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Covid-19, Occupational Social Distancing and Remote Working Potential in Ireland

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Abstract

The Covid-19 pandemic has had a sudden and drastic impact on labour supply and output in Ireland. As the Irish government responds, a key question is how covid-19 will impact people and places differently. There is considerable uncertainty around the implications of social distancing measures and remote working for the Irish labour market. The objective of this paper is to get a better understanding of the social distancing and remote working potential at an occupational, sector and regional level in Ireland. We generate two indices which capture the potential impact of Covid-19 through identifying (i) the occupations which may have the most potential to engage in social distancing procedures and (ii) the occupations which may have the most scope for remote working. This is accomplished using occupational level data from O*NET which provides very detailed information of the tasks performed by individuals with their occupations. The paper identifies that social distancing and remote working potential differs considerably across occupations, sectors and places. Examples of large employment which have relatively high indices are teaching occupations at secondary and third level and programme and software developers. While occupations which have large employment but which possess relative low indices are nurses and midwives and care workers. The potential for social distancing and remote work favours occupations located in the Greater Dublin region and provincial city regions. At a town level – more affluent, more densely and highly populated, better educated and better broadband provisioned towns have more jobs with greater potential for social distancing and remote working.

1. Introduction

The measures taken by governments throughout the world to suppress the spread of the Covid-19 virus had instantaneous impacts on labour markets. The sudden and large international collapse of labour demand and supply means; there is no previous economic crisis in living memory that compares with this one. In Ireland, over one million people became fully or partly reliant on the state for income support in only a few weeks since its first known covid-19 case. In March, 2020, the Economic and Social Research Institute (ESRI) predicted the Irish economy would contract by 7.1 per cent with 350,000 job losses (McQuinn, O'Toole, Allen-Coghlan, & Coffey, 2020). By late April, the Irish government predicted an even larger GDP contraction of 10.5 per cent with unemployment to rise to an unprecedented 22 per cent (Department of Finance, 2020). A significant variation in employment exposure to covid-19 is predicted across Ireland's regions (Regional Assemblies of Ireland, 2020). As time passes, we learn that modern economies are less resilient to the covid-19 pandemic than at first forecasted and that the economic impact will be uneven across regions.

Social distancing measures are having a significant impact on the quantity of labour which in turn is significantly reducing output worldwide (Barrot, Grassi, & Sauvagnat, 2020; Koren & Pető, 2020). It is estimated that six weeks of drastic social distancing rules will reduce GDP output from 4.3 per cent in Denmark to 9.2 per cent in Bulgaria, where cross-country differences are a result of national sectoral differences and remote work potential (Barrot et al., 2020). One of the significant elements of this crisis, is the economic contagion and supply chain disruptions across urban-rural divides, regions and countries. For example, scenarios of Tokyo under a lockdown state for a month results in a GDP decline of 5.3 per cent of annual GDP in Japan, where the indirect effects on other Japanese regions is twice as large as the direct effect on Tokyo (Inoue & Todo, 2020). Social distancing measures are currently impacting occupations, sectors and places unequally. In the U.S.; retail, hotels and restaurants, arts and entertainment and education providers are the most affected sectors (Koren & Pető, 2020; Muro, Maxim, & Whiton, 2020). The sectors with the most people in receipt of the Irish Government's Pandemic unemployment payment (Department of Employment Affairs and Social Protection, 2020) are accommodation and food services, followed by wholesale and retail trade, repair of motor vehicles and motorcycles and then the construction sector.

Social distancing measures are further forcing non-essential workers to work from home. Prior to the Covid-19 crisis, only 14 per cent of the Irish workforce worked remotely. Education, ICT and the Finance sectors contained the highest percentages of employees working remotely, whilst the sectors of other, administrative, health, construction, retail, transport and accommodation and food had less than 1 out of every 10 employees homeworking (Redmond & McGuinness, 2020). Since the lockdown, although the extent is unknown, a greater proportion of the workforce have adapted in some capacity to working from home. In the U.S., recent research identified that 37 per cent of jobs can be performed entirely at home, but with significant differences across industries and cities (Dingel & Neiman, 2020). The substitution effect from workplace to remote work has limited the economic impact of the covid-19 shock and has limited the further spread of the virus. However, Saltiel (2020) identified that working from home was limited in a cross-country

study for ten developing economies, with only 13 per cent of jobs across the economies having the capacity to be conducted remotely.

To date, little is known about social distancing and remote working potential in Ireland. The objective of this paper is to fill this gap in the literature by examining the occupational social distancing and remote working potential at an occupational, sectoral and regional level. We generate two indices which capture the potential impact of Covid-19 through identifying (i) the occupations which have the greater relative potential to engage in social distancing procedures and (ii) the occupations which have the potential greatest scope for remote working. This is accomplished using occupational level data from O*NET which provides very detailed information of the tasks performed by individuals with their occupations. We use these indices to provide insights into how different sectors of the economy and regions may be impacted by social distancing measures and the extent to which this may be offset (exacerbated) by the potential (inability) to work from home.

In doing so, we make two contributions to the literature. Firstly, examining occupational social distancing, alongside remote working potential will provide a more comprehensive understanding of covid-19 impacts on the Irish labour market. There are industries where social distancing and remote work indicators may collide and or diverge (Avdiu & Nayyar, 2020) and combining the both indicators provides more clarity on employment risk. For example, most agricultural, construction and manufacturing work cannot be completed remotely but also many work tasks in these areas may not require much face to face interaction or physical proximity. The analysis further examines the impact at three different levels: the national level; the industry level; and at the regional level. This will provide a greater understanding around the unequal impact covid-19 will have across people and places, which is particularly of relevance for covid-19 policy responses.

