

Quarterly Economic Observer

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About NERI and this publication

The Nevin Economic Research Institute (NERI) was established to provide information, analysis and economic policy alternatives. Named in honour of Dónal Nevin, scholar, trade unionist and socialist who gave a life of service to the common good, the Institute aims to undertake research that will be of relevance to the Trade Union movement and the general public across the island of Ireland.

This is the 28th *Quarterly Economic Observer* (QEO) of the Institute. The purpose of the QEO is to provide regular, accessible and timely commentary so as to equip trade unions and others in articulating and advancing a new economic paradigm where the old has failed. Unless otherwise stated, the data cited in this Observer are the latest available as of 18 February 2019. The final draft of this document was completed on 22 February 2019.

This report has been prepared by staff of the Institute. The lead authors of this QEO are Dr. Lisa Wilson and Paul Mac Flynn with contributions from Dr. Tom McDonnell and Sorchá Foster. We are grateful to our external reviewers from the academic and research community who reviewed and commented on an earlier draft of this document. The analyses and views expressed in this publication are those of the NERI and do not necessarily reflect those of others including the Irish Congress of Trade Unions or the unions supporting the work of the Institute.

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The Nevin Economic Research Institute
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Executive Summary

This edition of the NERI's *Quarterly Economic Observer* (QEO) outlines our latest expectations for the economic outlook in the Republic of Ireland and Northern Ireland (Section 1) and examines automation technologies and the future of work in Northern Ireland (Section 2).

Economic outlook for Northern Ireland

- Northern Ireland's economy looks likely to have enjoyed a slightly better year in 2018 than in 2017. On closer inspection, however, there is cause for concern relating to both growth in output and the labour market.
- While output growth recovered a little from events such as the sharp contraction of Manufacturing output in 2017, growth has lost momentum. A slowdown in the Retail and Hospitality sector is the main concern over the medium term.
- There has been strong growth in employment, but a worrying trend in the nature of some of the new employment. Over the course of 2018 the number of full-time jobs increased by 3,000, only, while there was an increase of 22,000 in the number of part-time workers and a 10,000 increase in temporary workers.
- While Brexit continues to exert uncertainty over the outlook in the short and medium term, reductions in public expenditure also weigh heavily on the outlook for the Northern Ireland economy.

Economic Outlook for the Republic of Ireland

- Real GDP grew by a very robust 7.4 per cent annually in the first nine months of 2018. The Republic's cyclical upswing is continuing, and there is, as of yet, limited evidence of overheating in the economy. However, the activities of a small number of large multinationals continue to distort these figures.
- Manufacturing and Services PMIs, while still positive, are on a downward trend. The bulk of real GDP growth in 2019 and 2020 will come from domestic demand, with only a minor role for net exports.
- Labour market performance, while improving, is merely average by EU standards. Fourteen EU countries had lower unemployment rates than the

Republic in December, while the Republic's employment rate was marginally below the EU average.

Automation technologies and the future of work in Northern Ireland

- Recent rapid advances in artificial intelligence (AI), robotics and other forms of smart technologies have led to widespread concern about the potential impact of automation technologies for the future of work.
- We use the *task-based* approach to estimate the impact of automation for the Northern Ireland labour market. This produces lower estimates of negative job impact than similar studies, which have used the *occupation-based* approach. We argue that our methodology produces a more realistic appraisal of the risk of job loss.
- We estimate that around 7 per cent or 60,000 jobs are at high risk of job loss from automation technologies. In addition, we estimate a further 58 per cent of jobs are estimated as being at risk of substantial change in the tasks involved.
- We estimate that 13 per cent of workers are employed in jobs classified as being at low-risk from automation technologies. The principal job tasks for these workers comprise functions described as 'engineering bottlenecks' in that they are non-substitutable by machines.
- Over 1 in 4 of those in the distribution, hotels and restaurant sector are at high risk of automation (26.8 per cent). A further 46 per cent of workers in this sector are at mid-to-high risk of automation. The lowest automation risk is found in the Public Administration, Education and Health sectors.
- The risk of automation is particularly elevated among low-skilled workers with 34 per cent of workers at high risk. A further 48 per cent are at risk of substantial change in the task structure of their job. Almost 40 per cent of middle-skilled workers face substantial change in the task structure of their job, as some tasks become substitutable by machines.
- Despite a significant number of workers facing a high risk of job loss owing to automation technologies, we anticipate that there will be enough new jobs created to replace lost jobs.
- However, the new jobs created are not in many cases comparable to those lost, and to think of them as replacement jobs can be quite misleading. New jobs are

more likely to be in different occupations to the jobs that are lost, but more importantly, they also differ in quality to the jobs that were replaced.

- There has been a polarisation in terms of the occupational structure, with growth concentrated at one end in non-routine abstract/cognitive, high skilled occupations such as engineers and at the other end in non-routine service occupations such as caring and leisure occupations. The evidence suggests a similar polarisation in the quality of jobs.
- Those in non-routine service occupations tend to have relatively poor earnings. These results stay constant whether we examine the quality of earnings via hourly pay, gross weekly pay or annual pay, with those in non-routine abstract occupations tending to be relatively much better paid.
- Workers in non-routine service occupations also appear to be unsatisfied with their job and have little autonomy or flexibility over their work. Thus, the quality of the working environment of these workers is much lower than that of other workers. This is of key concern given that these jobs are among the least likely to be displaced owing to automation technologies.
- Technological change is necessary for productivity growth and it is a key determinant of improved living standards. Automation technologies also have the capacity to improve dramatically the working environment and conditions for many workers.
- However, this does not detract from the fact that for a sizeable number of workers, automation technologies may lead to job loss or a negative job change in terms of the quality of employment. Policy action is needed to improve the quality of ‘bad’ jobs to ensure that workers in certain occupations or sectors do not lose out.
- We argue the need to strengthen labour market institutions, and in particular the importance of unionisation and collective bargaining capacity as a way to hedge against the risks of negative displacement or deterioration in job quality due to automation technologies.
- Furthermore, we argue for the introduction of a new occupational infrastructure in low-skilled sectors of the economy in order to rebuild good quality jobs. This will require a social dialogue between Government, employers and trade unions to ensure that technological advances benefit all.

1 Economic Trends and Outlook

1.1 World

The two Irish economies of Northern Ireland and the Republic of Ireland are both small, open and heavily trade-dependent. As such, conditions for their main trading partners, and more generally the global economy, strongly influence short-term economic performance. The most important trading partners are each other, the euro area, Great Britain, and the United States (US). We show the recent economic performances for these countries and regions in Table 1.1.

Table 1.1 Dashboard of Macroeconomic Indicators, Selected Regions*

	2013	2014	2015	2016	2017	2018
Real GDP	<i>Percentage volume change over previous year</i>					
Euro area	-0.2	1.4	2.1	1.9	2.4	1.8
United Kingdom	2.0	2.9	2.3	1.8	1.8	1.4
United States	1.8	2.5	2.9	1.6	2.2	2.9
Unemployment**	<i>Percentage of active population</i>					
Euro area	12.0	11.6	10.9	10.0	9.1	8.3
United Kingdom	7.6	6.2	5.4	4.9	4.4	4.4
United States	7.4	6.2	5.3	4.9	4.4	3.8
Inflation***	<i>Percentage annual average rate of change</i>					
Euro area	1.3	0.4	0.0	0.2	1.5	1.7
United Kingdom	2.6	1.5	0.0	0.7	2.7	2.5
United States	1.5	1.6	0.1	1.3	2.1	2.4
Compensation per Employee	<i>Percentage change from previous period</i>					
Euro area	1.6	1.3	1.3	1.1	1.6	2.3
United Kingdom	2.7	0.6	1.1	2.9	3.1	3.0
United States	1.5	2.9	3.2	1.0	1.9	2.9
Employment	<i>Percentage change from previous period</i>					
Euro area	-0.6	0.6	1.0	1.4	1.6	1.4
United Kingdom	1.2	2.4	1.7	1.4	1.0	0.8
United States	1.0	1.6	1.7	1.7	1.3	1.5
Current Account Balance	<i>Percentage of Gross Domestic Product</i>					
Euro area	2.2	2.5	3.2	3.6	3.5	3.0
United Kingdom	-5.1	-4.9	-4.9	-5.2	-3.8	-3.5
United States	-2.1	-2.1	-2.2	-2.3	-2.3	-2.5
Fiscal Balance	<i>Percentage of Gross Domestic Product</i>					
Euro area	-3.0	-2.5	-2.0	-1.5	-0.9	-0.6
United Kingdom	-5.3	-5.4	-4.2	-2.9	-1.8	-2.0
United States	-4.1	-3.7	-3.2	-3.9	-3.8	-4.7

Notes: *2018 figures for Real GDP, Inflation, *Fiscal Balance*, *Unemployment Rate* and *Current Account* are latest IMF projections. Figures for *Employment* and *Compensation per Employee* are EU AMECO.

Eurostat definition, *Harmonised consumer prices (national definition for the US)

Sources: IMF: [World Economic Outlook](#) and [Fiscal Monitor](#), EU Commission: [AMECO](#).

The global economy grew by 3.7 per cent in real GDP terms in 2018. Most institutional forecasters expect a modest weakening in 2019 as the cyclical upswing of recent years peters out. [The IMF projects](#) real GDP growth of 3.5 per cent in 2019 with Advanced economy growth of just 2 per cent. The only G7 country it projects will grow by more than 2 per cent is the US, with particularly weak outlooks for Italy (0.6 per cent), Japan (1.1 per cent), and Germany (1.3 per cent). The baseline forecast for the United Kingdom (UK) is 1.5 per cent. However, this forecast is particularly tentative given the very high level of uncertainty that persists around the form taken by Brexit. The [European Commission forecast](#) that the EU27 (i.e. the EU without the UK) will grow by 1.5 per cent and that Italy will come close to recession in 2019 (0.2 per cent). The [OECD, believe](#) the recent global expansion has peaked, but still forecasts economic growth to average close to 3.5 per cent over the next two years.

