Growing apart: The comparative political economy of income inequality and social policy development in affluent countries

Thewissen, S.H.

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1 Introduction

1.1 Mind the gap

Over the past few decades, until the onset of the Great Recession, real disposable per capita incomes have grown steadily in OECD countries. The benefits of this income growth, however, were not equally shared amongst households. On the contrary, most OECD countries witnessed a widening of the income distribution. Earnings grew more dispersed in particular (Morelli *et al.*, forthcoming). This was for a significant part due to increases in wage differentials between low- and high-skilled employees (OECD, 2008a; 2011a).

Only fairly recently, rising income inequality has returned to the political agenda as a major concern for policy makers and society at large. Piketty's thought-provoking premises of an increased concentration at the very top of the income and wealth ladder in his *magnum opus* 'Capital in the Twenty-First Century' (2014) has gained wide attention in academic and political discourse. The Great Recession has further fuelled the imperativeness to cope with policy issues stemming from rising levels of earnings dispersion and stagnating earnings at the bottom and middle of the distribution (Jenkins *et al.*, 2012; Salverda *et al.*, 2014).

Inequality is inextricably linked with ideological issues of fairness and equity. Inequality is a potential source of injustice when the income distribution is a result of rent-seeking behaviour, or when a lack of financial means inhibits people to pursue personal goals and realise their potential (Cingano, 2014). In the same vein, inequality can be deemed unfair from a perspective of equality of human beings and humanitarianism (Rawls, 1971). On the other hand, earnings differentials can be justified when they simply reflect personal choices in amount of effort, or productivity differences from which society at large can benefit (Mankiw, 2013).

I will refrain from taking ideological positions in this doctoral thesis. What should be core societal objectives and what level of inequality is defensible are normative questions. Conversely, what has caused such inequality, what effects it may have on economic and social wellbeing, and what policy strategies could be implemented in the case of public interference are more factual questions. The importance of analysing these issues looms large with a widespread widening of the income distribution. This doctoral thesis aims to contribute to such an inquiry. At the same time I emphasise the imperfections and limitations of the analysis presented here.

1.2 Untying a knot

The widespread trend of rising income inequality evokes a number of questions. To begin with, how can we explain this pervasive pattern of growing income disparities? Three explanations are regularly put forward, namely labour market institutions, international trade, and technological change (Atkinson, 2003; Brandolini and Smeeding, 2009; Oesch, 2013).

A first line of explanations for employment and wage variations are changes in labour market institutions (*e.g.*, Rueda and Pontusson, 2000; Mahler, 2004; Martin and Swank, 2012; ILO, 2015). Labour relations and the bargaining power of employers and employees can have an impact on the distribution of wages and other working conditions (Martin and Swank, 2012; Huber and Stephens, 2014). In particular the share of employees covered by wage bargaining agreements and the level of coordination of wage bargaining are often mentioned as important factors in shaping the wage distribution (Wren, 2013). Employment protection legislation might be another factor by protecting employees from being laid off, whilst it can also create a gap between insiders with a permanent contract and outsiders without one (Koeniger *et al.*, 2007; Rueda, 2007).

A second culprit often mentioned in comparative political economy and labour economics is international trade. The degree of international integration, in particular between developed countries and developing countries such as China, has increased substantially in the last decades. When imports substitute for the domestic production of goods, local labour demand will go down. Increased competition from for instance China could also reduce possibilities to export to foreign countries. The resulting employment and wage effects might not be equally shared across all skill groups. Given the relative abundance of low-skilled labour in developing countries, mainly low-skilled employees in exposed sectors in developed countries will be affected by increased levels of imports (Autor *et al.*, forthcoming).

A third prominent hypothesis is that current advances in information technology lead to substitution of routine work by capital, whilst occupations with abstract or interpersonal manual task structures are complemented or unaffected (Autor *et al.*, 2003; Goos *et al.*, 2014). Technological change will cause an increase in the demand for high-skilled labour to perform non-routine abstract work, which in turn leads to higher wages and better employment opportunities for highly educated workers. On the other hand, routine work that tends to lie in the middle and parts of the bottom of the wage distribution will be substituted by capital (Oesch, 2013). This will trigger polarisation of the wage structure and an increase in inequality.

Which of these three factors can be seen as the most important driver? Surprisingly perhaps, this question has not received much attention yet in the empirical literature. Studies in comparative political economy have mainly focused on changes in labour market institutions, whilst effects of technological

change are not taken into consideration (*e.g.*, Pontusson *et al.*, 2002; Rueda and Pontusson, 2000; Oliver, 2008; Huber and Stephens, 2014). The opposite holds for studies in labour economics (Autor *et al.*, 2013; Balsvik *et al.*, forthcoming). Effects of international trade are addressed in both strands of literature. Yet, in particular in comparative political economy the analyses tend to be based on a country level approach, ignoring variation in exposure to international trade at a more detailed sectoral level.

Having introduced possible explanations for rising levels of income inequality, a second main issue addressed extensively in public policy debates is whether this rising dispersion has had economic and political consequences (IMF, 2007; OECD, 2011a; Stiglitz, 2012). Inequality can hamper growth by leading to more social unrest or by causing lower overall levels of human capital accumulation, as people who lack financial means are inhibited to invest in themselves (Cingano, 2014). Conversely, income differences could incite people to exert additional efforts as the relative benefits are greater. If the earnings distribution is deemed undesirable, welfare states can mitigate earnings by redistributive policies (Boadway and Keen, 2000). Yet, alleviating inequality by redistributing income might have effects on growth as well. The trade-off hypothesis that redistribution based on economic outcomes reduces marginal benefits to gain income figures prominently in economics (Okun, 1975; Aghion *et al.*, 1999).

In addition to effects on economic output, rising earnings dispersion might induce a change in attitude. In particular, it might incite people to increase their redistributive claims. Based on a median voter model where redistribution preferences of individuals are a function of material self-interest, we would expect greater market earnings inequality to produce greater political demand for redistribution (Meltzer and Richard, 1981). Individuals might also favour social protection as insurance when they are exposed to an increased risk of job or wage loss. Since these forms of social security are redistributive (*e.g.*, Nelson, 2011), individuals exposed to occupational risks of technological change or international trade might show an increased preference for redistribution (Iversen and Soskice, 2001; Rehm, 2009).

Political and economic consequences of income inequality have been subject of much inquiry, but there are still a number of caveats. First, in an ideal world, when analysing the effects of inequality on growth we would take into account the effects of policies that were put in place to cushion dispersion as well, as these might have distinctive effects on growth. Moreover, the type of inequality might matter too. For instance, inequality across the population might impact human capital accumulation, whilst a rise in top incomes could be more important for levels of savings and investment. Regarding political consequences, international trade and labour market institutions have received wide attention as possible factor in explaining redistribution preferences (*e.g.*, Rehm, 2009; Walter, 2010; Gingrich and Ansell, 2012), but the same cannot be said for technological change. Whether individuals in occupations exposed

to risks of job loss due to automation increase their redistribution preferences has not been analysed so far.

A third main element of rising earnings dispersion pertains to possible policy responses that countries can use to mitigate inequality. In most OECD countries, transfers account for a larger part of the absolute income redistribution than taxes (OECD, 2008a; Immervoll and Richardson, 2011; Wang *et al.*, 2014b). Insight into what type of social policies governments choose to adopt contributes to our understanding of the bandwidth for possible policy strategies of affluent countries. There is a large body of literature looking into structural processes of welfare state development (Pierson, 2000). The two most prominent hypotheses are that countries converge to a common model by opting for more similar policy solutions or, on the contrary, that welfare states only adopt incremental changes and largely follow their institutional legacies (Esping-Andersen, 1990). Not much attention has been given to whether these two theories can explain how welfare states respond to urgent social matters.

1.3 Aims and research questions

This dissertation is a collection of five chapters aiming to provide insight into determinants and political and economic consequences of income inequality and social policy development in affluent countries. As this dissertation is based on papers, the chapters are loosely related and can be read independently of each other. Four of the chapters are written together with other scholars.

Chapters 2 and 3 look into determinants of earnings inequality, employment, and wages across sectors in developed countries over time. Two questions guide this first part of the analysis. The chapters aim to contribute to the comparative political economy literature on inequality by analysing simultaneously the effects of labour market institutions, international trade, and technological change. Moreover, they adopt a sectoral approach to account for the substantial variation across sectors in inequality patterns and their exposure to international trade and technological change.

> *Q1: What sectoral trends in levels of earnings inequality and employment can be delineated and can these trends be explained by differences in sectoral exposure to international trade, technological progress, or changes in labour market institutions?*

Specific attention is devoted to trade competition with China. The rapid rise of China on the global economic stage might have employment and wage effects that differ across skill groups given China's large volume of low-wage labour. China's surge has not received much attention in the comparative political economy literature on wage inequality. The analysis also looks at direct effects of Chinese imports and effects of Chinese competition on foreign

export markets, a route neglected thus far in the comparative political economy literature.

> *Q2: What are the employment and wage effects of China's rapid rise as a trading partner for low and high-skilled groups in advanced industrialised democracies?*

Chapters 4 and 5 address the possible economic and political impact of rising levels of inequality and its determinants in developed countries. Chapter 4 aims to provide some clarification on theoretical and empirical relations between inequality, redistribution, and economic growth at the country level over time. Essentially, this chapter consists of a discussion on how the socio-economic objectives of attaining economic growth and restricting income inequality are related to each other. This is a primary problem for the contemporary welfare state and a question in which political science and economics collide (Pierson and Castles, 2006). Data that consistently distinguish between the income distribution before and after taxes and transfers are used, which is a precondition to discern between inequality as such and redistribution. Moreover, generic measures of inequality across the population are used where top and bottom coding is applied, as well as enrichment at the top, captured by top shares (Atkinson *et al.*, 2011).

> *Q3: How can we theoretically and empirically understand the linkages between inequality and economic growth on the one hand, and redistribution and economic growth on the other?*

Having introduced redistribution as a key element of this doctoral study, the next question is whether preferences for redistribution are affected by inequality or its drivers. Even though it is often mentioned as a key cause of rising earnings dispersion in the labour economics literature, technological change has not received attention in comparative political economy accounts of determinants of redistribution preferences. Current advancements in technological change are said to be capable of substituting routine work by capital (Goos *et al.*, 2014). Chapter 5 examines whether individuals in routine task intensive occupations favour higher levels of redistribution as a means of public insurance. Reintroducing the sectoral approach, the chapter also analyses whether this relationship becomes stronger for individuals working in sectors that are more exposed to technological change. By doing so, the analysis aims to bridge the gap between studies emphasising occupational risk exposure influencing redistribution preferences, and studies that underline differences in risk exposure across sectors. Moreover, the role of personal income in shaping redistribution claims is revisited. Personal income is allowed to have a direct negative effect on the level of preferred redistribution in the spirit of Meltzer and Richard (1981), whilst it can accentuate the effects of risks resulting from

technological change on redistribution preferences as individuals have relatively more to lose from automation.

> *Q4: Do individuals in routine task intensive occupations prefer higher levels of redistribution as insurance against the increased risk of future income loss due to automation? Is this relation stronger for persons employed in sectors that are particularly exposed to technological change and for richer individuals who have more to lose from automation?*

Chapter 6 deviates from the earlier chapters in that it addresses actual social policy development in welfare states rather than inequality per se. Moreover, it is more conceptual in nature and based on a qualitative empirical approach. Although structural processes of welfare state development have been examined frequently, there is a caveat in knowledge on reactive policy strategies. The chapter aims to fill this gap by examining the reactive policy strategies of three countries representing the main welfare state regime types, namely Germany, the UK, and Sweden. By doing so, it provides a test whether structural policy development theories, namely the convergence and path dependence theories, can explain the policy strategies followed by these countries in response to the Great Recession.

> *Q5: Do the social and unemployment reactive policies adopted in Germany, the UK and Sweden in response to the Great Recession in 2008 and 2009 differ systematically and if so, can we use long-term policy development theories to explain these differences?*

1.4 Conceptual choices

In my dissertation I aim to provide insight into income inequality and social policy development. I confine myself to income when discussing inequality, rather than for instance wealth, consumption, or income accounted for in-kind benefits. Income is widely considered to be a measure of utility or welfare (Sen, 1992). Having income is a precondition for consumption in a capitalist system, though it clearly does not paint a full picture of social welfare.

Income is a flow variable; I will not devote any attention to its stock counterpart, wealth. While acknowledging the existence of wealth inequality – one only needs to consult Piketty (2014) to gain insight into highly skewed wealth concentration at the top – earnings and wealth inequality do not necessarily share the same trends, causes, or have a similar impact on growth or redistribution preferences (*e.g.*, Alvaredo *et al.*, 2013; Ansell, 2014). I will also not look into the distribution of consumption expenditures. The actual consumption of goods is arguably more directly linked with utility than income, or the means available for consumption. Yet, consumption contains

a stronger personal element – an individual voluntarily fasting would be considered poor (Sen, 1992; Morelli *et al.*, forthcoming). Furthermore, I will ignore in-kind benefits, such as publicly available services, even though in-kind benefits have redistributive effects as well (OECD, 2008a; Paulus *et al.*, 2010). The main reason for excluding the distribution of wealth, consumption, and in-kind benefits in this thesis is the availability of comparable data across countries and time.

In Chapters 2 and 3 of this thesis I will focus on earnings inequality and wage differences across sectors and skill groups. Rising income inequality is mainly a consequence of growing disparities in earnings. This also explains why factors that likely affect earnings patterns are addressed, namely labour market institutions, international trade, and technological change. I broaden the income definition in my analysis on associations between inequality, redistribution, and economic growth. I apply both disposable and market income as well as their difference as a proxy for the absolute level of redistribution, since we might theoretically expect distinctive effects of these different income definitions and redistribution on economic growth (Kenworthy and Pontusson, 2005). For instance, the distribution of disposable income might negatively affect growth by leading to more social unrest. A more unequal distribution of market income could hamper growth when this leads to more demand and actual levels of redistribution, and when redistribution negatively affects growth (Perotti, 1996).

Having selected income as the locus of distribution, the next step is the selection of units holding a certain level of income. I will delve in particular into the distribution of earnings among individuals and households within sectors and within countries. I use individual earnings and wage shares across skill groups in the sectoral studies on determinants of inequality, since individual earnings can more accurately be attributed to sectors than household earnings. Moreover, sectoral relative employment sizes and shares of hours worked across skill groups are used as additional dependent variables. I correct for differences in household composition using equivalence scales when looking at household income.

I restrict my analysis to OECD countries between 1970 and 2012. Which countries and years are covered exactly differs per analysis and depends on data limitations. The analyses encompass a broad set of OECD countries with diverse political-economic institutions. In emerging countries other factors such as malnutrition or democratic stability might play a crucial role, and data availability and quality are of much greater concern. Moreover, the chosen time span covers the widespread increase in earnings inequality in the developed world, the gradual trend towards international integration especially with developing countries, and the revolution in information technology.

1.5 Empirical and methodological approach

Chapters 2-5 address determinants and consequences of income inequality that are all based on a quantitative design. Most fundamentally, I seek to move beyond generic country-level measures of the variables of interest by using a variety of approaches and data sources. First, sectoral data built from a micro time-series database are used. Moreover, sectoral data that differentiate between employment and wage shares across skill groups are employed. I also apply country-level information, for instance on top income shares, redistribution, and labour market institutions. I will use multiple inequality measures for the country-level inequality indicators to test for robustness, since each measure by mathematical definition is particularly sensitive to shifts at certain parts of the income distribution – or equivalently, since each inequality measure has implicit social welfare judgments. When addressing redistributive claims, occupational and sectoral information on risk exposure are combined.

A few words on the quality of the data seem warranted. Crucial to my comparative design is that the income definitions are standardised across countries and time. I use secondary cross-national datasets from the OECD, LIS, EU-KLEMS, and the Standardised World Income Inequality Database in which the income definition is made consistent as adequately as possible. Moreover, the LIS and EU-KLEMS data I use allow for a consistent identification of sectors. Nevertheless, their comparability has its limits. The aforementioned datasets try to cope with consistency, but are still constructed on the basis of country-specific surveys (Atkinson and Brandolini, 2001; Atkinson, 2008; OECD, 2012a). I try to minimise these issues by testing whether my results are sensitive to the choice of dataset, if possible. LIS data play the most prominent role, since in this dataset the country surveys are harmonised using consistent definitions and concepts (Morelli *et al.*, forthcoming).

I base my regressions on a pooled time-series cross-section design exploiting variation across countries and time. Such a design permits correction of unobserved heterogeneity. I employ multiple estimation techniques, depending on the nature of the dependent variable, the data, and the question at hand. In an ideal world, I would analyse effects and consequences of income inequality and social policy development in a randomised and controlled setting across sectors, occupations, and countries over time. Since this is not feasible, possibilities of reverse causality hamper a causal interpretation of the found associations. This specifically holds true for the analysis of 'grand' associations between income inequality, redistribution, and economic growth. I will further reflect on these issues in the specific chapters.

Chapter 6, in which I examine social and unemployment crisis response policies, makes use of a comparative country case selection. As my objective is explicitly country-specific – I examine whether the crisis responsive policies fit with the historical-institutional tradition of three archetypal country cases – a qualitative approach seems most appropriate. The three selected European

countries, Germany, Sweden, and the UK, differ maximally in their institutional legacies, but all experienced a sudden shock to their GDP and employment levels in 2008 and 2009. Obviously, the fact that I examine the policy strategies of three non-representative countries to one crisis decreases the generalisability of the findings.

1.6 A READER'S GUIDE

The following two chapters focus on determinants of rising earnings dispersion in developed countries. Chapter 2, *Taking the sector seriously: Data, developments, and determinants of sectoral earnings inequality and employment*, co-authored by Chen Wang and Olaf van Vliet, maps trends in intrasectoral inequality across 8 OECD countries based on micro data, and relates these trends to differences in exposure to international trade, technological change, and labour market institutions. Chapter 3, *Competing with the dragon: Employment and wage effects of Chinese trade competition in 17 sectors across 18 OECD countries*, co-written by Olaf van Vliet, zooms in on trade competition with China, which might have distributive effects across skill groups given the country's large share of low-wage labour.

Chapters 4 and 5 move from determinants to possible economic and political consequences of rising levels of income inequality. Chapter 4, *Is it the income distribution or redistribution that affects growth?*, addresses linkages between income inequality, redistribution, and economic growth at the macro level. Chapter 5, *Technological change as a determinant of redistribution preferences*, co-authored by David Rueda, analyses whether individuals whose occupations are more exposed to risks resulting from technological innovations demand additional redistribution as a means of public insurance.

Chapter 6, *Falling back on old habits? A comparison of the social and unemployment crisis reactive policy strategies in Germany, the UK, and Sweden*, written with Heejung Chung, looks at the development of social and unemployment policies adopted by three countries in response to the Great Recession.

I end this doctoral thesis with a summary of the main results in Chapter 7, *Conclusions*. In this chapter I reflect on how these findings contribute to the academic literature and on their societal relevance in more general terms. Finally, I indicate a number of directions for future inquiries into inequality and social policy.

2 Taking the sector seriously

Data, developments, and determinants of sectoral earnings inequality and employment[1]

ABSTRACT

Studies using a country-level approach to examine developments and determinants of earnings inequality neglect the substantial variation in inequality patterns across sectors. A sectoral approach can also shed light on possible determinants of rising inequality, as sectors differ widely in their exposure to trade and technological change, whereas changes in labour market institutions would predict a more uniform rise in levels of intrasectoral inequality. This chapter delineates trends in sectoral earnings inequality and employment for eight OECD countries between 1985-2005 using a new database. Decompositions show that country-level earnings inequality and its rise are mainly consequences of inequality within rather than between sectors. Cross-sectional pooled time-series analyses indicate lower employment shares in sectors more exposed to import. No evidence is found for relations between intrasectoral inequality and international trade or skill-biased technological change. Waning trade union power at the country level is associated with higher levels of sectoral earnings inequality.

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1 Earlier versions of this chapter appeared as (in Dutch) Thewissen, S., Van Vliet, O., Wang, C. (2013a), Sectorale loonongelijkheid en werkgelegenheid in internationaal perspectief tussen 1985-2005, *TPEdigitaal* 7(3): 139-160, and as Thewissen, S., Wang, C. Van Vliet, O. (2013b) Sectoral trends in earnings inequality and employment: International trade, skill-biased technological change, or labour market institutions? *LIS Working Paper Series no. 595*. This working paper won the LIS Aldi Hagenaars Memorial Award for best LIS working paper written by a researcher under age 40. Earlier versions of this chapter were presented at the 2012 Dutch Economists day in Amsterdam, the 2012 UM/ICIS Measuring Globalisation workshop in Maastricht, the 2012 NIG conference in Leuven, the 2013 ILERA Amsterdam conference, the 2013 ESPAnet Mannheim doctoral workshop, the 2013 ECSR – EQUALSOC – University of Trento summer school on rising inequalities, and the 2014 LIS Summer Workshop in Luxembourg. We would like to thank all participants, in particular Paolo Barbieri, Michael Braun, Michael Gebel, Dirk Hofäcker, and Wiemer Salverda, for their helpful comments. In addition, we are grateful to Jason Beckfield, Koen Caminada, Wen-Hao Chen, Julian Garritzmann, Kees Goudswaard, Torben Iversen, Marike Knoef, and Vera Troeger for their useful suggestions.

2.1 INTRODUCTION

A widely observed phenomenon in social sciences is the gradual and widespread increase in earnings inequality within developed countries (Atkinson, 2003; Alderson *et al.*, 2005; Kenworthy and Pontusson, 2005; Brandolini and Smeeding, 2009; Immervoll and Richardson, 2011; Iversen and Soskice, 2013). In the political economy literature three explanations are generally put forward for this upsurge in inequality at the country level: increased international trade, technological change, both arguably disadvantageous to the low-skilled, and changes in labour market institutions, in particular weakening employment protection legislation and union power (*e.g.*, Alderson and Nielsen, 2002; Mahler, 2004; Koeniger *et al.*, 2007; Oliver, 2008; OECD, 2011a; Alderson and Doran, 2013; Oesch, 2013; Wren, 2013).

Even though substantial attention has been given to inequality trends at the country level, there is a knowledge gap on developments within countries across different sectors. It would help our understanding of the manifestation of inequality if we would know whether earnings dispersion at the country level is a consequence of earnings differences between industries, or intrasectoral earnings dispersion. Second, a sectoral design provides insight into possible drivers of inequality, as it allows us to differentiate between the three aforementioned explanations. If international trade or technological change indeed are explanations for rising inequality, then sectors more exposed to these trends should have higher levels of inequality, unless workers are perfectly mobile across sectors, an unrealistic assumption given persistent wage differences between sectors and the existence of labour market frictions (Krueger and Summers, 1988; Estevez-Abe *et al.*, 2001; Mares, 2005). When sectors follow comparable inequality trends over time, this would correspond more to the theory that changing labour market institutions, set at the national level, are the main driver of inequality.

This study describes trends in labour earnings inequality and employment at the sectoral level in eight OECD countries between 1985 and 2005 based on a new database (Wang *et al.*, 2014a). The level of intrasectoral inequality differs substantially across sectors, which indicates that a substantial part of the manifestation of inequality is overlooked or ignored when studies are confined to country-level inequality trends only. Using cross-sectional pooled time-series analyses we test whether international trade, technological change, or developments in labour market institutions can explain variations in inequality and employment across sectors in countries over time. For the first two factors sectoral data are available, allowing us to differentiate between the three theoretical explanations.

Our contributions to the political economy literature on inequality are threefold. First, our sectoral design is relatively new, allowing us to locate inequality at a more detailed level across sectors, countries, and time. Second, compared to studies examining possible determinants of rising inequality by

means of a sectoral design in multiple countries at two moments (Mahler *et al.* 1999; OECD, 2011a, Oesch, 2013; Michaels *et al.*, 2014), we seek to contribute by building a new sectoral database with more detailed information over time. Third, as opposed to the sectoral studies examining skill wage gaps rather than inequality per se (OECD, 2011a; Michaels *et al.*, 2014), we take into account sectoral earnings and employment developments separately. Compared to Mahler *et al.* (1999), who also construct sectoral inequality measures, we base our findings on individual rather than household earnings, so that we can more accurately attribute earnings and employment information to sectors.

The remainder of the chapter is structured as follows. Section 2.2 discusses the three main explanations of rising country-level inequality. In Section 2.3 we apply these theories to the sectoral level and we motivate our shift towards the sector in tracing inequality. Next, in Section 2.4, we describe our dataset and show trends across countries, sectors, and time. We decompose the level and growth of country-level inequality into inequalities within and between sectors. In Section 2.5 we conduct cross-sectional pooled time-series regressions to empirically test the three theoretical explanations. Section 2.6 concludes.

2.2 Current explanations for rising earnings inequality

Three explanations for the widespread trend of widening earnings at the country-level are regularly put forward, namely, increasing international trade, skill-biased technological change, and weaker labour market institutions (Atkinson, 2003; Oliver, 2008; Brandolini and Smeeding, 2009; Oesch, 2013).

The amount of international trade increased substantially during the last decades, in particular between developed and developing countries (Harrison *et al.*, 2011). The Stolper-Samuelson theorem predicts that when countries engage into trade, the production factors that are relatively abundant gain. In developed countries, where high-skilled workers are relatively more abundant, engaging into trade will lead to a higher skill demand, whilst the low-skilled will suffer from the increased competition with developing countries with a relative abundance of low-skilled labour (Van Reenen, 2011; Hellier and Chusseau, 2013). Mahler (2004) and Mahler *et al.* (1999) differentiate between effects of import and export on the earnings distribution. Import might impair the wages or employment possibilities of domestic workers by putting them into direct competition with foreign workers. When mainly the low-skilled jobs are prone to outsourcing to low-wage countries, import has a direct effect on the earnings distribution. For export, the opposite might hold as it could give room for higher earnings or job creation.

Country-level studies generally report insignificant associations between trade integration and inequality (Mahler, 2004; Harrison *et al.*, 2011; OECD, 2011a). Also sectoral studies report insignificant associations between their sectoral indicators of trade integration and earnings inequality (Mahler *et al.*,

1999), the skill wage gap (OECD, 2011a; Michaels *et al.*, 2014), or employment differences for high versus low-skilled employees (Oesch, 2013). Yet, sectors more exposed to import saw a relative decrease in the number of total and low-skilled jobs. A number of studies also incorporate financial flows (FDI) and outsourcing or trade in intermediates (see for an overview Hellier and Chusseau, 2013), for which some evidence of inequality-enhancing effects is presented (Alderson and Nielsen, 2002; Dreher and Gaston, 2008).

A second prevalent theory is that current technological innovation complements the high-skilled, whilst it substitutes routine labour by capital (Goldin and Katz, 2008; Van Reenen, 2011). The theory plays a central role in the wage literature, using skill demand or the skill wage gap as dependent variable. The wage literature reports evidence for skill-biased technological change leading to polarisation in the labour market, though the analyses are mainly limited to the US (Autor *et al.*, 2003; see for an overview *e.g.*, Hellier and Chusseau, 2013; Oesch, 2013). Also in sectoral studies positive correlations between the skill wage gap and technological change, measured by the information and communications technology (ICT) propensity from EU-KLEMS, are reported (OECD, 2011a). Michaels *et al.* (2014) find that industries with the greatest growth in ICT propensity were also the ones with the strongest growth in wages for the highly educated workers. The lowly educated were largely unaffected by this rise in ICT, whilst demand for middle educated workers fell in industries with the greatest growth in ICT intensity.

