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GLOBALISATION, TECHNOLOGICAL PROGRESS AND CHANGES IN REGULATIONS AND INSTITUTIONS – WHICH IMPACT ON THE RISE OF EARNINGS INEQUALITY IN OECD COUNTRIES?

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By

Wen-Hao Chen, Michael Förster and Ana Llena-Nozal*

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This paper examines the distributive impact of economic globalisation, technological progress and changes in labour market policies, regulations and institutions in OECD countries over the past quarter century, up to the Great Recession. It identifies the relevant pathways between macro-economic developments and earnings inequality among the whole working-age population by accounting for both changes in wage dispersion among workers and changes in earnings gaps between the employed and non-employed. The results suggest that technological progress is a key driver behind the upward trend of earnings inequality; it transmitted inequality mainly through raising wage dispersion. Economic globalisation, in terms of both rapidly rising trade and financial integration, appears overall distributional neutral once other factors, in particular changes in policies and institutions, are also controlled for. Regulatory reforms that aimed at promoting growth and productivity appeared to exert contrasting effects: they tended to close the gap between employed and non-employed, by increasing job opportunities but at the same time also contributed to greater wage inequality. Finally, the growth in the supply of skilled workers is an important equalizing factor contributing not only to reduce wage dispersion among workers but also to higher employment rates. Up-skilling provided a sizable counterweight to the increase in earnings inequality resulting from technological progress, pressure from globalisation and institutional changes.

JEL classification: F16, O30, J50, O15

Keywords: Globalisation, innovation, labour market institutions, inequality, employment

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1. Introduction

1. Over the two decades to the onset of the global economic crisis, real disposable household incomes increased in all OECD countries, on average by 1.7% per year. However, in a large majority of OECD countries, household incomes of the top 10% grew faster than those of the poorest 10%, leading to widening income inequality. Differences in the pace of income growth across household groups were particularly pronounced in some of the English-speaking countries and some of the Nordic countries.

2. At the onset of the crisis, in OECD countries, the average income of the richest 10% of the population was about nine times that of the poorest 10%, with a wide country variation. The ratio is much lower in the Nordics and many Continental European countries, but then reaches 10 to 1 in Italy, Japan, Korea and the United Kingdom, around 14 to 1 in Israel, Turkey and the United States, and 27 to 1 in Mexico and Chile (OECD 2011).

3. The Gini coefficient, a standard measure of income inequality that ranges from zero (when everybody has identical incomes) to 1 (when all income goes to only one person), stood at 0.28 in the mid-1980s on average in OECD countries; by the late 2000s, it had increased by some 10%, to 0.31. In particular, the Gini coefficient increased in 17 out of the 22 OECD countries for which longer trend data are available. In several countries, it increased by more than 4 percentage points: Finland, Germany, Israel, New Zealand, Sweden and the United States (OECD 2011).

4. Increases in household income inequality have been largely driven by changes in the distribution of wages and salaries which account for 75% of household incomes of working-age adults. With very few exceptions (France, Japan and Spain), wages of the 10% best-paid workers have risen relative to those of the 10% least-paid workers. This was due both to growing earnings' shares at the top and declining shares at the bottom, but top earners saw their incomes rising particularly sharply (Atkinson, 2008). The highest 10% of earners have been leaving the middle earners behind more rapidly than the lowest earners have been drifting away from the middle.

5. The OECD 2008 report "*Growing Unequal?"* analysed the impact of immediate, "direct" drivers of income inequality. It found an important impact of market income inequality trends on changes in the household income distribution. In particular, wage dispersion and employment/unemployment patterns were identified as significant drivers. The study also drew attention to the effect of population structure changes and the declining redistributive capacity of the tax and transfer systems in several OECD countries.

6. Between the mid-1980s and mid-2000s, inequality in the distribution of market incomes – gross wages, income from self-employment and capital income and returns from savings taken together – increased in all but three OECD countries for which data are available (Table 1). Changes in the structure of households due to factors such as population ageing or the trend to smaller household sizes played an important role in five countries, increasing income inequality considerably in four of them, and decreasing it in the fifth. Finally, income taxes and cash transfers became less effective in reducing high levels of market income inequality in half of the OECD countries, particularly during the past decade.

Table 1. Summary of key drivers of changes in household income distribution, mid-1980s to mid-2000s: market income dispersion, changes in household structure, and in tax/transfer redistribution

	Trends in market income inequality (A)	Impact of household structure changes (B)	Trends in tax/transfer effectiveness (C)
Australia	=	+++	=
Austria		=	
Belgium	+	+	---
Canada	+++	+	+++
Czech Republic	+++		+
Denmark	+++	=	+
Finland	+++	+	+++
France	-	+++	---
Germany	+++	+++	=
Italy	+++	-	---
Japan	+++		-
Luxembourg	+++	=	
Mexico		---	
Netherlands	-	+++	+++
New Zealand	+++		+
Norway	+++	+	=
Portugal	+++		-
Spain		=	
Sweden	+	-	+++
United Kingdom	+	+	=
United States	+++	=	+++

Note: Changes refer to the period from the mid-1980s to the mid-2000s.
(a) Column A refers to the percentage- point change in the Gini coefficient for market incomes. "+++"/"---"denotes changes greater than 4 points; "+"/"-"denotes changes between +/- 2 points; "=" denotes changes less than 2 points.
(b) Column B refers to differences between disposable income inequality changes assuming a constant population structure over the whole period and actual changes. . "+++"/"---"denotes differences greater than 30 percent; "+"/"-"denotes differences between 15 and 30 percent; "=" denotes changes less than 15 percent.
(c) Column C refers to the impact on inequality of percentage-point changes in the inequality reduction rate of taxes and transfers. Positive signs signal that the redistributive impact weakened over the period and thus raised inequality, while negative signs signal that the redistributive impact strengthened and hence served to lower inequality. "+++"/"---"denotes changes greater than 4 points; "+"/"-"denotes changes between +/- 2 points; "=" denotes changes less than 2 points.

Source: OECD (2008a).

7. While growing dispersion of market income inequality, in particular changes in earnings inequality, has been identified as one of the key drivers, this has left open the question: what are the underlying major *causes* of these changes? In this context, "globalisation" has been much debated as a main cause for widening inequality. From a political point of view, protectionist sentiments have been fuelled by the observation that the benefits of productivity gains in the past two decades accrued mainly – in some cases exclusively – to high-skilled, high-educated workers, leaving people with lower skills behind. From a conceptual point of view, the standard reading of traditional international trade theory[1] is that increased trade integration is associated with higher relative wages of skilled workers in richer countries, thus contributing to increased inequality in those countries (*e.g.* Kremer and Masking, 2006).

8. Next to globalisation, there are, however, other equally plausible explanations for the growing inequality in distribution of labour income. In particular, technological progress is often cited. Advances in

[1] This is often associated with the so-called Heckscher-Ohlin-Samuelson model, or variants of it (for a review, see Freeman 2009).

information and communication technology are considered inherently skill-biased and, therefore, seen as a factor increasing inequality. Some studies put this process at the forefront of their explanation: the IMF (2007) has found that "technological progress has had a greater impact than globalization on inequality within countries"; the OECD (2007a) reports that "technical change is a more powerful driver of increased wage dispersion than closer trade integration". In practice, it is, however, very difficult to disentangle technological change from the other aspects of globalisation that also increase the value of skills. Advances in technology are, for instance, at the origin of the fragmentation of economic activities and offshoring of production or, as Freeman (2009) puts it, "offshoring and digitalisation go together".

9. Moreover, policy choices, regulations and institutions have a crucial impact. They can shape how globalisation and technological changes affect the distribution of earnings and income. They can also influence the distribution directly, for instance via deregulation in product markets, changes in benefit rates, wage-setting mechanisms, or workers' bargaining power. However, connecting these factors with overall earnings inequality and household income inequality is less straightforward, as the employment impact of regulatory reforms may counteract the impact on wage inequality among workers.

10. The empirical evidence as to the key drivers of inequality remains largely inconclusive and is made more so by the use of different definitions and concepts used in different studies. In Annex D we review findings from the literature on the distributional impact of globalisation, technology and institutions from selected studies. When assessing the possible causes of increased inequality, three main issues require particularly precise definition. They are: i) inequality itself, ii) globalisation, and iii) reference populations.

11. First, use of term "income inequality" should clearly state inequality of what and among whom. Different income aggregates and population subgroups will be affected differently by different driving forces. It is useful, therefore, to consider the following concepts:

- dispersion of hourly wages among full-time (or full-time equivalent) workers;
- wage dispersion among workers (*e.g.* annual wages, including wages from part-time work or work during only part of the year);
- individual earnings inequality among all workers (including the self-employed);
- individual earnings inequality among the entire working-age population (including those who are inactive, *i.e.* not working);
- household earnings inequality (including the earnings of all household members);
- household market income inequality (including incomes from capital, savings and private transfers);
- household disposable income inequality (taking into account public cash transfers received and direct taxes paid);
- household adjusted disposable income inequality (taking into account the values of publicly provided services such as health or education).

12. The second term that requires clarification is "globalisation". There are different aspects to economic globalisation and they are likely to impact on trends in wage, earnings and income inequalities in different ways and in possibly opposing directions:

- trade integration (goods and services mobility);
- financial integration (capital mobility);

- technology transfers (information mobility);
- production relocation (firm mobility);
- international migration (labour mobility).

13. Third, the definition of the reference population which is being examined can have considerable effects on the results. Most studies which link "globalisation" to "inequality" refer to income inequality among the entire population. But the impact of globalisation, technology and regulatory reform will be different for people of working age than for children or senior citizens, *inter alia* because there are very specific policies in place addressed at these population groups. Changes in pension systems (in the past), for instance, will affect the present income situation of retired people which can obscure findings and blur the picture. The analyses in this paper focus on the working-age population, which allows the study to paint a more precise picture of the processes at work in the labour market and how they shape the distribution.

14. Box 1 proposes an analytical framework for a step-wise approach to link macro-economic trends in globalisation, technology and policies to changes in income distribution. As described in Box 1, it would be difficult to develop one single empirical model to explain changes in final household income inequality directly. The analyses in this paper therefore focus on the possible main drivers of changes in *labour earnings* inequality.[2] Earnings inequality in this framework is assessed in terms of both wage dispersion among workers, as well as disparity of individual earnings among the whole working-age population. The inclusion of the latter population takes account of the issue of unemployment and inactivity, which allows the study to include both the wage and employment impact and to estimate the effect of globalisation and other drivers on "overall" labour earnings inequality.

15. The paper is organized as follows. The next chapter documents recent trends in wage inequality, economic globalisation and labour market policies and institutions since the 1980s. Chapter 3 then uses econometric models to assess which global developments impact on within-country trends in wage dispersion. Chapter 4 presents and applies a theoretical work by Atkinson and Brandolini (2006) and quantifies how inequality *within groups* (due to wage dispersion among the employed) and *between groups* (caused by inequality between the employed and the non-employed) affects inequality across the entire working-age population. Chapter 5 synthesizes the empirical findings from chapters 3 and 4 to provide an overall assessment of the distributional impact of globalisation, technology and institutions, and reports through which channel (wage or employment) these drivers affect the "overall" earnings inequality. The final chapter summarises and concludes.

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[2] The transmission of labour earnings inequalities to household income inequalities is addressed in our companion LIS Working Paper (Chen *et al*, 2013) and in OECD (2011).

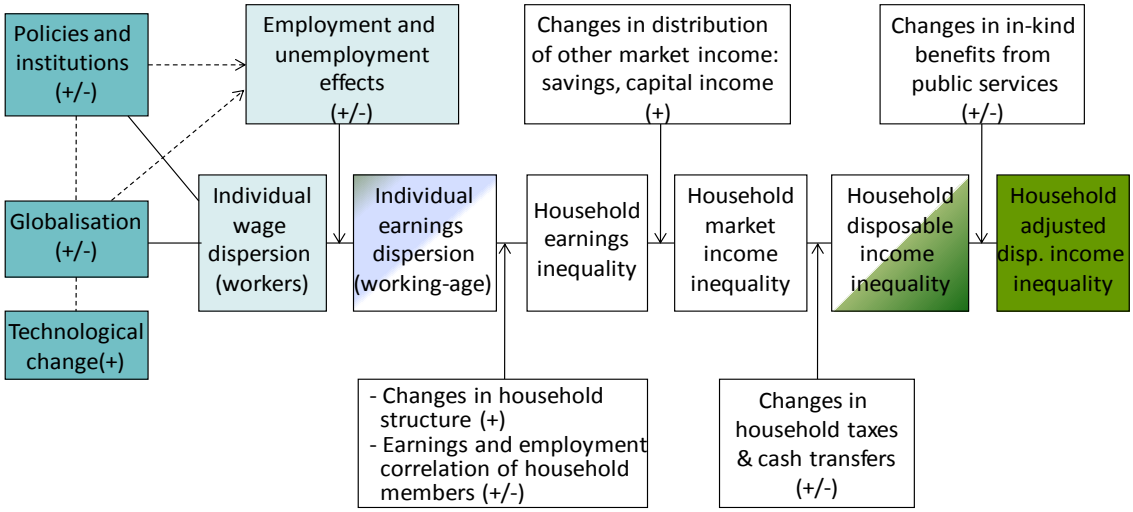
Box 1. Analytical framework and structure of the study

Globalisation and skills-biased technological change can affect policies via multiple pathways just as policies can, in turn, affect both market and final disposable income inequality. It would therefore be difficult to develop one single empirical model to explain changes in final household income inequality drawn directly from macro-economic variables. Instead, this study is part of a partial, step-wise approach that separately investigates the relevant pathways between the main driving factors and income inequality.

This approach is illustrated in the Figure below which describes the different links when moving from the macroeconomic explanatory variables to household income inequality. The first pathway is that from the possible main drivers to changes in labour earnings inequality – the move from the darker to the lighter shaded boxes. Earnings inequality in this framework is assessed in terms of both wage dispersion among workers, as well as individual earnings dispersion among the whole working-age population, which takes account of the issue of unemployment and inactivity. The second pathway is the transmission of labour earnings inequalities to household income inequalities – the move from the lighter to the un-shaded boxes. This involves several steps, in which the importance of earnings dispersion together with other factors (*e.g.* changes in household structure; influence of other income sources) is taken into account. The third pathway is the one to final household disposable and adjusted disposable income – the move from the un-shaded to the dotted boxes. This notably takes into account the impact of taxes and transfers, both cash and in-kind.[1)]

The present paper focuses entirely on the first pathway which examines the macro-economic drivers of changes in labour earnings. The second and third pathways are analysed and described in OECD (2011).

Figure. Analytical framework for the analysis of causes of income inequality



[1)] This "step-wise" and partial approach does not capture the full general equilibrium and dynamic complexity of the process. For instance, globalisation will also have a direct impact on tax/transfer policies and institutions and policies on changes in the distribution of savings or capital income. These interactions are, however, not modeled in the simplified analytical framework presented here.

2. Overview of recent trends in wage inequality and globalisation in OECD countries

16. This section provides an overview of longer-term and recent trends in wage inequality and discusses several notable developments in various aspects of economic globalisation, as well as changes in product and labour market regulations and policies. It sets the stage for the econometric analysis of the possible causes of growing earnings inequality in chapters 3 and 4 below. The time period under consideration is that between the early 1980s and the late 2000s, before the onset of the economic down-turn.

17. The chapter also provides empirical evidence on the association between changes over time in wage dispersion on the one hand and changes that occurred in the degree of economic globalisation, technological progress and developments in policies on the other. While such correlations do not establish actual causation, they provide useful initial insight how inequality outcomes and driving factors evolved across countries over time.

2.1. Trends in wage dispersion

18. Has the wage distribution within OECD countries become less equal? A key measure of wage dispersion is the decile ratio of the top 10 percent to the bottom 10 percent of full-time (or full-time equivalent) wage earners.[3] Figure 1 shows the evolution of this indicator for selected OECD countries and groupings over the period 1980-2008. It draws on data from the OECD earnings database for 23 OECD countries. This dataset provides comparable and consistent measures of wages through time for each country.[4]

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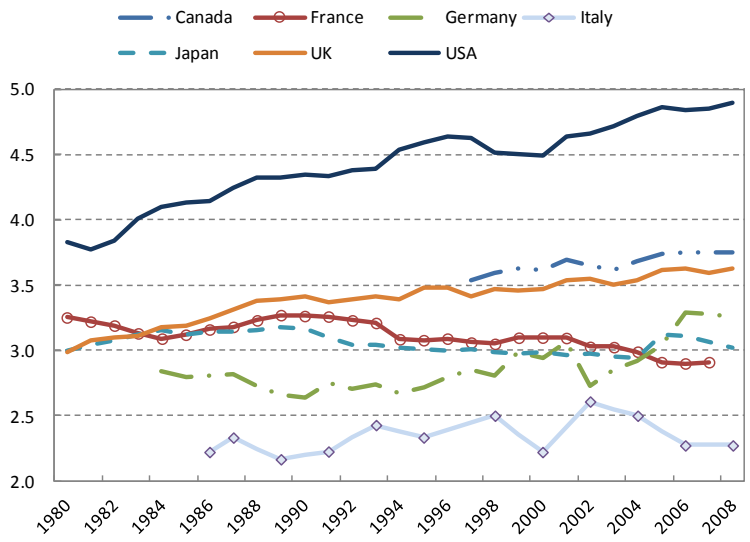
[3] Full-time, full-year earnings are often taken as an approximation of the wage rate (Blau & Kahn 2009). Changes in these therefore reflect 'price' rather than 'quantity' effects. Adding in earnings of part-time workers would lead to higher levels of earnings inequality in all countries.

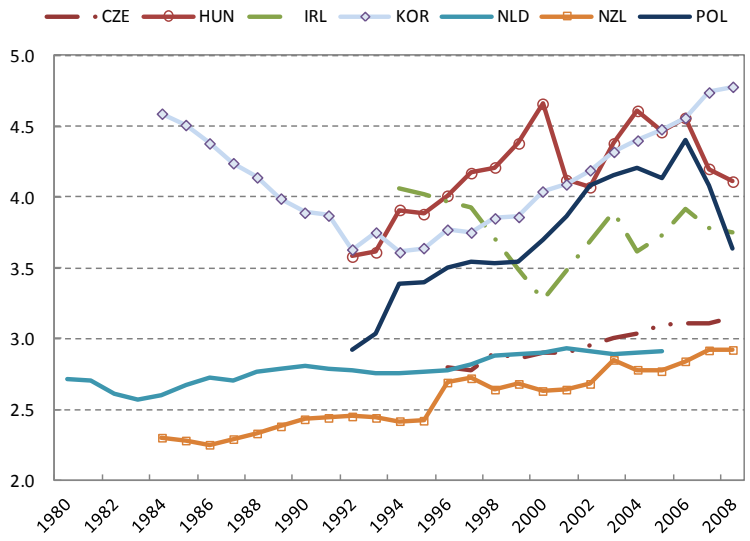
[4] The OECD earnings database is available via http://www.oecd.org/employment/labour-stats/onlineoecdemploymentdatabase.htm#deciles. See Annex A for data description. These data are drawn from different available sources, including surveys, administrative registers and tax records. While great care has been taken to standardise these data to common concepts and units (annual gross earnings of working-age individuals holding a full-time job), differences remain. In particular, the comparability of the earnings series *across* countries is less compelling due to differences in both population coverage and definitions. These data are therefore more suited for assessing changes in earnings distributions over time than for comparing levels across countries (see Atkinson 2008).

Figure 1. Trends in wage dispersion, selected OECD countries, 1980 – 2008

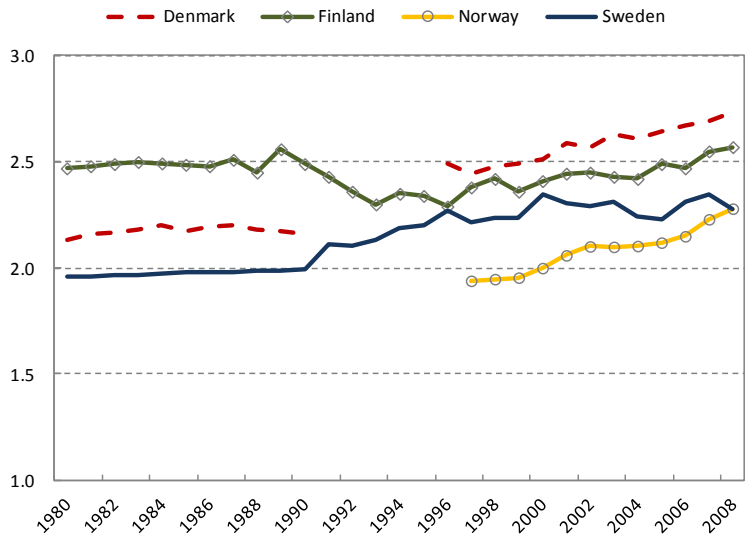
Panel A. OECD G7 countries



Panel B. other selected OECD countries



Panel C. Nordic OECD countries



Note: Wage dispersion: D9/D1 ratios of full-time earnings, i.e. the ratio of the wages of the upper bound value of the 9th decile to the upper bound value of the 1st decile of the distribution of wage earners.

Source: OECD Earnings Database.

19. Figure 1 reveals a widespread and often significant increase in wage dispersion in the OECD area over the past three decades, with a few notable exceptions such as France and Japan. The increases were particularly marked in the United States, the United Kingdom as well as some Central Eastern European economies such as Hungary and Poland. In the United States, for instance, the earnings gap between the richest and poorest 10% of full-time workers has widened from 3.8 times in 1980 to nearly 5 times in 2008. The comparable figures are 3.6 (1992) and 4.6 (2006) for Hungary and 2.9 (1992) and 4.4 (2006) for Poland (in both countries, however, the level of wage dispersion declined during 2007 and 2008). The extent of rising inequality was stronger during the late 1990s and 2000s than in the previous decades. This can be observed in Germany, New Zealand, Netherlands and Demark, where decile ratios remained stagnant throughout the 1980s, but started to increase in the mid-1990s. Korea's wage inequality trend was characterised by a unique U-shaped pattern, decreasing sharply during the 1980s and the early 1990s, before increasing at the same speed since the mid-1990s.[5] It is worth noting that the trend towards greater wage inequality, although more moderate, was also observed in some Nordic countries – a region that traditionally had rather low levels of wage inequality.[6] Overall, many OECD countries saw an increase in the D9/D1 ratio of between one fifth and a quarter during the past quarter century.

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5 Kang and Yun (2008) investigated this particular pattern and concluded that factors related to human capital played an important role in moulding the U-shaped changes in wage inequality in Korea. They speculate that the rapid growth in wage inequality since the 1990s may be related to skill-biased technological change since the Korean economy was transformed into a more knowledge-intensive, high-tech industrial economy around the mid-1990s. They also suggest that an increase in outsourcing to China and other low-wage countries may explain the surge in wage inequality in recent years.

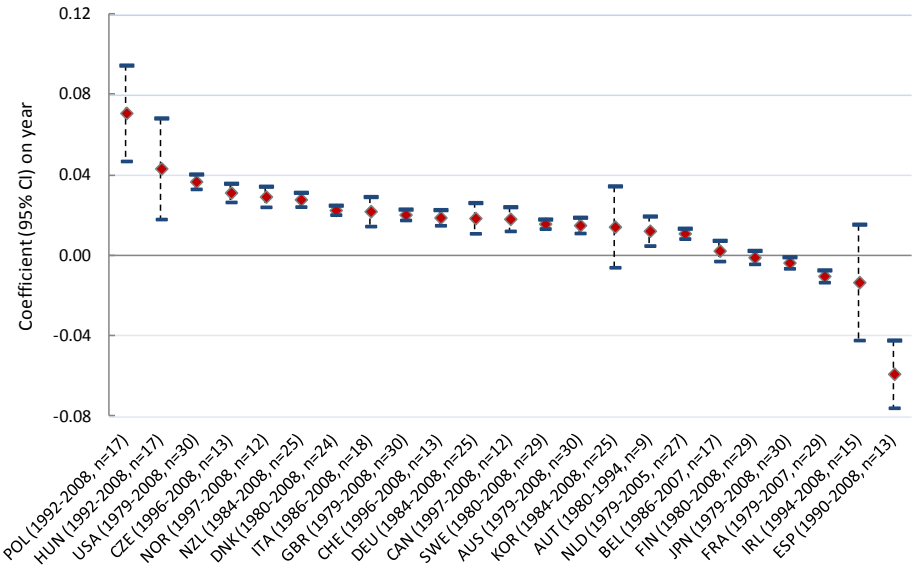
6 The D9/D1 ratio in Denmark, for instance, has increased from 2.1 in 1980 to 2.7 in 2008. This finding does not seem to support the conventional view of downward nominal wage rigidity, which has been predicted in this region (Holden & Wulfsberg 2007).

20. The widening of the wage distribution has resulted from both growing earnings shares at the top and declining shares at the bottom. But top earners experienced particularly sharp rises. The distance between the highest 10% earners and those in the middle has been growing faster than the distance between the middle and the lowest wage earners. Thus, in most countries wage disparities grew more in the upper half of the distribution than in the bottom half.

21. To show whether one can speak of a "generalised" tendency towards greater wage dispersion across the 23 OECD countries under study, Figure 2 presents a summary statistic. It shows the results of country-specific regressions where D9/D1 ratios are regressed against time. A positive and significant coefficient therefore indicates an upward trend in wage inequality. Overall, using available time-series data, wage dispersion increased in a majority (16 out of 23) of the OECD countries over this period, at the 5% level of significance. Only two countries (France and Spain) registered a moderate and statistically significant decline in wage inequality, whereas no significant trend was estimated for the other five countries (Korea, Belgium, Finland, Japan and Ireland).

Figure 2. Trends in wage dispersion, selected OECD countries, 1980 – 2008

Panel A. OECD G7 countries



Note: Lower and upper-bound signs refer to 95% confidence intervals.

Source: OECD Earnings Database.

2.2. Contextual changes: trends in global economic developments, and in institutions and regulations

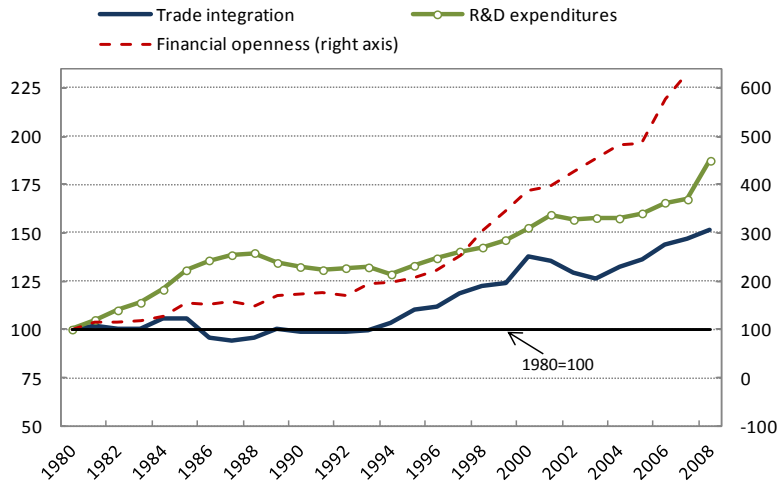
Integration of trade and financial markets and technological progress

22. Over the past decades, OECD countries underwent significant structural changes, driven by their closer integration into the global economy and to rapid technological progress. These changes often brought highly skilled workers greater rewards than low-skilled ones and thus affected the way earnings from work were distributed. The rising gap between the earnings of the highly skilled and those of the low-skilled therefore may spring from several factors. First, a rapid rise in the integration of trade and financial markets generated a relative shift in labour demand in favour of highly skilled workers. Second,

technological progress shifted production technologies in both industries and services in favour of skilled labour.

23. Figure 3 summarises the development of three key features of economic globalisation since 1980, for the OECD average: trade integration, financial openness and technological progress. It shows that these structural changes got underway in the early 1980s and accelerated from the mid-1990s.[7]

Figure 3. Developments in trade integration, financial openness and technological change, OECD average, 1980-2008 (1980=100)



Note: Trade integration is defined as the sum of imports and exports as a percentage of GDP. Financial openness is defined as the sum of cross-border liabilities and assets as a percentage of GDP. R&D expenditures refer to business-sector expenditures on research and development as a percentage of GDP.

Source: *OECD Trade Indicators Database;* External Wealth of Nations Mark II Database (EWN II), IMF dataset; *OECD Main Science and Technology Indicators.*

24. The share of global trade in world GDP grew from about one-third to over a half in the 30 years to 2008 (IMF, 2007). In that time, trade integration – the sum of imports and exports as a share of GDP – doubled in many OECD countries. In most OECD countries growth in trade intensity from developing countries contributed less than a quarter of the total increase in merchandise imports. The extent of OECD-developing world integration was much stronger in non-EU areas, notably in Australia, New Zealand, Korea and Japan, but also in the United States. Among developing countries, increased trade integration was dominated by the group of low/mid-income emerging market economies such as China and India. There was an across-the-board increase in imports from mid/low-income developing countries in all 23 OECD under study. The trade relationship with high-income developing countries, on the other hand, has become less important in many OECD countries. The rise in exports to mid/low-income developing countries has been less pronounced but it constitutes twice the increase in exports to high-income developing countries. In most cases, the enhanced ties with mid/low-income trading partners dominated the entire trade growth with developing countries, and most of the developments took place during the past 10-15 years (OECD 2011).