In the next section we discuss the data used in this analysis and the rationale underlying the construction of the two indices. Section 3 presents the results of our analysis. Section 4 concludes the study with a discussion on policy implications.

2. Data

In this section we begin in Section 2.1 by discussing the use of O*Net data in the Irish context and the information available from the Central Statistics Office of Ireland (CSO). Section 2.2 presents the construction of the Social Distancing Index. Section 2.3 presents the construction of the Remote Working Index.

*2.1 Occupational Codes and O*NET*

The O*NET database provides classifications, definitions and detailed information on a large number of occupations. The questionnaires used in the O*NET Data Collection Program collect detailed occupational data on the abilities, background, education, training, work activities, knowledge, skills, work context and work styles from workers associated with different occupations. More specifically for our interests, we exploit data from the generalized work activities and work context components to formulate the social distancing and remote work indices, which we will discuss later.

O*Net provides 968 occupational codes which match to 2010 US Standard Occupational Classifications (SOCs). These occupational codes do not directly match to Irish occupational codes as the Irish Central Statistics Office (CSO) bases their occupational classifications on the UK SOC system. We apply a crosswalk in the same way as Crowley and Doran (2019). The US and UK SOC are not directly comparable and there is no direct conversion available. Therefore, in order to convert the US codes to their UK counterparts (which are approximately identical to the Irish codes used by the CSO) we transform these data using a series of established international classifications. This is accomplished through the use of the International Standard Occupational Classifications (ISOC). The US SOCs can be converted using the Bureau of Labour Statistics official conversion (Bureau of Labor Statistics, 2012). The codes available from O*Net are 6-digit US SOCs. When converting these to the ISOC there is not a one to one match. This is due to the ISOC codes being at a higher aggregation level. Therefore, in some instances, two or more of the US SOC codes are combined into one ISOC code. Where this occurs, any data on occupations is averaged to provide a single value. Once the codes are in ISOC format it is possible to convert these ISOC codes to the UK SOC codes using a conversion framework developed by the Office for National Statistics (2010). In doing so, again there are a small number of occupations which have more than a one for one match and therefore there is a need to average any occupational details associated with these occupations. It is possible, once this process has been completed, to translate these UK SOC codes to Irish SOC codes in a perfect one for one match.

When the merge process is complete, out of a possible 327 SOC codes available in Ireland we have occupational level data for 318 of these. Therefore, our analysis begins with, what the CSO define as, the detailed occupational classifications for Ireland of which we have occupational information associated with 318 detailed occupations.

2.2 Overview of the Irish Census 2016 data

In this paper we use data from the 2016 Irish census. We use data at national, regional, and town level to perform our analysis. At the national level we can match the occupational codes from the US O*Net data to 318 detailed occupational codes. We only consider those who indicated that they were in employment in the 2016 census. Therefore, when we perform our analysis at the national level it is at the highest level of disaggregation available to us. The same is the case for regional data (31 regions of Ireland). This data is also available at the detailed occupational codes level. However, data at town level is only available at the intermediate occupational level. This is at 25 occupational codes. Therefore, our index data must be aggregated from 318 detailed occupations to 25 intermediate occupations at the town level. This aggregation is weighted by the proportion of individuals employed in each occupation.

It should also be highlighted that the data we use is based on place of residence, not place of work. Place of work data is not available with sufficient occupational detail to facilitate this analysis. Therefore, there is likely to be some bias in the regional and town level analysis, due to missing individuals who commute from rural regions or who reside in one region and travel to another for work. This should be kept in mind as a limitation of this analysis, but is only relevant for the regional level analysis. Nevertheless this analysis still provides a detailed, valuable insight into the patterns of social distancing and remote working potential across Ireland.

2.3 Measuring Social Distancing Potential by Occupation

When we consider the construction of an index measuring the extent to which social distancing may impact on individual's abilities to undertake their occupations we base this index on the work of Koren and Pető (2020) who develop a social distancing index based on occupational level data from O*Net. The index is comprised of 14 questions from O*Net which provide insights into the degree to which face-to-face contact is required for the role the individual undertakes. These can be divided into three broad categories (i) teamwork requirements, (ii) customer orientation, and (iii) physical presence. In addition to these elements we also add the extent to which the job requires individuals to work in close physical proximity to others. Each variable takes a value ranging from 0 to 100. In constructing our index we get the unweighted average of the 15 individual indicators. A value closer to 0 indicates that social distancing potential is low while a value close to 100 indicates that social distancing potential is high. Full definitions of the 15 variables are provided in Appendix 1.

2.4 Measuring Remote Working Potential by Occupation

To measure the potential for remote work we follow the approach adopted by Dingel and Neiman (2020). Again, this utilises data from O*Net to construct an index of the potential for different occupations to work from home. This is based on 17 variables from O*Net and again an unweighted average is taken to provide our index. These 17 variables relate to issues such as the ability to use e-mail rather than face-to-face communication, does the individual need to use or service specialized equipment, does the job require the use of protective equipment, among other factors. A full definition of the 17 variables as well as their coding is displayed in Appendix 2.

2.5 Overlap between the indexes

There is an inherent overlap between the two indexes in terms of some of the variables used from O*Net. Some variables which are indicators of the ease at which social distancing may take place overlap with some indicators of whether it is possible to work remotely. Indeed we observe a correlation of approximately 0.55 between our social distancing index and our remote work index. This is built into the definitions of our indexes due to the variable choice for each index.