The [CESifo sentiment of economic experts](#) in the euro area suggests the economic climate for the euro area has plummeted. The index is now below zero for the first time since 2014 while economic expectations are at their lowest point since 2011. Trade tensions, including tariff increases by the US and China, are already affecting global trade, while concerns about a slowing Chinese economy and a weakened German car industry are fuelling pessimism. There are also concerns for a re-emergence of the euro area crisis centred on politically and economically unstable Italy. Were Italy to plunge into meltdown it could provoke a fiscal and borrowing crisis with contagion risks for the euro area and the global economy.

Brexit related uncertainty is likely to weigh heavily on investment in the UK and the euro area for at least the first half of 2019, while a hard 'no-deal' Brexit could well spark a global slowdown. In addition, political tensions have recently increased in Latin America and the ensuing uncertainty dampens the outlook for that region. Finally, the weak growth in recent years in most advanced economies of investment in the productive capital stock, suggests weak productivity growth will continue over the medium-term. Greater investment in infrastructure, innovation and human capital will be required if the global economy is to generate higher levels of productivity growth.

Seasonally adjusted real GDP fell in Italy in the fourth quarter (Q4) of 2018 and the country is now in recession. **Euro area** real GDP growth (SA) was an anaemic 1.2 per cent in Q4 of 2018, down from 1.6 per cent in Q3. On the other hand, the euro area's unemployment rate was 7.9 per cent in December. While this was stable compared

with November, the rate was down from 8.6 per cent in December 2017. Unemployment in the euro area is now at its lowest rate since the start of the great recession in late 2008, while unemployment in the EU is, at 6.6 per cent, at its lowest point this century.

The unemployment rate is now below 4 per cent in seven EU countries, including Germany and Poland. On the other hand, three countries, including Italy and Spain, have unemployment rates in excess of 10 per cent. Job vacancy rates have been gradually trending upwards since 2013, and a number of countries are close to, if not already at, full employment. Hourly wages were up 2.4 per cent over the previous year in the euro area in Q3, and up 2.7 per cent in the EU. Euro area inflation was 1.4 per cent in January with upward pressure coming from higher energy prices. The ECB is likely to take a cautious approach to monetary policy, faced as it is with a mixed macroeconomic picture, and a high degree of geopolitical uncertainty.

The **UK** economy grew by 0.2 per cent in real terms in Q4 of 2018, and by 1.3 per cent over the previous year. Employment growth was up 1.1 per cent annually, while hourly wages were up 2 per cent. However, real average hourly wages are falling in the UK as consumer prices are increasing by more than 2 per cent per annum (the HICP was 2.4 per cent in October). This is somewhat surprising given the UK is close to full employment, but is partially a reflection of weak productivity growth in recent years. A hard 'no-deal' Brexit would likely precipitate a fall in Sterling and the introduction of tariffs meaning higher costs and ultimately leading to an even further fall in living standards in the UK. In addition, the UK already has large current account (3.9 per cent of GDP) and fiscal (2.2 per cent) deficits, suggesting limited room for countercyclical policy (increasing spending/reducing taxes) in the event of a hard Brexit.

The **US** economy continues to outperform the other large advanced economies. Annual real GDP growth was 3 per cent in Q3 2018. The unemployment rate of 3.9 per cent in December was close to a 50-year low, although it was up marginally over recent months. Consumer prices were up 2.4 per cent in December. Even so, real wages are increasing, with average hourly earnings up 3.2 per cent in January 2019. Despite the ostensibly strong macroeconomic picture, the US Federal Reserve has indicated it will be cautious in relation to tightening monetary policy, citing concerns about the global economy. The Federal Reserve's more dovish stance with regard to future interest rate

increases should reduce the risk of destabilising capital flight from at-risk emerging markets such as Turkey and Argentina.

1.2 Republic of Ireland

Trends and analysis

Real GDP grew by a very robust 7.4 per cent annually in the first nine months of 2018. The activities of a small number of large multinationals have distorted the growth figures and make the aggregate data volatile from year-to-year.

While recognising this caveat, the domestic Irish economy's cyclical upswing did continue throughout 2018, with strong growth in personal consumption, as well as in employment (Table 1.2). Modified domestic demand, which strips out intellectual property investment and purchases of aircraft by leasing companies, grew 5.1 per cent annually in the first nine months of 2018, while personal consumption grew 4.9 per cent. Total employment in 2018 was up 2.9 per cent compared to the previous year, while construction job growth was up 11.6 per cent. The unemployment rate in January was at a ten-year low of 5.3 per cent and total employment now exceeds the pre-crisis peak. However, the economic recovery has been uneven. For example, the rate of deprivation at 18.8 per cent, while declining, remains well above the pre-crisis rate of 11.8 per cent.

The Republic's cyclical upswing is continuing, and there is, as of yet, limited evidence of overheating in the economy. Due to the distortions in the national accounts, traditional indicators such as the current account balance have lost much of their value as indicators of overheating or the cyclical position more generally. Certain data is suggestive of overheating. For example, personal consumption, retail sales and average weekly earnings are all growing relatively quickly, as is underlying investment, which grew by 6 per cent annually in Q3. Perhaps most strikingly, residential property prices were up 6.5 per cent annually in December and by 30 per cent over the last three years. Even so, property prices in 2018 were just 80.7 per cent of 2007 levels.

Against this, the household savings rate is comfortably above its long-run average. In addition, we are now in the seventh year of sub 1 per cent consumer price inflation, with the CPI increasing 0.7 per cent in January, and averaging 0.5 per cent in 2018.

New dwelling completions were just 18,072 in 2018. This figure is less than 60 per cent of medium-term projected demand, with housing completions well below the long-run average, as well as the rate of new household formation. We should also understand the recent growth in consumption and weekly earnings within the context of years of stagnation in consumption and wage growth.

Table 1.2 Dashboard of Macroeconomic Indicators, Republic of Ireland

	2013	2014	2015	2016	2017	Latest
<i>Percentage volume change over previous year</i>						
Gross Domestic Product	1.3	8.8	25.1	5.0	7.2	7.4 (Q1-Q3'18)
Modified Domestic Demand	2.5	4.1	4.8	5.6	3.2	5.1 (Q1-Q3'18)
Personal Consumption	-0.6	2.1	3.6	4.0	1.6	4.9 (Q1-Q3'18)
Retail Sales	0.7	6.3	8.4	7.9	3.9	3.8 (2018)
GNI* (current prices)	8.3	8.6	8.6	9.0	3.0	3.0 (2017)
<i>Percentage annual average rate of change</i>						
Employment	3.0	2.6	3.5	3.7	2.9	2.9 (2018)
Average Hourly Earnings	-0.3	-0.3	0.1	0.8	1.7	2.1 (Q3'18)
Average Weekly Earnings	-0.5	0.3	1.2	1.1	2.0	3.2 (Q3'18)
Inflation (CPI)	0.5	0.2	-0.3	0.0	0.4	0.7 (M1'19)
<i>Percentage of annual GDP or quarterly GDP</i>						
Mod. Investment (% GNI*)	17.4	18.4	19.7	20.7	22.4	22.4 (2017)
Current Account Balance	1.5	1.1	4.4	-4.2	8.5	12.3 (Q1-Q3'18)
Government Balance (GGB)	-6.1	-3.6	-1.9	-0.5	-0.2	-1.2 (Q1-Q3'18)
Gov. Gross Debt (end year)	119.7	104.1	76.8	73.4	68.4	68.8 (Q3'18)
<i>Percentage of labour force</i>						
Unemployment (SA)	13.7	11.9	9.9	8.4	6.7	5.3 (M1'19)
Long-term Unemployment	8.0	6.7	5.4	4.3	3.0	2.0 (2018)
<i>Percentage of households</i>						
Deprivation	30.5	28.9	25.4	21.0	18.8	18.8 (2017)
At Risk of Poverty	16.2	16.7	16.3	16.2	15.7	15.7 (2017)
<i>Percentage</i>						
Gini Coefficient	31.8	32.1	30.8	30.7	31.5	31.5 (2017)

Notes: Half-year, ('H'), Quarterly ('Q'), monthly ('M') and other data is compared to same period of the previous year. Rates of change represent the average value over the period. *Modified domestic demand* is non-seasonally adjusted modified final domestic demand, which we define as 'Total domestic demand less the effects of the trade in aircraft by aircraft leasing companies and the imports of intellectual property'. *Modified investment* is the investment component of modified domestic demand. *GGB* is end-year figure as a % of annualised GDP or latest quarterly figure as % of quarterly GDP. *Unemployment* is average for four quarters or latest quarter/month seasonally adjusted. The Labour Force Survey replaced the Quarterly National Household Survey from Q3 2017 onwards.

Sources: CSO: [Annual National Accounts](#), [Quarterly National Accounts](#), [Retail Sales Index](#), [Labour Force Survey](#), [Earnings and Labour Costs Annual](#), [Earnings and Labour Costs Quarterly](#), [Consumer Price Index](#), [Balance of International Payments](#), [Government Finance Statistics](#), [Monthly Unemployment](#), [Survey on Income and Living Conditions](#).

