



QUANTITATIVE REPORT

# **Industry, Education and Occupational Contributions to Wage Inequality in Europe**

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## **Abstract**

Sociological approaches to inequality stress that social behaviour is embedded in social relations which shape workers' outcomes. Wider institutional forces mould social relations, conditioning how workers are valued and the extent to which they are able to extract rents from working in particular occupations and industries. Commensurate with this idea, the high rates of pay in the financial sector have attracted renewed attention to industry sector as an important factor in overall inequality. At the same time studies have pointed to the growth of low-wage work in particular industry sectors Europe. This study uses data from the European Structure of Earnings Survey to analyse the contribution of specific statuses derived from occupation, education and earnings to overall wage inequality. The results provide evidence of the salience of occupations for understanding inequality but sector also plays an important role, particularly the low paid administrative and food service sector. Educational differences account for part of the existing wage inequality but education is not the only explanatory factor. This finding is in line with studies which demonstrate the heterogeneity of returns to education in advanced economies. The factors explaining wage inequality vary across countries: occupation accounts for a high proportion of the wage inequality found in Italy and the UK, industry sector is of the greatest relevance in the UK, while age group accounts for a high proportion of wage inequality in the Netherlands. Education plays an important role in the Netherlands and Slovakia. In aggregate gender accounts for only a small amount of the overall inequality but sector level average wages show that women earn less than men across sectors and countries.

## Introduction

The extent and determinants of wage inequality vary widely across European countries. At the European level most of the overall inequality lies within rather than between countries (Fredriksen, 2012) which means that it is not the considerable income differences between EU countries but factors within each country which drive inequality at the European level. It is well documented that some European countries such as the UK in the 1980s and Germany more recently have experienced substantial increases in wage inequality. In the more recent periods (1997-2000 and 2000-2007) overall there has been stability or even decreasing inequality in around half of the European countries (Ramos and Royuela, 2015). The UK is generally documented to be one of the countries with the highest levels of income inequality in Europe, but even in UK income inequality remains below the high level of the US. The changing distribution of incomes in Europe and the USA has led to heightened awareness of social injustice and the repercussions of living in much more unequal societies which have been returning towards, although not attaining, the levels of inequality last seen in the early 20<sup>th</sup> century (Atkinson and Piketty, 2007). Concerns about increases in earnings inequality have led to policy action in the form of the Europe 2020 Strategy, which sets inclusive growth as one of the three main priorities for the European Union. The World Economic Forum identified severe income disparity at the very top of global risks (Atkinson, 2013) while the growth of very high incomes has been argued to be undemocratic (Deaton, 2014).

There is considerable disagreement over the importance of the many factors that have been put forward as contributing to changes in income inequality even within individual countries. Many studies focus on a single issue as the explanation for inequality; these including union decline, human capital or technology. Many studies conclude that the reality is more complex and that a range of factors have acted in concert depending on the country context. In the USA and also in Europe within-group inequality has increased even within narrowly defined groups, such as white, male college-educated engineers (Xie, Killewald and Near, 2016).

Institutional explanations have been found to be of critical importance. The highly evident and much documented decline in union power has been found to be an important determinant of increasing wage inequality in the USA and UK, and more recently research has uncovered this situation in Germany (Dustmann et al., 2014). Trade union decline affects both union and non-union pay inequality. Several studies in the context of the USA have found substantial effects of unions. Card (2001) considered that the decline in unionization explained about 15% to 20% of rising wage inequality between the early 1970s and the early 1990s. An even stronger effect was found by DiNardo, Fortin, and Lemieux (1996) who estimated that the decline in unionisation potentially explained one third of the 90/50 wage differential during the same period (the ratio of the wage at the 90<sup>th</sup> percentile in relation to wage at the 50<sup>th</sup> percentile). Union coverage has declined

substantially in Germany as has the proportion of workers covered by industry-wide agreements. Applying the reweighting technique of DiNardo, Fortin, and Lemieux (1996) to German data, Dustmann et al. (2014) calculated that if union coverage in 2008 had remained at the level of 1995 then inequality would have been less, particularly at the low end of the distribution. Other institutional contributions to rising German inequality were the increase in inequality in the sector covered by unions and the increase in top wages in the uncovered sector.

Based on household surveys in EU countries, Garnero, Kampelmann, and Rycx (2013) argue that the combination of sectoral minimum wages and high-coverage of collective bargaining can be regarded as equivalent to a binding statutory minimum wage at the national level. Estimates suggest that both a national statutory minimum wage and, in countries with sectoral-level minima, higher collective bargaining coverage is associated with lower levels of overall and inter-industry wage inequalities and a smaller fraction of workers paid below the prevailing minimum wage. Examining the causes of the large increase in wage inequality in the UK in the 1980s, Machin (1997) found that the decline of unions, which was partly linked to the lack of union representation in newly established organisations, and the decline of minimum wages set by the Wages Council to be important explanatory factors. A powerful institutional factor is the decline in the minimum wage. Lee (1999) has argued that declines in the minimum wage can explain almost the entire rise in wage inequality during the 1980s, whereas Card and DiNardo (2002) found that the minimum wage changes explain 90% of the variation in the 90/10 wage ratio during these years.

