically significant control variables across the social distancing model i.e. the marginal correlations are small. Furthermore, the R-squared is considerably higher for the remote working model.

Consequently, going forward in our analysis, we concentrate on the results associated with the remote working model and specifically on education and gender correlations where the marginal relationships are considerably larger for these variables, relative to other variables (i.e. where statistically significant coefficients occur). Females have on average a higher remote working potential, relative to men. This finding contrasts with other findings for remote work (Adams-Prassl *et al*., 2020; Alon *et al*., 2020), but is supported by similar empirical results using Canadian data by Gallacher and Hossain (2020) and Béland *et al*. (2020). Our finding on the relationship between gender and remote work potential contrasts with Irish findings by Redmond and McGuinness (2020) who reported that men are more likely to work from home in the Irish case. The reason for the difference in findings is due to the alternative measurements employed in the two studies. Redmond and McGuinness (2020) use a variable that measures whether the individual 'usually works at home', 'sometimes works at home' or 'never works at

[7] In the models presented in this paper we do not include NACE codes for the sectors individuals are employed in. However, we have completed a robustness check including the NACE codes of employment and the results are robust to this alternative specification.

home' which is inherently different from the remote working 'potential' index used in our paper.[8]

The gendered female effect observed here is likely to be due to gendered occupational segregation that is a deeply entrenched feature of education systems and occupations across countries (Cortes and Pan, 2019; EIGE, 2017; Lekfuangfu *et al*., 2020). However, the division of labour associated with household tasks, particularly caring responsibilities with schools and crèches closed, may impede females from taking advantage of this higher potential to work remotely (Sevilla and Smith, 2020).

Table 2: OLS Estimation of Equation (1)

Variables	(1) *Social Distance Index*	(2) *Remote Work Index*
Female	0.460***	6.063***
	(0.0832)	(0.0878)
Marital Status - Single	0.0141	–0.447**
	(0.191)	(0.202)
Marital Status - Married	–0.386**	0.127
	(0.171)	(0.181)
Highest Level of Education - Upper Secondary	1.953***	4.273***
	(0.131)	(0.138)
Highest Level of Education - Third Level	3.516***	10.87***
	(0.131)	(0.138)
Employment Type - Employees	2.358***	2.868***
	(0.119)	(0.125)
Age category - 17-22	0.756**	0.0850
	(0.380)	(0.401)
Age category - 22-27	1.552***	0.695*
	(0.373)	(0.394)
Age category - 27-32	0.936**	0.284
	(0.372)	(0.392)
Age category - 32-37	1.630***	0.522
	(0.370)	(0.391)
Age category - 37-42	1.638***	0.362
	(0.371)	(0.392)
Age category - 42-47	1.562***	0.902**
	(0.372)	(0.393)
Age category - 47-52	1.782***	1.279***
	(0.376)	(0.396)
Age category - 52-57	1.725***	1.416***
	(0.378)	(0.399)

[8] Our analysis, estimated with the same variable as used in Redmond and McGuinness (2020), confirm that men are more likely to have worked from home prior to the COVID-19 pandemic.

Table 2: OLS Estimation of Equation (1) (Contd.)

Variables	(1) *Social Distance Index*	(2) *Remote Work Index*
Age category - 57-62	1.724***	1.357***
	(0.387)	(0.409)
Age category - 62-67	1.152***	0.704
	(0.436)	(0.460)
Age category - 67-72	1.296**	0.217
	(0.539)	(0.569)
Age category - 72-77	0.0910	–0.723
	(0.656)	(0.692)
Age category - 77-82	0.00374	–3.361***
	(0.907)	(0.958)
Age category - 82-87	1.544	–2.002
	(1.355)	(1.430)
Age category - 87-92	–3.126	–1.945
	(5.259)	(5.551)
Nationality	0.231*	1.831***
	(0.135)	(0.142)
NUTS2 Region - Southern	0.135	0.398***
	(0.117)	(0.123)
NUTS2 Region - East and Midlands	1.091***	2.285***
	(0.113)	(0.119)
Constant	39.45***	40.80***
	(0.492)	(0.519)
Observations	52,205	52,205
R-squared	0.040	0.283

Source: Authors' analysis based on LFS 2018.
Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; The reference categories are NUTS2 Region, Northern and Western, age < 17 and marital status widowed, separated, or divorced.

Table 3: Predicted Values for Social Distancing by Education Category

Variable	*Margin*	*Standard Error*	*95% Conf. Interval*	
Lower Secondary	47.596	0.122	47.357	47.836
Upper Secondary	48.600	0.070	48.462	48.738
Third Level	49.220	0.063	49.096	49.344

Source: Authors' analysis based on LFS 2018.
Notes: Predicted values based on all other variables at their means.