A third branch of the literature addresses changes in labour market institutions as the main cause of growing earnings dispersion in the developed world. In particular the weaker influence of trade unions and changes in employment protection legislation are put forward in the empirical literature (Mahler, 2004; Koeniger *et al.*, 2007; Oliver, 2008; OECD, 2011a; Wren, 2013). From these studies it can be hypothesised that more centralised and coordinated wage bargaining processes lead to more compressed wages. Furthermore, the literature generally provides two effects of employment protection legislation on earnings inequality. On the one hand, strict legislation brings employees in a strong bargaining position for employees and therefore results in low wage dispersion. However, this will mainly apply to employees with a permanent contract. Therefore, stricter legislation can lead to a dual labour market with relatively high degrees of wage earnings inequality between the segments.

2.3 A SECTORAL APPROACH TO STUDYING INEQUALITY

Compared to a country-level study, in a sectoral research design the number of observations increases and industry-specific differences can be taken into account. In case there are differences in the degree to which sectors are exposed to factors that potentially drive inequality – which is indeed the case as shown later – these differences in exposure will cause variations in effects on earnings

or employment per sector, unless there is perfect labour mobility between sectors. Only in the situation of perfect labour mobility between sectors are production factors rewarded identically which would spread out across the economy.[2]

Evidence for imperfect labour mobility comes from persistent wage differences between sectors that cannot be explained by (observable) composition effects (Krueger and Summers, 1988; Dickens and Katz, 1987). These persistent differences may be a result of labour market frictions, such as search costs in looking for jobs (Mortensen and Pissarides, 1999), job and industry specific human capital (Estevez-Abe *et al.*, 2001), or institutions such as employment protection legislation that depress labour mobility (Hellier and Chusseau, 2013). Artuc *et al.* (2008) and Artuc and McLaren (2010) report heterogeneous distributional effects of trade resulting from limited factor mobility. They find that it takes around eight years before a wage effect of a trade shock in a liberalising sector spreads out across the economy.

To our knowledge only a few studies examine possible determinants of rising inequality by means of a sectoral design in multiple countries over time. Mahler *et al.* (1999) analyse earnings inequality within sectors using LIS household data, whereas OECD (2011a) and Michaels *et al.* (2014) calculate skill wage gaps from EU-KLEMS data.[3] Oesch (2013) studies total and low-skilled employment sizes, and upskilling measured as the change in share of high-skilled minus low-skilled workers at the sectoral level within Germany and the UK for 33 sectors based on LFS and SOEP data. All these studies analyse sectoral exposure to trade, whereas only OECD (2011a) and Michaels *et al.* (2014) take possible effects of technological change into consideration.

As far as we know there are no studies examining effects of labour market institutions on sectoral inequality, although there is a branch of literature examining differences in redistributive preferences across sectors (Scheve and Slaughter, 2004; Mares, 2005; Rehm, 2009). The aforementioned sectoral studies (Mahler *et al.*, 1999; OECD, 2011a; Oesch, 2013; Michaels *et al.*, 2014) also do not take labour market institutions at the country level into account in their regressions. A number of institutions are set at the national level, such as strictness of employment protection legislation. Yet, the impacts of others, such as unions, might well differ per sector, but unfortunately, no sectoral informa-

2 Our study should be seen as complementary to the branch of literature using heterogeneity in occupations and tasks rather than sectors to examine consequences of technological change and trade (*e.g.*, Autor *et al.*, 2003; Goos *et al.*, 2009; Rehm, 2009; Oesch, 2013). These studies are of particular interest when examining which types of jobs are prone to outsourcing or computerisation and what consequences this might have on for instance demand for redistribution, but occupations are arguably a less relevant categorisation for calculating inequality, our point of departure.

3 We were able to replicate the findings from Mahler *et al.* (1999), who also employ LIS data, with our own data using their sample of countries and periods and inequality indicators (available upon request).

tion is available with sufficient detail in a comparative setting over time. Pinto and Beckfield (2011) show that union membership differs between individuals working in services versus those working in industry between 2002-2008 using European Social Survey data, and that this gap in membership differs per country. For the US more detailed information on union membership for a longer period is available. Kristal (2013) reports a negative association between union membership and labour's share of national income for two-digit and four-digit industries. Nevertheless, these studies use union membership which seems a rough proxy for union influence in a European context, where laws or other practices extend coverage to non-union members.

In our approach we take the widely observed rise in earnings inequality at the country level as our point of departure. Hence, we calculate inequality indicators rather than wage bill shares. Yet, we base our main calculations on individual rather than household information, to avoid the problem of attributing earnings or employment information from the spouse or other relatives to the sector in which the household head is working, since the other household members might work in a different sector.

We elaborate on existing sectoral studies in two ways. First, we contribute by creating a new database on inequality and employment at the sectoral level that contains sectoral data over a longer period rather than for only two moments in time. This allows us to examine variations over time while taking into account industry-specific and country-specific developments. As a second contribution to existing sectoral studies, we explicitly explore both sectoral earnings and employment developments. For a sectoral design this is of particular importance. For example, when all low-skilled move to sectors less exposed to trade or technological change with lower earnings whilst all high-skilled congregate in exposed sectors characterised by higher earnings, then earnings inequality at the country level will increase whereas the levels of intrasectoral earnings inequality will decrease. Third, we take into account developments in labour market institutions at the country level.

Our sectoral design also has limitations. First, there might be dependencies between industries. In addition, certain confounding factors that might have an effect on both trade, technology, or institutions, and on sectoral earnings and employment, such as product market developments, are not included in the model, even though we control for unobserved sectoral trends. Therefore, the empirical results should be interpreted as associations rather than causal evidence.

2.4 DATA

2.4.1 Income definition, sector standardisation, and sample

For our sectoral approach we calculate indicators for earnings inequality and employment, standardised across countries, periods, and sectors. This dataset is available online (Wang *et al.*, 2014a), as is a more detailed description of the data (Thewissen *et al.*, 2013b). It is constructed on the basis of the Luxembourg Income Study (LIS) micro data, elaborating on Mahler *et al.* (1999). We restrict the sample to individuals aged between 25 and 54, which are those people most dependent on earnings as source of income. Since we are interested in labour earnings inequality, we only include income from wages and salaries or self-employment, omitting income from other sources such as interest and rent, and we do not adjust the wages for taxes or social contributions.[4] We follow standard LIS top- and bottom coding conventions. As explained above, we base our calculations on individual data and we apply individual weights to the earnings and employment indicators.

Sectors are standardised based on the ISIC 3.0 classification. We distinguish between nine sectors at the two-digit level, and we further break down the manufacturing and transport and telecommunication sector into twelve subsectors using the three-digit level, as in Mahler *et al.* (1999), OECD (2011a), and Michaels *et al.* (2014), see Table 2.1.[5]

4 We refer to our income definition as 'earnings', which corresponds to 'labour income' in the LIS template. Earnings of both part-time and full-time workers are included, see also our sensitivity tests.

5 No further breakdown in the community services sector is possible with LIS micro data for a sufficient number of country-period observations. The community sector consists of people working in public administration, education, health and social work, and other community and personal service activities.

Table 2.1 Country, period, and sector sample

Country	Period	Sectors (ISIC)
1 Czech Republic	1996, 2004	AtB Agriculture and fishing
2 Denmark	1987, 1992, 1995, 2000, 2004	C Mining and quarrying
3 Finland	1987, 1991, 1995, 2000, 2004	D Manufacturing
4 Germany	1984, 1989, 1994, 2000, 2004	15t16 Man. food
5 Ireland	1994-1996, 2004	17t19 Man. textile
6 Sweden	1987, 1992, 2000, 2005	20 Man. wood
7 UK	1986, 1999, 2004	21t22 Man. paper
8 US	1986, 1991, 1994, 2000, 2004	23t25 Man. chemicals
		26 Man. minerals
		27 Man. metals
		29t33 Man. machinery
		34t35 Man. transport
		36t37 Man. other
		E Utilities
		F Construction
		GtH Wholesale and hotels
		I Transport and telecommunications
		60t63 Transport
		64 Telecommunications
		JtK Finance, real estate, business
		LtQ Community services

Note We combine the 1994-1996 waves for Ireland where we recalculate the earnings information to 1995 levels using information on inflation from the World Bank (2012)

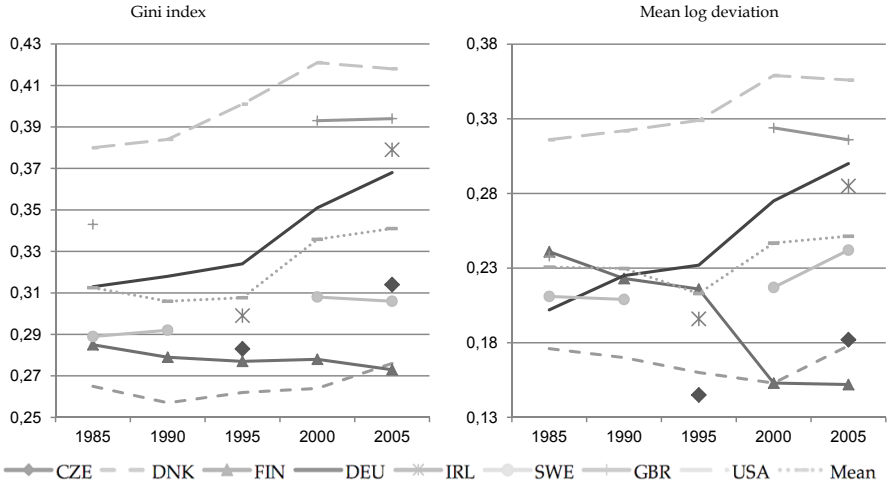
Sectoral information is available for eight OECD countries, allowing us to compose an unbalanced panel of five periods of five years between around 1985 and around 2005.[6] We have 31 waves containing a total of 651 observations at the sectoral level. The correlation between the relative employment size of sectors from our calculations based on LIS data and the sectoral indicators from OECD STAN (2011b) is 0.97, providing a reliability estimate of our dataset.

2.4.2 Trends at the country level

We begin by showing the trends in inequality at the country level for our sample and earnings definition, see Figure 2.1. We make use of two indicators; the mean log deviation is more sensitive to fluctuations at the bottom end of the distribution, whereas the Gini coefficient is more sensitive to changes across the mean of the distribution (Atkinson, 1970).

6 We exclude Spain, Belgium, and Poland, as not enough detailed information on earnings or technological change is available.

Figure 2.1 Earnings inequality at the country level 1985-2005



Note Mean: unweighted arithmetic average for the available observations of that period
Source Wang *et al.* (2014a)

Consistent with the existing country-level literature, inequality is higher in the Anglo-Saxon countries than in the Northern countries. Earnings are growing further apart within countries over time (Alderson *et al.*, 2005; Brandolini and Smeeding, 2009; Immervoll and Richardson, 2011; OECD, 2011a; Alderson and Doran, 2013; Wang *et al.*, 2014a). We see a particularly strong upsurge in earnings inequality in Germany, also documented elsewhere (Fuchs-Schündeln *et al.*, 2010). Part of this might be due to the unification as the LIS waves of 1984 and 1989 are based on West Germany only.[7]

By and large the Gini coefficient and the mean log deviation show comparable trends over time. A noticeable exception to this is Finland, where the Gini index shows a gradual descent whilst the mean log deviation drops rather abruptly from 1995 to 2000. During this period the earnings inequality at the bottom end of the distribution decreased rapidly, whilst inequality at the top half of the distribution actually rose (see also Cowell and Fiorio, 2011).[8] Due to these opposite dynamics the Gini index decreased less rapidly than the mean log deviation.

7 The waves 1984 and 1989 for Germany are not included in the regressions as no sectoral information on import or export is available.

8 Inequality shifts at the top end of the distribution are captured by the GE(2) index which rises for Finland from 1995 (0.145) to 2000 (0.167).

2.4.3 Decomposition of inequality at the country level

We decompose the level and change of earnings inequality at the country level into a part resulting from earnings differences between sectors, and a part stemming from earnings differences within sectors (intrasectoral inequality). We use the mean log deviation since this indicator does not leave a residual. Intrasectoral inequality is calculated as the sum of the mean log deviation in all separate sectors weighted by the number of individuals working in the sector relative to the total number of working individuals. The between-sector part is the weighted sum of the arithmetic mean earnings in the distinct sectors as a fraction of the mean earnings of the total population.[9] Sectors are defined at the two-digit level, and the three-digit level for the manufacturing and transport and telecommunications sectors.[10]

Table 2.2 Decomposition of inequality within and between sectors over time

	Level of mean log deviation at the country level			Share of mean log deviation due to within-sector inequality (%)			Difference 2005-1985 in mean log deviation over time		
	1985	1995	2005	1985	1995	2005	Total	Within	Between
Czech Republic	.	0.145	0.182	.	92.4%	96.0%	0.037[a]	0.040[a]	-0.004[a]
Denmark	0.176	0.160	0.178	95.4%	95.4%	96.5%	0.002	0.004	-0.002
Finland	0.241	0.216	0.152	87.6%	91.8%	93.7%	-0.090	-0.069	-0.020
Germany	0.202	0.232	0.300	95.0%	94.9%	94.1%	0.098	0.091	0.008
Ireland	.	0.196	0.285	.	93.5%	93.6%	0.089[a]	0.083[a]	0.006[a]
Sweden	0.211	.	0.238	95.3%	.	96.1%	0.027	0.027	-0.001
United Kingdom	0.246	.	0.316	94.5%	.	92.8%	0.070	0.060	0.009
United States	0.316	0.329	0.341	95.1%	95.3%	96.2%	0.025	0.028	-0.002
Average	0.232	0.213	0.249	93.8%	93.9%	94.9%	0.032	0.033	-0.001

Note We differentiate between 19 industries: all two-digit sectors apart from the manufacturing and transport and telecommunications sectors, for which we utilise the subsectors. The average is the unweighted arithmetic average for the available observations of that period. [a] Difference between 2005 and 1995

Source Own calculations by authors based on LIS (2013)

9 The decomposition is defined as: $$\mathrm{MLD} = \sum_{k=1}^{g} v_k \sum_{j=1}^{n} \frac{w_{kj}}{\sum_{j=1}^{n} w_{kj}} \log\left(\frac{\overline{y_k}}{y_{kj}}\right) + \sum_{k=1}^{g} v_k \log\left(\frac{\overline{y_k}}{\bar{y}}\right)$$ with sectors indexed $\{k = 1, ..., g\}$ weighted by their share of employed individuals v_k, where the sector includes the individuals indexed $\{j = 1, ..., n\}$ with earnings y_{kj}, weight w_{kj}, and arithmetic mean earnings $\bar{y}$. The first element on the right-hand side is inequality within industries, and the second consists of inequality between industries (see text). See also Kampelmann (2009) which contains an appendix with a decomposition of the mean log deviation that can be transposed to ours. The differences over time are defined as: $\mathrm{MLD}_{2005} - \mathrm{MLD}_{1985} = (\mathrm{Within}_{2005} + \mathrm{Between}_{2005}) - (\mathrm{Within}_{1985} + \mathrm{Between}_{1985}) = \mathrm{Within}_{2005} - \mathrm{Within}_{1985} + \mathrm{Between}_{2005} - \mathrm{Between}_{1985}$.

10 Of course, the share of inequality between groups depends on the number of distinguished groups. As an extreme case, the share of between-group inequality becomes 100 per cent when every individual is defined as a separate group. Yet, for our study with a relatively small number of sectors in comparison to the number of households, the results are not that sensitive to the number of sectors that are defined. As an example, if we differentiate between 9 rather than 19 industries by taking the manufacturing and transport and telecommunication sector at the aggregated rather than at the disaggregated level, the share of within-sector inequality for the United States in 2005 only rises from 96.2 to 97.0 per cent.

The decomposition presented in Table 2.2 reveals that the largest share of the level of inequality at the country level is a result of intrasectoral earnings dispersion, rather than differences in average earnings between industries. Intrasectoral inequality also dominates the growth of inequality at the country level; between-industry inequality even decreased slightly on average over time as noted in the last column.

2.4.4 Trends in inequality within industries

To analyse patterns of the level of intrasectoral inequality, we use the Gini coefficient, which is the most frequently used inequality measure in the literature. In addition, it can be corrected for underestimation bias in case of small sample sizes (roughly from $n < 30$) by multiplying it by $\frac{n}{n-1}$, called the first order correction (Deltas, 2003). For the regressions we also use the mean log deviation at the sectoral level.[11]

We first pool data from all available periods to compare the levels of inequality across industries and countries in Table 2.3. The rank of each observation at the sectoral and subsectoral level is placed between brackets. The bottom row shows the unweighted average level of intrasectoral inequality per country ('country average'), and the right column displays the unweighted average level of inequality for each sector ('sector average').

From Table 2.3 we can see the importance of the sector in understanding earnings inequality. The difference between the highest and lowest level of intrasectoral inequality within countries is on average at least as high as the difference between the highest and lowest level of country-level inequality.[12] Thus, at the sectoral level within countries, there is as much spread in levels of earnings dispersion as there is at the country level. This implies that a substantial part of the manifestation of inequality is ignored in a country-level approach.

The importance of the sector becomes even more noticeable when we look at the rankings of levels of intrasectoral inequality within each country. This shows that there are only a few differences between countries in their sectoral

11 The correlation between the first-order corrected Gini index and the MLD at the sectoral level is 0.89.

12 The countries with the most equally and unequally distributed earnings are Denmark (0.257) and the United States (0.421); their level of inequality differs by 0.164 Gini points for the full sample. If we first average the degree of intrasectoral inequality across countries, then we find that mining has the most equally distributed earnings (0.223), whilst agriculture has the most unequally distributed earnings (0.394); a difference of 0.170 Gini points. If we instead first calculate per country the difference between the sectors with most equally and unequally distributed earnings and then take the average, we come to an even higher difference of 0.210 Gini points.

levels of inequality. Agriculture, wholesale, and the financial sector ubiquitously stand out as sectors with high relative levels of sectoral inequality, shown by low rankings and a sectoral level of inequality higher than its country average.[13] The opposite holds for mining, utilities, and the manufacturing of transport and metals.

There are only a few differences between countries in their relative levels of intrasectoral inequality. In Czech Republic earnings are more equally distributed in agriculture. At the subsectoral level, we can see that there are country differences in ranking of inequality within other manufacturing, transport, and telecommunications.

Table 2.3 Earnings inequality across sectors and countries, pooled across time

	CZE	DNK	FIN	DEU	IRL	SWE	GBR	USA	Sector average
Sectoral level									
Agriculture	0.280 (5)	0.356 (1)	0.493 (1)	0.357 (3)	0.410 (1)	0.402 (1)	0.381 (3)	0.470 (1)	0.394 (1)
Mining	0.211 (9)	0.211 (8)	0.225 (8)	0.192 (9)	0.164 (9)	0.169 (9)	0.294 (8)	0.322 (8)	0.223 (9)
Manufacturing	0.285 (3)	0.230 (5)	0.236 (6)	0.294 (5)	0.289 (6)	0.255 (5)	0.316 (7)	0.360 (5)	0.283 (5)
Utilities	0.243 (8)	0.190 (9)	0.220 (9)	0.231 (8)	0.238 (8)	0.202 (8)	0.274 (9)	0.288 (9)	0.236 (8)
Construction	0.261 (6)	0.228 (6)	0.263 (4)	0.274 (6)	0.311 (5)	0.221 (7)	0.332 (6)	0.360 (5)	0.281 (6)
Wholesale	0.353 (1)	0.293 (3)	0.292 (3)	0.402 (1)	0.376 (2)	0.330 (3)	0.420 (1)	0.435 (2)	0.363 (2)
Trans. and telecom	0.260 (7)	0.223 (7)	0.233 (7)	0.268 (7)	0.247 (7)	0.253 (6)	0.336 (5)	0.331 (7)	0.269 (7)
Finance	0.339 (2)	0.298 (2)	0.300 (2)	0.386 (2)	0.371 (3)	0.334 (2)	0.401 (2)	0.427 (3)	0.357 (3)
Community	0.280 (4)	0.249 (4)	0.257 (5)	0.327 (4)	0.325 (4)	0.290 (4)	0.375 (4)	0.395 (4)	0.312 (4)
Subsectoral level									
Man. food	0.324 (2)	0.228 (4)	0.231 (3)	0.324 (3)	0.266 (8)	0.277 (2)	0.337 (4)	0.364 (4)	0.294 (3)
Man. textile	0.336 (1)	0.254 (1)	0.284 (1)	0.324 (3)	0.289 (4)	0.259 (4)	0.356 (1)	0.388 (1)	0.311 (1)
Man. wood	0.256 (9)	0.189 (12)	0.222 (6)	0.244 (12)	0.276 (7)	0.217 (10)	0.296 (9)	0.369 (3)	0.259 (9)
Man. paper	0.318 (3)	0.228 (5)	0.221 (7)	0.346 (2)	0.289 (4)	0.254 (7)	0.327 (6)	0.345 (6)	0.291 (4)
Man. chemicals	0.293 (4)	0.238 (2)	0.231 (4)	0.263 (8)	0.278 (6)	0.266 (3)	0.299 (8)	0.344 (7)	0.277 (6)
Man. minerals	0.258 (8)	0.228 (5)	0.195 (11)	0.301 (5)	0.308 (2)	0.217 (10)	0.262 (11)	0.323 (9)	0.261 (8)
Man. metals	0.260 (6)	0.196 (11)	0.208 (9)	0.252 (9)	0.222 (11)	0.211 (12)	0.271 (10)	0.318 (10)	0.242 (11)
Man. machinery	0.255 (10)	0.223 (8)	0.227 (5)	0.292 (6)	0.300 (3)	0.257 (5)	0.322 (7)	0.347 (5)	0.278 (5)
Man. transport	0.229 (12)	0.199 (9)	0.172 (12)	0.251 (10)	0.213 (12)	0.218 (9)	0.242 (12)	0.303 (12)	0.228 (12)
Other man.	0.260 (6)	0.225 (7)	0.208 (10)	0.379 (1)	0.322 (1)	0.279 (1)	0.339 (3)	0.387 (2)	0.300 (2)
Transport	0.250 (11)	0.230 (3)	0.239 (2)	0.274 (7)	0.255 (9)	0.257 (6)	0.333 (5)	0.342 (8)	0.272 (7)
Telecom	0.291 (5)	0.198 (10)	0.215 (8)	0.244 (11)	0.223 (10)	0.246 (8)	0.341 (2)	0.306 (11)	0.258 (10)
Country average	0.278	0.234	0.246	0.296	0.284	0.258	0.326	0.358	0.285

Note First order corrected Gini index, full sample, pooled across periods. Sector average: arithmetic average of sectoral earnings inequality per sector. Country average: arithmetic average of sectoral earnings inequality per country. Number between brackets: sectoral or subsectoral inequality level ranking within a country

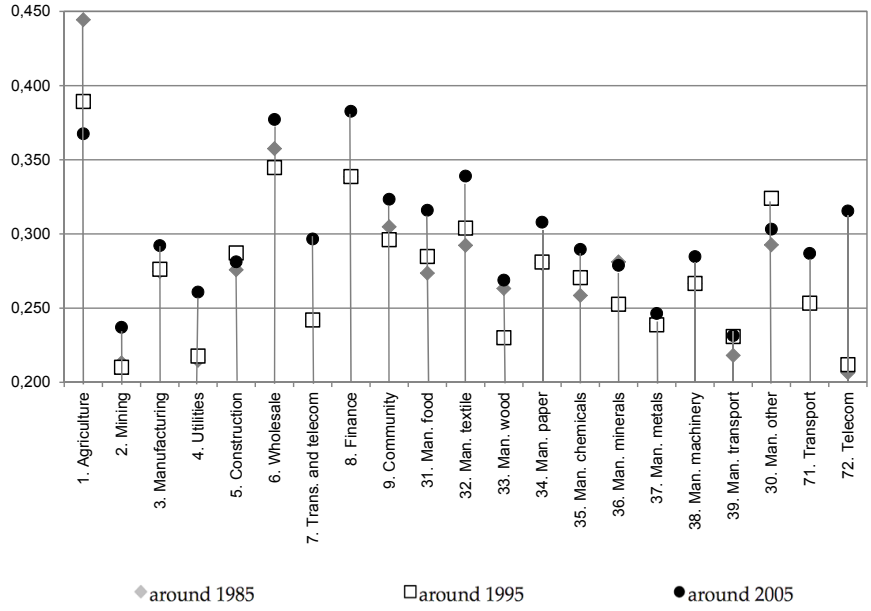
Source Wang et al. (2014a)

As the differences between countries in their levels of intrasectoral inequality are relatively small, we pool the sectoral levels for all countries and examine

13 The high level of earnings inequality within agriculture can partly be explained by the use of individual rather than household earnings information. Using household information the level of inequality drops from 40.4 to 35.7, whereas for the other sectors the inequality based on individual and household information are at par on average. The regression results are not sensitive to the inclusion of agriculture.

the developments over time in Figure 2.2.[14] Mirroring the trend at the country level, sectoral earnings in general have become more dispersed over time. Still, inequality decreased in agriculture, which has the highest level of earnings inequality on average. Also within the manufacturing of minerals subsector inequality reached its top around 1985. In only four sectors, next to the two aforementioned also construction and manufacturing other, earnings were more dispersed in 1985 or 1995 than in 2005.

Figure 2.2 Trends of sectoral earnings inequality over time



Note First order corrected Gini index, average for a sector and period across available countries
Source Wang *et al*. (2014a)

Particularly interesting is the comparison between the manufacturing sector, exposed to trade, and the sheltered community sector. Contrary to what we would expect from the application of the Stolper-Samuelson theorem at the sectoral level, we see on average higher levels and a stronger increase of inequality in the sheltered community sector than in the manufacturing industry.

14 The figure barely changes if we restrict the sample to the four countries for which we have data for all periods (Denmark, Germany, Finland, and the US). Inequality within the manufacturing of minerals in 1985 then becomes more pronounced.

2.4.5 Trends in sectoral levels of employment

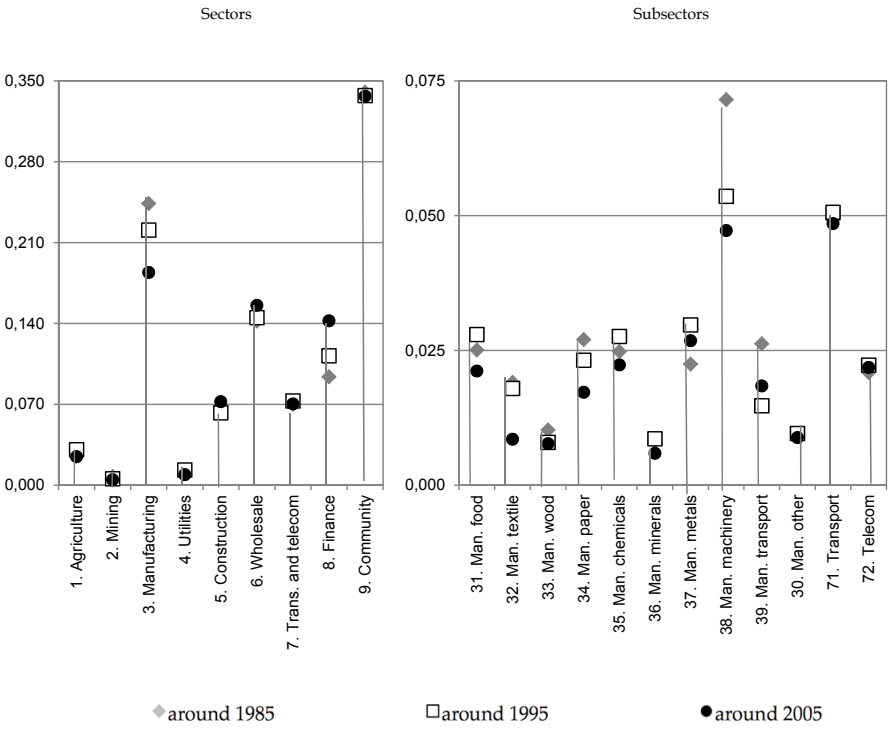
Increased inequality at the country level could also be a result of employment shifts between sectors or job loss in certain sectors (see also Atkinson, 2003; Kenworthy and Pontusson, 2005). Even though the LIS database allows for the standardised calculation of sectoral earnings inequality for multiple countries over time, unfortunately, it is not possible to track individual employment shifts over time. This is due to the fact that the LIS database is a time series rather than a panel at the individual level.

