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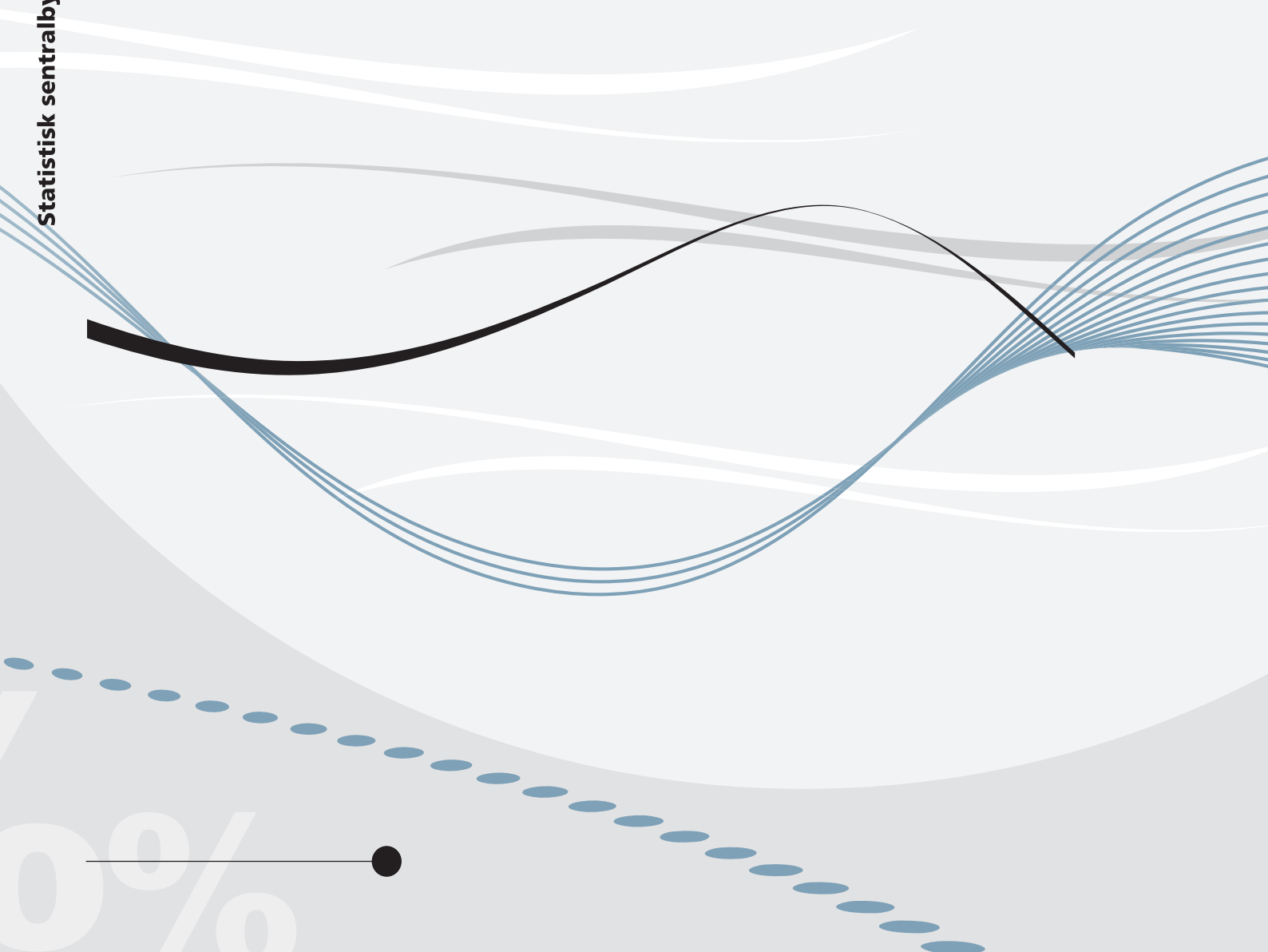
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Ellen Marie Rossvoll and Victoria Sparrman

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Abstract:

In this paper we attempt to investigate the effect on income inequality of some recent trends in the labour market, changes in regulations of temporary positions and the surge in immigration in many EU-countries. The empirical results show that less strict regulations of temporary positions and higher immigration increase income inequality. The effects of other labour market institutions, such as tax and benefit replacement ratio, on wage inequality are mainly in line with previous literature, but our results are based on a larger sample size in both the time and country dimension. The empirical analysis is conducted on panel data for 20 OECD countries between 1973 and 2011. We perform two robustness checks to our results. First, we account for indirect effects of changes in labor market institutions on wage inequality via the unemployment rates. The indirect effects suggest that labour market institutions have a larger effect on wage inequality than before. Second, we account for cross-sectional dependence and the results point at lower but significant effects of most of the labour market institutions on wage inequality. **Keywords:** Inflation modelling, pattern wage bargaining, inflation targeting, dynamic econometrics, cointegration, small open economy.

JEL classification: E24, J08, J31, J51.

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Sammendrag

Arbeidsmarkedsreguleringer og inntektsforskjeller i OECD land.

Inntektsforskjellene vokste raskt i de fleste anglosaksiske land på slutten av 1970-tallet. De har typisk vært lavere i Kontinental-Europa og Norden, men de siste tiårene har imidlertid inntektsforskjellene økt i flere land. De anglosaksiske landene, sammen med Portugal, har fortsatt betydelig høyere inntektsforskjeller enn kontinental Europa.

To vanlige forklaringer på tiltagende inntektsforskjeller er; globalisering og teknologisk endring, jfr. Acemoglu og Autor (2011). En tredje teori som også er grunnlaget for denne artikkelen er "Krugman hypotesen" (Krugman (1994)). Ifølge denne hypotesen, kan økende inntektsforskjeller forklares med et relativt fall i etterspørselen etter ufaglært arbeidskraft i kombinasjon med en fleksibel lønnsstruktur. Det er flere empiriske analyser som støtter "Krugman hypotesen", f.eks. Blau og Kahn (1996) og Koeniger et al. (2007). Sistnevnte finner at en vesentlig del av inntektsforskjellene blant menn i fulltidsstillinger i 11 OECD-land i perioden 1973-1998, kan forklares av arbeidsmarkedsreguleringer når man kontrollerer for endringer i teknologi, handel og etterspørselsforhold.

Vi benytter modellen i Koeniger et al. (2007), men på et dobbelt så stort datasett. Datasettet dekker både en lengre tidsperiode (1973-2011) og 9 ekstra OECD-land. Våre resultater støtter i hovedsak funnene i Koeniger et al. (2007), men arbeidsmarkedsreguleringer har noe mindre betydning sammenlignet med de opprinnelige resultatene. Økt stillingsvern, høyere nivå og varighet på arbeidsledighetstrygd, høyere koordinering og økte minimumslønninger reduserer inntektsforskjellene.

Vi har undersøkt to mulige forklaringer til at reguleringer i arbeidsmarkedet har mindre betydning for inntektsforskjeller enn tidligere; endring i reguleringer av midlertidige og faste stillinger samt økt mobilitet av arbeidskraft mellom landegrensene. Tidligere analyser har vist at stillingsvern for midlertidige og faste kontrakter har ulike effekter på sysselsettingen, se Nunziata og Staffolani (2007). Dersom endrede reguleringer øker sysselsettingen kan det igjen øke inntektsforskjellene, siden marginale arbeidstakere med lavere produktivitet kommer inn i arbeidsmarkedet. Blanchard og Landier (2002) har også vist at mindre regulering av midlertidige kontrakter har økt andelen ansatte i midlertidige stillinger. Hvis denne gruppen har lavere forhandlingsmakt, vil dette også øke lønnsforskjellene. Vi finner at strengere regulering av midlertidige stillinger reduserer lønnsforskjellene, mens strengere reguleringer av faste stillinger øker inntektsforskjellene. Vi finner også at økt innvandring øker inntektsforskjellene i den nederste delen av inntektsfordelingen, men at minimumslønninger til en viss grad demper effekten av økt innvandring.

1 Introduction

Income inequality started growing rapidly in most Anglo Saxon countries in the late 1970s. Levels of income inequality have typically been lower in Continental Europe and the Nordic countries than in the Anglo-Saxon countries, but many of the former countries have witnessed growing inequality in the past decades. The Anglo Saxon countries, along with Portugal, still have a substantially higher level of income inequality than Continental Europe. France is the only OECD country that has seen an overall decline in income inequality over the past decades, and two thirds of OECD countries have had growing inequality in the recent years (OECD (2011b)).

Two common explanations for growing inequality in developed countries are; globalization and skill biased technological change, cf. Acemoglu and Autor (2011). A third theory, which is also the foundation for this paper, is the “Krugman hypothesis” (Krugman (1994)). According to this hypothesis, rising inequality can be explained by a relative fall in the demand for low-skilled workers in combination with a flexible wage structure. On the contrary, a combination of a relative fall in demand with a rigid wage structure increases unemployment.

There are several empirical analysis which support the “Krugman hypothesis”, e.g. Blau and Kahn (1996) and Koeniger et al. (2007). Blau and Kahn (1996) have looked at the effect of labor market institutions vs. market forces in explaining the large deviation in wage inequality in the USA in the middle to late 1980s. Their findings suggest that cross country differences in labor market institutions provide the most persuasive explanation for national differences. Koeniger et al. (2007) look at the role of labor market institutions in explaining differences in wage dispersion between 11 OECD countries in the period 1973-1998 for men in full time positions, when controlling for technology, trade and supply and demand conditions. They find that changes in institutions can explain a substantial part of changes in male wage inequality.

By estimating the empirical model for wage inequality developed by Koeniger et al. (2007) on a double sample size, with both a longer time frame 1973-2011 and 9 additional OECD-countries, our results mainly support the findings in Koeniger et al. (2007). However, several of the variables have lower effect than previously reported.

We investigate two potential explanations to lower effect of labour market institutions on inequality differences; the measure of employment protection is decomposed into employment protection of temporary and regular positions and a variable representing immigration flow is added to the analysis. Previous work on separate measures for employment protection for temporary and regular contracts have revealed different effects on employment to population rates, cf. Nunziata and Staffolani (2007). Increased employment shares might increase the income inequality, since marginal workers with lower productivity enters the labor market. In addition, Blanchard and Landier (2002) found that reforms of regulations of employment protection for temporary contracts in the short run have increased the share of employees in temporary positions. If this group has lower bargaining power, this will also increase wage inequality. By investigating the variation in data, variation in regulation of employment protection of temporary contracts stems from the extended time period. We are therefore able to estimate separate effects of employment protection for temporary and regular contracts.

Along with an increase in wage inequality, most industrialized countries have seen a substantial increase in immigration over the past decades. This has led to a huge empirical debate on the socioeconomic impact of immigration, and on the effect it has on native workers wages. The “Krugman Hypothesis” would imply increased wage dispersion if higher immigration induce increased supply of low-skilled labor and/or will change the size of union density if immigrants do not mimic the native population with respect to union coverage. We make a first attempt to address this topic, and include the immigration rates to the former analysis disregarding that higher inequality might affect the immigration rates.

Finally we perform two robustness checks to our results. First, theoretical literature has pointed out that labour market institutions also affect unemployment, see Pissarides (2000) and Layard et al. (1991). How reliable are our results since some of the changes in unemployment are induced by changes in labour market institutions? Nickell et al. (2005) and Sparrman (2011) have estimated the effect of labor market institutions on the unemployment rates. By using the results in Sparrman (2011) we predict changes in unemployment caused by labor market institutions, and subtract the predicted effect from actual unemployment. Second, labor market institutions and income inequality might be caused by a third factor, the global economic development, affecting both. We investigate our results using methods described in Pesaran (2006).

The paper has the following structure: Chapter 2 presents econometric issues related to the robustness check and the equation for wage inequality. The equation is equal to the preferred specification in Koeniger et al. (2007). Chapter 3 contains a brief overview of the development and how the variables are assumed to affect wage inequality. Chapter 4 contains our main results and robustness checks. Chapter 6 summarizes and concludes.

2 Empirical specification and other econometric issues

This section presents the main results and preferred empirical specification of Koeniger et al. (2007) which is also the foundation for our empirical specification. This section also discusses how to account for cross-sectional dependence for the 20 OECD countries in our panel.

2.1 The empirical model for wage inequality

Koeniger et al. (2007) investigates the relationship between labor market institutions and wage inequality. The following model is estimated:

$$(1) \quad \ln\left(\frac{w_h}{w_l}\right)_{it} = \theta_0 + \gamma' z_{it} + \theta_1' v_{it} + \vartheta' s_{it} + d_i + d_t + \epsilon_{it}$$

Here w_h/w_l represent the 9/1-, 9/5- and 5/1-decile ratios of the gross degree of wage distribution. z_{it} is a vector characterizing the following labor market institutions; employment protection, the benefit replacement ratio, benefit duration, union density, coordination in wage bargaining, the tax wedge and the minimum wage. The development and a priori effects of labour market institutions on wage inequality are explained in Section 3.

In order to isolate the effects of the labor market institutions, we control for other exogenous factors that might affect the wage differential, v_{it} and s_{it} . The vector, v_{it} , controls

for relative supply and demand for skilled and unskilled labor, which can affect the relative price of the two types of labor and therefore the wage differential. The vector consists of the following variables: the natural logarithm of the skill endowment (measured by the ratio of persons with tertiary education or higher to persons with lower degree of education), the unemployment rate, and an interaction term between the two variables. The interaction variable is a proxy of the relative unemployment rate of high- and low-skilled workers, and implicitly assumes that this is proportional to the relative skill endowment. s_{it} is a vector of controls for trade and technology shocks, which can affect the relative wages of high and low-skilled labor through the processes mentioned in the introduction. Technology changes are proxied by research and development (R&D) intensity in manufacturing sector. It is measured by gross expenditures on R&D over gross value added in current prices. Trade is measured by import intensity, which is imports relative to value added in manufacturing in current prices. The d_i and d_t control for country specific attributes and for calendar year effects. Finally, ϵ_{it} , is the stochastic error term which is allowed to be heteroscedastic.

The results in Koeniger et al. (2007) are based on a feasible GLS fixed effects estimator, with a variance-covariance matrix that assumes heteroscedasticity across countries. The presence of autocorrelation in the error structure is neglected, but they illustrate that the estimated coefficients are almost identical when it is, and when it is not accounted for autocorrelation.

Koeniger et al. (2007) find a compressing effect on the wage differential of stricter employment protection and higher union density, minimum wages, and unemployment benefits and duration. The coordination of wage setting and the tax wedge also had a compressing effect, but are not statistically significant. They find a decompressing relationship with the skill endowment in the population and the wage differential, but no effect of the demand variables unemployment and the interaction term of unemployment and skill ratio. Moreover they find a decompressing association between the wage differential and import intensity, and a compressing association with R&D intensity.

2.2 Robustness check

Cross-sectional dependence might bias the estimated coefficients of the regressors in equation 1. For instance, if global business cycles have country specific effects on both income distribution and regressors, the estimated coefficients will be biased even if time dummies are included in the regression. Empirical support of that business cycles affect income distribution is provided by for instance Lindquist (2004). Business cycles may also affect the magnitude of labor market variables, like the benefit replacement rate and the tax wedge, and the demand and supply of labor, measured by the unemployment rate and import intensity. Therefore, cross-sectional dependence will imply that even if the estimated effects of tax wedge and benefits on income distribution are significant, the correlation might be caused by a third factor moving both income distribution and the regressors. The impact of cross-sectional dependence depends on the magnitude across cross-sections.