Finally, labour market performance, while improving, is merely average by EU standards. Fourteen EU countries had lower unemployment rates than the Republic in December, while the Republic's employment rate was only marginally above the EU

average in Q3 2018. The job vacancy rate in Q3, a measure of labour market tightness, was the fifth weakest out of a group of 24 EU countries. While average hourly earnings increased by 2.1 per cent annually in Q3, this was broadly equivalent to real growth of 1.3 per cent, and in line with long-run average labour productivity growth for an advanced economy. All told, the evidence suggests that the labour market still has some room remaining for sustainable expansion.

Box 1.1 Introducing a Household Net Wealth Tax: Some Considerations

The gradual increase in inequality in advanced economies over the last 40 years has prompted a discussion in a number of countries about the need for greater taxation of wealth. The distribution of wealth is more concentrated than that of income and wealth inequality will grow over time in the absence of progressive capital taxation and the taxation of acquired wealth.

Net household wealth is the value of the individual's gross stock of assets after deduction of all debts and liabilities.

The key objectives of a net household wealth tax are to raise a meaningful amount of revenue for the exchequer and reduce inequality, while at the same time minimising administration and compliance costs, economic distortions, and the risk of capital flight.

A tax on net household wealth is feasible (see [McDonnell, 2013](#) and [OECD, 2018](#) for discussions). It would raise revenue for the exchequer and target those with the broadest shoulders. If well designed it would affect just 1 per cent to 2 per cent of households, would be more equitable than almost all other forms of taxation, and would be more growth friendly than most other forms of taxation.

Arguments against a wealth tax usually revolve around concerns about capital flight, and a large administrative and compliance burden. A well-designed wealth tax needs to address these concerns and be consistent with the core objectives of equity, efficiency and simplicity. The structure most consistent with these goals is a tax with either zero or very few exemptions and reliefs (e.g. for human capital), with a relatively high tax-free allowance or threshold, and a flat marginal rate that is set at a low level.

Analysis from [Lawless and Lynch \(2016\)](#) indicates that potential wealth tax yield in the Republic of Ireland in 2013 from a 0.5 per cent wealth tax, with the above basic structure, and a threshold of €500,000 net wealth for a person with no children (doubled for couples), was €311 million. In practice, administration costs, non-compliance, and the need for an income cap would all reduce the net yield. On the other hand, net household wealth increased by two thirds between 2013 and 2017 so the expected yield would have increased significantly since 2013. Even so, the yield from a net wealth tax would be just a fraction of 1 per cent of economic output.

Outlook

Given the strong rate of output growth in the first nine months of the year, along with the strong rate of employment growth, it appears likely that the economy grew by close to 7.2 per cent in real GDP terms in 2018. The short-term outlook remains positive and we project real GDP will grow by 4 per cent in 2019 (see Table 1.3). The unpredictable tax planning activities of multinationals could push this figure in either direction. Crucially, our baseline projection assumes a soft Brexit. A hard or 'no deal' Brexit would significantly damage economic performance in 2019 and 2020. We describe the major risks and uncertainties faced by the economy in Box 1.2. These risks are mainly to the downside. The economy's cyclical upswing should continue out to the end of 2019 and the economy may be modestly overheating by that point given our assessment that the economy is already close to overheating.

Table 1.3 Macroeconomic performance & projections, Republic of Ireland

	2017	2017	2018	2019	2020
Real Output		<i>Percentage real change over previous year</i>			
Gross Domestic Product	€294.1bn	7.2	7.2	4.0	3.6
Personal Consumption	€99.9bn	1.6	3.0	2.7	2.3
Government Consumption	€29.6bn	3.9	4.7	4.6	4.6
Investment	€69.0bn	-31.0	-3.7	8.9	7.4
Exports	€352.6bn	7.8	7.5	4.8	3.8
Imports	€263.3bn	-9.4	2.7	5.8	4.4
Earnings		<i>Percentage nominal change over previous year</i>			
Average Hourly Earnings	€22.43	1.7	2.8	3.0	3.5
Government Finances		<i>Percentage of GDP</i>			
General Government Balance	-€0.7bn	-0.2	-0.2	-0.2	0.0
Gross Debt	€201.3bn	68.4	64.2	61.9	57.2
Labour Force		<i>Percentage change over previous year</i>			
Employment	2,194,150	2.9	2.9	2.5	1.9
		<i>Percentage of labour force</i>			
Unemployment	157,850	6.7	5.7	5.0	4.7

Notes: Projections for *Gross Domestic Product* and components refer to real economic activity; *Investment* refers to Gross Fixed Capital Formation; *Employment*, *Unemployment* and *Earnings* all represent the average value over the four quarters.

Technical assumption of offsetting or minimal further volatility to the national accounts arising from multinational tax avoidance activities. Projections based on soft-Brexit scenario.

Sources: See Table 1.2. NERI estimates for 2018-2020.

Box 1.2 Selected Macroeconomic Risks and Uncertainties: Republic of Ireland

- A) Brexit.** The precise impact of a disorderly Brexit, while economically damaging, is impossible to quantify. Our prior expectation of a 21-month transition period now looks shaky, although currency movements suggest that markets at least believe an extension will happen. A hard Brexit would have a deeply damaging impact on Irish trade and will create severe difficulties for businesses with cross border supply chains. The agri-food sector would be particularly hard hit. Sterling would likely depreciate with further negative implications for Irish exporters. The introduction of tariffs means the net impact on economy-wide consumer price inflation is uncertain. In addition, financial markets would likely come under strain, there may be disruption at ports and airports, and the fiscal position will deteriorate. Many consumers and businesses would likely delay investment decisions as they await greater clarity regarding the final Brexit outcome. The Central Bank estimates a disorderly Brexit would knock up to 4 percentage points off GDP growth in the first year.
- B) Monetary policy and financial fragilities.** The Irish economy has high public and private debt ratios. As such, higher interest rates would reduce domestic demand and could expose fragilities in the economy. One positive aspect for the Republic of the deteriorating economic outlook for the euro area is that the ECB is now likely to postpone the process of tightening monetary policy. A slower pace of tightening will delay the negative impact from higher interest rates on demand in the domestic economy. The US Federal Reserve has already indicated it will slow its own process of tightening monetary policy. This should help stabilise a number of emerging markets at risk from capital flight, or with significant dollar denominated debts. Overall, postponement of monetary tightening represents an upside risk to Irish growth.
- C) Protectionism and trade wars.** An escalation in the imposition of trade tariffs will damage global trade and would have particularly negative implications for a small open economy like the Republic.
- D) Energy prices.** Rising energy prices would mean an increase in input costs for business and would reduce real disposable income for households. Such an event would reduce corporate investment as well as private consumption.
- E) International corporation tax policy.** From a tax justice perspective, the momentum towards a Common Consolidated Corporate Tax Base (CCCTB) and similar initiatives is welcome. CCCTB is a European Commission proposal to provide a single set of rules for how EU corporations calculate EU taxes. The proposal would make it more difficult for companies to use transfer pricing and other tax avoidance mechanisms to erode their tax liabilities. The impact on the Republic's fiscal position would be negative and there could be an effect on investment decisions. In practice, any impacts are likely to occur outside the forecast horizon of 2019 and 2020.

A note of caution is that the Manufacturing (52.6) and Services (54.2) PMIs, while still positive, are on a downward trend. The bulk of real GDP growth in 2019 and 2020 will come from domestic demand, with only a minor role for net exports. This is mainly

because underlying imports are likely to grow quickly in 2019 given the expected growth in domestic incomes and demand. Beyond 2020, we anticipate medium-term trend growth rates of between 2.5 and 3 per cent per annum.

The Construction PMI fell to 54.6 in January (where anything over 50 represents expansion). Even so, we project strong growth in construction activity over the next 18 months as the market responds to increasing house prices. Rising employment and real wage growth will support growth in private consumption this year, although employment growth should start to slow in 2019-20. Wage pressures from a tightening labour market should push consumer prices higher over the next 18 months. We project nominal wage growth will be close to 3 per cent in 2019 and then 3.5 per cent in 2020, with faster growth in expanding sectors, most notably construction responding to demand for housing. The unemployment rate should fall below 5 per cent by the end of 2019 and average close to 5.5 per cent in 2020.

1.3 Northern Ireland

On the surface, the Northern Ireland economy looks likely to have enjoyed a slightly better year in 2018 compared to 2017. On closer inspection, however there is cause for concern relating to both growth in output and the labour market. Added to this, uncertainty surrounding the UK's withdrawal from the European Union continues to weigh heavily on both the short, medium, and long-term outlook for Northern Ireland's economy. Output growth has noticeably stalled since 2016 based on both Gross Value Added and the Northern Ireland Composite Economic Index. While the rate of growth no longer appears to be in decline, returning to pre-2016 growth rates is not in prospect. Whilst unemployment continues to fall, there are concerns over the composition of the employment that is being created. The UK budget last November set out the fiscal context for Northern Ireland over the next two years, with cuts in real terms still forecast. The absence of a Northern Ireland Executive makes the impact of this fiscal challenge hard to predict.