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[7] Figure 3 uses the sum of cross-border liabilities and assets as a proxy for financial openness and R&D expenditures as a proxy for technological change. Other proxies for these drivers have been used in the literature and additional proxies have been tested and applied in the underlying analyses of this paper.

25. But globalisation is not only about trade in goods and services. It also concerns the fast-growing financial transactions across national borders. Figure 3 above illustrates the rapid growth in total cross-border liabilities and assets which includes both foreign portfolio investment (FPI) and foreign direct investment (FDI). Although FPI dominated the changes in overall capital flows and stocks, it is expected to have less impact than FDI on the domestic labour market and wage structure. For this reason, the remainder of this paper focuses on the development of FDI, which reflects growing numbers of multinational corporations (MNC) in both home and host states, as well as a widespread phenomenon of globalisation of production.

26. The inward FDI stock as a percentage of GDP increased in all countries, on average from less than 7% in 1980 to over 45% in 2008. The increase was more than 40 percentage points in 11 out of 23 countries, and most of the increase has been experienced in the past decade. The rapid expansion of inward FDI investment may well reflect a tremendous growth of foreign affiliates in the OECD area. If the utilisation of capital and the technology it embodies requires a change in the skill composition of workers, it is likely to have an impact on the domestic wage distribution. Outward stocks of FDI also increased steeply in all OECD countries – from an average of less than 5% of GDP in 1980 to nearly 50% in the late 2000s. Again, most of the increase occurred during the past 15 years. OECD countries have seen substantial growth in the number of multinational corporations as well as their overseas operations, which reflects greater offshore outsourcing of their activities. A common assumption is that offshoring disproportionately hurts lower-skilled jobs.

27. Globalisation also went hand-in-hand with the rapid adoption of new technologies which may have penalised those workers who did not have the necessary skills to use them effectively. Technological progress is therefore often seen as inherently "skills-biased". In general, the stock of knowledge, measured either by innovative investments (*e.g.* R&D expenditure), output of knowledge production (*e.g.* patents) or by the degree of computerisation (*e.g.* the use of ICT by firms), increased considerably over time.

28. Privately-funded expenditure on business sector R&D as a share of GDP has increased since the 1980s in most OECD countries. Rising investment in R&D by the private sector increases the demand for skilled workers needed to perform R&D, such as scientists, technicians and research workers. Some part of R&D spending eventually results in technological innovation, and/or facilitates the absorption of technology, which is likely to be skill-intensive, and thus may result in changing wage differentials. The increase in R&D investment was most apparent in Scandinavian countries, Japan and Australia (OECD 2011).

29. Also patent counts - an alternative measure devised to capture the output of scientific and technological activities - show a clear upward trend across the OECD regions. In the United States, for instance, the number of total patent applications to both the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO) has increased four-fold from 70 000 in 1981 to nearly 280 000 in 2007. The speed of growth in patents accelerated particularly after the mid-1990s. Inventive activities increased in all countries under study.

30. Recent literature relating inequality to technological progress also focuses on the role of ICT (see, for instance, Autor *et al.* 2003). On average across OECD countries, the shares of ICT investment in total non-residential Gross Fixed Capital Formation (GFCF) doubled over time – from 9.2% in 1980 to 18% in 2006 – with a significant increase occurring during the 1990s. On the employment side, the share of ICT job in business sector employment also expanded, albeit modestly, in most of the countries.

31. The trends in different aspects of economic globalisation - trade and financial integration and technological change - are interdependent. For instance, trade liberalisation is very often accompanied by the removal of restrictions on FDI; and international investment may in turn facilitate more trade since

multinational enterprises often export goods from the host state. Furthermore, growing FDI implies that more capital, as well as embodied foreign technologies and know-how, is transferred to the host countries. The transfers of technology and know-how may increase productivity and indeed lead to more trade or investment. The complex interplay among these factors is expected to impact on the domestic wage distribution, for instance via a change in the skill composition of labour demand toward skilled workers.

Labour market policies, institutions and regulations

32. In the two decades from 1980 to 2008, most OECD countries carried out regulatory reforms to strengthen competition in the markets for goods and services and to make labour markets more adaptable. All countries, for example, significantly relaxed anti-competitive product-market regulations (PMR) and many also loosened employment protection legislation (EPL). The OECD average value for PMR dropped from 4.9 (of a maximum value of 6) in 1985 to 1.9 in 2007. For EPL, developments were different for legislation for regular than for temporary workers. Legislation for regular workers changed little and became more flexible mainly in countries which had stricter regulations in 1985. Such trend reveals a slight pattern of convergence in employment protection legislation for regular workers across OECD countries. On the other hand, there was more of diversity in EPL trends for temporary workers. In about one third of countries, EPL decreased significantly. Only in a smaller group of countries with rather flexible regulations employment protection for temporary workers became stricter over the years.

33. Wage-setting mechanisms also changed: the share of union members among workers fell across most countries, although the coverage of collective bargaining generally remained rather stable over time.[8] In addition to density or coverage rates, the extent of union wage-setting may be influenced by the dominant levels at which bargaining takes place (*i.e.* the degree of centralisation and co-ordination of bargaining). While there are significant cross-national variations in the degree of union centralisation and co-ordination, the scores are relatively stable over time within countries. The pattern remains very similar when an alternative OECD-developed measure (corporatism) is used. Since the value of centralisation/co-ordination is generally invariant across time within countries, it seems to suggest that this variable is more relevant in the analysis of inequality between-countries rather than within-countries.

34. A number of countries cut unemployment benefit replacement rates though, overall, the development was rather heterogeneous across the OECD area with increases in Switzerland, France, Ireland, Norway and Spain and decreases in the Netherlands, the United Kingdom and Canada. In an attempt to promote employment among low-skilled workers, some countries also reduced taxes on labour. So-called tax wedges vary sharply across OECD countries, ranging from 22% in New Zealand to 54% in Belgium. They declined more noticeably in Ireland and the Netherlands, but increased in Austria, Belgium, Canada, Germany and Japan. Minimum wages also declined relatively to median wages in a number of countries between the 1980s and 2008. Statutory national minimum wages exist in 14 of the 23 countries included in the analysis below. Among this sample, the minimum wage ratio declined in eight countries, particularly in the Netherlands, Australia, Ireland and the Czech Republic.[9] Figure 4 summarises the trend in four key dimensions of regulatory and institutional change for the OECD average.

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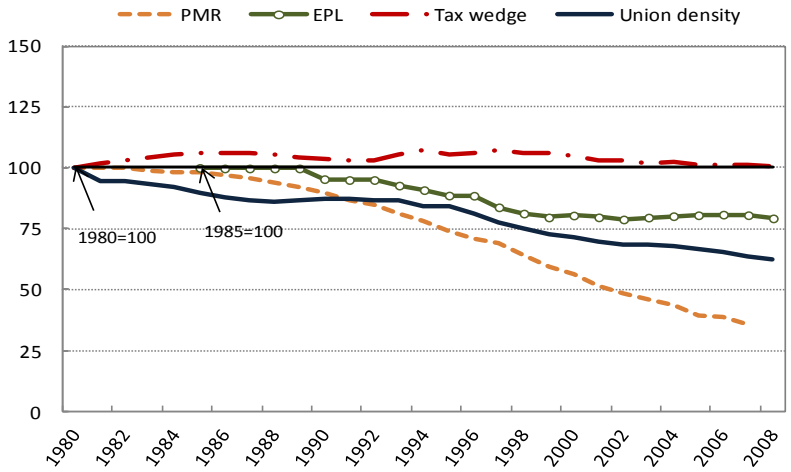
8 In three of the Nordic countries, coverage rates increased despite a decline in union membership.

9 The only country that registered a considerable increase in the relative minimum wage was New Zealand.

Figure 4. Developments in product market regulation, employment protection legislation, tax wedges and union density, OECD average, 1980-2008 (1980=100)



Note: "PMR" is a summary indicator for product market regulation. "EPL" is a summary indicator of the strictness of overall employment protection legislation (only available from 1985 onwards). "Tax wedge" refers to an average worker and is the sum of income tax and employees and employers payroll taxes as a percentage of labour costs. "Union density" is the number of union members as a proportion of all employees eligible to be members.

Source: Union coverage (B) and union centralisation/co-ordination (C) from Visser (2009); all others are from *OECD Employment Database, OECD Taxing Wages Database* and *OECD Benefits and Wages Database.*

35. These changes in policies and institutions affected the ways in which globalisation and technological changes translated into distributional changes. On the one hand, past empirical evidence points to the significant positive impact of reforms on *employment levels* (*e.g.* OECD, 2006). Greater product market competition in particular has been found to increase aggregate employment by reducing market rents and expanding activity, which in turn leads to stronger labour demand (Blanchard and Giavazzi, 2003; Spector, 2004; Messina, 2003; Fiori *et al*., 2007; Bassanini and Duval, 2006). There is also some evidence that lower unemployment benefit replacement rates and lower tax wedges were associated with higher aggregate employment. At the same time, another strand of literature provided strong evidence that many regulatory and institutional reforms also contributed to widening *wage disparities*, as more low-paid people entered employment and the highly skilled reaped more benefits from a more dynamic economy. For instance, a number of previous studies associated less strict EPL and declines in union density and bargaining coverage with higher wage dispersion among those in work (*e.g.* Koeninger *et al*., 2007; Visser and Cecchi, 2009; Wallerstein, 1999). It has also been argued that the declining role of institutions and policies has significantly reduced the government's redistributive potential, and thus widened the distribution of earnings and/or incomes.

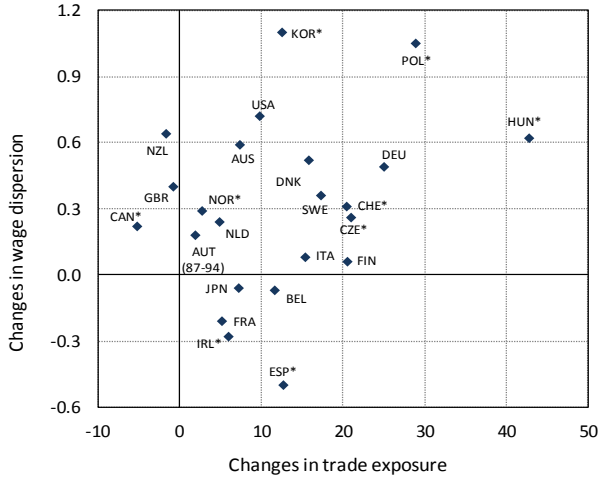
36. However, few studies, if any, looked simultaneously at both, the employment and wage dispersion impacts of regulatory and institutional changes. Chapters 4 and 5 below propose and apply a framework for such an integrated analysis.

2.3. Association between trends in wage inequality and contextual changes

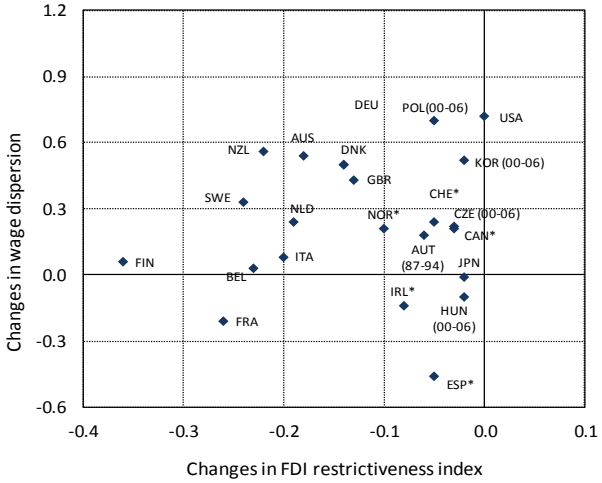
37. Were rapid global economic developments in terms of trade and financial integration and technological progress associated with growing wage dispersion? The scatter plots in Figure 5 seem to suggest a rather inconclusive picture about such association for the OECD area. If anything, they seem to

Figure 5. The association between trends in economic globalisation and wage inequality

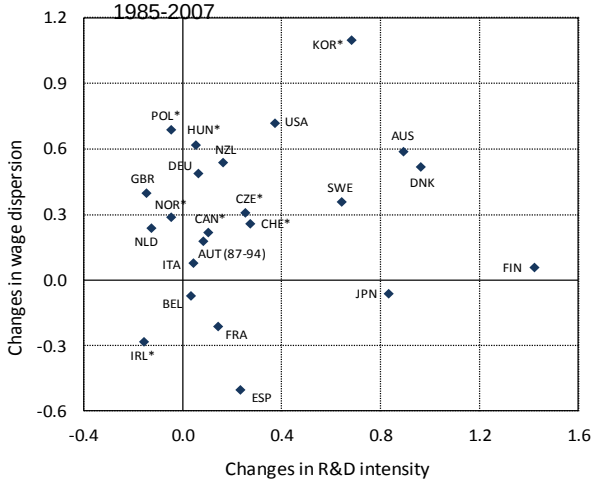
Panel A. Trade and wage inequality, 1985-2007



Panel B. FDI restrictiveness index and wage inequality, 1985-2006



Panel C. R&D intensity and wage inequality, 1985-2007



Note: Wage dispersion: D9/D1 ratios of full-time earnings. Trade exposure is defined as a weighted average of export intensity and import penetration. FDI restrictiveness is a de-jure measure which takes a value between 0 (open) and 1 (closed). R&D intensity refers to business sector expenditures on research and development as a percentage of GDP. * Series start from mid-1990s. All changes in percentage points.

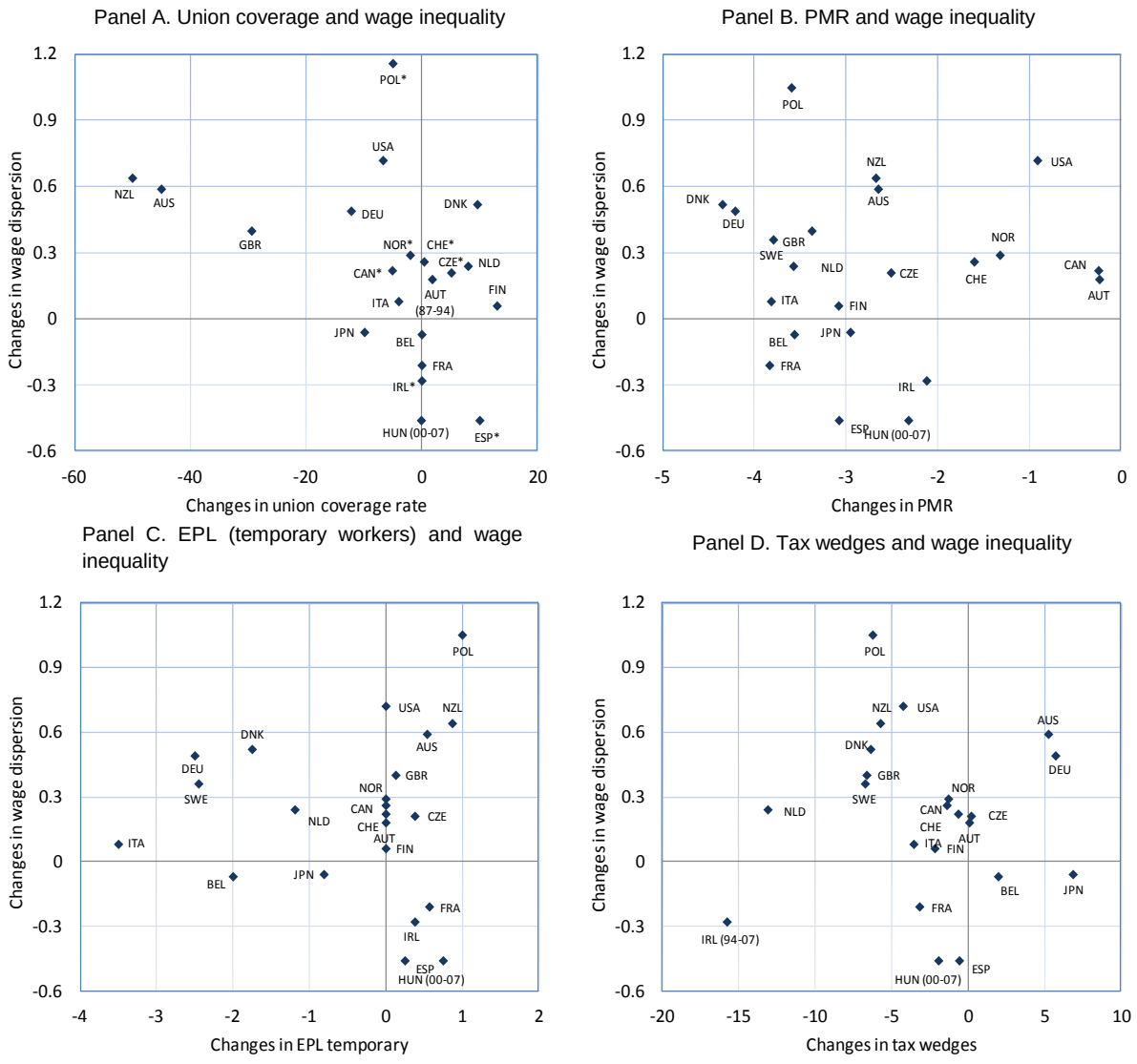
Source: Wage inequality - OECD Earnings distribution Database. Trade exposure - OECD Trade Indicators Database. FDI restrictiveness index - Kalinova *et al.* (2010). R&D intensity - OECD main science and technology indicators. ICT intensity - OECD Productivity Database, 08-02-2010.

suggest a moderate positive correlation between trade (and, to a lesser extent, also R&D intensity)[10] and wage inequality. Such finding, however, is influenced by some few outlier countries (such as Hungary and Poland in the case of trade openness or Korea in the case of R&D intensity).

10 The correlation between trends in technological progress and wage dispersion is stronger when an alternative indicator – ICT intensity (i.e. the share of ICT investment in total non-residential gross fixed capital formation) is used. This may, however, be due to the reduced country sample (data for only 18 countries are available, excluding countries which recorded higher growth in wage dispersion but lower growth in innovation activities, *e.g.* Hungary and Poland).

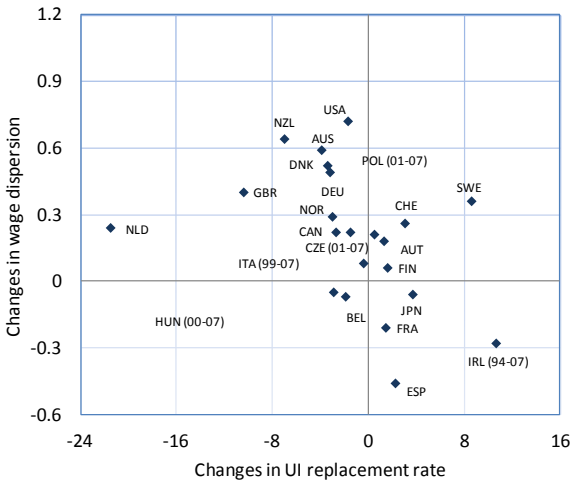
38. As for the distributional impact of regulatory reforms and institutional changes, Figure 6 seems to suggest that such changes in institutions, policies and regulations in general are negatively correlated with changes in wage differentials within countries, albeit very modestly. These can be seen for union coverage (Panel A) – though driven by a few countries, tax wedge (Panel D), UI replacement rate (Panel E) and minimum wages (Panel F). The data, however, also suggest no correlation (or a very moderate negative relationship, if any) between changes in product market regulation and wage inequality (panel B) as well as between changes in employment protection[11] and wage inequality (panel C).

Figure 6. The association between trends in regulatory changes and wage inequality, 1985-2007

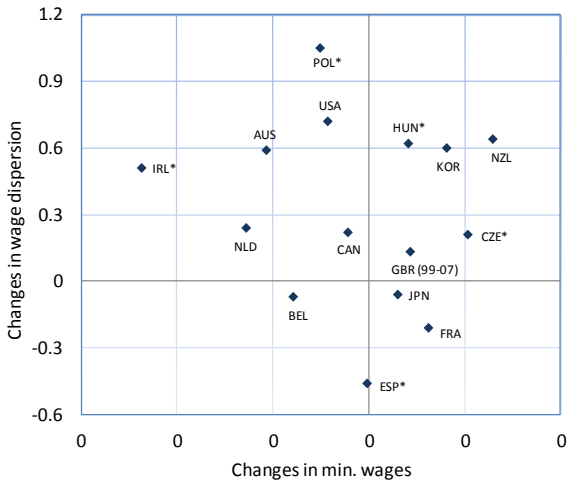


11 There is no correlation between the trends in overall employment protection (for all workers) and wage differentials (not shown) but some very moderate negative association seems to exist between EPL for temporary workers and wage inequality trends.

Panel E. UI replacement rate and wage inequality



Panel F. Minimum wage and wage inequality



Source: See Figure 4.

39. In sum, casual observation does not seem to suggest an *obvious* association between trends in wage inequality and changes that occurred in various aspects in which countries have globalised. Further, such correlation as presented above tells us nothing about causation and it is necessary to take into account many other determinants before we could draw some useful inferences about possible links between trade openness and wage inequality. Chapter 3 therefore proposes and applies an econometric framework to better grasp the relative strength of drivers of earnings inequality in the OECD area.

3. The impact of globalisation, technology and institutional developments on wage dispersion

40. Empirical studies of inequality that used data from the 1980s and 1990s have generally been inconclusive as to causal links between developments in globalisation (particularly trade) and inequality (see literature review in Annex D). Over the past decade, however, there have been several notable shifts in patterns of globalisation, as documented above. As more information and time-series data become available, there is renewed interest in examining whether global processes alter wage structures. While globalisation and technological change were long considered the prime explanation for wage inequality, empirical studies are now also documenting the importance of changes in labour market institutions and policies. However, many of these studies look at the impact of globalisation, or of institutions and regulations on inequality in isolation. This chapter considers both the effect of globalisation and regulatory changes and analyses how much of the rise in within-country wage inequality can be attributed to changes in labour market institutions, regulations, and policies rather than to globalisation and technological change.

41. The chapter applies an econometric model to assess the distributional consequences of globalisation, technological progress and institutions on within-country wage inequality. The following macro-regression model is estimated:

$$\ln(\text{Wage dispersion}_{it}) = \alpha + \beta' \ln(\text{GLOBs}_{it}) + \lambda \ln(\text{Tech}_{it}) + \theta' \ln(\text{Instit}_{it}) + \gamma' X_{it} + C_i + \eta_t + \varepsilon_{it}, \qquad (1)$$

where wage dispersion is measured by the decile ratio (D9/D1) of weekly earnings among full-time workers.[12] *GLOBs* are a set of globalisation indicators, including measures for both trade and financial

12 In most cases, "wages" refers to gross weekly or monthly earnings of full-time workers. There are, however, a few exceptions. Wage data for Finland, France and the Netherlands refer to annual earnings of

movements. *Tech* is an indicator of technological progress, principally measured by expenditure on business sector R&D as a share of GDP.[13] *Instit* refers the institutional variables, including unionisation, product market regulation (PMR), employment protection legislation (EPL), tax wedges and the unemployment insurance replacement rates. *X* is a vector of control variables, which includes the sectoral share of employment (*i.e.* agriculture, industry and service sectors), education (percent of population with post-secondary education), the share of female employment and the output gap (to capture cyclical fluctuations in aggregate demand).

42. Equation (1) is estimated by a fixed-effects model with both country-specific effects, C_i, (to focus on within-country changes) and year-specific effects, η_t (to capture common global shocks and business cycle effects). ε_{it},is a random disturbance. We use annual cross-county, time-series data covering 22 OECD countries from the early 1980s to 2008 (see Annex A for sources and details about the data). The dependent variable and most explanatory variables are logarithm-transformed.[14]

3.1. Baseline specification

43. The baseline specification of the regression uses summary indicators to capture the impact of global economic developments on wage inequality among full-time or full-time equivalent workers. Trade integration is captured by trade exposure, defined as a weighted average of export intensity and import penetration, while technical progress is proxied by the business R&D-to-GDP share deviated from its long-term trend.[15] The development of financial openness is instrumented by a *de jure* foreign direct investment (FDI) measure – the FDI restrictiveness index – which takes a value between 0 (open) and 1 (closed).[16] The advantage of using *de jure* indices rather than *de facto* (volume-based) measures of international

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full-time (and full-year equivalent) wage earners. In these countries, changes in wage dispersion may be influenced by changes in work patterns towards atypical work (i.e. full-time to part-time as well as full-year to part-year employment).

13 Further analyses also used alternative science and technology measures – such as public sector R&D expenditure, patent counts, trade performance of R&D-intensive industries and ICT intensity – for sensitivity testing of alternative technology indicators.

14 Since both dependent and independent variables used in the analysis tend to be skewed by their very nature (i.e. ratios), the use of logarithmic transformations makes the distribution more symmetric. In addition, there is a considerable heteroskedasticity in the cross-country data that could make some of the tests and confidence intervals invalid. For instance, trade volumes as a percentage of GDP range from as little as 25% in one country to over 150% in another. A logarithmic transformation reduces unequal variability and therefore makes the within-group variability more similar across groups.

15 This is based on the suggestion that unexpected technology shocks rather than the long-term trend would affect the demand for skilled/unskilled labour. The variable for technological progress is thus derived using the Hodrick-Prescott (HP) filter which decomposes a time series into a growth component and a cyclical component: $y_t = \tau_t + \theta_t$. Here y is the logarithm of technology variables (business R&D-to-GDP ratio), τ is its growth component and θ is its cyclical component. The former reflects a long-term growth curve around which the variable fluctuates, while the latter captures a transitory deviation from its growth curve which can be interpreted as "technology shock". Note that the appropriate values of the smoothing parameter depend upon the periodicity of the data. Following Ravn and Uhlig (2002), a smoothing parameter of 6.25 for annual data has been chosen.

16 The OECD FDI restrictiveness index covers four types of financial regulations: (i) foreign equity restrictions, (ii) screening and prior approval requirements, (iii) rules for key personnel, and (iv) other restrictions on the operation of foreign enterprises (see Kalinova *et al.* 2010). The consistency of sources used in constructing the FDI restrictiveness index makes it possible to track the progress of financial investment liberalisation over time.

financial flows is that they mitigate the problem of endogeneity since *de facto* measures are often endogenously determined by other factors included in the framework, *e.g.*, the openness of the economy to international trade or technological progress. The baseline specification uses four variables for policies and institutions: union coverage, product market regulation (PMR), employment protection legislation (EPL) and tax wedges.[17] The results from the regression analysis are presented in Table 2.

Table 2. The impact of globalisation, technological progress and regulatory reform on trends in wage dispersion

Dependent variable: natural logarithm of D9/D1 ratio of full-time earnings

	Baseline (Trade)	w/ financial regulation	w/ technology	w/ institutions & policies
	(1)	(2)	(3)	(4)
Trade				
ln(Total trade exposure)	0.049 (1.37)	0.059* (1.72)	0.060* (1.66)	0.035 (0.95)
Financial				
ln(FDI restrictiveness index) [0-1, 0 open, 1 closed]		-0.049*** (-3.36)	-0.049*** (-3.35)	-0.001 (-0.04)
Technology				
ln(Business R&D/GDP)[1]			0.103** (1.98)	0.097** (2.06)
Labour Market institutions & policies				
ln(Union coverage rate)				-0.039* (-1.90)
ln(PMR)				-0.040** (-2.26)
EPL				-0.052*** (-4.62)
ln(Tax wedges)				-0.112*** (-3.66)
Other controls				
ln(% has attained post-secondary edu.)	-0.119*** (-6.56)	-0.152*** (-6.91)	-0.156*** (-6.89)	-0.116*** (-4.57)
ln(female employment share)	-0.173 (-1.44)	-0.260** (-2.22)	-0.273** (-2.30)	-0.351*** (-2.92)
Other[2]	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Number of obs.	333	333	333	333
Number of countries	22	22	22	22
Adjusted R-squared (within)	0.45	0.48	0.48	0.55

Note: *t* – statistics (in parentheses) are obtained from heteroskedasticity-robust standard errors**.** Estimates are significant at the 10% level *, 5% level ** and 1% level ***. For definition of variables, see Annex A.

[1] The variable is detrended using the Hodrick-Prescott (HP) filter (see footnote 15).

[2] Other controls include the output gap, the sectoral share of employment (i.e. agriculture, industry and service) and the trend component of technology variable from the HP filter.

Source: Annex A. Authors calculations.

[17] The country sample is thus restricted to those 22 countries in which information on all variables used in the regression analysis is available.

44. Without controlling for any other macro-economic developments and changes in regulations and institutions, Column (1) in Table 2 suggests that trade integration has no significant impact on trends in wage dispersion among full-time wage earners within countries, at least at the aggregate level. An inequality-increasing effect of trade, however, becomes marginally significant (t=1.72) when changes in FDI restrictiveness are controlled for (see Column [2]). This suggests a possible interplay between trade and financial openness, as growing trade exposure tends to be accompanied by certain inequality-reducing elements in financial flows (*e.g.* inward investment). As a result, a disequalising effect of trade becomes apparent when financial factors are held constant.