Using a number of proxies we try to depict employment effects at the sectoral level in an indirect fashion. First, we use our own LIS-based data (Wang *et al.*, 2014a) to calculate the relative employment size of sectors to map total labour shifts between sectors. The relative employment size is defined as the number of persons engaged per industry divided by the total number of persons engaged in a country.

In general, the sectoral employment sizes appear to be relatively stable over time, as shown in Figure 2.3 pooled across countries.[15] Most clearly perceptible is the drift in employment from manufacturing, in particular the manufacturing of machinery, towards the financial sector (see also Oesch, 2013). We can also discern a minor reduction in employment in agriculture and mining, whereas a small increase is observable in construction and wholesale. There is hardly any fluctuation in the largest sector, the community sector.

15 For 1985 data are missing for a number of sectors, causing the sum of all relative employment sizes to differ from 1 for this period. The ratios presented in Figure 2.3 are corrected for this overestimation. Restricting the figure to the four countries for which data are available for all periods only causes minor shifts.

Figure 2.3 Trends of relative employment size over time



Note Relative employment size, average for a sector and period across available countries
Source Wang *et al.* (2014a)

For the relative employment size the differences between countries are again small.[16] In Czech Republic still a little over one in three persons is employed in agriculture, mining, or manufacturing, compared to less than one in four for the other countries. The community sector is relatively large in Finland and Denmark (around 40.0 per cent compared to 31.0 per cent on average in the other countries). The Anglo-Saxon countries are characterised by a comparatively extensive financial sector (around 14.0 per cent compared to 10.6 per cent). The manufacturing industry, in particular the manufacturing of transport, metal, and chemicals, is relatively large in Germany (29.7 versus 20.3 per cent).

As a second employment indicator, following Mahler *et al.* (1999) who coin this inequality between sectors, we also calculate the relative median earnings, defined as the sectoral median labour earnings divided by the national median

16 Results are available upon request, see also Thewissen *et al.* (2013b).

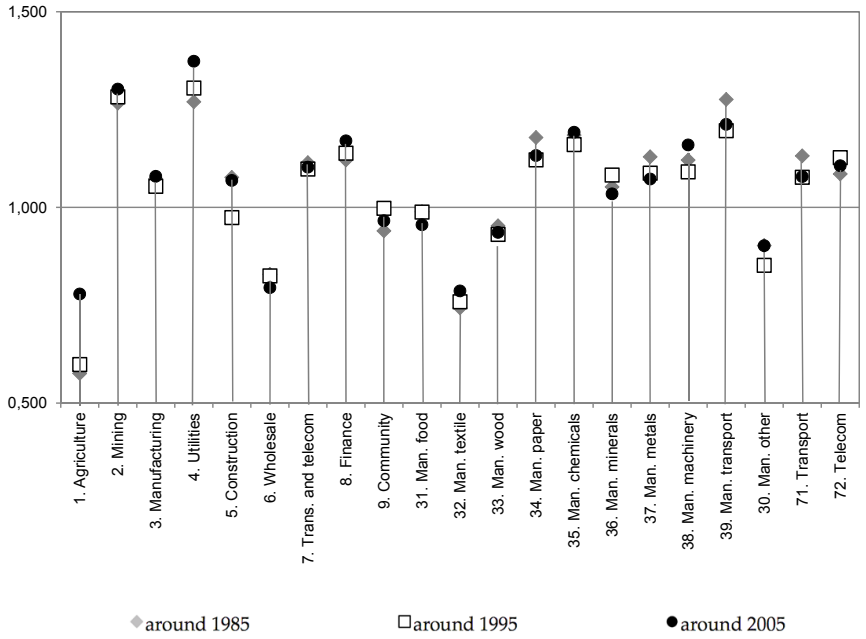
labour earnings. When job loss mainly occurs at the lower end of the earnings distribution in a sector, we should see an increase in the sectoral relative median earnings.

Figure 2.4 shows that there are few fluctuations in relative median earnings over time, pooled across countries.[17] This seems to suggest that the loss of employment within the manufacturing sector was not concentrated at the low end of the earnings distribution. The largest change took place in agriculture, where the (low) earnings went up significantly between 1995 and 2005. Apparently, in agriculture individuals at the lower end of the earnings distribution saw an increase in their earnings, as indicated by an increase in relative median earnings combined with a decrease in earnings inequality. Also within the mining and utilities industry, homogeneous sectors with low earnings dispersion and a decreasing employment size, we can see increasing median earnings.

Figures 2.3 and 2.4 display that both the relative employment size and median earnings of the community sector have been stable over time. From this we infer that it is not likely that low-skilled labour was shed in sectors exposed to trade, and that subsequently this labour went to the sheltered community sector, as could be hypothesised from the Stolper-Samuelson theorem.

17 Restricting the figure to the four countries for which data are available for all periods only causes minor shifts.

Figure 2.4 Trends of relative median earnings over time



Note Relative median earnings, average for a sector and period across available countries
Source Wang *et al.* (2014a)

Also for the relative median earnings there are few country-level differences.[18] Mining, utilities, transport and telecommunications, and finance pay relatively well in all countries. On the contrary, earnings are uniformly low in agriculture, followed by the manufacturing of textile and wholesale. The sectoral median earnings for the manufacturing industry are below 1 for Czech Republic and Ireland (0.95 and 0.97), whilst only in these two countries the median earnings are above 1 in the community sector (1.04 and 1.06). Principally in Finland the relative median earnings are low in agriculture (0.45 to 0.71 on average for the other countries), whilst earnings are above average for mining in the UK (1.59 to 1.25) and utilities in Ireland (1.71 to 1.28). Within the manufacturing industry the differences between countries are even smaller.

18 Results are available upon request, see also Thewissen *et al.* (2013b).

2.5 Regression analyses of sectoral trends

2.5.1 The regression model and data

Our database consists of country-industry data, which allows us to exploit variation within countries across industries and over time. Following Bassanini, Nunziata, and Venn (2009), we estimate the following equation using OLS:

$$\text{inequality}_{ijt} = \beta_0 + \beta\ \text{trade}_{ijt} + \gamma\ \text{techn}_{ijt} + \text{instit}_{it}\delta + X_{it}\mu + \varphi_i\theta + \varphi_j\theta + \varepsilon_{ijt}$$

Our main dependent variable is earnings inequality within sector *j*, country *i*, and period *t*. Employment effects are explored using the relative employment size and relative median earnings at the sectoral level as dependent variables.[19]

For sectoral exposure to international trade ($\beta\ \text{trade}_{ijt}$) we use the OECD STAN database (2011b) where we calculate trade values in percentage of sectoral added value. We differentiate between import and export as advocated by Mahler (2004). Unfortunately there is no sufficient information on sectoral foreign direct investment.[20] For our sectoral indicator of technological progress ($\gamma\ \text{techn}_{ijt}$) we follow OECD (2011a) and Michaels *et al.* (2014) and use the share of compensation of ICT capital in total capital compensation from EU-KLEMS (2011).[21] The rise of ICT could potentially affect a large segment of the workforce and its adoption took place during a relatively brief period (Goldin and Katz, 2008). This indicator should be seen as a proxy to gauge technological change, as technological change exhibits itself in multiple fashions, many of which are unobservable (OECD, 2011a). Acknowledging its limitations, it is the best sectoral indicator available for comparisons across countries and time.[22]

To test the waning labour market institutions hypothesis, we add a vector of institutional variables at the country level ($\text{instit}_{it}\delta$). We take a measure of

19 All dependent variables are multiplied by 100 in the regressions to enhance readability of the coefficients in the tables.

20 Our regressions do not provide evidence for inequality-enhancing effects of inward or outward FDI (available upon request).

21 The sectoral definition in EU-KLEMS differs slightly from the one in LIS. There is only information available for the individual sectors 'machinery n.e.c.' and 'electrical and optimal equipment', and for 'wholesale and retail trade' and 'hotels and restaurants' rather than the aggregates we use, namely, the manufacturing of machinery, and wholesale. We transform the EU-KLEMS indicators to these aggregate sectors by taking the average ICT intensity of the two respective individual sectors, weighted by the share of the gross value added at current basic prices from EU-KLEMS data of the respective sector. We use data from 1993 for Sweden 1992. Calculations are available upon request.

22 See Michaels *et al*. (2014) for a discussion of the strengths and weaknesses of this indicator. In the sensitivity analyses reported below, we examine alternative indicators of technological progress.

overall employment protection legislation from OECD data (2009). Visser (2011) provides us with data on union coverage, defined as the proportion of employees covered by wage bargaining agreements, and the level of wage coordination, where a higher number indicates a more centralised level of wage bargaining. The vector $X_{it}\mu$ contains two common control variables measured at the country level, namely, the unemployment rate and real GDP per capita divided by 100, from the OECD National Accounts (2012b). The relationship between GDP per capita and inequality is strongly contested in both causal directions (see *e.g.*, Thewissen, 2014) but it corrects for effects from possible differences in economic development between countries. Inclusion of the country-level unemployment rate can be seen as a rough control for labour market efficiency differences between countries.

We also control for unobserved industry-specific developments, such as the fact that industries might be exposed to different demand dynamics in their product markets, by including interactions of sector dummies and the trend $\varphi_j\theta$. The set $\varphi_i\theta$ includes interaction terms of the country dummies and the trend, to control for unobserved effects that have comparable effects on earnings within different industries at the country level. Standard errors ε_{ijt} are clustered at the country level to allow for general forms of heteroskedasticity and autocorrelation within countries.

2.5.2 Descriptive statistics for the independent variables

Table 2.4 shows that the degree to which sectors are exposed to international trade and ICT intensity differs substantially. Also the increase over time in international trade differs per sector. The largest increase took place in the manufacturing of textile and manufacturing of transport; in mining import rose significantly while exports remained stable. The amount of international trade barely rose in the utility sector.

As can also be seen from Table 2.4, for a number of sectors no data on international trade are available. Of particular importance are the community sector, which can be expected to be relatively sheltered against international trade, and the financial sector, in which the relative employment size grew relatively fast.[23]

Also for the levels and developments of ICT propensity we can see differences between sectors. The starkest increases took place in other manufacturing, telecommunications, and mining. The ICT propensity decreased sharply in

23 The results are comparable if we calculate the relative employment size in percentages of the total employment size of the sectors which are included in the regressions rather than all sectors (available upon request).

agriculture, which is fully due to high values in Germany around 1985.[24] Minor reductions occurred in the manufacturing of wood, minerals, and transport.

Table 2.4 Trends in international trade and technological change at the sectoral level

	Import (% sectoral value added)			Export (% sectoral value added)			ICT (share in total capital compensation)		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Sectoral level									
Agriculture	21.15[a]	33.15	47.85	22.57[a]	21.43	25.81	0.19	0.02	0.03
Mining	285.94[a]	223.97	459.81	46.72[a]	35.01	49.97	0.03	0.05	0.11
Manufacturing	91.63	114.36	144.40	88.25	132.12	167.30	0.10	0.09	0.12
Utilities	3.13[a]	2.23	3.79	1.06[a]	1.30	5.47	0.04	0.05	0.05
Construction	.	.	.	.	.	.	0.06	0.28	0.12
Wholesale	.	.	.	.	.	.	0.21	0.17	0.18
Transport and telecommunications	.	.	.	.	.	.	0.23	0.20	0.26
Finance	.	.	.	.	.	.	0.09	0.10	0.12
Community	.	.	.	.	.	.	0.14	0.16	0.18
Subsectoral level									
Man. food	50.75	57.56	81.07	59.80	100.24	83.18	0.07	0.07	0.09
Man. textile	208.18	249.14	503.79	95.18	161.39	264.39	0.07	0.07	0.13
Man. wood	65.16	73.67	83.37	72.08	86.08	81.69	0.08	0.06	0.07
Man. paper	31.15	58.10	54.91	64.57	87.59	83.03	0.14	0.13	0.16
Man. chemicals	130.61	135.74	166.18	96.18	131.70	188.81	0.06	0.06	0.09
Man. minerals	41.20	44.93	65.52	30.37	55.16	63.09	0.09	0.07	0.07
Man. metals	87.43	111.04	123.94	72.77	95.02	111.63	0.07	0.08	0.13
Man. machinery	124.23	177.30	209.20	109.38	181.77	239.74	0.18	0.14	0.18
Man. transport	174.15	269.00	424.87	120.47	171.65	245.23	0.26	0.13	0.20
Other man.	75.77	87.87	132.52	66.65	95.82	110.70	0.09	0.12	0.26
Transport	.	.	.	.	.	.	0.13	0.14	0.15
Telecommunications	.	.	.	.	.	.	0.30	0.29	0.40
Average	99.32	117.00	178.66	67.57	96.88	122.86	0.13	0.12	0.15

Note Import and export are expressed in % of sectoral value added, pooled for countries for which data are available. [a] Data from 1990. The average is the unweighted arithmetic average for the available observations of that period

Source Import and export from OECD STAN, share of ICT in total capital compensation from EU-KLEMS

Table 2.5 summarises the country-level data for the incorporated set of institutions per country. On average the union coverage rate decreased and employment protection legislation became less strict. Finland and Sweden are the only countries in which the union coverage rate increased over time. In the UK and Ireland employment protection legislation became (somewhat) stricter. There is not much fluctuation in the level of wage coordination within countries over time. In Sweden wage coordination became more decentralised whereas it became more centralised in Denmark (see for a further discussion on this Thewissen *et al.*, 2013b).

24 These extreme values for Germany drop out in the regressions as no data on export and import are available for 1985 and 1990. Without Germany the ICT propensity in agriculture in 1985 decreases to 0.02, causing the average ICT propensity in 1985 to drop to 0.12.

Table 2.5 Trends in institutions at the country level

	Union coverage rate (%)			Level of wage coordination			Employment protection legislation		
	1985	1995	2005	1985	1995	2005	1985	1995	2005
Czech Republic	.	60.0	43.5	.	2	2	.	1.90	1.90
Denmark	83.0	84.0	83.0	3	3	4	2.40	1.50	1.50
Finland	77.0	82.2	90.0	4	3	4	2.33	2.16	2.02
Germany	78.0	72.0	64.3	4	4	4	3.17	3.09	2.12
Ireland	.	60.0	54.6	.	5	5	.	0.93	1.11
Sweden	85.0	94.0[a]	94.0	4	3[a]	3	3.49	2.24[a]	2.24
UK	64.0	36.1	34.7	1	1	1	0.60	0.60	0.75
US	19.9	17.4	13.8	1	1	1	0.21	0.21	0.21
Average	65.9	63.2	59.7	2.8	2.8	3.0	1.88	1.58	1.48

Note [a] Data from around 2000. The average is the unweighted arithmetic average for the available observations of that period. Level of wage coordination is divided into: 5 = economy-wide bargaining, 4 = mixed industry- and economy-wide bargaining, 3 = industry-level bargaining with no (standard) pattern setting, 2 = mixed industry- and firm-level bargaining, 1 = fragmented or no bargaining

Source Union coverage rate and level of wage coordination from Visser (2011), employment protection legislation from OECD

2.5.3 Intrasectoral inequality

As shown in Table 2.6 no evidence is found for the hypothesis that international trade leads to higher intrasectoral earnings inequality. The only borderline significant result is the negative association between export and the first order corrected Gini index, which suggests that sectors more exposed to export actually have a more compressed earnings structure. The sectoral ICT propensity is insignificant in all regressions, providing no evidence for the skill-biased technological change hypothesis.

The union coverage rate is consistently significant and its negative sign corresponds to our hypothesis that stronger trade unions are associated with lower earnings inequality. The level of wage coordination is significant only for the Gini index regressions, whereas employment protection legislation becomes significant in the regressions with the mean log deviation as the dependent variable. We find mixed evidence for significant associations between the unemployment rate at the country level and sectoral inequality. It might be that when the unemployment rate is high, people with earnings at the lower end of the distribution are most prone to job loss resulting in lower earnings inequality, or that starters with relatively low earnings postpone entry to the labour market (Elsby *et al.*, 2010).

Table 2.6 Panel data regressions for earnings inequality within sectors

	First order corrected Gini index		Mean log deviation	
	(1)	(2)	(3)	(4)
Sectoral data				
Import	-0.002		-0.000	
	(0.354)		(0.876)	
Export		-0.008*		-0.009
		(0.066)		(0.155)
Share of ICT	1.311	0.672	0.676	0.353
	(0.494)	(0.774)	(0.771)	(0.886)
Country level data				
Union coverage rate	-0.138***	-0.136***	-0.230***	-0.225***
	(0.002)	(0.001)	(0.002)	(0.002)
Level of wage	-1.070**	-0.973**	-0.533	-0.421
coordination	(0.012)	(0.017)	(0.525)	(0.608)
Employment protection	1.089	1.054	3.129***	3.076***
legislation	(0.228)	(0.217)	(0.008)	(0.006)
Unemployment rate	-0.195**	-0.177**	-0.019	-0.001
	(0.039)	(0.050)	(0.879)	(0.993)
Real GDP per	-0.006	-0.007	-0.020	-0.020
capita/100	(0.532)	(0.496)	(0.435)	(0.430)
Constant	36.735***	36.633***	29.025***	28.883***
	(0.000)	(0.000)	(0.004)	(0.004)
N*T*I	345	345	345	345
Adjusted R^2	0.628	0.630	0.429	0.431

Note OLS with country*period and sector*period interaction effects, full sample, 1985-2005, clustered standard errors. Significance levels are noted by *** (1 per cent), ** (5 per cent), or * (10 per cent). The constant is allowed to vary at the sectoral level

Source First order corrected Gini index and mean log deviation from Wang et al. (2014a), import and export from OECD STAN, share of ICT in total capital compensation from EU-KLEMS, union coverage and level of wage coordination from Visser (2011), all other data from OECD

2.5.4 Sectoral employment

Increased inequality at the country level could also be a consequence of employment loss, in particular at the bottom end of the earnings distribution (Atkinson, 2003; Kenworthy and Pontusson, 2005). We first use the relative employment size of a sector as our dependent variable. If trade and technological change were associated with job loss, we should expect a negative association with the relative employment size of the sector. Second, median earnings should go up if job loss mainly occurred for people at the lower end of the earnings distribution. As the sectoral employment indicators are expressed in percentages relative to the national level so that they average out to around 100 at the country level, the institutional and control variables at the country level lose their interpretation. The country-level variables are therefore left out of the regressions, although the results are not affected by their inclusion.

We can see in columns 1 and 2 of Table 2.7 that import is negatively associated with the relative employment size of industries.[25] We can infer from this that the relative number of jobs has decreased in sectors more exposed to import. This is in line with the hypothesis that trade leads to job loss in import-competing sectors, and it corresponds to the sectoral findings for Germany and the UK of Oesch (2013). A causal interpretation does not seem warranted, however, since it could be that less productive sectors have shed labour and increased imports to fill these gaps. From the results we can conclude that for a given sector, an increase in import of 1 percentage point of the sectoral value added is on average associated with a 0.002 percentage point lower relative employment size in a period, holding constant the control variables.

The results provide no evidence for job creation in sectors with a large export fraction. In addition, the finding that the ICT propensity is insignificant in all regressions does not correspond with the skill-biased technological change job loss hypothesis. The fact that we find a decline in employment in import-competing industries combined with no significant association with technological progress is in line with the industrial findings from Autor *et al.* (forthcoming) for the US.

Table 2.7 Panel data regressions for the relative employment size and relative median earnings

	Relative employment size		Relative median earnings	
	(1)	(2)	(3)	(4)
Import	-0.002***		-0.016*	
	(0.008)		(0.054)	
Export		0.001		0.014
		(0.421)		(0.504)
Share of ICT	0.706	0.380	3.208	0.407
	(0.138)	(0.487)	(0.741)	(0.968)
Constant	2.495***	2.450***	103.473***	102.716***
	(0.000)	(0.000)	(0.000)	(0.000)
N*T*I	336	336	345	345
Adjusted R^2	0.627	0.606	0.663	0.653

Note OLS with country*period and sector*period interaction effects, full sample, 1985-2005, clustered standard errors. Significance levels are noted by *** (1 per cent), ** (5 per cent), or * (10 per cent). The constant is allowed to vary at the sectoral level

Source Relative employment size and relative median earnings from Wang et al. (2014a), import and export from OECD STAN, share of ICT in total capital compensation from EU-KLEMS

In case that low wage jobs for low-skilled workers have disappeared we should expect higher relative median earnings in sectors that became more exposed

25 The number of observations decreases as we leave out the UK 1986, for which data are missing for a number of individual industries which would induce an upward bias to the relative employment sizes of individual industries as we would underestimate total employment size (the denominator). The only difference when including UK 1986 is that ICT propensity becomes significant at the 10 per cent for the import regression. The results are fully comparable if we would also exclude waves for which information on a subsector within the manufacturing industry is missing (in addition to UK 1986 also SWE 1992; DNK 1987 and 1992).

to international trade or more skill intensive. Yet, the regressions presented in columns 3 and 4 of Table 2.7 actually show a negative association between import and the relative median earnings, albeit only significant at the 10 per cent level.[26] This finding indicates that the diminution of employment found in the former regressions is not associated with job loss for the low-skilled, which is not in line with our hypothesis that trade hurts the lowly skilled. An alternative explanation is that sectors responded to import with wage moderation to remain competitive, so that relative median earnings did not go up.

2.5.5 Sensitivity tests

We perform multiple tests to examine the sensitivity of our findings; the results are available on request. We first use different specifications or data sources for our dependent variables. Results are fully comparable when we use data from OECD STAN (2011b) on the relative employment size. Import is still found to be negatively associated with the relative employment size with a coefficient of comparable size significant at the 1 per cent level.[27] Next, we inspect whether our results are robust to different household definitions. We recalculate earnings and employment for household heads only, most likely a more homogeneous group in which part-time work is less widespread. There are still no signs of inequality-enhancing effects of trade or technological change. The positive association between employment protection legislation and inequality becomes significant in all inequality regressions, while the level of wage coordination is no longer significant in any regression. Import remains to have a significant association with the relative employment size, whereas the significance between import and the relative median earnings disappears. The results are fully comparable to the ones presented above when we include household heads and their spouses. When we base our regressions on equivalised household earnings rather than individual information, as Mahler *et al.* (1999) did, a number of changes appear. We still do not find inequality-enhancing effects of trade, but in all regressions there is a positive association between the ICT propensity and within-sector inequality. In addition, the EPL index is positive and the level of wage coordination is negative in all regressions. Import still has a negative association with the relative employment size, while the association between import and relative median earnings disappears. Thus,

26 For these regressions we do not exclude the country/period observations for which data on individual industries are missing, as there is no clear upward or downward bias when a certain industry is not included in the calculation of median earnings at the country level. Results are fully comparable if we exclude UK 1986, or in addition to this Sweden 1992 and Denmark 1987 and 1992.

27 The coefficient is with -0.00136 slightly less negative than the one found with LIS data (-0.00160).

based on household level data we do find evidence for skill-biased technological change. Nevertheless, the original calculations based on individual data are preferable as with household-level information earnings of the spouse or other household members are attributed to sectors in which they were not necessarily made.

As a second set of sensitivity tests, we use different indicators or specifications for trade and technological change. Our results by and large remain comparable when we restrict our sample from 1995 onwards, when trade between developed and developing countries mainly increased. Export becomes insignificant and so does the union coverage rate for the mean log deviation, and the level of wage coordination. Next, we use different sectoral indicators for technological change, namely, the contribution of ICT capital to value added growth from EU-KLEMS and R&D spending relative to the sectoral value added from OECD STAN.[28] The results remain similar; export is no longer significantly associated with the first order corrected Gini index when R&D spending is used as technological change indicator. Interactions of labour market institutions and the sectoral indicators (import, export, and ICT intensity) are generally insignificant, providing no evidence that the country-level labour market institutions mitigate the effects of international trade or technological change on earnings inequality.

As a third sensitivity test, we control for supply effects. As Goldin and Katz (2008) argue, it is not only the increased demand for high-skilled labour that may explain increased earnings inequality, changes in the supply are relevant too. Inclusion of the share of hours worked by low-skilled, medium-skilled, and high-skilled workers at the sectoral level from EU-KLEMS data does not have consequences for our results and the shares of hours worked are generally insignificant.[29] The same holds when we run regressions with the average years of total schooling for the total population aged 25 and over from Barro and Lee (2013) as a measure of total supply of skills available at the country level. In addition, we include the average hours worked per sector from EU-KLEMS data in our regressions to control for sectoral differences in the prevalence of part-time work.[30] Export is no longer significantly associated with the first order corrected Gini index, the EPL index becomes significant in all four regressions while the level of wage coordination is no longer significant. The average hours worked is insignificant in all regressions.

Fourth, we test for effects of our selected sample of sectors. The results remain firm when we exclude industries in which the number of included

28 For the contribution of ICT capital to value added growth data for Ireland 1995 are taken from the Groningen Growth and Development Centre. For the R&D spending we use data from 2001 for Denmark 2000, and data from 1987 for the UK and US 1986.

29 Due to data availability for the US the data are based on the SIC rather than NAICS sectoral classification, which should have negligible consequences.

30 Data from EU-KLEMS are complemented with OECD STAN data on total hours worked by employees divided by the number of employees for the US 2000 and 2004.

individuals in the LIS micro data is below 30, or when we include the community sector by assuming that no trade took place by replacing the zeros for missing values. Also from a more general test, excluding sectors one by one, we find that import remains significantly associated with the relative employment size. The coefficient becomes twice as large (-0.003) when the mining sector is excluded. The significant association between the union coverage rate and earnings inequality is also robust to the exclusion of sectors, whilst the relationships between export and the first order corrected Gini coefficient and between import and relative median earnings disappear frequently.

Last, we allow for more lenient specifications by excluding the interactions of country dummies and the time trend, sector dummies and the trend, or both, or by including fixed effects at different levels rather than interactions. This comes at a high price, as it makes the results more susceptible to unobserved heterogeneity bias. There are still no signs of inequality-enhancing effects of international trade or technological change. Without the country and time trend interactions or country dummies the institutions become significant in all regressions with earnings inequality as dependent variable. Again, the initially found negative significant association between import and the relative median earnings and between export and the first order corrected Gini index disappears regularly.

All sensitivity tests considered, the relationships between import and the relative employment size, and the union coverage rate and sectoral earnings inequality remain firm. The associations between export and the first order corrected Gini index, and between import and the relative median earnings, that were significant at the 10 per cent level only, disappear frequently. There are no indications of inequality-enhancing effects of trade.

2.6 Conclusions

This chapter aims to contribute to our understanding of developments and causes of earnings inequality by using new sectoral data for eight countries between 1985 and 2005. Our study shows the importance of taking into account sectoral trends for our understanding of earnings inequality. In fact, there is on average as much spread in intrasectoral levels of inequality within countries, as there is in levels of country-level inequality between countries. In addition, the same intrasectoral trends can be found in our set of included countries. Agriculture, wholesale, and the financial sector ubiquitously stand out as the sectors with the most unequally distributed earnings, whereas mining, utilities, and the manufacturing of metals and transport are characterised by low levels of earnings dispersion in all countries. Hence, these results suggest that a substantial part of the manifestation of inequality is overlooked or ignored when studies confine themselves to country-level inequality trends only.

Our decomposition shows that the level and the increase of inequality at the country level is by and large determined by intrasectoral inequality developments, instead of earnings differences between sectors. Intrasectoral earnings inequality has increased in the vast majority of sectors, although the rise differs per sector. In the sector with the highest level of inequality, agriculture, there is actually a trend towards more equalisation. From our comparison of the relative employment sizes of industries over time we see an employment shift from the manufacturing industry towards the financial sector.