In the UK unions raised enforcement of the minimum wage as one of the key issues that they face and their priority area at the NEWIN meeting with social partners in London in April 2016. In the Netherlands there has been a steady increase in the median wage combined with a decreased minimum wage which has significantly depressed the position of those at the bottom of the wage distribution. The steady erosion of the minimum wage has largely reduced its labour market significance and increased earnings inequality (Salverda, 2008; Gini Project 2012). Unions and the minimum wage are more likely to impact the bottom of the wage distribution.

Increasing dispersion in the returns to tertiary education have been reported across a number of contexts. However, in their study of 12 countries, Maier et al. (2004) report that between 20 and 30 per cent of German male workers earn a negative return from schooling while more than 25 per cent earn a return exceeding 15 per cent. Wage dispersion amongst those with tertiary education is increasingly reported (Lauer, 2004 for France and Germany; Gosling et al for the UK, 2004). In terms of education, analysis shows that expanding tertiary education has had an inequality increasing impact (Lauer et al, 2007). Barth and Lucifora (2006) note that decomposition analyses of wage inequality reveal a large and persistent rise in within-group earnings inequality including for education. The comparison of European countries not only reveals differences in the returns to education and dispersion in those returns, it also shows that the distribution of attainment levels varies widely across European countries.

A different angle on institutions lies in the workings of wage setting within organisations. A large number of studies adopt a human capital approach to wage setting, relegating the

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social explanations for wage setting, some of which stem from education. Avent-Holt and Tomaskovic Devey (2013) argue that distinctions such as education levels are influential not because they indicate skills differences, which may to some extent hold, but because they operate as status markers, in the same way that other categories such as race and gender categorise workers. Avent-Holt and Tomaskovic Devey (2013) explain the process of wage setting as inherently social and relational. Understanding how these relational processes work in practice requires examination of the workplace context in which relational processes of negotiation and status display take place. The sociological argument is that wages are not simply set by an impersonal market clearing mechanism which co-ordinates without reference to the organisations in which people work. The critical importance of status for understanding inequality explains the sociological focus on occupations as a source of stratification.

A key dimension of status difference relates to occupations, which can be seen as closed social positions. It is social processes that protect or expose these positions, for example in the barriers that prevent workers from entering a particular occupation or to the tasks associated with that occupation. Occupations provide the basis for an institutionalised view of status and inequalities (Grusky and Ku, 2008). Studies have shown that occupations make a substantial contribution to understanding inequalities, over and above the contribution of educational differentials, for example in the UK (Williams, 2013). Mouw and Kalleberg (2010) found that between occupation changes accounted for 66 per cent of the increase in inequality from 1983 to 2002 and that 18 percentage points of this change were due to only three occupations: manager (not elsewhere classified), secretaries and computer systems analysts. In a highly-cited economic study Goos and Manning (2007) found that a large part of the overall increase in inequality was attributable to changes in the occupational structure, namely the hollowing out of the occupational structure in combination with increasing divergence in average wages across occupations. This finding seems to be mirrored to a remarkable extent in many countries, and is found in Slovakia (Kahanec et al, 2012 - Gini Country Report) as well as in 14 European countries (Goos, Manning and Salomons, 2014).

Drawing on their comparative cross-country work on income inequality, Piketty and Saez (2014) also identify the very important role of institutions in regulating levels of inequality which is reflected in the very different course that inequality takes in different contexts. The influence of wage setting institutions is illustrated by the fact that larger firms pay higher wages and there is greater intra-firm wage inequality in these organisations.

A rather different group of explanations lies in the changing nature of work, for example the argument relating to skills biased technological change. The argument is that changes in the nature of work have required considerably more information technology and digital skills. The demand for workers with these skills has outstripped supply thus leading to an increase in the rewards obtained by workers in such jobs, which has fuelled overall wage inequality. Increasing the supply of these workers would eventually lead to a diminution in their relative premium and thus to a diminution in wage inequality. Although this argument has been very popular in economics, a recent study in the US found that declining unions and the declining level of the real wage accounted for half the increase

in inequality between 1968 and 2012 while computerisation explained about a quarter of the overall rise in inequality (Kristal and Cohen, 2016). The thesis of SBTC has been most convincingly found to hold in the US, while in Europe DiPrete (2007) showed that with similar changes in technology increases in inequality in Europe were of a lesser order, potentially undermining the thesis of SBTC. Other studies have also pointed to the lack of a similar effect related to SBTC in other countries which experienced technological change (Piketty and Saez, 2014).

Theories of skills-biased technical change rely heavily on human capital theory for their explanatory power. Human capital theory has held a privileged place in explanations of inequality but more recent findings about the increasing dispersion of wages at the highest education level call for new interpretations of the role of human capital. As the returns to education at the tertiary level are now more dispersed than previously, we need to find other factors that potentially go with human capital in order to understand inequality outcomes based on education.