45. With respect to financial deepening, Column (2) shows that relaxing FDI regulation (to attract more external investment) is associated with higher wage inequality. The effect is strong and statistically significant at the 1% level. The coefficient indicates that a 10% decrease in the average FDI restrictiveness index would yield a roughly 0.5% increase in the mean wage differential. For a baseline D9/D1 of 3.0, this is an equivalent of an increase of 0.015 point (*i.e.* 3x1.005=3.015).

46. Column (3) includes the impact of increased expenditure on science and technological activities, controlling for both trade and financial determinants. Technological progress has a large, significant disequalising impact on the wage distribution: an increase of BERD-to-GDP ratio by 10% above its long-run trend value is associated with a 1% increase in the D9/D1 ratio.[18] The result, despite focusing on shocks, is consistent with previous findings that technological progress tends to widen the wage distribution by making the demand for skilled labour higher than for unskilled labour. The result, similar to IMF (2007) findings, also suggests that advances in technology have a greater impact than trade and financial factors on inequality *within* countries.

47. Column (4) is the preferred specification and includes the effects of regulatory reform and changes in institutions. It presents the overall picture of the relationship between globalisation, technology, policies/institutions, and within-country wage inequality. The results, which are discussed in more detail in the sections below, show that changes in labour market policies and institutions (in particular PMR, EPL and tax wedges) and technological change were generally the main determinants of the increase in wage inequality between the early 1980s and the late 2000s. Trade integration and international financial flows exerted little distributional impact, once policies and institutional effects were taken into account.

48. Over the same period, however, the rise in educational attainment led to an increase in the supply of skilled labour, which reduced wage differentials and helped to considerably offset growing inequality. Rising female labour force participation also exerted a sizable equalising effect, a trend in line with the hypothesis of a gender-biased demand shift in favour of female labour.[19] It raises relative wages for women and thus reduces overall wage inequality.

49. Some of the aggregate indicator results above may hide the effects of certain sub-components of economic globalisation on inequality. The next three sections therefore examine in detail the impact of changing trade, financial and institutional patterns on wage dispersion, respectively, looking at several sub-aggregates of these global developments.

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[18] The following hypothesis illustrates this finding. If the BERD-to-GDP ratio grows about 5% on average per year in the long run, an unexpected spurt in growth one year of 8% (i.e. 3% deviation from the mean) would increase the D9/D1 ratio by 0.3%. For a baseline D9/D1 of 3.0, this translates into an increase of nearly 0.01 point (i.e. 3x1.003=3.01).

[19] The demand for female labour could be driven by changes in technology conducive to occupations in services where women have a comparative advantage. It could also spring from changes in social norms that encourage women to seek highly paid jobs and employers to hire them (Goldin, 2006).

3.2. The impact of trade integration on wage inequality

50. Table 3 disaggregates the overall trade exposure variable into subcomponents to gain insight into the channels through which trade may affect wage dispersion. Columns (1) and (2) report the distributional impact of exports and imports, considering other macroeconomic developments to be constant. Neither estimate is statistically significant, a finding consistent with previous empirical literature which generally shows no conclusive evidence between trade integration and income or earnings inequality (*e.g.* IMF, 2007; ILO and WTO, 2007; ILO, 2008).

51. Theoretical models have predicted different distributional impacts between trade among advanced countries (North-North) and trade with developing countries (North-South) (see, for example, Krugman 1981; Helpman 1981; or Wood 1994, 1995). In the rest columns we further disaggregate the trade indicator by region of origin and destination.[20] Columns (3) and (4) look at the inequality impact of increasing trade with advanced countries. Closer integration of high-income countries during this time period (e.g. via NAFTA, Maastricht, or the Uruguay Round liberalisation) could have had an impact on wage inequality. However, the regression result indicates that trade (in merchandise) with advanced countries had no effect on the D9/D1 wage differential.

52. For the impact of deepening trade with developing countries, columns (5) – (7) indicate no apparent disequalising impact from trade (in merchandise) with emerging economies. This is also true when focusing on import competition from low- and mid-income countries.

53. However, the impact of trade integration on wage inequality might depend on the institutional setting of the country considered. Rising import competition, for instance, may have a larger effect on wage dispersion in countries with less strict regulations, e.g. in terms of employment protection. To test this hypothesis, in columns (8) and (9) we interact the measures of trade integration with a binary policy dummy, p, which indicates whether or not a country has less strict employment protection.[21] The coefficient of trade integration therefore reflects the impact on wage inequality for countries with a more rigorous EPL regime ($p=0$), and the estimate of the interaction term captures the difference in the wage inequality effect of trade between these two types of country groups, "strict EPL" and "weak EPL" countries.[22] The results suggest that trade (imports) with emerging economies tends to reduce wage inequality among countries in which stronger employment protection legislation prevails. At the same time, the interaction term indicates the opposite scenario for countries with less strict EPL[23], namely that growing import competition from developing regions was associated with higher wage inequality (column

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20 The data source here is UNCTAD (http://unctadstat.unctad.org), which provides trade (in merchandise) statistics by region of origin and destination. Unfortunately, regional information for trade in services is not available. As a result, analyses in columns (3)-(9) of Table 2 concern only trade in merchandise.

21 The dummy is specified in a way that 1 indicates an economy with less strict employment protection, and 0 otherwise. A country is defined as having less-strict employment protection if its average EPL score over the period studied is below 1.4, on a scale of 0 (least restrictions) to 5 (most restrictions). This less-strict group includes 8 countries: Australia, Canada, Hungary, Ireland, New Zealand, Switzerland, the United Kingdom and the United States. The median EPL value over all 22 countries under study is 1.9.

22 Technically, the wage inequality effect of imports in countries with less strict EPL is given by the sum of the coefficient of imports and the coefficient on the interaction term. This implies that its significance cannot be determined as such.

23 The wage inequality impact of trade integration for countries with less strict EPL can be gauged by the sum of the coefficient on imports and the coefficient on the interaction.

8). These results get stronger when the impact of imports from low-income developing countries like China and India is considered (column 9).

54. While the effect of trade integration has been estimated to be insignificant for wage dispersion at the aggregate level, there are reasons to believe that there were effects on the more disaggregated level. Recent literature has emphasised the importance of firm heterogeneity in international trade and a number of possible new mechanisms (see Tybout 2003 and Harrison *et al.* 2010 for a survey). One such mechanism at play is that trade induces a "quality" upgrading of products, plants, and workers in exporting firms, and thus leads to an increase in the wage premium between exporters and non-exporters. Such trade-induced reallocation of resources is likely to occur across firms within the same sector (Melitz 2003). Empirically, the quality-upgrading mechanism is more evident for developing countries, especially in Latin America.[24] There are also a few recent studies that document the presence of exporter wage premiums in industrial countries. Klein *et al.* (2010), for instance, find that an increase in the average export share in Germany raises wage inequality along the dimension of skill, but diminishes wage gaps between genders and between German citizens and non-citizens, leaving the overall impact ambiguous.

55. The analyses presented in this chapter focus on the country-level and do not take account of developments at the more disaggregated level, e.g. in terms of industry sectors. To test whether globalisation may have affected wage inequality in specific sectors which were more exposed than others to trade opening, innovation or FDI development, Annex B examines sector-specific developments in skill wage gaps. The results from this analysis suggest that most of the increase in skill wage gaps was driven by inequality within rather than between sectors and confirm one of the main findings from this chapter namely that trade is not the main factor behind this trend.

[24] Hanson and Harrison (1999) and Verhoogen (2007), for example, both find evidence of upgrading for exporting firms in Mexico. A somewhat different mechanism involving rising exporter wage premium is the possible interplays between technology, skills and exports. Bustos (2011), for instance, argues that increased export opportunities make the adoption of new technologies profitable for more firms, and thus generate increased demand for skilled workers in Argentina, leading to a widening skill premium.

Table 3. The impact of trade integration on trends in wage dispersion

Dependent variable: natural logarithm of D9/D1 ratio of full-time earnings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trade integration									
ln(Export intensity)	0.038 (1.33)								
ln(Import penetration)		-0.052 (-1.38)							
Trade w/ advanced countries									
ln(exports to AD as % GDP)			0.039 (1.56)						
ln(Imports from AD as % GDP)				-0.056 (-1.58)					
Trade w/ developing countries									
ln(exports to DC as % GDP)					-0.011 (-0.70)				
ln(Imports from DC as % GDP)						-0.018 (-1.08)		-0.028* (-1.75)	
ln(Imports from low/med-income DC as % GDP)[1]							-0.017 (-1.11)		-0.037** (-2.39)
Interaction (Trade x institutions)									
ln(Imports from DC as % GDP) x dummy for less-regulated economies[2]								0.053** (2.26)	
ln(Imports from low/med-income DC as % GDP) x dummy for less-regulated economies[2]									0.073*** (4.67)
Financial									
ln(FDI restrictiveness index) [0-1, 0 open, 1 closed]	0.003 (0.20)	0.007 (0.39)	0.010 (0.61)	0.001 (0.02)	-0.001 (-0.07)	-0.001 (-0.03)	0.001 (0.04)	-0.001 (-0.02)	-0.004 (-0.24)
Technology									
ln(Business R&D/GDP)[3]	0.098** (2.05)	0.103** (2.20)	0.092* (1.90)	0.112** (2.36)	0.100** (2.13)	0.094** (2.03)	0.093** (1.96)	0.094** (2.02)	0.090* (1.90)

Labour Market institutions & policies									
ln(Union coverage rate)	-0.040*	-0.033*	-0.043**	-0.030	-0.034*	-0.037*	-0.039*	-0.017	-0.004
	(-1.91)	(-1.68)	(-2.06)	(-1.50)	(-1.65)	(-1.82)	(-1.93)	(-0.82)	(-0.20)
ln(PMR)	-0.039**	-0.041**	-0.038**	-0.041**	-0.037**	-0.038**	-0.036**	-0.042**	-0.048***
	(-2.22)	(-2.33)	(-2.18)	(-2.37)	(-1.98)	(-2.16)	(-2.01)	(-2.43)	(-2.69)
EPL	-0.052***	-0.058***	-0.050***	-0.062***	-0.053***	-0.054***	-0.053***	-0.060***	-0.066***
	(-4.68)	(-5.04)	(-4.32)	(-5.17)	(-4.83)	(-4.86)	(-4.85)	(-5.14)	(-5.65)
ln(Tax wedges)	-0.110***	-0.106***	-0.106***	-0.104***	-0.104***	-0.099***	-0.102***	-0.108***	-0.110***
	(-3.59)	(-3.54)	(-3.42)	(-3.50)	(-3.37)	(-3.18)	(-3.34)	(-3.39)	(-3.76)
Dummy for less-strict EPL economies[2]								-0.008	0.001
								(-0.12)	(0.02)
Other controls									
ln(% has attained post-secondary edu.)	-0.120***	-0.102***	-0.116***	-0.105***	-0.109***	-0.116***	-0.115***	-0.100***	-0.089***
	(-4.68)	(-4.02)	(-4.68)	(-4.33)	(-4.49)	(-4.62)	(-4.70)	(-3.66)	(-3.53)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	333	333	333	333	333	333	333	333	333
Number of countries	22	22	22	22	22	22	22	22	22
Adjusted R-squared (within)	0.55	0.55	0.55	0.56	0.55	0.55	0.55	0.56	0.57

Note: *t* – statistics (in parentheses) are obtained from heteroskedasticity- robust standard errors**.** Other controls include the output gap, female and sectoral employment shares, and the trend of technology variable. For definition of variables, see Annex A.

[1] The income level of developing countries is defined according the United Nation Conference on Trade and Development's (UNCTAD) classification (http://www.unctad.org/Templates/Page.asp?intItemID=2166&lang=1). High-income countries are defined as countries where per capita GDP in 2000 (corrected for fluctuations in the exchange rates) is above US $ 4,500; mid-income countries, between US$1,000 and US$4,500; and low-income countries, below US $ 1,000.

[2] Less-strict EPL economies refer to counties in which the average score of the employment protection over the study period is 1.5 or less, on a scale of 0 (least restrictions) to 5 (most restrictions).

[3] The variable is detrended using the Hodrick-Prescott (HP) filter (see footnote 15).

Source: see Annex A. Authors calculations.

3.3. The impact of international financial integration on wage inequality

56. In the baseline specification (Table 2), international financial integration is measured by a *de jure* variable based on legal restrictions on FDI transactions. This indicator, however, may not adequately reflect actual exposure of countries to international capital markets, and in particular, does not distinguish between inward and outward financial transactions. This section investigates the impact of financial integration by testing a series of *de facto* measures of financial openness. These include total cross-border assets and liabilities as a share of GDP, which reflect the overall exposure of countries to international capital markets.[25] The overall capital stock is further disaggregated into foreign portfolio investment (FPI) and foreign direct investment (FDI). The results of the analyses are shown in Table 4.

57. In general, financial deepening, measured at the aggregate level, has no significant impact on changes in the distribution of wages in OECD countries over the period studied. The coefficients of the overall cross-border capital movement (column 1), foreign portfolio investment (column 2) and foreign direct investment (column 5) are all imprecisely estimated, holding other effects constant. It is not overly surprising that the growth of FPI exerted little impact on domestic wage distribution since it does not involve any management control in the enterprise; rather, it is often channelled to recipient countries through, for instance, venture capital or investment funds. Disaggregating FPI into inward and outward stocks does not reveal alternative findings (columns 3 and 4).

58. It is, however, surprising to observe that FDI growth, which is largely driven by fast-rising multinational corporations (MNC), seemed to have had little impact on widening wage disparity. One may expect the use of the overall FDI measure to mask important information since the distributional impact of FDI flows could depend on the direction of flows.[26] By disaggregating the overall FDI into its subcomponents, inward (liabilities) and outward (assets) stocks, different scenarios emerge.

59. Column (6) suggests indeed that an increase in the *inward* FDI-to-GDP ratio has an equalising impact on the wage distribution in OECD countries. This finding is consistent with previous cross-national studies that focus on advanced economies.[27] However, it is somewhat different from studies which used pooled data from both advanced and developing countries (IMF 2007; Baccaro 2008; Reuveny & Li 2003).[28] The latter studies generally find an inequality-increasing effect of FDI, particularly inward FDI, but mainly for for developing countries since inward

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25 This volume-based measure of international financial integration is derived by Lane and Milesi-Ferretti (2003). The components of the variable include, for assets and liabilities, (1) FDI, (2) portfolio equity, (3) debts, (4) financial derivatives, and (5) total reserves minus gold.

26 The wage inequality impact of FDI may also depend on the destination/source country of FDI. For instance, Griffiths and Sapsford (2004) in their study on Mexico argued that FDI from countries that are closer to the world technology frontier should have a greater impact than FDI from technologically less advanced countries. The physical distance to investors' home countries may play a role, too. Javorcik *et al.* (2004), using data from Romania, show that the share of intermediates sourced locally by multinationals is likely to increase with the distance between the host and the source economy. Unfortunately, the data at hand do not allow for testing these hypotheses.

27 Figini and Gorg (2006), for example, find that wage inequality decreases with inward FDI stock for developed countries; IMF (2007) also shows that inward debt and FDI stock tend to reduce inequality in advanced countries, though for the latter the estimate is not statistically significant.

28 For country-specific studies, see Taylor and Driffield (2005) for the United Kingdom and Bruno *et al.* (2004) for the Czech Republic, Hungary and Poland.

investment is expected to be relatively skill-intensive in these countries, leading to higher inequality through more demand for skilled labour.

60. The second finding in column (6) refers to an apparent interplay between trade and inward FDI stock, linked to the fact that growing trade exposure seems to be correlated with more inward investment. By holding inward investment constant, increased trade exposure exerts a disequalising albeit weakly significant impact on the wage distribution. One explanation may be that the estimate of trade integration in column (6) is overstated if much of the increase in inward investment is trade-induced. [29]

61. The impact of *outward* FDI stock on wage dispersion is shown in column (7). According to the outsourcing hypothesis, growing outward investment reflects the rapid development of international production-sharing (from home companies to their foreign affiliates) which may, in turn, distort the wage distribution of home countries by shifting relative labour demand within industries (*e.g.* Feenstra & Hanson 1996; 1997; 2003; Hijzen 2007).[30] Column (7) indeed suggests that an increase in the outward FDI-to-GDP ratio tends to raise wage inequality, but the effect is rather modest.

62. To test whether inward or outward FDI has different effects in countries with distinct institutional settings, columns (8) and (9) interact the measures of inward and outward FDI, respectively, with a policy dummy for EPL (see description in Table 3). The estimated coefficient on the interaction term in both cases is trivial and insignificant, indicating inflow investment as well as outsourcing plays no major role in wage inequality trends regardless of the institutional (EPL) setting of the country considered. This result is also consistent with the fact that outsourcing activities to developing economies in general only account for a small portion of total outward FDI stock in most advanced countries. Intra-OECD investment, in fact, accounts for over 75% of total outward FDI stocks in more than half of OECD countries (OECD 2005, p.49).

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[29] The interplay between trade integration and financial deepening may, however, exist in both directions.

[30] There are also studies suggesting that outward FDI bears little distributional effect. Slaughter (2000), for instance, shows that outsourcing activities of US multinational enterprises tend to have small, imprecisely estimated effects on the US relative labour demand. Similarly, OECD (2007a, 2007b) also concludes that outsourcing in general only has a rather moderate effect on shifting relative demand away from low-skill workers within the same industry. Lorentowicz *et al.* (2005) suggest that outsourcing actually has *lowered* the skill premium in Austria, a skill-abundant country, while it has increased the wage gap in Poland, a relatively labour-abundant country.

Table 4. The impact of financial openness on trends in wage dispersion

Dependent variable: natural logarithm of D9/D1 ratio of full-time earnings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trade integration									
ln(Total trade exposure)	0.044 (1.09)	0.044 (1.09)	0.045 (1.13)	0.020 (0.52)	0.033 (0.90)	0.067* (1.82)	0.021 (0.60)	0.066* (1.79)	0.023 (0.67)
Financial integration									
ln(Cross-border assets_liabilities /GDP)	-0.010 (-0.52)								
Foreign portfolio investment (FPI)									
ln(FPI/GDP)		-0.008 (-0.54)							
ln(Inward FPI stock /GDP)			-0.009 (-0.65)						
ln(Outward FPI stock /GDP)				0.014 (1.11)					
Foreign direct investment (FDI)									
ln(FDI/GDP)					0.004 (0.22)				
ln(Inward FDI stock /GDP)						-0.041*** (-3.23)		-0.043*** (-3.36)	
ln(Outward FDI stock /GDP)							0.021** (2.12)		0.019 (1.56)
ln(inward FDI stock / GDP) x dummy for less-regulated economies[1]								0.011 (0.86)	
ln(Outward FDI stock / GDP) x dummy for less-regulated economies[1]									0.007 (0.62)
Technology									
ln(Business R&D /GDP)[2]	0.095** (2.02)	0.095** (2.02)	0.096** (2.04)	0.104** (2.17)	0.098** (2.08)	0.083* (1.90)	0.097** (2.04)	0.085* (1.92)	0.099** (2.08)

Labour Market institutions & policies									
ln(Union coverage rate)	-0.036*	-0.038*	-0.037*	-0.036*	-0.042*	-0.009	-0.060***	-0.005	-0.055**
	(-1.76)	(-1.84)	(-1.80)	(-1.70)	(-1.84)	(-0.42)	(-2.73)	(-0.23)	(-2.33)
ln(PMR)	-0.039**	-0.039**	-0.039**	-0.043**	-0.038**	-0.040**	-0.021	-0.043**	-0.026
	(-2.36)	(-2.32)	(-2.35)	(-2.53)	(-2.12)	(-2.45)	(-1.17)	(-2.61)	(-1.40)
EPL	-0.052***	-0.052***	-0.051***	-0.052***	-0.052***	-0.058***	-0.057***	-0.060***	-0.058***
	(-4.93)	(-4.92)	(-4.86)	(-4.91)	(-4.92)	(-5.29)	(-5.30)	(-5.27)	(-5.13)
ln(Tax wedges)	-0.120***	-0.120***	-0.119***	-0.096***	-0.110***	-0.131***	-0.103***	-0.123***	-0.102***
	(-3.61)	(-3.61)	(-3.65)	(-2.93)	(-3.38)	(-4.27)	(-3.43)	(-3.87)	(-3.42)
Dummy for less-strict EPL economies[1]								0.073	0.041
								(1.23)	(0.66)
Other controls									
ln(% has attained post-secondary edu.)	-0.113***	-0.114***	-0.113***	-0.116***	-0.116***	-0.103***	-0.123***	-0.103***	-0.123***
	(-4.97)	(-5.05)	(-5.04)	(-5.07)	(-5.00)	(-4.56)	(-5.24)	(-4.54)	(-5.20)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	333	333	333	333	333	333	333	333	333
Number of countries	22	22	22	22	22	22	22	22	22
Adjusted R-squared (within)	0.55	0.55	0.55	0.55	0.55	0.57	0.56	0.57	0.56

Note: *t* – statistics (in parentheses) are obtained from heteroskedasticity- robust standard errors**.** Other controls include output gap, female and sectoral employment shares, and the trend of technology variable. For definition of variables, see Annex A.

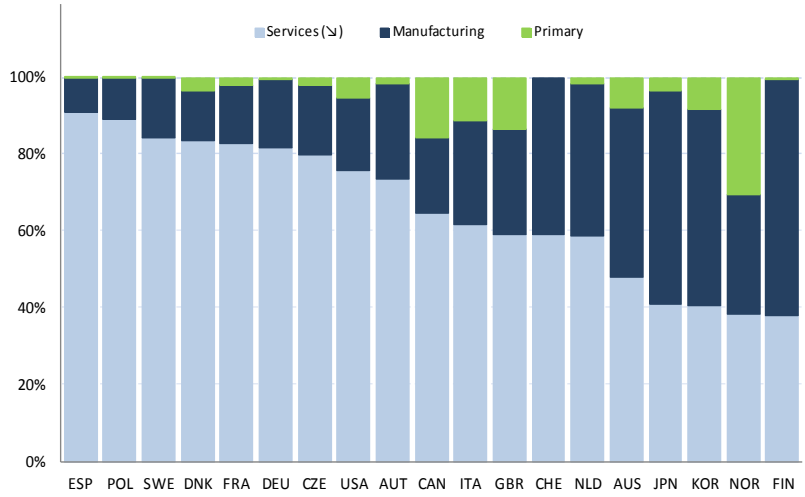
[1] Less-strict EPL economies refer to counties in which the average score of the employment protection over the study period is 1.4 or less, on a scale of 0 (least restrictions) to 5 (most restrictions).

[2] The variable is detrended using the Hodrick-Prescott (HP) filter (see footnote 15).

Source: see Annex A. Authors calculations.

63. One possible reason why the outward FDI stock has only a moderate impact on the wage distribution may be related to the industry from which the investment originated. If a firm in tradable sectors expanded by moving its activities abroad to produce tradable goods, one would expect a substitution between the foreign and the home labour market, as the firm could either export goods produced at home or produce them in its foreign affiliates and export the good back to its home market (*e.g.* Braconier and Ekholm 2000, for Sweden). Figure 7 shows that in most countries the majority of direct investors were actually located in the non-tradable services sector.[31] In 2007, the share of outward investment in the service sector on average represented about 66% of total outward FDI stock. Only in Finland, Japan and Korea does manufacturing play a more important role (50% of outward FDI or more). Given that pattern, it is reasonable to infer that many goods produced in the foreign affiliates are non-tradable and cannot substitute for home-country exports. This may partially explain why outward FDI has a rather small distributional impact in the findings above.

Figure 7. Share of outward FDI stock by industry sectors, selected OECD countries, 2007



Source: OECD FDI Statistics by industry.

64. Another noteworthy finding (not shown here) is that the distributional impacts of trade and financial integration changed significantly in size when a technology variable (business R&D) is taken into account, suggesting a (likely positive) correlation between technology and trade as well as international capital flows. This echoes a growing literature that focuses on the interplays between globalisation and technological change.[32] If scientific activities were induced in response to a more integrated global economy, then the interactions between globalisation and technology may create an important mechanism leading to a rise in wage differentials in OECD countries. In such a case, one

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31 However, some services are tradable, due to technical progress in telecommunications. Services such as call centres or IT hotlines are leading examples and may account for a non-negligible part of outsourcing activities to emerging economics.

32 For hypotheses related to trade-induced skill-biased technological change, see, for instance, Wood (1994, 1995), De Santis (2002), Thoenig and Verdier (2003), Stojanovska and Cuyvers, (2010), Bloom *et al.* (2008). For endogenous technological change related to capital deepening, see Coe and Helpman (1995), Schiff and Wang (2006). See also Goldberg and Pavcnik (2007) for a review of the literature on mechanisms through which globalisation induces technical change in developing countries.

may argue that the distributional impacts of technology estimated above are likely to be overstated, while the impacts of economic globalisation may partly be understated.

65. In sum, the empirical findings suggest that financial deepening generally had no significant impact on the distribution of wages in OECD countries when measured at the aggregate level and as long as other macro-economic changes and changes in policy and institutions are controlled for. However, the average results hide two opposing effects of growing foreign direct investment, which closely relates to the presence of multinational corporations. By disaggregating the overall FDI into inward and outward components, we find inward investment contributing to reducing wage dispersion and outward investment, although to a lesser extent, contributing to increasing wage dispersion.

3.4. The impact of technological change on wage inequality

66. So far, technological progress has been mainly proxied by business sector R&D in this paper. While this concerns resources devoted to private research and experimental development, it may overlook many aspects of scientific and technological activities. In particular, the role of ICT, which was discussed in recent inequality literature (e.g. Autor *et al.* 2003), has been omitted. In this section, we test a number of alternative measures to capture the effect of technological progress (Table 5).

67. First, the inclusion of *public* sector R&D expenditure has little impact on wage inequality (column 1). The result is not surprising since public-sector R&D is often directed at improvements in fields not directly related to general labour markets (such as defence or medical sciences). Second, other than R&D expenditures, indicators of trade performance in R&D-intensive industries have also been used as proxy measures of the industrial and economic impact of scientific and technological progress (OECD 2010).[33] It is hypothesised that a country that uses its resources more efficiently due to better technologies has a comparative advantage in goods whose production requires advanced technologies. As a result, the technological performance of a country should be reflected in the pattern of its foreign trade by R&D intensity. The more R&D-intensive goods a country exports, the better its technological performance (Schmoch *et al* 2006). Column (2) reveals that technological progress – measured by this indicator – is also associated with higher wage dispersion.

68. As a third alternative indicator, in column (3) the ratio of ICT capital stocks to GFCF is used for technological advancement, based on a smaller sample (18 countries only).[34] ICT intensity, as expected, exerted a notable positive effect on trends in wage inequality, albeit this had only borderline significance. The estimate, nevertheless, tends to be understated since some of the countries excluded from the analysis (due to unavailability of ICT data) also experienced a relatively large increase in wage inequality. Given the fact that the usage of ICT is generally on the rise, it is reasonable to infer that the disequalising effect of ICT will be more visible if data from these economies were also included.

69. Finally, in columns (4) and (5) technological progress is captured by patents. This measure conveys information on output and processes of inventive activities. The findings show a positive coefficient on patent variables, however the estimates are not statistically significant at the 10% level. This may reflect the fact that patent counts do not adequately capture technological progress for two reasons. First, not all inventions are patented and certain companies can rely on other mechanisms to

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33 The series concern trade balances and export market shares for five selected groups of R&D-intensive industries: aerospace, electronic, office machinery and computers, pharmaceuticals and instruments.

34 Comparable time-series ICT data for Czech Republic, Hungary, Poland, Korea and Norway are not available.

gain market dominance. Second, not all patents reflect innovation. Rather, firms increase their number of patents by taking out more intellectual property protection so as block imports from developing countries. Simple patent counts, which give the same weight to all patents regardless of their value, may therefore be misleading.

70. In sum, rapid technological advancement tends to widen wage dispersion, although the degree of magnitudes and significance varies depending on the measure used. The result is consistent with many previous findings that technological progress tends to be more important—than trade and financial factors—in affecting the distribution of wage *within* countries (e.g. IMF, 2007).