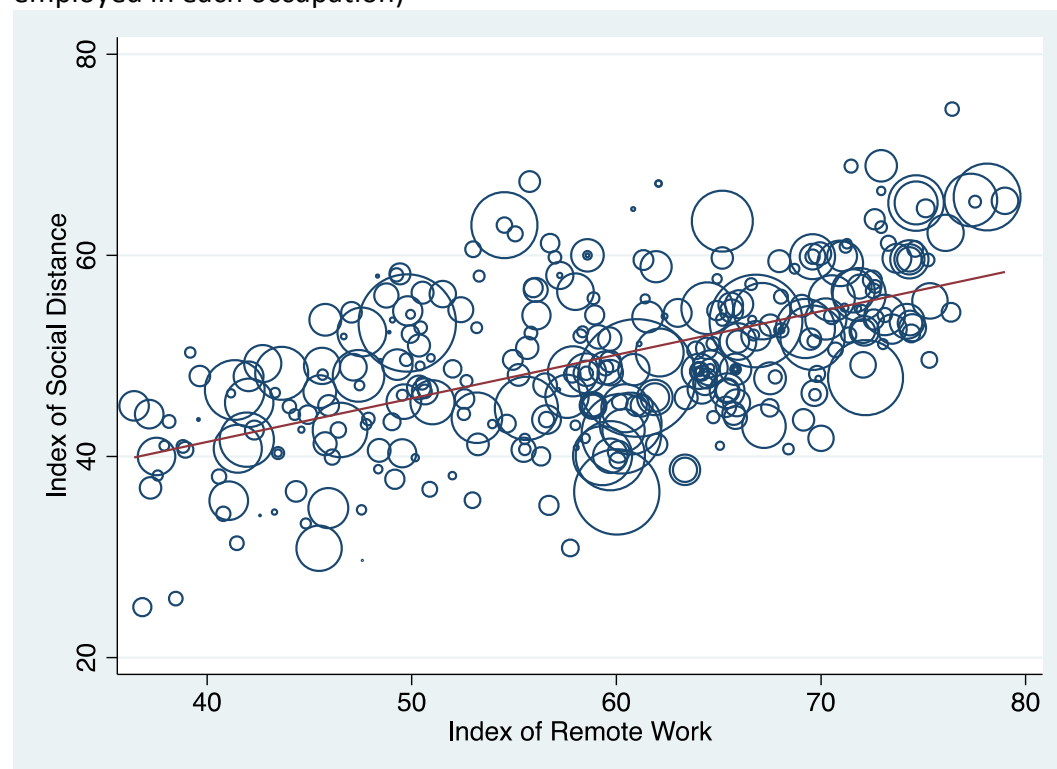
3. Results

3.1 Social Distancing and Remote Work Potential at National Level

We begin our analysis at the national level at detailed occupational codes of which we possess 318. For each occupation we have a specific value for social distancing potential and remote work potential. At a national level the two indices display a degree of correlation as has been discussed in the previous section.

Figure 1 shows a scatter plot of the social distancing and remote work indices with the points weighted by the importance of that occupation to the economy (in terms of number of people employed). What can be observed is that occupations which have a high degree of social distancing potential also possess a high degree of remote work potential. In addition to this the size of the bubble indicates the proportion of the workforce employed within that occupation. What we observe is that there are occupations with large proportions of employment at either end of the spectrum of our indices. These are the occupations which offer opportunities for continued work at lower levels of risk (through either social distancing or remote working) and occupations which will prove challenging (as it will be difficult to social distance and/or remote work). Examples of large employment occupation which have relatively high indices are teaching occupations at secondary and third level and programme and software developers. While occupations which have large employment but which possess relative low indices are nurses and midwives and care workers.

Figure 1: Social Distancing and Remote Work Potential Indexes (weights – proportion employed in each occupation)