The expansion of wages at the top of the income distribution has been accompanied by the growth of low wage jobs in a number of European countries, although the importance of the growth of top incomes has varied by country (Atkinson and Piketty, 2007). The incomes of the highest earners have been identified as contributing to the overall widening of income inequalities in the work of Atkinson (2007) and Piketty (2014). However, this does not necessarily apply to all countries: Wang and Caminada (2015) show using the data base compiled by Piketty that the top 1% share was quite stable in Germany, Spain and the Netherlands for example and even declined slightly in Denmark and France. In Germany, evidence with regard to top wages is mixed: the share of wages in wages at the very top of the distribution, the 0.001 percentile, has increased, incomes at this highest level have markedly increased while overall inequality remained stable (Bach, Corneo and Steiner, 2009). In the Netherlands over 1977-2012 the shares of the top decile in labour income grew from 19.4 per cent to 26.7 per cent which was a fairly modest increase, certainly compared to the US. One possibility is that the sectoral composition of the economy is related to what has happened to the top income share. Bell and Van Reenen's (2010) research points to the importance of incomes at the very top of the wage distribution for understanding the causes of recent increases in inequality in the UK and the USA. Their analysis of the Annual Survey of Hours and Earnings shows that bonus payments to workers in the financial sector accounted for around 60% of the increased income share attained by the top percentiles even though those workers only comprised 5% of the UK workforce. It is not clear whether this role of the financial sector extends to other European countries or is related to the particular status of the financial sector in the UK. Further support for the importance of industry classification for understanding overall inequality comes from the finding that the share of public sector workers in the top percentile of pay decreased (Bell and Van Reenen, 2010).

Germany experienced dramatic changes to its income distribution, the wages of those at the bottom of the distribution, that is those at the 15<sup>th</sup> percentile decreased dramatically from the mid 1990s onwards, that is from around the time of reunification. From the 2000s only the wages of those at the top of the distribution continued to increase. Pursuing explanations for inequality that relate to globalization, Dustmann et al (2014)

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identify distinct patterns by tradable or non-tradable sector: inequality in tradable services increased the most with an increase at the 85<sup>th</sup> percentile and a steady decrease at the 15<sup>th</sup> percentile. It was only in tradable manufacturing that the wages at the 15<sup>th</sup> percentile maintained their value over time, while in tradable services and non-tradable manufacturing the wages of those at the bottom of the distribution fell considerably.

Wage rate inequality is only one aspect of earnings inequality which is increasingly shown to be differentiated by bonus payments. Earnings and wage rates have been increasingly differentiated by the spread of workers' hours which are per se a marker of status as well as translating into diverging earnings' figures. Examination of wage rates provides on insight into gender inequality but largely masks the inequalities between men and women, which come from their very different patterns of hours of work (Kanji, 2012; Kanji and Samuel, 2015). Earnings matter of themselves but also because inequality in earnings also translates into inequality in household earning and consumption (Blundell and Etheridge, 2010). Using household income as the measure of welfare provides leads to different findings.

This research takes up this institutional theme and approach to inequality by examining how both industry and occupations structure wage inequality in the European countries in the study: the UK, Netherlands, Slovakia, Italy and the Netherlands. Where possible, given data access limitations, we examine the situation with regard to wage inequality in Germany.

## Data and variables

The Structure of Earnings Survey (SES) is a 4-yearly survey which provides EU-wide harmonised structural data. The SES provides detailed and comparable information on relationships between the level of hourly, monthly and annual remuneration, personal characteristics of employees (sex, age, occupation, length of service, highest educational level attained) and their employer (economic activity, size and economic control of the enterprise). The strength of the data from the perspective of the current analysis is that they provide cross-country comparable data and detailed information on occupation and industry sector (with the exception of Germany). Not all sectors are covered and it is optional for countries to provide information about the public sector, although many countries do actually provide this information. For other sectors the data are representative at the sector level. The data collection is based on legislation and data become available approximately 2 years after the end of the reference period. The SES covers businesses with at least 10 employees and all economic activities defined in sections B to N, and P to S, of the Statistical classification of economic activities in the European Communities (NACE Rev 2). The transmission of data covering small enterprises (below 10 employees) and enterprises belonging to NACE Rev 2 section O is optional. From 2010 the SES uses the NACE Rev 2 classification.

NACE is the European Union's statistical classification system for economic activities which has been developed since 1970. It is based on ISIC, the UN International Standard Industrial Classification of all Economic Activities. NACE codes are comparable across countries. The NACE classification system is hierarchical: the first level includes headings defined by an alphabetical code; the second level consists of headings identified by a two-digit numerical code (divisions), the third level consisting of headings identified by a three-digit numerical code (groups) and the fourth level consists of headings identified by a four-digit numerical code (classes).