Our sectoral design allows us to differentiate between three explanations put forward to explain rising inequality at the country level. By means of cross-sectional pooled time-series we do not find evidence for associations between international trade and earnings inequality, in line with other sectoral studies (Mahler *et al.*, 1999; OECD, 2011a; Michaels *et al.*, 2014). Yet, the reported results denote that the employment size has decreased in sectors that are more exposed to import, corresponding to findings for the UK and Germany (Oesch, 2013). No further evidence is found that this job loss has occurred at the bottom end of the earnings distribution. This corresponds to the hypothesis that trade can lead to job loss, even though the results do not suggest that this job loss took place at the bottom end of the earnings distribution where most low-skilled workers are located. Indeed, our finding that job loss is not biased towards the low-skilled is consistent with the fact that we do not find evidence that trade leads to inequality. Causal interpretations of these results do not seem warranted, since it could be that less productive sectors have shed labour and increased imports to fill these gaps, leading to a negative association between imports and relative employment size. In addition, sectors might have responded to import competition with wage moderation to remain competitive, causing a negative association between imports and the relative median earnings.

Our regressions with intrasectoral inequality as the dependent variable point to labour market institutions as important variables. This corresponds to our observation that levels of intrasectoral inequality increased in almost all sectors. The union coverage rate at the country level is found to be negatively associated with sectoral earnings inequality, which corresponds to the hypothesis that waning trade union power is an explanation for rising inequality (e.g., Koeniger *et al.*, 2007). These results are robust to different sensitivity analyses. Further analysis using sectoral data on union coverage rates could provide more insight into how trade unions' influence works its way into sectoral earnings differences – unfortunately, such data are not available with sufficient detail for our set of countries over time (e.g., Pinto and Beckfield, 2011; Kristal, 2013).

The regression results are not in line with the skill-biased technological change hypothesis, as we do not find significant associations between several indicators of technological progress and any of the dependent variables. Michaels *et al.* (2014) report effects of technological progress for a larger group

of countries, but their study is focused on polarisation in skill demand rather than earnings inequality, and that they only use two periods over time. It therefore seems relevant to further analyse in what way polarisation seeps through to inequality at the sectoral level.

Methodologically, with our sectoral approach the number of observations increases and (unobserved) industry-specific developments can be taken into account. Yet, the regressions do not provide causal evidence on the effects of international trade, technological change, and labour market institutions on earnings inequality. Other confounding factors, in particular in product markets, can be expected to affect both earnings and employment, as well as trade and technology opportunities. There could also be dependencies between sectors that have not been taken into account in this study. In addition, individual labour market transitions cannot be tracked directly by means of the used database, which opens up an interesting avenue for further research. Acknowledging these limitations, the analyses presented here encourage a sectoral approach in understanding inequality, in which heterogeneity between sectors is accounted for. As there is as much variation in levels of intrasectoral inequality within countries as there is between levels of country-level inequality, the sectoral dimension is crucial for our understanding of the manifestation of earnings inequality. In addition, a sectoral approach could help our theoretical understanding of inequality and its causes, as there are clear differences in the degree to which sectors are exposed to factors that potentially drive inequality, in particular, technological change and international trade. Indeed, our sectoral approach points to the direction of trade unions having an equalising effects on earnings, whereas no support is found for international trade or technological change, two popular explanations for rising inequality.

3 Competing with the dragon

Employment and wage effects of Chinese trade competition in 17 sectors across 18 OECD countries[1]

ABSTRACT

The rapid rise of China on the global economic stage could have substantial and unequal employment and wage effects in advanced industrialised democracies given China's large volume of low-wage labour. Thus far, these effects have not been analysed in the comparative political economy literature. Building on new pooled time-series data, we analyse the effects of Chinese trade competition across 17 sectors in 18 countries between 1990 and 2007. Our empirical findings reveal overall employment declines and higher earnings inequality in sectors more exposed to Chinese imports. We devote particular attention to a new channel, increased competition from China in 59 foreign export markets, which positively affects the high-skilled whilst the low-skilled bear the brunt. Hence, this study shows that neglecting the competition in foreign countries leads to underestimation of the distributive effects of trade. More generally, our findings provide new insights into how international trade, technological change, and labour market institutions contribute to the widely observed trend of rising inequality.

3.1 INTRODUCTION

During the past two decades China's manufacturing exports to advanced industrialised democracies have grown enormously. As a result of its liberalisation of product and financial markets, its growth in productivity, and its World Trade Organisation (WTO) accession in 2001, China became the world's largest exporter of goods in the span of two decades between early 1990s and 2010 (OECD, 2012c).

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1 This chapter appeared as Thewissen, S., Van Vliet, O. (2014) Competing with the dragon: Employment and wage effects of Chinese trade competition in 17 sectors across 18 OECD countries, *LIS Working Paper Series no. 623*. Earlier versions of this study were presented at the 7th ECPR-SGEU Conference, 5-7 June 2014 The Hague, the 2014 LIS Summer Workshop, 29 June-5 July, Luxembourg and the 26th SASE Annual Conference, July 10-12 2014 Chicago. We thank all the participants, Michael Blauberger, Koen Caminada, Kees Goudswaard, John Peters, David Rueda, and Vera Troeger for their helpful comments and suggestions. All errors remain ours.

Given China's large volume of low-wage labour, its growing exports can potentially have substantial consequences for the wages and employment possibilities of employees in OECD countries. Globalisation as such has a long history of being examined as a cause of rising earnings inequality in the comparative political economy literature. Studies tend to use imports and exports with less developed countries summed together as a percentage of GDP as indicator; most studies report insignificant associations between this measure and wage inequality (Pontusson *et al.*, 2002; Rueda and Pontusson, 2000; Oliver, 2008). Huber and Stephens (2014) do not find significant effects of total imports and exports as a percentage of GDP on wage inequality. Yet, these studies do not devote specific attention to China's rise on the global economic stage. In addition, trade is measured at the country level even though there are substantial differences in the degree to which sectors within countries are exposed to trade. Furthermore, an important theoretical channel through which trade has an impact on employment and wages is neglected. Traditional measures of trade only capture direct linkages between trading partners. These approaches disregard that exporting sectors are also affected by the rise of China when foreign export markets switch to Chinese imports instead.

Recent studies in international economics and labour economics reveal strong distributive effects of the rise of China on the global economy in single-country studies. Autor *et al.* (2013) and Autor *et al.* (forthcoming) find that rising Chinese import competition on US labour markets has reduced employment and wages in manufacturing sectors. For Norway, Balsvik *et al.* (forthcoming) find negative employment effects, but no indications of wage effects. These authors attribute these dissimilarities in results to the lower flexibility of Norwegian labour market institutions compared to the US Although these case studies insightfully depict country-specific developments, they do not allow for a general assessment of employment and wage effects of Chinese trade competition across a broader group of OECD countries with diverse political-economic institutions.

We aim to complement our existing knowledge of determinants of earnings inequality by analysing the developments in employment and wages in 17 sectors across 18 OECD countries between 1990 and 2007. This approach allows us to examine the distributive effects of Chinese trade competition, while we can account for institutions found to be relevant in the comparative political economy literature on wage inequality (e.g. Rueda and Pontusson, 2000; Mahler, 2004; Martin and Swank, 2012). With respect to this literature, we seek to make three contributions.

First, existing research pertains to distributive effects of international trade in general, but does not devote attention to effects of Chinese trade in particular. We empirically test whether increased Chinese trade competition provides an explanation for rising levels of inequality in Western countries (Bradley *et al.*, 2003; OECD, 2011a; Huber and Stephens, 2014). Second, we extend our analysis of trade effects on the distribution of earnings by taking into

account Chinese competition on foreign export markets. This route has been neglected thus far in the existing inequality literature. Third, we take the sector as the unit of analysis. Exposure to international trade and therefore its labour market effects vary substantially across sectors (Scheve and Slaughter, 2004; Hays *et al.*, 2005; Walter, 2010; Oesch, 2013). Our central hypothesis is that sectors with greater exposure to Chinese trade competition experience stronger labour market effects. Building on Mahler *et al.* (1999) and Thewissen *et al.* (2013b), we examine the sectoral variation in employment, wages, and earnings inequality using a new sectoral dataset based on LIS micro data (Wang *et al.*, 2014a). Furthermore, our study is complementary to recent research on de-industrialisation. We inspect the evolution of the manufacturing sectors in detail, whilst recent accounts mainly focus on developments in the services sectors (Rehm, 2009; Ansell and Gingrich, 2013; Wren, 2013; Dancygier and Walter, forthcoming).

The chapter is organised as follows. We begin by reviewing the literature and formulating hypotheses on the effects of Chinese trade competition, skill-biased technological change and labour market institutions on employment and earnings inequality. In Section 3.3, we discuss the data and methods and specify the measure for Chinese export competition in foreign markets. Subsequently, Section 3.4 presents the results of the analysis. Section 3.5 summarises the main findings and concludes.

3.2 LITERATURE AND HYPOTHESES

Our theoretical understanding of the distributive effects of Chinese exports is based on two standard trade models from international economics. In the Ricardo-Viner model, sectors are the central unit of analysis as it is assumed that factor mobility is limited. Employees in sectors with higher exports as a result of the reduction of trade restrictions benefit, whereas employees in sectors with increased imports loose (Samuelson, 1971; Hays, 2009). In contrast, the Stolper-Samuelson model (1941), in which factor mobility is assumed to be perfect, hinges on factor endowments. Owners of abundant production factors profit from trade.

Increased trade competition stemming from China may affect workers in OECD countries in two ways. First, Chinese imports in OECD countries can substitute the domestic production of goods, resulting in a reduced labour demand. Hence, it can be expected that sectors with more Chinese exports experience negative employment and wage effects. The findings of Autor *et al.* (2013) and Balsvik *et al.* (forthcoming) for respectively the US and Norway support this hypothesis. Second, Chinese exports may also affect sectors by generating increased competition in the foreign markets where sectors sell their products. As an example, it could be that a German manufacturer has a large market share in France, but that France substitutes German imports

for Chinese products (Balsvik *et al.*, forthcoming). Thus, we hypothesise that the employment size of sectors more exposed to Chinese trade competition will shrink.

Furthermore, we predict that employment and wage effects of Chinese trade competition are not equally shared across all workers. Given the relative abundance of low-skilled labour in China, mainly the low-skilled employees in exposed manufacturing sectors in OECD countries will be affected by Chinese exports. Therefore, we hypothesise that sectoral exposure to Chinese trade competition is associated with negative employment and wage effects for low-skilled employees. For high-skilled workers, however, expectations are less clear-cut. Based on an empirical analysis for the UK, Bloom *et al.* (2012) find positive wage effects of Chinese trade competition for high-skilled workers. As more competition from China does not imply more exports to China, on the contrary, these positive effects are not an indication of the typical winners from the Stolper-Samuelson model. Instead, according to recent insights from international economics (e.g. Melitz, 2003), increased competition triggers firms to increase their productivity in order to survive. Indeed, Bloom *et al.* (2012) find that Chinese trade competition has a positive impact on innovation and productivity. In order to achieve this, firms hire more high-skilled workers, leading to positive labour market effects in sectors that are more exposed to Chinese competition. Thus, we expect positive employment and wage effects for high-skilled workers in sectors more exposed to Chinese export competition. Last, as we predict that the high-skilled gain from Chinese trade competition whilst this negatively affects the low-skilled, we expect that sectors more exposed to Chinese trade competition have higher levels of intrasectoral earnings inequality.

Another explanation for rising levels of labour market inequality is the effect of so-called skill-biased technological change (Goldin and Katz, 2008; Oesch, 2013; Wren, 2013). According to this argument, technological innovation complements the high-skilled, whilst it substitutes routine labour by capital. The demand for high-skilled labour increases, leading to more employment opportunities and higher wages for highly educated workers. In contrast, the demand for low-skilled labour decreases, resulting in fewer jobs and lower wages for lowly educated workers. These effects of technological change are supported by various empirical studies on the US (Autor *et al.*, 2003; Goldin and Katz, 2008). Focusing on the labour market effects of information and communication technologies (ICT), Michaels *et al.* (2014) extend this empirical evidence to sectors in Japan and nine European countries.

Prompted by the fact that the theoretically predicted labour market effects of trade and technological change are rather similar, there has been a debate which of the two is most responsible for growing levels of inequality. A recent study on the US by Autor *et al.* (forthcoming) pushes this debate forward by showing that the effects of trade and technological change actually differ. The authors find that sectors with a greater exposure to trade competition exper-

ience overall declines in employment. In contrast, technological change yields neutral effects on overall employment, but substantial compositional effects within sectors, as low-skilled employment declines and high-skilled employment grows. Hence, we expect that technological change has positive employment and wage effects for highly educated workers and negative employment and wage effects for lowly educated workers, without affecting the overall employment size of the exposed sector.

A third line of explanations for the variation in employment and wages, and one that is central in the current comparative political economy literature, emphasises the importance of labour market institutions. As employers and employees bargain over wages and other working conditions, the outcomes of these negotiations are a function of a country's system of labour relations and political power distributions (Kenworthy, 2001; Martin and Swank, 2012; Huber and Stephens, 2014). A first factor is the share of employees covered by wage bargaining agreements (Wallerstein, 1999). When more employees are covered by bargaining agreements, there is less variation in wages between workers. Hence, we expect bargaining coverage to be negatively associated with wage inequality.

In addition to the coverage, also the level of coordination of wage bargaining may affect labour market outcomes. In the wage inequality literature, the main hypothesis on this score is that countries with centralised systems of wage bargaining have a more compressed wage distribution. Centralised wage bargaining creates fewer and smaller wage differentials as more firms and industries are covered by the same wage settlements (Wallerstein, 1999; Rueda and Pontusson, 2000; Mahler, 2004). As the existing empirical evidence is based on country-level studies, it is an empirical question whether and how coordination affects wage inequality within sectors.

Moreover, the coordination of bargaining may also have employment effects. High wage settlements may have adverse effects on employment if wages are not in line with productivity. Hence, as multiple sectors are involved in the bargaining, the resulting wage settlement may harm employment in low-productivity sectors (Iversen and Wren, 1998). On the other hand, it could also be expected that in highly coordinated bargaining systems, the employment implications of wage determination are taken into account more explicitly by unions and employment organisations as norms of fairness and solidarity become more dominant (Soskice, 1991; Wallerstein, 1999).

Furthermore, labour market outcomes may be influenced by employment protection legislation (EPL). EPL increases the gap between employees with a permanent contract (insiders) and employees without a permanent contract (outsiders). The costs of dismissal increase with the strictness of EPL, which gives insiders bargaining power in wage setting (Lindbeck and Snower, 2001; Rueda, 2007). Hence, we expect that the strictness of EPL is positively related to earnings inequality. Moreover, EPL might also yield distributive effects between skill groups. Because of a substantial component of fixed costs, EPL

protects low-skilled workers more than high-skilled workers (Koeniger *et al.*, 2007).

Finally, the political ideology of governments might also have an impact on the wage dispersion. In the wage inequality literature, two effects are highlighted. First, since governments are extensively involved in private-sector wage setting in many advanced industrial countries, the ideology of governments might have a direct effect on wage inequality. Hence, left-wing governments can be expected to pursue greater wage inequality than liberal or conservative governments (Wallerstein, 1999). A second and more indirect argument is that governments might influence wages and employment through minimum wage legislation, taxes, and other forms of income policies. Again, it may be expected that left-wing governments adopt policies that lead to less inequality (Rueda and Pontusson, 2000; Pontusson *et al.*, 2002; Oliver, 2008).

3.3 Data, measures and method

3.3.1 Dependent variable

To examine the labour market effects of import and export competition at the sectoral level across countries and over time, we use multiple data sources. First, we analyse sectoral employment effects, using the relative employment size. This measure is defined as the number of employees in a sector divided by the number of employees in the national economy. Data are taken from the EU-KLEMS database (2011) that consists of harmonised data from national statistical institutes (Timmer *et al.*, 2010; O'Mahony and Timmer, 2009).[2] The effects of trade with China may vary across skill groups, but the EU-KLEMS data do not contain information on the skill levels of the employees. Yet, sectoral information on the share of hours worked per skill group is available. Following other studies (OECD, 2011a; Michaels *et al.*, 2014), we use this measure, relying on data from the EU-KLEMS March 2008 release.

In addition to the employment effects, we examine sectoral wage effects across different skill groups. We use the wage bill share per skill group, based on EU-KLEMS data. A second measure that we use to examine the wage effects is the level of earnings inequality within a sector, measured by the Gini index. Data come from the Leiden LIS Sectoral Income Inequality Dataset (Wang *et al.*, 2014a). This database is constructed on the basis of LIS micro data (LIS, 2014). It includes income from wages and self-employment for individuals aged between 25 and 54 across sectors. The analysis focuses on 17 sectors at

2 For Canada we have to use the EU-KLEMS March 2008 dataset.

the 2-digit International Standard Industrial Classification (ISIC) 3.1 level[3] across 18 capitalist countries[4] and utilises annual data for the years 1990-2007.[5]

3.3.2 Measuring Chinese trade competition

For our measure of exposure to Chinese import competition, we follow existing sectoral studies (Mahler *et al.*, 1999; Michaels *et al.*, 2013) and measure this as the value of the total imported goods as a share of the value added for sector i in country j in year t. This measure is the sectoral equivalent of imports as a share of GDP at the country level.[6] Data on imports come from the OECD STAN Bilateral Trade Database (2011b) and value added is taken from EU-KLEMS (2011).

To capture the Chinese competition in foreign markets p to which sectors export their goods, export competition for sector i in country j at time t is measured as follows:

$$\sum_{p}\left(\frac{\text{exports}_{ijpt}}{\text{exports}_{ijt}}\times\frac{\left(\text{Chinese exports}_{ipt}-\text{exports}_{ijpt}\right)}{\text{total exports}_{ipt}}\right) \tag{3.1}$$

The second part of equation 3.1 measures the difference in exports from the sector type i of China and country j to country p, relative to the total exports – from all countries – of sector type i to country p.[7] Hence, this measure

3 See Table A3.1 in the appendix for the ISIC codes. We leave out total manufacturing; and manufacturing of chemical, rubber, plastics, and fuel products (23t25) in our descriptives and regressions to avoid having sectoral overlap, as we include all constituent sectors separately.

4 Australia, Austria, Belgium, Canada, Czech Republic, Germany, Denmark, Spain, Finland, France, the UK, Ireland, Italy, Japan, the Netherlands, Portugal, Sweden, and the US.

5 The beginning is set by data availability on imports from China and the end is due to data availability from EU-KLEMS. Information on shares of hours worked per skill group is only available up to and including 2004.

6 As a simple test we calculate the correlation between total imports in value added at the country level from our database and imports of goods and services in percentages of GDP from World Bank National Accounts. The correlation is 0.93, with a comparable mean (32.0 versus 35.2 from the World Bank) and standard deviation (both 17.5).

7 We restrict our analysis to 59 partner countries as data for other countries contain too many missings. We calculate Chinese exports to each of the 59 partner countries at the sectoral level for our sample of countries individually as follows. We collect both export data reported by China at the sectoral level, and import data reported by each of the 59 partner countries at the sectoral level. The correlation between the two is 0.99. To maximise data availability, we first interpolate both time series. Next, we extrapolate the export data from China using the trend in import data from the separate partner countries. As a final check we calculate the percentage of (unweighted) values at the country partner sector year level larger than +1 and smaller than -1. These numbers would be the result of data differences in the combination of bilateral trade from multiple reporting countries, as it is substantively

indicates the difference between the export market shares of the sectors *i* from China and country *j* in country *p*. Subsequently, the pressure from the Chinese competition in the foreign market *p* depends on the relative importance of foreign market *p* for sector *i* in country *j*. Therefore, the competition in foreign market *p* is weighted by the first term of equation 3.1, which is the value of the exported goods from sector *i* in country *j* to country *p* divided by the total exports of sector *i* in country *j*.[8] An advantage of the export competition measure used in this study over the measures used by Autor *et al.* (2013) and Balsvik *et al.* (forthcoming), is that our measure accounts for the temporal variation in the exports from sector *i* in country *j*, whereas the other measures only include the initial market share of this sector. For the export competition measure, sectoral data from the OECD STAN Bilateral Trade Database are collected for 59 partner countries *p*, including all OECD countries, all European countries, the BRIICS, Malaysia, Pakistan, the Philippines, and Thailand, which amounts to little over half a million observations, covering around 85 per cent of all imports for our sample of countries.

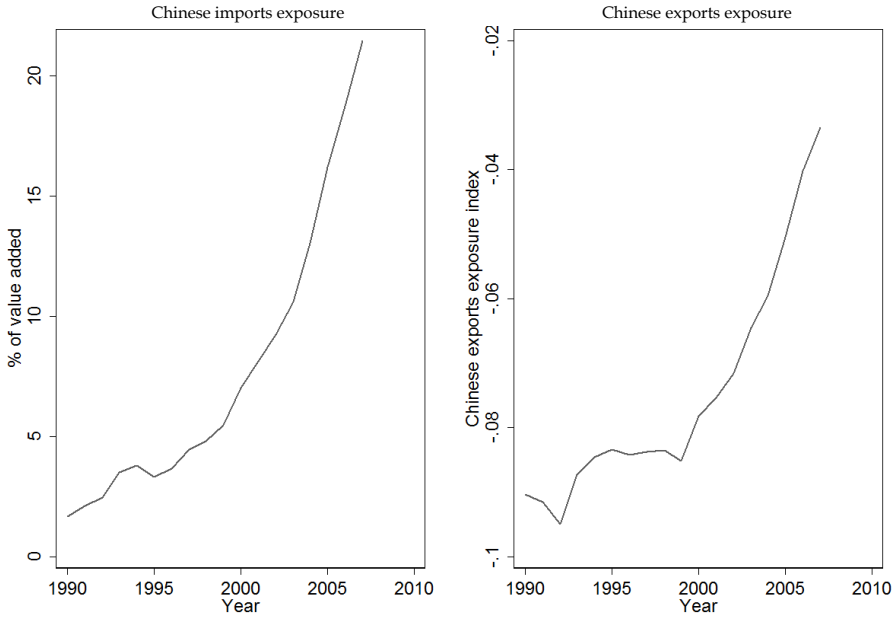
Figure 3.1 and Table 3.1 show that China is becoming an increasingly important trade partner for developed countries. Figure 3.1 presents averages for all sectors, whereas Table 3.2 presents trade exposure per sector averaged across countries. Between 1990 and 2007, the imports from China as a percentage of value added increased in all sectors but the mining industry. The export competition measure shows negative values for all sectors in 1990. This indicates that in the foreign markets, the value of the exports from the OECD countries is on average larger than the value of the Chinese exports. Over time, the exposure to Chinese competition has rapidly increased for exporting firms, as indicated by less negative values.

Interestingly, the exposure to import and export competition from China varies considerably across sectors. This is also reflected by a low correlation between the two measures (0.25). For instance, exposure to Chinese export competition in the electrical manufacturing sector increased between 1990 and 2007, whereas it hardly changed in the paper industry. However, exposure to Chinese imports in the home markets did increase substantially in the paper industry.

impossible that the difference between Chinese and home country's exports to a partner's sector divided by total exports to this partner's sector is larger than 1. The 0.2 per cent of all observations for which this is the case are changed to missings.

8 We make two amendments to this weighting factor to make sure it adds to 1 at the sector country year level. First, we multiply the weighting factor by the difference between total country exports and the sum of country exports to each individual country, since we 'only' collect data for 59 countries rather than to all countries. Second, for each indicator separately we correct for missing trade information from a partner country, which is only a minor adjustment (the correlation between the corrected and uncorrected series is above 0.97).

Figure 3.1 Evolution of Chinese imports and exports competition



Note Unweighted averages across all countries and sectors in our sample

Table 3.1 Imports and exports exposure

Sector	Exposure to imports from China (% value added)			Chinese exports exposure (index)		
	1990	2007	Change	1990	2007	Change
Agriculture	0.4	0.7	0.3	-0.08	-0.08	0.00
Mining	3.4	3.0	-0.4	-0.03	-0.05	-0.01
Total manufacturing	1.1	16.2	15.1	-0.09	0.00	0.09
Man. food	0.6	1.7	1.1	-0.08	-0.07	0.00
Man. textiles	10.4	128.6	118.2	-0.04	0.11	0.15
Man. wood	1.1	9.1	8.0	-0.10	-0.05	0.05
Man. paper	0.1	1.9	1.8	-0.13	-0.12	0.01
Man. coke, chemicals, rubber	0.7	6.2	5.5	-0.09	-0.06	0.03
Man. coke	0.5	2.0	1.5	-0.10	-0.12	-0.03
Man. chemicals	0.8	6.2	5.4	-0.08	-0.05	0.03
Man. rubber	0.8	12.0	11.3	-0.12	-0.05	0.08
Man. other non-metal	0.5	7.2	6.7	-0.11	-0.02	0.09
Man. basic metals	0.4	9.3	8.9	-0.10	-0.03	0.07
Man. machinery	0.6	17.3	16.7	-0.10	-0.01	0.09
Man. electrical	1.3	75.7	74.4	-0.08	0.08	0.16
Man. transport equip	0.1	5.4	5.3	-0.13	-0.08	0.05
Man. n.e.c	4.3	41.9	37.7	-0.07	0.04	0.11
Average (unweighted)	1.7	21.5	19.8	-0.09	-0.03	0.06

Source Trade data from OECD STAN Bilateral Database, value added from EU-KLEMS

3.3.3 Other independent variables

To account for effects of skill-biased technological change on employment and wages, we follow Michaels *et al.* (2014), Massari *et al.* (2013), and Wren (2013) and include ICT capital compensation as a share of sectoral value added from the EU-KLEMS dataset (2011).[9] We include two measures to account for wage-setting institutions, namely the bargaining coverage, which is defined as the proportion of employees covered by wage bargaining agreements, and the level of wage coordination.[10] Both measures are taken from the ICTWSS database (Visser *et al.*, 2013).[11] As a measure for the strictness of employment

9 As Michaels *et al.* (2014) also note, since capital compensation is calculated as a residual, it could be negative. We replace values by zeros if negative (3 per cent of total observations). We calculate the indicator by multiplying ICT capital compensation as a share of total capital compensation by capital compensation, and divide this by value added, where we have placed capital compensation and value added in real dollars using OECD information on exchange rates. We have to use the EU-KLEMS March 2008 version for Portugal.

10 We linearly interpolate the bargaining coverage rate.

11 For Ireland there are only 3 observations available for bargaining coverage in the fourth version of ICTWSS; the first observation is for 2000. We use the third ICTWSS version for this country and we interpolated the data. The correlation between the linearly interpolated series from the third and fourth version for the 9 overlapping observations is 0.89.

protection legislation, the EPL index from the OECD (2014a) is included. To analyse the impact of left-wing governments, we use the percentage of total cabinet posts held by left-wing parties from the Comparative Political Data Set (Armingeon *et al.*, 2012). Furthermore, employment and wages may be affected by cyclical dynamics. To control for these dynamics, we include a number of variables. At the sectoral level, we include the volume of gross value added. Data are taken from the EU-KLEMS dataset (2011). For more general economic conditions at the country level, we include the unemployment rate. As low-skilled workers are more substitutable than high-skilled workers, the bargaining position of low-skilled workers is more directly and more disadvantageously affected by unemployment (Pontusson *et al.*, 2002). Hence, unemployment can be expected to be positively associated with earnings inequality. Unemployment rates are taken from the OECD (2014b) Labour Force Statistics. Finally, we include real GDP per capita from the OECD (2014c) National Accounts.

Last, we include a measure of total excluding Chinese imports as a share of sectoral value added to account for the effect of other imports. Chinese imports and total excluding Chinese imports are substantively and empirically distinct, as indicated by a low correlation (0.14) and a much more rapid average rise of Chinese imports (15.2 instead of 2.0 per cent on average per year for our sample).