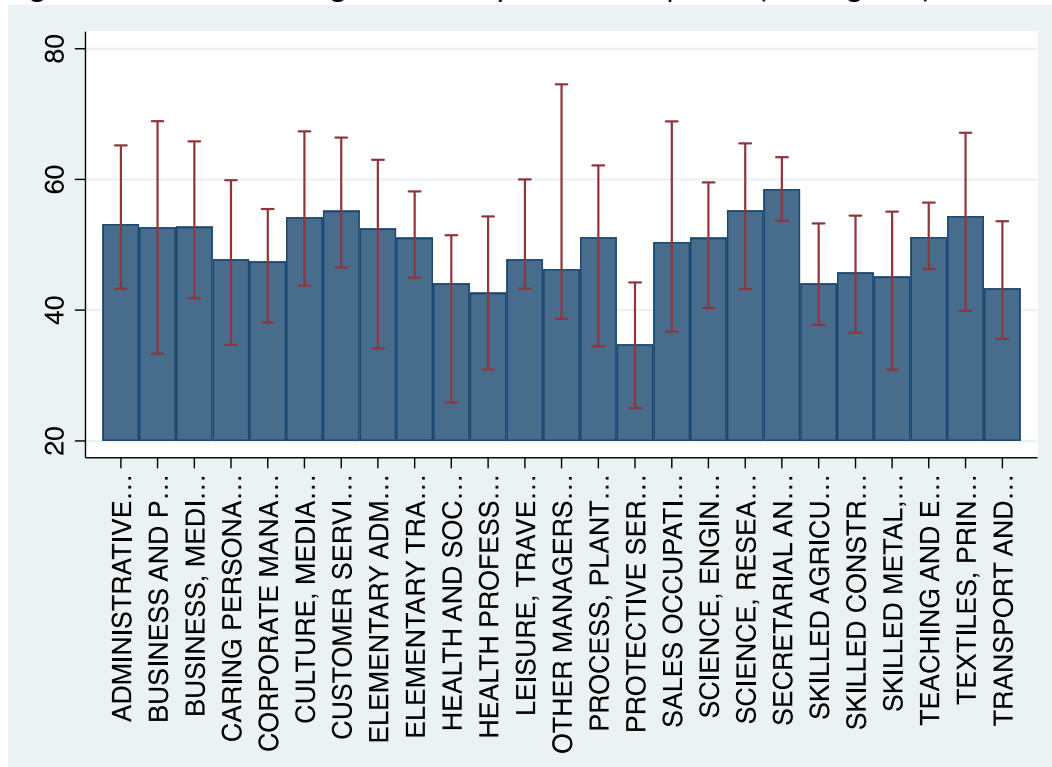


Further insights into the national level picture emerge when one aggregates occupations to broad occupational classification and also considers the spread within these occupations. For example one can clearly observe in Figure 2 below that individuals employed in the protective services occupation classification have the lowest potential for remote work on

average. Which is closely followed by those in Health and social care associate professionals occupations. We note there is a spread between the minimum and maximum values in these occupations which indicates the degree of variability within these areas. Although in the case of *protective service occupations*, which include occupations such as firefighters and police officers the values, despite having some degree of spread, are all relatively low. The other managers and proprietors occupational category has a large spread across minimum and maximum values in our social distancing potential index. One of the best placed occupations within this broad occupational category to social distance is *Managers and proprietors in forestry, fishing and related services* while some of the occupations with the least ability to socially distance are *residential, day and domiciliary care managers and proprietors* and *health care practice managers*,

Progressing to the remote working potential index in Figure 3 we observe a similarly low index value for protective services occupations. But other occupations, such as Elementary trades and related occupations which had a relatively high potential for social distancing in this case possess a low remote working potential index. Teaching and educational professional occupations which were at the middle of the ranking for social distancing potential have significant potential for remote working. We note that within Health and social care associate professional occupations there is a large degree of variation in the degree of remote work potential. In this instance councillors have the potential for remote work, while occupations such as paramedics have limited ability.

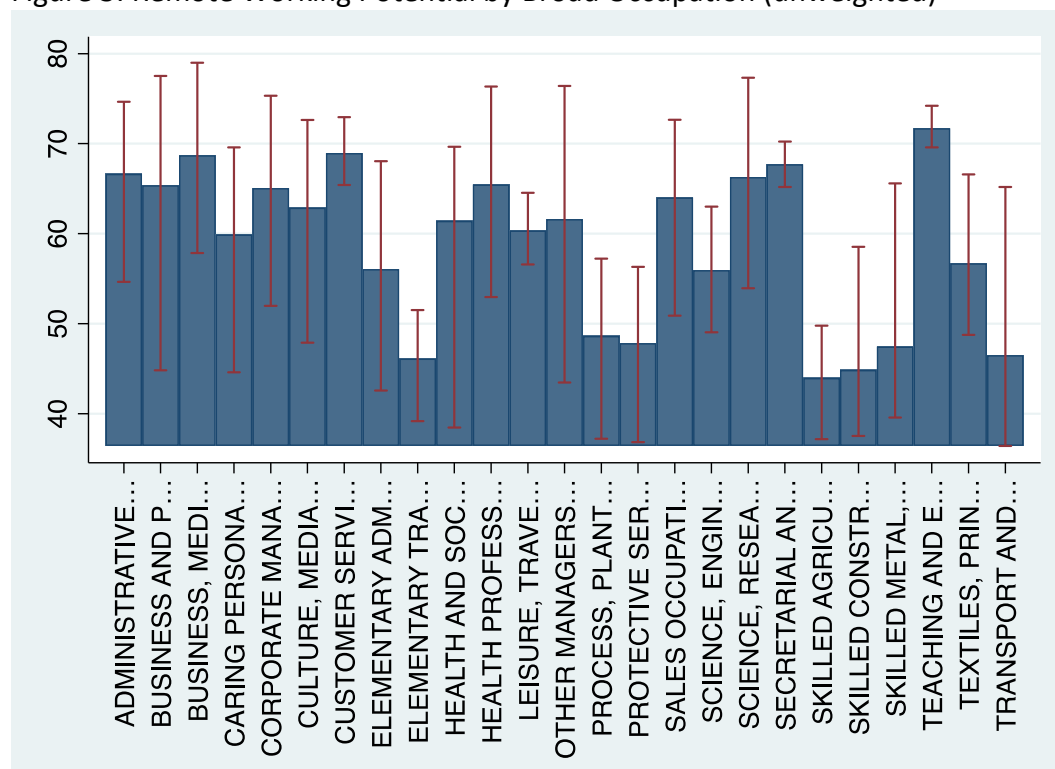
Figure 2: Social Distancing Potential by Broad Occupation (unweighted)



Note 1: The average social distancing index value is taken when aggregating to the broad occupational category. 327 detailed categories are aggregated to 25 intermediate categories.

Note 2: Error bars show the minimum and maximum index value within that intermediate occupational category.