There exist several tests for cross-sectional dependence, when the number of units are relatively high (as in our panel with 20 counties) and when there are no natural ordering of the included countries. Breusch-Pagan Lagrange-Multiplier test is one method to test for

cross-sectional dependence in FGLS models, see Greene (2000) for explanations.¹ However, the cross-sectional dependence is tested using the correlation matrix for variables common to all cross-sectional units (the number of observations used is reduced when the panel is unbalanced). The reliability of the test is higher for panels where $T > N$, hence we excluded some of the countries with short time series to investigate the error structure in a longer time frame.

We also apply three other tests for cross-sectional dependence, i.e. Pesaran et al. (2008), Friedman (1937) and Frees (1995).² All three tests test the null-hypothesis of cross sectional independence. These tests are best suited for panels with $N > T$. The tests are however only available for fixed effects models. Pesaran’s test can be used with balanced and unbalanced panels, while the other two use observations available for all cross-sectional units. Friedman and Pesaran’s tests are sensitive to cross-sectional dependence where the signs of the correlations are both negative and positive, which can cause the tests to be unreliable. This is the case when common time effects are included in the regression. The Pesaran CD test can be conducted with an additional “abs” function that calculates the average absolute correlation of the residuals. A high value indicates the presence of cross-sectional dependence, even when the test fails to reject the null hypothesis of independence because of altering signs in the correlations. Free’s test is, however, not subject to this problem, and should be given more weight if the Pesaran test with the “abs” option give contradicting results.

Pesaran (2006) has developed a method to account for cross sectional dependence. The idea is to include cross-sectional averages of both the explained variable and regressors, such that the differential effects of unobserved common factors are eliminated. Westerlund and Urbain (2011) give a theoretical argument for why the CCE - estimator performs better than for instance the principal component estimator by Bai (2009) on a finite sample. In our panel, most of the variation in the institutional variables comes from the between country variation, cf. the absolute relative standard deviation in Table 1, column 7. Including the cross country average with low within variation, will therefore mainly affect the estimate of the country specific coefficient and not remove the cross-country dependence over time. Table 1 shows that absolute relative standard deviation of benefit duration, coordination and minimum wage have relatively large within variation compared to the other institutional variables, while all the control variables have large within variation.

3 Data

The theory of income inequality relates to skilled and unskilled labour. However, time series for wage differentials by skill are not available for a sufficiently long time period to capture the effect of labour market institutions. Income inequality is measured by the decile ratio of yearly wages for men in full time positions.

This section gives an overview of the development of income-deciles for men in full-time dependent positions and of the variables included in the empirical analysis; employment protection, benefit replacement ratio, benefit duration, union density, coordination in wage

¹The test is performed by using the command “xtttest2” in Stata Baum (2001)

²The test are available with the command “xtcsd” in Stata-package.

bargaining, the tax wedge and the minimum wage, immigration, R&D intensity and import intensity.

Data are mainly from OECD Economic Outlook (2013). Coordination of wage setting and the skill attainment that are from Visser (2011) and Barro and Lee (2010) respectively. With exception of data for these two variables, the sources are the same as the ones used in Koeniger et al. (2007). Data for the variables are provided for different time periods for different countries, and results in a unbalanced panel. For a more thorough explanation of sources and construction of variables see Appendix B.

3.1 Decile Ratios

The decile ratios are income in the 9th to the 1st decile (9/1-decile ratio), the 9th to the 5th decile (9/5-decile ratio) and the 5th to the 1st decile (5/1-decile ratio). Three decile ratios reflect the wage dispersion in different parts of the wage distribution and male wage earners are assumed to be directly affected by labour market institutions.

Figure 1 shows the different decile ratios for the countries in the sample period. The 9/1-decile ratio ranges from just under 2 to just above 5 in 2012. US is the country with the highest level of wage inequality in 2012. Portugal comes in second with a 9/1-ratio of around 4. Australia, Canada and the UK also have large differences in wages, with 9/1-decile ratios above 3.5. The countries with the lowest 9/1-decile ratios in the sample are the Nordic countries and Belgium.

The decile ratios have increased in most countries, but there are some exceptions, e.g. France. The increase in the 9/1-decile ratio has mainly been driven by increasing wage differential in the upper half of the distribution in Austria, Switzerland and New Zealand, while the decline in the 9/1-decile ratio in France is driven by a decline in the wage disparity in the lower half of the distribution.

3.2 Tax Wedge

The tax wedge measures the sum of the employment tax rate, the direct tax rate and the indirect tax rate. It represents the gap between the cost of labor for the employer and the purchasing power of the wage for the employee.

The tax wedge has been increasing in most OECD countries since the 1970s, cf. Appendix Figure B7. It is particularly high in Sweden, almost 75 percent. The tax wedge is also fairly high in countries like France, Finland, Denmark, and in Italy in the recent years. The tax wedge is especially low in the US and Switzerland, where it is below 30 percent.

Increased tax wedge can affect wage inequality by affecting the claims for pre-tax wages. A increase in the tax burden decreases the total surplus to be shared, and all wages are reduced. Since income taxes tend to be progressive, it is reasonable to assume that the surplus of those with higher wages are more affected than those with lower wages. On the other hand, a higher tax burden can increase the payoff of non-taxable goods, and hence lead so lower wage claims, in particular the top end of the wage distribution.

3.3 Employment protection legislation

Employment protection legislation (EPL) measures mandatory restrictions regulating the contractual relationship between employers and employees. Three different measures of EPL are used; EPL for temporary contracts, EPL for regular contracts and an overall measure which is an average of the two.

EPL on regular contracts include a measure of the price associated with firing workers and regulations on how easy it is to fire workers. Stricter regulations increases employment protection. The measure includes features such as: definition of when a dismissal is unfair, compensations following unfair dismissals, notification process when dismissing workers and severance pay.

The measure of EPL for temporary employment contracts cover the extent to which temporary contracts are allowed and regulated. A stricter level of employment protection of temporary contracts implies fewer allowances and more regulations of temporary positions. The measure includes the maximum duration of fixed term contract and contracts through temporary agency work, and regulates the types of work where the use of temporary contracts is permitted. The restrictions of number of renewals of temporary contracts, and number of successive temporary contracts for the same position, and whether there are regulations that ensure equal treatment for employees in temporary and regular positions.

The level of overall EPL was stable or increasing in all countries in the sample until around 1990, then many countries eased the regulation of regular contracts, see Appendix Figure B1. The Anglo Saxon countries stand out with a low level of strictness for the whole time period. On a scale of 0-3, all of the Anglo Saxon countries have had a level of EPL below 1 since the 1970s. Today, the strictest level of overall EPL are in France, Spain, Portugal, Norway and the Netherlands. Germany, Belgium and Sweden were among the countries with strictest regulations in the 1980s and early 1990s, but have eased their regulations over the past decades.

The development for separate measures of EPL for temporary and regular positions are shown in Appendix, Figures B2 and B3. The regulations of temporary contracts have become less strict in most countries, with some exceptions. In countries where the regulations were very low to begin with, such as; Australia, Canada, Finland, the United Kingdom and the United States, they have remained low. France and Ireland have only increased slightly in strictness. The regulations of regular contracts are have been held more or less unchanged in most countries, but has decreased in strictness in Portugal and Spain, where they were very strict to begin with. They have increased marginally in strictness in most Anglo Saxon countries, and after 2000 they have increased in Germany and been reduced in Austria. We will come back to the effects of the different measures of EPL in Section 4.

3.4 Union density and coordination of wage setting

Union density equals the proportion of wage-earners who are unionized, while collective bargaining coverage is a measure of the proportion of wage earners that are covered by collective agreements.

The level of collective bargaining and union density varies a lot across OECD countries, and there is not necessarily a connection between the sizes of the two. Union density has

varied a lot within countries over time, see Appendix Figure B9. It has increased in countries like Denmark, Finland and Belgium, while it has decreased in France, USA, Australia and United Kingdom. Union density has declined in all the countries since the late 1980s/early 1990s, where they peaked. The collective bargaining coverage has been kept at a rather steady level in most countries, but has decreased in Japan, United States and United Kingdom and increased in France and the Netherlands, cf. Appendix Figure B8.

Calmfors (1993) and Calmfors and J. (1988) explain that different levels of coordination might affect the wage bargaining process differently. If the coordination index is at a very low level, the unions have very little power, and act as if the labour market were characterized by perfect competition. If the coordination level is very high, unions will take into account that their wage claims also affect the unemployment rate, and the wage claims will go down. If the unions on the other hand is at an intermediate level, they can not affect unemployment, but have more bargain power than at the low level of coordination. The wage claims will therefore increase, and can increase the wage distribution for the workers covered by the union. Koeniger et al. (2007) explain the compressing effect of the union density by the fact that unions have more aggressive wage bargaining for low-skilled workers.

3.5 Unemployment benefit duration and benefit replacement rate

The benefit replacement rate is a measure of how much unemployed workers are compensated by the government the first year after losing their job. The benefit replacement rate after year one of unemployment is also used to calculate the benefit duration, which measures the duration of benefit replacement, and how the replacement rate develops relative to the benefit replacement rate in the first year of unemployment.

The duration and size of unemployment benefit replacement vary a lot among the countries in the OECD, see Figures B6 and B5. Some countries, like Australia, New Zealand and the United Kingdom have a low level of benefit replacement rate and a relatively high level of benefit duration, while it is the opposite in Canada. Benefit replacement rates are high in the Nordic countries, France, Netherlands, Portugal, Spain and Switzerland and relatively lower in Germany, Japan and the Anglo Saxon countries, with exception of Ireland. The duration of unemployment benefits are as low as one year in Canada and Japan. Australia and New Zealand give benefits at a constant level every year of unemployment, but at a relatively low rate.

The benefit duration and the benefit replacement rate represent the outside option to being employed. An increase in unemployment benefits would increase the reservation wage of workers and therefore also the wage. Also in this case the relative benefit replacement rate would have to be relatively larger for the low-skilled for it to affect the wage dispersion.

3.6 Minimum wage

Minimum wage is the lowest wage which is legally possible to pay an employee. It is common to use the measure of minimum wage to median wage for countries with a minimum wage set at the national level (Cahuc and Zylberberg (2004)), which is also done in this paper. The value of the minimum wage variable is set to zero if a county has no regulation of minimum wages.

Figure B10 in appendix shows the level of minimum wage relative to median wage for the countries in the panel. The figure shows that most countries have minimum wage at some level or for some sectors. The figure shows that the size of the minimum wage relative to the median wage varies a bit across the countries of interest. The minimum wage has decreased in size relative to the median wage in most countries, except France and Japan, where it has increased.

Earlier work on minimum wage by Brown (1999), DiNardo et al. (1996) and Lee (1999) have concluded that the regulation of minimum wages reduce wage inequality. Normally, the minimum wage are above the competitive wage of workers, and will therefore bring wages to a higher level. At the same time are wages of high skilled workers not directly affected. Workers that are affected by minimum wages tend to be young workers below 24 and workers over 24 with few years of education (Addison and Blackburn, 1999). However, our data show that minimum wages to medium wages have decreased over time, this reduction has therefore contributed to increase wage inequality over time. A minimum wage could also increase wage inequality if the job-destruction rate increases and reduces labor market tightness for the low skilled workers.

3.7 Skill endowment

The skill ratio of the working population (15-74) is measured by the share of the population in each country with tertiary education or higher, to the share of the population with a lower degree of education.

Relative skill endowment has had a prominent increase in all the countries in the sample over the past decades, especially in countries like Australia, Canada and the US, which have the highest levels today, cf. Appendix Figure B12. The skill endowment is still relatively low in countries like Italy and Portugal and fairly low in Austria and Switzerland.

The skill-attainment can affect the wage dispersion through different channels. Either through a compositional effect if wages are higher for high-skilled workers, and the number of high-skilled workers increase, the dispersion will increase. cf. Blau and Kahn (2001) and Devroye and Freeman (2002). The skill-attainment can also affect the wage dispersion through the price of skilled labor, if an increase in skill-attainment lowers the price of high-skilled workers and reduces income dispersion, cf. Goldin and Katz (2007).

3.8 Immigration

Immigration is measured as net immigration to the population in age (15-74). The migration flows into OECD countries have varied over the sample period, but increased until 2008 in most OECD countries. In the following years immigration declined as a result of the recession, cf. Appendix Figure B15. If skill distribution of immigrants are different from the native population. this may affect the wage distribution. We will return to the effects of immigration on the wage dispersion in Section 4.

3.9 Trade and Technology

Changes in international trade and technology are approximated by the import intensity, the ratio of imports over value added, and the research and development intensity, the ratio of R&D expenditure over value added, both for the manufacturing sector, all in current prices.

Over the past decades, the import intensity has been overall increasing in all countries, except for Ireland, where it has decreased, see Figure B13. Figure B14, also show that R&D intensity has increased in all, but one country, over the de past decades. R&D fell in UK but from a very high level.

An increase in international trade is thought to affect the relative wages of high- and low-skilled workers through an increase in the relative demand for high-skilled labor. Technological development is thought to capture the effect of the skill-biased technological change that, supposedly, contributed to making skilled labor relatively more productive and increased relative demand and the relative wages for for this type of labor.

3.10 Unemployment Rate

An increase in the unemployment rate reduces the wage pressure, and the effect on the wage dispersion depend on the composition of high- and low-skilled workers among the unemployed.

The unemployment rates have been increasing in most countries towards the beginning of the 2000s, and the dispersion between the countries have also increased, cf. Figure B11. The unemployment rates decreased in the period from 2000 and prior to the financial crisis. The unemployment rates have then increased for most countries in the sample, one exception is Norway.

The responsiveness of wages to the level of unemployment can also differ for different groups in the labor market. de Galdeano and Turunen (2005) look at the elasticity of real wages with respect to local unemployment in the EU. They find that the wage elasticity is higher in the lower part of the distribution, and that wages in the public sector are especially rigid. Blanchflower (1991) suggests that this is also the case for wages of unionized workers. This could cause the wages in the middle of the distribution to be less affected by unemployment than the upper and lower half of the distribution, leading to higher wage dispersion in the lower half and lower wage dispersion in the upper half.

4 Labour market institutions and income inequality

The link between institutions and income inequality might change over time. Estimating Equation 1 on the same sample period as Koeniger et al. (2007), 1973-1998, and then on an extended time period, 1973-2011, reveal that labour market institutions still are important in explaining wage differentials between OECD countries, but some of the effects are numerically smaller than previously reported. In this section, we investigate two potential explanations, separate measures for employment protection on regular and temporary contracts and surge in immigration.

4.1 The overall link between labour market institutions and wage inequality

The link between labour market institutions and wage inequality can change with time. We have therefore first replicated the models for the 9/1-, 9/5- and 5/1- decile ratios in Koeniger et al. (2007), Table 2, column 1, 3 and 4, with revised data, but by using the original time series for coordination and skill due to data limitations, see Appendix B for a comprehensive review. Then, the coordination and skill variable are replaced with new time series to form a new baseline scenario before we extended the data set. We are interested in the time effects and the results from the revised and the baseline scenario are hence relegated to Appendix A.