Table 4: Predicted Values for Remote Working by Education Category

Variable	*Margin*	*Standard Error*	*95% Conf. Interval*	
Lower Secondary	53.554	0.124	53.311	53.798
Upper Secondary	57.315	0.072	57.174	57.455
Third Level	62.475	0.064	62.349	62.601

Source: Authors' analysis based on LFS 2018.
Notes: Predicted values based on all other variables at their means.

To further assess the relationship between education and gender, we interact the two variables (see Table 5). The results indicate that less educated females are more able to work remotely than less educated males. This effect persists for all education types in terms of remote working, but males with a third-level education possess almost the same ability to engage in remote working relative to females with a third-level education. Broadly, this suggests that with progression up the educational ladder, the gap closes and in fact at the highest education level there is no significant economic difference between males and females. We identified previously that males are more exposed, but this analysis confirms that this is especially the case for less educated males. By examining the employment numbers by industry, the proportion of lower educated males in employment in agriculture and construction, relative to female employment in the same sectors, appears to be driving this.

Table 5: Predicted Values for Gender by Education category for Remote Working

Variable	*Margin*	*Standard Error*	*95% Conf. Interval*	
Lower Secondary#Male	50.161	0.153	49.859	50.463
Lower Secondary#Female	59.522	0.221	59.087	59.956
Upper Secondary#Male	53.536	0.096	53.346	53.726
Upper Secondary#Female	61.531	0.105	61.324	61.738
Third Level#Male	61.759	0.093	61.575	61.943
Third Level#Female	63.887	0.084	63.721	64.054

Source: Authors' analysis based on LFS 2018.
Notes: Predicted values based on all other variables at their means.

V CONCLUSION

It has been widely predicted across the COVID-19 literature that individuals with lower levels of education, along with younger workers and minority workers will experience the greatest inequalities due to the pandemic (Pouliakas and Branka, 2020; Yasenov, 2020). Many studies examining the role of education during the

COVID-19 crisis focus on employment loss (Adams-Prassl *et al*., 2020; Béland *et al*., 2020; Montenovo *et al*., 2020) and working from home (Delaporte and Peña, 2020; Dingel and Neiman, 2020; Mongey *et al*., 2020). However, a significant gap in this literature exists regarding the dual and simultaneous impact of social occupational distancing along with remote working on the labour market. The objective of this paper was to contribute to this gap in the literature by examining the impact of educational attainment on a worker's potential to engage in both occupational social distancing in the workplace and their ability to work from home for the Irish case.

We identify that remote working will have a more significant economic effect on labour market inequalities. In fact, the results indicate there is no significant economic relationship between occupational social distancing and differences in worker demographics. We identify that remote working inequalities are primarily related to differences in individual education and gender, whereas age, nationality, work class and regional location play a minimal role in remote working inequalities, in contrast to previous literature which suggested that younger individuals and marginal groups tend to be more vulnerable to the COVID-19 pandemic (Béland *et al*., 2020; Gallacher and Hossain, 2020; Montenovo *et al*., 2020). More specifically, less educated and male workers are particularly at risk in the Irish case. To ensure the public health measures introduced to deal with COVID-19 do not lead to a further inequality between the most and the least educated workers in our society and particularly for less educated males, targeted policy responses will be critical in the medium and longer term, including job reintegration, upskilling and reskilling, and job support initiatives to build adaptability and resilience among those most impacted by the crisis (Costa Dias *et al*., 2020; Green, 2020; OECD, 2020; Pouliakas and Branka, 2020).

The pandemic unemployment payment and the temporary wage subsidy scheme implemented by the Irish Government will continue to be a vital safety net in the months (and possibly years) ahead. Considering the significant economic costs of the crisis and the types of groups affected, the prioritisation of health benefits over economic losses may need to be revisited as the crisis continues to evolve (Eichenberger *et al*., 2020); or alternatively, a balance may be struck by targeted isolation strategies towards more at risk individuals such as those with underlying conditions and older people, whilst enabling younger cohorts in the labour force to continue working normally, leading to substantial economic and societal benefits without enormous health costs (Bank, 2020; Eichenberger *et al*., 2020; Oswald and Powdthavee, 2020).

We would like to note a potential limitation with this study. O*NET data are based on occupational work from the United States. Consequently, O*NET data are used as an approximation of the workplace environment for the same occupations in Ireland.