Figure 3: Remote Working Potential by Broad Occupation (unweighted)



Note 1: The average remote working index value is taken when aggregating to the broad occupational category. 327 detailed categories are aggregated to 25 intermediate categories.

Note 2: Error bars show the minimum and maximum index value within that intermediate occupational category.

3.2 The Sectoral Perspective

Aggregating our occupational data to broad sectoral level gives an indication of the extent to which broad sectors of the economy have the potential to transition to work from home. Much of the discussion of the re-opening of the economy focuses on sectors as opposed to occupations, and there can be a large degree of variability in the ability to social distance and remote work within a given sector due to the different characteristics of occupations. If we consider the Agriculture, forestry and fishing sector of the economy we note significant potential for social distancing, but very limited potential for remote working. Other sectors have low scores for both indices such as Water supply; sewerage, waste management and remediation activities.

Table 1: Remote Work Potential by Sector

NACE Sector	Social Distancing	Remote Working
Agriculture, forestry and fishing (A)	0.89	0.03
Mining and quarrying (B)	0.3	0.26
Manufacturing (C)	0.61	0.31
Electricity, gas, steam and air conditioning supply (D)	0.54	0.57
Water supply; sewerage, waste management and remediation activities (E)	0.33	0.35
Construction (F)	0.24	0.15
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	0.24	0.59
Transportation and storage (H)	0.27	0.23
Accommodation and food service activities (I)	0.27	0.53
Information and communication (J)	0.85	0.86
Financial and insurance activities (K)	0.67	0.78
Real estate activities (L)	0.32	0.69
Administrative and support service activities (N)	0.53	0.41
Professional, scientific and technical activities (M)	0.75	0.82
Public administration and defence; compulsory social security (O)	0.55	0.6
Education (P)	0.66	0.92
Human health and social work activities (Q)	0.26	0.86
Arts, entertainment and recreation (R)	0.56	0.76
Other service activities (S)	0.21	0.84
Activities of households as employers producing activities of households for own	0.89	0.93
Activities of extraterritorial organisations and bodies (U)	0.7	0.77

3.3 The Regional Perspective

Progressing from the national context to the regional context, Figure 4 presents a map of Ireland with social distancing potential across administrative areas. What can be noted is that the regions which have the highest potential social distancing indexes are in the regions around Dublin, Cork City, Galway city and Donegal with mid-high values in other provincial city counties. However, what is important to note here is that this index is based on where people live, not where people work. Therefore, while the regions around Dublin City have high values of these indices it is highly likely that many of these individual work in Dublin City itself. Occupational data is not available at a sufficiently detailed level to use place of work data to recreate this type of analysis. Regarding remote working potential a similar pattern is observed in Figure 5.

Figure 4: Social Distancing Potential by County

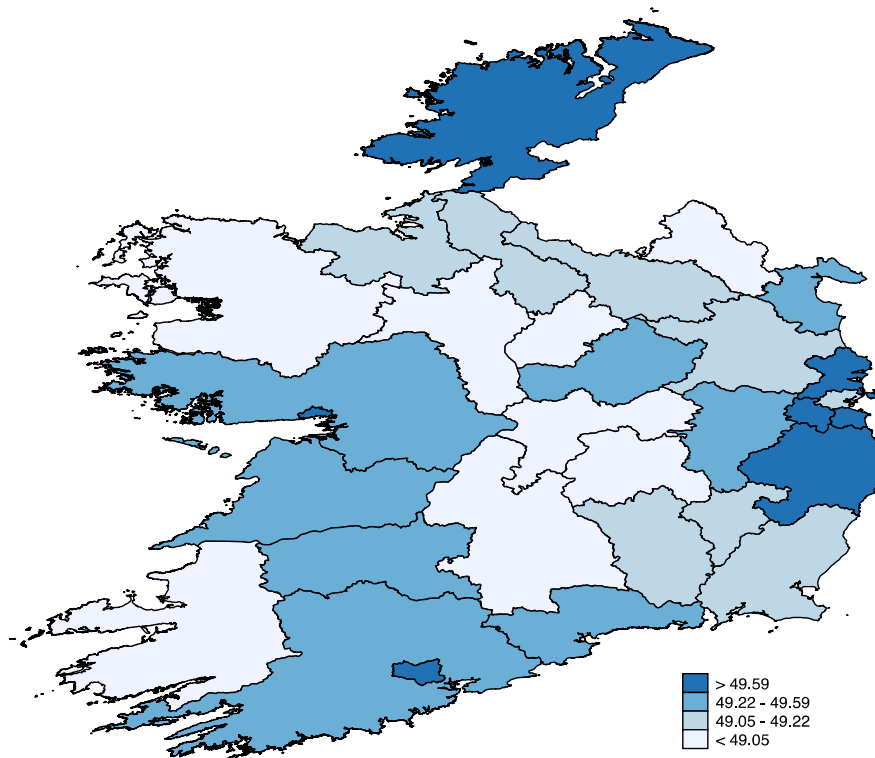
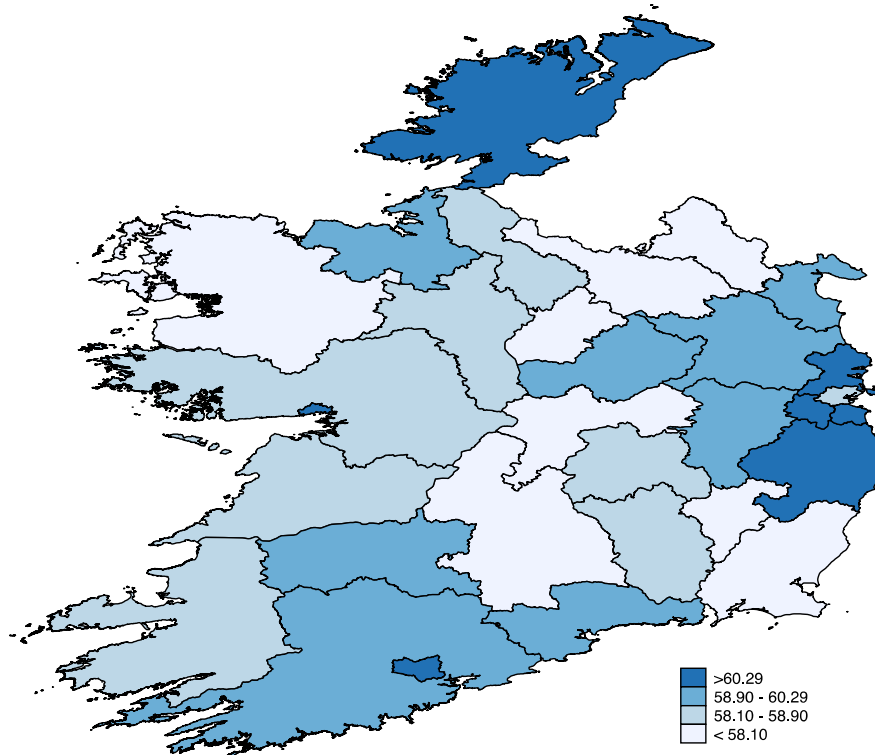