This section evaluates the preferred econometric model in Koeniger et al. (2007) using a revised and extended data set. The extended dataset covers the time period 1973-2011, which includes the additional years from 1998-2011 compared to Koeniger et al. (2007). The data set also has more cross country variation since it includes 9 additional OECD countries; Austria, Belgium, Denmark, Norway, New Zealand, Switzerland, Ireland, Portugal and Spain, in addition to Australia, Canada, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, the UK and the US.

Table 2, column (1), shows the results of the regression of the preferred econometric specification in Koeniger et al. (2007) on our dataset. All institutional variables have compressing effects on the 9/1-decile ratio, as in the original regression. With the exception of the union density and benefit duration, they are all significant.

The estimated coefficient of employment protection legislation is considerably smaller than in Koeniger et al. (2007), which is both due to data revision cf. Figure A1 and to the extension of the data set, see Figure 2. The lower estimated effect on the extended data set might be due to the opposing effects of employment protection for temporary and regularly contracts, which are discussed in the next section. The estimated coefficient of the tax wedge has increased, while the estimated coefficient of benefit replacement rate, coordination and minimum wage are close to those in Koeniger et al. (2007).

The effect on the upper and the lower part of the income distribution, the 9/5-decile ratio and 5/1-Decile ratio in Table 2, columns (2) and (3), disentangles the effect of labor market institutions on two separate parts of the income distribution. The table shows that employment protection, benefit replacement rate, tax rate, coordination and minimum wage compress both the lower and upper part of the income distribution, but the effect of coordination and minimum wage are only significant on the upper part. The latter result could be due to how the minimum wage is measured, i.e. minimum wage over median wage. Union density has a compressing effect on the upper part of the income distribution, and an increasing, but insignificant effect, on the lower part. The effect of benefit duration is not significant on either the upper or lower part of the income distribution.

The quantitative implications of the results in Table 2 are presented in Table 3. Panel A presents the change in the 9/1-decile ratio, of one standard deviation increase in the rigidity of the measures of the institutional variables. Table 3, Panel B, presents the change in the 9/1-decile ratio associated with an increase in institutions from the minimum levels of rigidity to the maximum levels of rigidity. A change from minimum rigidity to maximum rigidity is associated with a change in the 9/1-decile ratio of around 6% for the coordination of wage

setting and an increase in the minimum wage from non-existing to 67% of the median wage, 7.7% of a change of the union density from 7% to 84%, 21% decrease for a rise in the tax wedge from 20% to 75%. An increase in the measure of overall EPL is associated with a decrease in the 9/1-decile ratio of 15.7%.

The results from the extended model in Table 2 imply that the largest effect of a standard deviation change comes from the tax wedge which is associated with a 5.4 decline in the 9/1-decile ratio from a change of a standard deviation of 13,9 percentage points in the tax wedge. A one standard deviation in the strictness of the overall EPL measure of 0.6 on a scale from 1-3, is associated with a 4.6% decline in the 9/1-decile ratio. A standard deviation change in the measures of unemployment protection is associated with around 3% decline in the 9/1-decile ratio, while the one standard deviation change in the minimum wage, the coordination of wage setting and the union density are associated with a decline in the 9/1-decile ratio of around 2%.

A more intuitive way of presenting the results, is to compare how the growth in income inequality would change if a country changed their institutions from strict to less strict labor market institutions. For instance, how would income inequality in Scandinavia change if their institutions went from highly regulated to unregulated, such as the average level of the UK and US? Our results show that the average growth in inequality in Scandinavia would increase by 42 percent if labor market institutions changed from the average level in 2011 to the average level in UK and US.

The controls for relative supply and demand conditions for labor; the unemployment rate, the skill attainment and the interaction term between have opposing effects on the extended data set. The unemployment rate has a compressing effect on the 9/1-decile ratio, and the effect is significant at a 5 percent level. As in the original paper, the effect on the 9/5 and 5/1-decile ratios in column (2) and (3) are in opposite directions, but only significant on the upper half of the distribution. The interaction between unemployment and skill is a proxy for unemployed high skilled workers. The result show a decompressing effect on the upper part of the wage distribution and increased wage dispersion in the lower part, which might imply that the medium wage has changed. As in the baseline scenario, skills has a compressing effect on the 9/1-decile ratio. In the original paper it had an increasing effect, but it turned negative when the US was omitted after 1990. Using the extended data set lends support to the change in direction of the coefficient of the skill attainment in the replication, indicating that higher skill attainment decreases wage dispersion. However, the results do not indicate that the upper part of the wage distribution, 9/5-Decile ratio, is more compressed, since the coefficient is close to zero and not significant, but the effect on the lower part of the wage distribution, the 5/1-Decile ratio, is negative and significant, cf. Table 2 column (2) and (3). The result on the upper part of the distribution is reasonable since the effects of skill attainment can affect the wage distribution through different channels. One channel is that the price of skilled labor decreases because the supply of skill increases. Another channel, is that more high skilled workers with higher wages increase wage dispersion (to some degree), c.f. Blau and Kahn (2001) and Devroye and Freeman (2002)).

The controls for trade and technology both have negative coefficients and are significant for all parts of the wage distribution. The coefficient of the trade proxy was positive in the original paper and in the baseline scenario, but turned from positive to negative using the extended dataset. However, a recent article by Autor et al. (2013), find that manufactur-

ing employment decreased more in districts where the production traditionally consisted of typical Chinese export products in the US. In sum, they find that 25 percent of the reduction in manufacturing employment from 1990 to 2007 is due to imports from China, and there are no sign of increased production of other goods in these districts. They also find that even if wages in manufacturing sector are unaffected by the negative shock of higher imports, wages outside manufacturing sector were negatively affected. This implies that workers from manufacturing sector seek jobs outside this sector and creates a downward pressure on wages in the non-manufacturing sector and contributes to compressing the wage dispersion as our results are implying. The negative effect of R&D fits less well with the theories of the skill-biased technological change and the Stolper-Samuelson theorem. From theory, R&D is assumed to increase relative productivity in skill-intensive sector, and hence increase the wage dispersion. On the other hand the results are in line with the original paper, and might support the conclusions of that R&D it is not a good proxy for the stock of technology, being both a stock and flow variable.

The explanatory power of the extended regression on the 9/1-decile ratio in column 1, Table 2, is compared with a regression with only the time and country dummies. As in the original regression in Koeniger et al. (2007), the measure of fit, R^2 , is lower with only time and country dummies and equal to 0.72, while the model with institutional variables in Table 2 column 1 where equal to 0.94. The higher level indicates that including the institutional variables substantially improve the fit.

In the lower part of Table 2 we present the results of the test for heteroscedasticity described in Section 2. The test result in Table 2, model 1, clearly rejects the null hypothesis of homoscedasticity and the remaining results allows residuals to be heteroscedastic.

4.2 Impact on income inequality of employment protection for temporary and regular contracts

Our investigation so far, has used a measure of overall EPL. However, the underlying variables employment protection of regularly and temporary contracts show a diverging development over time. EPL for regular contracts has been more or less unchanged at a relatively high level, while EPL for temporary positions has been eased to stimulate job creation and flexibility in the labor market. In addition, the number of people in temporary positions has increased in many countries (see Appendix Figure B4).

Previous work on separate measures for employment protection for temporary and regular contracts have revealed different effects on employment to population rates, cf. Nunziata and Staffolani (2007). Increased employment shares might affect the wage distribution, since marginal workers with lower productivity enters the labor market. In addition, Blanchard and Landier (2002) found that reforms of regulations of employment protection for temporary contracts in the short run have increased the share of employees in temporary positions. If this group has lower bargaining power, this can affect the wage distribution.

However separate measures of EPL for temporary and regular contracts exist only after 1985, causing the time series to become shorter and some institutional variables may have lost significance. Table 5, column (4) contains the results with overall EPL for the same time period. The R^2 of the results in the 1st and the 4th column are both 0.96, so the fit of

the model with separate measures of EPL is the same.

Table 5, column (1) to (3), shows the estimated results of this specification with separate measures of EPL for regular and temporary contracts. The results in Table 5 show that the effects of the overall measure of EPL used previously, disguises the ambiguous effects of the two measures of EPL for regular and temporary positions. The part of employment protection that covers regular contracts increases the differences between the 9th and the 1st decile, while EPL concerning temporary contracts compresses the wage distribution. The results indicate that the reforms, where EPL for regular contracts were held more or less unchanged, while EPL for temporary contracts was eased to stimulate job creation, have contributed to a greater division of labor markets. Some workers have stable regular positions with a high degree of employment protection and high wages, while others have low-paid temporary jobs.

Our findings are in line with previous empirical studies of labor market institutions on unemployment. Cahuc and Postel-Vinay (2002) and Blanchard and Landier (2002) have found that reforms increased the share of employees in temporary positions, but did not have a clear long term effects on unemployment. Blanchard and Landier (2002) also suggest that the types of positions that were offered in the labor market were changed to adjust to these reforms, and that firms now create routine, lower productivity jobs where workers can easily be replaced with temporary contracts.

One explanation of our findings are proposed by Autor (2003). He finds that EPL for regular contracts increases the incentives to invest more in training of employees in regular positions, leading to accumulation of firm-specific human capital which can increase both productivity and wages. On the other hand, workers with temporary contracts have little possibility for advancement. Increased investment in one type of contract will contribute to increase the within group wage dispersion in both the upper and lower part of the income groups. It will also increase the between group wage dispersion between high and low-skilled workers if a disproportionate share of low-skilled workers end up in the temporary positions (cf. Barbieri (2009)). Nunziata and Staffolani (2007) also find that the effect of EPL for temporary contracts on the share of employees in temporary contracts, increases with the strictness of EPL for regular contracts.

The quantitative implications of the effect of the different aspects of EPL are quite large. According to the results from Table 3, one standard deviation change in the measure of EPL for regular contracts leads to a change in the 9/1-decile ratio of over 6%, while the effect of a one standard deviation increase in the rigidity of the measure of EPL for temporary contracts reduces it by 2.57%.

The quantitative implications of the measures of EPL for temporary and regular positions are larger if we consider a change from the minimum level to the maximum level of rigidity, cf. Table 3, panel B. An increase in the rigidity of EPL for regular positions from 0.17 like in the US since the mid 1980s to 4.17 like in Portugal in the 2000s, on a scale from 1-6, is associated with an increase in the size of the 9/1-decile ratio of 30.7%, while an increase in the rigidity of EPL for temporary positions from 0.25 which is common in Anglo Saxon countries to 5.38, the level in Italy until 1996, is associated with a decline in the 9/1-decile ratio of 10.46%. Few countries have seen a change in institutions of the magnitudes described here, so the content of Panel B should be interpreted with even more care than Panel A.

4.3 Impact on income inequality of changes in immigration

The increased level of immigration has become a popular explanation for the growth in wage dispersion in the recent years. The effect of immigration depends on the skill-level of immigrants and natives and the substitutability at different skill-levels of the two groups. If the within group inequality in the immigrant population is larger than the level of inequality in the native population, the relative growth of the immigrant population will lead to a more unequal overall wage dispersion. Immigration can also affect the wages of natives at the same skill-level through substitution.

The results from the analysis where immigration as a share of total population is included in equation 1, are presented in Table 6. The results show that immigration has a significant diverging effect on the 9/1- and 5/1-decile ratio. The effect on the 9/5-decile ratio is also decompressing, but not significant, and much smaller than the effect on the 9/1- and 5/1-decile ratios, cf. Table 6 columns (1) to (3). This indicates that more immigrants contribute most to increasing the wage dispersion in the lower half of the wage distribution. The inclusion of immigration has little effect on coefficients of the other variables in the regression.

The effect on the lower half of the distribution could be due to, either, that immigrant workers on average have lower wages than native workers, causing the between group inequality between native and immigrant workers to increase, or because immigrant workers are relatively better substitutes for low-skilled workers than high skilled workers, and hence causes the wages for all low-skilled workers to decrease.

Brücker and Jahn (2011) have looked at the wage and employment effects of immigration in Germany, a country with a rigid labor market. They find evidence that native and immigrant workers are imperfect substitutes at the same skill-level. They find that native workers tend to benefit from immigration in terms of higher wages and lower risk of unemployment, but foreign workers experience a major impact from immigration at their given skill and experience level. It is also studied by Card (2009), who looks at the connection between immigration and inequality in the US, where low-skilled immigrant from Mexico and Central-America are thought to have contributed to an increase in the skill-differential and lower the wages for low-skilled native born through substitution. The immigrant population in the US is concentrated in the upper and lower tails of the skill-distribution. Similarly to Brücker and Jahn (2011), Card (2009) finds that immigration had little impact on the wages of the native born, but that the overall impact is clearly contributing to increasing the level of inequality. He estimates that about five percent of the rise in overall wage inequality in the US between 1980 and 2000 can be explained by immigration. However, Bratsberg and Raaum (2012) show that higher immigrant employment shares also reduces wage growth of native construction workers. The empirical analysis is conducted using Norwegian micro data and licensing requirements to achieve exogenous variation in immigrant employment across trades.

We find that one standard deviation change in immigration of 2.4% is associated with an increase in the 9/1-decile ratio of 1.36%, cf. Table 3.

From a policy perspective, it could be interesting to investigate if minimum wages can prevent the lowest wages from falling when immigration increases. This has led us to investigate the differences between countries with and without minimum wages. The results for

countries with and without minimum wages on the 9/1-decile ratio are shown in Table 6³, and show that the effect on wage dispersion is larger if a country also has minimum wages, but it is not significant. The effect of immigration on the lower part of the wage distribution increases the distribution, but the effect is dampened in countries with minimum wages, although not significantly. The small estimated effects of minimum wages might be due to the fact that minimum wages have been kept at a low level or been decreasing in the estimation period.

However, we should consider the results of immigration as a first attempt to capture the effects of immigration on income inequality, as small income differences could increase immigration of low skilled workers, since the skill premia is relatively high. While high income differences could imply high immigration of high skilled workers and dampen the effect.

5 Robustness

We perform two types of robustness checks on the aggregate effects of labour market institutions. First, we study how robust the estimated effects of labour market institution are to cross-sectional dependence. Second, we investigate how reliable our are if we account for that part of the changes in unemployment is due to changes in labour market institutions.

5.1 Cross-sectional dependence

The tests for cross-sectional dependence are presented in the lower part of Table 2. All tests rejects the null hypothesis of cross-sectional independence. As mentioned in Section 2, the different tests are developed for different compositions of time- and cross-sectional dimensions. We have therefore adjusted the sample size according to the different specifications. The Breusch-Pagan Lagrange Multiplier (LM) - test is conducted on 10 countries, which insures a sufficiently long series of observations common to all cross-sectional units. The time dimension is equal to 16. The test statistic is equal to 144 with degrees of freedom equal to 45. The Friedman and Frees' tests are also based on 10 countries and the test statistics are respectively equal to 3.53 and 0.9. The Pesaran test does not have the same restrictions in the T-dimension as the other tests. It is hence performed on 17 countries, has a test statistic equal to -2.99, and shows a fairly high value of average absolute correlation of residuals equal to 0.32.

We control for cross-sectional dependence in Table 2, column 4, by including the cross-sectional average of the dependent variable, benefit duration, and all the control variables except for import intensity. There is no sign of 1. or 2. order autocorrelation when the averages are included in the CCEP model. The results show that employment protection, benefit replacement ratio, tax wedge, coordination and minimum wage, have a significant compressing effect on the 9/1-decile ratio, and union density is negative, but not significant. With exception of the effect of minimum wage, the estimated effects are smaller than the GLS-estimates in column 1. On the other hand, all the control variables have lost significance.