3.3.4 Method

An important issue in the analysis of time-series cross-section data is non-stationarity. Indeed, we find evidence for non-stationarity of our main variables.[12] The study relies on an error correction model, in which changes of the dependent variable are regressed on the lagged levels and the changes of the independent variables. Such a model is better able to cope with non-stationarity than specifications in levels only (Beck, 1991; De Boef and Keele, 2008). Given the nature of the data in many studies in comparative political economy, it is a conventional estimator in the field (Iversen and Cusack, 2000; Ansell and Gingrich, 2013; Wren *et al.*, 2013). In an error correction model, the lagged levels capture the long-term structural effects, whereas the changes capture the short-term transitory effects (Podestà, 2006). Hence, the estimated equation is:

12 We conduct Im-Pesaran-Shin tests for each of our time series individually, where the time trend and a lag structure are allowed to differ across time series. The lion's share of our time series suffers from stationarity. Further tests show that first differencing our variables removes the persistence in the majority of the time series for our variables.

$$\Delta y_{ijt} = \alpha_0 + \alpha_1 y_{ijt-1} + \beta_0 \Delta x_{ijt} + \beta_1 x_{ijt-1} + \beta_2 z_{it-1} + \varepsilon_{ijt} \quad (3.2)$$

Here, Δy_{ijt} denotes the first difference in the dependent variable in sector i in country j and year t; α_0 is the intercept and ε_{ijt} is the error term. For the vector of independent variables x_{ijt} the short-term effects are indicated by β_0. The long-term effects are indicated by $\beta_1/-\alpha_1$.

To analyse the data, the study relies on OLS regression analyses. The main model does not include sector or country fixed effects, since the inclusion of both a lagged dependent variable and unit dummies renders the estimator inconsistent (Nickell, 1991). Nevertheless, estimating the model with sector or country dummies generally replicates the main results. Despite the fact that the lagged dependent variable absorbs autocorrelation in the error term, Breusch-Godfrey tests indicate that there is still autocorrelation left. Therefore, the error term is specified to follow a panel-specific AR(1) process. In addition, we use panel-corrected standard errors to correct for panel-heteroskedasticity and contemporaneous spatial correlation (Beck and Katz, 2011).

3.4 Empirical analysis

3.4.1 Employment effects

The results of estimation of employment effects are presented in Table 3.2. Model 1 starts with the analysis of the relative employment size of a sector, defined as the number of people working in a sector divided by people working in the national economy. As this ratio sums to one for each country-year observation, we leave out country-level variables as they lose their interpretation.[13] Our findings indicate that Chinese imports are negatively associated with the employment size.[14] This result provides empirical support for the hypothesis that imported Chinese goods substitute domestically produced goods leading to negative employment effects. The employment effects of total imports excluding Chinese imports are comparable but smaller. Models 2 and 3 show that the negative employment effects from Chinese imports mainly impinge on low-skilled workers. Exposure to Chinese export competition seems to have a negative effect on overall employment, but only in the short run as the coefficient for the lagged level is not significant. For low-skilled workers, there is a negative effect of Chinese export competition on their hours worked. In sectors that are exposed to strong competition from

13 Our results hardly change when we include the labour market institutions: import competition becomes insignificant whilst export competition becomes significant.

14 Our main results do not change when we restrict our analysis to the 3777 observations for which we also have information on share of hours worked per skill group. Total excluding Chinese imports become insignificant.

China in their foreign export markets, there is less work for lowly educated workers. Interestingly, there is more work for highly educated workers in these sectors. In response to the increased competition, firms seek to increase their productivity and highly educated workers benefit from this.

With respect to technological change, the results indicate that there is no significant association between technological change and the employment size of sectors. Nevertheless, technological change is negatively related to the share of hours worked by lowly educated workers and it is positively related to the share of hours worked by highly educated workers. Taken together, these results lend support to the argument that technological change alters the composition of employment within sectors rather than the overall employment size of sectors. In sectors with greater skill-biased technological change, the number of low-skilled jobs declined whilst the number of high-skilled job increased.

Among the institutional variables, EPL is positively associated with the share of hours worked by lowly educated workers, whereas it is negatively associated with the share of working hours of the highly educated workers. In line with our expectation, these results indicate that EPL provides more protection for low-skilled workers than for high-skilled workers. For the coordination of wage bargaining, we find a negative association with the share of working hours of low-skilled workers. The coverage of wage bargaining and the political ideology of governments do not yield significant employment effects.

Turning to the economic control variables, the unemployment rate is negatively associated with the share of hours worked by low-skilled workers, whereas it is not significantly associated with the share of hours worked by high-skilled workers. These results are in line with the theoretical argument that unemployment affects the labour market position of low-skilled workers more adversely than the position of high-skilled workers. Furthermore, the results provide some evidence for positive employment effects of the value added and GDP per capita.

Table 3.2 Chinese import and export competition and employment

	Δ Relative employment size	Δ Share of hours worked low-skilled	Δ Share of hours worked high-skilled
	(1)	(2)	(3)
Δ Chinese imports (x 10^{-1})	-0.177	7.317	2.513
	(0.535)	(0.286)	(0.432)
Chinese imports (t-1) (x 10^{-1})	-0.259**	-4.612*	-0.631
	(0.039)	(0.061)	(0.588)
Δ Chinese exports comp	-0.141**	0.060	0.111
	(0.015)	(0.964)	(0.924)
Chinese exports comp (t-1)	0.001	-0.782**	0.596***
	(0.787)	(0.018)	(0.000)
Δ Total excluding Chinese imports (x 10^{-1})	0.001	0.167**	0.054
	(0.489)	(0.014)	(0.671)
Total excluding Chinese imports (t-1) (x 10^{-1})	-0.003**	0.008	0.018
	(0.019)	(0.782)	(0.797)
Δ Technology	-0.048	2.605	-0.091
	(0.699)	(0.328)	(0.971)
Technology (t-1)	-0.012	-3.114***	3.073***
	(0.875)	(0.000)	(0.004)
Δ Value added	0.028***	0.070	0.101
	(0.005)	(0.495)	(0.265)
Value added (t-1)	0.004	0.009	0.194***
	(0.655)	(0.910)	(0.005)
Bargaining coverage (t-1)		-0.007	0.001
		(0.148)	(0.394)
Bargaining coordination (t-1)		-0.136**	0.022
		(0.032)	(0.435)
Left government (t-1)		0.001	-0.000
		(0.593)	(0.408)
EPL (t-1)		0.436***	-0.103*
		(0.009)	(0.081)
Unemployment rate (t-1)		-0.028**	0.002
		(0.037)	(0.784)
GDP per capita (x 10^{-3}) (t-1)		0.023***	-0.005
		(0.004)	(0.494)
Lagged dependent variable	-0.026***	-0.012**	0.009
	(0.000)	(0.014)	(0.208)
Constant	0.007	-1.014***	0.262
	(0.525)	(0.001)	(0.373)
N	4270	3777	3777
Adjusted R^2	0.12	0.18	0.08

Note Error correction model with panel-corrected standard errors and panel-specific AR(1) structure. 1990-2007 for the relative employment size, 1990-2004 for the shares of hours worked low- and high-skilled. P-values in parentheses, *p<0.1, **p<0.05, ***p<0.01

3.4.2 Wage effects

Table 3.3 presents the results of the regression analyses of wage bill shares. Exposure to Chinese export competition is negatively associated with the wages

of low skilled workers, whereas it is positively associated with the wages of high skilled workers. In line with the results for the employment effects, these results indicate that sectors with great exposure to Chinese export competition face substantial distributive effects. Furthermore, Chinese imports do not reach significance in these analyses. This suggests that the distributive effects of Chinese imports run via employment rather than via wages, as we predicted from our theoretical section for our set of countries with more rigid labour market institutions (Balsvik *et al.*, forthcoming).

Table 3.3 Chinese import and export competition and wage bill shares

	Δ Wage bill share low-skilled	Δ Wage bill share high-skilled
	(1)	(2)
Δ Chinese imports (x 10^{-1})	3.130	6.414
	(0.557)	(0.137)
Chinese imports (t-1) (x 10^{-1})	-2.592	-0.908
	(0.129)	(0.670)
Δ Chinese exports comp	1.647	-0.673
	(0.182)	(0.754)
Chinese exports comp (t-1)	-0.773***	0.537*
	(0.007)	(0.056)
Δ Total excluding Chinese imports (x 10^{-1})	0.183***	0.023
	(0.009)	(0.907)
Total excluding Chinese imports (t-1) (x 10^{-1})	0.026	0.022
	(0.512)	(0.865)
Δ Technology	2.990	0.025
	(0.232)	(0.995)
Technology (t-1)	-2.472***	3.540**
	(0.000)	(0.015)
Δ Value added	0.124	0.050
	(0.122)	(0.637)
Value added (t-1)	0.025	0.168*
	(0.620)	(0.071)
Bargaining coverage (t-1)	-0.005	0.000
	(0.313)	(0.973)
Bargaining coordination (t-1)	-0.147***	0.026
	(0.000)	(0.569)
Left government (t-1)	0.001	-0.001
	(0.529)	(0.418)
EPL (t-1)	0.461***	-0.110
	(0.001)	(0.357)
Unemployment rate (t-1)	-0.025**	0.008
	(0.016)	(0.618)
GDP per capita (x 10^{-3}) (t-1)	0.024***	-0.002
	(0.000)	(0.859)
Lagged dependent variable	-0.019***	0.004
	(0.000)	(0.627)
Constant	-1.195***	0.439
	(0.000)	(0.444)
N	3777	3777
Adjusted R^2	0.21	0.06

Note Error correction model with panel-corrected standard errors and panel-specific AR(1) structure, 1990-2004. P-values in parentheses, *p<0.1, **p<0.05, ***p<0.01

For technological change, the results indicate a negative effect for low-skilled workers and a positive effect for high-skilled workers. As expected, skill-biased technological change increases the differences in wages between lowly and highly educated workers. As to EPL, the results suggest that it is mainly the low-skilled workers who benefit from the increased bargaining power. The results for the unemployment rate correspond to the estimations of the employment effects. Low-skilled workers are more severely affected by high levels of unemployment and this culminates in negative wage effects.

Subsequently, we analyse Gini coefficients to examine the distributive consequences of Chinese trade competition. This allows us to tap into levels of inequality at the sectoral level. Yet, as these estimations rely on LIS instead of EU-KLEMS data for this measure, the set of sectors and countries is different and the number of observations is substantially smaller.[15] Even though this alters some of our results since we lose power and as outliers become more influential, our main results remain visible.

The results in Table 3.4 show that sectors that are more exposed to imports from China are characterised by more dispersed earnings. This corresponds to our previous findings presented in Table 3.2 and 3.3. Furthermore, we see that exposure to total imports excluding those from China are negatively rather than positively related to intrasectoral inequality, suggesting that the labour market effects of Chinese imports differ from those of imports in general. The coefficient is very small. In model 1, the long-run effect of Chinese export competition – the coefficient of the lagged level – does not reach significance. The coefficient of the first difference suggests even a negative effect in the short run. However, a jack-knife analysis presented in Table A3.2 (appendix) indicates that these results are driven by a single country, the US[16] Model 2 shows that when the US are not included, the long-run effect of Chinese export competition is positive and strongly significant. This indicates that export competing sectors are characterised by greater earnings inequality. The US has a disproportional effect on the coefficients with 20 per cent of the observations. The country combines high levels of inequality with a large domestic market with relatively low overall levels of exports.

15 For the LIS data we have to lump together the manufacturing of coke (23), manufacturing of chemicals (24), and manufacturing of rubber (25). The same holds for the manufacturing of machinery and equipment not elsewhere classified (29) and electrical and optical equipment (30t33). The included country-waves are: Czech Republic (1996 and 2004), Finland (1991, 1995, 2000, 2004, 2007), Germany (1994, 2000, 2004, 2007), Denmark (1992, 1995, 2000, 2004), the UK (1999, 2004, 2007), Ireland (1994-1996 which is combined to one wave, with earnings corrected for inflation, 2004, 2007), Sweden (1992, 2000, 2005), and the US (1991, 1994, 2000, 2004, 2007). We move away from an annual model to one in which available waves are directly linked over time (so for Czech Republic the dependent variable is the difference in first order corrected Gini between 1996 and 2004, and lagged levels refer to 1996).

16 Our other main findings hardly change when we conduct a jack-knife analysis.

Interestingly, we do not find robust evidence for inequality-enhancing effects of skill-biased technological change, as the coefficient for technological change does not reach significance. The difference between these and our previous estimations of employment and wages could be due to the lower number of observations here. In line with our hypothesis, the results indicate that higher degrees of bargaining coverage are associated with lower levels of earnings inequality. When more employees are included in the wage settlements, there are smaller and fewer wage differentials between employees. The fact that we do not find significant effects for bargaining coverage in the estimations presented above indicates that bargaining coverage can explain the variation in earnings inequality better than the variation in employment or wage shares. The positive effects for EPL suggest that stricter EPL contributes to segmented labour markets with greater earnings inequality between insiders and outsiders. The positive effect of the coordination of wage bargaining contradicts our expectation and the findings in earlier studies. This is probably a reflection of the mechanism that coordination tends to link wages across sectors and therefore reduces inequality at the country level rather than within sectors. Unemployment increases earnings inequality, which corresponds with the results that unemployment is mainly detrimental to low-skilled workers.

Table 3.4 Chinese import and export competition and intrasectoral earnings inequality

	Full sample	Without US
	(1)	(2)
Δ Chinese imports (x 10^{-1})	-0.022	-0.071
	(0.951)	(0.876)
Chinese imports (t-1) (x 10^{-1})	0.787***	0.774**
	(0.007)	(0.045)
Δ Chinese export comp	-0.152***	-0.136
	(0.000)	(0.155)
Chinese export comp (t-1)	0.014	0.096***
	(0.444)	(0.006)
Δ Total excluding Chinese imports (x 10^{-1})	0.011	0.004
	(0.616)	(0.879)
Total excluding Chinese imports (t-1) (x 10^{-1})	-0.056***	-0.066***
	(0.000)	(0.000)
Δ Technology	-0.081	-0.038
	(0.862)	(0.943)
Technology (t-1)	-0.215	-0.146
	(0.220)	(0.464)
Δ Value added	0.001	0.000
	(0.880)	(0.968)
Value added (t-1)	-0.002	-0.005
	(0.692)	(0.410)
Bargaining coverage (t-1)	-0.002***	-0.002***
	(0.000)	(0.000)
Bargaining coordination (t-1)	0.011***	0.009**
	(0.004)	(0.029)
Left government (t-1)	0.000	0.000
	(0.140)	(0.173)
EPL (t-1)	0.014**	0.028***
	(0.021)	(0.000)
Unemployment rate (t-1)	0.003***	0.003***
	(0.005)	(0.000)
GDP per capita (x 10^{-3}) (t-1)	0.001***	0.002***
	(0.001)	(0.000)
Lagged dependent variable	-0.432***	-0.462***
	(0.000)	(0.000)
Constant	0.132***	0.111***
	(0.000)	(0.000)
N	250	202
Adjusted R^2	0.42	0.45

Note Error correction model with panel-corrected standard errors and panel-specific AR(1) structure, 1990-2007. P-values in parentheses, *p<0.1, **p<0.05, ***p<0.01

3.4.3 Sensitivity analysis

We perform a number of additional tests to examine the robustness of our results. First, we account for other emerging economies to examine the uniqueness of the Chinese trade competition. The sum of imports from India, Malaysia, Mexico, the Philippines, and Thailand – which is lower and grew

less than the imports from China – is never significant in the regressions and it does not affect our main results. In the regressions on earnings inequality, the coefficient for the lagged level of Chinese export competition becomes also significant when the US is included.

Furthermore, the rise of the Chinese economy may not only increase the competition for sectors in OECD countries, it may also increase the exports of these sectors to China, which could have positive employment effects. To account for these effects, we use two measures, namely the exports to China and the net imports from China, defined as imports from China minus exports to China. The coefficients for exports to China are never significant, whilst employing net imports leads to fully comparable findings as presented above.

Another aspect of globalisation that might have distributive consequences is the increased international flows of capital, although the economic theory on such effects is developed less (Mahler, 2004; but see Burgoon and Raess, 2014). As in other recent inequality studies (e.g. Michaels *et al.*, 2014), capital flows are not included in our main analyses, because there is only limited bilateral data on capital at the sectoral level. Utilising the limited data available (OECD, 2014d), we run regressions with the total foreign direct (FDI) investment positions, inflows, and outflows. None of these variables reaches significance, nor does including these variables affect the main results for the other variables.

3.5 Conclusions

With the rapid expansion of the Chinese economy, the international trade arena has changed substantially for manufacturing sectors in Western countries in the last two decades. Yet, to date this surge of China has not received much attention in comparative political economy on inequality. We contribute to our understanding of the effects of Chinese trade competition by analysing employment and wage effects for a broad set of advanced industrialised democracies. We use sectoral measures of Chinese trade competition between 1990 and 2007 for 18 countries. Moreover, we include a measure that taps into export competition stemming from China.

Accounting for institutional variation across countries, our analysis shows employment declines in sectors that are more exposed to imports from China. Furthermore, effects on wages and employment are not equally shared across skill levels, as we hypothesised. The lowly educated workers bear the brunt of the substitution of domestic production by Chinese imports. This translates into higher levels of earnings inequality in sectors that compete more strongly with Chinese imports.

Existing studies report distributive effects of Chinese imports on employment levels in the US and Norway, whilst wage effects are only found in the US (Autor *et al.*, 2013; Balsvik *et al.*, forthcoming). Our study generalises these

findings to a set of 18 OECD countries with diverse labour market institutions. The distributive effects of Chinese import competition are channelled through employment rather than wages.

With respect to the increased competition from China in foreign export markets, our results show distributive effects. This implies that current accounts where competition for exporting sectors is neglected leads to underestimation of the distributional effects of trade competition. Sectors with greater exposure to export competition experience declines in employment and wages for low-skilled workers and rises in employment and wages for high-skilled workers. The production work of low-skilled workers is substituted by Chinese exports, resulting in a lower demand for low-skilled labour. For the high-skilled workers, our results tend to support earlier findings for the United Kingdom indicating that stronger competition triggers innovation and productivity increasing activities in exporting sectors, which increases the demand and so employment and wages for high-skilled workers (Bloom *et al.*, 2012).

Skill-biased technological change is often put forward as an additional determinant of rising earnings dispersion. We find neutral effects of technological change on the overall employment size of sectors. However, in sectors with greater technological innovation, we find negative employment and wage effects for low-skilled workers and positive employment and wage effects for high-skilled workers. Interestingly, these findings suggest that the effects of Chinese trade competition in the US which have recently been found by Autor *et al.* (forthcoming) also apply to other OECD countries. Technological change has merely distributive consequences, whereas international trade is also related to overall declines in employment.

More generally, our study stresses the importance of considering the substantial differences in Chinese imports and overall globalisation, and the large variation in exposure across sectors. Theoretically, we would expect trade competition from China to have particularly strong distributive effects given its large volume of low-wage labour. Our empirical evidence supports this. Our sectoral approach acknowledges the substantial variation in wages and employment on the one hand, and the exposure to Chinese imports and technological change on the other. A sectoral approach seems to be a fruitful direction for the analysis of the determinants of the widely observed trend of increasing inequality across OECD countries over the past decades. Future research could shed more light on employment shifts between sectors when detailed micro-level panel data becomes available.

APPENDIX 3.1 – SECTORAL DEFINITIONS

Table A3.1 Sectors

ISIC code	Full name
AtB	Agriculture, Hunting, Forestry and Fishing
C	Mining and Quarrying
D	Total Manufacturing
15t16	Food products, Beverages and Tobacco
17t19	Textiles, Textile Products, Leather and Footwear
20	Wood and Products of Wood and Cork
21t22	Pulp, Paper, Paper Products, Printing and Publishing
23t25	Chemical, Rubber, Plastics and Fuel Products
23	Coke, Refined Petroleum Products and Nuclear Fuel
24	Chemicals and Chemical Products
25	Rubber and Plastics Products
26	Other Non-Metallic Mineral Products
27t28	Basic Metals and Fabricated Metal Products
29	Machinery and Equipment, not elsewhere classified
30t33	Electrical and Optical Equipment
34t35	Transport Equipment
36t37	Manufacturing not elsewhere classified; Recycling

APPENDIX 3.2 – SENSITIVITY TEST

Table A3.2 Effects of dropping a country for intrasectoral earnings inequality

	Full sample (1)	Without CZE (2)	Without DEU (3)	Without DNK (4)	Without FIN (5)	Without GBR (6)	Without IRL (7)	Without SWE (8)	Without USA (9)
Δ Chinese imports (x 10^{-1})	-0.022 (0.951)	-0.456 (0.285)	0.023 (0.950)	0.689*** (0.000)	0.041 (0.927)	-0.086 (0.834)	0.034 (0.915)	-0.051 (0.892)	-0.071 (0.876)
Chinese imports (t-1) (x 10^{-1})	0.787*** (0.007)	1.144*** (0.004)	0.596** (0.011)	0.502*** (0.000)	0.725** (0.040)	0.833*** (0.006)	0.779*** (0.001)	0.734** (0.020)	0.774** (0.045)
Δ Chinese export comp	-0.152*** (0.000)	-0.118*** (0.000)	-0.106*** (0.002)	-0.205*** (0.000)	-0.202*** (0.000)	-0.142*** (0.000)	-0.152*** (0.000)	-0.140*** (0.000)	-0.136 (0.155)
Chinese export comp (t-1)	0.014 (0.444)	-0.019 (0.511)	0.034 (0.292)	0.019 (0.486)	-0.005 (0.869)	0.026 (0.254)	0.002 (0.929)	0.024 (0.348)	0.096*** (0.006)
Δ Total excluding Chinese imports (x 10^{-1})	0.011 (0.616)	0.013 (0.535)	0.022 (0.473)	0.021 (0.432)	0.044*** (0.000)	0.010 (0.650)	0.012 (0.626)	-0.011 (0.620)	0.004 (0.879)
Total excluding Chinese imports (t-1) (x 10^{-1})	-0.056*** (0.000)	-0.051*** (0.000)	-0.048*** (0.000)	-0.065*** (0.000)	-0.097*** (0.000)	-0.060*** (0.000)	-0.051*** (0.000)	-0.033*** (0.000)	-0.066*** (0.000)
Δ Technology	-0.081 (0.862)	-0.367 (0.367)	0.149 (0.661)	0.450 (0.263)	-0.058 (0.914)	-0.131 (0.804)	-0.420 (0.395)	-0.142 (0.754)	-0.038 (0.943)
Technology (t-1)	-0.215 (0.220)	-0.264 (0.217)	-0.150 (0.235)	-0.182 (0.146)	-0.101 (0.447)	-0.227 (0.214)	-0.236* (0.098)	-0.155 (0.486)	-0.146 (0.464)
Δ Value added	0.001 (0.880)	0.007** (0.026)	0.000 (0.957)	-0.000 (0.941)	0.004 (0.303)	0.001 (0.829)	-0.007 (0.306)	-0.006 (0.455)	0.000 (0.968)
Value added (t-1)	-0.002 (0.692)	-0.004 (0.326)	0.001 (0.753)	-0.003 (0.592)	-0.023*** (0.000)	-0.002 (0.611)	0.007 (0.115)	0.003 (0.262)	-0.005 (0.410)
Bargaining coverage (t-1)	-0.002*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.002*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.002*** (0.000)	-0.002*** (0.000)
Bargaining coordination (t-1)	0.011*** (0.004)	0.013*** (0.006)	0.009*** (0.003)	0.007** (0.027)	0.020*** (0.000)	0.009*** (0.002)	0.010* (0.095)	0.012*** (0.000)	0.009** (0.029)
Left government (t-1)	0.000 (0.140)	0.000 (0.116)	-0.000 (0.756)	0.000 (0.367)	0.000* (0.080)	0.000** (0.016)	0.000 (0.175)	0.000 (0.511)	0.000 (0.173)
EPL (t-1)	0.014** (0.021)	0.003 (0.805)	-0.002 (0.812)	0.018** (0.012)	0.020*** (0.000)	0.010* (0.082)	0.011* (0.064)	0.015* (0.051)	0.028*** (0.000)
Unemployment rate (t-1)	0.003*** (0.005)	0.004*** (0.003)	0.001 (0.250)	0.001 (0.100)	0.000 (0.753)	0.002*** (0.001)	0.003** (0.011)	0.004*** (0.001)	0.003*** (0.000)
GDP per capita (x 10^{-3}) (t-1)	0.001*** (0.001)	0.001*** (0.004)	0.000 (0.983)	0.002*** (0.001)	0.001*** (0.000)	0.001** (0.047)	0.001* (0.059)	0.001*** (0.003)	0.002*** (0.000)
Lagged dependent variable	-0.432*** (0.000)	-0.420*** (0.000)	-0.351*** (0.000)	-0.486*** (0.000)	-0.567*** (0.000)	-0.437*** (0.000)	-0.445*** (0.000)	-0.430*** (0.000)	-0.462*** (0.000)
Constant	0.132*** (0.000)	0.093*** (0.000)	0.144*** (0.000)	0.130*** (0.000)	0.197*** (0.000)	0.156*** (0.000)	0.134*** (0.000)	0.128*** (0.000)	0.111*** (0.000)
N	250	238	214	204	202	226	226	238	202
Adjusted R^2	0.42	0.46	0.42	0.44	0.46	0.43	0.41	0.42	0.45

Note Error correction model with panel-corrected standard errors and panel-specific AR(1) structure. P-values in parentheses. *p<0.1. **p<0.05. ***p<0.01

4 Is it the income distribution or redistribution that affects growth?[1]

Abstract

This chapter addresses the central question in political economy how the objectives of attaining economic growth and restricting income inequality are related. Thus far few studies explicitly distinguish between effects of income inequality as such and effects of redistributing public interventions to equalise incomes on economic growth. In fact, most studies rely on data that do not make this distinction properly and in which top-coding is applied so that enrichment at the top end of the distribution is not adequately captured. This study aims to contribute using a pooled time-series cross-section design covering 29 countries, using OECD, LIS, and World Top Income data. No robust association between inequality and growth or redistribution and growth is found. Yet there are signs for a positive association between top incomes and growth, although the coefficient is small and a causal interpretation does not seem to be warranted.

4.1 Introduction

The attainment of economic growth and the restraining of income inequality are amongst the most important socio-economic objectives of welfare states. Economic expansion implies a higher aggregate standard of living and more utility-enhancing consumption possibilities for society as a whole. The goal of limiting income inequality pertains more to ideological concepts of fairness, humanitarianism and equality of human beings. Rawls (1971), for example, argues that societies should have 'fair equality of opportunities', enabling every citizen to pursue personal goals, not limited beforehand by financial con-

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straints. In addition, the objective of limiting inequality is generally linked to the provision of a certain level of income security guaranteed by the state.

The question of what the core objectives of society should be is largely ideological. Conversely, how the objectives of economic growth and limited income inequality can be reached is a more technical question, although not less contested in academic and political debates. The crux here is whether states are able to stimulate economic growth whilst at the same time limit income inequality through their policies – or the absence of them. To attain high economic growth, policies should not have too high costs in terms of forgone output, and the (financing of) public expenditures should not negatively affect incentives beneficial to growth (OECD, 2012d). Limiting income inequality requires that state actions are relatively more beneficial to people with low income more in the long run.

States play an important role in alleviating inequality by redistributing income (Brady, 2003). The general view in economics, however, is that redistribution based on economic outcomes such as income reduces marginal benefits of gaining wealth, leading to lower incentives, which retards growth. Okun (1975) coins this the 'big trade-off ', as this negative effect of redistribution on the attainment of growth 'plagues us in dozens of dimensions of social policy'. The alleged trade-off is considered to be the primary problem for the contemporary welfare state by many politicians and researchers (Pierson and Castles, 2006; Sapir, 2006).