Figure 5: Remote working by county



3.4 Remote Work Potential at Town Level

When we progress to town level we consider all towns with a population of 1,500 or more in the 2016 census. It should again be highlighted that to calculate town values an aggregation method must be applied to the index as only broad occupational codes are available at town level. Therefore, we generate a weighted average by broad occupational codes of our social distancing and remote working index. We observe that both social distancing and remote work at the town level are again correlated. Again, this is not surprising and is to be expected given the variable construction of these indices.

Figure 6: Social Distancing and Remote Work Potential by Town



When we consider the potential for social distancing and remote work across towns by the median gross income of individuals within that town (Figure 7), we observe that towns which have a higher median gross income per individual have higher levels of our social distancing and remote working potential index. This suggests that relatively more affluent towns are more likely to be able to return to a greater degree of economic normality through social distancing measures or continuation of work via remote working. There is a certain degree of endogeneity here as occupations which are relatively higher paid have a higher degree of social distancing and remote work potential.

There is also a pattern of larger towns possessing higher values for our social distancing and remote working indices. This pattern is also present when one considers population density (which is the population per square kilometre of the town size) presented in Figure 8. Towns where more households have access to broadband also possess greater potential to socially distance and remote work based on our index (Figure 9). This particular graph is interesting as it appears to show that there is a correlation between towns which have the potential to remote work (based on our index) and also the capacity to do so (based on the

proportion of households which have broadband). Regarding educational attainment, we also observe that towns with a higher concentration of third level educated individuals also possess higher levels of our social distancing and potential for remote working indices (Figure 11).

This paints a picture of unequal potential to reengage fully in economic sense across Irish towns, with larger, higher income towns being better positioned from a social distancing and remote working occupational basis.

Figure 7: Social Distancing and Remote Work Potential and Median Gross Income

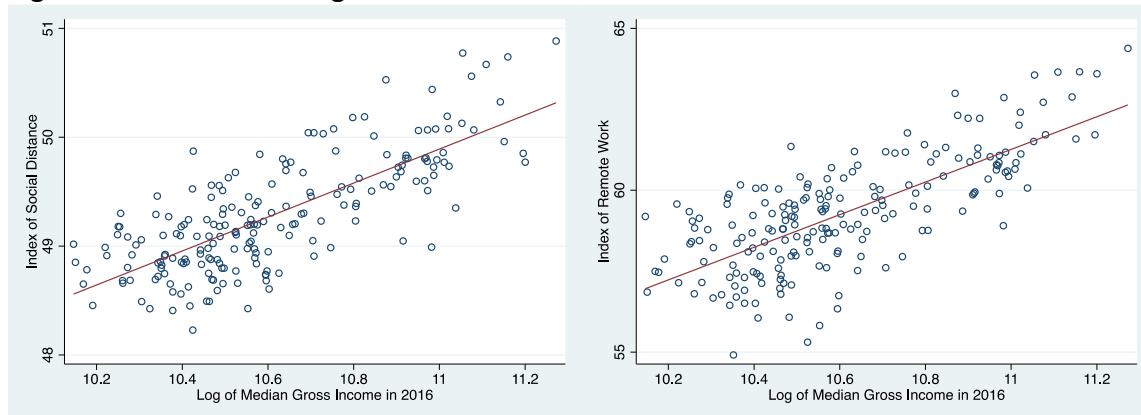


Figure 8: Social Distancing and Remote Work Potential and Town Size (by Population)