<http://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF/dd5443f5-b886-40e4-920d-9df03590ff91?version=1.0>

We use the first level of classification, the industry headings defined by an alphabetical code, as listed in Appendix 1.

Hourly wage rates In the SES gross annual earnings cover remuneration in cash and in kind paid during the reference year before any tax deductions and social-security contributions payable by wage earners and retained by the employer. The main difference between annual and monthly earnings in the SES is that annual earnings are not only the sum of the direct remuneration, bonuses and allowances paid to an employee in each pay period. Annual earnings hence usually exceed the figure produced by multiplying the 'standard monthly package' by 12. The 'standard monthly package' includes those bonuses and allowances which occur in every pay period, even if the amount for these 'regular' bonuses and allowances varies, but excludes bonuses and allowances not

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occurring in every pay period. Furthermore, monthly earnings leave payments in kind out of consideration. However, annual earnings also cover all ‘non-standard payments’, i.e. payments not occurring in each pay period, and payments in kind. In this analysis we focus on wage rates, using average gross hourly wages in the reference month – this indicator excludes annual bonuses.

Education is measured by the International Standard Classification of Education (ISCED) levels 0-6. ISCED 1997 was used as the basis of the survey (as ISCED 2011 was introduced after the data were collected). Broadly the different levels correspond to: level 0 pre-primary education, level 1 to primary education, level 2 Lower secondary education that is the second stage of basic education; level 3 is (Upper) secondary education; level 4 is post-secondary non-tertiary education; level 5 is the first stage of tertiary education and level 6 corresponds to the second stage of tertiary education leading directly to an advanced research qualification (Unesco, 2006) <http://www.uis.unesco.org/Library/Documents/isced97-en.pdf> qualification)

Occupation is measured at the one digit level using the classification system of ISCO-88. By including occupation, we take away some of the effect that could be attributed to education, but we do this because our focus is on understanding the determinants of wages rather than the returns to education per se (Psacharopoulos and Patrinos, 2004).

Inequality. We measure inequality using the generalised entropy set of measures of inequality. The value of GE ranges from 0 to  $\infty$ , with zero representing an equal distribution (all incomes identical) and higher values representing higher levels of inequality. The parameter  $\alpha$  in the GE class represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value. For lower values of  $\alpha$  GE is more sensitive to changes in the lower tail of the distribution, and for higher values GE is more sensitive to changes that affect the upper tail. The commonest values of  $\alpha$  used are 0, 1 and 2: hence a value of  $\alpha=0$  gives more weight to distances between incomes in the lower tail,  $\alpha=1$  applies equal weights across the distribution, while a value of  $\alpha=2$  gives proportionately more weight to gaps in the upper tail. The GE measures with parameters 0 and 1 become, with l’Hopital’s rule, two of Theil’s measures of inequality (Theil, 1967), the mean log deviation and the Theil index respectively, as follows:

One of the advantage of Theil’s measure is that it is additively decomposable, a property which permits us to establish the contribution to total inequality of different components.

## **Analytical approach**

The first step is to calculate the variance of log wages for the countries in the ESES. The variance of log wages is presented in table 1 because of its comparability based on its widespread use in the existing large body of research into inequality. Other measures of inequality, which measure inequality at different points in the distribution, are presented to aid comparison between different aspects of inequality at different points in the distribution and across countries.

In the second step I use an a priori decomposition approach as advocated by Cowell and Fiori (2011) to gain preliminary insight into the importance of differences by industry sector in explaining inequality. Wren Lewis and Brewer (2015) provide a full explanation of what the different inequality decomposition approaches yield. The most important drawback of the within versus between decomposition is that it does not hold in the case of many interesting inequality measures such as the interquartile range. The shortcoming arises because an important aspect of understanding inequality is in identifying the

In the third step use a regression based inequality decomposition following Fields (2003). This method decomposes the sources of variation in log wage inequality into the parts that can be attributed to the right hand side variables such as occupation, education and industry sector. By using this method we can establish the contribution that each factor makes to overall inequality. These calculations are performed using the stata package `ineqbrd` written by Fiorio and Jenkins (2007).

## Results

The SES data show considerable differences in inequality between countries. Eastern European countries generally experience the highest rates of inequality along with the UK and Germany. The Baltic States and Bulgaria have high rates of inequality while the Czech Republic (the variance of log wages is 0.2137) and Slovakia (variance of log wages of 0.2253) register relatively lower rates which are also very similar to each other. Other research has also found that Slovakia is amongst the countries with the lowest levels of inequality in Europe

(<http://ec.europa.eu/social/main.jsp?catId=1050&intPageId=1870&langId=en>).