Table 5. The impact of technological progress on trends in wage dispersion

Dependent variable: natural logarithm of D9/D1 ratio of full-time earnings

	(1)	(2)	(3)	(4)	(5)
Trade					
ln(Total trade exposure)	0.032 (0.87)	0.049 (1.38)	0.022 (0.60)	0.040 (1.14)	0.045 (1.32)
Financial					
ln(FDI restrictiveness index) [0-1, 0 open, 1 closed]	-0.002 (-0.08)	-0.005 (-0.24)	-0.003 (-0.16)	0.001 (0.02)	-0.001 (-0.03)
Technology					
ln(Business R&D/GDP)[1]	0.091* (1.86)				
ln (Public R&D/GDP)[1]	-0.057 (-0.80)				
ln(Export of R&D-intensive industries as % GDP)[1]		0.043* (1.89)			
ln (ICT as % GFCF)[1]			0.085 (1.61)		
ln (Patent counts)[1]				0.036 (0.67)	
ln (Patent per million population)[1]					0.033 (0.62)
Labour Market institutions & policies					
ln(Union coverage rate)	-0.038* (-1.86)	-0.035* (-1.77)	-0.002 (-0.12)	-0.036* (-1.79)	-0.033* (-1.66)
ln(PMR)	-0.039** (-2.21)	-0.043** (-2.46)	-0.038** (-2.46)	-0.042** (-2.43)	-0.044** (-2.54)
EPL	-0.052*** (-4.58)	-0.048*** (-4.17)	-0.027*** (-2.68)	-0.051*** (-4.61)	-0.048*** (-4.35)
ln(Tax wedges)	-0.110*** (-3.51)	-0.112*** (-3.76)	-0.093*** (-3.28)	-0.110*** (-3.56)	-0.114*** (-3.71)
Other controls					
ln(% has attained post-secondary edu.)	-0.116*** (-4.54)	-0.120*** (-4.98)	-0.130*** (-5.08)	-0.118*** (-5.04)	-0.121*** (-5.10)
ln(female employment share)	Yes	Yes	Yes	Yes	Yes
Other[2]	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Number of obs.	333	333	**291**	333	333
Number of countries	22	22	**18**	22	22
Adjusted R-squared (within)	0.55	0.55	0.68	0.54	0.54

Note: *t* – statistics (in parentheses) are obtained from heteroskedasticity-robust standard errors**.** Estimates are significant at the 10% level *, 5% level ** and 1% level ***. For definition of variables, see Annex A.

[1] The variable is detrended using the Hodrick-Prescott (HP) filter (see footnote 15).

[2] Other controls include the output gap, the sectoral share of employment (i.e. agriculture, industry and service) and the trend component of technology variable from the HP filter.

Source: Annex A. Authors calculations.

3.5. The impact of policies and institutional changes on wage inequality

71. The baseline specification in Table 2 above suggested that changes in policies and institutions (in particular PMR, EPL and tax wedges) exerted an important impact on rising wage inequality in OECD countries. This section discusses the distributional impact of these different policy instruments in more detail. It also looks at additional policy variables, namely the unemployment replacement rate and the minimum wage ratio, though at the cost of a reduced sample size.[35] The results are presented in Table 6.

72. Column (1) repeats the baseline specification as shown in Table 2 (4). In line with previous studies (e.g. Burniaux *et al*. 2006; Checchi and Garcia-Penalosa 2005), declining union coverage rates had a disequalising, albeit moderate, effect on higher wage inequality. Also both more flexible PMR and weaker EPL are found to be associated with higher wage inequality. The estimated coefficients indicate that the D9/D1 ratio would increase by 0.4% (0.5%) for a ten-percent decline in the PMR (EPL) index. For a baseline D9/D1 of 3.0, this is equivalent to an increase of 0.012 (or 0.015) points. The result for the impact of EPL on wage inequality is in line with previous literature (*e.g.* Koeniger *et al*. 2007). For PMR, most previous empirical studies focused on its impact on employment while the wage inequality impact remained less analysed. Nonetheless, the results are consistent with Nicoletti *et al.* (2001) who argue that product market liberalisation tends to reduce market rents available for unions to capture through collective bargaining. This may lead to a decline in union power (or more decentralised bargaining) and hence result in greater wage dispersion.

73. In Column (2), the synthetic employment protection (EPL) indicator is disaggregated into its two major components: for dismissal of employees on regular contracts, and for strictness of regulation on temporary contracts – the overall EPL is a weighted average of these two subcomponents. Since in most OECD countries a weakening in overall EPL occurred primarily in the area of temporary and fixed-term contracts, it is expected that the temporary component of EPL would play a more important role for wage inequality trends. It is put forward that EPL tends to protect unskilled workers more than skilled workers due to a substantial fixed-cost component (Boeri *et al.* 2006). Weakening of employment protection, in particular the liberalization of temporary contracts, would therefore contribute to higher wage inequality. Results in column (2) confirm this hypothesis. The distributional effect of the overall EPL measure is entirely driven by changes in the employment protection for temporary workers.

74. Lower taxation of earnings (tax wedges) had a strong and significant effect on increased wage inequality. The estimated coefficient indicates that a 10 percent decline in tax wedges would increase the D9/D1 ratio by 1.1%. Higher tax wedges imply higher labour costs for employers and lower take-home pay for employees, which discourages recruitment and acceptance of (as well as the participation in) low-paid jobs. A fall in tax wedges therefore would increase the share of low-skilled labour leading to higher wage differentials.

75. Consistent with literature, higher UI replacement rates are negatively associated with wage dispersion (Column 3). The level of generosity in Table 6 is proxied with the replacement rate of a lower-wage worker at two thirds of average earnings. If the average level is used instead, the effect of gross replacement rates becomes quite modest and not significant at the 5% level (data not shown). This suggests that the effect of UI replacement rates are relatively more important for unskilled labour

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35 By including the UI replacement rate, the year coverage drops notably for Czech Republic, Hungary, Italy and Poland as the comparable time-series UI replacement data for these countries are only available from the early 2000s. For the minimum wage model, the number of observations is almost halved (from 327 to 188) and the number of countries covered is reduced from 22 to 14.

and the findings support evidence that more generous UI benefit rates for low-wage workers raises the reservation wage and compresses the wage distribution.

Table 6. Impact of changes in product and labour market policies and institutions on trends in wage inequality

Dependent variable: natural logarithm of D9/D1 ratio of full-time earnings

	Baseline	w/EPL split	w/ UIRR	w/ min. wage	Lagged policy[2]
	(1)	(2)	(3)	(4)	(5)
Trade integration					
ln(Total trade exposure)	0.035 (0.95)	0.036 (1.00)	-0.041 (-0.98)	0.007 (0.17)	-0.004 (-0.09)
Financial integration					
ln(FDI restrictiveness index) [0-1, 0 open, 1 closed]	-0.001 (-0.04)	0.004 (0.27)	0.030* (1.92)	-0.040** (-2.34)	-0.007 (-0.38)
Technology					
ln(Business R&D /GDP)[1]	0.097** (2.06)	0.096** (2.08)	0.086* (1.81)	0.028 (0.69)	0.063 (1.33)
Labour Market institutions & policies					
ln(Union coverage rate)	-0.039* (-1.90)	-0.041** (-2.15)	-0.043** (-2.27)	-0.097*** (3.09)	-0.026 (-1.24)
ln(PMR)	-0.040** (-2.26)	-0.033* (-1.91)	-0.028* (-1.65)	0.034 (1.02)	-0.040** (-2.04)
EPL	-0.052*** (-4.62)		-0.078*** (-7.06)	0.010 (0.53)	-0.048*** (-4.23)
EPL_regular		0.010 (1.01)			
EPL_temporary		-0.062*** (-5.76)			
ln(Tax wedges)	-0.112*** (-3.66)	-0.134*** (-4.27)	-0.135*** (-4.55)	-0.103*** (-3.33)	-0.083*** (-2.49)
ln(UI replacement rate) for low-wage workers			-0.074*** (-3.11)		
ln(min/median wage)				-0.298*** (-5.88)	
Other controls					
ln(% has attained post-secondary edu.)	-0.116*** (-4.57)	-0.101*** (-4.00)	-0.073** (-2.54)	0.007 (0.15)	-0.119*** (-4.38)
Other variables	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Number of obs.	333	333	**318**	**190**	317
Number of countries	22	22	22	**14**	22
Adjusted R-squared (within)	0.55	0.57	0.60	0.69	0.53

Note: *t* – statistics (in parentheses) are obtained from heteroskedasticity- robust standard errors**.** Other controls include the output gap, female and sectoral employment shares, and the trend of technology variable. For definition of variables, see Annex A.

[1] The variable is detrended using the Hodrick-Prescott (HP) filter (see footnote 15).

[2] All policy variables, ln(union coverage), ln(PMR), EPL, ln(tax wedges) and ln(FDI restrictiveness), were instrumented using their lagged (for one year) value.

Source: see Annex A. Authors calculations.

76. Column (4) looks at the impact of changes in the minimum wage (relative to the median wage) on wage inequality. This reduces the country sample, mostly countries that are characterized by relatively strict labour market institutions.[36] Not surprisingly, higher minimum wages are negatively associated with wage inequality. The effect of minimum wages is strong and statistically significant: a ten-percent increase in the minimum/median wage ratio reduces the D9/D1 differential by 2.6%. Overall, the findings on the distributional impact of changes in policies and institutions are in line with previous studies (Koeninger *et al.* 2007; Visser & Cecchi 2009; Wallerstein 1999).

77. Several sensitivity tests confirm the results above. To address concerns of reverse causality in which inequality may itself influence institutional variables, in column (5) all institutional and policy variables were instrumented using their lagged (for one year) value. The results confirm that the findings are robust. Furthermore, in macro regressions with limited observations and time-series, results may be influenced by outliers. To test whether the inclusion of a given country significantly alters the regression results discussed above, the preferred specification (column 1) has been re-estimated by successively dropping one country at a time from the sample. A total of 22 separate estimates of coefficients were obtained and plotted in Figure 8 for PMR, EPL, tax wedges and technology variables, respectively.

78. The results show that the estimated coefficients of these variables are always within 95% confidence intervals (dashed lines) of the preferred estimates based on the full sample. This suggests that the general findings above are robust and not affected by any particularly influential country data. This exercise, however, highlights a few influential countries that may have a noticeable impact on the point estimate. For instance, removing Denmark from the sample would significantly reduce the disequalizing effect of PMR. The opposite is true when Spain was removed from the estimation. Dropping Finland from the country sample tends to greatly mitigate the impact of EPL on wage inequality. The distributional impact of tax wedges would be stronger if Australia or Ireland were removed from the samples. Finally, results for the technology variable appear to be quite robust and do not depend on the sample coverage.

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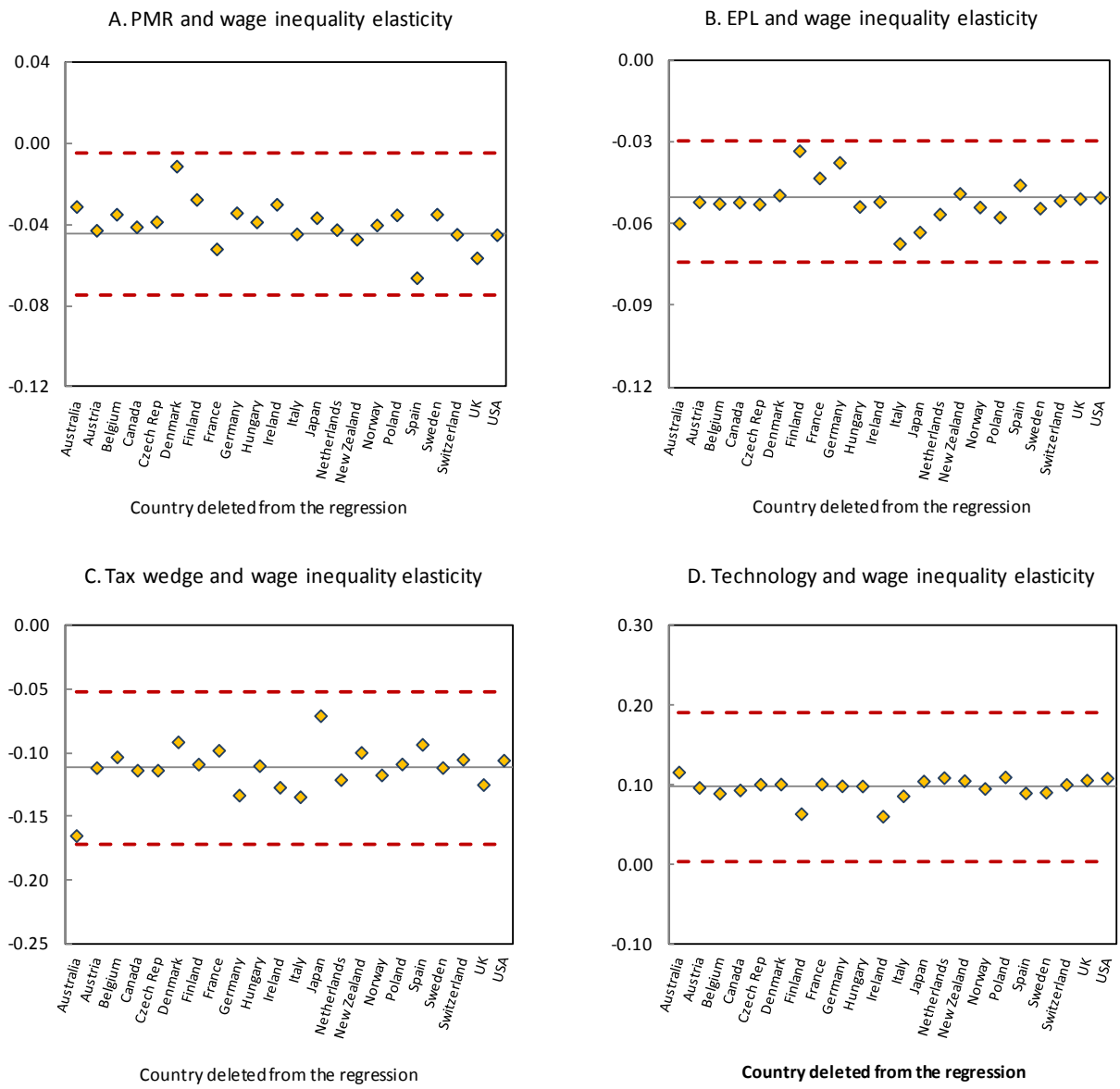
[36] The eight countries removed from the sample because of the absence of a nation- and economy-wide minimum wage are Austria, Denmark, Finland, Germany, Norway, Sweden and Switzerland.

Figure 8. Robustness tests: influential country in the regression of wage inequality



Note: The robustness tests have been applied to the specification of column (1) in table 6. Dashed lines indicate 95% confidence interval.

Source: Authors calculations.

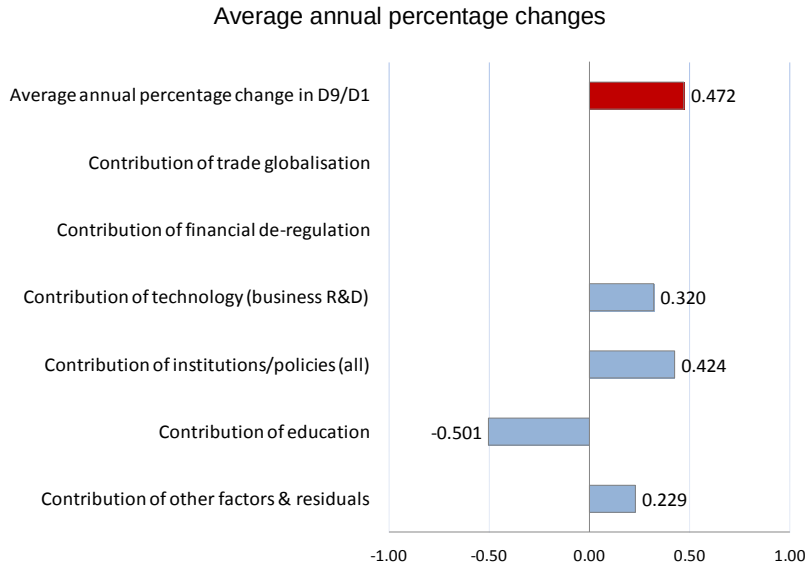
3.6. Quantifying the contribution of changes to wage inequality

79. To what extent have economic globalisation, technological advancement and changes in policies and institutions contributed to the overall rise in wage inequality over the past decades? Using the estimated coefficients which are statistically significant from the preferred specification in Table 2 (column 4), the respective contribution of macro-economic developments to changes in wage inequality can be estimated. This is done by calculating the average annual change in each of the significant explanatory variables, multiplied by the coefficients (the elasticity) from the regression

results to obtain a simulated change in wage inequality arising from changing globalisation or other factors.[37] The results are shown in Figure 9. The D9/D1 ratio of wage dispersion grew on average (across countries) by 0.47 percent annually between the early 1980s and the late 2000s. For a baseline D9/D1 of 3.0, this translates to a rise of 0.014 point per year.

80. The results suggest that changes in policies and institutions[38] on the one hand and technological progress on the other are the two main forces that contribute to the annual increase in the D9/D1 wage differential: institutions together contribute a 0.42 percent annual increase to this ratio, and technological progress contributes another 0.32 percent average increase in inequality annually. On the other hand, the increased share of educated workers exerted a sizable equalising effect, offsetting almost entirely the rise in the D9/D1 ratio due to the combined effects of institutions and technology. The impact of trade and financial integration on wage dispersion is not reported as their coefficients were insignificant. Other factors, which combine changes in sectoral and female employment shares as well as the residuals, account for the rest of 0.23 percent annual increase in the wage differential. When leaving aside institutions and other unexplained factors, Figure 8 would suggest that the evolution of wage dispersion can be viewed, to some extent, as the differences between demand and supply, or in Tinbergen's terms (1975), a "race between education and technology" (see also Goldin & Katz 2008). The results obtained suggest that policies focusing on education can be a successful tool as the increase of average years of schooling more than balanced out the increase in wage inequality brought by technological change in OECD countries.

Figure 9. Accounting for changes in wage inequality: the role of globalisation, technology and labour market policies and institutions



Note: Other factors include sectoral employment shares and female employment share. The contributions of trade and financial deregulation are not reported due to imprecise estimates of coefficients.

Source: Table 5, Authors calculations.

37 The contributions of the variables of interest to the change in the D9/D1 ratio are computed as the average annual change in the respective variable multiplied by the corresponding coefficient in Table 5 (1). Following IMF (2007), the averages across country groups are weighted by the number of years covered for each country in order to give more weight to countries with a longer period of observation.

38 For ease of presentation, all institutional and policy effects were grouped together.

3.7. Effects on the top and the bottom of the wage distribution: tail-sensitive analyses

81. Policies and institutions have been found in previous studies to have a greater impact at the bottom end of the wage distribution and to affect unskilled workers more than skilled workers (*e.g.* Lemieux, 2008). Similarly, globalisation and technological progress could also have a different impact on inequalities on different income groups. Analysis of the OECD earnings data reveals an increase in wage disparity in both halves of the distribution, but with larger increases at the top than at the bottom (OECD, 2008a). Recent studies document the sharp rise in top earnings and incomes since the 1970s (Atkinson 2005; Atkinson & Leigh 2010; Piketty & Saez 2006), while some other empirical evidence points to a polarisation of the labour market (e.g. Goos & Manning 2003, 2007) which may also lead to greater wage disparity both at the top and at the bottom.[39] This section applies tail-sensitive inequality measures, namely D9/D5 and D5/D1 decile ratios of earnings, to test the distributional impact of the different drivers in these two parts of the distribution.

82. Table 7 shows that increased trade integration in general had no impact on both halves of the wage distribution.[40] FDI deregulation appears to exert two opposing effects: reducing dispersion at the bottom half of the wage distribution and widening it for at the top half. The disequalising effect of FDI deregulation for the upper part of the distribution is mainly driven by outward investment (column 5). This may be partly explained by the off-shoring hypothesis that outsourcing, through moving non-skill-intensive activities abroad, has shifted employment towards skilled labour, widening dispersion predominantly among the top due to increased wage premia for skilled labour (Feenstra & Hanson 1996). The equalising effect of FDI deregulation for the lower half of the wage distribution is partially driven by inward investment (not shown).[41] As for the impact of technological change proxied by business R&D, it contributed to increasing inequality predominantly for the upper part of the wage distribution.

83. By contrast, changes in product market regulation and employment protection policies seem to impact exclusively on the lower part of the wage distribution: both changes in PMR and EPL have a negative and significant effect on the D5/D1 but not on the D9/D5 ratio. Trends in tax wedges have a notable impact on both parts of the wage distribution, with marginally more influence on higher-wage workers. Given that the variable for tax wedges used in the analysis here refers to a single individual without children at the average earnings levels, one might expect that changes in tax wedges would have a more considerable impact on the wage distribution at the lower part if the reference rates that correspond to lower-wage workers (67% of average earnings) were used. However, such data are not available as longer-time series. A fall in the UI replacement rates tends to widen wage dispersion for both lower- and higher-wage workers, and the effects are somewhat stronger among the lower part of the distribution (columns 3 and 6): to the difference of tax wedges, the level of generosity is measured on the basis of rates for lower-wage workers. Higher union coverage rates exert some an equalising impact predominantly on the upper part of the wage distribution. The finding is in line with Koeniger *et al.* (2007), who also find that union density is more important for the upper part of the distribution than for the lower part. They argue that more powerful unions tend to transfer rents from the very skilled high earners to other workers.

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39 Polarisation of the labour market refers to a growth in employment of both low wage and high wage jobs at the expense of middle-skill jobs. See also Autor *et al.* (2006) for discussion of the U.S. market and Goos *et al.* (2009) for Europe.

40 Previous studies report mixed findings on the effect of trade openness on the different segments of the earnings distribution also in developing countries (*e.g.* Birdsall & Londono 1997, Lundberg & Squire 1999).

41 The coefficient of inward FDI is about -0.15 and is only significant at the 10% level.

84. Finally, an increase in the proportion of skilled workers tends to reduce wage differentials at both halves of the distribution. Likewise, the increase in female employment also contributed to equalising the wage differential, and the effects are quantitatively similar for both lower- and higher-wage workers.

Table 7. Globalisation, Labour market policies/institutions and inequality, lower-wage and higher-wage workers

	Dependent variable ln(D5/D1)			Dependent variable ln(D9/D5)		
	Baseline	Outward FDI stock	w/ UIRR	Baseline	Outward FDI stock	w/ UIRR
	(1)	(2)	(3)	(4)	(5)	(6)
Trade integration						
ln(Total trade exposure)	0.033 (1.21)	0.046 (1.63)	0.012 (0.39)	-0.001 (-0.05)	-0.028 (-1.13)	-0.052* (-1.75)
Financial integration						
ln(FDI restrictiveness index) [0-1, 0 open, 1 closed]	0.030** (2.49)		0.044*** (3.64)	-0.032*** (-2.94)		-0.014 (-1.29)
ln(Outward FDI stock /GDP)		-0.005 (-0.74)			0.026*** (3.19)	
Technology						
ln(Business R&D /GDP)[1]	0.010 (0.26)	0.011 (0.28)	-0.008 (-0.26)	0.092*** (2.96)	0.091*** (3.00)	0.099*** (2.99)
Labour Market institutions & policies						
ln(Union coverage rate)	0.002 (0.10)	0.001 (0.05)	-0.003 (-0.20)	-0.038*** (-2.93)	-0.056*** (-3.75)	-0.037*** (-3.16)
ln(PMR)	-0.045*** (-3.16)	-0.041*** (-2.72)	-0.040*** (-2.98)	0.005 (0.49)	0.019 (1.59)	0.012 (1.08)
EPL	-0.044*** (-4.75)	-0.036*** (-4.14)	-0.065*** (-6.39)	-0.008 (-1.09)	-0.012 (-1.45)	-0.013 (-1.51)
ln(Tax wedges)	-0.042* (-1.83)	-0.032** (-1.42)	-0.056** (-2.49)	-0.069*** (-3.77)	-0.071*** (-4.12)	-0.077*** (-4.44)
ln(UI replacement rate) for low-wage workers			-0.044*** (-2.70)			-0.029** (-2.06)
Other controls						
ln(% has attained post-secondary edu.)	-0.045** (-2.30)	-0.058*** (-3.30)	-0.041* (-1.82)	-0.071*** (-3.82)	-0.065*** (-3.83)	-0.034* (-1.69)
ln(female employment share)	-0.160* (-1.89)	-0.185** (-2.38)	-0.113 (-1.36)	-0.186** (-2.44)	-0.143** (-1.98)	-0.188** (-2.48)
Output gap	Yes	Yes	Yes	Yes	Yes	Yes
Sector employment shares	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	333	333	**318**	333	333	**318**
Number of countries	22	22	22	22	22	22
Adjusted R-squared (within)	0.33	0.32	0.44	0.64	0.65	0.65

Note: *t* – statistics (in parentheses) are obtained from heteroskedasticity- robust standard errors**.** For definition of variables, see Annex.A.

[1] The variable is detrended using the Hodrick-Prescott (HP) filter (see footnote 15).

Source: see Annex A. Authors calculations.

4. Inequality between the employed and the non-employed

85. So far, the discussion in the preceding chapters focused on changes in wage inequality among workers. However, trends in economic globalisation, policies, and institutions affect labour markets not only through changes in wage rates but also through shifts in employment, unemployment and inactivity. Inequality in the entire working-age population, therefore, may widen even if wage inequality among the employed remains unchanged – for instance via increased non-employment. Alternatively, if earnings inequalities across the entire working-age population are considered, rising employment may act as a considerable counterweight to growing wage inequality. Analyses that look only at changes in wage dispersion and that do not consider the possible impacts on employment and unemployment may therefore tell only a partial story.

86. A vast body of empirical evidence points to the significant impact of both product market regulation (PMR) and labour market policies on employment levels (OECD, 2006). Greater product market competition, in particular, tends to increase aggregate employment because it reduces market rents and expands activity (Blanchard and Giavazzi, 2003; Spector, 2004; Messina, 2003; Fiori *et al*., 2007; Bassanini and Duval, 2006). Some studies also put forward that the higher unemployment benefits are and the longer they last, the greater are the levels of unemployment (Nickell, 1998; Nunziata, 2002). Similarly, higher tax wedges are hypothesised to discourage the labour supply and curb employment.

87. Labour market bargaining models (Layard *et al.*, 1991; Pissarides 1990) suggest that, other things being equal, an increase in the bargaining power of workers may lead to higher labour shares and, possibly, to a more compressed wage structure and lower levels of employment. The effect of employment protection legislation (EPL) is uncertain in these models: although it may raise wages and lower employment by strengthening workers' bargaining power, it may also widen wage dispersion by promoting greater dualism (strict EPL for regular workers associated with lax regulations for temporary workers).

88. At the same time, there is an interaction between product market and labour market institutions that affects employment: unions' power to bid for higher wages also depends on the extent to which product market rents can be shared between employers and workers. Empirical evidence in this respect is mixed. Some studies find that product market deregulation is more effective when labour market policies are less restrictive (Berger and Danniger, 2006; Bassanini and Duval, 2006). Others, however, show that employment gains from product market deregulation are greater when labour market settings give workers strong bargaining power (Nicoletti and Scarpetta, 2005; Fiori *et al*., 2007; Griffith *et al*., 2007).

89. There is a strand of empirical literature that examines globalisation's impact on employment and unemployment (*e.g.* OECD, 2007ab; Helpman and Itskhoki, 2007). Unfortunately, though, most such studies do not factor inequality into the story (Acemoglu [1999] and Helpman *et al.* [2008] being among the few exceptions). In particular, they fail to explain to what extent a potential rise in unemployment – due to globalisation – might spread inequality across the whole working-age population or, alternatively, a potential rise in employment might cushion an overall inequality increase. Empirically, little has been done to assess the overall distributional impact of globalisation by combining analyses of both the wage inequality effect and the employment effect.

90. This and the following chapter aim to fill that knowledge gap. We address two questions in particular. To what extent do globalisation, evolving technology, and changes in institutions and regulations affect inequality among the whole working-age population (rather than just among the employed)? Through which channel (wage dispersion or employment) is inequality transmitted?

91. This chapter proceeds in two steps. First, it quantifies how inequality *within groups* (due to wage dispersion among the employed) and *between groups* (caused by inequality between the employed and the non-employed) affects overall earnings inequality across the entire working-age population, applying a model proposed by Atinson and Brandolini (2006). In a second step, it relates such inequality dynamics to macroeconomic developments, particularly globalisation and institutional and policy changes. To that end, it assesses the impact of institutional and policy changes on trends in employment rates. Finally, the subsequent chapter combines that assessment with the findings on determinants of wage inequality trends from chapter 3.

4.1. Trends in wage inequality and the employment rates

92. While there is a trend towards higher wage dispersion among workers, developments in employment may reinforce or accentuate the impact of increased wage inequality. Higher rates of unemployment and inactivity would widen the gap between the employed and the non-employed, and thus, lead to greater earnings inequality among the whole working-age population. To understand through which mechanism (wage or the employment) inequality was transmitted to the whole working-age population, it is useful to start by looking, in a descriptive manner, at the development of both trends together. Using annual time-series data from 1980 to 2008, Figure 10 displays both trends in wage inequality (of full-time workers) and employment rates (of the working-age population). For comparison, each series is normalised to 1 in the initial year. Three panels of countries can be distinguished.