Table 1.4 Dashboard of Macroeconomic Indicators (Northern Ireland)

	2014	2015	2016	2017	2018	Latest
<i>Percentage volume change over previous year</i>						
Gross Value Added	2.4	3.0	1.9	1.7	-	1.7 (2017)
NICEI	0.6	1.6	1.5	0.7	-	0.4 (Q3 2018)
Index of Services	0.9	1.1	2.9	1.5	-	-0.6 (Q3 2018)
Index of Production	2.2	1.7	0.1	-6.1	-	2.4 (Q3 2018)
<i>Percentage annual average rate of change</i>						
Employment Rate	1.8	0.2	2.1	-1.2		0.9 (M10-M12 '18)
Average Hourly Earnings	-1.3	4.2	1.7	2.6	3.6	3.6 (2018)
Price Inflation (UK)*	1.5	0.4	1	2.6	2.3	1.8 (M1'19)
<i>Percentage of GVA</i>						
Exports	27.2	26.0	25.2	25.5	-	26.6 (2016)
Government Spending	57.7	55.7	53.8		-	53.8 (2016)
<i>Percentage of labour force</i>						
Unemployment	6.4	6.1	5.8	4.6		3.8 (M10-M12 '18)
Youth Unemployment	19	19.3	14.9	11.2		8.2 (M10-M12 '18)
Long-term Unemployment	3.4	3.6	2.6	2.3		1.7 (M10-M12 '18)
<i>Percentage of population</i>						
Relative Poverty	22	18	20	-	-	20 (2016)

Notes: Employment Rate refers to all persons in employment (ILO definition) aged 16-64 as proportion of all persons 16-64. GVA is deflated using UK GDP deflator. NI Exports refer to sales outside the UK. Exports refers to both goods and services sold from NI beyond the UK. Government Spending refers to Total identifiable expenditure on services apportioned to NI.*CPIH is now the ONS recommended measure of UK inflation.

Source: [ONS Regional Gross Value Added](#) (Income Approach); [HMT GDP Deflators](#); NISRA [Northern Ireland Composite Economic Index](#); NISRA [Index of Production](#); NISRA [Index of Services](#); NISRA [Labour Force Survey](#); NISRA [Annual Survey of Hours and Earning](#); ONS [Consumer Price Inflation](#); HMT [Public Expenditure Statistical Analyses](#); NISRA [Households Below Average Income](#)

As Table 1.4 shows, output in the Northern Ireland economy grew by 0.4 per cent in the third quarter of 2018. This was largely driven by a rebound in *Production* sector activity and a very strong performance in the *Construction* sector. The Index of Services in Northern Ireland actually decreased by 0.6 per cent over the quarter. This was driven in large part by a significant fall in output in the *Wholesale and retail trade* and *Accommodation and Food service* sector which declined by almost 0.9 per cent during the third quarter. This is the largest component of the services sector and follows a 0.8 per cent decrease in this sector in the previous quarter erasing almost all of the strong gains made over 2017. There was also a sharp decrease in the *Transport, storage, information & communication* sector which also reverses some of the gains made over the course of the previous year.

The index of Production saw solid growth of 2.4 per cent in the third quarter of 2018 rebounding sharply from a significant contraction in 2017. As noted in previous editions of this publication the loss of Tobacco production in Northern Ireland had a substantial and lasting impact on *Manufacturing* output. The *Food products, beverages and tobacco* contracted in this quarter but overall the sub sector has largely stabilised following this loss. However, the sub sector as a whole is now just over half the size (51 per cent) that it was at its peak in mid-2009 (Q2).

Construction sector activity increased by almost 6 per cent in Q3 of 2018, compounding growth of 4.2 per cent in the second quarter of the year. The results for Q2 and Q3 of 2018 follow a disappointing performance in 2017 and a very shaky start to 2018 which saw activity contract by just under 7 per cent. While growth in Q2 was driven by *Repair and Maintenance*, Q3 saw strong growth in *New Work*. Caution is needed however as Construction statistics for Northern Ireland can be quite volatile and cannot remove the value of work carried out in the Republic of Ireland by Northern Ireland firms.

Overall annualised growth in the NICEI stood 2.1 per cent in Q3 of 2018 compared to Q3 of 2017. However, when rolling 4 quarter average growth is compared, the annualised rate fell from 1.6 per cent at this stage in 2017 to 0.5 per cent at this stage in 2018. What this means is that while growth may have recovered from events such as the sharp contraction of Manufacturing output in 2017, the trend of growth, while still positive, is not following such a steep velocity.

The Northern Ireland labour market appears to have performed strongly over 2018. In the final quarter of 2018, the seasonally adjusted unemployment rate was 3.8 per cent unchanged from the previous quarter and down by 0.7 per cent on an annual basis. While there has been a significant and sustained increase in economic inactivity over the course of much of 2018, much of this net increase appears to be accounted for by those aged 65 and over. There has been a marked increase in economic inactivity among the 25 to 49 age group, but much of this has been negated by decreases among the 50 to 64 years cohort. This means that both the economic activity rate and the employment rate for those aged 16-64 increased by 0.9 per cent in 2018.

While there have been encouraging signs regarding the numbers of people in work, there is cause for concern regarding the nature of that work. In the 12 months ending in December 2018, the number of full-time jobs only increased by 3,000. Over the same period there was an increase of 22,000 in the number of part-time workers and a further 10,000 increase in temporary workers. An increase in part-time or temporary work is not necessarily a bad outcome in and of itself. However [research](#) has shown that non-standard forms of employment tend to be less secure in nature, offer less opportunities for progression; fewer opportunities for training; possess higher occupational health and safety risks and lead to lower job satisfaction. Therefore, the quantity of employment may have improved at a cost to the quality of employment.

The rate of inflation fell to 1.8 per cent in January 2019 following an annualised rate to 2.3 per cent in 2018. This is down from the 2.6 per cent recorded in 2017, but still significantly ahead of the 1 per cent and 0.4 per cent recorded in 2016 and 2015 respectively. The impact of Sterling's depreciation has clearly begun to wane and this was acknowledged in the Bank of England's decision earlier this month to hold interest rates at 0.75 per cent. Brexit continues to exert uncertainty over the UK economy as a whole and the Bank of England has lowered its forecasts for the UK economy in 2019 to 1.2 per cent, down from 1.9 per cent. This downgrade is attributed purely to uncertainty as the Bank's forecast is predicated on a deal being agreed between the UK and the EU. Should that eventuality not come to pass, a significant revision to growth in medium term will be expected.

Box 1.2 The UK Budget

The UK Budget for 2019/20 was unveiled last November by Chancellor of the Exchequer Philip Hammond. While nearly all recent discussion and debate at Westminster has been consumed by Brexit, the political context for this budget was quite different. This budget was billed as one which would 'end austerity' and end a policy of fiscal retrenchment in the UK that began in 2010. There were problems with this claim from the outset.

Firstly, the idea of ending austerity in 2019 would seem to contradict the Chancellor's stated plan to 'balance the books' by the mid-2020s. The Institute for Fiscal Studies pointed out that unless taxes were to rise by some £19bn by 2022/23, then only increased borrowing could accommodate this change of policy. Secondly, it is not clear whether the end of austerity would mean an end to all cuts to expenditure. £19bn is the figure that would be required just to avoid further cuts in departmental expenditure, but there are a further £7bn cuts already pencilled in for welfare expenditure.

In the event, the budget did not meet expectations. In the longer term, however, whether or not the UK government actually achieves an end to cuts in public expenditure or not, the idea that austerity can just end is misplaced. This is because the scale of cuts that have been imposed since 2010 means that public services, wages and growth more generally will be constrained by the effects of austerity for many years to come.

On current spending plans, day to day spending in Northern Ireland will have decreased to £9.9bn in real terms by 2019/20. Even if austerity ended this April, we would still be £600m below where we were in 2010. If it continues for one more year, it will be over £750m less. Capital spending, on infrastructure such as road, rails, schools and hospitals fares only marginally better. It saw some of the steepest declines during the last parliament. Despite a significant projected increase over the next three years, capital spending is set to be 7% lower in 2019/20 than it was in 2009/10. In cash terms, capital expenditure in Northern Ireland will be £86m lower annually by 2019/20.

However, none of this money deals with welfare payments. That money comes from another government funding mechanism (Annually Managed Expenditure), over which any Northern Ireland Executive would have very little control. Working age benefits have seen some of the largest cuts, particularly over the last number of years, and there are no current plans to end this. The introduction of Universal Credit could lead to thousands of families losing out on payments and the full extent of this may only be clear once the roll out in Northern Ireland is complete. However, the biggest cuts to welfare has come from the freezing of all working-age benefits. This is forecast to cut £5bn from working-age benefits by 2019/20.

The scale of austerity is vast and it would take a significant and extensive change in policy to just stop it in its tracks. However, even if such an outcome was achieved, it would be mistaken to characterize this as the 'end of austerity'. While the budget deficit has been brought down, the economic impact of these policies has been a lost decade of growth.

Nowhere has the impact of austerity been more evident than in wages and income. Looking at the percentage change in full-time hourly earnings since 2010, adjusted for CPI inflation, growth in has averaged at -0.5% over that period. Apart from a period of very low inflation in 2015 and 2016, wages have been held behind prices every year since 2010. Wages in 2018 were still 1.2% below where they were in 2009, and this does not look at specific cases such as the public sector where increases have been limited to 1% through most of those post-recessionary years.

The end of austerity would be welcome, but it was always unlikely to be delivered in this budget. Furthermore, the more important task of reversing austerity does not appear to be a policy priority. Without such a change of policy, any real economic recovery will be painfully and needlessly slow.

2. Automation technologies and the future of work

2.1 Introduction

Automation refers to technologies that are used to substitute labour in the performance of specific tasks in the production process. As well as replacing the need for human labour, automation technologies can augment the capabilities of, and demand for human labour. From the first industrial revolution onwards, the utilisation of automation technologies in the production process has transformed how we work, produce, consume and live.