Another branch in political economy has focussed on the effects of income inequality on economic development (e.g., Voitchovsky, 2005; Barro, 2008). Inequality can affect growth by leading to more social unrest or by inhibiting people lacking financial means to invest in themselves to realise their potential, although it could also incite people to put forth additional efforts as the relative benefits are higher.

We might thus expect an effect from the income distribution as well as from the policies put in place to equalise incomes on economic growth. Yet surprisingly, few studies properly distinguish between those two effects. In the substantial amount of literature on the effects of income inequality on growth, hardly any study also takes into account effects through the redistributive system which might cause bias due to omitted variables (e.g., Aghion *et al.*, 1999; Banerjee and Duflo, 2003; Barro, 2008); a similar story holds for the redistribution to growth literature (e.g., Romer and Romer, 2010). In fact, in the often used Deininger and Squire (1996) database, no consistent distinction is made between the income distribution before and after government intervention through taxes and transfers (Banerjee and Duflo, 2003, p. 284). Moreover, studies generally only cover generic measures of inequality across the population in which top- and bottom-coding are applied. In this way, enrichment at the top, an important development in inequality, is left out of the analysis (Atkinson *et al.*, 2011).

This study investigates the associations between economic growth on the one hand and inequality and redistribution on the other; a primary problem for the contemporary welfare state and a question in which political science and economics collide (Pierson and Castles, 2006; Sapir, 2006; Lübker, 2007). The possible negative economic effects of the current widespread rise in inequality have also been expressed recently by international organisations (e.g., OECD, 2011a, 2012d, 2012e; ILO, 2012). Employing a pooled time-series cross-section design of a total of 29 OECD countries and using data from OECD and Luxembourg Income Study (LIS) that accurately differentiate between disposable and market income, this study does not find robust associations between generic measures of income inequality and economic growth, nor between redistribution and economic growth. Yet employing recently collected data from the World Top Incomes Database (Alvaredo *et al.*, 2012), this study finds signs for positive associations between the share of income held by the top end of the distribution and economic growth, although the coefficients are small.

4.2 THEORETICAL SECTION

4.2.1 Inequality and growth

Four main channels through which inequality can affect economic growth can be discerned in the existing literature. They all focus on actual income or income differences between people, and thus should be tested using inequality figures after taxes and transfers. Two lines of reasoning predict a positive effect. First, higher dispersion can incite people to put forth additional effort or to invest in their human capital, as the rewards of this additional effort are higher compared to the situation in an egalitarian society. Rooth and Stenberg (2011) provide exploratory evidence that income inequality in Swedish regions increased economic growth by stimulating commuting patterns. Within firms, a higher wage dispersion can enhance productivity (Mahy *et al.*, 2011). Second, if high income classes have higher marginal propensities to save, and if the rates of savings and investment are positively related, more unequal societies will grow relatively faster (Castelló-Climent, 2010). It could also be that a concentration of capital is crucial for the construction of new activities with high set-up costs (Galor and Tsiddon, 1997). Possibly, because of the internationalisation of the capital market, the relationship between inequality and savings has weakened. Firms in countries with lower saving rates can rely on the savings available in other countries to finance their investments.

Two reasons are commonly put forward for why inequality can slow down growth. First, more unequal societies might be less socio-politically stable as inequality lowers costs of participating in disruptive actions. This can reduce the security of property and contract rights and, ultimately, discourage invest-

ment (Keefer and Knack, 2002). Within this literature, a specific manifestation of inequality – called 'polarisation' by Esteban and Ray (2011) or in the international relations literature more commonly referred to as 'horizontal inequality' (e.g., Østby, 2008; Cederman *et al.*, 2011) – is said to be an important determinant of (growth-disrupting) tensions and civil war. Rather than inequality between individuals, these indicators refer to inequalities between certain (ethnic) groups. Yet inequalities between groups may play a less important role in affecting economic growth in developed countries because property rights are relatively well secured (Barro, 2008). In addition, data for developed countries on these measures are not universally available.[2] More tailored to developed countries, a number of arguably less mainstream studies claim that inequality has been a root cause of the current financial crisis by leading to structural economic imbalances. According to this perspective, increasing shareholder power and capital share of income, both manifested in higher levels of inequality, has led to a financial bubble and high levels of household debt, which eventually burst, severely affecting gross domestic product (GDP) (Hein, 2011; Stockhammer, 2013; Van Treeck, 2014). A second channel pertains to the alleged negative effects of inequality on the stock of human capital. Credit market imperfections inhibit people lacking financial means to fully realise their potential, dampening investment in human capital and overall knowledge building, thereby reducing economic output. As the economic importance of schooling has increased in current knowledge-based economies, this channel might have become more imperative (Galor, 2011).

It could be that developments at the top end of the distribution have distinctive effects on economic growth (Voitchovsky, 2005). The lines of reasoning about why inequality might stimulate growth might also hold for the level of concentration at the top end of the income distribution (Andrews *et al.*, 2011). High rewards can incite people to invest, and in particular, a concentration of asset ownership could facilitate large investments. Regarding negative effects, there is no reason to expect that high top income shares are associated with lower average stocks of human capital, which could be the case for inequality across the society. Yet it could be that the rich use their wealth to lobby for rent-seeking policies that disrupt growth (see also Hacker and Pierson, 2010).

A difficulty in understanding the consequences of inequality on growth is the possibility of reverse effects. Unless all people benefit in equal proportions to their income, growth itself also affects the income distribution. Growth might benefit the poor by leading to higher tax revenues and higher demands for goods produced by low-income groups, although other scholars

2 Esteban *et al.* (2007) calculate polarisation measures for five countries over time, whilst Duclos *et al.* (2004) consider a larger subset of developed countries, but only at two points in time. Also horizontal inequality data sets generally address (grids within) developing countries and are limited across time (Østby, 2008; Cederman *et al.*, 2011).

do not find evidence for this trickling down (Kenworthy, 2010). Famously, Kuznets (1955) argues that the long-term effect of growth on inequality shows an inverted U-shape pattern. During initial phases of development only part of the labour moves towards modern sectors, leading to a higher wage dispersion, whilst the rest lags behind. Eventually more and more people become active in this modern sector, leading to a catch-up and a more equalised distribution. In this sense, economic growth is the forerunner of income equality.

4.2.2 Redistribution and growth

Not only the level of inequality but also the policies put in place to equalise incomes through means-tested transfers or progressive taxing to finance public expenditures might affect growth (Goudswaard and Caminada, 2010). According to the well-known trade-off argument, the alteration of market outcomes by public redistribution leaves people to change their behaviour by reducing financial incentives to gain individual wealth (Allegrezza *et al.*, 2004). With lower marginal returns to work, substitution to leisure becomes more attractive. A related argument is that public provision, for example, in the form of unemployment benefits, can make people dependent on government support. The very creation of unemployment benefits might lead to higher unemployment rates, as people are less inclined to seek jobs (Kenworthy, 2003; Bassanini and Duval, 2006).

Empirical evidence for the trade-off hypothesis on the macro level is more mixed (see also the empirical literature overview in Online Appendix 1 of the *Socio-Economic Review* publication). Romer and Romer (2010) present macroeconomic evidence for 'exogenous tax changes' in the USA, which are fiscal changes implemented to influence long-term growth rather than short-term counter-cyclical reactions, using a VAR model. They estimate that a 1 per cent increase in exogenous tax lowers growth with 2.5 per cent permanently. Conversely, Lindert (2004) stresses that the welfare state is a free lunch. He shows that growth patterns of strongly redistributing states, for instance Sweden, have not been surpassed by economic growth in more liberal states such as the USA or the UK. According to Lindert, generous welfare states have come up with strategies to minimise behavioural changes, most notably by universal provision instead of means testing, and by relying on taxes for which elasticities are relatively low. According to Kenworthy (2003), the negative effects of public intervention on employment also prove better than expected from the trade-off argument. He only reports a weak negative effect of higher replacement rates on employment.

Other arguments focus on the alleged lower effectiveness of public allocation of recourses. Reallocation increases transaction costs, as aptly captured by Okun's (1975) metaphor of a leaky bucket: 'The money must be carried

from the rich to the poor in a leaky bucket. Some of it will simply disappear in the transit, the poor will not receive all the money that is taken from the rich'.

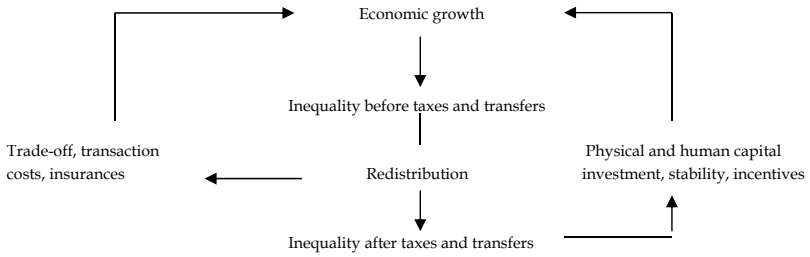
Public policies that potentially have redistributing effects may facilitate growth by publicly providing for insurances against risks, such as unemployment, disabilities and old age, that markets cannot (efficiently) provide for (Boadway and Keen, 2000). In addition, the existence of a safety net might also make people less risk-averse and more innovative, which might be beneficial to economic growth.

Yet there might also be a reverse effect in the situation that economic growth influences the need and demand for redistribution. Growth shapes possibilities for government provisions, such as public insurances against unemployment, sickness or on pensions, commonly referred to as Wagner's law (Meltzer and Richard, 1983). In addition, in a system with automatic stabilisers, greater inequality because of economic turmoil leads to more redistribution by default (Immervoll and Richardson, 2011). In addition, countries can implement short-term policies to respond to economic downturns, which are generally designed to stimulate employment and in this way affect redistributive levels (Chung and Thewissen, 2011).

4.2.3 Combining the lines of reasoning

Figure 4.1 schematically displays the arguments discussed earlier about why we might expect effects of income inequality and redistribution, in some way isolated from each other, on economic growth. Yet there are also likely to be direct links between redistribution and income inequality. All current welfare states decrease income inequality through redistribution (Immervoll and Richardson, 2011). This implies that the 'total' effect of redistribution on growth consists of a direct effect of redistribution on growth, and an effect on growth by alleviating income inequalities. For instance, in the scenario that inequality hampers growth, lowering it via redistribution can be seen as a social investment – so that 'the welfare state can be an irrigation system which supports economic efficiency and growth' (Korpi, 1985) – albeit with possible costs on its own.

Figure 4.1 Schematic overview of the hypotheses



There might also run a causal relationship from inequality to redistribution by influencing preferences for redistribution. If preferences are determined by income, then the majority will favour distorting redistribution when the (gross) mean income exceeds the (gross) median income (Lübker, 2007; Finseraas, 2010). Here, we should expect a negative effect of inequality before taxes and transfers on growth, by leading to more redistribution. Yet the empirical literature on the effects of inequality on the amount of redistribution is quite inconclusive. Kenworthy and McCall (2008) do not find any evidence for a positive effect of inequality before taxes and transfers on the level of redistribution, tracking eight countries during the 1980s and 1990s. Lübker (2007) also does not find evidence that public support for redistribution rises with inequality across countries.

Banerjee and Duflo (2003) also make use of political economy arguments, but they predict a nonlinear relationship between inequality and growth, concluding that 'growth rate is an inverted U-shape function of net changes in inequality'. According to them, changes in inequality in any direction are associated with lower growth. Based on a political economy model, they argue that 'planned changes in inequality' or 'hold-ups' are more common in situations of extreme equality and extreme inequality.

4.3 METHODOLOGY

4.3.1 Estimation methods

The inequality to growth literature from the 1990s generally connects a country's income distribution at the beginning of a long time period, usually around 30 years, to the average growth rate during that period (Persson and Tabellini, 1994; Rodrik and Alesina, 1994; Perotti, 1996). The regressions are estimated by ordinary least squares (OLS). By and large, the estimations report negative associations, leaving Benabou (1996) to argue that 'these regressions, run over a variety of data sets and periods with many different measures of income distribution, deliver a consistent message: initial inequality is detrimental to

long-run growth'. Yet OLS estimations yield biased results when unobserved time-invariant country effects, such as culture and adopted technological levels, are correlated with the included explanatory variables. Therefore, later studies turn to pooled time-series cross-sectional data to examine how changes in income distribution affected the growth rate in the subsequent 5- or 10-year period, mostly by using fixed effects estimation (Barro, 2000; Forbes, 2000; Castelló-Climent, 2004). Generally, the negative coefficient becomes insignificant.

Even though fixed effects estimation is unaffected by heterogeneity bias, it is quite sensitive to measurement error for relatively time-invariant stock variables. Monte Carlo studies indicate underestimation of the effects of physical and human capital in growth regressions (Hauk and Wacziarg, 2009). Because the levels of income inequality and redistribution are also relatively stable over time, fixed effects estimation might under-report those factors. A number of authors cope with these problems by using system-generalised method of moments (GMM) (Castelló-Climent, 2004; Voitchovsky, 2005). Yet GMM has disadvantages as well. The procedure of first-differencing and using lags as instruments involves a loss of multiple periods of data. In addition, its first-differenced nature does not allow for inclusion of the level of income as a control variable to account for conditional convergence (see Section 3.3).

This article uses fixed effects regressions, controlling for a set of growth determinants explained in Section 3.3 and unobserved heterogeneity across time and countries. To limit the possibility of reverse causality, inequality or redistribution at the beginning of the period is regressed on the average economic growth in the years after that period. Extensive sensitivity tests are conducted. Fixed-effects regressions are employed as Hausman tests indicate that the country effects are correlated with the other explanatory variables, even though all results still hold when random effects or pooled OLS is used which both exploit also the variation between countries, with coefficients of comparable size.[3]

4.3.2 Inequality and redistribution indicators

An important concern is the availability and quality of data, especially for the income distribution before taxes and transfers. The larger income inequality databases that include observations for developing countries suffer from measurement error, low comparability between countries and heterogeneity in survey design (Atkinson and Brandolini, 2001). Many studies, as can be seen in Online Appendix 1 of the *Socio-Economic Review* publication, rely on the Deininger and Squire (1996) income distribution database. This database

3 Results available on request.

does not consistently distinguish between the income distribution before and after taxes and transfers so that hypotheses cannot be tested properly (Banerjee and Duflo, 2003, p. 284). Moreover, these data sources generally do not adequately capture enrichment at the top due to top-coding, even though the surge of top incomes has been noted as an important trend in the distribution within affluent democracies with possibly distinctive effects on economic growth (Hacker and Pierson, 2010; Atkinson *et al.*, 2011).

Because data quality is such a main concern, this article employs data from three different sources. First, we use the OECD database on income distribution and poverty, which contains comparable country-level data for multiple distribution indicators after taxes and transfers, for entire and working-age population (OECD, 2011a). For inequality after taxes and transfers, we employ three indicators, namely, the Gini coefficient, the squared coefficient of variation (SCV) and the mean log deviation (MLD), for the entire and working-age population. The Gini is sensitive to changes around the middle of the distribution, whilst the SCV and MLD indicators are more sensitive to the upper and lower tail of the income distribution, respectively. For the distribution before taxes and transfers, only the Gini for the entire and working-age population are available. Even though we refer to these indicators as based on 'entire' and 'working-age population', they do not cover top incomes well due to top-coding.

Second, the Leiden LIS Budget Incidence Fiscal Redistribution Dataset is used, which contains data on inequality and redistribution standardised across countries and over time based on LIS household data (Wang and Caminada, 2011). Here, only the Gini for the entire population (in which again top incomes are not well covered due to top-coding) for primary and disposable income are available. The OECD and LIS data use the same income definition for disposable income (after taxes and transfers), and both apply a square root equivalence scale. Yet primary income from the LIS data is not exactly the same as income before taxes and transfers in the OECD data set, as primary income also includes private transfers and other cash income, although these are generally relatively small amounts (Caminada *et al.*, 2012). Another difference is that the LIS micro data are based on standardised surveys rather than questionnaires. The two measures after taxes and transfers, which we refer to as disposable income inequality, are highly correlated (0.91), whereas the correlation is lower between the OECD inequality indicator before taxes and transfers and primary income from LIS (0.72); we refer to these last indicators as market income inequality.

Third, we use the World Top Incomes Database (WTID), which contains information on the income shares of the top 10, 5, and 1 per cent per country over time to capture concentration of income at the top end of the distribution (Alvaredo *et al.*, 2012). The estimates are based on the amount of income reported to the tax authorities to an estimate of total personal income from the same year taken from a country's national accounts. Unfortunately, no

information on top income shares after taxes and transfers, and thus the amount of redistribution, is available. The three indicators are highly correlated (between 0.89 and 0.98).[4]

In line with Kenworthy and Pontusson (2005), redistribution is defined in an absolute fashion, namely, the difference between the Gini before and after taxes and transfers for the OECD data, and as the difference between the Gini for primary and disposable income for the LIS data. Absolute measures are not expressed relative to the market income distribution. In this way the coefficients are easier to interpret. Relative measures tracked over time are essentially the 'percentage change in percentage change' (Caminada *et al.*, 2012, p. 7). The absolute redistribution measures from OECD and LIS are highly correlated (0.86).

In total, 29 OECD member states are included in the regressions.[5] Because of data coverage, the exact country sample differs slightly per data set regression.[6] In total our data set contains eight periods of five years each, from 1970 to 2009. For the OECD data, no information is available for 1970–1974 and 1980–1984. All results shown are robust to the exclusion of a single country or period (unless stated otherwise).[7] Results are comparable when 10-year periods are used instead.[8] Our data set is unbalanced mainly due to missing observations for Eastern European countries; leaving out those countries does not affect the results in any significant way.

4 In Finland (1989) and Canada (1982) the data suffer from trend breaks due to changes in tax collection. The trends prior to the changes have been adjusted based on the average difference in overlapping years (1990–1992 for Finland, 1982–2000 for Canada). Missing years in Germany, Italy, the Netherlands, Portugal, Switzerland and the UK have been linearly interpolated.

5 Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Luxembourg (LUX), the Netherlands (NLD), New Zealand (NZL), Norway (NOR), Poland (POL), Portugal (PRT), Slovenia (SVN), Spain (ESP), Sweden (SWE), Switzerland (CHE), Turkey, (TUR), the UK (GBR) and the US (USA). A limited number of observations are available for Mexico, but we exclude it because it is an outlier, combining low redistribution, high inequality and tempestuous growth.

6 For the OECD data, no information is available for EST and SVN for our main inequality indicator, the Gini after taxes and transfers. In addition to that, AUT, IRL, POL, ESP, CHE and TUR drop out for the redistribution regressions. For the LIS data, no information is available for JPN, NZL, PRT and TUR. Last, for the WTID, no data are available for AUT, BEL, CZE, EST, GRC, HUN, ISR, LUX, POL, SVN and TUR. JPN and IRL are excluded because they do not have data for all three top income indicators. The results shown still hold when JPN and IRL are included.

7 Results available on request.

8 The top shares become significant at the 10 per cent level, and redistribution becomes significant at the 5 per cent level, but only for the OECD data and only when the level of inequality is excluded as a control variable.

4.3.3 The MRW framework

This article adopts the Mankiw *et al.* (1992) (MRW) framework, to investigate the associations with growth. The MRW design was originally constructed to estimate the rate of income convergence between countries, but is also often used in the inequality to growth literature (e.g., Voitchovsky, 2005; Rooth and Stenberg, 2011). Real GDP growth per person is regressed on the level of real GDP per capita, population growth and the stocks of human and physical capital. Due to convergence, the initial level of income is thought to have a negative effect on subsequent growth. The same holds for population growth, as 'high population growth lowers income per capita because the amounts of both physical and human capital must be spread more thinly over the population' (Mankiw *et al.*, 1992). The stocks of physical and human capital are expected to have positive effects on subsequent economic growth. Yet these last two variables are also channels through which inequality or redistribution might affect growth, as discussed in the theoretical section. Therefore, additional tests are conducted leaving out the stocks of physical and human capital.

The MRW framework can be written in the following way as a fixed effects model, with y_{it} as the level of real GDP per person for country i at time t; x_{it} as the vector of the other control variables; g_{it} as the independent variable of interest, that is, inequality, redistribution or both; and a set of a_i country and η_t period dummies; and idiosyncratic error term u_{it}:

$$\frac{\ln(y_{it+4}) - \ln(y_{it+1})}{3} = \beta_1 \ln(y_{it}) + \gamma \ln(g_{it}) + \ln(x_{it})\beta + u_{it} + a_i + \eta_t$$

To prevent endogeneity problems, economic growth is measured as the difference between the level of GDP per capita at the end of the period and at the beginning of the period plus one year, as the level of GDP per capita at the beginning of the period is already present as an explanatory variable. As five-year periods are taken, excluding the first year, the growth rate is divided by 3 to end up with having an average annual growth rate. For the period 1970-1974 for instance, economic growth is measured as the difference in log GDP per capita between 1974 and 1971, whilst initial level of income is defined as log GDP per capita in 1970. Standard errors are clustered on country level to allow observations within countries to be correlated; the significance of the results does not change when other corrections to the standard errors are made.[9]

9 Results are fully comparable when robust standard errors are used. When panel-corrected standard errors with a general AR(1) error process are employed, the only difference is that the Gini, working-age population, becomes borderline significant at the 10 per cent level and the top 10 per cent income share becomes significant at the 1 per cent level. Results are shown for clustered standard errors. The contemporaneous correlation of standard errors between certain countries cannot be calculated due to too many differences in the periods for which data are available.

Two baseline equations are formulated. When the income distribution indicator refers to the entire population, economic growth, level of income and population growth are also expressed per capita. For the indicators focussing on working-age population, the growth model variables are expressed per working-age person as well. As is common in the growth literature, all variables are expressed in natural logarithm, including the inequality and redistribution indicators. Hence, these coefficients should be interpreted as elasticities. Following Andrews *et al.* (2011), the top income shares are not expressed in logs; the coefficients of the shares should be interpreted as a percentage point change in top share associated with a percentage change in growth.[10]

Economic growth and level of income are expressed as real GDP growth per person, 2005 purchasing power parity (PPP) in US dollars. Population growth is defined as the growth of the total population between 15 and 64 at the beginning of the period. The stock of physical capital is measured as the average annual total gross fixed capital formulation in percentage of real GDP; for the stock of human capital, the average years of total schooling for the total population aged 25 and over is used. All data come from OECD Annual Labour Force Statistics (2012f) and National Accounts (2012g), except for the human capital indicator (Barro and Lee, 2011).

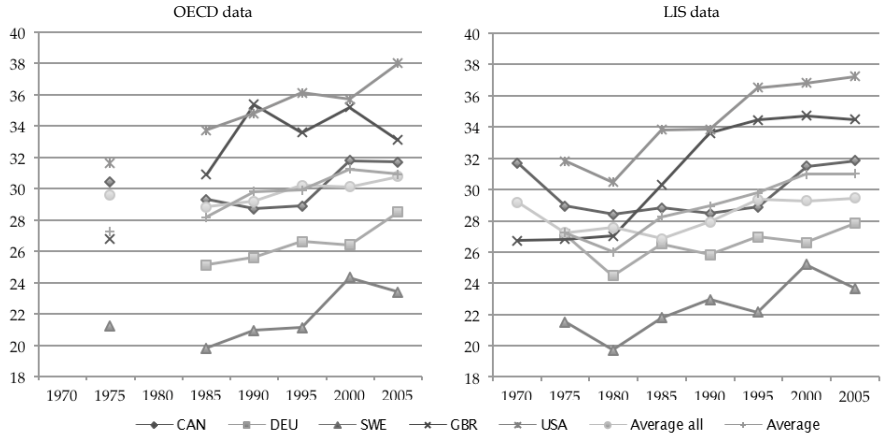
4.4 Empirical analyses

4.4.1 Data description and trends

The data reveal a moderate trend towards increasing disposable income inequality, as graphically displayed in Figure 4.2. The OECD data Gini for the entire population increased on average from 29.6 to 30.8 (from 27.3 to 30.9 for the five countries without any missing values). The LIS data display a comparable rise (from 27.2 to 29.5 and from 27.2 to 31.0 for the five countries without missings). Interestingly, in both data sets France, Greece, Ireland, Spain and Switzerland show a decrease over time for the longest time span available. Slovenia and Estonia, which are only in the LIS data set, and Turkey, only covered by OECD data, also show lower inequality over time. Inequality in Belgium rose according to LIS data whilst it decreased according to OECD data. This probably is a consequence of different coverage; inequality around 2005 is not available for LIS data, which is when Belgium became more equalised according to the OECD data. Denmark became more equal according to LIS, whilst the opposite is true according to the OECD figures, a consequence of a higher inequality estimate in the first year covered (1985) in the LIS data set.

10 The results do not change when the top shares are expressed as natural logarithm (available on request).

Figure 4.2 Gradual and widespread rise in disposable income inequality within the OECD area



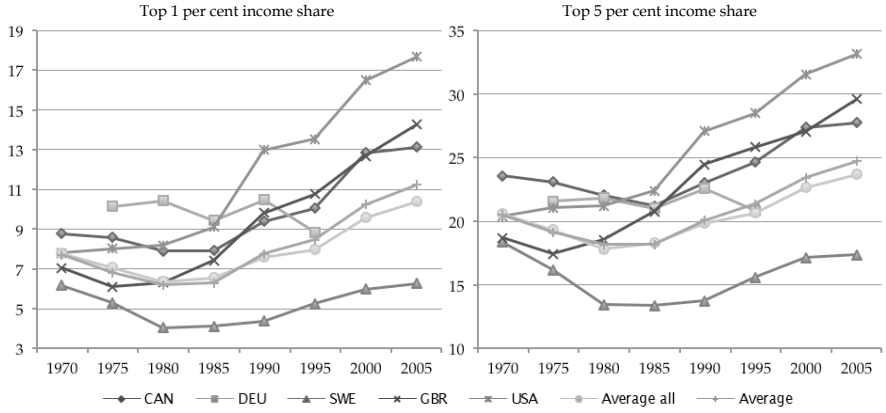
Note Data refer to the Gini, entire population, after taxes and transfers. 'Average all' is the unweighted average for all countries. 'Average' is the unweighted average for the countries without missing observations (CAN, NLD, SWE, GBR, and USA for OECD; and CAN, DEU, SWE, GBR, and USA for LIS)

Source OECD (2011a) and Wang and Caminada (2011)

The data sets indicate that market incomes have grown further apart than disposable incomes. The Gini for the entire population for OECD data increased on average from 39.9 to 47.6 (from 38.8 to 45.6 for the five countries without missing observations), and according to the LIS estimates from 37.8 to 46.4 (from 37.8 to 46.7 for the five countries without missing observations). Australia is the only country for which market income inequality decreased according to the OECD data set, but this is probably due to limit coverage, because the LIS data with a longer time span report an increase in inequality over time. Market income inequality decreased marginally so in Ireland and Estonia, both only covered by LIS data. Results are more contradictory for France, which again might be due to longer coverage by the LIS data.

Figure 4.3 shows that the share of income held by the top 1 per cent increased in all countries for which information up to 2005 is available, except Finland. Yet in Finland, the top share in 2005 was higher than in every other period, apart from the first one in 1970. The three countries for which data are available only up to 1995, Germany, the Netherlands and Switzerland, show a decrease in top income shares. The share of income held by the top 5 per cent shows a comparable pattern. Yet here we see a marginal decrease over the full time period for France and Spain and a larger decrease for Sweden, although again, the income share of the 5 per cent in 2005 was higher in every other period apart from the first one. The top 10 shares are closely in line with the top 5 shares, except from an increased share in Finland and a decrease in Denmark (results not shown here).