**Table 1.** Inequality measured at the country level using the SES

	2006	2010	2010	2010	2010	2010	2010
Inequality measure/country	Var log wage		p90/10	p90/50	p10/50	p75/p25	Gini
BG	0.3331	0.3368	4.121	2.425	0.588	2.199	0.35941
BE	0.1770	0.1528	2.685	1.849	0.689	1.678	0.08327
CY	0.3100	0.3423	4.653	2.233	0.480	2.450	0.33227
CZ	0.1992	0.2137	2.999	1.758	0.586	1.733	0.27428
EE	0.3632	0.3300	4.593	2.130	0.464	2.161	0.33413
EL	0.2309	0.2074	3.110	2.007	0.645	1.835	0.27084
ES	0.2268	0.2444	3.394	2.061	0.607	1.953	0.29790
DE	N/A	0.3720	4.482	2.003	0.447	2.142	0.31749
FI	0.1264	0.1406	2.394	1.703	0.711	1.556	0.21636
FR	0.2212	0.2112	2.867	1.858	0.648	1.763	0.27623
HU	0.2490	0.2768	3.861	2.069	0.536	2.111	0.31264
IT	0.2114	0.2285	3.046	1.934	0.635	1.749	0.28156
LT	0.3819	0.3575	4.833	2.203	0.456	2.543	0.35043
LU	0.2287	0.2364	3.324	2.096	0.630	1.939	0.28809
LV	0.4733	0.3612	4.578	2.354	0.514	2.456	0.36071

NEWIN

NL	0.3640	0.2923	3.161	1.769	0.560	1.789	0.27005
NO	0.1177	0.1124	2.197	1.554	0.707	1.455	0.19304
PL	0.3462	0.3189	4.607	2.348	0.510	2.263	0.33335
PT	0.4263	0.3892	4.918	2.880	0.586	2.453	0.38403
RO	0.4684	0.4241	4.927	2.664	0.541	2.473	0.40139
SE	0.0909	0.0932	2.017	1.553	0.770	1.386	0.17896
SK	0.2470	0.2253	3.246	1.904	0.587	1.799	0.28609
UK	0.2948	0.2903	3.819	2.252	0.590	2.128	0.33453

Note: The SES does not cover the entire population (see data section). Wage rates are used to calculate the inequality ratios and the gini coefficient

Rates of inequality are considerably lower in all the Scandinavian countries than other countries in Europe. The variance of log wages in Sweden is 0.0932 and in Norway it is 0.1124, levels which register considerably less inequality than many of the other countries in the data set. Interestingly Belgium also seems to belong the Nordic group of countries in relation to wage inequality. There is a medium wage inequality group of countries which includes France, Luxembourg, Slovakia and the Czech Republic. The level of wage inequality calculated for the Netherlands equals the level in the UK, which is in contradiction to popular perceptions and in contrast to the findings of the analysis of Ramos and Royuela who place the Netherlands in the low inequality group of countries in relation to income inequality, which is of course different to our measure of wage inequality. Other research has found that while wage inequality is moderate in the Netherlands, annual earnings inequality is high because of the high proportion of part-time work. Inequality in Italy was measured by the variance of log wages at 0.2114 in 2006 and at 0.2285 in 2010, which places it at the low end of inequality amongst the countries in the SES, higher than the Nordic countries but considerably lower than many other countries. Other research has similarly found the level of earnings inequality in Italy to be relatively low (Blau and Kahn, 2009).

The SES data are not entirely suited for examining earnings inequality in general over time in part because definitions of variables and the industry sector included have changed over time, although more targeted studies over time could be conducted. We can draw tentative conclusions by examining the variance of log wages over time. It is clear that this measure of inequality has not changed substantially between 2006 and 2010. This is consistent with what we might expect given that much of the data have been drawn from firms with over 10 employees. Most of the growth in lower earning and low wages may well have taken place amongst those who work in smaller enterprises or who are self-employed and thus often excluded from calculations on wage rate inequality. We know that the effect of minimum wages on inequality is substantial and by using data that may disproportionately exclude those on low wages, it is inevitable that the measure of inequality is lower than would be the case if we were able to include all workers. The

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data from the SES suggest a decrease in inequality in some contexts such as Latvia, Lithuania, Poland, the Netherlands and Portugal. Existing studies show that much of the growth of income inequality occurred after 1990 while earnings inequality increased up until around 2000. In general there has been relative stability or even some small decline in inequality in more recent times in some countries (look up OECD reference). Ramos and Romuela's (2014) study suggests that earnings inequality increased between 2006 and 2011 in two thirds of the EU countries they studied but that these increases were of small magnitude particularly when examining hourly wage rates. In the remaining one third of countries inequality actually decreased, which seems to bear out the broad implications of comparing inequality using the SES. A number of studies have drawn attention to the growing importance of examining annual earnings in order to understand earnings inequality (see for example Bell and Van Reenen, 2014).

Examining the P90/P10 ratio gives us a measure of how much those at the top of the income distribution out-earn those at the 10<sup>th</sup> percentile. The ratio is highest for several countries in eastern Europe: including Latvia, Lithuania, Estonia, Poland and Russia. Unexpectedly, Germany (4.482) has an even higher ratio than the UK (3.819), although for Germany the P90/P50 is relatively lower suggesting that wages are more polarised rather than simply being high in the top half of the distribution which is more the case in the UK, although the UK is also polarised.