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SUPPLEMENTARY APPENDIX 1:

Definition of Elements of Social Distancing Index

Variable	*Original Coding*	*Recoding*	*Context*
How important is it to work with others in a group or team in this job?	0 – Not important at all 25 – Fairly important 50 – Important 75 – Very important 100 – Extremely important	0 – Extremely important 25 – Very important 50 – Important 75 – Fairly important 100 – Not important at all	Face-to-face discussions several time a week and often more than e-mails, letters, and memos.
Providing guidance and expert advice to management or other groups on technical, systems-, or process-related topics.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Getting members of a group to work together to accomplish tasks.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Providing guidance and direction to subordinates, including setting performance standards and monitoring performance.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Encouraging and building mutual trust, respect, and cooperation among team members.	0 – Not important 100 – Important	0 – Important 100 – Not important	
How important is it to work with external customers or the public in this job?	0 – Not important at all 25 – Fairly important 50 – Important 75 – Very important 100 – Extremely important	0 – Extremely important 25 – Very important 50 – Important 75 – Fairly important 100 – Not important at all	Face-to-face discussions several times a week

Definition of Elements of Social Distancing Index (Contd.)

Variable	*Original Coding*	*Recoding*	*Context*
Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores and receiving clients or guests.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Providing personal assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Developing constructive and cooperative working relationships with others and maintaining them over time.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.	0 – Not important 100 – Important	0 – Important 100 – Not important	Density of co-workers like shared office or more
Running, manoeuvring, navigating, or driving vehicles or mechanised equipment, such as forklifts, passenger vehicles, aircraft, or water craft.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.	0 – Not important 100 – Important	0 – Important 100 – Not important	

Definition of Elements of Social Distancing Index (Contd.)

Variable	*Original Coding*	*Recoding*	*Context*
Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.	0 – Not important 100 – Important	0 – Important 100 – Not important	
Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.	0 – Not important 100 – Important	0 – Important 100 – Not important	
To what extent does this job require the worker to perform job tasks in close physical proximity to other people?	0 – I don't work near other people (beyond 100 ft.) 25 – I work with others but not closely (e.g., private office) 50 – Slightly close (e.g., shared office) 75 – Moderately close (at arm's length 100 – Very close (near touching)	0 – Very close (near touching) 25 – Moderately close (at arm's length 50 – Slightly close (e.g., shared office) 75 – I work with others but not closely (e.g., private office) 0 – I don't work near other people (beyond 100 ft.)	Physical Proximity

Source: Questions from Occupational Information Network (O*NET).

SUPPLEMENTARY APPENDIX 2:

Definition of Elements of Remote Working Index

Variable definition	*Original coding*	*New Coding*
How often do you use electronic mail in this job?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	same as original
How often does this job require working outdoors, exposed to all weather conditions?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never
How often does this job require working outdoors, under cover (e.g., structure with roof but no walls)?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never
How frequently does this job require the worker to deal with physical aggression of violent individuals?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never
How much does this job require wearing common protective or safety equipment such as safety shoes, glasses, gloves, hard hats, or life jackets?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never

Definition of Elements of Remote Working Index (Contd.)

Variable definition	*Original coding*	*New Coding*
How much does this job require wearing specialised protective or safety equipment such as breathing apparatus, safety harness, full protection suits, or radiation protection?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never
How much does this job require walking and running?	0 – Never 25 – Less than half the time 50 – About half the time 75 – More than half the time 100 – Continually or almost continually	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never
How often does this job require exposure to minor burns, cuts, bites, or stings?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never
How often does this job require exposure to disease/ infections?	0 – Never 25 – Once a year or more but not every month 50 – Once a month or more but not every week 75 – Once a week or more but not every day 100 – Every day	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week 75 – Once a year or more but not every month 100 – Never
Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.	0 – Not important 100 – Important	0 – Important 100 – Not important

Definition of Elements of Remote Working Index (Contd.)

Variable definition	*Original coding*	*New Coding*
Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.	0 – Not important 100 – Important	0 – Important 100 – Not important
Using either control mechanisms or direct physical activity to operate machines or processes (not including computers or vehicles).	0 – Not important 100 – Important	0 – Important 100 – Not important
Running, manoeuvring, navigating, or driving vehicles or mechanised equipment, such as forklifts, passenger vehicles, aircraft, or water craft.	0 – Not important 100 – Important	0 – Important 100 – Not important
Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores and receiving clients or guests.	0 – Not important 100 – Important	0 – Important 100 – Not important
Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.	0 – Not important 100 – Important	0 – Important 100 – Not important
Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.	0 – Not important 100 – Important	0 – Important 100 – Not important
Inspecting equipment, structures, or materials to identify the cause of errors or other problems or defects.	0 – Not important 100 – Important	0 – Important 100 – Not important

Source: Questions from Occupational Information Network (O*NET).