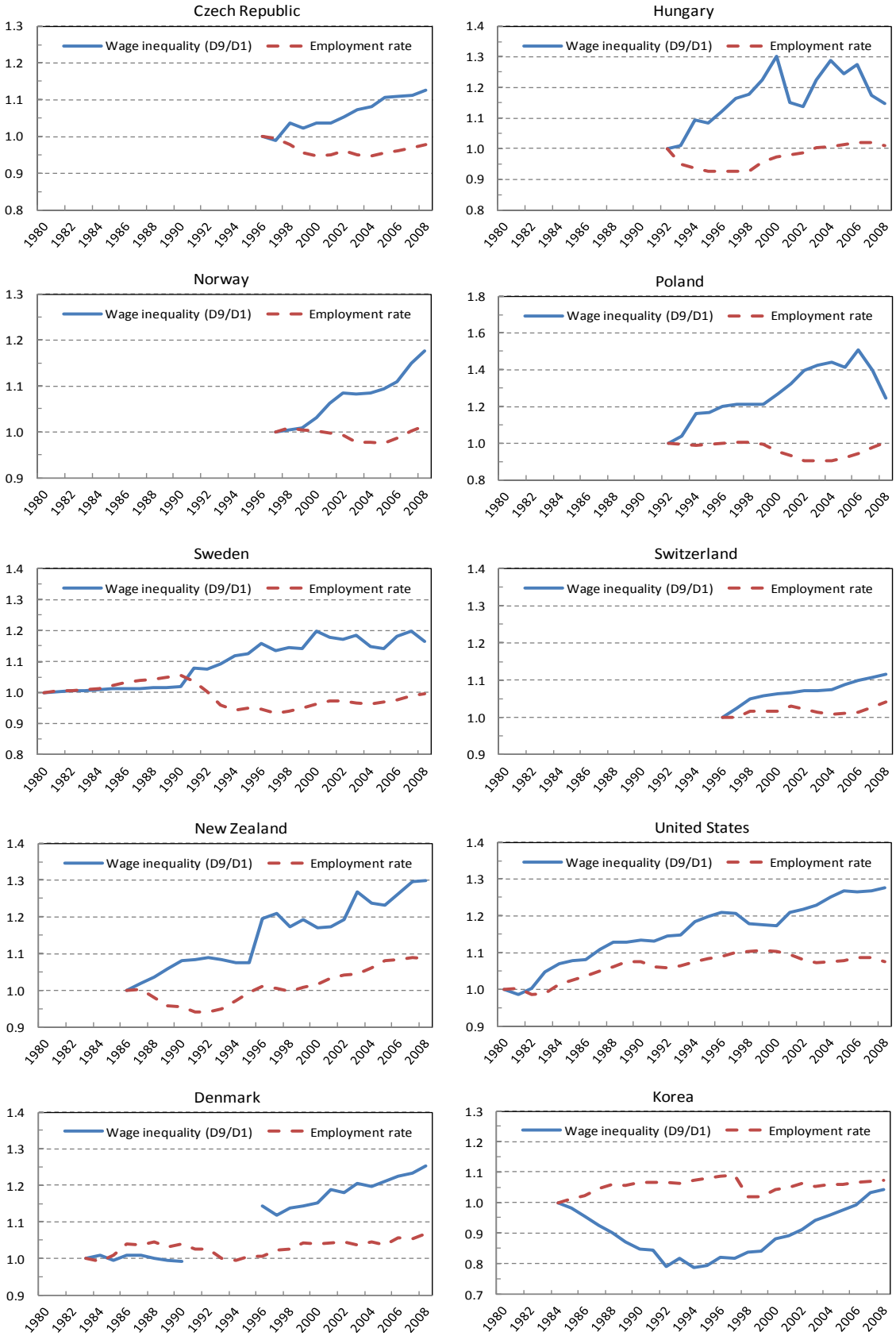
93. Panel A describes a group of countries in which wage inequality rose notably but where the trend in the employment rate was rather stagnant (or moderately increasing). This includes 10 of 22 countries under studies. In Norway, for instance, wage inequality (measured by the D9/D1 ratio) increased by nearly 20% between 1997 and 2008, while its employment rate remained unchanged during this period. For this country group, growing earnings inequality among the working-age population seemed predominately driven by the rise in *within*-inequality (i.e. the wage dispersion effect). For Korea, this pattern only describes the developments after the mid-1990s and the Asian financial crisis.

94. The second constellation (Panel B) consists of a group of countries that showed a rise in the employment rate along with a declining or stable trend in wage inequality. These include Belgium, Ireland, Spain, the Netherlands and to a lesser extent, France and Japan. Korea prior to 1997 would also fall into this group. Inequality among the whole working-age population is expected to fall in the country group since both *within*- and *between*-inequality tended to drop over time.

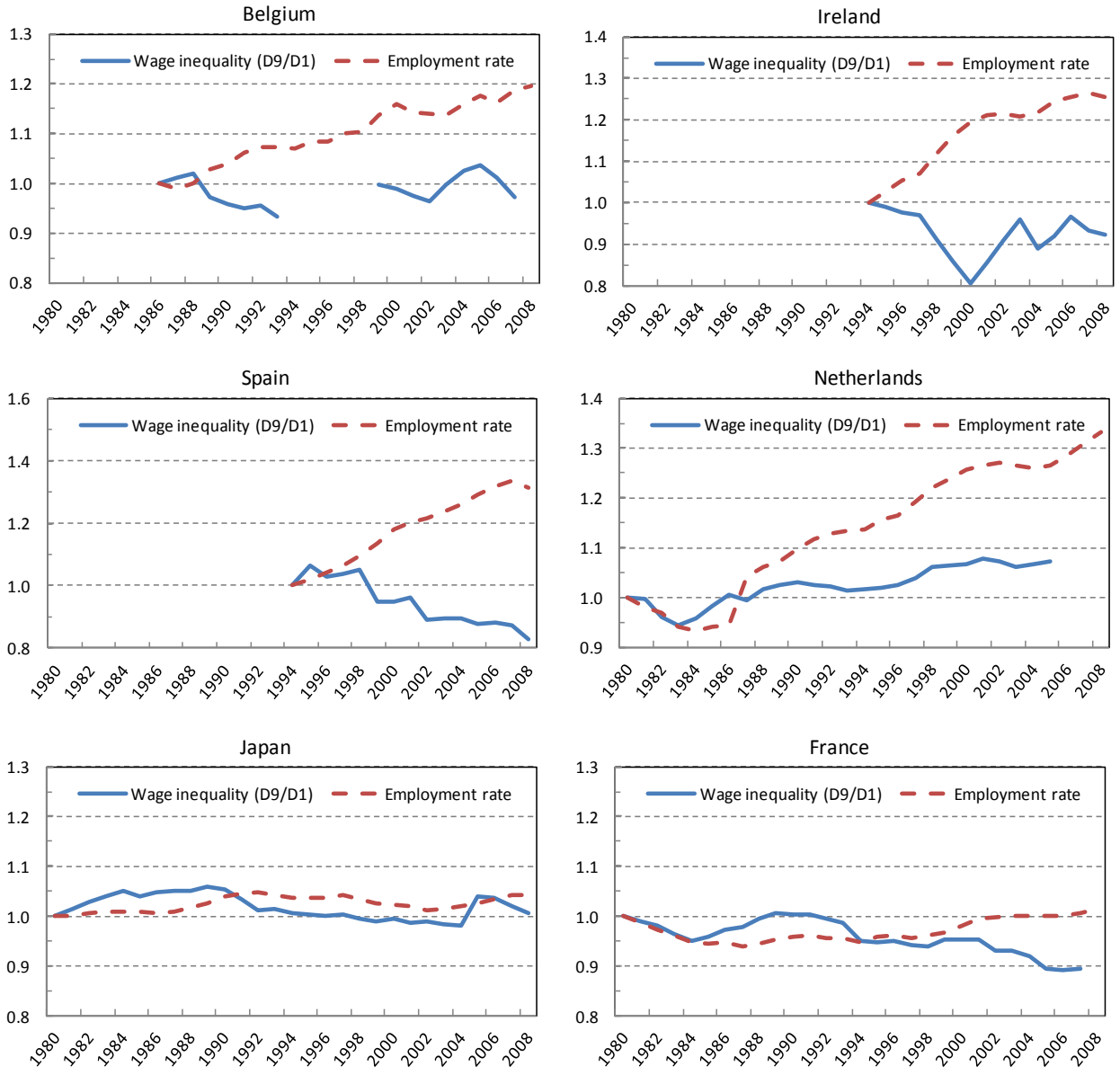
95. For the third country group (Panel C) both wage inequality and the employment rate seemed to move in the same direction, in most cases trending upward. The distributional impact on overall earnings inesqaulity in these countries is less clear since falling *between*-groups inequality (due to increased employment rates) may well have been offset by rising *within*-groups inequality (due to increased wage dispersion among workers), and thus lead to little change in the earnings inequality among the working-age population. Italy appears to be an outlier and cannot be easily fitted into any of the three groups described, due to its irregular patterns of wage dispersion and employment trends.

Figure 10: Trends in wage inequality and the employment rate

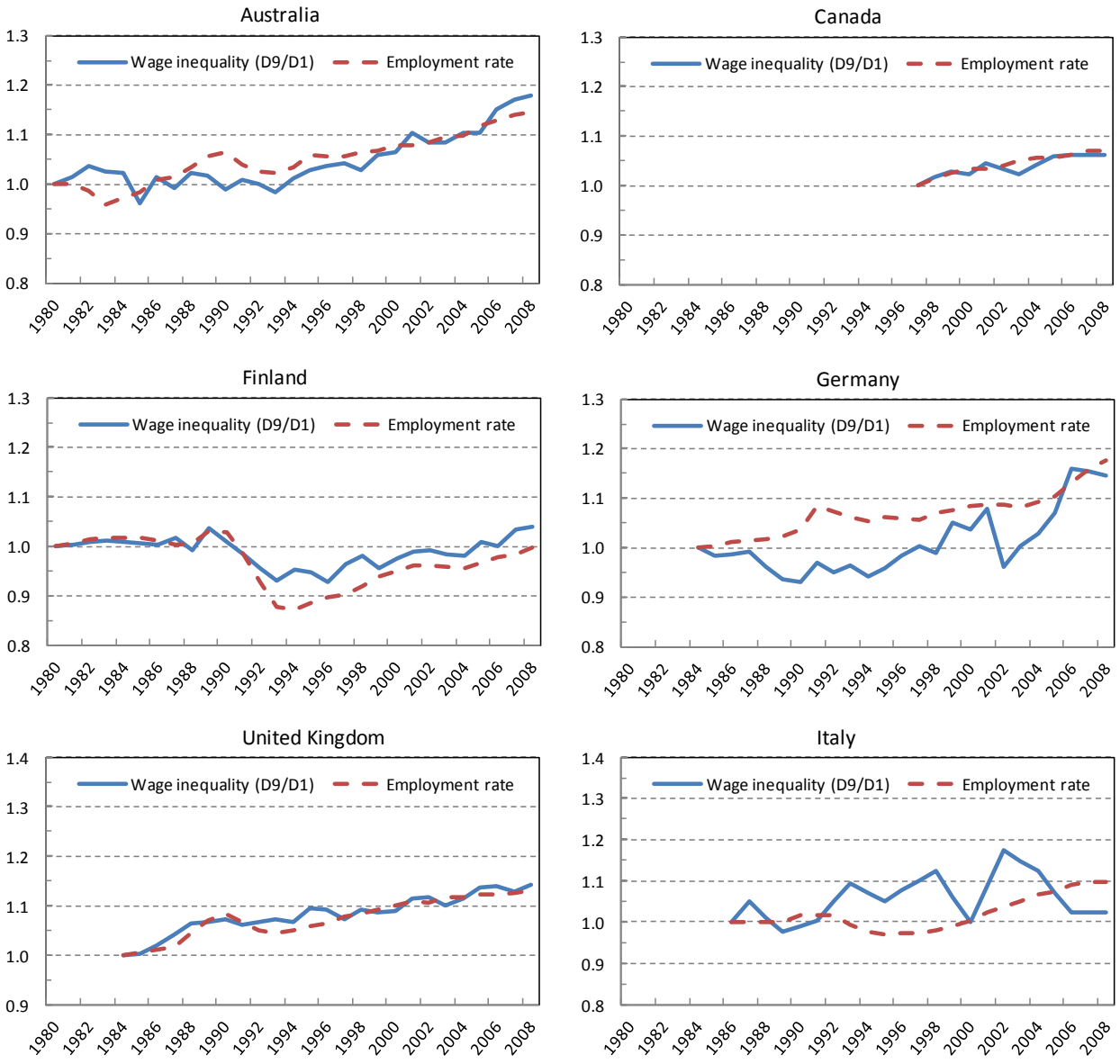
Panel A.



Panel B.


Belgium
Wage inequality (D9/D1)
Employment rate
Ireland
Wage inequality (D9/D1)
Employment rate
Spain
Wage inequality (D9/D1)
Employment rate
Netherlands
Wage inequality (D9/D1)
Employment rate
Japan
Wage inequality (D9/D1)
Employment rate
France
Wage inequality (D9/D1)
Employment rate

Panel C.



Note: Wage inequality refers to D9/D1 of full-time workers; Employment rate refers to (employment/population) ratio among the working-age (25-64) population.

Source: OECD earnings database; OECD employment database.

4.2. Decomposing earnings inequality among the whole working-age population

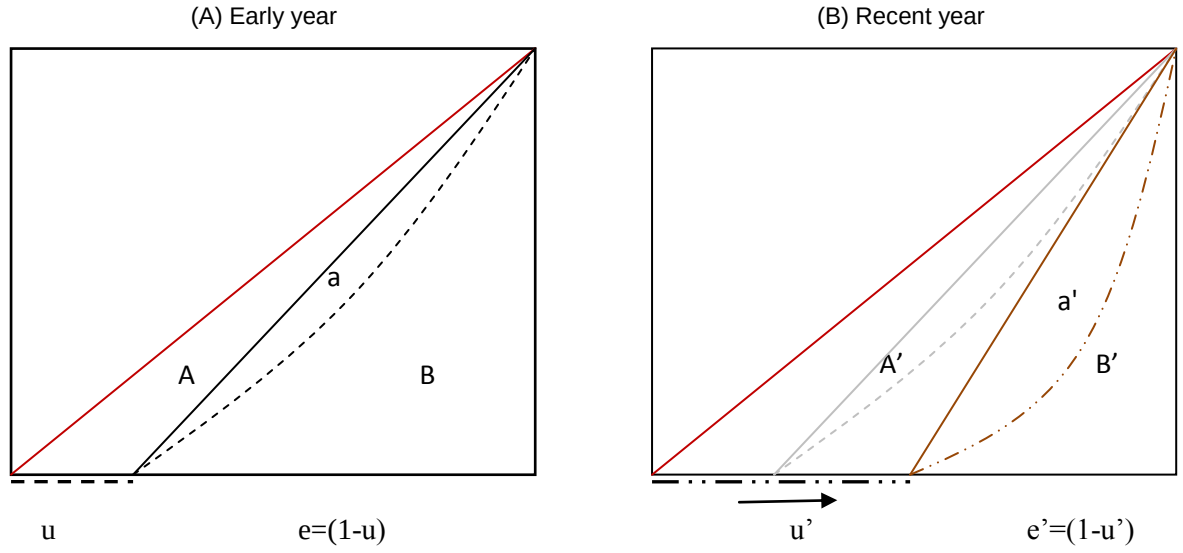
96. Figure 10 above illustrates the need to distinguish between the wage-inequality and the employment effect: changes in earnings inequality among the whole working-age population can be decomposed into two major components, those due to changes in wage dispersion and those due to changes in the non-employment rate. A theoretical framework to connect the change in earnings dispersion among the employed to earnings inequality among the whole working-age population has been proposed by Atkinson and Brandolini (2006), which offers a way to measure the overall impact on inequality accounting for both the wage effect and the employment effect.

97. The main idea is to use the Lorenz curve to represent inequality, measured by the Gini coefficient (Figure 11). The extent of inequality is represented by the areas underneath the curve which may be decomposed between the employed and the non-employed[42] under the assumption that the non-employed have zero earnings. While this assumption is not perfect, it allows us to derive some first indicative findings on one possible indicator for gauging the extent of "overall earnings inequality".

98. That said, rather than assigning zero earnings to non-workers, it is preferable to impute some shadow wage or "potential" marginal income (such as the minimum wage or unemployment benefits) since many unemployed receive unemployment benefits and for some people inactivity is related to their preference for leisure over work or job search. As a result, by assigning zero earnings we artificially inflate the "between-groups" effect. In section 4.3 below we also propose an alternative approach to account for this issue.

99. Let *u* be the share of the non-employed and *e = (1-u)* the share of the employed. The Lorenz curve of the entire population can be depicted as a dashed line in Panel (A). Also let B denote the area of the inner triangle (i.e. distribution of the employed only) and A+B be the area of the large triangle (i.e. distribution of the entire working-age population). Given this, inequality (as measured by the Gini coefficient) of the employed and of the whole working-age population can be expressed, respectively, as $gini_{emp}$ = a/B and $Gini_{all}$ = (A+a)/(A+B). The Gini coefficient is computed as the area between the Lorenz curve and the line of perfect equality (i.e. the 45-degree line).

Figure 11. Lorenz curves and changes in inequality among the employed and among the whole working-age population



100. Now suppose globalisation, technological progress or changes in institutions in a recent year not only widened wage dispersion among the employed (from *a* to *a'*), but also increased unemployment or inactivity rates (from *u* to *u'*) as shown in Panel (B). As a result, $gini'_{emp}$ = a'/B' and $Gini'_{all}$ = (A'+a')/(A'+B'). Changes in inequality among the employed and among the whole population can be expressed, respectively, as

[42] The data which will be used in the following do not allow distinguishing the unemployed from inactive people.

$$\Delta gini_{emp} = a'/B' - a/B \quad (1)$$

$$\Delta Gini_{all} = (A'+a')/(A'+B') - (A+a)/(A+B). \quad (2)$$

Since areas A and B (also A' and B') can be expressed in terms of the unemployment share, *u* (and *u'*), equations (1) and (2) can be rewritten as

$$\Delta gini_{emp} = 2a'/(1-u') - 2a/(1-u) \quad (3)$$

$$\Delta Gini_{all} = (u' + 2a') - (u + 2a). \quad (4)$$

Note that B=(1-u)/2 and A=u/2; similarly, B'=(1-u')/2 and A= u'/2. Using equation (3) to substitute 2a (and 2a') in (4) gives

$$\begin{aligned} \Delta Gini_{all} &= u' + gini'_{emp}\,(1-u') - u - gini_{emp}\,(1-u) \\ &= (1-u) \cdot (gini'_{emp} - gini_{emp}) + (1-gini'_{emp}) \cdot (u'-u) \\ &= e\,\Delta gini_{emp} - (1-gini'_{emp})\,\Delta e \end{aligned} \quad (5)$$

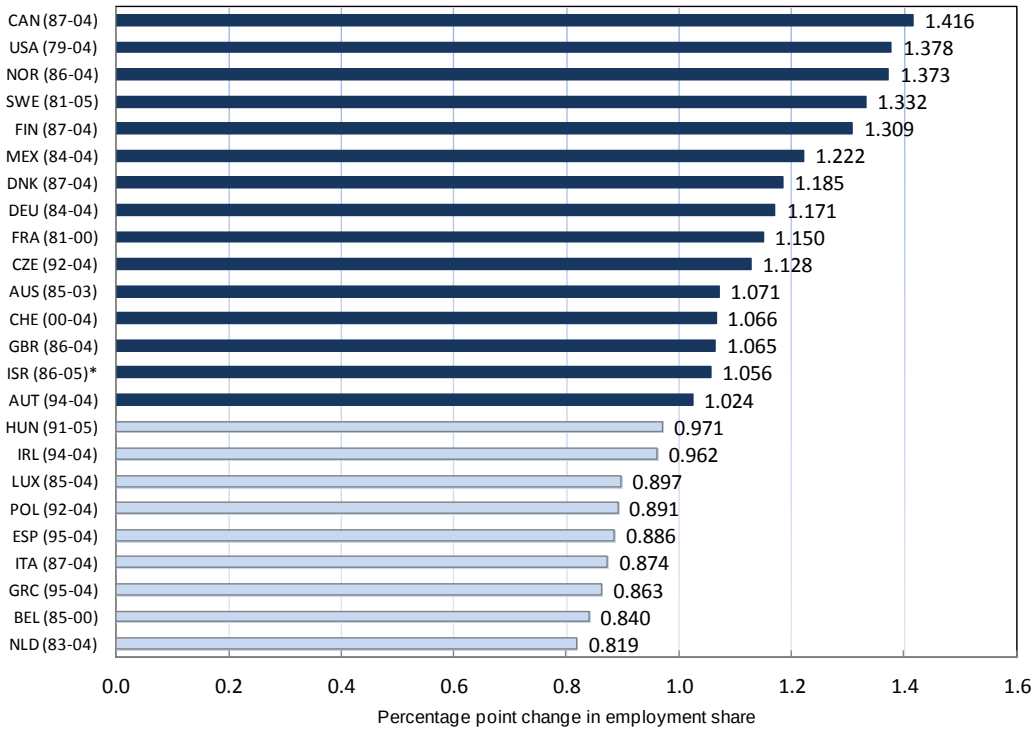
Keeping inequality among the whole population constant over the study period gives

$$\Delta e = e\,\Delta gini_{emp}/(1 - gini'_{emp}). \quad (6)$$

101. Equation (5) implies that changes in earnings inequality among the whole working-age population can be decomposed into two major components; they are positively associated with wage dispersion among the employed and negatively related to the employment rate. Equation (6) provides an indicator of how much increase in the employment rate is needed to compensate for a one percentage point increase in wage inequality, in order keep "overall" earnings inequality among the whole population unchanged. We carry out this exercise by using micro data from the Luxembourg Income Study (LIS) for 24 OECD countries for a period between mid-1980s and mid-2000s (see Annex C for a discussion on data sources).

102. Figure 12 reveals the simulated results derived from equation (5). It shows the responsiveness of the employment rate to the change in wage dispersion. In general, there is a great variation across countries, with simulated values ranging from 0.82 (Netherlands) to 1.42 (Canada). A value greater than one indicates that more than a one percentage point increase in the employment rate is needed to compensate for a one percentage point rise in the Gini coefficient of wages among workers in order to maintain the *status quo* of inequality among the whole working-age population. This occurs in 15 of the 24 countries under study, with a stronger effect in Canada and the United States as well as in Nordic countries.

Figure 12. Change in employment rate needed to compensate change in wage inequality among workers, in order to keep earnings inequality among the whole working-age population unchanged



Source: Secretariat calculations from Luxembourg Income Study micro data, www.lisdatacenter.org.

4.3. Contributions of the wage and employment effects to earnings inequality among the whole working-age population

103. Equation (5) allows us to decompose country-specific changes in overall inequality into a wage dispersion effect and an employment effect among the whole working-age population, under the assumption that non-workers received zero earnings. This assumption, however, is not very plausible since it does not account for the value of leisure (Atkinson & Brandolini 2006). The estimated results therefore overstate the employment effect and understate the wage effect. Hence, these estimates may be considered an upper (lower) bound effect of the employment (wage). To provide a lower (upper) bound estimate of the employment (wage) effect, an alternative scenario is also applied and analysed. This is done by imputing some "shadow" earnings for all non-workers under the assumption that people out of work have "potential earnings" equivalent to an amount to lift them above the poverty threshold. For simplicity, potential earnings are defined here as one-half of median annual earnings among the working-age population in each country and each year. This amount is assigned to all non-workers as "potential earnings".

104. We fit parameters in equation (5) with a fixed-effects model using pooled observations from all countries.[43] The results for the two different scenarios are presented in Table 8. It shows that trends in both wage dispersion and the employment rate contribute to changes in earnings inequality among the whole working-age population. When zero earnings for non-workers were assumed (Column 1),

43 This is done by working with an unbalanced panel of 24 OECD countries with on average 5 time-series observations per country.

on average a 10 percentage-point increase in the Gini coefficient of annual earnings among the employed would raise the Gini coefficient of the working-age population by about 6 percentage points in the OECD area, holding the employment rate constant. Likewise, a 10 point increase in the employment share would reduce the overall Gini coefficient of the working-age population by 6.5 percentage points, other things being equal. When the imputed earnings were assigned to non-workers (Column 2), as expected, the estimated wage effect becomes stronger (with a coefficient of 0.982) and the estimated employment effect becomes weaker (-0.445). These estimates are statistically significant at the 1% level.

Table 8. Wage inequality and employment effects on overall inequality among the working-age population

Dependent variable: Gini coefficient of annual earnings among the entire working-age population

	(1)	(2)
	assuming zero earnings for non-workers	assuming imputed earnings for non-workers
Gini of annual earnings among the employed	0.614***	0.982***
	(18.7)	(23.2)
Percent of workers w/ positive annual earnings	-0.646***	-0.445***
	(-33.2)	(-17.7)
Country-fixed effects	Yes	Yes
Year-fixed effects	Yes	Yes
Number of obs.	123	123
Number of countries	24	24
Adjusted R-squared (within)	0.97	0.96

Note: Imputed earnings for non-workers are one-half of median annual earnings among the working-age population in each country and each year

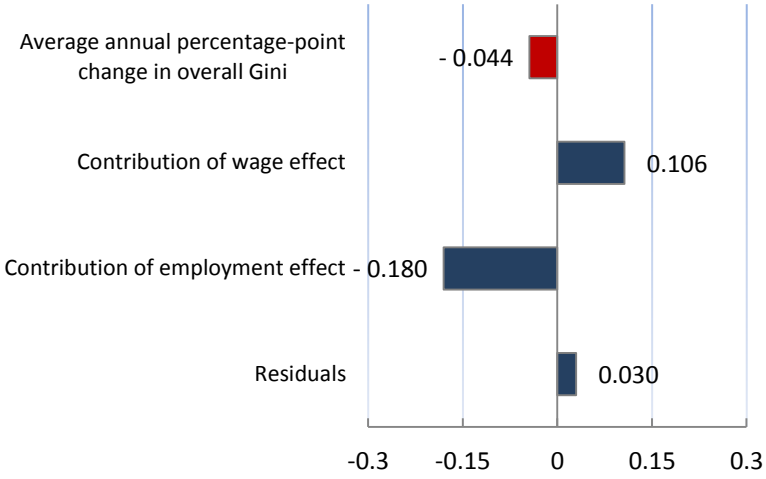
Source: Authors' calculations from Luxembourg Income Study (LIS) micro data, www.lisdatacenter.org.

105. Using these estimated coefficients, we compute a crude decomposition to quantify how much of the annual change in inequality among the entire working-age population can be attributed to the wage and the employment effects, respectively (Figure 13). For the first scenario (assuming zero earnings for non-workers), it indicates that the Gini coefficient of earnings among the whole working-age population on average decreased by 0.04 percentage points annually over the mid-1980s to mid-2000s for the first scenario (Panel A). This is the net outcome of the two opposing forces: increasing wage dispersion among the employed has exerted a disequalising impact, contributing 0.11 percentage point a year to raising the population inequality; whereas the growing employment rate has contributed to offset rising inequality by a slightly stronger reduction (0.18 point annually) over the period examined.

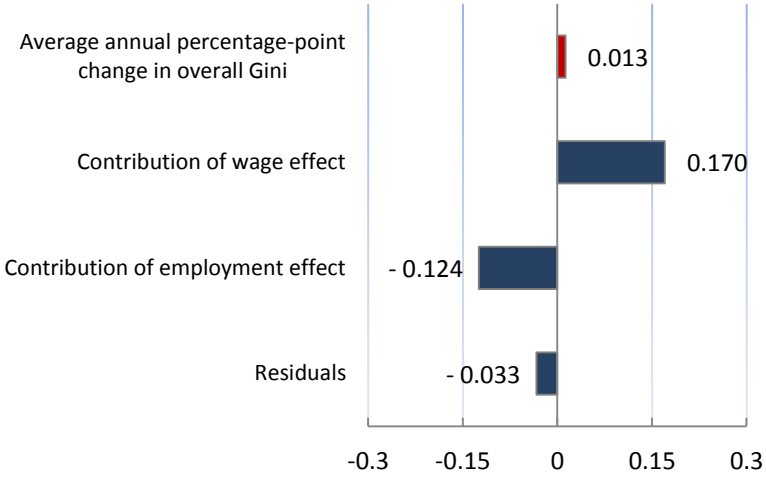
106. Under the second scenario, when imputing potential earnings for non-workers (Panel B), the Gini coefficient of earnings among the whole working-age population increased marginally over the mid-1980s to mid-2000s (0.013 point annually). The contribution of the disequalising effect of rising wage dispersion among the employed is now stronger, contributing 0.17 percentage point a year to raising inequality among the whole population, whereas the growing employment rate has contributed to offset rising inequality by about 0.12 point annually over the period examined.

Figure 13. Estimated contributions of wage dispersion and employment effects to overall earnings inequality among the working-age population

A. Zero earnings for non-workers



B. Imputed earnings for non-workers



Note: The contribution of each variable is computed as the average annual change in the variable multiplied by the regression coefficients (Table 7) on that variable.

Source: Authors' calculations from Luxembourg Income Study (LIS) micro data, www.lisdatacenter.org.