Recent rapid advances in artificial intelligence (AI), robotics and other forms of smart technologies however have led to widespread concern about the potential impact of such automation technologies for the future of work. A lively debate has ensued about the ways in which technology is going to transform the world of work (Brynjolfsson and McAfee, 2014)¹. Although there is no widely shared agreement on the expected impacts of automation technologies, broadly speaking, there are two camps with starkly different views.

On the one hand, there are those who are pessimistic about the extensivity and invasiveness of technological change and fear that automation, AI and new robotic technologies are going to wipe out large numbers of our jobs, lead to widespread technological unemployment and ultimately an economic and social dystopia (McAfee, 2014). Others criticise this view and maintain that whilst there will be some disruption and change to the nature of work, the net effect of technological advancements will be positive and indeed necessary to ensure long-run economic growth and improved living standards (Autor, 2014; McDonnell, 2019). To support this position, they point to historical periods of rapid technological change when the same fears about technological unemployment existed, but never materialised - a phenomena that Autor (2015a) describes as 'automation anxiety'.

In this edition of the Observer, we summarise the findings of two NERI working papers which explore the expected impact of automation technologies for the future of work in Northern Ireland: [Foster and Wilson \(2019\)](#) and [Mac Flynn and Wilson \(2019\)](#). We estimate that around 7 per cent or 60,000 jobs are at high risk of job loss from automation technologies. In addition, we

¹ Full details of all references can be found in the bibliography section of the two working papers on which this QEO is based:

Foster, S. and Wilson (2019) *The Future of Work: The impact of automation technologies for employment in Northern Ireland*, NERI Working Paper Series, NERI WP 2019/No 59, Belfast: NERI.

Mac Flynn, P. and Wilson, L. (2019) *The Future of Work: The impact of automation technologies for job quality in Northern Ireland*, NERI Working Paper Series, NERI WP 2019/No 60, Belfast: NERI.

estimate a further 58 per cent are estimated as being at risk of substantial change in the tasks involved in their job. Despite a significant number of workers facing a high risk of job loss owing to automation technologies, we anticipate that there will be enough new jobs created to replace lost jobs, and consequently we argue that technological unemployment is not a key concern.

Nevertheless, this does not mean that we do not need to be concerned with the impact of automation technologies for the labour force. What jobs are lost, what the newly created jobs are, and how each compare to the other in terms of quality are central to determining the effects of automation technologies for work.

Employment levels have been growing alongside continual technological advancements and other megatrends such as globalisation. However, the new jobs created are not in many cases comparable to those lost, and to think of them as replacement jobs can be quite misleading. New jobs are more likely to be in different occupations to the jobs that are lost, but more importantly, they also differ in quality to the jobs that were replaced.

There has been a polarisation in terms of the occupational structure, with growth concentrated at one end predominately in non-routine abstract/cognitive, high skilled occupations such as professional occupations and at the other end in non-routine service occupations such as caring and leisure occupations. The evidence suggests a similar polarisation in the quality of jobs. As technology displaces workers, some have been faring well in terms of job quality, while others have been faring poorly in terms of job security, earnings and quality of working environment.

In policy terms, we need to focus on upskilling and ensuring that workers who face the largest risks of job loss owing to automation technologies have the skills required to transition into new jobs, which are at least of equal, if not of higher quality. However, the evidence also suggests the need to find a way to improve the quality of 'bad' jobs to ensure that workers in certain occupations or sectors do not lose out. We argue the need to strengthen labour market institutions, and in particular the importance of unionisation and collective bargaining capacity as a way to hedge against the risks of negative displacement or degrading owing to automation technologies. Furthermore, we argue for the introduction of a new occupational infrastructure in low-skilled sectors of the economy in order to rebuild good quality jobs. This will require a social dialogue between Government, employers and trade unions. This will ensure that the gains from further advances in automation technologies are more equally shared and that large swathes of our workforce are not left behind as the price worth paying.

2.2 Automation technologies and Job Quantity

Much of the discussion around the risk to jobs from automation technologies stems from a study titled *The Future of Employment: How susceptible are jobs to computerisation?* published in 2013 by Carl Frey and Michael Osborne. In their work, Frey and Osborne (2013) argue that the risk of job loss is becoming increasingly more likely due to advances in automation technologies whereby machines are increasingly capable of performing a wide range of tasks that historically have been the reserve of human labour, including non-routine manual tasks.

Frey and Osborne (2013) set out the likelihood of jobs in the USA being substituted by automation technologies using what has been termed the ‘occupation based’ methodological approach. They begin from the premise that the probability of an occupation being automated is a function of its task characteristics. Thus, a job can be automated so long as the tasks are not subject to any ‘engineering bottlenecks’. Engineering bottlenecks relate to three categories of tasks, including tasks requiring: perception and manipulation; creative intelligence; and social intelligence. Frey and Osborne (2013) rely on O*NET data which provides standardised descriptions of occupations to provide information on the tasks involved across different occupations. Based on whether the tasks involved in an occupation, as described in the O*NET data, are subject to any engineering bottlenecks, occupations are classified as at risk or not at risk of job loss due to automation technologies.

Researchers, most notably Arntz *et al* (2016), have questioned this ‘occupation based’ methodological approach. In particular, they question the focus by Frey and Osborne (2013) on whole occupations, rather than tasks. They argue that in utilising this approach estimates of the risk to jobs from automation technologies are overstated. Arntz *et al* (2016) point to the fact that since automation usually aims at automating certain *tasks*, rather than whole occupations, the potential for automating entire occupations is likely to be much lower than that suggested by estimates based on the occupation-based approach. They suggest an alternative ‘task-based approach’ to take into account the shortcomings of Frey and Osborne’s approach.

The ‘task-based approach’ allows for the fact that task structures may differ within occupations and across firms and geographical areas. This accounts for the idea that the risk from automation depends on the tasks which workers perform within occupations. This is important because for example one receptionist might solely greet customers, while another might also carry out administrative duties and operate a switchboard. In taking into account their differing task structures in the estimation of the risk of both of these jobs to automation we end up with a more tentative assessment of the risk to jobs from automation technologies. Foster and Wilson (2019)

argue that this ‘task-based’ approach offers a more accurate way to assess the risk of jobs to automation. This approach is used in this Observer to obtain the estimates of the risk to jobs from automation technologies for Northern Ireland.

In applying the task-based approach to Northern Ireland the estimates show that 7 per cent of workers have a probability of automation of 70 per cent or higher, and thus are classified as being at high-risk of job loss from automation. A further 58 per cent are classified as being at high to mid-risk of automation. This means that their jobs are at risk of substantial change in their task structure over the medium term. Thirteen per cent of workers are employed in jobs classified as being at low-risk from automation technologies. Workers whose jobs are classified as facing a low-risk of job loss are those whose principal job tasks involve aspects which have been described as ‘engineering bottlenecks’ in that they are non-substitutable for by machines, or as of yet are not possible to be automated. The risks presented by automation however are not evenly spread across the workforce, with automation technologies more likely to displace workers in particular industries and occupations, and with particular sociodemographic characteristics such as gender and age.

Industrial sector of employment is an important factor in determining likelihood of job loss from automation. Specifically, over 1 in 4 of those in the *distribution, hotels and restaurant* sector are at high risk of automation (26.8 per cent). A further 46 per cent of workers in this sector are at mid-to-high risk of automation. The lowest automation risk is found in the *Public Administration, Education and Health* sectors.

The risk of automation is particularly elevated among low-skilled workers with 34 per cent of workers at high risk. A further 48 per cent are at risk of substantial change in the task structure of their job, as some tasks become substitutable for by machines, whilst others remain non-substitutable. For those in middle-skilled occupations, we estimate that although only a very small proportion face a high-risk of job loss, almost 40 per cent of middle-skilled workers face substantial change in the task structure of their job. It is important to remember here however, that the lack of data on caring roles in the methodological approach means that automatability for those in caring, leisure and other service occupations is over-estimated. Those in high-skilled occupations such as those in teaching, management and health professional occupations requiring a significant period of training and high levels of educational attainment face the lowest risks of job loss. High-skilled workers, at least for now, are relatively protected against the risks posed by automation technologies.

In terms of gender, females tend to be working in jobs which are at a higher risk of automation than is the case for males - 9 per cent of females are at high risk of job loss from automation technologies, compared to 6 per cent of males. That said, females (20 per cent) are much less likely to be at mid-to-high risk of automation than males (42 per cent) which would suggest that males might be more vulnerable to change going forward. Differences are less marked by age group although young workers are most at risk of job loss (11 per cent at high-risk), followed by older workers (6 per cent at high risk).

Based solely on the above estimates, it is clear that automation technologies present considerable challenges to the future of work. Nevertheless, there are good reasons to be cautious when interpreting the results. Estimates of the risk to jobs from automation technology reflect what is technologically possible, rather than actual technology utilisation. However, other factors, such as the particular economic, social, political and legal or regulatory environment will ultimately determine the extent to which machines substitute for jobs.

For example, the economic viability of implementing automation technologies is one of the most important things to consider in assessing risk to jobs. In this sense, when thinking about whether or not it would be economically attractive from a business point of view to invest in automation technologies there is a need to give careful consideration to the relative cost and productivity of such technologies when deciding on whether or not to substitute labour. In low-wage economies such as Northern Ireland, businesses may choose to rely on low paid workers to complete some tasks, rather than make large investments in labour-saving technologies. Northern Ireland has the highest proportion of workers earning below the real living wage, when compared to any other UK region. It is reasonable to argue that relying on low-paid workers is a comparatively attractive option for many businesses in Northern Ireland rather than incurring the potentially large up-front costs of technology investments and all of the risks that this entails. Furthermore, previous NERI research shows that Northern Ireland is stuck in a low-skills equilibrium, with little incentive for either workers or business to upgrade its skills based (Mac Flynn, 2018).