Decomposition of overall inequality into between and within group inequality (see Table 2) based on industry sector shows that most of the inequality exists within industry sector. Nevertheless a rather stable proportion of around 13 % of total inequality is accounted for by inequality between sectors for Italy, Slovakia and the Netherlands, while for the UK the level is much higher at 16% and possibly this also holds for Germany (although this is very tentative and cannot be fully evidenced by the data). These results suggest that industry sector is not the whole story behind inequality in these countries but it is evidently of importance and certainly part of the story of wage inequality.

**Table 2.** Inequality between and within industry sector

	GE(0)				GE(1)			GE(2)		
	Between group	Between group as proportion of total	Within groups	Total	Between Group	Within Group	Total	Between Group	Within Group	Total
UK	0.028	0.156	0.153	0.182	0.028	0.228	0.256	0.028	2.727	2.755
NL	0.019	0.142	0.115	0.134	0.082	0.114	0.132	0.018	0.149	0.167
SK	0.019	0.144	0.115	0.134	0.022	0.143	0.164	0.025	0.278	0.302
IT	0.020	0.152	0.114	0.132	0.020	0.136	0.156	0.021	0.235	0.256
DE*	0.024	0.135	0.155	0.177	0.022	0.152	0.173	0.022	0.198	0.219

\* results for Germany are speculative

The advantage of the SES data is in enabling comparison of wages across economic activities. The average wages by area of economic activity reported in Appendix 2 show substantial variation across areas of economic activity. There is a high degree of consistency in the rankings of average wage by area of economic activity across countries. Across all the countries average wages are highest in financial services although to different degrees. In the UK average wages in financial services are 161 per cent higher than average wages overall, for men average wages in finance are 181% higher than average wages. In the Netherlands there is also a premium to work in the finance sector but it is less marked than in the UK: wages in finance are 135% higher than the overall average by sector, in Italy the comparable premium is 159% and in Slovakia it is 155%. The high disparity between wages in the financial sector compared to other sectors points to the direct effect of the existence of the finance sector on wage inequality. Much research has pointed to the less direct effects. In terms of sectors with the lowest wages, there is a clear tendency for wages to be lowest in accommodation and food service activities and administrative and support service activities in all the countries. In all five countries men earn more than women in these low paid sectors, so the gender distinction is maintained even in the lower paid sectors. Of course, this could be because of the tendency of men and women to perform different work within these industry sectors. Gender differences in wages are striking across all countries and across the majority of sectors. In general and almost without exception by industry sector average wages for men are higher than for women. However, there are substantial differences by sector and by country.

The levels of ISCED educational attainment by country reflect the varying education systems and historical developments in the countries under study. Thus, the UK has a high proportion of workers who have attained ISCED level 5 whereas Slovakia, Italy and Germany have a high proportion of workers classified at ISCED level 3. In part the differences reflect the difficulties of comparing across countries which have rather different educational systems. Notwithstanding this variation, the data do show only minor differences by gender in educational attainment across the 5 countries, which reflects the rapid improvement in female educational attainment in recent decades, a finding which is well-established in the literature.

In order to understand the part played by industry sector better we also ran a regression based inequality decomposition which allowed us to account for the other factors that have been put forward as important in explaining inequality, namely occupation and education with gender and age group added as controls. Table 3 presents the main aggregate results.

**Table 3.** Regression based decomposition of inequality based on group membership

<b>Country</b>	<b>Occupation</b>	<b>Industry sector</b>	<b>Sex</b>	<b>Education</b>	<b>Age group</b>	<b>Residual</b>
Slovakia	23.52	6.54	5.24	11.84	2.54	52.72
Italy	31.38	6.67	2.68	8.40	6.74	53.76

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NL	15.15	3.77	2.05	11.33	23.22	44.47
UK	31.38	8.83	2.37	3.05	5.86	48.50

In terms of the contribution of industry sector we find commonalities across countries. In Slovakia, of all the NACE sectors included, administrative and support activities account for the highest contribution to inequality out of the NACE sectors included. Interestingly, notwithstanding that the highest wages are in the financial sector, we do not find that the financial sector per se particularly contributes to understanding inequality, even in the UK. It is likely that the higher wages in this sector are associated with status related to education and occupation as well as industry sector. Further understanding of the financial sector wage premium would require more in-depth examination of the skills and requirements of specific jobs within the sector.

The regression-based decomposition of inequality shows highly divergent patterns even across the 4-5 European countries that have been studied. Occupation makes the greatest contribution, of around 30% of the total in the UK and Italy, whereas its contribution is much less in the Netherlands at 15%. Age group is highly relevant in the Netherlands, suggesting strong status differentials between younger and older workers contributing substantially to inequality. However, in Italy there is also high bargaining coverage with a wage group effect which is slightly higher than the UK and Slovakia but not at a level comparable to the Netherlands.