³The other results of immigration on the other parts of the wage distribution are available on request.

The results are not surprising as these variables are more directly affected by global changes in the world economy.

The estimated effects of EPL of temporary and regular contracts remain even if we control for cross-sectional dependence by including the average of the 9/1-decile ratio or averages of all significant explanatory variables as described in Section 2. The results are available on request.

5.2 Indirect effects of the labor market institutions

According to the “Krugman Hypothesis”, unemployment increases with the rigidity of labor market institutions. Many studies have found this to be true. Nickell et al. (2005) and Sparrman (2011) find that unemployment is increasing in EPL, unemployment benefit replacement ratio, while an interaction of the coordination and union density decrease unemployment. It is therefore likely that some of the effect of the institutional variables on the wage differential is picked up in the coefficient of the unemployment rate, because some of the effects of the institutional variables affect the wage dispersion indirectly through unemployment.

The unemployment rate variable in the baseline model is replaced by two variables. One which should account for the indirect effect of labor market institutions on unemployment and the second which should be unaffected by labor market institutions. The new variable for the development in the unemployment rate caused by labor market institutions is based on the estimated coefficients of the institutional variables on the unemployment rate in Sparrman (2011) Table (12). The second variable; the share of unemployment which is assumed not to be correlated with institutional variables consists of the actual unemployment rate subtracted by the predicted unemployment rate.

The compressing effect of labor market institutions on wage inequality are even larger when the effect of labor market institutions through the unemployment rate is accounted for, cf. Table 4. The unemployment rate without labor market institutions has a significant compressing effect on the upper part of the wage distribution, while it significantly increases the lower part of the wage distribution

6 Conclusion

Between 1980 and 2000 most countries in the OECD carried out neo-liberal regulatory reforms that made labor markets more flexible. These reforms included easing of employment protection legislations, lowering of the relative minimum wage, weakening of union power, and some also reduced unemployment benefits. Most of these regulatory changes were associated with lower unemployment rates, but also higher wage disparity, cf. Koeniger et al. (2007). The Temporary Agency Work Directive in the EU has actualized the effects of labour market institutions as this directive implies more restrictions on employment protection of temporary positions.

The analysis in this paper is based on the empirical specification in Koeniger et al. (2007) but is conducted on a twice as large dataset. The data set covers 20 OECD countries from 1973 to 2011. The results give empirical support to the view that labor market institutions

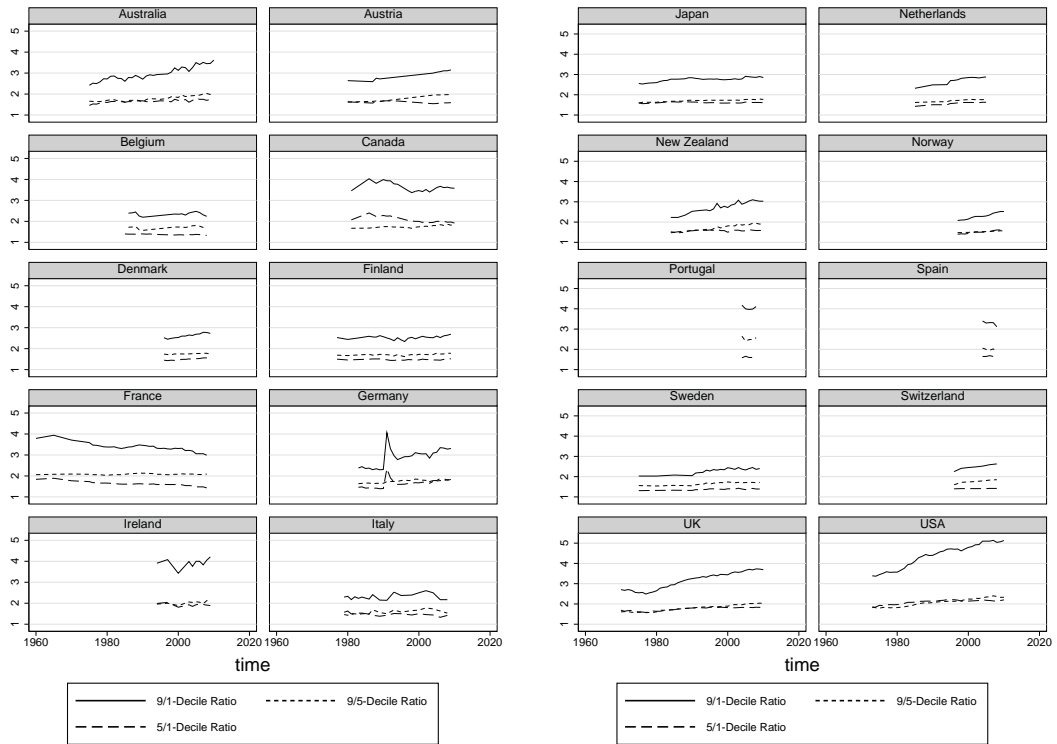
increases wage inequality. For example, our data set contains all of the Scandinavian countries which traditionally have had small income differences, and our results suggest that the growth in income inequality in the Scandinavian countries would increase by more than 40 percent if their institutions become like the average level of the UK and US. The detailed results show that employment protection legislation, the benefit replacement rate, the unemployment benefit duration, the tax wedge, the minimum wage and the coordination of wage setting all have a significant compressing effect on the 9/1-decile ratio. Union density also has a compressing effect, but it is only significant on the 9/5-decile ratio.

Recently, in Europe, the introduction of the TWA directive has raised a discussion of how regulations on temporary and regularly contracts affect the economy. We replace the overall measure for employment protection in the empirical analysis with variables for temporary and regular contracts, and the results show that these measures have significant opposite effects on wage distribution. Employment protection for temporary contracts has a compressing effect on the wage differential, while employment protection for regular contracts has contributed to increasing the wage differential. This implies that easing the restrictions on employment protection for temporary positions in order to stimulate job creation has led to an increase in wage dispersion. In combination with previous results, which have found that less strict employment protection only increased the share of temporary workers, but did not have any long lasting effects on unemployment, Cahuc and Postel-Vinay (2002) and Blanchard and Landier (2002) may imply a division of the labor market. The separate effects of employment protection for regular and temporary contracts, are interesting in forecasting the effect of Temporary Agency Work Directive in the EU. The new directive does to some extent reverse the features of the neo-liberal labor market reforms that took place in the 80s and 90s, where employment protection concerning temporary positions were deregulated. The new directive gives employees in temporary contracts and employees working through agencies equal treatment as employees in regular contracts with similar work, and our results suggest that wage inequality will be considerable reduced with this regulation.

We also extend the analysis in another direction by looking at the effect of immigration. The results show that higher immigration in the lower part of the wage distribution increases wage inequality, but the effect is dampened in countries with minimum wages. The dampened effect, however, is not significant. The small estimated effects of minimum wages might be due to the fact that minimum wages have been kept at a low level or been decreasing in the estimation period. It would be interesting to look more closely at the effect of institutions on the employment among immigrants. While labor market institutions have a compressing effect on the wages of employed workers, many of the institutional variables have an increasing effect on unemployment for immigrants. Labor market institutions can give immigrants better conditions in the labor market, but at the same time make it harder for immigrants to enter the labor market. This topic is left for the future.

We also perform some robustness checks to our results achieved on the long sample period. First, theoretical literature has pointed out that labour market institutions also affect unemployment, see Pissarides (2000) and Layard et al. (1991). By using the results in Sparman (2011) we predict changes in unemployment caused by labor market institutions, and subtract the predicted effect from actual unemployment. The results show that institutions have an additional effect on the wage differential through the effect on unemployment rate. In addition, our results and the results in Koeniger et al. (2007) could be due to a common

economic development and hence not be robust to account for cross-sectional dependence. Our results are tested using methods in Pesaran (2006) and we find that six out of seven labour market institutions still have a compressing impact on inequality. The effect of union density is not significant and the effect of benefit duration has changed sign. While the separate and opposing effects of employment protection of temporary and regular contracts are unaffected by applying this method.



Graphs by c_index

Graphs by c_index

Figure 1: Development of Decile Ratios

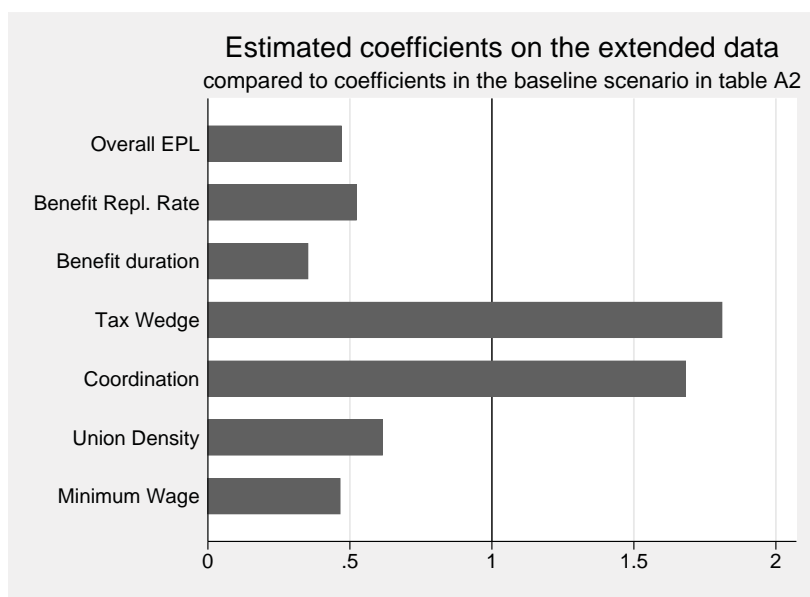


Figure 2: The estimated coefficients from Table A and Table 2. The relative size is equal to one if the estimated coefficients from the two tables are equal.

Table 1: Relative standard deviations for the within and between variation. Sample period: 1973-2011

Variable		Mean	Std. Dev	Min	Max	Rel. Std. Dev	Obs
9/1-decile ratio	overall	1.07	0.21	0.67	1.64	0.20	N = 465
	between		0.20	0.79	1.47	0.19	n = 20
	within		0.08	0.81	1.27	0.08	T = 23.25
Employment protection	overall	1.21	0.63	0.13	2.51	0.52	N = 798
	between		0.62	0.13	2.27	0.51	n = 20
	within		0.21	0.51	1.64	0.17	T = 39.9
Benefit replacement ratio	overall	0.47	0.20	0.00	0.89	0.42	N = 820
	between		0.17	0.23	0.78	0.36	n = 20
	within		0.11	-0.05	0.82	0.23	T = 41
Benefit duration	overall	0.47	0.33	0.00	1.04	0.69	N = 818
	between		0.31	0.00	1.02	0.65	n = 20
	within		0.13	-0.23	0.83	0.27	T = 40.9
Tax wedge	overall	0.46	0.13	0.19	0.75	0.29	N = 764
	between		0.13	0.22	0.67	0.27	n = 20
	within		0.05	0.24	0.59	0.10	T = 38.2
Coordination	overall	3.21	1.31	1.00	5.00	0.41	N = 753
	between		0.99	1.10	4.26	0.31	n = 20
	within		0.89	0.55	7.10	0.28	T = 37.65
Union density	overall	0.40	0.20	0.08	0.84	0.50	N = 751
	between		0.19	0.13	0.78	0.48	n = 20
	within		0.08	0.20	0.69	0.19	T = 37.55
Minimum wage	overall	0.24	0.25	0.00	0.70	1.07	N = 820
	between		0.22	0.00	0.54	0.94	n = 20
	within		0.13	-0.30	0.76	0.55	T = 41
log(Unempl. rate)	overall	1.69	0.77	-5.81	3.23	0.45	N = 820
	between		0.51	0.15	2.41	0.30	n = 20
	within		0.58	-4.26	3.04	0.34	T = 41
log(Skill Ratio)	overall	-1.69	0.75	-3.80	0.07	0.45	N = 763
	between		0.62	-2.78	-0.38	0.37	n = 20
	within		0.45	-2.86	-0.82	0.26	T = 38.15
log(Skill)*log(Unempl. rate)	overall	-2.76	1.89	-7.23	12.90	0.69	N = 763
	between		1.52	-5.63	0.23	0.55	n = 20
	within		1.18	-5.40	9.91	0.43	T = 38.15
Import intensity	overall	0.13	0.07	0.01	0.56	0.58	N = 735
	between		0.06	0.02	0.30	0.49	n = 20
	within		0.04	-0.03	0.38	0.32	T = 36.75
R&D	overall	0.05	0.03	0.00	0.16	0.73	N = 649
	between		0.03	0.00	0.10	0.65	n = 20
	within		0.02	0.01	0.15	0.33	T = 32.45

Table 2: Labour market institutions and wage inequality on the period 1973-2011.

	GLS						CCEP	
	(1)		(2)		(3)		(4)	
	9/1-Decile Ratio	9/5-Decile Ratio	5/1-Decile Ratio	9/1-Decile Ratio	Coef./se	p-value	Coef./se	p-value
Institutional variables:	ref.	ref.	ref.	ref.			ref.	
Employment Protection Legislation(EPL)	-0.056** (0.02)	0.00	-0.019* (0.01)	0.04	-0.052*** (0.01)	0.00	-0.038* (0.02)	0.04
Benefit Replacement Rate	-0.157*** (0.04)	0.00	-0.080*** (0.02)	0.00	-0.114*** (0.03)	0.00	-0.119** (0.05)	0.01
Benefit Duration	-0.041 (0.02)	0.09	0.008 (0.01)	0.58	-0.031 (0.02)	0.09	0.011 (0.03)	0.70
Tax Wedge	-0.431*** (0.09)	0.00	-0.111* (0.05)	0.04	-0.189** (0.06)	0.00	-0.207* (0.10)	0.04
Coordination of Wage Setting	-0.011** (0.00)	0.00	-0.009*** (0.00)	0.00	-0.004 (0.00)	0.08	-0.006* (0.00)	0.02
Union Density	-0.119 (0.07)	0.08	-0.153*** (0.04)	0.00	0.017 (0.04)	0.70	-0.015 (0.10)	0.88
Minimum Wage	-0.080*** (0.02)	0.00	-0.032* (0.01)	0.02	-0.026 (0.02)	0.10	-0.104*** (0.02)	0.00
Supply and demand conditions:	ref.		ref.		ref.		ref.	
Ln(Skill Ratio)	-0.119*** (0.03)	0.00	-0.010 (0.02)	0.59	-0.130*** (0.02)	0.00	-0.062 (0.04)	0.10
Ln(Unemployment Rate)	-0.050* (0.02)	0.03	-0.041** (0.01)	0.00	0.008 (0.02)	0.58	-0.026 (0.02)	0.21
Ln(Unemploymentrate)*Ln(Skill Ratio)	0.005 (0.01)	0.74	-0.011 (0.01)	0.17	0.028** (0.01)	0.00	0.001 (0.01)	0.97
Trade and Technology:	ref.		ref.		ref.		ref.	
Import Intensity	-0.466*** (0.13)	0.00	-0.221** (0.08)	0.00	-0.279*** (0.06)	0.00	0.172 (0.17)	0.32
R&D Intensity	-0.972*** (0.20)	0.00	-0.486*** (0.11)	0.00	-0.205 (0.14)	0.14	0.057 (0.22)	0.80
Observations	421		421		424		421	
Number of Countries	20		20		20		20	
Avg years pr country	21.1		21.1		21.2		21.1	
F-test of all the exogenous variables	357.94	(0.00)	252.33	(0.00)	236.03	(0.00)	74.60	(0.00)
F-test of institutional variables	96.37	(0.00)	88.42	(0.00)	75.73	(0.00)	58.60	(0.00)
F-test of non-institutional variables	168.45	(0.00)	85.50	(0.00)	124.87	(0.00)	23.10	(0.00)
R ²	0.94		0.94		0.93		0.61	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

a) All estimations include dummies for countries and years and assumes country-level heteroscedasticity.

b) Numbers in parenthesis are standard deviations.