Figure 4.3 Enrichment at the top of the income distribution

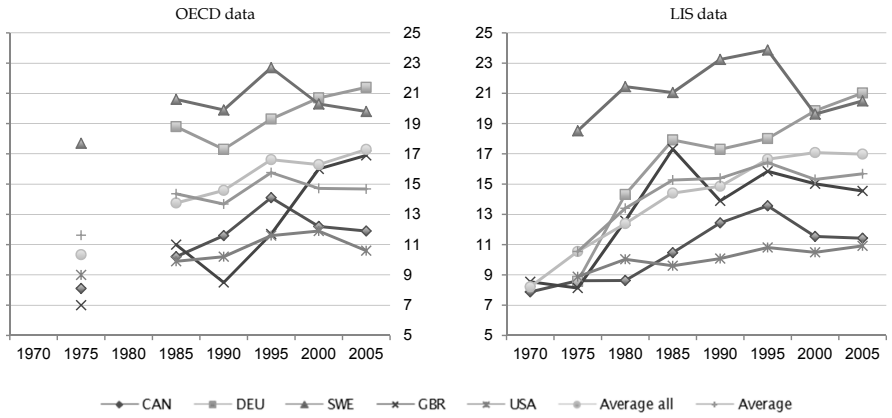


Note Data refer to the pretax top income share. 'Average all' is the unweighted average for all countries. 'Average' is the unweighted average for the countries without missing observations (AUS, CAN, FIN, FRA, JPN, NZL, NOR, SWE, GBR, USA)

Source Alvaredo *et al.* (2012)

The average level of absolute income redistribution has increased over time as shown in Figure 4.4. The OECD data set reports an average increase from 10.3 to 17.3 from 1975 to 2005 (11.6 to 14.7 for the five countries without missing values), whilst the LIS data set displays a rise from 10.5 to 17.0 (10.5 to 15.7 for the five countries without missings). The LIS data set shows increasing redistribution over time in all countries; according to the OECD data, redistribution decreased in Australia, Israel, and the Netherlands, which is probably due to differences in the time span covered.

Figure 4.4 Higher levels of redistribution over time



Note Data refer to the absolute redistribution, entire population. 'Average all' is the unweighted average for all countries. 'Average' is the unweighted average for the countries without missing observations (CAN, NLD, SWE, GBR, and USA for OECD; and CAN, DEU, SWE, GBR, and USA for LIS)
Source OECD (2011a) and Wang and Caminada (2011)

The data sets indicate a moderate positive correlation between market inequality and redistribution, which is in line with the median voter model. Redistribution and disposable income inequality are negatively and stronger correlated. Still, the higher levels of redistribution have not fully compensated the widening of market incomes, as shown by increased inequality in disposable income over time. Both data sets show a positive correlation between the rise of disposable income inequality and redistribution per country over time, indicating that the countries with the sharpest rise in inequality also were the ones with the largest increase in redistribution. Yet this correlation is much higher for the OECD data (0.77) than for LIS (0.17), which is probably due to different coverage of countries and periods.

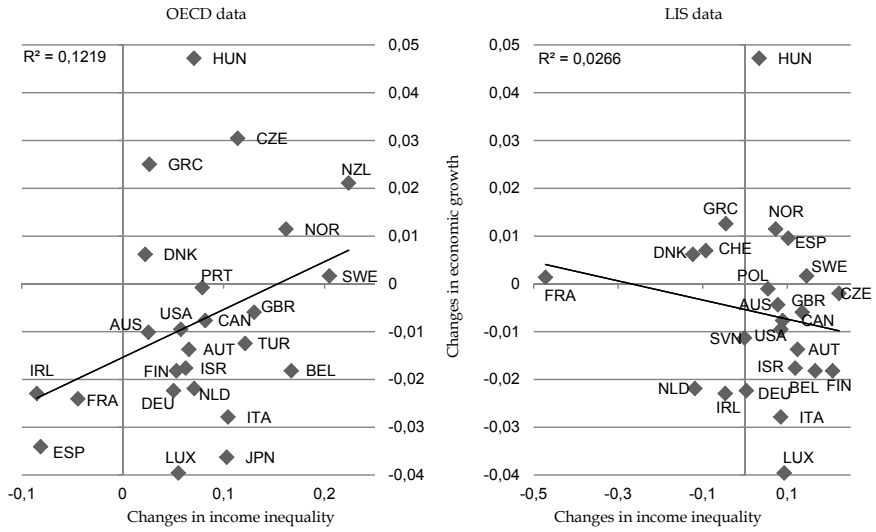
4.4.2 Associations between inequality and growth

Simple associations between changes in income inequality, for both OECD and LIS data, and changes in economic growth summarised in Figure 4.5 reveal an inconclusive pattern because the sign of the association differs per data source.[11] France displays a substantial decrease in inequality for the LIS data,

11 The difference between 2000-2004 and 1985-1989 is used for all scatterplots, because otherwise the crisis from 2008 onwards would disproportionally affect the picture and few data points before 1985 are available.

but this does not affect the trend line. The trend lines have a low R-squared value.

Figure 4.5 Inconclusive associations between trends in inequality and economic growth

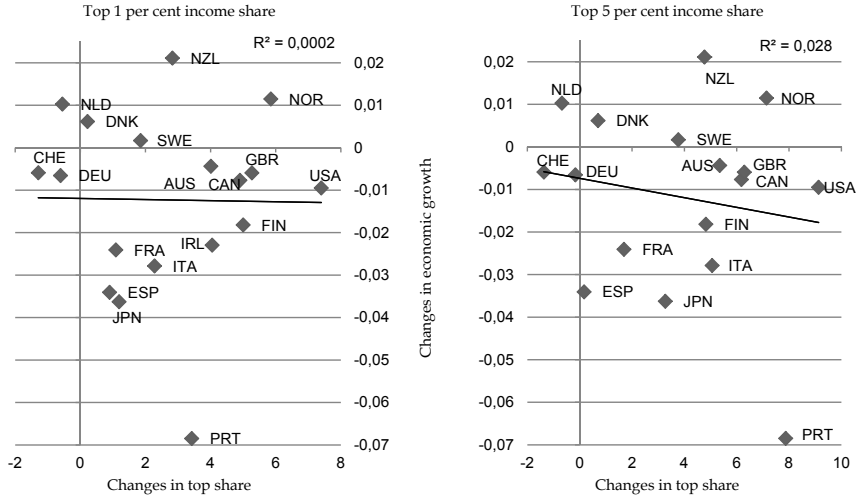


Note Indicators are defined as the log difference in real GDP growth per capita and Gini, entire population, disposable income between 2000 and 1985 (OECD data: CZE, HUN, and PRT 2000 and 1990; AUS 2000 and 1995; TUR 1995 and 1985; LIS data: FRA, HUN, POL, ESP, and CHE 2000 and 1990; GRC and SVN 2000 and 1995; CZE 1995 and 1990)

Source OECD (2011a) and Wang and Caminada (2011)

Also, for the top income shares simple plots do not indicate clear associations over time, as shown in Figure 4.6. For the top 5 per cent income share the association is somewhat clearer, which seems to be due to Portugal showing a more rapid rise in top 5 per cent than in top 1 per cent income shares.

Figure 4.6 No clear associations between trends in top shares and economic growth



Note Indicators are defined as the log difference in real GDP growth per capita and the difference in top shares between 2000 and 1985 (DEU, NLD, and CHE: 1995 and 1985)

Source OECD (2011a) and Wang and Caminada (2011)

Table 4.1 presents fixed effects estimation results in which we control for unobserved heterogeneity and other potential growth determinants. The results consistently indicate that inequality after taxes and transfers does not have a clear association with economic growth. This holds for all inequality indicators with different sensitivity for changes in the distribution and for both the OECD and LIS data. Thus, the results do not support the theories that inequality stimulates growth by inciting people to put forth additional effort or that it negatively affects growth by decreasing the stability. In addition, no systematic evidence is found for positive effects of inequality through the savings channel or negative effects through decreasing the human stock, as the exclusion of respectively the stock of physical capital or stock of human capital do not strongly affect the results.[12] The coefficients of the inequality measures are robust to the exclusion of countries and, by and large, to the exclusion of periods.[13] Also excluding the new EU member states, which might

12 The Gini, working-age population becomes borderline significant at the 10 per cent level, but this loses significance in particular when GRC is excluded (the p value of the inequality coefficient drops to 0.49).

13 The Gini, entire population of the OECD data becomes significant at the 5 per cent level without FIN, but much weaker without GRC, DEU or NOR. For the SCV and MLD, and Gini, entire and working-age population, the coefficient sometimes becomes significant at the 10 per cent level, but this is never in any robust fashion; the results become strongly insignificant without DEU (SCV), NOR (MLD) or GRC (Gini entire and working-age

show different patterns due to their relatively recent economic transitions, does not affect the results in a significant way.[14]

Table 4.1 No clear associations between inequality after taxes and transfers and economic growth

	Baseline	OECD						LIS
		Entire population			Working age population			Entire population
		Gini	SCV	MLD	Gini	SCV	MLD	Gini
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income inequality		0.029 (0.150)	0.003 (0.286)	0.016 (0.118)	0.031 (0.106)	0.001 (0.450)	0.002 (0.408)	0.010 (0.362)
Level of income	-0.102*** (0.000)	-0.098*** (0.000)	-0.094*** (0.000)	-0.094*** (0.000)	-0.116*** (0.000)	-0.115*** (0.000)	-0.116*** (0.000)	-0.102*** (0.000)
Population growth	0.234 (0.140)	0.226 (0.136)	0.216 (0.311)	0.203 (0.317)	0.275** (0.049)	0.289 (0.190)	0.280 (0.212)	0.224 (0.489)
Physical capital	0.005 (0.749)	0.005 (0.733)	0.004 (0.830)	0.005 (0.751)	-0.002 (0.920)	-0.003 (0.869)	-0.003 (0.863)	-0.000 (0.995)
Human capital	-0.012 (0.225)	-0.005 (0.604)	-0.010 (0.363)	-0.006 (0.532)	-0.010 (0.254)	-0.019* (0.086)	-0.021 (0.115)	-0.010 (0.472)
Constant	0.317*** (0.000)	0.196** (0.018)	0.285*** (0.000)	0.242*** (0.000)	0.318*** (0.002)	0.440*** (0.000)	0.449*** (0.000)	0.294*** (0.008)
N	121	121	107	107	119	105	105	123
Countries	27	27	24	24	27	24	24	25
R^2	0.702	0.707	0.713	0.719	0.716	0.714	0.715	0.683
F-test	47.189***	50.176***	61.658***	65.264***	55.906***	86.948***	78.507***	10.905***

Note Country fixed effects, 1975-2009 for OECD; 1970-2009 for LIS, five year periods with period dummies, clustered standard errors, P values between brackets. Significance levels are noted by *** (1 per cent), ** (5 per cent), or * (10 per cent). All variables in logs. Columns 1-4 and 8: per capita sample. Columns 5-7: working age population sample. All inequality indicators are measured after taxes and transfers

Source OECD (2011a) and Wang and Caminada (2011)

Further evidence that there is no evident relationship between income inequality across the society and economic growth for affluent countries comes from Table 4.2. Here, the Gini before taxes and transfers for entire and working-age population from OECD data and the Gini for primary income for the entire population from LIS data are not robustly associated with economic growth.[15] Thus, these results are not in line with the prediction that inequality before taxes and transfers lowers growth by leading to more redistribution. Leaving out the new EU member states or human capital or investment as explanatory variables does not affect these results.

population). The SCV and MLD for the working-age population and Gini for the LIS data never become significant. A number of inequality indicators become (positively) significant when certain periods are excluded, but the specific period differs per indicator and for other periods, the p values drop substantially.

14 The SCV, entire population, becomes significant when excluding the new member states. Yet this is due to DEU; excluding DEU yields a p value of 0.31.

15 The Gini, entire population of the OECD data never becomes significant. The working-age population version becomes significant without NLD but much weaker (p = 0.66) when GRC is excluded. The LIS Gini, primary income, becomes borderline significant without HUN or IRL, but becomes weaker when POL or GBR are excluded (p > 0.3).

Table 4.2 Indications for positive associations between top income shares and economic growth

	Baseline	OECD Gini before taxes and transfers, entire population	Gini before taxes and transfers, working age population	LIS Gini, primary income, entire population	WTID Top income share 10%	Top income share 5%	Top income share 1%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Income inequality		0.011	0.035	0.023	0.001**	0.002**	0.002**
		(0.718)	(0.186)	(0.161)	(0.047)	(0.030)	(0.019)
Level of income	-0.110***	-0.111***	-0.128***	-0.101***	-0.113***	-0.111***	-0.110***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Population growth	0.310**	0.278	0.258	0.211	-0.163	-0.135	-0.149
	(0.042)	(0.122)	(0.187)	(0.507)	(0.535)	(0.588)	(0.557)
Physical capital	0.004	0.007	0.001	0.001	-0.031	-0.023	-0.018
	(0.820)	(0.742)	(0.943)	(0.966)	(0.106)	(0.180)	(0.210)
Human capital	-0.010	-0.009	-0.019	-0.011	-0.018	-0.011	-0.011
	(0.462)	(0.551)	(0.229)	(0.431)	(0.355)	(0.547)	(0.544)
Constant	0.342***	0.296*	0.348**	0.241*	0.440***	0.404***	0.403***
	(0.000)	(0.086)	(0.041)	(0.051)	(0.000)	(0.000)	(0.000)
N	98	98	96	122	108	112	112
Countries	21	21	21	25	16	16	16
R^2	0.716	0.717	0.722	0.686	0.708	0.711	0.703
F-test	25.12***	30.608***	47.006***	16.595***	27.285***	36.937***	49.095***

Note: Country fixed effects, 1975-2009 for OECD; 1970-2009 for LIS, five year periods with period dummies, clustered standard errors, P values between brackets. Significance levels are noted by *** (1 per cent), ** (5 per cent), or * (10 per cent). All variables in logs, except the top income share variables. Columns 1, 2, 4-7: per capita sample. Column 3: working age population sample

Source: OECD (2011a), Wang and Caminada (2011), and Alvaredo et al. (2012)

Yet the results show an association between growth and the top income shares. This seems to imply that developments at the top end of the distribution have distinctive effects on economic growth. The positive association is in line with the predictions that high rewards can incite people to invest or that a concentration of asset ownership facilitates large investments. It is not in line with the theory that the rich use their wealth to lobby for rent-seeking policies that disrupt growth. Still, the coefficients are small, pointing to a weak relationship. The coefficients for the top 1 and 5 income shares imply that for a given country, a percentage point change in top shares across time is associated with an on average 0.002 per cent higher annual economic growth during that five-year period, holding the control variables constant. Over the total period, for the countries without missing values the top 1 and top 5 income shares increased roughly by 4 percentage points on average. Thus, according to the estimates, we should expect an associated 0.008 per cent higher annual economic growth during that same period. These weak associations are also found by Andrews *et al.* (2011),[16] and they seem to be in line with the observation

16 Their sample slightly differs from ours. We exclude the period 1960-1970 but include FIN, ITA, NOR and PRT as country cases. Also, Andrews *et al.* only use the top 1 per cent and top 10 per cent income shares.

from Kenworthy (2010) that the rise of top shares has not resulted in faster growth or rising incomes for those at the bottom – nor in retarding growth. All in all, the results seem to suggest that the enrichment at the top end of the distribution has not affected growth in any noticeable fashion.

The positive signs are fully robust to the exclusion of countries for the top 5 and top 1 income shares; see also Online Appendix 2 of the *Socio-Economic Review* publication. By and large, this also holds for the exclusion of periods.[17] For the top 10 income share, results become borderline insignificant without Denmark or Portugal, but become significant at the 1 per cent level when we exclude Norway. Leaving out 1980-1984 leads to an insignificant coefficient for the top 10 income share, most likely a consequence of the substantial increase of the top 10 income share in particularly Portugal and the UK during this period.

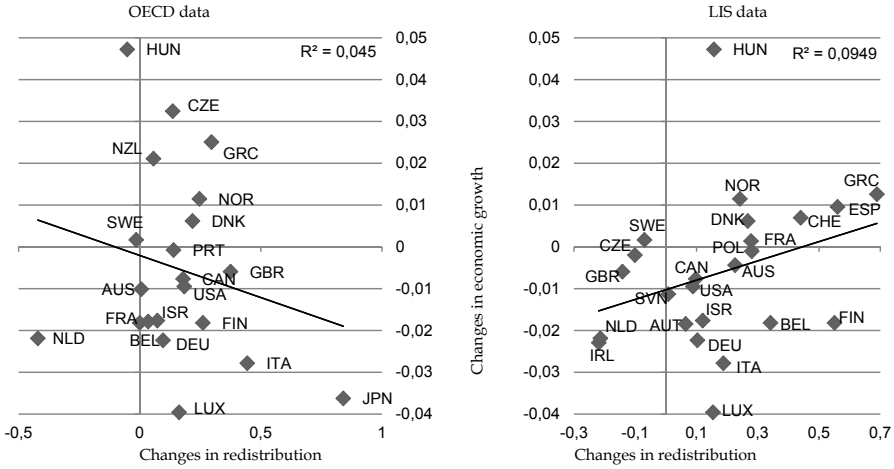
As a further test, we check for nonlinear relations between income inequality and economic growth, as proposed by Banerjee and Duflo (2003, p. 267) to analyse whether changes in inequality in any direction lead to lower growth. We find insignificant coefficients for the Banerjee and Duflo specification (results not shown here) for both OECD and LIS data. It is possible that the (somewhat) larger country sample of Banerjee and Duflo, which includes a number of developing countries, can explain the difference in results of this study and theirs.

4.4.3 Associations between redistribution and growth

Now we address the relationship between income redistribution and economic growth. Simple plots shown in Figure 4.7 do not reveal a uniform picture. The OECD data denote a negative association, whilst a positive one is reported for the LIS data. Again, the R-squared values are low.

17 Leaving out 1980-1984 leads to a borderline insignificant coefficient for the top 5 per cent income share, and the same holds for leaving out 1990-1994 for the top 1 per cent income share (p values of 0.13). Yet without 1975-1979 or 1995-1999 the coefficients become significant again.

Figure 4.7 Inconclusive associations between income redistribution and growth



Note Indicators are defined as the log difference in real GDP growth per capita and absolute redistribution, entire population, between 2000 and 1985 (OECD data: HUN and PRT 2000 and 1990; AUS, CZE, and FRA 2000 and 1995; LIS data: FRA, HUN, POL, ESP, and CHE 2000 and 1990; AUT, GRC, and SVN 2000 and 1995; CZE 1995 and 1990)

Source OECD (2011a) and Wang and Caminada (2011)

The pooled time-series cross-section estimations reported in Table 4.3 do not yield significant associations between redistribution and economic growth for both OECD and LIS data. This does not support the trade-off argument, nor the reasoning that redistribution facilitates growth by providing public insurances that (also) redistribute income. Also the regressions in which we control for the level of inequality after taxes and transfers, in columns (3) and (6), do not yield significant associations for our variables of interest. In fact, the coefficients of the redistribution indicators are hardly affected by the inclusion of the inequality indicator. Hence, the insignificant results of the inequality regressions presented earlier in Table 4.1 were not due to spurious relations because of not taking into account the amount of redistribution. We also cannot conclude that redistribution mitigates effects of inequality.

Table 4.3 Income redistribution does not seem to have a clear association with growth

	OECD Baseline	Absolute redistribution	Absolute redistribution and inequality	LIS Baseline	Absolute redistribution	Absolute redistribution and inequality
	(1)	(2)	(3)	(4)	(5)	(6)
Income redistribution		-0.014	-0.012		0.008	0.008
		(0.131)	(0.276)		(0.413)	(0.390)
Income inequality			0.016			0.011
			(0.474)			(0.339)
Level of income	-0.110***	-0.111***	-0.111***	-0.102***	-0.099***	-0.100***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Population growth	0.310**	0.386**	0.356*	0.220	0.199	0.203
	(0.042)	(0.023)	(0.051)	(0.489)	(0.538)	(0.537)
Physical capital	0.004	-0.006	-0.004	-0.000	-0.000	0.000
	(0.820)	(0.746)	(0.827)	(0.987)	(0.999)	(0.991)
Human capital	-0.010	-0.009	-0.007	-0.011	-0.012	-0.011
	(0.462)	(0.497)	(0.622)	(0.426)	(0.365)	(0.407)
Constant	0.342***	0.404***	0.336**	0.329***	0.307**	0.268**
	(0.000)	(0.000)	(0.025)	(0.003)	(0.011)	(0.026)
N	98	98	98	122	122	122
Countries	21	21	21	25	25	25
R^2	0.716	0.728	0.730	0.681	0.683	0.685
F test	25.118***	24.431***	55.120***	10.680***	15.148***	14.988***

Note Country fixed effects, 1975-2009 for OECD; 1970-2009 for LIS, five year periods with period dummies, clustered standard errors, P values between brackets. Significance levels are noted by *** (1 per cent), ** (5 per cent), or * (10 per cent). All variables in logs. Per capita sample. Income redistribution: absolute redistribution. Income inequality: Gini after taxes and transfers, disposable income

Source OECD (2011a) and Wang and Caminada (2011)

The redistribution coefficients remain insignificant when countries are excluded, when investment or human capital are omitted as explanatory variables, when the new EU member states are left out of the analyses or when periods are excluded.[18] Results also do not change when we use the same set of observations for OECD and LIS data.

4.5 Discussion and conclusion

This study addresses how the socio-economic objectives of attaining growth and restricting income inequality are related to each other. Thus far studies do not simultaneously investigate effects of inequality on growth and redistribution on growth, even though the existing literature provides reasons why the income distribution might affect growth, and also why public re-

18 Excluding GBR yields a borderline significant coefficient for the OECD data regressions without inequality, but the *p* value drops to 0.4 when JPN is excluded. Excluding 2000-2004 leads to a significant coefficient for redistribution based on the OECD data, but it is strongly insignificant without 1985-1989 or 2005-2009 ($p > 0.5$). Leaving out 2005-2009 for the LIS data leads to a borderline significant association for redistribution, but again, this disappears without 1990-1994 or 1995-1999 ($p > 0.8$).

distribution to equalise incomes can influence economic output. Moreover, many studies rely on data that do not properly distinguish between inequality before or after taxes and transfers. A second contribution of this article is that it includes a set of generic inequality measures from two data sources, namely, OECD and LIS data, both before and after taxes and transfers, and it also investigates associations between top income shares and economic growth. Theoretically, the rise of top income shares might alter growth differently than generic inequality across the bottom 99 per cent of the population. The empirical analyses presented here using a pooled time-series cross-section design of 29 OECD countries seem to suggest that there are no clear signs of associations between generic measures of inequality and growth, or redistribution and growth. Yet we find significant positive associations between top shares and economic growth, although the coefficients are small.

The empirical analyses do not provide evidence for theories predicting a positive effect of inequality on growth, through the savings or incentives channel, or for theories suggesting a negative effect of inequality, by affecting stability or the attainment of human capital. This finding corresponds to other studies employing a pooled time-series cross-section design to investigate the effects of inequality on growth (Forbes, 2000; Castelló-Climent, 2004). The finding that top income shares are positively associated with growth might provide some support for the argument that high rewards can incite people to invest or that a concentration of asset ownership could facilitate large investments. Still, the small coefficient corresponds more to the argument that top income shares do not boost growth – nor that they retard it (Kenworthy, 2010).

We also do not find significant associations for redistribution, for both the OECD and LIS data set. Therefore, the results do not support the trade-off theory, as also found for instance by Lindert (2004). The coefficient remains insignificant when the level of income inequality is held constant, thus, it does not seem to be so that any negative (positive) effects of redistribution are cancelled out because of positive (negative) effects of inequality.

It is important to keep in mind that the number of observations is relatively low. Also, the fixed effects estimation employed here assists in controlling for unobserved country differences, but it is known to have low predictive power when variables are highly persistent over time, which is the case for the levels of income inequality and redistribution within affluent countries, although similar results are obtained when random effects or pooled OLS are used. An alternative to increase the number of observations could be to employ a regional design. An extra advantage is that such a design automatically holds constant the redistributing effects of national policies and institutions (e.g., Rooth and Stenberg, 2011).

A second limitation of the design employed here is that the results cannot offer causal evidence due to the possibility of reverse effects of economic growth on inequality and the need and demand for public interference. Future

research could focus on the persistent issue to separate the two causal effects, for instance, by exploiting an exogenous shock in redistribution or inequality, not resulting from a fluctuation in growth or vice versa. Last, this study used an indicator of overall absolute redistribution. An interesting possibility for future research is to compare the effects of different kinds of redistributing instruments on growth, such as means-tested spending, progressive taxing or a minimum wage.

All in all, the question how the socio-economic objectives of attaining economic growth and restricting income inequality are related to each other will continue to be one of the most central questions in political economy. This study has tried to contribute to this debate by describing the importance of taking into account both effects through inequality itself and redistribution on economic growth. In addition, it shows the importance of using high-quality data sources for generic measures of inequality that consistently distinguish between inequality before and after taxes and transfers, but also the use of top income data, as the estimations indicate that enrichment at the top can have different effects on economic growth.

5 Technological change as a determinant of redistribution preferences[1]

Abstract

Technological change is widely considered to be a key driver of the economic and occupational structure of affluent countries. Current advances in information technology have led to significant substitution of routine work by capital, whilst occupations with abstract or interpersonal manual task structures are complemented or unaffected. We develop a simple theoretical framework in which individuals in routine task intensive occupations prefer public insurance against the increased risk of future income loss resulting from automation. Moreover, we contend that this relation will be stronger for persons employed in sectors particularly exposed to technological change, and for richer individuals who have more to lose from automation. In this way we combine occupational and sectoral elements of risk exposure, whilst we revisit the role of income in shaping redistribution preferences. The implications of our theoretical framework are tested using survey data for 23 European countries between 2002 and 2012.

5.1 Introduction

Technological change is widely regarded to be a main driver of long-term economic development (Romer, 1990). By complementing occupations with certain skill profiles whilst making others redundant, it structures employment and significantly shapes the occupational structure (Goldin and Katz, 2008; Oesch, 2013). This entails that technological innovations can have far-reaching social implications that differ across occupations. These implications played a key role for instance in the work of Marx. He regarded technology to be the instrument through which the organisation and execution of work could

1 This chapter appeared as Thewissen, S., Rueda, D. (2015) Technological change as a determinant of redistribution preferences, *Leiden Department of Economics Research Memorandum no. 2015.01*. Financial support from the Leiden University Fund and the KETEL 1 scholarship fund is gratefully acknowledged. An earlier version of this study was presented at the 4th European Political Science Association (EPSA) annual general conference, 19-21 June 2014 in Edinburgh. We thank all participants, Nils-Christian Bormann, Koen Caminada, Kees Goudswaard, Robert Hellpap, Lieke Kools, Stefanie Reher, and Margit Tavits for their helpful suggestions. All errors remain ours.

be separated, so that labour could be transformed into deskilled operative work. More optimistically, technological change enables specialisation and skill upgrading, which facilitated societies to shift from routine labour particularly in agriculture towards manufacturing, and later services (Erikson and Goldthorpe, 1992; Iversen and Cusack, 2000; Wren, 2013).

Current technological innovations particularly take place in computer-based information technology. Its precipitous implementation in the last decades has been spurred by significant real price declines in computing power (Autor *et al*., 2003). Computers are capable in performing routine tasks, which are well defined and repetitive. On the other hand, computer capital complements complex and more ambiguous abstract tasks structures, whilst it does not have clear effects on interpersonal service tasks. Studies report significant decreases in the share of routine occupations, which tend to lie in the middle of the educational and wage distribution. Information technology therefore does not lead to linear upskilling of work, but rather to a process of polarisation (Spitz-Oener, 2006; Autor *et al*., forthcoming).

Given the pervasive substitutive effects of information technology on routine occupations, we might expect individuals holding routine occupations to prefer additional nonmarket protection to insure against increased risk of employment and wage loss. The conception that preference for insurance against job risks can fuel preferences for redistributive social protection plays a prominent role in the comparative political economy literature. Allusion to risks resulting from technological change have been made within this literature, for instance by Iversen and Cusack (2000) who state that '[…] most of the risks being generated in modern industrialized societies are the product of technologically induced structural transformations inside national labor markets. […] It is these structural sources of risk that fuel demands for state compensation and risk sharing'. Yet, occupational susceptibility for technological change is not directly examined by these authors. Kitschelt and Rehm (2014) are to our knowledge the only ones mentioning routine occupations as a group having higher redistribution preferences. The authors, however, do not operationalise this in terms of routine task intensity, but differentiate a routine group based on educational lines.