One of the most striking findings is the low contribution of education level to explaining inequality in the UK, at least through the decompositions that were carried out in this analysis. Two factors are of note in this regard. First, a high proportion of school leavers enter tertiary education in the UK, as the summary statistics bear out. This high proportion with tertiary level qualification could potentially diminish the difference between groups. A diminishing rate of return to education in the UK and Germany was found in analysis of data from the Luxembourg Incomes Study (LIS) in the GINI project (Mastromarco, Peragine and Serlanga, 2011). Second, increasing dispersion of rates of return to tertiary education are evident in the UK (Gosling, Machin and Meghir, 2000).

## Conclusion

This study focused on sociologically orientated explanations for inequality in Europe in four countries, the UK, Slovakia, Italy, the Netherlands and, in addition, where possible Germany. I drew on the strengths of the Structure of Earnings Survey to examine how occupation, education and industry classifications as signifiers of status contribute to inequality. Their contribution is assessed on the basis that as markers of status they differentiate workers' outcomes. A small but important literature in sociology has followed this approach (see for example Mouw and Kalleberg, 2010 and for the UK, Williams 2012).

The results showed considerable variation between countries in the importance of each of these factors. In Italy and the UK, occupation was found to be a key contributor to overall inequality even after controlling for education, age group and gender. In the Netherlands age group category made a much higher contribution to overall inequality than in the other countries, suggesting that seniority carries a high premium and also underscoring the precarious position of younger workers in the labour market. This divergence may be related to the extent of collective bargaining coverage: in firms where collective agreements are in place there may be more emphasis on seniority as a means of distinguishing workers (Dell'Aringa, Lucifora, Orlando and Cottini, 2004).

In contrast to the differences seen in the regression based decomposition, the ranking of wages by industry was consistent across countries, with higher wages in the financial sector, as is consistent with Magda, Rycx, Tojerow and Valsamis' (2011) exploration of central and eastern European countries using the SES for 2002. However the average wages by industry sector also highlighted the importance of the low wage sectors, which were found to be consistently relevant for understanding inequality in all the countries. Overall, the results of this study showed that industry sector accounted for around 6-8 % of total inequality even after occupation, education, gender and age were accounted for. This accounts for a substantial portion of variation and is consistent with Krueger and Summer's (1988) finding that industry sector is influential in explaining wage variation. It will be important in future work to examine in depth the contribution of gender differences by industry sector to the dispersion in wages by industry. These gender differences are likely to play out differently according to country context: so we might expect it to be of particular relevance in Slovakia which has one of the highest gender pay gaps in Europe (Gini Report 2012) and industry and occupational gender segregation are likely to play an important role. Indeed further development of this research is required to understand the gendered dimensions of inequality, particularly as they relate to occupations and inequality.

Considerable differences in both the headline rates of inequality and dispersion across the distribution between countries show that a high degree of inequality is not inevitable. In particular minimum wages make a substantial difference. The relevance of low wage

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industry sectors for understanding inequality is an area that is likely to be of increasing relevance to understanding inequality and its consequences in Europe.

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## Appendix 1: NACE Highest level classification

B	Mining and quarrying			
C	Manufacturing			
D	Electricity, gas, steam and air conditioning supply			
E	Water supply, sewerage, waste management and remediation activities			
F	Construction			
G	Wholesale and retail trade; repair of motor vehicles and motorcycles			
H	Transportation and storage			
I	Accommodation and food service activities			
J	Information and communication			
K	Financial and insurance activities			
L	Real estate activities			
M	Professional, scientific and technical activities			
N	Administrative and support activities			
O	Public administration and defence, compulsory social security			
P	Education			
Q	Human health and social work activities			
R	Arts entertainment and recreation			
S				
T	Activities of households as employers; undifferentiated goods and services-pr			
U	Activities of extraterritorial organisations and bodies			