Variables:

The Benefit Replacement Ratio, Union Density, Minimum Wage, Import Intensity, R&D Intensity and Tax Wedge are proportions with range (0-1), Benefit Duration has a range (0-1.1) EPL Overall ranges (0-3) and Coordination ranges (1-5).

Tests :

Modified Wald test for groupwise heteroskedasticity in cross-sectional time-series FGLS regression model,

H0: $\sigma_i^2 = \sigma^2$ for all i , $\chi^2(20) = 2543174.8$ and p-value = 0.

Breush-Pagan test $\chi^2(45) = 149.31$ and p-value is equal to = 0.00.

Pesaran's test of cross sectional independence = -2.99 and p-value equal to 0.00. The average absolute value of the off-diagonal elements = 0.32

Friedman's test of cross sectional independence = 3.53 and p-value equal to 0.94

Frees' test of cross sectional independence = .89 and critical value for $\alpha = 0.01$ is equal to 0.31

Table 3: Quantitative implications of changes in the institutional variables. Change in $\log(w_{90}/w_{10})$

Panel A <i>One Std.dev Change</i>	EPL Overall	Benefit Rep. Rate	Benefit Duration	Tax Wedge	Coord	Union Density	Min Wage	Immigration	EPL Temp.	EPL Reg.
Coefficients from:										
Table 2, Baseline model	-0.03	-0.03	-0.01	-0.06	-0.01	-0.03	-0.02			
Table 5, EPL temp. and reg.		-0.02	0.00	-0.04	-0.01	-0.01	0.00		-0.02	0.01
Table 6, Immigration	-0.04	-0.03	-0.02	-0.07	-0.01	-0.04	-0.02	0.02		
Panel B <i>Change from Min to Max</i>										
Coefficients from:										
Table 2, Baseline model	-0.11	-0.14	-0.04	-0.23	-0.04	-0.09	-0.05			
Table 5, EPL temp. and reg.		-0.08	0.01	-0.14	-0.03	-0.02	0.00		-0.07	0.05
Table 6, Immigration	-0.14	-0.14	-0.07	-0.27	-0.04	-0.13	-0.06	0.12		

Table 4: Indirect effects of labour market institutions via unemployment on wage inequality. Estimation Period 1973-2011

	(1)		(2)		(3)	
	9/1-Decile Ratio	9/1-Decile Ratio	9/5-Decile Ratio	9/5-Decile Ratio	5/1-Decile Ratio	5/1-Decile Ratio
	Coef./se	p-value	Coef./se	p-value	Coef./se	p-value
Institutional variables:						
Employment Protection Legislation(EPL)	-0.072*** (0.02)	0.00	-0.021* (0.01)	0.03	-0.065*** (0.01)	0.00
Benefit Replacement Rate	-0.263*** (0.05)	0.00	-0.141*** (0.03)	0.00	-0.167*** (0.04)	0.00
Benefit Duration	-0.052 (0.03)	0.06	0.012 (0.01)	0.37	-0.056** (0.02)	0.01
Tax Wedge	-0.498*** (0.10)	0.00	-0.092 (0.05)	0.10	-0.275*** (0.07)	0.00
Coordination of Wage Setting	-0.010* (0.00)	0.01	-0.009*** (0.00)	0.00	-0.002 (0.00)	0.49
Union Density	-0.084 (0.07)	0.25	-0.045 (0.04)	0.26	-0.018 (0.05)	0.70
Minimum Wage	-0.066** (0.02)	0.00	-0.019 (0.01)	0.14	-0.021 (0.02)	0.20
Supply and demand conditions:						
Ln(Skill Ratio)	-0.553*** (0.11)	0.00	-0.605*** (0.06)	0.00	-0.147* (0.07)	0.04
Ln(Share of UNR caused by LMIs)	-0.004 (0.06)	0.95	-0.174*** (0.03)	0.00	0.104* (0.04)	0.02
Ln(UNR controlled for Effects of LMIs)	-0.032 (0.02)	0.17	-0.015 (0.01)	0.22	0.004 (0.02)	0.79
Ln(Skill)*Ln(UNR by LMIS)	-0.084*** (0.02)	0.00	-0.116*** (0.01)	0.00	-0.005 (0.01)	0.69
Ln(Skill)*Ln(UNR unaff. by LMIs)	0.019 (0.01)	0.16	0.006 (0.01)	0.45	0.026** (0.01)	0.01
Trade and Technology:						
Import Intensity	-0.445*** (0.13)	0.00	-0.120 (0.07)	0.10	-0.291*** (0.06)	0.00
R&D Intensity	-1.129*** (0.21)	0.00	-0.591*** (0.11)	0.00	-0.302* (0.14)	0.03
Observations	420		420		423	
Number of Countries	20		20		20	
Avg years pr country	21.0		21.0		21.1	
F-test of all the exogenous variables	424.77	(0.00)	503.39	(0.00)	244.18	(0.00)
F-test of institutional variables	101.25	(0.00)	100.24	(0.00)	72.05	(0.00)
F-test of non-institutional variables	195.58	(0.00)	258.42	(0.00)	131.56	(0.00)
R ²	0.95		0.95		0.93	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

a) All estimations include dummies for countries and years and assumes country-level heteroscedasticity.

b) Numbers in parenthesis are standard deviations.

Variables:

The Benefit Beplacment Ratio, Union Density, Minimum Wage, Import Intensity, R&D Intensity and Tax Wedge are proportions with range (0-1), Benefit Duration has a range (0-1.1) EPL Overall ranges (0-3) and Coordination ranges (1-5).

Table 5: Labour market institutions, and separate measures of EPL for regular and temporary positions. Estimation Period 1985-2011

	(1)		(2)		(3)		(4)	
	9/1-Decile Ratio	9/1-Decile Ratio	9/5-Decile Ratio	9/5-Decile Ratio	5/1-Decile Ratio	5/1-Decile Ratio	9/1-Decile Ratio	9/1-Decile Ratio
	Coef./se	p-value	Coef./se	p-value	Coef./se	p-value	Coef./se	p-value
Institutional variables:								
EPL for Regular contracts	0.013 (0.03)	0.62	0.039** (0.02)	0.01	0.004 (0.01)	0.79		
EPL for Temporary Contracts	-0.013* (0.01)	0.02	-0.005 (0.00)	0.10	-0.016*** (0.00)	0.00		
Benefit Replacement Rate	-0.091 (0.05)	0.09	-0.065* (0.03)	0.03	-0.081* (0.03)	0.02	-0.084 (0.05)	0.11
Benefit Duration	0.014 (0.03)	0.67	0.023 (0.02)	0.15	0.006 (0.02)	0.80	0.011 (0.03)	0.73
Tax Wedge	-0.256* (0.11)	0.02	-0.145* (0.06)	0.02	0.045 (0.08)	0.56	-0.255* (0.11)	0.02
Coordination of Wage Setting	-0.007 (0.01)	0.19	-0.003 (0.00)	0.30	-0.003 (0.00)	0.48	-0.008 (0.01)	0.14
Union Density	-0.029 (0.10)	0.77	-0.009 (0.06)	0.88	-0.004 (0.06)	0.95	-0.074 (0.09)	0.40
Minimum Wage	-0.007 (0.04)	0.86	0.031 (0.02)	0.14	-0.017 (0.03)	0.52	-0.002 (0.04)	0.97
Supply and demand conditions:								
Ln(Skill Ratio)	-0.099* (0.04)	0.01	-0.002 (0.03)	0.92	-0.063* (0.03)	0.03	-0.097* (0.04)	0.01
Ln(Unemployment Rate)	-0.066** (0.02)	0.01	-0.054*** (0.02)	0.00	-0.018 (0.02)	0.33	-0.067** (0.02)	0.00
Ln(Unemploymentrate)*Ln(Skill Ratio)	-0.020 (0.02)	0.21	-0.025* (0.01)	0.02	0.002 (0.01)	0.83	-0.021 (0.02)	0.17
Trade and Technology:								
Import Intensity	-0.369* (0.15)	0.01	-0.166* (0.08)	0.04	-0.201** (0.07)	0.00	-0.332* (0.15)	0.02
R&D Intensity	-1.034*** (0.27)	0.00	-0.416** (0.16)	0.01	-0.237 (0.18)	0.19	-1.115*** (0.26)	0.00
EPL Overall							-0.044* (0.02)	0.03
Observations	321		321		324		321	
Number of Countries	20		20		20		20	
Avg years pr country	16.1		16.1		16.2		16.1	
F-test of all the exogenous variables	186.72	(0.00)	132.06	(0.00)	84.51	(0.00)	186.81	(0.00)
F-test of institutional variables	19.01	(0.01)	32.71	(0.00)	30.16	(0.00)	18.82	(0.01)
F-test of non-institutional variables	116.98	(0.00)	61.20	(0.00)	41.60	(0.00)	128.10	(0.00)
R ²	0.96		0.95		0.80		0.96	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

a) All estimations include dummies for countries and years and assumes country-level heteroscedasticity

b) Numbers in parenthesis are standard deviations

Variables:

The Benefit Replacement Ratio, Union Density, Minimum Wage, Import Intensity, R&D Intensity and Tax Wedge are proportions with range (0-1),Benefit Duration has a range (0-1.1) EPL for Regular and Temporary Contracts ranges (0-5) and Coordination ranges (1-5).

Table 6: Labour market institutions, immigration, and interaction between minimum wage and immigration on wage inequality. Estimation Period: 1973-2011

	(1)		(2)		(3)		(4)		(5)	
	9/1-Decile Ratio	p-value	9/5-Decile Ratio	p-value	5/1-Decile Ratio	p-value	9/1-Decile Ratio	p-value	5/1-Decile Ratio	p-value
	Coef./se		Coef./se		Coef./se		Coef./se		Coef./se	
Institutional variables:										
Employment Protection Legislation(EPL)	-0.070*** (0.02)	0.00	-0.023* (0.01)	0.02	-0.057*** (0.01)	0.00	-0.070*** (0.02)	0.00	-0.057*** (0.01)	0.00
Benefit Replacement Rate	-0.160*** (0.04)	0.00	-0.081*** (0.02)	0.00	-0.112*** (0.03)	0.00	-0.156*** (0.04)	0.00	-0.111*** (0.03)	0.00
Benefit Duration	-0.069** (0.02)	0.00	0.001 (0.01)	0.97	-0.052** (0.02)	0.00	-0.061* (0.03)	0.01	-0.053** (0.02)	0.01
Tax Wedge	-0.493*** (0.09)	0.00	-0.119* (0.05)	0.03	-0.262*** (0.06)	0.00	-0.494*** (0.09)	0.00	-0.270*** (0.06)	0.00
Coordination of Wage Setting	-0.011** (0.00)	0.00	-0.009*** (0.00)	0.00	-0.004 (0.00)	0.08	-0.011*** (0.00)	0.00	-0.004 (0.00)	0.07
Union Density	-0.174** (0.07)	0.01	-0.164*** (0.04)	0.00	-0.001 (0.04)	0.99	-0.150* (0.07)	0.03	0.001 (0.04)	0.98
Minimum Wage	-0.089*** (0.02)	0.00	-0.033* (0.01)	0.02	-0.032* (0.02)	0.03	-0.115*** (0.03)	0.00	-0.026 (0.02)	0.25
Supply and demand conditions:										
Ln(Skill Ratio)	-0.120*** (0.03)	0.00	-0.008 (0.02)	0.67	-0.126*** (0.02)	0.00	-0.118*** (0.03)	0.00	-0.125*** (0.02)	0.00
Ln(Unemployment Rate)	-0.053* (0.02)	0.02	-0.042** (0.01)	0.00	0.006 (0.01)	0.66	-0.050* (0.02)	0.03	0.005 (0.01)	0.75
Ln(Unemploymentrate)*Ln(Skill Ratio)	-0.002 (0.01)	0.89	-0.013 (0.01)	0.12	0.023** (0.01)	0.01	-0.000 (0.01)	1.00	0.022* (0.01)	0.01
Trade and Technology:										
Import Intensity	-0.480*** (0.13)	0.00	-0.216** (0.08)	0.00	-0.322*** (0.06)	0.00	-0.487*** (0.13)	0.00	-0.324*** (0.07)	0.00
R&D Intensity	-0.758*** (0.21)	0.00	-0.461*** (0.11)	0.00	-0.123 (0.14)	0.38	-0.800*** (0.21)	0.00	-0.126 (0.14)	0.38
Immigration:										
Net Immigration	0.861*** (0.21)	0.00	0.152 (0.12)	0.22	0.665*** (0.14)	0.00	0.684* (0.27)	0.01	0.700*** (0.20)	0.00
Immigration if min wage							0.366 (0.34)	0.29	-0.056 (0.24)	0.82
Observations	421		421		424		421		424	
Number of Countries	20		20		20		20		20	
Avg years pr country	21.1		21.1		21.2		21.1		21.2	
F-test of all the exogenous variables	387.87	(0.00)	256.30	(0.00)	275.90	(0.00)	388.66	(0.00)	278.34	(0.00)
F-test of institutional variables	117.18	(0.00)	91.26	(0.00)	96.10	(0.00)	115.47	(0.00)	87.75	(0.00)
F-test of non-institutional variables	191.73	(0.00)	87.18	(0.00)	156.74	(0.00)	192.63	(0.00)	156.21	(0.00)
R ²	0.95		0.94		0.93		0.95		0.93	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

a) All estimations include dummies for countries and years and assumes country-level heteroscedasticity

b) Numbers in parenthesis are standard deviations

Variables:

The Benefit Replacement Ratio, Union Density, Minimum Wage, Import Intensity, R&D Intensity, Net Immigration and Tax Wedge are proportions with range (0-1), Benefit Duration has a range (0-1.1) EPL Overall ranges (0-3) and Coordination ranges (1-5)

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A Replication

This section replicates the main findings in Koeniger et al. (2007). The replication is done in several steps: First, the main model in Koeniger et al. (2007) is estimated on revised data but with the old figures for coordination and skill from Koeniger et al. (2007), since these data are no longer available and cannot be updated from the original sources. Secondly, the main model in Koeniger et al. (2007) is estimated on the revised data and new measures of coordination and skill attainments, respectively from Visser (2011) and Barro and Lee (2010). These results are the new baseline scenario, which can be compared with the results of the extended data set in 4. The extended data set contains a longer time period and more OECD countries.