107. The results from Figures 13 therefore provide upper and lower bound estimates of the wage effect and the employment effect with respect to inequality among the whole working-age population. Combining these results, on average, it is reasonable to conclude that both rising wage dispersion and growing employment rates contributed to considerable but opposing effects. Both effects tend to cancel each other out and result in little change in an estimate of "overall" earnings inequality trends among all working-age individuals.

4.4. Country-specific counterfactuals

108. Country patterns differ considerably. Figure 14 presents country-specific counterfactuals to illustrate the quantitative importance of the wage dispersion and employment effect, for scenario A

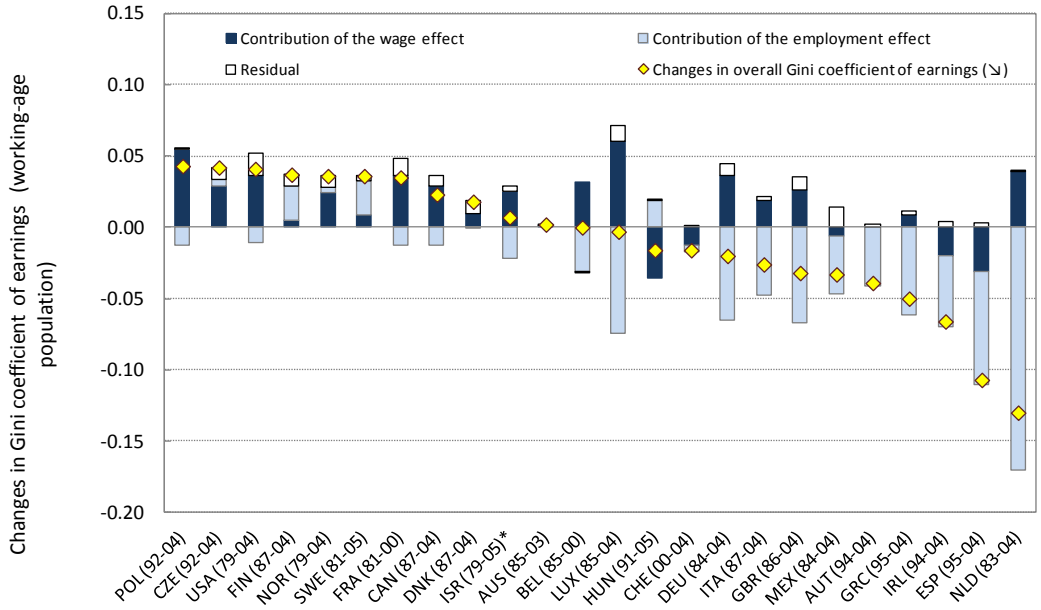
(i.e. assigning zero earnings for non-workers). Basically, two counterfactuals are computed.[44] The first one is the predicted Gini coefficient of earnings of the whole working-age population (*i.e.* including the non-employed) for each country by holding the wage dispersion of workers constant at the initial-year levels, and the second one calculates the predicted value by holding both wage dispersion and the employment rate at the previous levels (see Annex C, Table C1). Differences between the first predicted Gini coefficient and the actual Gini coefficient of the recent year indicate the contribution of the wage effect; and differences between the first and second predicted values indicate the contribution of the employment effect. Finally, the residual is the gap between the second predicted value and the actual Gini coefficient of the initial year.

109. We rank countries (from high to low) in Figure 14 according to the increase of overall Gini coefficients. In Norway, for example, earnings inequality of the whole working-age population increased by 3.6 points between 1979 and 2004, and both the wage and employment effects contributed to this rising inequality among the population. But the former contributed much more, about 67% of the total increase, and the latter about 10%, while unexplained factors were responsible for the remaining fifth of the total change.

110. For countries that experienced a rise in overall earnings inequality over the period examined, rising wage dispersion among workers appeared to be the driving force of the change in most cases. Two notable exceptions are Finland and Sweden in which a decline in the employment share is the main driver of rising inequality among the whole working-age population. For countries that registered a decline in overall earnings inequality over time, an increase in the employment rate is the main reason for this change. In the Netherlands, the country with the largest decline in overall inequality, more than 130% of the total decline between 1983 and 2004 can be attributed to the rising employment share. Figure 14 also shows that in more than half of the countries, the wage dispersion and the employment effect exerted opposite influences on inequality over time. Residuals are generally small, suggesting a good model fit to the data.

[44] The counterfactuals are computed using the estimated coefficients from Table 7, column (1).

Figure 14. Decomposing changes in the Gini coefficient of earnings among the entire working-age population



Note: Gini coefficient of earnings among the entire working-age population estimated by assigning zero earnings to non-workers.

* Information on data for Israel: http://dx.doi.org/10.1787/888932315602.

Source: Authors calculations from the Luxembourg Income Study microdata.

4.5. Linking globalisation and developments in policies and institutions to changes in employment

111. The previous section identified the respective contributions of the wage inequality effect and the employment effect to an estimate of overall earnings inequality among the whole working-age population. The next question is to evaluate to what extent such overall earnings inequality trends may be explained by globalisation and policy/institutional changes, respectively, and through which channels (wage inequality, employment or both)? We use a simple two-step approach to identify such channel(s). In this section we first examine the employment impact of globalisation and policy/institutions based on a macro-regression framework, following the econometric framework applied in chapter 3. In a second step (in chapter 5), we assess the overall distributional impact of these macroeconomic developments among the working-age population by combining and summarising - in qualitative terms - findings from its influence on both the wage dispersion (derived from chapter 3) and the employment outcomes (as analysed and discussed below).

112. The impact of globalisation, technological progress and institutions on employment is estimated in a similar fashion as the wage regression described above but with replacement of the dependent variable by the employment rates:

$$Emp_{it} = \delta\, Glob_{it} + \rho\, Tech_{it} + \gamma\, Instit_{it} + \sum \beta_j\, X^j_{it} + \alpha_i + \lambda_t + \varepsilon_{it}. \qquad (7)$$

113. The dependent variable, employment rates (*Emp*), is obtained from the OECD employment database. As for explanatory variables, *Glob* denotes two globalisation factors, namely trade and

financial integration, *Tech* refers to business-sector R&D that captures technological change,[45] *Instit* includes a set of institutional and policy variables, *X* refers to other controls such as the output gap (to capture "excess demand" of economic activity) and education, and α_i and λ_t refer to country-specific and time-specific fixed effects, respectively. The regression coefficients are estimated using the fixed-effects procedure, identifying the average impact of the *within*-variation. The final sample consists of an unbalanced country-year panel of the same 22 OECD countries which have been analysed in chapter 3, for a period between 1985 and 2007. The results of the employment regression for the whole working-age population are presented in Table 9.

114. Trade integration in general has little impact on changes in the employment rates in OECD countries over the period studied (Column 1). This result is consistent with previous OECD studies, which generally find the net employment effects of changes in trade have not been significant in OECD countries (OECD 1985, 1992, 2007b).[46] A recent OECD study (Dee et al., 2011), however, uses a different methodological approach and reaches a more positive result: in the long-run, trade openness has been estimated to increase employment (among both lower-skilled and skilled workers). Rather than regression analyses, this study is based on computable general equilibrium (CGE) simulations.[47]

115. A rapid growth in international financial transactions may affect job creation and destruction. Foreign corporations that establish new local plants or affiliates (*i.e.* greenfield investment) may potentially stimulate economic growth and create jobs linked to their activities in the host country. On the other hand, increased subcontracting by multinational corporations across national boundaries (in particular, outsourcing to developing countries) may lead to job displacement in the home country. There is mixed evidence on whether outsourcing affects employment in advanced countries.[48]

116. Overall, the empirical results from table 9 indicate that international financial flows have little impact on employment in OECD countries. In general, FDI deregulation (*i.e.* a decline in the value of the FDI restrictiveness index) seems to have a labour-augmenting effect as the coefficients are negatively estimated, albeit not statistically significant at convention levels. A small labour-augmenting effect of FDI deregulation, however, becomes apparent (at the 5% level) once institutional and policy variable are excluded from the regression (not shown). When replacing the

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45 For consistency reasons with the analyses in chapter 3, trade globalisation is measured by ln(trade exposure), financial integration is instrumented by ln(FDI restrictiveness index), and technological progress is assessed by the detrended unit of ln(business R&D-to-GDP ratio).

46 Although the overall employment effect of trade has been estimated as insignificant, these studies also reveal that, at industrial level, the increased import competition had adverse employment effects in certain sectors (OECD 1992), and imports from emerging economies tended to reduce sectoral labour demand (OECD 2007b).

47 The CGE model in this study considers the effects of two policy scenarios. One assumes weak labour markets ("unemployment scenario"), while the other assumes absence of involuntary unemployment ("full-employment scenario"). The model covers global world trade and production, using the latest GTAP database.

48 Falk and Wolfmayr (2005), Harrison and MccMillan (2006), Anderton and Brenton (1999), and Hijzen *et al.* (2005) find that international outsourcing has had a strong negative impact on the demand for unskilled labour. However, Slaughter (2000) shows that outsourcing activities of US multinational enterprises tend to have small, imprecisely estimated effects on US relative labour demand. Similarly, using industrial data for a group of OECD countries, OECD (2007b) also concludes that outsourcing in general only has a rather moderate effect on shifting relative demand away from low-skill workers within the same industry.

proxy of FDI regulation by two *de facto* FDI measures (inward and outward FDI-to-GDP stock) we find that a labour-creating effect of FDI would be mainly derived from its inward component, while the employment effect of outward movement remains insignificant (results not shown).[49]

117. Technological progress is expected to result in substantial changes in the demand for labour. Process innovation that introduces automated assembly lines may increase productivity, but may result in a decline in the demand for unskilled workers. On the other hand, product innovation that leads to an increase in total consumption may stimulate employment due to stronger sales or exports and counterbalance the decline in demand linked to improved processes. Previous empirical evidence on the employment consequences of technological change is mixed, and depends largely on the forms of innovation and the levels of unit (firms, sectors or the whole economy) analysed (see, for instance, Vivarelli 2007). The results in Table 9 suggest that technological progress, proxied by the deviation from of the BERD-to-GDP ratio from its long-term trend, has no significant impact on employment in OECD countries over the period studied.

118. The relation between regulatory reform and employment trends among OECD countries is well documented (*e.g.* Bassanini & Duval 2006; Fiori *et al.* 2007). In general, the results in Table 8 are consistent with previous studies. Changes in the union coverage are found to be negatively correlated with employment: a 10% decline in the union coverage rate increases the employment rate by roughly 0.8%. This is consistent with a view that higher union coverage is assumed to strengthen workers' bargaining power over wages, and lower employers' demand for labour. Hence, the declining trend of union coverage in OECD countries over recent decades would be expected to contribute to higher aggregate employment.

119. Regulations that curb competition by state control and barriers to entry are expected to have a significant impact on labour demand. This is confirmed in table 9 which shows that the decline in product market regulation (PMR) has contributed to increasing employment rates among OECD countries: a 5 percentage-point decrease in the indicator would increase the average employment rates by roughly 3.5 - 4 percentage points. As noted by Nicoletti and Scarpetta (2005), these are likely to be lower bound estimates of the potential employment effects of product market reforms because the PMR indicator used in the study covers only reforms in a subset of non-manufacturing.

120. The impact of changing employment protection on employment is more difficult to predict as it depends crucially on the extent to which the extra costs can be shifted onto workers from employers. A decline in employment protection (EPL) may reduce the costs of employment adjustment (both hiring and firing), and as a result, lead to little change in the aggregate employment rate if both inflows to and outflows from employment tend to cancel each other out. The results in table 9 indicate that changes in overall EPL have no impact on aggregate employment. The findings are also consistent with previous OECD studies (*e.g.* Nicoletti & Scarpetta 2005; Bassanini & Duval 2006). By splitting EPL into two subcomponents (column 2), we find that deregulation of temporary contracts exerted a negative effect on employment, while the stringency in the protection for regular contracts are found to be negatively associated with employment.[50]

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[49] Some empirical studies also find a labour-saving effect of inward FDI. A possible reason is that multinational corporations tend to provide better pay than their domestic counterparts (OECD 2008b), so the entry of multinationals may skim the domestic labour market and cause the labour supply to fall by crowding out local entrepreneurs at least in the short-run. See De Backer and Sleuwaegen (2003) for a discussion of Belgium. Misun and Tomsik (2002) also find that FDI tends to crowd out domestic investment in Poland.

[50] As emphasized in Bassanini and Duval (2006), the result for regular contracts is highly fragile, as it is mainly driven by an outlier country, Spain—the country which underwent the deepest reforms of EPL

121. Concerning changes in labour costs, higher tax wedges tend to reduce overall employment. Coefficient estimates imply that a 10 percentage-points rise in the tax wedges would reduce the aggregate employment rate by about 3 percentage points. This result echoes previous studies (Nickell 1997; Bassanini & Duval 2006) according to which an increase in the overall tax burden may raise unemployment and reduce employment.

122. The employment effect of unemployment benefits is examined in column (3).[51] The findings indicate that a generous UI benefit (for low-wage workers) is detrimental for employment, and the estimated coefficient is significant at the 1% level. This is consistent with the view that more generous UI benefits tend to increase unemployment because the costs of being unemployed is reduced (*e.g.*, Nickell 1997; Layard *et al*. 1991; OECD 1994).

123. Previous studies have also suggested that public employment is an important predictor of overall employment since public jobs may crowd out employment opportunities in the private sector by creating wage pressures, thus increasing the equilibrium unemployment rate (*e.g.* Holmlund & Linden 1993).[52] As a robustness check, we further include the public employment rate (measured as public employees/population ratio) in column (4), at the cost of reducing the sample coverage.[53] However, the findings reveal that public employment has a positive and significant impact on aggregate employment. This might suggest that a one-to-one substitution effect between public and private employment is not likely to occur. Moreover, both columns (3) and (4) suggest that the main findings in the baseline specification (column 1) are generally robust to the sample coverage.

124. Among other controls, changes in the output gap have a strong employment effect as expected and the increased supply of skilled workers (measured by percent of population which has a post-secondary education) also improves job creation. These results are generally robust to different specifications.

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for regular workers over the period considered. For other countries in the sample, EPL for regular contracts in general experienced little change over time.

51 The inclusion of UI benefits reduces the sample coverage by three countries (Czech Republic, Hungary and Poland) as the information of benefit rates is only available from 2001 and onward for these countries.

52 These studies argue that wage premium in the public sector can generate "wait unemployment" phenomena, in which unemployed workers reduce job search efforts and wait for a job in the public sector.

53 New Zealand had to be dropped from the sample due to lack of employment data for public sector.

Table 9. Globalisation, polices and institutions and changes in the employment rate

Dependent variable: employment rate (working-age population)

	Baseline	w/ EPL split	w/ UIRR	w/ public Emp. rate
	(1)	(2)	(3)	(4)
Trade integration				
ln(Total trade exposure) /100	-0.028 (-1.55)	-0.032 (-1.61)	-0.015 (-0.73)	-0.021 (-1.00)
Financial integration				
ln(FDI restrictiveness index) /100 [0-1, 0 open, 1 closed]	-0.006 (-0.69)	-0.015* (-1.71)	-0.006 (-0.64)	-0.011 (-1.11)
Technology				
ln(Business R&D /GDP)[1] /100	-0.004 (-0.14)	0.005 (0.20)	-0.009 (-0.30)	0.004 (0.15)
Labour Market institutions & policies				
Union coverage rate)	-0.077*** (-2.63)	-0.136*** (-4.36)	-0.074** (-2.50)	-0.111*** (-4.07)
PMR	-0.896** (-2.16)	-0.781** (-2.16)	-0.770* (-1.73)	-0.718* (-1.71)
EPL	0.928 (1.44)		0.757 (1.02)	-0.088 (-0.13)
EPL_temporary		0.646* (1.92)		
EPL_regular		-3.95*** (-3.97)		
Tax wedges	-0.294*** (-5.69)	-0.276*** (-5.11)	-0.302*** (-5.34)	-0.344*** (-5.63)
UI replacement rate for low-wage workers			-0.113*** (-3.43)	-0.107*** (-3.80)
Other controls				
% has attained post-secondary edu.	0.172*** (3.57)	0.136*** (2.80)	0.172*** (2.68)	0.142** (1.97)
Output gap	0.607*** (7.60)	0.615*** (8.08)	0.634*** (7.97)	0.598*** (6.18)
Public employment rate				0.925*** (3.90)
Other variables	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Number of obs.	406	406	389	**366**
Number of countries	22	22	22	**21**
Adjusted R-squared (within)	0.59	0.63	0.61	0.64

Note: *t* – statistics (in parentheses) are calculated based on heteroskedasticity- robust standard errors**.** Other controls include country fixed effects and the trend component of technology variable. For definition of variables, see Annex A.
[1] The variable is detrended using the Hodrick-Prescott (HP) filter (see footnote 15).
Source: see Annex A. Authors calculations.

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5. Globalisation, policies and institutions and changes in overall earnings inequality: bringing together the evidence

125. Having examined the respective effects of contextual developments on wage dispersion (chapter 3) and on employment (chapter 4.5), in this section we evaluate the impact of described drivers on an estimate of "overall earnings inequality" among the entire working-age population (*i.e.* workers and non-workers taken together). This is done in Table 10 by synthesizing the evidence (in a qualitative approach) from the previous analyses on both the wage inequality effects and the employment effects.

126. An important caveat has to be made here. The results used from the employment equation include full-time and part-time workers as well as self-employed people, while the results for wage equation refer to full-time workers only. As shown in more detail in OECD (2011, chapter 4), the level of earnings dispersion among all workers (including part-timers and self-employed) is higher and also increased at a higher pace than that of full-time workers. Therefore, the estimates given here of the wage inequality effect will be underestimated with regard to the employment effect.

Table 10. Main drivers for changes in the earnings distribution among the whole working-age population

Summary results from pooled regression analysis in chapters 3 and 4.5

	Economic impact (statistical inference) on		Impact on the overall inequality of the working-age population due to		Impact on changes in estimated "overall" earnings inequality
	Wage dispersion	Employment rate	Wage effect	Employment effect	
	(1)	(2)	(3)	(4)	(5)
Globalisation & technology					
Trade integration	=	=			=
Foreign direct investment (FDI) deregulation	=	=			=
Technological progress	+ (**)	=			+
Policies & Institutions					
Declining union coverage	+ (*)	+ (***)			= / –
Product market deregulation (PMR)	+ (**)	+ (**)	+ (***)	– (***)	+ / = / –
Less strict employment protection legislation (EPL)	+ (***)	=			+
Declining Tax wedges	+ (***)	++ (***)			= / –
Declining unemployment benefit replacement rate	+ (***)	+ (***)			+ / = / –
Other control					
Upskilling (increased education level)	– (***)	+ (***)			– –

Note: Columns (1)-(2) are derived from the regression results from Table 2 and Table 9, respectively; and columns (3) and (4) are obtained from Table 8. Column (5) is a qualitative assessment of the overall effect, taking into account the two alternative hypotheses of potential earnings of non-workers (i.e. zero and imputed earnings) from Figure 12. Definitions of signs are given in the text. *, **, ***: significant at the 10%, 5% and 1% level, respectively.

Source: Authors calculations.

127. Since the variables under examination are measured in different units of measurement (for example, trade exposure is measured in ratios and EPL is measured on a 0-5 scale), we re-estimate the above analyses using standardized variables in order to answer the question of which of the explanatory factors played a greater role on influencing the wage dispersion or the employment effect.[54] In columns (1) and (2) of Table 9, we denote with "+" (or "-") if the standardized coefficient is positive (or negative) and is less than one-third (0.33) for one standard deviation change in the unit, and "++" (or "--") if the standardized coefficient is 0.33 or more.[55] We also include statistical inference in the parentheses (***, **, *) indicating the estimated coefficient is significant at the 1%, 5% and 10% levels respectively. Finally, a "=" is indicated for imprecise estimates (less than the 10% level) regardless of the value of the coefficient. In columns (3) and (4), we report the findings from the first part of this section (from Figure 13) that changes in wage dispersion and changes in the employment rate contributed a considerable (but opposing) effect to earnings inequality among the whole working-age population.

128. Based on columns (1) to (4), we then evaluate the overall impact of each contextual change on an estimate of overall earnings inequality of the working-age population in column (5). This is done in a suggestive and qualitative way by taking into account both the absolute magnitudes (in columns 1 and 2) and relative contributions to annual percentage changes in overall earnings inequality (in columns 3 and 4), considering the two alternative hypotheses of potential earnings of non-workers, namely zero earnings and imputed earnings of one half of median earnings (sections 4.2.1 and 4.2.3).[56] Under the first hypothesis, the employment effect slightly outweighs the wage-inequality effect while the inverse is true under the second hypothesis. Therefore, some of the results in column (5) appear as undetermined.

129. The mechanisms through which inequalities are transmitted to the earnings distribution of the whole working-age population are complex. Technological progress appears to be a main factor behind the rise in earnings inequality among the working-age population. This factor exerted a disequalizing effect predominantly through the wage inequality channel (the "within-group" inequality component). The trends toward greater trade exposure and less regulated FDI tend to be overall distribution neutral when institutional and policy variables are also controlled for.

130. Changes in most policy and institutional variables exert opposing effects in that they tend to increase wage inequality at the same time as increasing aggregate employment. Lower union coverage, less PMR, lower tax wedges and less generous UI benefits all contributed to increasing wage dispersion on the one hand, and to increasing employment rates on the other, resulting in little change in overall inequality of the working-age population. Changes in EPL (for temporary contracts) tend to have a moderate disequalising effect on the overall earnings distribution among the entire population, mainly through the wage inequality channel.

131. The disequalizing effects from various transmission channels mentioned above is offset to a large extent by a similar reduction in inequality from the growth in the supply of skilled workers. This factor affects the earnings distribution among the working-age population through both the wage and

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54 Standardized coefficients (or beta coefficients) are the estimates obtained by first standardizing for all variables to have a mean of zero and a standard deviation of 1. They indicate the expected change in the dependent variable, per standard deviation increase in the predictor variable.

55 The threshold of 0.33 is somewhat arbitrary. It implies that every time the independent variable changes by one standard deviation, the estimated outcome variable changes by one-third a standard deviation, on average.

56 Quantitatively, one may interpret the results in column 5 as a simple weighted average of the wage and the employment effect from columns 1-4 (*i.e.*, (1)*(3)+(2)*(4)).

the employment channels: it reduces both wage inequality among workers and inequality between the employed and the non-employed.

6. Summary and conclusions

132. OECD countries underwent marked changes in the wage distribution, economic globalisation, and product and labour market regulations during the past three decades. First, there was a general trend towards greater wage inequality. With very few exceptions, the ratio of the wages of the 10% best-paid workers to those of the 10% worst-paid (D9/D1 decile ratios) increased significantly across the 23 OECD countries under review. While the widening gap has affected the entire wage distribution, disparities were greater in the upper half than in the lower half. This trend occurred at the same time as aggregate employment rates increased in most countries, particularly since the mid-1990s until the Great Recession.

133. Second, trade integration spread and deepened substantially in practically all OECD countries from the 1980s, with the pace particularly accelerating from the early 1990s. Another trend was the fast-growing transfer of finance across national borders, with the GDP share of foreign direct investment (FDI) doubling to 50% between the mid-1990s and the mid-2000s. The rapid advance of technology was another notable feature of global integration, whether considered as innovative investments (R&D expenditure), the output of knowledge (patents) or the degree of computerisation (the use of information and computer technology by firms).

134. Third, the strength of many product and labour market institutions and regulations declined in most OECD countries over the period in question. Union density, the strictness of employment protection legislation and product market regulation, and tax wedges all decreased, sometimes significantly. In those countries where they exist, minimum wages fell substantially relatively to median wages. Trade union coverage remained relatively stable, while union co-ordination showed a trend towards more decentralised wage bargaining.

135. How do these trends link together? This paper addresses the following questions: Is economic globalisation the main culprit for rising earnings inequality in OECD countries? To what extent is technological progress responsible? What is the role of regulatory reform and changes in institutions and policies? Through which channel (wage dispersion among workers or employment gaps between workers and non-workers) is inequality transmitted? The key findings from the analyses in this paper are set out below.

Links between globalisation and rising wage inequality among workers

- Trends in trade exposure have no distributional impact at the aggregate level. This result holds when exports and imports are examined separately or are further disaggregated by region of origin and destination. However, increased imports from emerging economies – in particular from low-income developing countries – tend to heighten wage dispersion in OECD countries with weaker employment protection legislation.

- Financial deepening, proxied by either *de jure* or *de facto* measures, has no significant impact on within-country trends in wage inequality in OECD countries. However, inward FDI seems to contribute to reducing wage dispersion while outward FDI appears to increase it.

- Technological progress considered as business expenditure on R&D is positively related to increases in wage dispersion.

– The rise in the supply of skilled labour and in the share of women in employment constitutes substantial counterweights to the increase in wage inequality.

Links between regulatory reforms and changes in institutions, and rising wage inequality among workers

– Trends in product and labour market policies and institutions are generally negatively related to trends in wage dispersion within countries. In particular, a decline in tax wedges and a trend towards more flexible employment protection (EPL) and product market regulation (PMR) have contributed substantially to the increase in wage inequality among full-time workers.

– The distributional effect of EPL is driven entirely by the weakening of employment protection for temporary workers.

– Drops in union coverage and lower unemployment benefit replacement rates for low-wage workers (but not for average-wage workers) tend to increase wage inequality.

Effects of globalisation and regulatory reform on the upper and lower part of the wage distribution

– Trends in trade exposure generally have little impact on either end of the wage distribution. Financial deepening, while overall distribution neutral, seems to widen inequality in the upper part of the distribution. Technological change impacts predominantly on the upper part of the wage distribution.

– Less strict PMR and EPL are associated with an increase in wage inequality exclusively in the lower part of the wage distribution. On the other hand, wage inequality in the upper half of the distribution is more sensitive to changes in average tax wedges and union coverage.

– Upskilling of the workforce is closely associated with inequality reduction in both the bottom and the top parts of the wage distribution. The same pattern is found in the rise of women's employment

Employment effects of economic and policy drivers

– Neither rising trade integration nor financial openness seem to have had any significant effect on employment.

– However, more flexible PMR, together with declining union coverage, lower tax wedges, and less generous unemployment replacement rates all appear to have contributed to higher employment rates within OECD countries. Relaxing EPL did not impact significantly on the overall employment rate.

– Technological change, which is one of the main determinants of increased wage inequality, seems not to have had a significant impact on employment rates once changes in globalisation and institutions are taken into account.

Decomposing earnings inequality among the whole working-age population

– "Overall earnings inequality" among the whole working-age population (*i.e.* employed and non-employed) increased little in the typical OECD country between the mid-1980s

and the mid-2000s. This was the result of two opposing forces, increasing wage dispersion and growing employment cancelling each other out. The increasing wage dispersion among workers exerted a marked disequalising impact, while the mounting employment rate contributed to offset rising earnings inequality by an almost equivalent reduction.

– When non-workers are assumed to have zero earnings, the employment effect slightly outweighs the wage inequality effect. When shadow wages are imputed to non-workers to account for their potential earnings, the wage inequality effect slightly outweighs the employment effect.

Contributors to changes in earnings inequality among the whole working-age population (workers and non-workers)

– Technological progress appears to have been an important factor behind the rise in overall earnings inequality among the working-age population – predominantly through the wage inequality channel.

– Overall, trade and financial globalisation trends tended to be distribution-neutral.

– More relaxed PMR, dwindling union coverage, declining tax wedges, and less generous UI replacement rates all had undetermined effects on overall earnings inequality among the working-age population. As they contributed to greater wage dispersion and higher employment rates at the same time, they resulted in little change in overall earnings inequality trends (*i.e.* among workers and non-workers).

– Weaker employment protection (in particular for temporary contracts), however, widened the wage distribution among the employed and so had an overall disequalising effect.

– The sizable disequalising effect of these various factors was largely offset by a similar reduction in overall earnings inequality attributable to the growth in average educational attainment. Upskilling appears to have been the main force which succeeded not only in reducing wage dispersion among workers but in increasing employment rates over the past decades up to the Great Recession.