## Appendix 2: Average wages by industry sector

industry	Netherlands			United Kingdom			Slovakia			Italy			Germany		
	F	M	Total	F	M	Total	F	M	Total	F	M	Total	F	M	Total
Mining and quarrying	24.13	31.8	31.11	21.42	22.35	22.18	4.52	5.16	5.08	13.18	11.22	11.41	17.87	20.56	20.24
	13.51	16.04	15.95	11.74	15.45	14.82	2.53	2.25	2.29	11.93	5.62	6.53	8.88	13.06	12.66
Manufacturing	14.67	19.31	18.34	11.23	14.57	13.77	3.8	5.35	4.7	8.82	10.71	10.18	14.62	19.82	18.39
	6.99	10.34	9.92	6.42	10.38	9.7	2.39	3.89	3.43	4.13	7.1	6.46	8.14	11.47	10.91
Electricity, gas, steam and air conditioning supply	18.75	24.62	23.22	13.62	19.2	17.66	7.04	8.34	8.04	11.18	13.17	12.76	19.91	25.4	23.94
	6.7	10.9	10.36	6.75	11.94	11.05	3.61	4.84	4.62	4.19	7.92	7.36	9.09	13.62	12.81
Water supply, sewerage, waste management	18.63	18.87	18.82	13.86	13.17	13.32	5.22	4.87	4.94	9.43	10.23	10.09	15.55	16.41	16.23
	5.96	7.23	6.97	9.82	7.48	8.03	3.02	3.04	3.04	3.85	4.84	4.68	6.86	8.26	8
Construction	15.41	19.16	18.78	11.33	16.13	15.19	4.89	5.02	5	10.05	10.55	10.49	14.42	16.25	16.05
	5.58	8.35	8.19	6.02	94.44	84.76	3.27	4.35	4.21	4.63	5.53	5.44	6.93	8.6	8.45
Wholesale and retail trade, repair of motorcycles and motor vehicles	11.63	16.04	13.97	8.83	11.76	10.3	3.68	5.48	4.32	8	10.1	9.08	13.25	17.55	15.64
	6.78	10.7	9.34	5.69	10.31	8.46	2.21	5.62	3.89	3.77	7.44	6.04	8.09	13.1	11.37
Transportation and storage	14.21	17.46	16.71	12.95	13.28	13.21	4.27	4.77	4.6	9.37	10.76	10.46	14.51	15.35	15.09
	7.39	11.21	10.54	7.2	8.21	8	2.2	3.14	2.87	5.17	7.23	6.86	7.24	10.31	9.49
Accommodation and food service activities	9.46	10.44	9.91	7.23	8.31	7.73	3.32	3.92	3.52	6.86	8.57	7.6	9.11	10.61	9.71
	4.39	6.6	5.55	3.39	6.22	4.94	1.79	2.48	2.07	3.39	4.9	4.2	4.89	8.52	6.63
Information and communication	19.92	23.41	22.49	16.16	20.89	19.21	7.21	9.84	8.95	10.99	13.92	12.73	17.23	23.82	21.33
	13.28	11.8	12.3	11.43	15.36	14.27	5.3	9.68	8.55	6.36	10.8	9.37	10.21	15.29	13.97
Financial and insurance activities	19.47	28.37	24.17	16.5	28.41	22.39	6.71	10.49	7.75	13.51	18.51	16.21	10.28	11.31	10.84
	8.84	15.63	13.62	13.14	26.45	21.64	4.04	8.8	6	7.31	13.22	11.19	5.47	7.52	6.68
Real estate activities	18.14	23.55	20.94	12.07	15.84	13.71	4.41	5.14	4.8	10.06	13.22	11.67	15.85	16.69	16.25
	11.36	12.86	12.45	6.53	11.41	9.18	2.44	3.58	3.13	6.21	10.68	8.91	8.92	11.51	10.24
Professional, scientific and technical activities	17.55	23.92	21.21	15.3	21.96	18.65	6.69	8.06	7.36	10.53	13.35	12			
	9	14.81	13.06	10.36	20.04	16.31	5.17	8.6	7.08	5.8	10.31	8.57			
Administrative and support service	12.26	14.27	13.35	9.92	11.08	10.57	3.19	3.72	3.5	6.64	8.34	7.43			
	6.02	9.41	8.08	6.58	9.59	8.41	1.98	2.78	2.49	3.73	5.21	4.56			
Public administration and defence	19.55	22.04	21.08	13.46	16.49	15.02	4.56	5.82	4.95	NA	NA	NA			
	6.75	8.81	8.17	6.23	8.36	7.56	1.93	2.84	2.33						
Education	20.04	24.12	21.58	13.96	17.3	14.93	4.29	5.45	4.63	13.74	16.92	14.75	14.54	15.8	15.03
	7.17	10	8.58	8.11	10.21	8.91	1.88	2.73	2.23	6.67	11.53	8.64	7.85	10.04	8.79
Human health and social work	16.96	22.59	17.83	13.08	19.04	14.32	4.56	6.03	4.88	10.21	14.64	11.45	14.68	19.34	15.79
	8.49	13.57	9.68	46.87	91.77	59.15	2.49	4.76	3.17	6.18	11.24	8.18	6.98	15.24	9.82
Arts, entertainment and recreation	14.1	17.15	15.47	9.83	16.26	13.08	3.77	4.36	4.03	8.69	11.12	10.04			
	6.42	12.27	9.62	5.27	162.3	115.4	1.54	2.71	2.14	5.44	17.27	13.43			
Others services	15.28	20	16.97	10.52	13.78	11.91	3.49	3.33	3.39	6.81	8.48	7.62			
	8.28	11.89	9.98	6.81	9.83	8.39	1.71	1.74	1.73	3.18	4.63	4.04			
Total	15.95	19.58	17.81	12.28	15.63	13.9	4.36	5.59	4.98	9.81	11.64	10.88	14.2	17.9	16.34
	8.32	11.58	10.28	22.85	40.48	32.63	2.72	4.67	3.87	5.77	8.87	7.78	7.99	11.82	10.54

M is male, F is female, author's calculations from the SES 2010