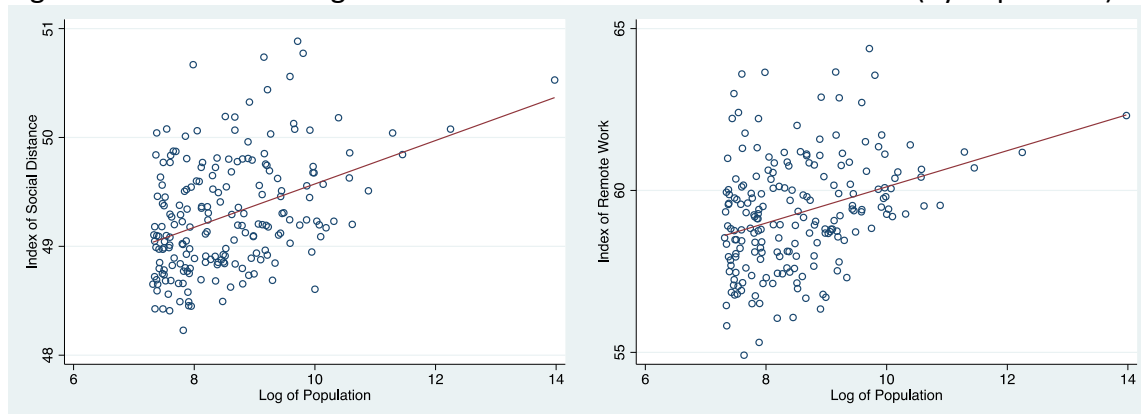


Figure 9: Social Distancing and Remote Work Potential and Population Density

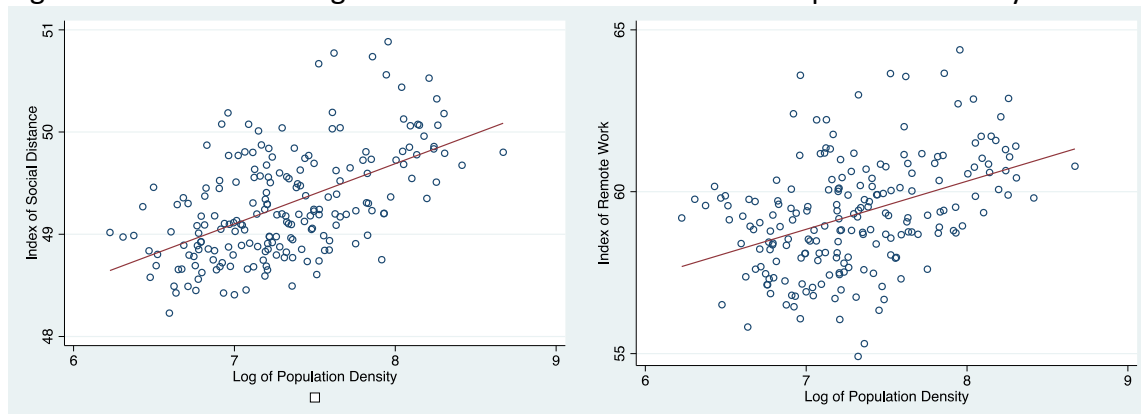


Figure 10: Social Distancing and Remote Work Potential and Proportion of Households with Broadband

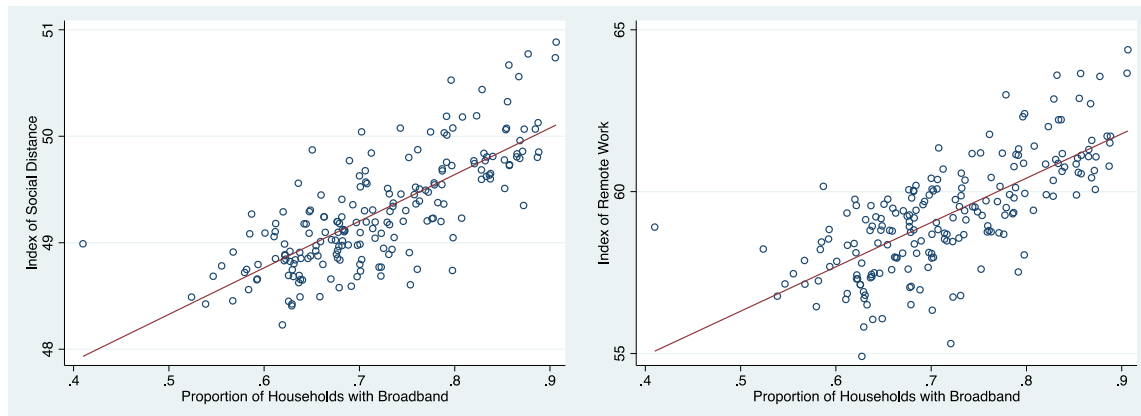
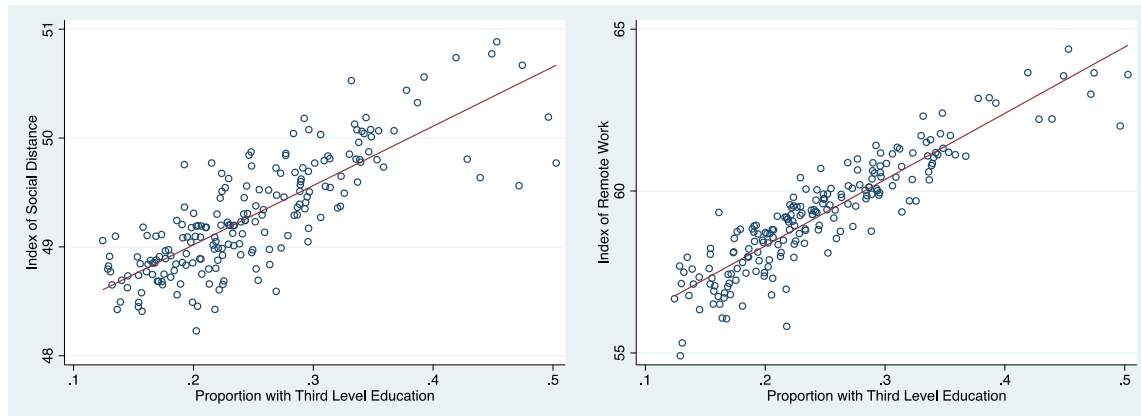