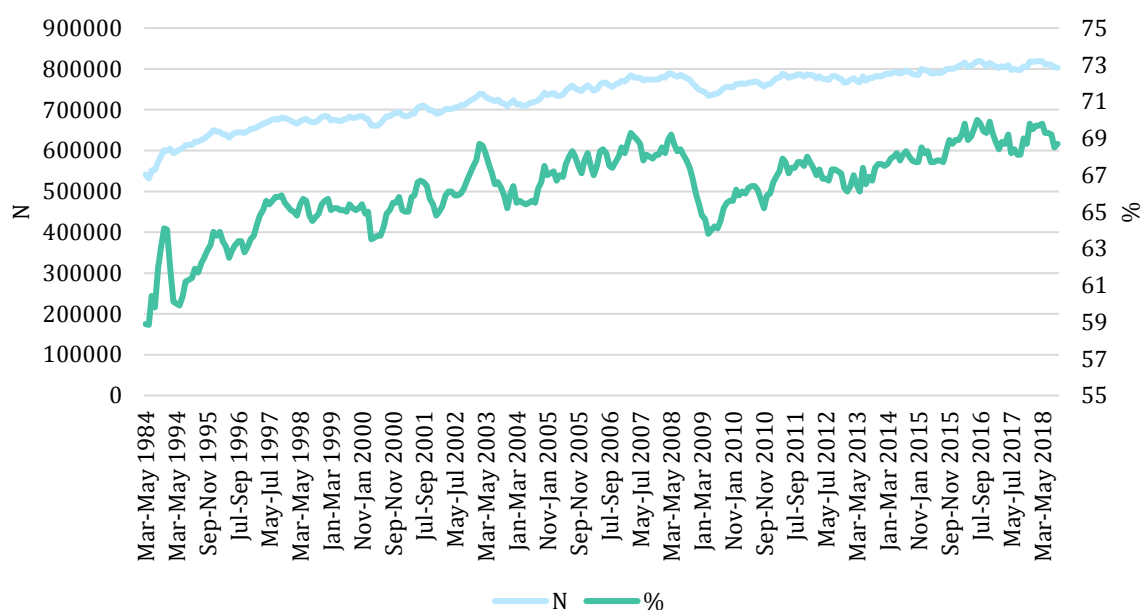
There may also be ethical or legal obstacles that slow down the utilisation of new technologies. Consider the range of legal and ethical challenges being brought to the fore in the case of the autonomous car, and how an algorithm should/could make different decisions in different scenarios (Bonnenfan *et al*, 2015; Thierer and Hagemann, 2015). Another fundamental aspect strongly influencing the utilisation of technology, but given relatively little attention in debates is the fact that there is a strong societal preference for the provision of certain tasks and services by

humans, rather than by robots or machines. The care and hospitality sectors provide further examples of where people attach social value to humans providing the service.

2.3 Automation technologies and Job Quality

Recent studies concerned with the impact of automation technologies for employment have tended to focus primarily on the ability of technology to substitute for human labour. Much of the focus of this stream of literature has been to estimate the destruction effect of technology and thus the risk of job loss. Still, from looking over the longer-term, it is clear that whilst previous periods of technological advancement did cause some job losses, they have also tended to have a job creation effect. Indeed, as employment numbers have continued to grow alongside continual technological advancements, it can be shown that, over the long-term, technological innovations have had a net employment creation effect (Autor, 2014). It is from this ‘job quantity effect’ that the widespread acceptance that technological advancements have contributed to improved labour market outcomes has arisen.

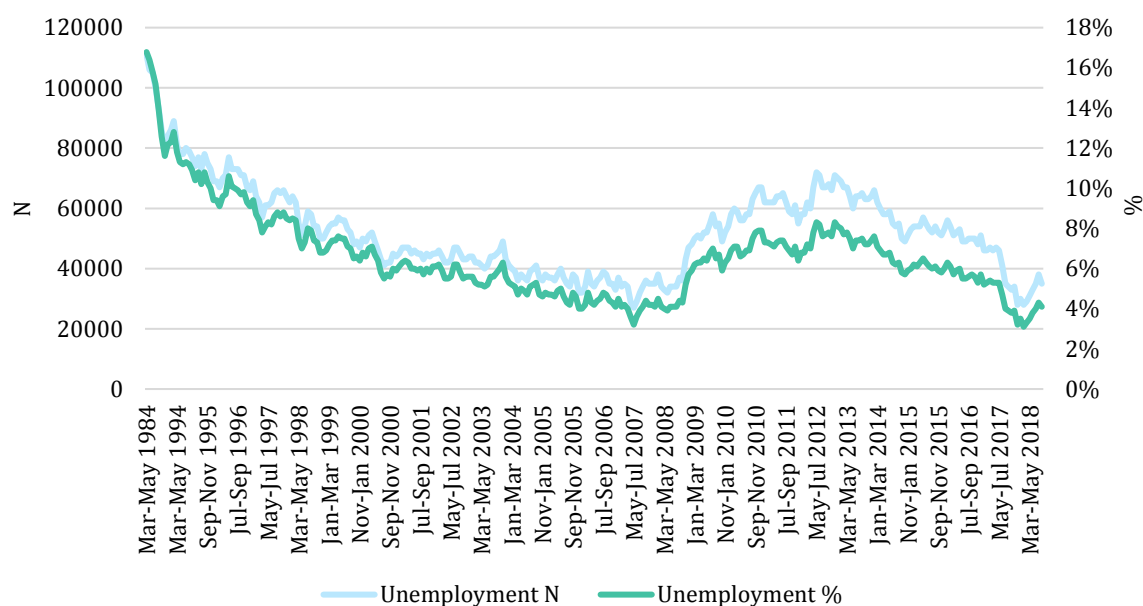
Figure 1: Employment trends in Northern Ireland overtime, number of workers (aged 16-64) and employment rate



Source: Labour Force Survey

Despite a re-emergence of ‘automation anxiety’, advancements in technology are not having a labour substituting effect in aggregate. Indeed, what is most clear from an examination of trends in employment overtime, presented in Figure 1, is the long-run increase in both the number of workers in employment and an increase in the rate of employment. Figure 2 shows a corresponding long-run decline in the rate of unemployment.

Figure 2: Unemployment trends in Northern Ireland overtime, number of individuals (aged 16+) and unemployment rate



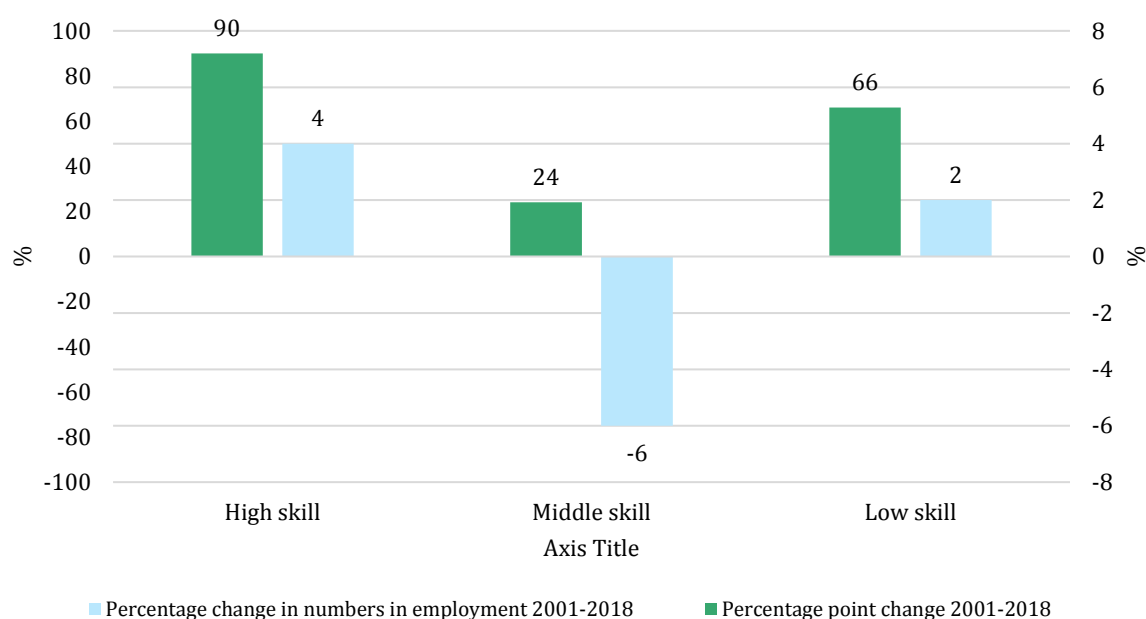
Source: Labour Force Survey

However, just because overall employment numbers have continued to grow does not necessarily mean that we can conclude that the net labour market effects have been wholly positive. This is an impetuous conclusion and ignores the fact that technology can displace workers in ways other than via unemployment or job loss. Moreover, this conclusion is one which by its very nature gives priority to the importance of job quantity over job quality, thus disregarding the fact that not all replacement jobs or new jobs are equal to the ones that are lost. For instance, technological advances can lead to job loss, but not necessarily unemployment, if one finds another job. However, what the job lost is, what the replacement job is, what the newly created job is, and how each compare to the other in terms of quality are all important factors to take into account when determining the effects of technological advancements for the labour market. In short, to fully understand the labour market impacts of technological advancements there is a need to think about the different types of displacement, and the quality of both the jobs lost and the jobs created which result from the disruption.