Before we turn to the results of the replication, it is worth looking at the main changes in the revised data (see appendix 3 for a comprehensive review). The figures for the income deciles before 1990 in Sweden, is revised down compared to the data set in Koeniger et al. (2007). This is detected by comparing the data in OECD (1996) Table 3.1 with the new data from OECD (2010d). The figures for Germany is substantially different compared to the original data set. And the development in Germany shows that the 9/1 - decile ratio became more compressed until the beginning of the 1990s, and then increased more slowly towards the end of sample period than the original figures for Germany illustrated. In Italy are the income distribution for men now more volatile than in the data set by Koeniger et al. (2007). For all the other countries in the sample are the development in the decile ratios in the previous and this revised data set, very similar. The largest changes in the labor market institutions are found in the measure of benefit replacement and benefit duration, especially for Canada. There are also level-differences in the measure of minimum wage for France and the Netherlands. The data on wage dispersion for Canada in 1973 is no longer available, and not included in the analysis. The measure of EPL was found in OECD (2010b), where they exist from 1985 and onwards. The data was extended backwards using the growth rate of the measure in the original paper. However, as mentioned in the introduction, to be able to compare the revised results with the previous findings in Koeniger et al. (2007), the replication is performed on the revised data and the time series for coordination and skill attainment from Koeniger et al. (2007).

In spite of that the time series are revised, the labor market institutions do with the exception of the union variables, still have a compressing significant effect on the wage differentials, cf. Table A. Note that the replicated results are based on the revised data from OECD and the old figures for coordination and skill from Koeniger et al. (2007). The scope of the coefficients in Koeniger et al. (2007) seem to be quite sensitive to revising the data, cf. Figure A1, Figure A. The figure show the relative values of the estimated coefficients from estimation on the replication on the revised the original data. The relative value is equal to one if the two estimations lead to the same coefficient. The effect of employment protection legislation appears to be smaller in the replication than in Koeniger et al. (2007), while benefit replacement rate and tax wedge appear to have a more compressing effect. The estimated coefficient of coordination and union density have changed sign, and have an increasing effect on the wage dispersion, but only union density is significant.

Also the control variables changes due to the revision of the time series, but all variables, except the unemployment rate, have the same effects as in Koeniger et al. (2007).

On the other hand, the new data sources for coordination and skill do not to change the estimated coefficients of the other variables to a large extent, cf. Figure A1, Figure A. and B. The estimated effect of unemployment rate is somewhat lower, but otherwise are the coefficients in line with the results on the revised data. The effect of the new variable for coordination is more in line with previous finding and compresses the wage differentials, but is not significant in the baseline scenario or in Koeniger et al. (2007). The new variable of skill-attainment has gone from having an increasing effect to having a compressing effect on the wage dispersion at the 9/1- and 5/1-decile ratio level, and is significant. However, skill-attainment was prolonged with trend in skill-attainment for the years after 1990 for the US and after 1995 for the other countries in the sample in Koeniger et al. (2007) due to data limitations at the time of investigation. A comparison of the new and original data show that US after 1990 has turned out differently than the prolonging implied. If we exclude US after 1990 in the original data set and estimate equation 1, the coefficient of skill-attainment becomes negative also here. The previous results for skill-attainment therefore seem less robust. It is, however, reasonable to assume that an increase in relative supply of high-skilled workers lowers their wages, as this is exactly what we find when the US is excluded after 1990 on the original data set and in the revised results. The results are now more in line with what we expect from theory, as higher labor supply of high-skilled workers meets the demand. We also consider the skill attainment to be more robust in the data series for the extended sample, as the data has more variation across time and countries.

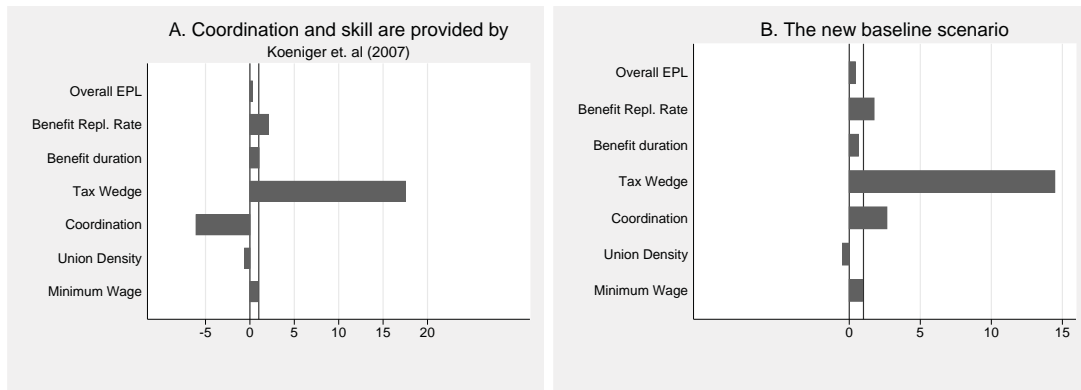


Figure A1: The estimated coefficients from Table A and Koeniger et al. (2007). The relative size is equal to one if the estimated coefficients from the two tables are equal.

Table A1: Replication of the preferred model in Koeniger et al. (2007). Estimation Period 1973-1998.

	(1)		(2)		(3)	
	9/1-Decile Ratio	Ratio	9/5-Decile Ratio	Ratio	5/1-Decile Ratio	Ratio
	Coef./se	p-value	Coef./se	p-value	Coef./se	p-value
Institutional variables:						
Employment Protection Legislation(EPL)	-0.08*	0.01	-0.07***	0.00	-0.03	0.21
	(0.03)		(0.02)		(0.02)	
Benefit Replacement Rate	-0.39***	0.00	-0.17***	0.00	-0.23***	0.00
	(0.06)		(0.03)		(0.04)	
Benefit Duration	-0.17*	0.01	-0.05	0.12	-0.11*	0.01
	(0.07)		(0.03)		(0.04)	
Tax Wedge	-0.81***	0.00	-0.33***	0.00	-0.32***	0.00
	(0.15)		(0.08)		(0.10)	
Coordination of Wage Setting	0.01	0.69	0.03	0.11	-0.02	0.38
	(0.03)		(0.02)		(0.02)	
Union Density	0.26*	0.02	-0.01	0.88	0.16*	0.03
	(0.11)		(0.06)		(0.07)	
Minimum Wage	-0.22***	0.00	-0.15***	0.00	-0.08*	0.02
	(0.05)		(0.02)		(0.03)	
Supply and demand conditions:						
Ln(Skill Ratio)	0.16**	0.01	0.09**	0.00	0.07	0.07
	(0.06)		(0.03)		(0.04)	
Ln(Unemployment Rate)	0.03	0.23	-0.04**	0.01	0.07***	0.00
	(0.03)		(0.01)		(0.02)	
Ln(Unemploymentrate)*Ln(Skill Ratio)	0.05**	0.00	-0.02*	0.04	0.06***	0.00
	(0.02)		(0.01)		(0.01)	
Trade and Technology:						
Import Intensity	0.92*	0.03	0.68**	0.00	0.23	0.41
	(0.42)		(0.22)		(0.27)	
R&D Intensity	-1.38***	0.00	-0.81***	0.00	-0.65**	0.00
	(0.30)		(0.17)		(0.21)	
Observations	169		169		169	
Number of Countries	11		11		11	
Avg years pr country	15.4		15.4		15.4	
F-test of all the exogenous variables	590.26	(0.00)	460.87	(0.00)	332.01	(0.00)
F-test of institutional variables	311.67	(0.00)	246.78	(0.00)	163.23	(0.00)
F-test of non-institutional variables	80.23	(0.00)	58.78	(0.00)	76.99	(0.00)
R^2	0.98		0.97		0.98	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

a) All estimations include dummies for countries and years and correct for country-level heteroscedasticity.

b) Numbers in parenthesis are standard deviations.

Table A2: The new baseline scenario of the preferred model in Koeniger et al. (2007), Estimation Period 1973-1998

	(1)		(2)		(3)	
	9/1-Decile Ratio	Ratio	9/5-Decile Ratio	Ratio	5/1-Decile Ratio	Ratio
	Coef./se	p-value	Coef./se	p-value	Coef./se	p-value
Institutional variables:						
Employment Protection Legislation(EPL)	-0.13*** (0.03)	0.00	-0.07*** (0.02)	0.00	-0.06** (0.02)	0.00
Benefit Replacement Rate	-0.33*** (0.05)	0.00	-0.16*** (0.03)	0.00	-0.19*** (0.04)	0.00
Benefit Duration	-0.11 (0.06)	0.10	-0.05 (0.04)	0.14	-0.07 (0.04)	0.10
Tax Wedge	-0.67*** (0.15)	0.00	-0.24** (0.08)	0.00	-0.26* (0.10)	0.01
Coordination of Wage Setting	-0.00 (0.00)	0.13	-0.00 (0.00)	0.13	-0.00 (0.00)	0.20
Union Density	0.20 (0.12)	0.08	-0.07 (0.06)	0.29	0.14 (0.08)	0.06
Minimum Wage	-0.25*** (0.05)	0.00	-0.16*** (0.03)	0.00	-0.10** (0.03)	0.00
Supply and demand conditions:						
Ln(Skill Ratio)	-0.16** (0.05)	0.00	0.00 (0.03)	0.97	-0.18*** (0.04)	0.00
Ln(Unemployment Rate)	0.00 (0.03)	0.95	-0.04** (0.01)	0.00	0.06*** (0.02)	0.00
Ln(Unemploymentrate)*Ln(Skill Ratio)	0.04** (0.02)	0.00	-0.02 (0.01)	0.06	0.06*** (0.01)	0.00
Trade and Technology:						
Import Intensity	0.50 (0.41)	0.22	0.47* (0.21)	0.03	0.00 (0.27)	0.99
R&D Intensity	-0.58 (0.34)	0.09	-0.45* (0.19)	0.02	-0.04 (0.23)	0.85
Observations	169		169		169	
Number of Countries	11		11		11	
Avg years pr country	15.4		15.4		15.4	
F-test of all the exogenous variables	631.36	(0.00)	390.61	(0.00)	452.60	(0.00)
F-test of institutional variables	285.66	(0.00)	220.51	(0.00)	157.29	(0.00)
F-test of non-institutional variables	62.72	(0.00)	43.69	(0.00)	73.33	(0.00)
R^2	0.98		0.97		0.98	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

a) All estimations include dummies for countries and years and correct for country-level heteroscedasticity.

b) Numbers in parenthesis are standard deviations.

B Data Appendix

The data appendix describes where the data used in this paper is found and how the variables are build up.

Wage differentials:

The measure of wage inequality used in this paper is the ratio of 9th to 1th , 9th to 5th (median), and 5th to 1th decile-ratio. The deciles are gross earnings of full-time dependent male employees. Most of the numbers are from the OECD (2010d).

The data are prolonged backwards for some countries using OECD (1996), Table 3.1: Austria 1980 to 1989, Belgium 1986 to 1990, Canada from 1981 to 1994, Germany from 1983 to 1991 and Italy from 1979 to 1985. For Norway and Denmark the data are extended backwards using OECD (1996), Table 3.1, but by using the data for the total workforce between 1980 and 1990.

Employment Protection Legislation Indicator (EPL):

The OECD indicators of EPL are synthetic indicators of the strictness of regulation on dismissals of individuals or groups, and the procedures involved in hiring workers on fixed-term or temporary work agency contracts. They are compiled of 21 items, and divided into three areas: Individual dismissal of workers with regular contracts, additional cost for collective dismissals, regulations of temporary contracts, and an overall measure of EPL which is an average of the indicators for regulations for temporary and regular contracts.

The main data source is OECD (2010c). The series is prolonged backwards by the growth rate of the measure of employment protection “ep” in the Nickell (2006) database for all countries before 1985, except New Zealand that was prolonged backwards before 1990. The Nickell (2006) figures are based on the figures in Blanchard and Wolfers (2000).

Benefit Replacement Rates:

The benefit replacement rate is a measure of how much each unemployed worker receives in benefit from the government. OECD has information about the unemployment benefits for year 1, the average of year two and three, and the average of year four and five for unemployed person in different family situations and with different initial income level. The three different family types are: Single, with a dependent spouse and with a working spouse.

The different income levels are: 67 percent and 100 percent of average earnings. The figures are the average over family types. This results in six different groups: $brra_{xy}$ where $x = 67, 100$ (the percent of average earnings) and $y = 1, 2, 4$ (the benefits received in year y). Year 2 is the average of year three and four, and year 4 is the average of year four and five. The benefit replacement rate is calculated by taking the average of the first year brr_{671} and brr_{1001} , while the other groups are used to calculate benefit duration below.

The data is received from OECD by mail.

Benefit Duration:

The benefit duration is a measure of how long benefits last when you are unemployed and how the amount given changes over the duration. Benefit duration is given by the equation:

$$bd_x = \alpha \frac{brr_{x2}}{brr_{x1}} + (1 - \alpha) \frac{brr_{x4}}{brr_{x1}}$$

Where brr_{xy} is the benefit replacement rate for the employment situation $x = 67, 100$ received in year $y = 67, 100$. $\alpha = 0.6$ and gives more weight to the second and third year as

compared to the fourth and fifth year. Benefit duration is equal to zero if benefit replacement stops after one year, i.e. $brr_{x2} = brr_{x4} = 0$, and $bd_x = 0$. Benefit duration is equal to one if benefits are equal in all of the years, i.e. $brr_{x1} = brr_{x2} = brr_{x4}$, and $bd_x = 1$. Some countries have increasing benefits with time and in those countries are $bd > 1$.

The data is based on the benefit replacement ratio for different groups, and are as described above received from OECD by mail.

Tax Wedge:

Tax wedge is equal to the sum of the employment tax rate ($t1$), the direct tax rate ($t2$) and the indirect tax rate ($TW = t1 + t2 + t3$). It measures the total amount the government receives as an effect of taxing the labor force. It can also be seen as the difference between the employees take-home earnings and the total cost of employing them.

$t1$: is equal to employers actual tax payment calculated by taxes paid by the employer to the government and the sum of wages received by employees ($t1 = \frac{EC}{IE-EC}$). EC - Employers Social Security contributions are the actual or imputed payments to social insurance schemes to make provision for social insurance benefits. They may be made by employers on behalf of their employees, self-employed or non-employed persons on their own behalf. The contributions may be compulsory or voluntary and the schemes may be funded or unfunded. IE - Compensation of employees is made up of two components, wages and salaries payable in cash or in kind. These include the values of any social contributions, income taxes, etc., payable by the employee even if they are actually withheld by the employer and paid on behalf of the employee.

$t2$: Direct Tax Rate is calculated by the following formula $t2 = \frac{IT+WC}{HRC}$. Where WC- Employees social security contributions are the actual or imputed payments to social insurance schemes to make provision for social insurance benefits. They may be made by employers on behalf of their employees, self-employed or non-employed persons on their own behalf. The contributions may be compulsory or voluntary and the schemes may be funded or unfunded. IT - Income tax is current taxes on income, wealth, etc. HCR- Current receipts of households consist of all income to a household, whether monetary or in kind received by the household or by individual members of the household. It includes income from employment, investments, current transfers, etc.

$t3$: Indirect Tax Rate is calculated by the following formula $t3 = \frac{TX-SB}{CC}$. Where TX - Indirect taxes is taxes on consumption goods. SB - The value of subsidies is value of subsidies paid by government. CC - Final consumption is final consumption expenditure for entire economy.

All variables were found in OECD National Accounts. EC (NFD12R), IE (NFD1R), WC (NFD61P-NFD12R), IT (NFD5P), HCR (NFB5GR) were found in OECD (2013a), Table 14.A, for household sector, while SB (NFD3P) was found in OECD (2013a), Table 14.A, for general government sector. TX(D2) was found in OECD (2013b), Table 10, for general government sector. CC(P3) was found in OECD (2013c).