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ANNEX A. DATA SOURCES AND VARIABLES

Table A.1. OECD structure of earnings database

Country	Source	Years available First/latest	Earnings	Type of worker
Australia	Labour force survey	1979/2008	Weekly	Full-time
Austria	Social security data	1987/1994	Monthly	All workers
Belgium	Social security data	1986/2007	Weekly	Full-time
Canada	Labour force survey	1997/2008	Weekly	Full-time
Czech Republic	Enterprise survey	1996/2008	Monthly	Full-time/Full-year
Denmark	Tax registers	1980/2008	Hourly	All workers
Finland	Income distribution survey	1980/2008	Annual	Full-time/Full-year
France	Salary records of enterprises	1979/2007	Annual (net)	Full-time/Full-year
Germany	Socio-economic panels	1984/2008	Monthly	Full-time
Hungary	Enterprise survey	1992/2008	Monthly	Full-time
Ireland	Living in Ireland/EU-SILC	1994/2008	Weekly	Full-time
Italy	Survey of H income & wealth	1986/2008	Monthly	Full-time
Japan	Enterprise survey	1979/2008	Monthly	Full-time
Korea	Enterprise survey	1984/2008	Monthly	Full-time
Netherlands	Enterprise survey	1979/2005	Annual	Full-time/Full-year
New Zealand	Household economic survey	1984/2008	Hourly	Full-time
Norway	Enterprise survey	1997/2008	Monthly	Full-time
Poland	Enterprise survey/EU-SILC	1992/2008	Monthly	Full-time
Spain	ECHP/EU-SILC	1994/2008	Hourly	Full-time
Sweden	Income distribution survey	1980/2008	Monthly	Full-time
Switzerland	Employer survey	1996/2008	Monthly (net)	Full-time
UK	Enterprise survey & Annual survey of hours and earnings	1979/2008	Weekly	Full-time
USA	Current population survey	1979/2008	Weekly	Full-time

Note: 2011 version
Source: http://www.oecd.org/employment/labour-stats/onlineoecdemploymentdatabase.htm#deciles

Table A.2. Explanatory variables and data sources

Title	Definition	Sources
Globalisation & SBTC indicators		
Trade globalisation	Preferred definition Trade exposure (a weighted average of import penetration and export intensity) Other definitions tested in the analysis - Trade openness (trade volume /GDP) - Export (import)-to-GDP ratio - Import penetration - Exports (imports) from advanced countries /GDP - Exports (imports) from developing countries /GDP - Exports (imports) from high-income* developing countries /GDP - Exports (imports) from mid/low-inc* developing countries /GDP * income level according to UNCTAD definition	OECD trade statistics & United Nations Conference on Trade and Development (UNCTAD)
Financial factors	Preferred definition - FDI restrictiveness index	OECD FDI index
	Other definitions used/tested in the analysis - Cross-border assets and libabilities /GDP - Private credit by deposit money bank to GDP - Foreign portfolio investment (FPI) /GDP - Foreign direct investment (FDI) Inward FDI stock / GDP Outward FDI stock /GDP	External Wealth of Nations Mark II database & Financial Structure Dataset (Beck and Demirgüç-Kunt, 2009)
		UNCTAD & OECD
Technological progress	Preferred definition - Business sector Expenditure on R&D /GDP Other definitions used/tested in the analysis - Patent counts (total patent applications to both the European Patent Office and the United States Patent and Trademark Office) - patents per million population - Gross Domestic Expenditure on R&D investment /GDP - ICT investment /GDP - ICR employment/Business sector employment - Export performance in R&D intensive industries - Technology Balance of Payment /GDP	OECD science and technology indicators OECD science and technology indicators & OECD Patents database
Other variables in the regression		
Education	% of population has post-secondary education Note: Data for 1980, 85, 90, 95 and 2000 are drawn from Barro and Lee (2000) dataset, and for the years 2001-08 are from OECD education at a glance. For years between 1985 and 2000 are interpolated linearly.	OECD education at a glance Barro & Lee (2000)
Sectoral employment share	% of employment in industry % of employment in service % of employment in agriculture	OECD statistics

Table A.2. (cont.) Explanatory variables and data sources

Title	Definition	Sources
Female employment share	Female as a % of total employment	OECD statistics
Aggregate output	- Gross domestic product (GDP) - Output gap between actual and potential output as a % of potential output Other definitions tested in the analysis - GDP per capita	OECD statistics
Institutional variables		
Union density rate	% of employees who are members of a trade-union	OECD employment database
Union coverage rate	The variable "AdjCov" from Visser (2009) (0-100) It refers to employees covered by wage bargaining agreements as a proportion of all wage and salary earners in employment with the right to bargaining	Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS)
Union Centralisation and Coordination index	The variable "WCoord" from Visser (2009) 5 = economy-wide bargaining 4 = mixed industry and economy-wide bargaining 3 = industry bargaining with no or irregular pattern setting 2 = mixed industry- and firm level bargaining, 1 = none of the above, fragmented bargaining	
Union corporatism	Indicator of the degree of centralisation/coordination of the wage bargaining processes 3 = high corporatism 2 = intermediate corporatism 1 = low corporatism	OECD, Employment outlook
Product Market Regulation (PMR)	From 0 – 6 (least to most restrictions) The indicators of regulation in energy, transport and communications (ETCR) summarise regulatory provisions in seven sectors: telecoms, electricity, gas, post, rail, air passenger transport, and road freight.	OECD PMR indicators
Employment protection legislation (EPL)	From 0 – 5 (least to most restrictions)	OECD employment database
Tax wedges	Tax wedges are calculated by expressing the sum of personal income tax, employee plus employer social security contributions and payroll tax, as a percentage of labour costs (gross wages + employer social security contributions and payroll taxes). The reference rates are for single person without children at 100% of the average level.	OECD Taxing wages
Gross UI replacement rate	Gross replacement rates are calculated as gross unemployment benefit levels divided by previous gross earnings. The data refer to the average of the gross unemployment benefit replacement rates for two earnings levels, three family situations and three durations of unemployment. The reference earnings are 67% of the average level.	OECD wages and benefits
Minimum wages	Minimum relative to mean and median wages of full-time workers	OECD employment database

ANNEX B. CHANGES IN THE SKILL WAGE GAP AND THE ROLE OF SECTORS

136. The analysis in chapter 3 is confined to the overall impact of globalisation and other drivers on the wage distribution among all workers. However, there are good reasons to believe that these impacts will not be evenly distributed across different sectors and by skill level. Globalisation may well have affected wage inequality in specific industry sectors which were more exposed to trade opening, for instance, and the overall results which showed globalisation to be distribution neutral may hide such effects. This annex examines whether this was indeed the case.

137. Real wages may fall after trade barriers are lowered mainly for those whose skills are specialised in *specific* import-competing industries and wage inequalities will persist in the absence of mobility of production factors across sectors. On the other hand, following Acemoglu (2003), changes in technology predict a rising skill premium across *all* sectors. Technological change can be endogenous and trade openness might be contributing to the diffusion of new technologies which induce skilled-biased technical change, resulting in a greater impact of trade on a rising skill gap. The result will be an increase in wage inequality and in relative skilled employment within each industry instead of skill-intensive sectors gaining at the expense of low-skill intensive sectors.

138. In addition, the growing importance of trade in intermediate inputs (outsourcing) may also lead to rising skill gaps across all sectors (Feenstra and Hanson, 2003). This is because trade in intermediates may affect not only sectors in which imports occur but also other sectors which use the imported intermediates. Many countries export and import similar product groups but outsourcing in intermediate inputs by higher wage countries is leading to lower-wage labour abundant countries produce lower-value items within the same sector. This theory has very different implications for wage inequality because by relocating the unskilled-intensive stages of production in LDCs, increasing skill intensity of production in OECD countries will occur across all industries.

139. The analysis in this Annex examines inequality between skilled and unskilled workers to test whether the increase in wage inequality in OECD countries is also associated with an increase in the skill gap (*i.e.* the wage gap between skilled and unskilled workers). It looks at i) whether the skill gap increased across all countries and whether such an increase was steady across periods and sectors; and ii) whether changes in the skill gap coincided across sectors and countries with similar changes in trade, financial investment and skill-biased technological change.

B.1 Trends in skill wage gaps by sectors

140. Skill wage gaps measured by the ratio of the average wage of high-skilled to low-skilled workers increased across almost all sectors between 1985 and 2005, on country average[57] (Figure B1). This seems to confirm that industries have raised their skill-intensity of production rather than skill-intensive sectors increasing in employment at the expense of less skill-intensive sectors (see Box B.1

[57] The analysis of wage inequality by skill level was performed for 12 OECD countries. Including additional four countries for which data are only available since the 1990s results in a higher increase in inequality between 1995 and 2005. The detailed analysis shows large similarities in terms of the sectors which experienced the highest growth (machinery, electrical equipment, transport, finance).

for the definition of wages by skill level). At the same time, there is a large variation in the changes in the skill wage gap across sectors, ranging from quasi-stability (pulp, paper, printing and publishing; textiles, leather and footwear) to an increase of over 10% (finance and transport equipment). The increase appears to be more pronounced since the mid-1990s than it was in the 1980s.[58]

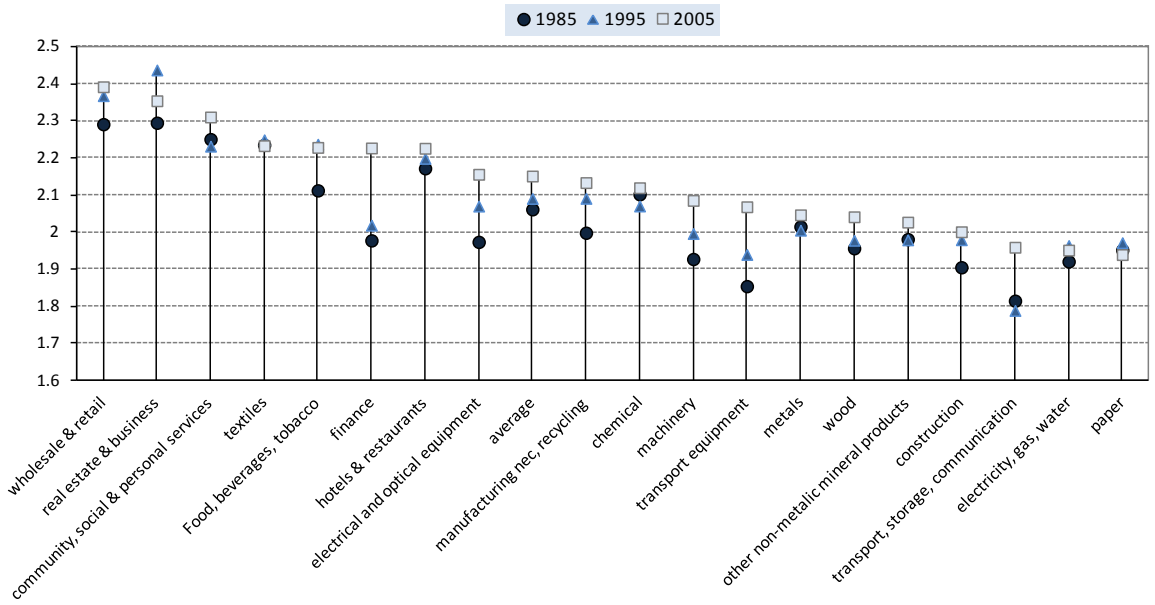
Box B.1. Constructing ratios of hourly wages by skills

The EU-KLEMS dataset which has been used for the analyses includes wage compensation by educational attainment for three types of educational levels corresponding to high, medium and low-skilled workers (W_h, W_m, W_l) and hours worked by education attainment (H_h, H_m, H_l). The wage rate for each skill level is obtained by dividing the share of the labour compensation by hours worked. Therefore, the relative compensation level of high-skilled workers compared with the industry average corresponds to $w_h = W_h / H_h$. The wage ratios examined in this chapter (high/low) correspond to w_h / w_l . The term skill gap refers to this wage ratio.

The data have several shortcomings. Data on educational attainment is used to define high, medium and low education in each country. The definitions are consistent over time for each country, but might differ across countries. Data by labour type are only available in most countries for the number employed. Therefore, the EU-KLEMS dataset assumes that 1) hours worked by labour types in a particular industry are identical to the industry average; 2) labour characteristics of self-employed and employees are the same within an industry; and 3) the compensation per hour of self-employed workers is equal to the compensation per hour of employees.

Figure B1. Ratio of high to low-skilled hourly wages relative to industry average, 1985-2005

Average for 12 OECD countries



Note: See Annex Table B.2 for more details on the country coverage.
Source: Authors calculations based on EU-KLEMS.

58 Inequality between medium and low-skilled workers has increased on average by a similar amount to that between high and low-skilled workers (analysis not shown) and the largest increases occur in the same sectors within services but not for the manufacturing sector.

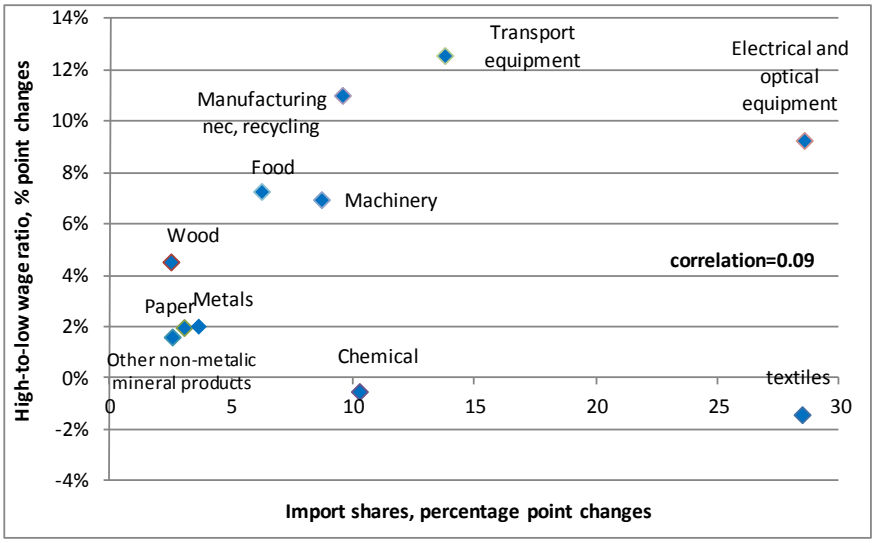
141. While a majority of OECD countries have experienced an increase in the skill wage gap across all sectors, its evolution is mixed across countries and within sectors (analysis not shown). The United States tends to have the largest relative increase in the skill wage gap between 1985 and 2005 except in transport where it occurred in the United Kingdom. Other countries such as Spain show a moderate increase in some sectors while inequality was reduced in others (*e.g.* Austria, Denmark).

B.2 Sectoral wage gaps and trade integration

142. Trade has grown greatly across all sectors in the past two to three decades but has trade openness coincided with the widening of skill wage gaps across sectors? On average, growth in import penetration has been slower than in the export share of production but both have risen by more than 50% and this growth has accelerated since the mid-1990s in most sectors. At the same time, the largest changes in trade openness were not observed in the same sectors where wage inequality increased. The largest relative increase in import penetration and in the export shares of production was observed in textiles which in parallel saw among the smallest increases in wage inequality between high and low-skilled workers. Electrical and optical equipment experienced, on the other hand, increases in both trade openness and inequality. Figure B.2 shows the cross-sectoral correlations of the association between trade integration and skill wage gaps. It reveals that changes in the sectoral skill wage gaps are not related with increased imports. Instead patterns of wage dispersion by skill may be related to the overall skill intensity of the sectors.

Figure B.2. Wage gaps and trade openness by sectors, 1985 – 2005

Increases in import shares and skill wage gaps by sector, average of 12 OECD countries



Note: Point changes refer to the difference between 1995-2005 averages and 1985-1995 averages. Data for imports are only available for manufacturing. Countries included: see Figure B.1.

Source: Authors calculations based on STAN and EU-KLEMS. See Table 2.B1.2 for more details.

B.3 Sectoral wage gaps and technological change

143. The share of the wage bill going to high-skilled labour in total labour compensation increased. But which part of this increase in is due to between-industry shifts and which part to within-industry shifts of the shares? Table B.1 reports the results from a decomposition analysis (based on Berman *et al.* 1994 and described in Box B.2). This shows that around four fifths of the 12% increase in the OECD average share of high-skilled wages are accounted for by rising wage

dispersion within the same industry. Rising inequality has thus been dominated by increasing wage dispersion *within* rather than *between* industries.

Table B.1. Changes in the share of high-skilled workers wages (1985- 2005)

	Change in the share	Between industry shifts	Within industry shifts
Share in labour compensation going to high-skilled labour	12.3	2.15	10.2

Source: Authors calculations using EU-KLEMS.

Box B.2. Decomposing the share of the wage bill going to high-skilled workers within and between sectors

Following the work of Berman, Bound and Griliches (1994), a standard way of decomposing change in an aggregate proportion is modeled by a term reflecting reallocation between industries and another term reflecting changes of proportions within industries as follows:

$$\Delta P_n = \sum_i \Delta S_i \overline{P}_{ni} + \sum_i \Delta P_{ni} \overline{S}_i$$

For *i*=1,…, N industries. Where P_n is the share of the wage bill going to skilled workers in all industries and P_{ni} is the share of the wage bill going to skilled workers in a particular industry *i*. S refers to the share of industry *i* in total industry. *A* bar over a variable denotes an average over the period and Δ denotes the change in the variable.

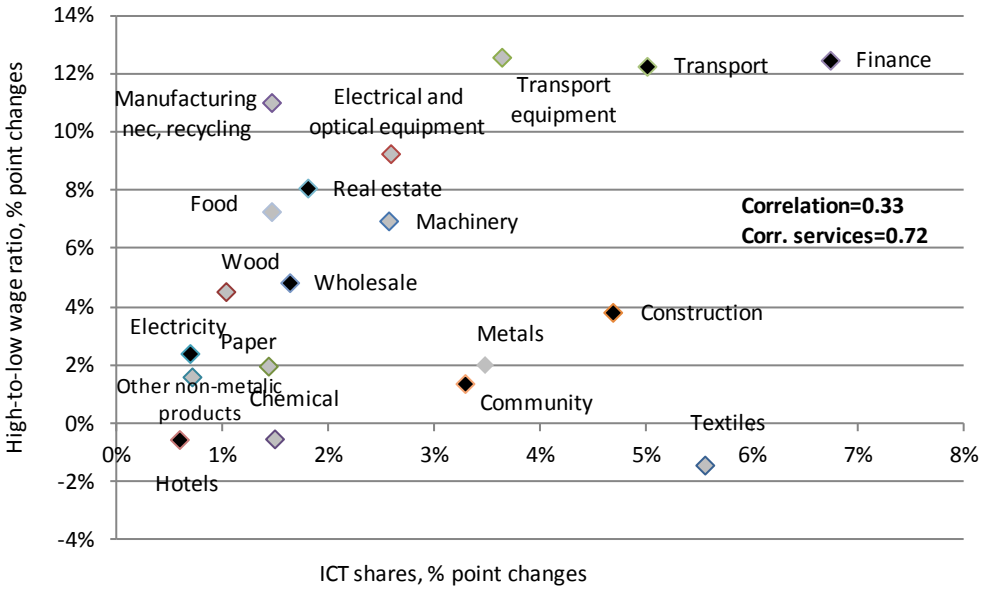
144. A greater pace of skill-biased technological change could be behind such changes in relative wages (Berman *et al*. 1994; Autor *et al*. 1998). Such an explanation predicts that the adoption of new technologies across industries and within industries will be positively correlated with an increased demand for skilled workers or reducing the relative demand for less-educated workers within industries. In contrast, increased trade in OECD countries will shift the demand for labour towards skill-intensive production in sectors more exposed to trade, at the expense of less-skill intensive sectors.

145. Figure B.3 provides a correlation analysis to further test the hypothesis of a link between skill wage gaps and technological change, proxied by the share of ICT in capital investment.[59] The data do not suggest a strong correlation at first glance. However, sectoral analysis reveals that technological change was pronounced in the same sectors as wage disparities within services, but not within the manufacture.

59 While business sector R&D is used as the key indicator for technological change in chapter 3, the share of ICT in capital investment is used here, as this indicator is available in time series for a number of OECD countries at the sector-specific level. It has also been widely used in the literature (Wheeler 2005; Autor *et al.* 1998). Technological change measured by the share of ICT in capital investment has experienced a large surge since 1980 but it appears to have preceded changes in wage inequality as the largest increase occurred in the first decade studied.

Figure B.3. Wage gaps and technological change by sectors, 1985 – 2005

Increases in ICT and high-to-low wage ratios, average of 12 OECD countries



Note: Point changes refer to the difference between 1995-2005 averages and 1985-1995 averages. Countries included: see Figure B.1.

Source: OECD calculations based on STAN and EU-KLEMS.

146. One explanation for the weak correlation between changes in skill gaps and technological change is that no account is taken for growing wage inequality among workers with similar skills. A growing body of literature has shown that, even after accounting for observable differences across workers the dispersion of wages has risen, *i.e.* there has been an increase in residual wage variation. The simple distinction between skilled and unskilled workers is not detailed enough to capture such recent changes in employment and inequality. In fact, technological change, in particular ICT developments, is accompanied by shifts away from routine and toward non-routine labour (Autor *et al*, 2003; Michaels *et al*. 2010; Goos & Manning 2007).

B.4 Sectoral wage gaps and other forms of globalisation

147. Outsourcing is also a likely explanation for within-industry shifts in wage inequality. While technological change has been favoured in the literature as the main factor contributing to the declining position of low-skilled workers, recent years have seen a new debate about whether the effect of trade on inequality has been overlooked. Feenstra and Hanson (2003) argue that the impact of trade on wages may be much larger because an increasing amount of international trade takes the form of trade in intermediate inputs and increased international outsourcing of production activities. Outsourcing is predicted to increase both the skill gap and the skill intensities of final goods in OECD countries. Some estimates of the effect of outsourcing have shown that it could explain between 15 to 40% of the increase in wage inequality, depending on the specification (Feenstra & Hanson 1999). While additional research using comparative data is still needed to settle the issue, some studies suggest that technological change remains the dominant effect (Hijzen 2007).

Box B.3 Outsourcing and trade in intermediate inputs

The Imports of Intermediate Goods and Services dataset contains data on bilateral flows of intermediate inputs. Import values are estimates based on a combination of trade statistics (using the BEC classification: the International Trade by Commodity Statistics -UN/OECD ITCS common database for goods-, and the OECD Trade in Services by Partner country –TISP- for services' trade flows) with Input-Output (I/O) tables. Data has been computed for three reference years: 1995, 2000 and 2005. Imports of intermediate goods and services are available for 29 economic sectors, following the underlying International Standard Industrial Classification (ISIC rev.3).

The imports of intermediate input (good or service) **p** from country **j** by using industry **k** in country i in year **t**, $IMP_{ijpkt,}$ are estimated by multiplying the share of imported inputs **p** by using industry **k** in overall imported inputs **p** of country **i**, $SHARE_{ipkt}$, by the imports of input **p** of country **i** from country **j**, $VALUE_{ijpt}$. This relationship can be expressed formally as:

$$IMP_{ijkpt} = SHARE_{ipkt} \times VALUE_{ijpt}$$

The allocation of bilateral intermediate imports across using industries assumes that import coefficients are the same for all trade partners, i.e. $SHARE_{ipkt}$ is identical across exporter countries. Hence, the bilateral pattern of imported intermediates from industry **p** is the same across all using industries **k**. However, it is different from the bilateral pattern of total imports from industry **p** because trade data (measured by $VALUE_{ijpt}$) allows distinguishing bilateral imports of intermediates from final good imports in industry **p**.

In the case of trade in services, $VALUE_{ijpt}$ is the total value of imports of service **p**, i.e. both final and intermediate (and not only services that are used in the production of other goods and services, as in the case of goods data). By making an additional assumption and adjusting $SHARE_{ipkt}$, it is however possible to calculate trade in intermediate services. In the case of services imports, $SHARE_{ipkt}$ is the share of imported service inputs **p** used by industry **k** in **total** imports of **p** of country **i**. In the case of services, besides the assumption that all trading partners have the same distribution of intermediate imports **p** across using industries **k**, it is furthermore required that the share of intermediate services in overall bilateral services imports of country **i** is the same across all partner countries **j**.

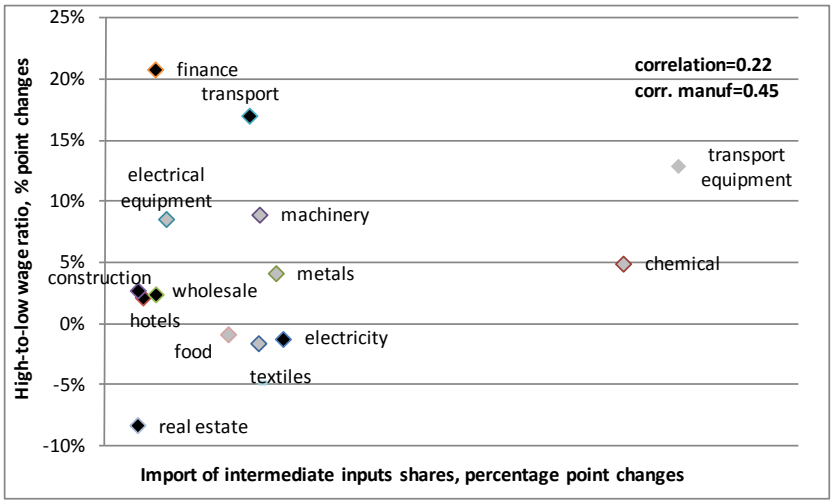
Finally, it should be mentioned that trade data reported in the trade statistics do not fully match imports as reported in I-O tables. One main reason is that while trade data is recorded at consumer prices, I-O tables are evaluated at producer prices. There are also other differences such as the treatment of re-exports, scrap metal, waste products and second hand goods or unallocated trade data. The measure used here includes imports of intermediate goods that are used in countries' production independently of the destination of the goods produced.

148. While recent evidence has found that international outsourcing to low-income countries has a negative effect on the demand for workers at the bottom of the skill distribution in manufacturing in OECD countries, less is known about outsourcing of services because of measurement problems. The analysis below looks at the correlation between trends in import in intermediate inputs and the skill wage gap using newly available data[60] for both goods and services across OECD countries (see Box B.3 for the methodology). Figure B.4 shows that the correlation is weak overall (0.22) but somewhat higher (0.45) when looking at the manufacturing sector only.

[60] Data are only available for more recent years (1995 to 2005).

Figure B.4. Wage gaps and trade in intermediate inputs, 1995 – 2005

Increases in trade in intermediate inputs and high-to-low wage ratios, average of 12 OECD countries



Note: Countries included: see Figure B.1.

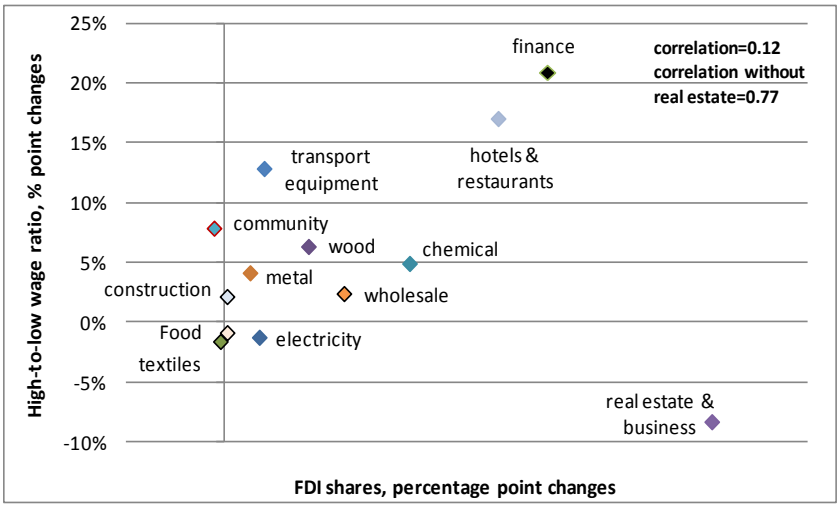
Source: Authors calculations based on EU-KLEMS and OECD Imports of Intermediate Goods and Services dataset.

149. Capital flows from OECD to developing economies might capture another dimension of outsourcing by multi-national corporations (MNCs) and may have contributed to an increase in the relative demand for skilled labour (Feenstra and Hanson 1996). Globalisation is also characterised by international production networks where different stages of production are performed in different countries. As a result, a particular country may import goods from another country and use them as input for other goods which are exported. OECD countries may outsource activities that use relatively large amounts of unskilled labour.

150. FDI has seen a progressive shift towards services at the expense of manufacturing and, often, the largest growth in inward FDI within services has been among knowledge-intensive sectors such as finance and real estate (OECD, 2008b). But also some non-knowledge-intensive sectors such as restaurants and hotels have experienced a substantial growth. A gradual shift in both outward and inward FDI towards more technological and skill-intensive sectors would point to a possible link between FDI and wage inequality. At first glance, correlation analysis does not confirm a strong link between FDI and skill wage gaps across sectors (Figure B.5). However, the association between changes in FDI and skill wage gaps is sensitive to the outlier industry "real estate". Once excluded, a stronger correlation is found.

Figure B.5. Changes in wage gaps and outward FDI, (1995-2005)

FDI shares and high/low wage ratio, average of 12 OECD countries



Note: Point changes refer to the difference between 2000-2005 averages and 1995-2000 averages..

Source: Authors calculations based on EU-KLEMS data.

B.5 Summary

151. The analysis has found that the skill wage gap increased across almost all industry sectors and correlation analysis tends to confirm the findings in chapter 3 above that trade is not the main explanatory factor behind the trend. Sectors which were particularly exposed to trade openness were not necessarily the ones which recorded higher increases in skill wage gaps. Most of the increase was driven by inequality *within* sectors rather than *between* sectors. Correlation between changes in the skill wage gap and possible drivers such as trade in total and intermediate goods and services was weak.