Mac Flynn and Wilson (2019) outline many ways in which automation technologies affect individuals both directly and indirectly. Looking beyond individual impacts to the labour market as a whole, it is clear that different groups of workers have been differentially impacted by technological advancements to-date. The type of displacement which a given worker is likely to face is dependent upon their occupation.

In examining evidence of the displacement of workers across occupations we look at changes overtime in the broad occupational structure of the labour market. The first point to make is that there is no evidence of technological unemployment across each of the skill levels over the period 2001 to 2018. As shown in Figure 3, over the period 2001 to 2018 there has been a 90 per cent increase in the number of high-skilled workers, a 66 per cent increase in low skilled workers, and a 24 per cent increase in the number of middle-skilled workers.

Figure 3: Percentage change in numbers in employment 2001-2018 & percentage-point change as a share of employment 2001-2018, by broad occupational skills group



Source: Labour Force Survey

However, what becomes clear from an examination of changes in the percentage share of employment over time is the general trend towards a polarisation of the labour market. Specifically, when we look at the percentage-point change in the share of employment by different broad occupational skills groups, the most notable trend is the substantial decline in middle-skilled occupations, and in turn the substantial increase in high-skilled and low-skilled occupations. This has meant that not only has the labour market become more polarised, but also most new jobs created are not middle-skill jobs, as would have traditionally been the case. As new jobs have mainly been created in high and low-skilled occupations, middle-skilled occupations have been crowded out, meaning that workers are more likely to find new employment in either end an increasingly polarised labour market.

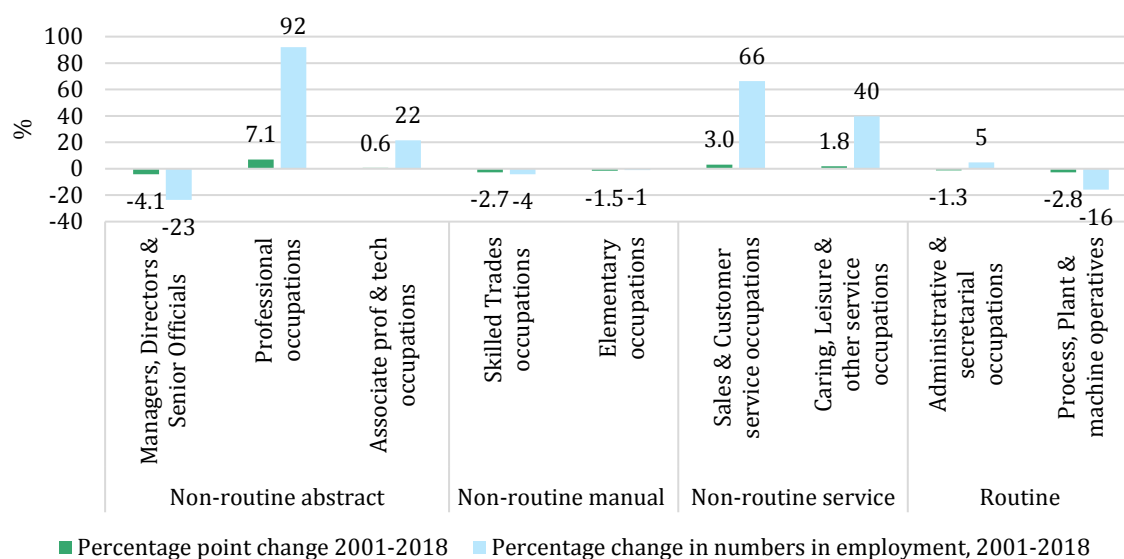
Thinking about this data one might lean toward the conclusion that the impact of recent technological advances has been skill-biased, in that it favours skilled labour over lower/un-

skilled labour. However, while this theoretical framework is useful to some extent, it cannot explain the growth in employment amongst low-skilled occupations evidenced in Figure 3. Rather, the routine-biased technological change model introduced by Autor *et al* (2003) which argues that computers tend to substitute for workers in routine tasks that follow well-defined rule-based procedures offers a more accurate account of the data. Thus, because non-routine tasks tend to be dominant in higher-skill and lower-skill occupations and routine tasks tend to be dominant in middle-skill occupations, it appears that the theoretical proposition of the routine-biased technological change model can more accurately describe the impact which advances in technology are having in terms of the skills distribution of the labour force.

Specifically, using the 2-digit SOC 2010 classification, occupations in either routine or non-routine, and involving principally abstract/cognitive tasks or manual or non-routine service tasks. Those in *Managerial, Director and Senior Official* occupations; *Professional* occupations; and *Associate Professional and Technical* occupations are classified as involving principally non-routine abstract tasks. Those in *Administrative and Secretarial* occupations and those in *Process, Plant and Machine operative* occupations are classified as involving principally routine tasks (both abstract and manual). Those in *skilled trades* occupations and elementary occupations are classified as involving principally non-routine manual tasks; and *personal service* occupations; and *sales and customer service* occupations are classified as involving principally non-routine service tasks. Clearly, within these broad occupational groupings there will be exceptions as to whether or not particular jobs involve routine or non-routine and abstract, manual or service tasks and so this methodological approach is by no means perfect. However, given that the approach matches broadly to the description of tasks given for broad occupational categories, it has some merit. Figure 4 charts the percentage-point change in the share of employment and the percentage change in the numbers in employment across over the period 2001 to 2018 in each of these groupings.

What is most notable from Figure 4 is the relative surge in the number of workers employed in what can broadly be classified as non-routine abstract and non-routine service occupations, albeit with the exception of a substantial decline in the numbers working in *Managerial, Director or Senior Official* occupations. In turn, this has reduced the share of employment accounted for in what can broadly be classified as routine and non-routine manual occupations. There has been a 92 per cent increase in the number of workers employed in *Professional* occupations, a 22 per cent increase in the numbers working in *Associate Professional and Technical* occupations, a 66 per cent increase in the numbers working in *Sales and Customer Service* occupations, and a 40 per cent increase in the numbers working in *Caring, Leisure and Other Service* occupations.

Figure 4: Percentage change in numbers in employment 2001-2018 and Percentage-point change as a share of employment 2001-2018, grouped by broad task structure



Source: Labour Force Survey

The above data support the theoretical framework of the routine-biased technological change model. Technological advances appear to be having a labour-saving effect in occupations whose tasks are predominantly routine manual and non-routine manual in nature. In contrast, there has been sharp increases in the number of jobs whose tasks are predominantly either non-routine abstract or non-routine service-orientated in nature. These changes in the task structure of jobs is not something for which we need inherently be concerned. However, there is a need to question the quality of jobs and to whether the quality of jobs is staying the same, increasing or decreasing overtime as the occupational and task structure of the labour force changes. There is also need to give consideration to the likelihood that as the occupational structure becomes increasingly polarised, that the quality of jobs also becomes polarised into 'good' and 'bad' jobs.

In order to assess changes in the quality of jobs overtime we examine data on key indicators of job quality across occupations in order to provide some insight as to how the shift in the occupational and task-structure of jobs has shifted the quality of jobs.

The working arrangements and working hours provided by a job are a key aspect of job quality. It is clear from the data that the increasingly polarised nature of the occupational structure has implications in terms of the overall quality of employment arrangements and working hours available. Given the increased likelihood of non-standard employment arrangements in non-routine abstract and non-routine manual occupations it appears that changes in the occupational structure of the labour force are leading to an overall decline in the traditional 'standard' full-time

permanent job. This, in and of itself, is not necessarily bad. However, given that non-standard forms of employment tend to be less secure in nature, offer fewer opportunities for progression; fewer opportunities for training; possess higher occupational health and safety risks and lead to lower job satisfaction, there is reason for concern (Wilson, 2016). In this respect, given that non-standard forms of employment are more likely in some occupations than in others, the overall security of employment is lower than what it would have been had occupational structure not polarised in the way that it has. This is likely to have had a particularly negative impact for workers who have been displaced from routine or non-routine manual occupations and who have subsequently been re-employed in non-routine service occupations. Furthermore, as shown in Table 1 workers in these occupations are more likely to work very short or short working hours when compared to those employed in other occupations and are among the most likely to say that they would like to work more hours.

Another key indicator of job quality is earnings quality. We can assess the quality of earnings in terms of hourly pay excluding overtime as a percentage of the median, gross weekly pay as a percentage of the median, or via annual gross earnings as a percentage of the median. It is clear from Table 2 that those in non-routine abstract occupations tend to have relatively good earnings quality. On the other hand, those in non-routine service occupations tend to have relatively poor earnings quality. These results stay constant whether we examine the quality of earnings via hourly pay, gross weekly pay or annual pay, with those in non-routine abstract occupations tending to be relatively much better paid, and those in non-routine service occupations tending to be relatively much worse paid. As the occupational structure of the labour force changes, it is likely to have particularly negative effects for those who are displaced from routine and non-routine manual occupations, and who have subsequently found employment in a non-routine service job.

Another important aspect of job quality relates to issues such as autonomy and flexibility at work and the degree to which employees feel valued, satisfied and secure in their job. Table 3 outlines how occupations fare under several of these measures. As jobs trend increasingly towards non-routine abstract occupations and non-routine service occupations, we are seeing an overall upgrading in terms of the quality of the working environment. Nonetheless, it remains that large shares of those in non-routine service occupations are unsatisfied with their job and have little autonomy or flexibility over their work. Thus, the quality of the working environment of these workers is much lower than that of other workers. This is concerning given the fact that these jobs are among the least likely to be displaced owing to automation technologies.