The series are extended backwards with the growth rate in the time series for tax wedge used in Sparrman (2011) before 1995 for: Austria, Belgium, Denmark, France, Germany, Netherlands, Norway, Portugal and Sweden. The time series are extended backwards before the 1990 for UK and Italy, before 1975 for Finland, before 2002 for Ireland, Before 2000 for Spain and before 1998 for US. Australia, Canada, New Zealand and Switzerland are replaced for the entire time series.

Coordination of Wage bargaining: The coordination of wage bargaining is based on Kenworthys 5-point classification of wage-setting, cf. Visser (2011). The measure is on a scale of 1 to 5.

Trade Union Density:

Trade union density corresponds to the ratio of wage and salary earners that are trade union members, divided by the total number of wage and salary earners (OECD Labor Force Statistics). Density is calculated using survey data, wherever possible, and administrative data adjusted for non-active and self-employed members otherwise.

The data source is OECD (2010f).

Minimum Wage:

The minimum wage is measured as the minimum wage relative to median wage and is taken from OECD (2010a). The countries with no minimum wage are set to zero.

Unemployment Rate (UNR):

The standardized unemployment rate (UNR) is from OECD (2013d). The data are prolonged backward for some countries, using the growth rate of numbers found in older versions of OECDs Economic Outlook: for Germany for Former Federal Republic of Germany before 1992 using numbers from OECD (2011a), Ireland before 1990 using OECD (2012) and Spain before 1967 using OECD (2005).

Education attainment:

This is the ratio of the overall population over 15 with some level of tertiary education. The data are taken from the Barro-Lee database, Barro and Lee (2010), on educational attainment, where levels are given every fifth year. We have filled in the missing years by linear approximation.

Import intensity

The import intensity is measured by imports over value added in the manufacturing sector. Gross value added is the value of output subtracted the value of intermediate consumption. It is a measure of the contribution to GDP made by an individual producer, industry or sector. The numbers are taken from OECD (2010e).

R&D intensity

The R&D intensity is measured by the R&D cost over value added in the manufacturing sector. The numbers for R&D cost in the manufacturing sector are taken from OECD's ANBERD database OECD (2011d), while the numbers for value added are collected from OECD (2010e). The OECD's ANBERD database presents annual data on industrial R&D expenditures. Time series are available from 1987 to 2010.

OECD's ANBERD data base is prolonged backwards by the growth rate before 1987 with data in OECD (2011c). The latter data source contains information in the time period 1973 to 1997 (or 1998). Data for Germany consists of data for Former Federal Republic of Germany prior to 1991. In addition, the time series for Austria was missing in the period 1999 to 2001, and was interpolated. The time series in New Zealand was missing in every second year from 1994 to 2008 and interpolated as well. The missing observations in Sweden before 1995 are replaced by observations from the Eurostat (2012), variable "rd_e_berdcost".

Immigration:

The measure of immigration is found in Nations (2010), table for Net Migration Rate. The data is provided for every fifth year, and is interpolated.