152. Changes in other drivers linked to globalisation did show a very moderate correlation with changes in the skill wage gap across sectors. This is the case for technological change (but only within services and not within manufacturing) and FDI (after excluding the outlier sector "real estate") and trade in intermediate output (but to an even weaker degree and only for the manufacturing sector).

153. Weak correlations between the skill wage gap and possible drivers reflect in part difficulties to determine the direction of causality and to measurement problems of skills. Indeed, the definition of skills might be too broad to capture changes between routine and non-routine tasks within occupations and skills (Autor *et al.*, 2003; Michaels *et al*, 2010). Besides, the direction of causality remains unclear and many factors may be interlinked. For instance, higher skill endowment among workers may encourage the adoption of skill-intensive technologies. In addition, recent theories suggest that trade liberalisation itself is one of the drivers of technological change (Acemoglu, 2003). Trade-induced technological change occurs for instance when trade increases the relative price of skill-intensive goods, encouraging skill-intensive technologies. The market expansion generated by trade is also believed to boost technological change and the demand for skills, and so does any international technological spillovers.

Table B.2. Data sources, country, year and sector coverage

			Country coverage	Industry coverage (ISIC Rev. 3)
Wage	Share of high-skilled, medium and low-skilled in total labour compensation and in hours worked	EU-KLEMS 1985-2005	Austria, Belgium, Denmark, Germany, Finland, Japan, the Netherlands, Poland, Spain, Sweden, the United Kingdom, the United States	15-16, 17-19, 20, 21-22, 23-25, 26, 27-28, 29, 30-33, 34-35, 36-37,45, 50-52, 55, 60-64, 65-67, 70-74, 75-99
Import of in intermediate inputs	Import values of Intermediate Goods and Services, estimates based on I/O tables dataset as a share of GDP	OECD Globalisation indicators 1995, 2000, 2005	Austria, Belgium, Denmark, Germany, Finland, Japan, the Netherlands, Poland, Spain, Sweden, the United Kingdom, the United States	15-16, 17-19, 20, 23-25, 27-28, 29, 30-33, 34-35, 36-37,45, 50-52, 55, 60-64, 65-67, 70-74, 75-99
Import penetration	Imports as a percentage of total demand (=production plus imports less exports)	OECD STAN Database 1985-2005	Austria, Belgium, Denmark, Germany, Finland, Japan, the Netherlands, Poland, Spain, Sweden, the United Kingdom, the United States	15-16, 17-19, 20, 21-22, 23-25, 26, 27-28, 29, 30-33, 34-35, 36-37
Export share of production	Exports as a percentage of production	OECD STAN Database 1985-2005	Austria, Belgium, Denmark, Germany, Finland, Japan, the Netherlands, Poland, Spain, Sweden, the United Kingdom, the United States	15-16, 17-19, 20, 21-22, 23-25, 26, 27-28, 29, 30-33, 34-35, 36-37
Inward FDI	Inward positions in direct investment as a share of GDP	OECD International Direct Investment Statistics database 1985-2005	Austria, Belgium, Denmark, Germany, Finland, Japan, the Netherlands, Poland, Spain, Sweden, the United Kingdom, the United States	15-16, 17-19, 20, 23-25, 27-28, 34-35, 45, 50-52, 55, 60-64, 65-67, 70-74, 75-99
Outward FDI	Outward positions in direct investment as a share of GDP	OECD International Direct Investment Statistics database 1985-2005	Austria, Belgium, Denmark, Germany, Finland, Japan, the Netherlands, Poland, Spain, Sweden, the United Kingdom, the United States	15-16, 17-19, 20, 23-25, 27-28, 34-35, 45, 50-52, 55, 60-64, 65-67, 70-74, 75-99
Share of ICT	Share of ICT in total capital compensation	EU-KLEMS 1985-2005	Austria, Belgium, Denmark, Germany, Finland, Japan, the Netherlands, Poland, Spain, Sweden, the United Kingdom, the United States	15-16, 17-19, 20, 21-22, 23-25, 26, 27-28, 29, 30-33, 34-35, 36-37,45, 50-52, 55, 60-64, 65-67, 70-74, 75-99

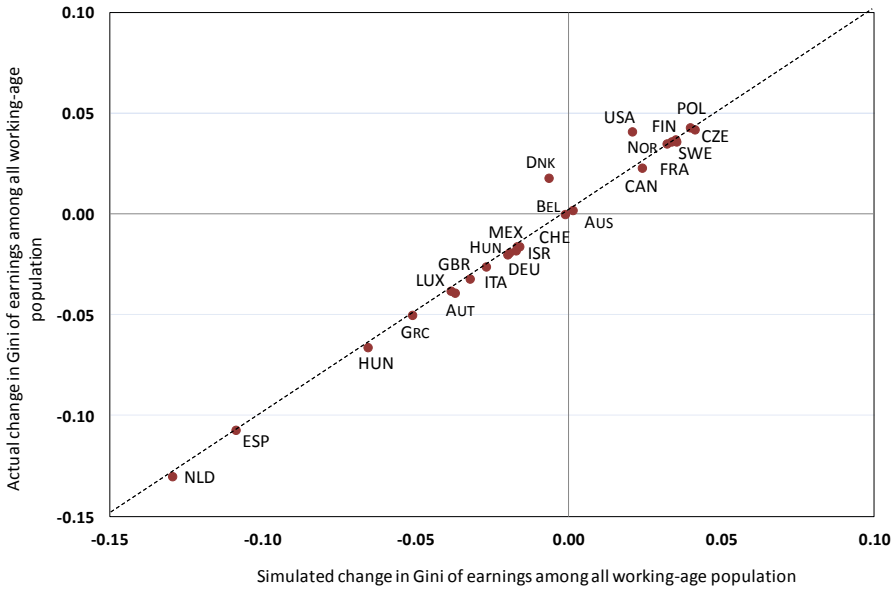
ANNEX C. DATA FOR THE ANALYSES IN CHAPTER 4

154. For the empirical analyses in Sections 4.2-4.4, the *OECD Earnings Database* from the previous analyses is not adapted because it covers only the earnings of workers. The challenge for estimating equation 5 is that the three variables – the Gini coefficient of the working-age population, the Gini coefficient of the employed population and the employment share – need to be obtained from the same data source to avoid discrepancies due to different sample coverage or variable definitions. For this reason, these factors are obtained from the microdata using the Luxembourg Income Study (LIS) for 24 OECD countries for a period between mid-1980s and mid-2000s (*www.lisdatacenter.org*).

155. To test whether the LIS data fit the proposed model, real earnings data are applied to equation 6 for 24 OECD countries for a period between the mid-1980s and mid-2000s. Figure B1 plots the simulated change in Gini coefficients among the working-age population (computed from equation 6) against the actual change in the Gini coefficients on the y-axis. If the Gini coefficient and employment shares are estimated precisely from the data, one should expect both the simulated change and the actual change to be the same, and all countries should lie along the 45-degree line.

156. In general, Figure C1 shows that this is the case of nearly all countries under study, suggesting an overall fit of the theoretical framework to the empirical data. The only two minor deviations are Denmark and the United States which data points lie slightly above the 45 line, suggesting possible minor measurement issues of the data for these countries.

Figure C1. Actual versus simulated changes in Gini coefficients among the working-age population



*, **, ***: statistically significant at the 10%, 5% and 1% level, respectively.

Source: Authors calculations from the Luxembourg Income Study (LIS) microdata.

Table C1. Simulation of the wage and employment effects by country, entire working-age population

Country	Actual Gini coefficient of earnings			Counterfactual Gini coefficient of earnings in last year holding following factors at the first year levels		
	First year	Last year	Change (2)-(1)	Gini of earnings among workers	(4) + employment share	Residuals
	(1)	(2)	(3)	(4)	(5)	(5)-(1)
AUS (85-03)	0.531	0.533	0.002	0.001	0	0.001
AUT (94-04)	0.542	0.503	-0.039	0	-0.041	0.002
BEL (85-00)	0.546	0.546	0	0.032	-0.031	-0.001
CAN (87-04)	0.516	0.539	0.023	0.029	-0.013	0.007
CZE (92-04)	0.446	0.488	0.042	0.029	0.005	0.008
DNK (87-04)	0.428	0.446	0.018	0.01	-0.001	0.009
FIN (87-04)	0.412	0.449	0.037	0.005	0.024	0.008
FRA (81-00)	0.482	0.517	0.035	0.036	-0.013	0.012
DEU (84-04)	0.537	0.517	-0.02	0.036	-0.065	0.009
GRC (95-04)	0.614	0.564	-0.05	0.009	-0.061	0.002
HUN (91-05)	0.578	0.562	-0.016	-0.036	0.019	0.001
IRL (94-04)	0.609	0.543	-0.066	-0.02	-0.05	0.004
ISR (79-05)	0.591	0.598	0.007	0.025	-0.022	0.004
ITA (87-04)	0.579	0.553	-0.026	0.019	-0.048	0.003
LUX (85-04)	0.541	0.538	-0.003	0.06	-0.074	0.011
MEX (84-04)	0.69	0.657	-0.033	-0.006	-0.041	0.014
NLD (83-04)	0.645	0.515	-0.13	0.039	-0.17	0.001
NOR (79-04)	0.405	0.441	0.036	0.024	0.004	0.008
POL (92-04)	0.61	0.653	0.043	0.055	-0.013	0.001
RUS (92-00)	0.593	0.701	0.108	0.036	0.08	-0.008
ESP (95-04)	0.635	0.528	-0.107	-0.031	-0.079	0.003
SWE (81-05)	0.395	0.431	0.036	0.009	0.024	0.003
CHE (00-04)	0.446	0.43	-0.016	-0.013	-0.004	0.001
GBR (86-04)	0.59	0.558	-0.032	0.026	-0.067	0.009
USA (79-04)	0.519	0.56	0.041	0.036	-0.011	0.016

* Information on data for Israel: http://dx.doi.org/10.1787/888932315602.

Source: Authors calculations from the Luxembourg Income Study (LIS) microdata.

ANNEX D. FINDINGS FROM SELECTED STUDIES

Authors	Title	Countries, period, number of observations, estimation method	Dependent variables and regressors	Findings
Globalisation and inequality				
Bertola, G. (2008)	"*Inequality, Globalization, and Financial Development*", Paper prepared for the conference "Globalization and Inequality: Reflections on the Development of a Divided World," European University Institute in Florence	467 observations for 51 countries, up to around 2000, pooled OLS regressions with and without country fixed effects, with and without interaction effects	Dependent: Gini of incomes (UNU/WIDER WIID) Regressors: trade ((exports+imports)/ GDP) (Penn tables); share of government in GDP (Penn tables); private credit/GDP (WB). With and without controls for GDP/capita	- strong significance of GDP/capita in pooled OLS estimates - with fixed country effects (not controlling for GDP), positive association between inequality and trade openness, but insignificant, once controlling for financial development; - without country fixed effects, gvt expenditure is positively related to openness, with fixed effects it is negatively related (suggests that increasing international competition makes taxation and policies more difficult) - interaction between gvt spending and openness is a significant explanatory variable for inequality
Bruno G.S.F., R. Crino, and A.M. Falzoni (2004)	"*Foreign Direct Investment, Wage Inequality, and Skilled Labor Demand in EU Accession Countries*", CESPRI working paper n. 154	3 countries (Poland, Hungary, Czech Republic), 1993-2001, pooled cross country/time series OLS, with country and time-fixed effects; IV	Dependent: skilled labour shares of total wage-bill and employment and wage ratio between skilled & unskilled Regressors: inward FDI for 6 sectors (stocks), business enterprise expenditure on R&D, exports and imports of final goods, gross value added. All data in constant 1995 US dollars and all variables are lagged	- no impact of FDI on the skilled-labor share of total wage-bill i.e FDI does not favor labor demand shifts -on the other hand, FDI has contributed to the skill-premium, as indicated by the positive coefficient on the wage ratio between the skilled and the unskilled. Trade has an equalising effect and technology tends to increase wage inequality

Authors	Title	Countries, period, number of observations, estimation method	Dependent variables and regressors	Findings
Feenstra R. and G. Hanson (1996)	"*Globalization, Outsourcing, and Wage Inequality*," American Economic Review, (86), 240-245	US, 1972-1994, first differences	Dependent: annual change in nonproduction workers share of the industry wage bill, controlling for value added and capital Regressors: imports, estimated imports of intermediate inputs for manufacturing industries, controls for value added, capital stock	- between 1972-1979 the change in outsourcing is insignificant and the change in import share is negative while for the 1979-90 period both the change in outsourcing and the change in the import share are positively correlated with the change in the nonproduction wage share
Figini, P. and H. Gorg (2006)	"*Does Foreign Direct Investment affect Wage Inequality? An empirical Investigation*," IZA Discussion Paper No. 2336	100 countries, 1980-2002, pooled OLS regressions with country and time fixed effects, quadratic specification for FDI; also FDI lagged, GMM (UNIDO industrial statistics database)	Dependent: Gini and Theil indices calculated for average wages per employee across 3-digit ISIC manufacturing industries, weighted by the number of employees in each sector Regressors: inward FDI as a % of GDP Controls: trade openness, GDP/capita and secondary education as a % of the total population	-FDI statistically insignificant in the total sample, concave relationship between FDI and inequality for developing countries while for developed countries inequality is negatively linked to FDI but this effect diminishes as the FDI stock increases
IMF (2007)	*World Economic Outlook*, Volume October 2007, 'Globalisation and Inequality', pp. 31-65. IMF, Washington	143 countries, 1980-2006, annual data, estimations with country fixed effects	Dependent: Natural log of Gini coefficients Per capita income by quintile Regressors**:** Trade openness, 00 minus tariff rate, ratio of cross-border assets and liabilities, inward FDI stock to GDP, capital account openness index, share of ICT in total capital stock, education, sectoral share of employment, credit to private sector as % of GDP	Technological progress has a greater impact than globalisation on inequality within countries. Trade globalisation is associated with a reduction in inequality whilst financial globalisation increases it. Amongst advanced countries, globalisation contributed more than technology.FDI and technological progress benefit higher income quintiles while trade benefit the lower quintiles.

Authors	Title	Countries, period, number of observations, estimation method	Dependent variables and regressors	Findings
ILO (2008a)	*World of Work Report*, Volume October 2008, 'Ch. 2: The Role of Financial Globalization', pp. 39-70. ILO, Geneva	102 countries (for inequality), 5 eight-year periods between 1960-2006, feasible generalized least squares, controlling for regional fixed effects	Dependent: Gini of income and wealth Regressors: Capital account opening, Total foreign assets and liabilities, FDI, Frequency of banking crises in %, Bank credit growth, initial per capita GDP, initial ratio of secondary schooling, inflation rate, ratio of government consumption as percentage of GDP, and measure of trade openness	Financial globalization led to a depression of share of wages in GDP and to an increase in income inequality, resulting from increasing financial assets and growing incidence of financial crises. Financial globalization did lead to higher growth and incomes.
ILO (2008b)	*World of Work Report*, Volume October 2008, 'Ch. 3: Labour Institutions and Inequality', pp. 71-114. ILO, Geneva	42-44 countries, annual data 1983-2003, within and between country regression with time dummies	Dependent: Income Gini Regressors: Inward FDI, tariff openness, capital account openness, trade openness, education, ICT share private credit, trade union density, collective bargaining structure, core convention ratifications, convention no. 87 and 98 severity indices, reversed democracy index.	Considerable decline in union density, however no evidence that labour institution changes caused increasing inequalities. Economic factors, including shifts towards skilled labour, FDI, and tariff liberalization are associated with higher inequalities, whereas increases in human capital supply lowers inequalities. Labour market institutions are associated with lower inequalities.

Authors	Title	Countries, period, number of observations, estimation method	Dependent variables and regressors	Findings
Meschi, E. and M. Vivarelli (2009)	*"Trade and Income Inequality in Developing Countries*," World Development, 37(2), 287-302.	70 developing countries, 1980-1999, dynamic pooled cross-country regression with country fixed effects: Least squares dummy variable corrected estimator	Dependent: household income inequality: EHII index Regressors: import and export flows according to origin, Controls: GDP/capita, education level, inflation rate	- contemporaneous trade and imports have a small and barely significant positive impact on inequality - trade, imports and exports with industrialized countries worsen the income distribution while trade and imports from other developing countries do not affect income inequality and exports to other developing countries improve inequality. All lagged trade flows with developing countries have an equalizing effect. - Results are significant only for middle-income countries and are not significant for low-income countries.
Milanovic, B. (2002)	"*Can We Discern The Effect Of Globalization On Income Distribution? Evidence From Household Surveys*", World Bank Policy Research Working Paper 2876	88 countries; 113 observations for levels 1993, and 45 for changes 1988-1993, 10 cross-sectional regressions, one for each income decile run across all countries	Dependent: relative income level of each decile (to the mean), $PPP incomes Regressors: openness ((exp+imp)/GDP); FDI/GDP; controls for financial depth (M2/GDP) and democracy indicator (competitiveness in legislative elections and chief executive elections)	- for bottom seven deciles, openness negatively related with income share, but effect is lessened for richer countries: from $5-6000/cap income shares of poor and middle class positively affected and for rich countries, decreasing share of top deciles -->openness makes inc. distribution worse before making it better (effect of openness depends on county's initial level) - FDI and financial depth are not significant in any regressions

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Milanovic, B. and L. Squire (2005)	"*Does tariff liberalization increase wage inequality? Some empirical evidence*", World Bank Policy Research Working Paper 3571	around 70 countries (unbalanced), 1983-1999 and 90 countries for 1975-1999, pooled cross-country, time series regression in first differences	Dependent: 1) inter-occupation wage inequality measured by Gini coefficient, 2) Theil index of inequality for inter-industry wages Regressors: 1) unweighted average tariff rate, import-weighted indicator of presence of trade reforms in country's most important trading partners, 2) unweighted average tariff rate, share of labor force covered by collective agreements, share of unionized labor force	- decreasing the tariff rate increases inter-occupational wage inequality, mainly in poor countries, while the reverse is found in richer countries -a reduction in tariffs is also associated with increasing wage inequality between industries, particularly in high trade-union density countries for poorer countries while tariff reduction decreases inter-industry wage inequality in richer countries
Toth, I. and A. Gabos (2005)	"*Income inequality and poverty in the EU: a macro level comparative analysis*", Chapter 5 of the EU Report of the Social Situation Observatory 2005	EU24 countries (excluding Cyprus), for 2004, OLS, with dummy for NMS status	Dependent: Gini, S80/S20, 60%-median poverty rate, for disposable equivalised income of total population (EU-SILC) Regressors: GDP/head in PPS as % of EU-25 average; openness-indicator (0-100, source WMRC, mainly trade but also FDI and PCF); SOCX/GDP; overall employment rate	- openness of the economy is statistically not significant for inequality and poverty measures, in any of the models

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Policies/institutions and inequality and employment				
Baccaro, L. (2008)	"*Labour, Globalisation and Inequality: Are Trade Unions Still Redistributive?*" Discussion paper No. 192, International Institute for Labour Studies, Geneva.	42 countries, 1989-2003, pooled cross country/time series econometric model; OLS with country and time fixed effects with AR(1) SE	Dependent: log of the Gini coefficient Regressors: trade union density, index of collective bargaining, centralization/coordination, number of core convention ratifications, OECD indexes of C87 and C98 severity violations; trade openness, tariff liberalization, FDIs tock as a % of GDP, capital account openness, share of ICT investment in total capital stock. Controls: average number of years of education, credit by banks and other financial institutions	- growth in FDI is associated with higher inequality, tariff liberalization is also positively associated with inequality while capital account liberalization, average education years and credit to the private sector are not significant; technology-induced shifts tend to increase inequality - trade unionism (union density) and collective bargaining do not a significant association with within country inequality, except in Central and Eastern European countries. - In Advanced countries labour institutions tend to be associated with a larger welfare state but institutions have become less effective in reducing inequality since the 1990s
Bassanini, A. and R. Duval (2005)	"*Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions*", OECD Social, Employment and Migration Working Paper 35.	21 OECD countries, 1982-2003, pooled cross country/time series econometric model; OLS, OLS with country and time fixed effects, IV for interactions	Dependent: i) standardised rate of unemployment; ii) employment rate disaggregated by main LM groups. Regressors: tax-wedge between labour costs and take-home pay (for a single-earner couple with 2 children, at average earnings leveles), average replacement rate of UB, stringency of EPL, stringency of PMR for 7 non-	-Changes in policies & institutions explain almost 2/3 of non-cyclical unemployment changes in last 20 years - High and long-lasting UB, High tax wedges and strict PMR increase UE while centralised/coordinated wage bargaining reduces it. No significant impact of EPL or union density on unemployment is found. - the impact of policy reforms

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			manufacturing industries, union membership rates, the degree of centralisation/co-ordination of wage bargaining levels	varies depending on the institutional context (they are complementary) - The effects of macroeconomic shocks are amplified by high UB and dampened by highly centralised/coordinated wage bargaining systems - high UB, high tax wedges reduce prime-age male employment rate, union density increases it, EPL and PMR insignificant - high UB, high tax wedges and stringent PMR reduce female prime-age employment rate, strict EPL has no effect, union density positive on FT but negative on PT employment.
Burniaux, J-M, F. Padrini and N. Brandt (2006)	"*Labour market performance, income inequality and poverty in OECD countries*", OECD Economics Department Working Paper 500	18 OECD countries, 1978-2000, pooled cross country/time series econometric model; OLS, OLS with country and time fixed effects, MLE with country random and time fixed effects	Dependent: Gini, D9/D1, 50%-median relative poverty rate, for disposable equivalised income of total population Regressors: vector of policies (UB generosity, union density, tax wedge)(separately SOCX and ALMP); vector of controls (capital-labour ratio, average years of education)	- Inequality: Without country or time heterogeneity, all institutions/policies reduce ineq significantly. But with country and time fixed effects, significance vanishes, except for union density (and only when using D9/D1 ratio). SOCX remains negative and ALMP a little negative. - Poverty: with baseline model (country and time fixed effects), union density and tax wedge reduce poverty while impact of average education years is positive.

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Checchi, D. and C. Garcia-Penalosa (2005)	*Labour Market Institutions and the Personal Distribution of Income in the OECD*, IZA Discussion paper 1681	16 OECD countries, 1960-96; 200-460 observations, cross-section time series OLS, with and without country and time fixed effects	Dependent: Gini coefficient of gross income Regressors: Reduced form: union density, minwage/median; UB; tax wedge; log capital/worker; years of education	- growth, globalisation, education explain little of inequality differences across OECD but LM institutions do - Gini expressed as a function of the labour share, the relative wage, UB, and the proportion of the population in each category. - LM institutions affect simultaneously relative wages, the labour share, and UR, all of which then have an impact on personal income distribution - labour share important determinant of overall inequality patterns; stronger unions and a more generous UB negatively affect inequality (comparable magnitude), minimum wage marginally significant, tax wedge strong negative effect
Koeninger, W., M. Leonardi, and L. Nunziata (2007)	"*Labour Market Institutions and Wage Inequality*," Industrial and Labour Relations Review 60/3, 340-356	11 OECD countries, 1973-1998, feasible fixed-effect GLS, including time dummies	Dependent: wage 90/w10 for male workers (also 90-50 and 50-10 male wage differentials) Regressors: labour market institutions: wage bargaining coordination, union density, generosity and duration of UB, strictness of EPL, tax wedge, minimum wages; import intensity and R&D intensity; Controls: unemployment rates, educational attainment	-EPL, benefit replacement rate and duration, union density and the minimum wage are negatively affecting the male wage differential. Coordination and the tax wedge are insignificant. The wage differential is positively associated with import intensity and skill endowment and negatively with R&D intensity. Changes in institutions can explain as much as is explained by trade and technology. –Additional controls for the share of women in the labour force, the ratio of government expenditures to GDP and the age composition of employment do not affect the results on institutions except for union coordination and the tax wedge which become insignificant - the effect of tax wedge on real wages depends on union density and coordination; employment protection has more bite if wages are downwardly rigid

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				and the generosity of UB matters more the longer such benefits are provided - Coefficients on employment protection, replacement rates and minimum wages are similar for the upper and lower part of the wage distribution; union density is more important for the upper part of the distribution - if institutions were changed to match the regulation in the US, wage inequality would increase between 15 to 30% in Anglo-Saxon countries and between 50 and 80% in continental European countries -institutional changes during 1973-98 were associated with a 23% reduction of wage inequality in France but with an increase of 11% in the US and the UK
Weeks, J. (2005)	"*Inequality Trends in Some Developed OECD Countries*", DESA Working Paper No. 6, UN	7 countries, 1980-1998, cross-section time series OLS, with fixed country effects	Dependent: ln(Gini) (WIDER and national sources) Regressors: current public expenditure share in GDP; unemployment rate; union density rate	- in countries in which inequality increased, this was primarily the result of the decline in the importance and bargaining power of organized labour, aggravated by unemployment and reductions in government expenditure
SBTC and inequality				
Autor, D.H., L.F. Katz, and A.B. Krueger (1998)	"*Computing Inequality: Have Computers Changed the Labor Market*?" The Quarterly Journal of Economics, November, 1169-1213	US, 1940-1995, shift and share analysis *i.e.* decomposition of growth into 'between' and 'within' industry components OLS, OLS first difference, pooled cross-industry regressions	Dependent: 1) log hourly wages, 2) annual change in employment share by educational group 3) annual change in the share of payroll due to college-educated workers in each industry, 4) changes in the college graduate share of the wage bill	- the relative demand for more skilled workers grew more rapidly between 1970-1995 than during 1940-1970. –The acceleration in demand shifts for more skilled workers in the 1970s and the 1980s relative to the 1960s is entirely explained by within-industry changes in skill-utilization rather than between-industry employment shifts -the increase in the rate of growth of the

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			Regressors: 1 to 3)% of workers using a computer at work, 4) computer capital intensity and changes in overall capital intensity	demand for more educated workers is concentrated in the most computer-intensive industries and those industries with the most rapid growth in computer investments -changes in computer use account for a substantial increase in the share of payroll devoted to college graduates (30 to 50% of the increase in the rate of growth of the wage-bill share of more skilled workers)
Autor, D. , F. Levy, and R. Murnane (2003)	"*The Skill Content of Recent Technological Change: An Empirical Exploration*", Quarterly Journal of Economics, 118(4), November 2003, 1279-1334.	US, 1960-1998, first differences, controlling for trend change in industry task input for each decade relative to the base period	Dependent: within-industry changes in input task for 4 tasks measures measured in percentiles of 1960 task distribution (also by education group) Regressors: annual change in the percentage of industry workers using a computer at their jobs OR industry's real log investment in computer capital per FTE AND change in occupational input of tasks	- Rapidly computerizing industries raised their input of non-routine tasks more than others. Holding computer investment constant, investment in computer capital explains more than 100% of the overall trend increase in non-routine cognitive/analytical task input, a substantial part of the trend increase in non-routine cognitive/interactive input and substantial parts of the trend decreases in routine cognitive and routine manual inputs -industry-level computerization is strongly predictive of shifts toward nonroutine and against routine tasks within all education groups -occupations making relative large increases in computer use saw relatively greater increases in labour input of routine cognitive skills -changes in task demands accompanying workplace computerization contribute substantially to relative demand shifts 93avouring educated labour in the US

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Goos, M & A. Manning (2007)	"*Lousy and Lovely Jobs: The Rising Polarization of Work in Britain*," The Review of Economics and Statistics, MIT Press, vol. 89(1), pages 118-133, 01	UK, 1979-1999, OLS	Dependent: change in log employment in a job (3 digit occupation codes) Regressors: initial log median wage in the job	- U-shaped relationship between employment growth and the initial level of wages supporting the view of polarisation in the quality of jobs with growth at both ends of the distribution (observed for both men and women) -the type of occupations with most rapid growth are specialized occupations mainly in finance and business industries at the top end of the wage distribution or low-paid service occupations intense in non-routine manual tasks (difficult to substitute by machines). -the large increase in the employment shares of managerial and professional workers is mostly within industries and the increase in the employment share of low-paid personal and protective services and sales occupations has a large within and between component -overall there is a big rise in non-routine interactive tasks and large declines in routine tasks within occupations. in the case of jobs at the lower end of the wage distribution, the increase in skill requirements is between occupations while within-occupation task requirements are falling - job polarization can explain 1/3 of the rise in the log(50/10) wage differential and 1/2 of the rise in the log(90/50)
Machin, S. and J. Van Reenen (1998)	"*Technology and Changes in skill Structure: Evidence from Seven OECD Countries"* The Quarterly Journal of Economics, November, 1215-1244	5 OECD countries, 1973-1989, first differences for all variables to remove industry-specific fixed effects, country fixed effects; IV	Dependent: nonproduction wage-bill share Regressors: capital stock, value added, R&D expenditures to value added (either as average, lagged or initial)	- R&D is positively associated with changes in nonproduction wage-bill shares in all five countries; growth of capital intensity is also positively correlated with the wage-bills shares. R&D coefficients are smallest in the UK and the US and are higher in Denmark & Japan.

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				- Using computer usage government-funded business enterprise R&D as technological change indicators gave similar results -Rising import competition is concentrated in similar industries as skill upgrading but the coefficient of import penetration was insignificant