Figure 11: Social Distancing and Remote Work Potential and Proportion Third Level Education



4. Conclusions

The Covid-19 pandemic has had a sudden and drastic impact on labour supply and output in Ireland. There is considerable uncertainty around the implications of social distancing measures and remote working for the Irish labour market. As the Irish government responds, a key question is how covid-19 will impact people and places differently. The objective of this paper is to get a better understanding of the social distancing and remote working potential at an occupational, sectoral and regional level in Ireland.

This paper identifies that social distancing and remote working potential broadly (0.55 correlation) move in the same direction; that is, if social distancing potential in an occupation, sector or place is high, then it is also likely that remote working potential is high. However, we note that the construction of these indices contributes to this. There is a wide variation of social distancing and remote working potential across occupations and within industries. Potential for social distancing and remote work favours workers located in the Dublin region and provincial city regions and these measures are also higher in more affluent, larger, more densely populated, better educated and better broadband provisioned towns.

The key characteristics underlying the occupational, sectoral and regional differences are driven firstly, by the unique implications of social distancing for tasks that involve high degrees of face to face communication, customer facing interaction and physical proximity, and secondly, by the unique working conditions with some conditions representing an impossibility for remote work such as working outdoors or with the operation of vehicles and machinery. Occupations in the hospitality, wholesale and retail trade, transportation, other services (i.e hairdressing and beauty) and construction sectors are the most affected. This pattern aligns with data of individuals in receipt of the Irish government's Covid-19 pandemic unemployment payment since March 2020. This policy measure has been critical in supporting the people in the most vulnerable occupations and sectors. Unfortunately, over the medium to longer term of the pandemic crisis, the scope for remote working potential in these sectors, particularly in construction and transportation, is also considerably lower relative to other sectors. In other words, remote working is not going to be a panacea for social distancing concerns in many sectors. A key issue in the short to medium term is the implication for these sectors, if the Covid-19 pandemic unemployment payment is curtailed. Further, since we know the sectors that will be hardest hit, sector specific interventions such as business rates and tax holidays are likely to be on the policy and lobbying agendas (Overman, 2020).

Due to occupational and industrial clustering and the associated social distancing and remote working potential required; the economic crisis is likely to play out differently across places. Regional context effects such as population size, density, regional education levels and broadband availability will also be important in determining medium and long term regional inequalities. The Greater Dublin city region will be the least affected by social distancing measures and will likely be better insulated due to greater remote working potential for the population living there. Consequently, a one size fits all policy approach to the crisis, is unlikely to resolve regional inequalities. For example, given the dependence of some peripheral and smaller urban areas on the tourism and hospitality industry, the economic contagion effect at the local level may have devastating consequences for these communities. The Irish government needs to consider carefully how local and regional policy settings could be redesigned in order to better accommodate the impacts of increased social distancing and remote working on society over the short term and how it can help deeply affected workers and businesses recover in the medium to longer term.

We would like to note a few limitations of the study. Firstly, by using O*NET data we are relying on data from U.S. occupations as an approximation of working conditions across occupations for Ireland. While working conditions are likely to be slightly different between the U.S. and Ireland, the estimates should provide a close approximation of social distancing and remote working potential in Ireland. Also, the most detailed analysis below local authority level can only be conducted on the occupations of towns with a population of greater than 1,500. Consequently, the rural surrounds are not included in the town level analysis. Despite, these minor limitations, the current study provides a robust and the most comprehensive analysis to date on occupational social distancing and remote working in Ireland.

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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
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	0 – Not important	0 – Important	

assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.	100 – 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, maneuvering, navigating, or driving vehicles or mechanized 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	
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	0 – Not important 100 – Important	0 – Important 100 – Not important	

other problems or defects.			
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

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
How much does this job require wearing specialized protective or safety equipment such as breathing apparatus, safety	0 - Never 25 - Once a year or more but not every month 50 - Once a month or more but not every week	0 – Every day 25 – Once a week or more but not every day 50 – Once a month or more but not every week

harness, full protection suits, or radiation protection?	75 - Once a week or more but not every day 100 - Every day	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
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, maneuvering,	0 – Not important	0 – Important

navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or water craft.	100 – 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

Appendix 3: Full titles of broad occupations

Full titles of broad occupations

Administrative occupations

Business and public service associate professionals

Business, media and public service professionals

Caring personal service occupations

Corporate managers and directors

Culture, media and sports occupations

Customer service occupations

Elementary administration and service occupations

Elementary trades and related occupations

Health and social care associate professionals

Health professionals

Leisure, travel and related personal service occupations

Other managers and proprietors

Process, plant and machine operatives

Protective service occupations

Sales occupations

Science, engineering and technology associate professionals

Science, research, engineering and technology professionals

Secretarial and related occupations

Skilled agricultural and related trades

Skilled construction and building trades

Skilled metal, electrical and electronic trades

Teaching and educational professionals

Textiles, printing and other skilled trades

Transport and mobile machine drivers and operatives