Table 1: Working arrangements across occupations, 2017-2018

		Employment arrangements	Working hours			
		Non-standard	0-10	11-20	21-40	41+
		%	%	%	%	%
Non-routine abstract	Managers, Directors & SO	33.7	1.1	1.7	67.8	29.4
Non-routine abstract	Professional	30.9	3.8	8	78.3	10.4
Non-routine abstract	Associate Professional & Tech	25.7	3	5	74.3	14.8
Routine	Administrative & Secretarial	36.1	2.2	8	77.9	3.4
Non-routine manual	Skilled Trades	40.6	x	4.8	57.1	3.1
Non-routine service	Caring, Leisure & Other	47.1	3.9	22.4	63.3	10.3
Non-routine service	Sales & Customer Service	53	11.4	29.7	51.6	7.3
Routine	Process, Plant & Machine Op	23.8	x	6	65	29
Non-routine manual	Elementary	47.4	12.1	23.4	52.4	12.1

Source: Quarterly Labour Force survey 2017-2018

Table 2: Earnings quality across occupations, 2018

		Hourly pay excluding overtime as a % of the median	Gross weekly pay as a % of the median	Annual gross pay as a % of median
Non-routine abstract	Managers, Directors & Senior Officials	179.7	177.1	177.4
Non-routine abstract	Professional	171.6	159.5	156.7
Non-routine abstract	Associate Professional & Technical	130.9	131.8	135.5
Routine	Administrative & Secretarial	90.9	85.2	82.9
Non-routine manual	Skilled Trades	92.2	107.7	104.6
Non-routine service	Caring, Leisure & Other service	79.2	65.6	63.7
Non-routine service	Sales & Customer service	70.2	55.2	53.1
Routine	Process, Plant & machine operatives	83.3	94.5	96.7
Non-routine manual	Elementary	70.8	52.5	54.6

Source: Quarterly Labour Force survey 2017-2018**Note: Blue = high compared to the average, Red = low compared to the average.****Table 3: Quality of the working environment**

		Autonomy over speed of work	Flexibility over work tasks	Flexibility over work pace	Flexibility over manner of work	Flexibility over order of tasks	Flexibility over hours of work	Job Satisfaction	Job Satisfaction
		%	%	%	%	%	%	%	%
Non-routine abstract	Managers, Director & SO	82	96	92	95	98	72	82	97
Non-routine abstract	Professional	78	87	79	92	95	44	84	92
Non-routine abstract	Associate Professional & Technical	80	82	80	90	90	55	88	95
Routine	Administrative & Secretarial	76	59	67	67	70	52	78	92
Non-routine manual	Skilled Trades	63	78	75	82	85	63	85	99
Non-routine service	Caring, Leisure & other service	79	70	69	81	65	30	93	97
Non-routine service	Sales & Customer service	74	60	63	70	66	21	81	77
Routine	Process, Plant & Machine	45	43	57	61	48	31	77	92
Non-routine manual	Elementary	57	59	71	70	69	23	80	92

Source: PIACC (2012)**Note: Blue = high compared to the average, Red = low compared to the average.**

2.4 Policy

While it is understandable that much of the focus at present is on potential job losses, there is no evidence that policy would be effective in attempting to either prevent or delay these losses. Furthermore, technological change is necessary for productivity growth and it is a key determinant of improved living standards (McDonnell, 2018). Automation technologies also have the capacity to improve dramatically the working environment and conditions for many workers. These developments are welcome in many instances. At the same time however, this does not detract from the fact that for a sizeable number of workers, automation technologies may lead job loss or a negative job change. As outlined in the previous sections, a significant share of workers have already experienced a negative downgrading in the quality of their job owing to automation technologies. Policy should therefore focus on those who are negatively affected by automation technologies.

While technological unemployment is unlikely on any significant scale, we must accept that a large number of workers will change employment either by sector, occupation or both. The scale of this movement requires a policy platform to directly intervene and ameliorate the transition between different forms of employment. Firstly, we need to reform labour market policy in order to smooth transitions to new employment and to make allowances for the small number of workers who will not transition. This encompasses skills, social security, regional development, unionisation and collective bargaining capacity. Secondly, we need to introduce a new occupational infrastructure in what are currently considered low-skilled/low paid sectors of the economy in order to rebuild good quality jobs and provide opportunities for career progression.

Policy intervention needs to begin with the social security system. At present, in Northern Ireland, both in work and out-of-work benefits have faced several years of cuts in real terms in addition to the curtailment of many entitlements (Edmiston, 2017). Such an environment is not conducive to large transfers of workers between different forms of employment. Furthermore, if workers are not to suffer significant material loss from automation technologies, we must address the issue of welfare-wage replacement rates.

Over the last three decades welfare state reforms have moved unemployment benefit away from acting as a preserver of living standards to one that simply aims to provide

subsistence income. In tandem with other active labour market policies, the intent was designed to prevent welfare from hindering full-employment and creating other perverse incentives. The Hartz reforms in Germany are a key example of such reforms. However, as Bruttel and Kemmerling (2005) noted at the time, such policies can also lead to the creation of low wage jobs, as welfare no longer provides a higher income floor.

Though there are disagreements about the comparability of data, most research on replacement rates for unemployment benefits put the UK in the bottom half of both EU and OECD countries (Wang and Van Vliet, 2016). This varies between family types and wage brackets, but the UK scores consistently below Nordic countries and also the Netherlands and France (Drejer *et al* 2010). The system of unemployment social transfers needs to be reformed to allow for a greater link between the support level provided and existing income levels. Moving toward replacement rates of the Northern European average is necessary to guard against the impact of automation technologies. Concerns over the effects of higher replacement rates on unemployment have been used to block such policies in the past, but most recent research finds no discernible or significant effect between the two (Eugster, 2015).

An issue, which often sees less attention in the automation technology debate, is that of regional development. As with Foster and Wilson (2019), and many other studies much of the analysis of automation technology impacts are carried out on a national or in this case regional level. While there is unlikely to be aggregate employment losses from automation technologies, we cannot say the same with any degree of certainty for local areas. Whilst new employment will be created, there is no guarantee that new employment opportunities will match job losses on geographic terms. This poses problems for workers in areas exposed to automation risk with little chance of replacement jobs. While the state could provide support for workers in these areas to move to areas with greater employment prospects, such policies can become costly, particularly as employment moves toward cities and urban areas with a higher cost of living. Berger and Frey (2015) argue that bringing down the cost of living in productive cities can aid worker mobility and provide benefit to existing city workers. However, providing incentives for workers to move out of areas where automation has taken place can compound the issue by decreasing economic activity further, and endangering support and ancillary jobs.

In order to tackle these impacts, governments need to target industrial development in tandem with a strategy for balanced regional development. The UK has some of the largest regional variation in economic output per head of population of any comparable European economy, (Mac Flynn, 2016) and the island of Ireland is even more polarized (Goldrick-Kelly and Mac Flynn, 2018). Policy should not seek to directly subsidise job creation in particular areas through tax breaks or other deductions as these policies can create perverse incentives. Policy should involve identifying localised risks and putting in place strategies to boost infrastructure and human capital.

As with any significant realignment of employment, the issue of skills is clearly very important. There is a great deal of emphasis on the need to upgrade skills in order to respond to the challenges posed by automation technologies (Dolphin, 2015; Berger and Frey, 2016). Clearly, for example, intensive use of technology requires a greater proportion of engineers, computer scientists and technicians. However, there is also an increasing requirement for workers in jobs which are not necessarily high-skilled, such as sales and customer service jobs and caring, leisure and other service jobs. Policy cannot solely focus on upskilling workers and needs also to concentrate on reskilling workers for these jobs. Given that the evidence shows that they have a higher likelihood of having poor conditions, policy needs also to focus on improving the quality of these jobs.

Recognition and reward for skills acquisition and use is key to building a new occupational structure within the low-skilled/low-wage sector of the economy. Studies of the returns to skills acquisition in the UK indicate that while there is a significant wage premium for high and medium-level skills, the return on low-level skills is zero or negative in some cases (Dickerson and Vignoles, 2006). There have been many proposals in this area, such as the boosting of skills councils and the role of employer led initiatives (IPPR, 2017). Skills councils do provide a model for bringing regulation and standardisation of skills to new sectors of the economy. However, most of the policy emphasis in this area has been on upgrading rather than re-skilling (Payne, 2007). Skills councils can theoretically provide a mechanism for lower skilled work but, in reality, successful implementation of a new occupational infrastructure requires pressure from worker representation.

The weight of international evidence argues the importance of strong labour market institutions, and in particular the importance of unionisation and collective bargaining capacity as a way to hedge against the risks of negative displacement or degrading owing to automation technologies. Increasing union density in occupations with poor conditions will also be key to increasing the quality of these jobs. Unionisation and collective bargaining or a system of sectoral agreements provide a mechanism to introduce a skills and wage infrastructure that could improve job quality. Madison (2008) highlights the role that unions have historically played in introducing specificity in occupations and fostering skills recognition. Furthermore, research has shown that devolved bargaining structures such as works councils in Germany that implement sectoral agreements at firm level, give the greatest premium to workers at the lower end of the wage distribution (Addison, Teixeira and Thomas, 2006). Moves toward outsourcing and contracting in employment relations complicates the capacity for unionisation among workers in new areas of employment. It will be necessary for the legal definition of an employee to evolve to reflect these new employment practices. However, legal definitions can only go so far. It will also be necessary for trade unions to develop new way of providing these workers with the representational capacity they will require to achieve greater job quality.

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