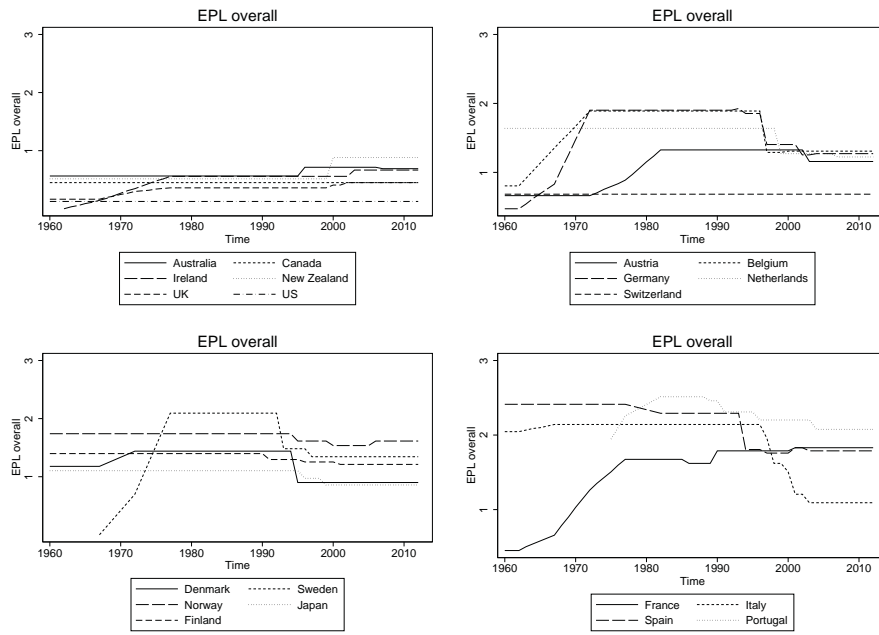


Figure B1: Overall EPL

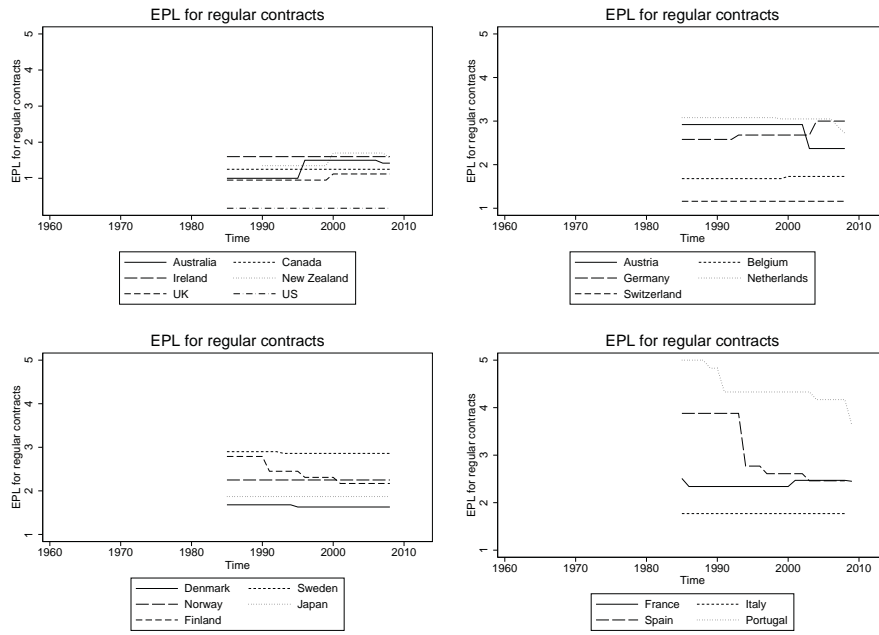


Figure B2: EPL for Regular Contract

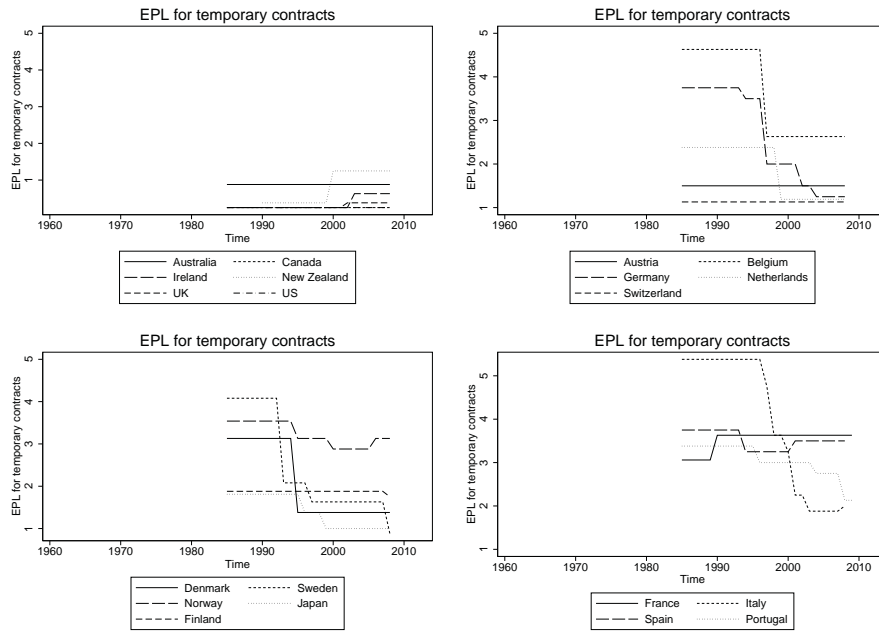


Figure B3: EPL for Temporary Contract

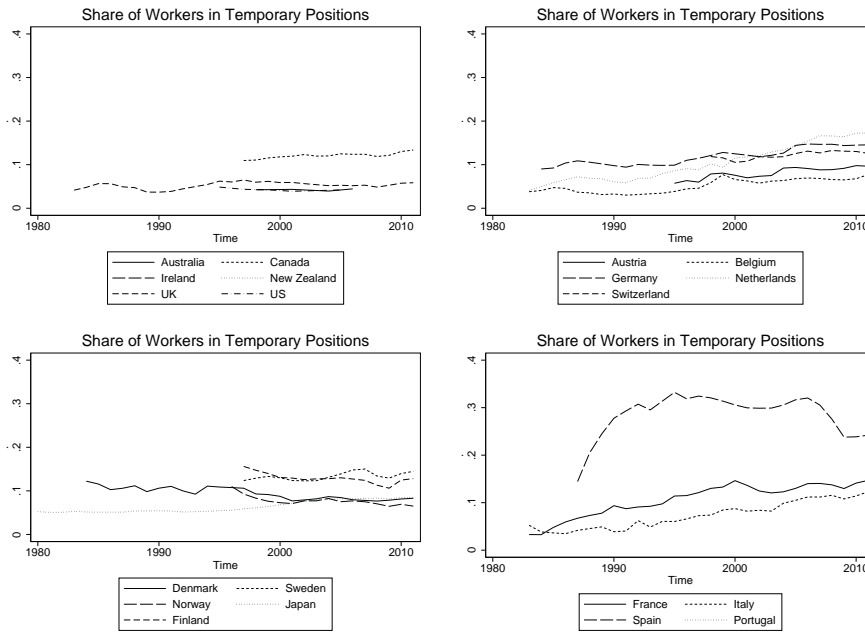


Figure B4: The Share of Workers in Temporary Positions

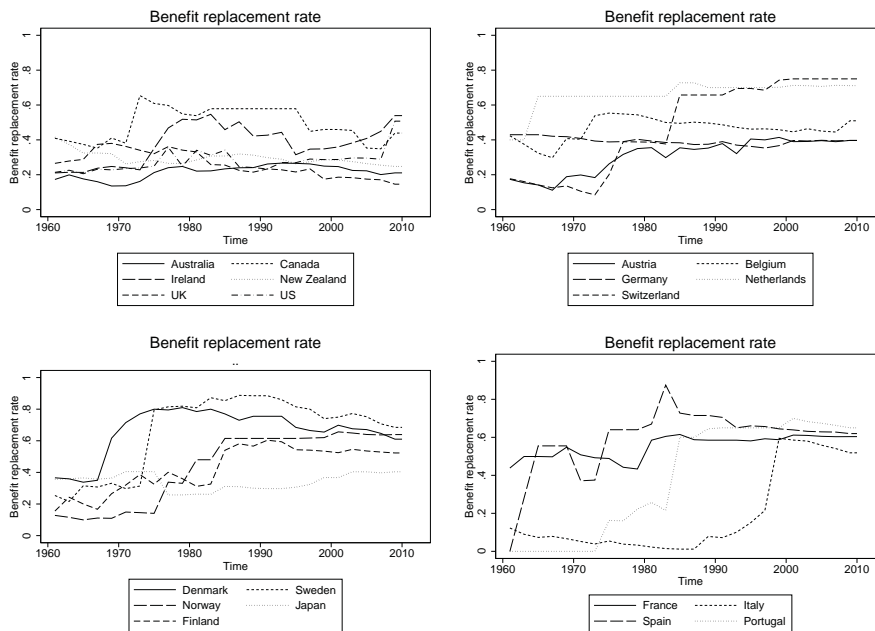


Figure B5: Unemployment Benefit Replacement Rate

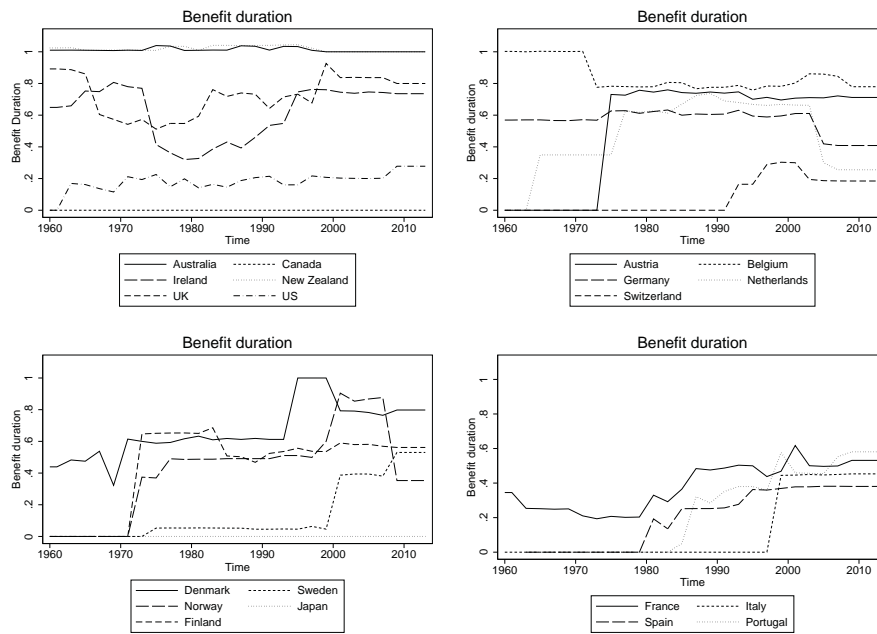


Figure B6: Development of the Unemployment Benefit Duration

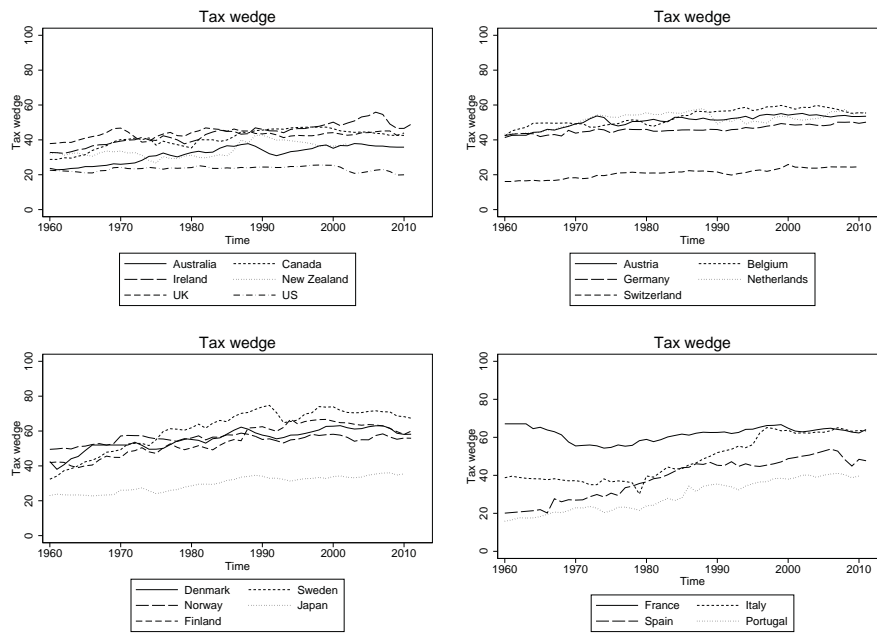


Figure B7: Development of the Tax Wedge

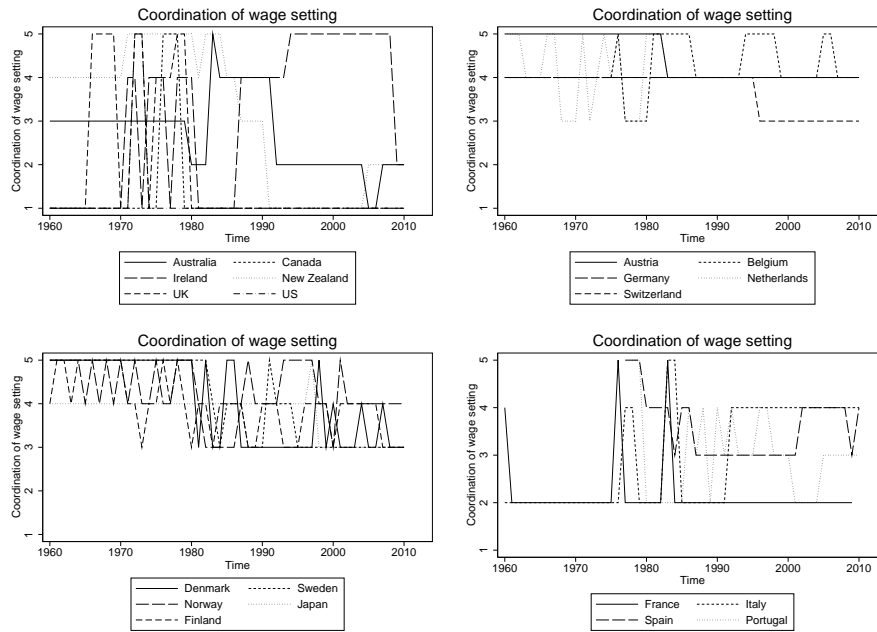


Figure B8: Development of the Coordination of Wage Setting

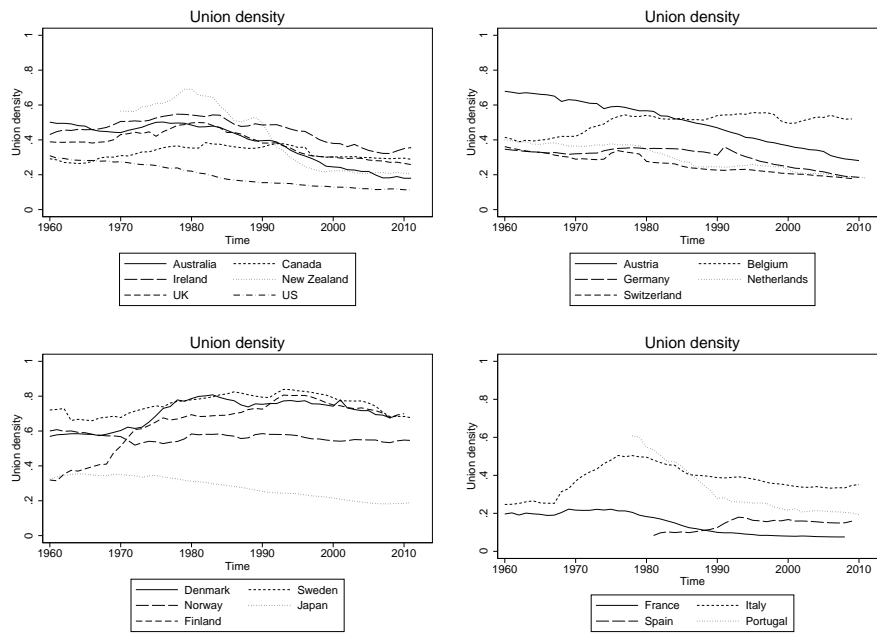


Figure B9: Development of the Union Density

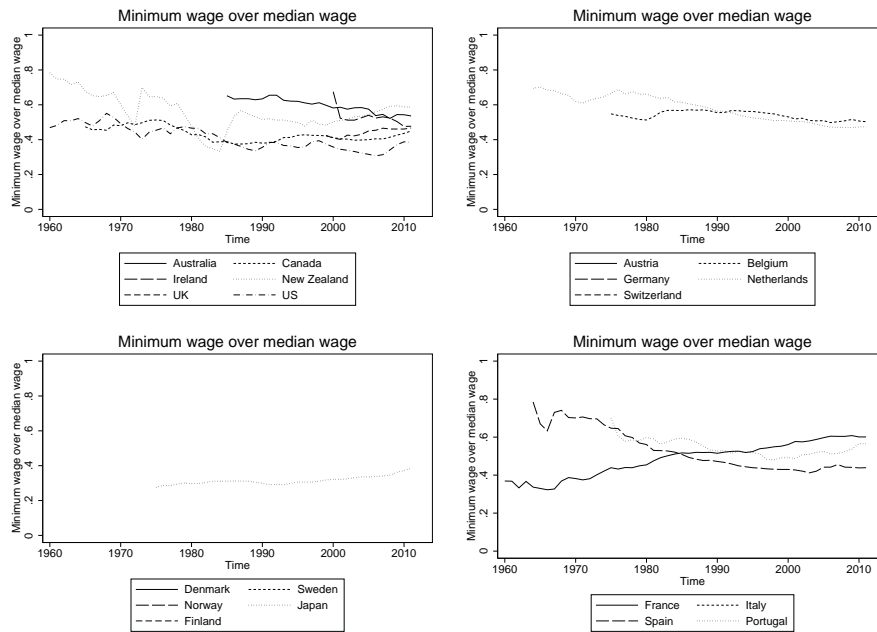


Figure B10: Development of the Minimum Wage in Countries That Have Minimum Wage Set at a National Level

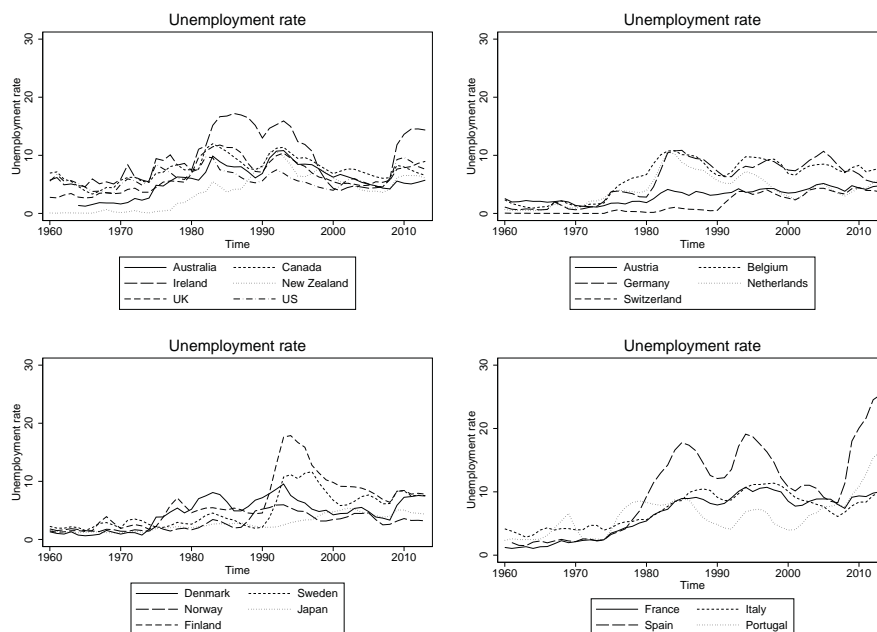


Figure B11: Development of the Unemployment Rate

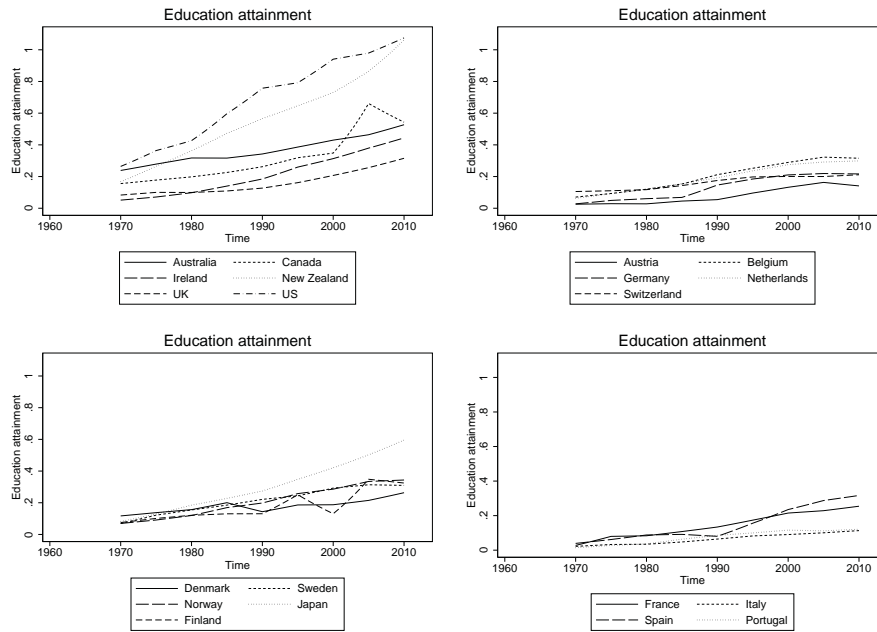


Figure B12: Development of the Education Attainment

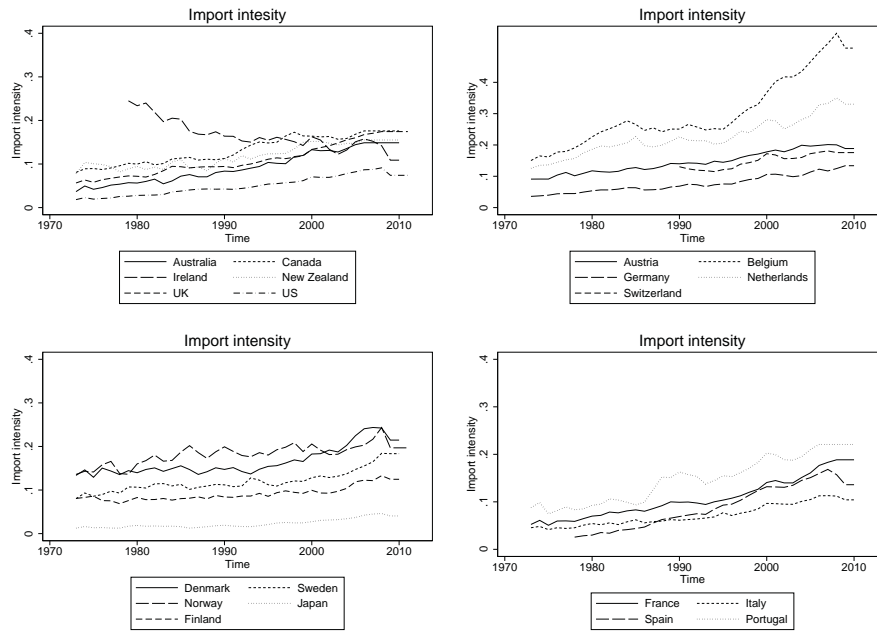


Figure B13: Development of import intensity

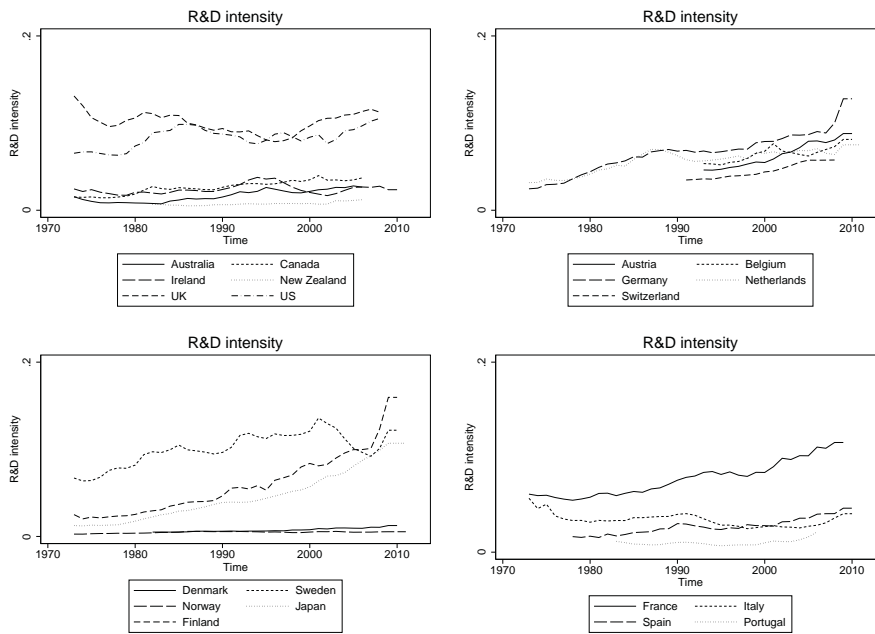


Figure B14: Development of R&D intensity

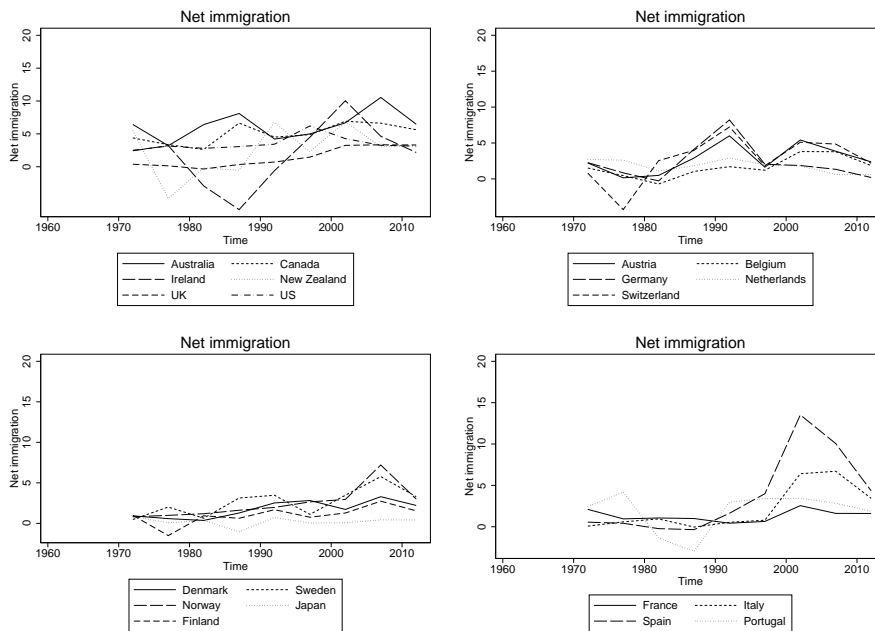


Figure B15: Development of Net Immigration

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