In this chapter we devote explicit attention to risks of technological change depending on the degree of routine task intensity of occupations as a determinant of redistribution preferences. Because of the widespread implementation, advances in information technology is widely regarded to be a main driver of rising earnings inequality and can therefore be seen as an influential occupational risk (Goldin and Katz, 2008; Michaels *et al*., 2014). We develop a simple theoretical framework in which risk-averse individuals prefer to insure against occupational hazards by means of redistribution when markets cannot provide such insurance.

Moreover, we argue that insurance preferences resulting from risks of technological change will be accentuated by two factors. First, the degree of

routine task intensity of occupations will be a stronger determinant of preferences for social protection for individuals employed in sectors particularly exposed to technological change. Second, we argue that income plays a moderating role, since individuals will have more to lose from automation when their income level is higher. By introducing these moderating variables we aim to bridge the gap between studies emphasising occupational and sectoral risks (Rehm, 2009). Furthermore, we revisit the role of personal income in shaping redistribution preferences, allowing income to have a negative effect on the level of preferred redistribution in the spirit of Meltzer and Richard (1981), whilst it amplifies the effects of risks on redistribution preferences.

The remainder of this chapter is divided into three sections. In Section 5.2 we propose a simple theoretical argument and derive its main empirical implications. We discuss our measure of routine task intensity and our dataset that covers 23 countries between 2002 and 2012 in Section 5.3. In Section 5.4 we examine the empirical validity of our hypotheses and conduct extensive sensitivity tests. We conclude in Section 5.5.

5.2 Our argument

Our line of reasoning is as follows. Current technological innovations involve an occupational risk for individuals depending on the degree to which their occupation is susceptible to automation. The ease of automation increases when an occupation contains more routine tasks. As individuals are risk averse, they favour more redistribution to insure against the risk of automation when the routine task intensity (RTI) of their occupation goes up. Moreover, we theorise that this positive effect of RTI on preferences for redistribution is moderated by two factors. The first factor is risk exposure, which increases when an individual is employed in a sector where technological change plays a prominent role. Second, RTI becomes a more important determinant of redistribution preferences when an individual has more to lose from automation, that is, when his or her income is higher.

5.2.1 Technological change as an unequally distributed occupational risk

The first element of our argument is that technological change causes an employment risk for individuals with routine occupations that can relatively easily be automated. As already mentioned in the introduction, current technological innovations in information technology are generally viewed to have strong and dissimilar effects across occupations (Goldin and Katz, 2008; Oesch, 2013; Wren, 2013). These developments complement individuals with abstract or personal tasks, whilst individuals in routine occupations face an increased risk of being substituted by capital (Autor *et al*., forthcoming). Routine tasks

can be partitioned into step-by-step rules, and do not require cognitive or service task skills that are more difficult to automate (Goos and Manning, 2007; Goos *et al*., 2014). Routine tasks susceptible to automation might well be complex and can require extensive educational training, such as bookkeeping. Because of this, information technology advancements do not impact occupations linearly across educational lines. In fact, routine occupations tend to lie in the middle of the educational and income distribution (Oesch, 2013).

Information technology has generally been found to have substantial effects on the occupational structure in affluent countries in the last decades (see also Autor *et al*., 2003; Spitz-Oener, 2006 for single-country studies). Oesch (2013) finds a decrease of relative employment between 29 and 41 per cent in routine occupations in Denmark, Germany, Spain, Switzerland, and the UK from around 1990 to 2008, whilst employment in non-routine analytical and interactive occupations went up by 23 to 41 per cent. Michaels *et al*. (2014), using data for the US, Japan, and nine European countries between 1984 and 2004, report strong polarising effects of information technology, accounting for a quarter of the growth in relative demand towards non-routine high-skilled labour. Goos *et al*. (2014) extend this to 1993-2010 for 16 Western European countries, estimating that technological change and offshoring can account for three quarters of the observed increase in high-skilled non-routine work and the observed decrease in medium-skilled routine employment. Interestingly, these studies all find much weaker or insignificant effects of international trade and offshoring once the impact of technological change is accounted for.

5.2.2 Routine task intensity as determinant of preferences for redistribution

Having put forward that technological change is an employment hazard for individuals in routine occupations, we will now argue that this occupational risk translates into increased preferences for redistribution.

In the classic comparative political economy approach redistribution preferences are a function of material self-interest (Meltzer and Richard, 1981). From this model we would predict that preferences for redistribution are decreasing in the relative level of present individual income at the micro level. An implication of this is that increased market earnings inequality will lead to greater political demand for redistribution at the macro level.

More recently, scholars have distinguished an insurance component of redistribution preferences that incorporates an intertemporal element. When individuals are risk averse, they will prefer to insure against uncertain future income levels. Individuals will favour additional nonmarket insurance when they are presently exposed to an increased risk of job or wage loss, assuming that markets cannot provide for insurance against such risks. Social protection arrangements such as unemployment benefits or social assistance offer insur-

ance for individuals against job and wage loss. As these forms of social security are redistributive (*e.g.*, Nelson, 2011), the redistribution preferences for individuals exposed to risks will go up (Sinn, 1995; Moene and Wallerstein 2001; Iversen and Soskice, 2001; Iversen and Soskice 2009; Rehm 2009). This insurance perspective in understanding determinants of social protection was pioneered and formally modelled by two papers. We will contrast our reasoning to theirs.

Iversen and Soskice (2001; IS from here onwards) argue that individuals with more specific as opposed to general skills favour more insurance as protection against their investment in human capital. In the IS model there is a homogeneous risk of job loss across the electorate, but the opportunities for reemployment are lower for individuals who invested in specific skills. Holding income and risk aversion constant, an increase in the ratio of specific versus general skills will lead individuals to prefer higher levels of nonmarket insurance.

Moene and Wallerstein (2001; MW from here onwards) have a slightly different ambition. Using a micro level model, they seek to explain a macro level phenomenon that runs counter to the Meltzer-Richard model, that is, why a more skewed income distribution can in fact lead to lower levels of redistribution. MW theorise that insurance is a normal good, leading individuals to favour more public insurance when their income rises. Assuming that individuals are sufficiently risk averse, so that the insurance motive dominates the Meltzer-Richard redistribution motive, then income will positively affect preferences for redistribution, holding risk and risk aversion constant. From this MW conclude that a means-preserving increase in earnings inequality that lowers the income of the median voter decreases preferences for insurance. In the MW model risk of job loss is a function of income; it is lower (or set to zero) for high-income than for low-income groups.

Our point of departure lies closer to the IS model, as we explicitly recognise an occupational hazard, independent of the level of income, that translates into higher preferences for nonmarket protection. We slightly deviate from the IS model by theorising that the risk of job or wage loss is heterogeneous across the electorate, depending on the occupational level of RTI, instead of proposing that reemployment possibilities differ conditional on occupational risk. The implication is similar, however; given a level of income and risk aversion, the occupational risk leads individuals to favour higher levels of nonmarket insurance.

Hypothesis 1: The level of routine task intensity of an occupation positively affects preferences for redistribution

As already stated, technological change has not yet been recognised as an occupational threat in the redistribution preferences literature as far as we know. How does the degree of RTI compare to occupational risks that have

been described in the comparative political economy literature? We will show later that correlations among occupational risks are low.

Kitschelt and Rehm (2014) mention routine occupations in their study which also looks at occupational characteristics and redistribution preferences. As we show in more detail in Appendix 5.1, their operationalisation follows educational and income lines and does not capture the degree of routine task intensity of occupations. Kitschelt and Rehm also do not argue that individuals in routine occupations favour more redistribution as an insurance against increased risk of job loss due to automation. Rather, elaborating on Oesch (2006), they are interested in occupations as socialisation profiles. They differentiate occupations based on discretionary disposal over own work (the 'logic of authority'), where the hypothesis is that individuals with more discretionary space and authority over subordinate employees will find the preserving of material incentive to be important, and therefore will be against redistribution. The two groups with the lowest degree of authority are coined skilled and unskilled routine, versus professionals and associate professionals. The differences across these groups are measured by dummies rather than by means of a continuous measure of the routine task intensity of occupations.

We already introduced the degree of skill specificity from the IS model (see also Cusack *et al.*, 2006). Skill specificity pertains to job risks following investments in human capital. It comprises a scale of specific versus general skills, instead of whether a certain skill (be it specific or general) is routine, manual, or abstract. There are no *a priori* reasons to believe that the degree of specificity of skills (and therefore occupations) is related to the degree of RTI. As an example, models, salespersons, and demonstrators have the most general skills, whilst stationary-plant and related operators have the most specific skills. In terms of routine task intensity, however, these occupations are very comparable – both are very average as we will also show later.

A second occupational risk is the outsourcing of certain parts of the production process as performed by certain occupations (Grossman and Rossi-Hansberg, 2008). The crucial occupational factor here is the degree to which parts of the production process can be executed abroad, which is generally called offshorability. Walter and co-authors have applied the concept of offshorability to redistribution preferences (2010; 2014; Dancygier and Walter, forthcoming; Rommel and Walter, 2014). There is an analytic distinction between offshorable and automatable occupations (Oesch, 2013: 18-19; Goos *et al.*, 2014; Autor *et al.*, forthcoming). Certain occupations can relatively easily be executed abroad, but require non-routine cognitive skills that are difficult to automate. Examples are architecture, software developing, or statistical analysis. Other occupations are routine and can be computerised relatively straightforwardly, but require spatial proximity. Examples here are security guards or customer service clerks.

5.2.3 Moderating factors

The last part of our argument concerns factors that moderate the (positive) effect of RTI on preferences for redistribution. We will argue that the importance of RTI as a determinant of nonmarket insurance preferences will be increasing in the degree of sectoral risk exposure and the level of present income. By considering factors that moderate the translation from job risk to preferences for insurance, we part from the IS and MW models. Moreover, the role of the level of present income in affecting redistribution preferences in our model differs from theirs.

We hypothesise that RTI becomes a stronger predictor of redistribution preferences for individuals employed in sectors more exposed to technological change. This can be the result of an increased actual risk of job or wage loss (*e.g.*, Michaels *et al.*, 2014; Thewissen and Van Vliet, 2014), or it can be a consequence of increased visibility of this risk as relatively more individuals employed in the same sector are exposed to risk of automation too. Sectoral differences in risk exposure are examined more frequently in studies on preferences for insurance (*e.g.*, Rehm, 2009; Walter, 2010).[2] Yet, occupational factors are generally seen as more important determinants of nonmarket protection preferences than sectoral factors. Human capital is more tied to an occupation than to an industry, and occupations are considered to be more important socialisation factors (Oesch, 2006; Rehm, 2009; Kitschelt and Rehm, 2014).

> *Hypothesis 2: Sectoral exposure to technological change strengthens the positive effect of the occupational level of routine task intensity on preferences for redistribution*

We propose to view income as a second factor that accentuates the preferred level of insurance for individuals holding more routine occupations. If an individual has relatively more to lose from an occupational risk, then this risk will become a more decisive factor in preferred levels of nonmarket protection. This view deviates from existing models of redistribution preferences. In the Meltzer-Richard model individuals do not have an insurance motive so that the level of income always negatively affects preferred levels of redistribution. Income enters the IS model in a comparable fashion; in their regression results the level of redistribution preferences is also negatively associated with levels of present income. MW, however, argue that insurance is a normal good so

2 We do not include industry-level risks other than technological change in our regressions, such as FDI in value added (Walter, 2010), unemployment rates (Rehm, 2009), or the share of foreign-born workers (Dancygier and Walter, forthcoming). This is because we can only define sectors at a highly aggregated level as we will explain later. Yet, we incorporate occupational equivalents of these variables as sensitivity tests.

that individuals will favour more when their income level goes up. In a follow-up paper (2003) the authors do not explicitly argue that richer individuals prefer more insurance than poorer individuals. Rather, a more skewed income distribution will lead to lower levels of insurance against income loss compared to a more equalised country with the same mean income and risk distribution. We still follow Meltzer-Richard in hypothesising that income has a negative direct effect on redistribution preferences. Yet, we add a moderating effect of income to this. We pose that RTI translates into higher favoured levels of insurance particularly when individuals have more to lose. Thus, in our model, income has a direct negative effect on preferred levels of redistribution, but it will positively influence the effects of RTI on redistribution preferences.

Hypothesis 3: The individual level of present income strengthens the positive effects of the occupational level of routine task intensity on preferences for redistribution

To our knowledge, individual levels of income or sectoral exposure have not been considered as moderating factors in existing studies on redistribution preferences. Other scholars have argued that educational levels moderate the effects of offshoring on redistribution preferences, since high-skilled individuals benefit from globalisation whilst low-skilled individuals lose (Walter, 2010; Dancygier and Walter, forthcoming). In addition, country-level institutions that mitigate risks have been put forward as a moderating factor in the effects of skill specificity on preferences for insurance (Gingrich and Ansell, 2012).[3]

5.3 DATA

5.3.1 Routine task intensity across occupations

In our theoretical section we argued that individuals holding routine occupations particularly bear risks of wage or employment loss from automation. We use the routine task intensity index from Goos *et al*. (2014), who rely on Autor and Dorn (2013) and Autor *et al*. (forthcoming). Goos *et al*. (2014) distinguish between routine, manual, and abstract task inputs, derived per occupation from the Dictionary of Occupational Titles (DOT). The RTI index measures the log routine task input per occupation, minus the log manual and abstract task inputs, so that the measure is increasing in the relative importance of routine tasks vis-à-vis manual and abstract tasks. As the RTI index gauges the tasks structure of an occupation, the index is time- and country-invariant. Goos *et al*. (2014) rescale these actual measures to mean 0 and standard deviation 1.

3 We test for the effects of these possibly confounding factors in our sensitivity analysis.

Measures are available at the 2-digit occupational International Standard Classification of Occupations (ISCO)-88 level.[4]

Another occupational measure of the degree of routine task intensity comes from Oesch (2013). Oesch codes occupations at the 4-digit ISCO-88 level into multiple non-routine and routine occupations drawing on Spitz-Oener (2006), also differentiating between routine, manual, and abstract (or analytical and interactive) tasks. These occupational categories can be combined into a dummy equal to 1 if an occupation is routine, and equal to 0 if otherwise. This dummy indicator and the continuous variable from Goos *et al*. (2014) are quite highly correlated (0.73). As we have more variation and more observations for the continuous Goos *et al*. RTI index, we use this one as our benchmark and use the Oesch (2013) dummy as a sensitivity test.

The European Social Survey (ESS) provides us with pooled time-series cross-section data of redistribution preferences of individuals. It has a standardised occupational identifier at the 4-digit ISCO-88 level for 2002-2010 and ISCO-08 for 2012. We recode the 2012 wave into ISCO-88 definitions using the ILO 4-digit correspondence table.[5] By means of this occupational identifier we can link individuals to the RTI index of Goos *et al*. (2014). Our analysis draws on ESS surveys between 2002-2012 for the 23 countries for which at least two waves of information is available.[6]

To obtain a better understanding what type of occupations score high and low on the RTI index, we postpone our definition of redistribution preferences for a moment and first discuss our operationalisation of education and income. We define the level of education by years of education maximised to 25. Our measure of present income is constructed using respondents' answers to the ESS survey question on household's total net income. Respondents answer on the basis of a show-card, which contains categories identifying income ranges for weekly, monthly, or annually income. We transform the income bands into their survey-specific midpoints, following Rueda *et al*. (2014) and Rueda (2014). The highest income band, which has no upper limit, is assumed to follow a

4 For six groups at the 2-digit ISCO-88 level no information on RTI is available. These agricultural, supervisory, and residual occupational groups are also excluded by Goos *et al*. (2014), Autor *et al*. (forthcoming), and Autor and Dorn (2013).

5 The correspondence table can be found here: http://www.ilo.org/public/english/bureau/stat/isco/isco08/index.htm. A number of occupations are not included in the ILO correspondence table but can easily be transformed to ISCO-88 at the 2-digit level; coding is available upon request. Only a couple of occupations (for 0.1 per cent of the sample) cannot unequivocally be coded and are left out. None of our results change when we exclude 2012 in which the ISCO-08 coding is used, as shown in the sensitivity tests. We have to exclude individuals in all waves for which information is only available at the 1-digit ISCO level (0.8 per cent of the total sample).

6 Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the UK.

Pareto distribution (Hout, 2004; Kopczuk *et al*., 2010).[7] Self-reported household's total net income is recoded into annual 2010 PPP-adjusted US dollars using exchange rate information from the OECD (2014e). In our regressions we place income in natural log.

Table 5.1 lists the occupations ranked by their level of RTI. We can see that on average non-routine occupations have a higher wage and educational level. Yet, these relationships are not very strong; particularly middle-paid and middle-skilled occupations have high values of RTI (Autor *et al*., forthcoming; Goos *et al*., 2014). This is also reflected in relatively low correlations between the RTI index and income (-0.14) and educational level (-0.17). General managers have the least routine occupation, a profession with above-average wage and skill level, but the second-least routine are drivers and mobile-plant operators, a low-skilled low-paid occupation. The most routine occupations are customer service and office clerks, and precision workers. These middle-skilled occupations require relatively few cognitive or interpersonal skills and can fairly easily be partitioned into step-by-step rules.

In our theoretical section we already discussed findings from the labour economics literature that automation is a significant risk for individuals holding routine occupations (Autor *et al*., 2003; Spitz-Oener, 2006; Goos *et al*., 2014; Michaels *et al*., 2014). Using the ESS data we can also look at developments in employment measured by headcounts and wages. As shown in Table 5.1, we can see that within the relatively short time frame of 2002-2012 non-routine occupations (with a negative RTI score) saw on average an increase in their employment share and a higher increase in their wage compared to routine occupations (with a positive RTI score).

7 From 2002-2006 respondents were shown 12 categories that were the same across all countries. The waves 2008-2012 distinguish between 10 categories that differ per country. Moreover, the income bands of the show-card cover substantially different income ranges. We calculate the survey specific midpoints. For the upper band we apply the Hout (2004) calculation, with frequency f and lower limits L, and the country- and wave-specific highest income band indexed as *top* and next-to-last as *top*–1: $M_{top} = L_{top}\frac{V}{V-1}$ where $V = \frac{\ln(f_{top-1} + f_{top}) - \ln(f_{top})}{\ln(L_{top}) - \ln(L_{top-1})}$. There are a small number of observations for which this calculation leads to incorrect top income calculations, as the number of people in the last or next-to-last income band is too low. We exclude the top income band persons in Czech Republic 2002 (two persons), Hungary 2004 (one), Slovak Republic 2004 (seven), and Slovenia 2006 (one). Leaving out these country waves does not affect our main results.

Table 5.1 Levels and changes in employment shares and wages for occupations ranked by their level of RTI

				Wages		Employment shares	
	ISCO	RTI	Average years of education	2002 average (dollar)	% change 2002-2012	2002 average	% change 2002-2012
Non-routine		*-0.68*	*14.1*	*42522*	*12.61*	*61.06*	*0.26*
General managers	13	-1.52	14.0	45287	21.56	3.78	3.99[1]
Drivers and mobile-plant operators	83	-1.50	11.4	30073	11.95	4.23	0.31
Life science and health professionals	22	-1.00	17.7	55880	3.65	2.06	0.93
Physical, mathematical and engineering science professionals	21	-0.82	16.6	52930	6.67	3.94	0.44
Corporate managers	12	-0.75	15.4	60583	8.99	6.42	-4.90
Other professionals	24	-0.73	16.5	49217	9.21	6.43	0.04
Personal and protective services workers	51	-0.60	12.4	31930	13.51	9.37	0.56
Other associate professionals	34	-0.44	14.3	42901	13.23	10.23	0.17
Physical and engineering science associate professionals	31	-0.40	14.0	40254	20.93	5.05	-1.33
Life science, health associate professionals	32	-0.33	14.9	39797	12.92	3.93	-0.19
Extraction and building trades workers	71	-0.19	11.5	30531	12.28	5.64	0.24
Routine		*0.91*	*12.0*	*31708*	*5.53*	*38.94*	*-0.26*
Sales and services elementary occupations	91	0.03	10.7	26293	6.00	5.24	1.65
Models, salespersons and demonstrators	52	0.05	12.3	31327	5.80	5.14	0.59
Stationary-plant and related operators	81	0.32	11.7	31056	13.98	1.29	-0.14
Labourers in mining, construction, manufacturing and transport	93	0.45	11.1	27040	-1.37	2.60	0.38
Metal, machinery, related trades workers	72	0.46	12.0	31894	16.30	6.26	-2.13
Machine operators and assemblers	82	0.49	11.4	28833	5.78	3.34	1.61
Other craft and related trades workers	74	1.24	10.9	27845	4.20	2.29	-0.19
Customer services clerks	42	1.41	13.1	34873	2.57	2.28	0.81
Precision, handicraft, printing and related trades workers	73	1.59	12.3	34770	13.97	0.94	-0.45
Office clerks	41	2.24	13.1	36991	13.14	9.56	-2.40

Note Average values for RTI, average years of education, and wages for non-routine and routine weighted by employment share

[1] The substantial increase in employment for general managers combined with the large drop in number of corporate managers is at least partly due to coding differences between ISCO-08 (for 2012) and ISCO-88 (for earlier waves). If we calculate the employment difference between 2002 and 2010 the employment share of general managers increased by 0.97, whilst the employment share of corporate managers dropped by -0.16. As already stated, none of our results change when we leave out 2012.

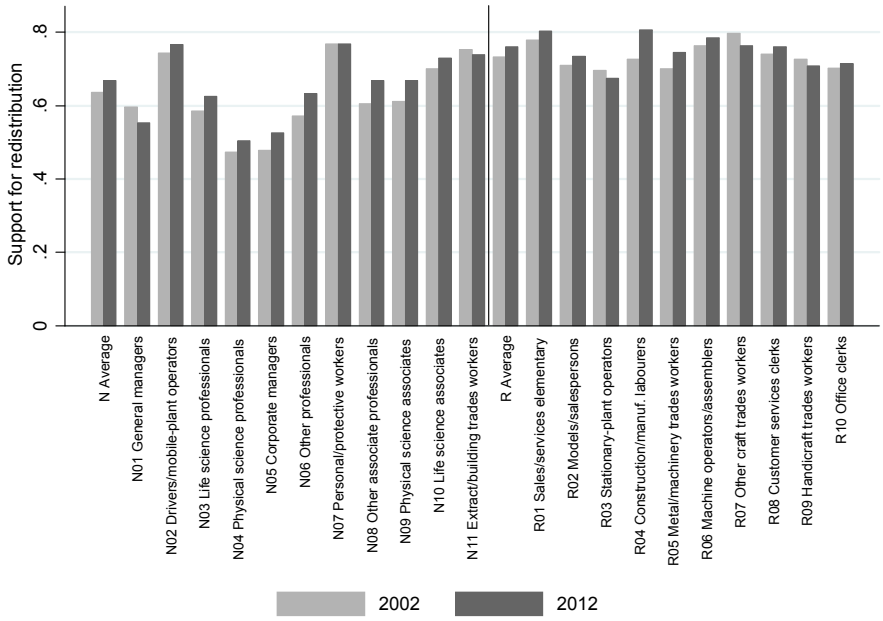
5.3.2 Redistribution preferences

The ESS contains a question designed to directly capture what we aim to explain: whether or not an individual supports government redistribution. Respondents are asked whether they agree or disagree on a five-point scale to the following statement: 'Using this card, please say to what extent you agree or disagree with each of the following statements: The government should take measures to reduce differences in income levels'. This variable is recoded to capture support for government redistribution. Our final measure

contains the following categories: 1: Disagree strongly; 2: Disagree; 3: Neither agree nor disagree; 4: Agree; and 5: Agree strongly.[8] This question is the only one tapping into social policy preferences available in all waves of the ESS, and the question is frequently used in studies seeking to explain redistribution preferences (Rehm, 2009; Burgoon *et al*., 2012; Burgoon, 2014; Kitschelt and Rehm, 2014; Rueda, 2014; Wren and Rehm, 2014; Hausermann *et al*., forthcoming). The mean of our ordinal measure of support for redistribution for the full sample is 3.73. Support for redistribution went slightly up on average from 3.65 (2002) to 3.81 (2012).

To better view the differences in redistribution preferences across occupations, we generate a binary measure for support for redistribution equal to 1 if an individual agrees or agrees strongly with support for redistribution (see also Rehm, 2009; Wren and Rehm, 2014). This variable has an overall mean of 0.68; its average values increased from 0.67 in 2002 to 0.70 in 2012. In Figure 5.1 we rank the occupations on their level of RTI, again distinguishing between occupations with a negative RTI index score (non-routine, N) and a positive RTI index level (routine, R). We can see that on average individuals in routine occupations have higher levels of support for redistribution. In both groups support for redistribution increased over time.

Figure 5.1 Support for redistribution across occupations in 2002 and 2012



8 Refusals and don't knows are recoded as missings (1.7 per cent of the sample).

5.3.3 Sectoral exposure

In our theoretical section we hypothesised that income and sectoral exposure can moderate the relationship between RTI and preferences for public insurance. We already explained how we measure income. The ESS contains a sectoral identifier whose definition unfortunately differs across waves. We generate a standardised sectoral identifier based on the 1-digit Nomenclature statistique des Activités économiques dans la Communauté Européenne (NACE) 1.1 level.[9]

We follow Wren and Rehm (2013) by defining the degree of exposure at the sectoral level using our occupational indicator for RTI. We use the means of the RTI index for this. We can see in Table 5.2 that manufacturing, financial intermediation, and wholesale and retail trade are sectors containing on average relatively large volumes of routine work, and can therefore considered to be exposed to technological change. Interestingly, public administration is also relatively exposed to RTI, which again illustrates the substantive difference between RTI and offshoring. We can see that exposure is low in agriculture, hotels and restaurants, but also in health and social work. This corresponds to their large shares of manual and interpersonal work.

Table 5.2 Sectoral exposure

Sector	NACE	Exposure
Agriculture and fishing	AtB	-0.46
Hotels and restaurants	H	-0.46
Health and social work	N	-0.40
Transport, storage, communication	I	-0.25
Education	M	-0.22
Other community, social and personal service activities	O	-0.22
Real estate, renting, business activities	K	-0.21
Construction	F	-0.18
Mining	C	-0.15
Electricity, gas, water supply	E	-0.04
Public administration, defence, social security	L	-0.01
Wholesale and retail trade	G	0.01
Financial intermediation	J	0.06
Manufacturing	D	0.20

9 ESS 2002 is based on NACE Rev. 1.0, 2004-2008 on NACE Rev. 1.1, and 2010-2012 on NACE Rev. 2.0. To link NACE Rev. 1.0 and 1.1 we only need to drop the tiny industry P: Activities of households. NACE Rev. 1.1 and 2.0 can be (slightly imperfectly) linked, but only at the 1-digit level. We use the correspondence table from the UK National Statistics (2009: 2-3) for this.

5.3.4 Other individual-level controls

We include a vector of common controls in the redistribution preferences literature (*e.g.*, Rehm, 2009; Burgoon, 2014; Rueda *et al.*, 2014). We include variables for years of education, age in years, the degree of religiosity (scaled 1-10), and we include dummies for gender, (former) trade union membership, and whether an individual is unemployed. This last dummy can be seen as a measure of realised risk; if an individual lost her or his job (Cusack *et al.*, 2006).

5.3.5 Country-level factors

At the country level, we follow the literature by including social spending as a percentage of GDP (Burgoon *et al.*, 2012; Rueda *et al.*, 2014) and the unemployment rate (Burgoon *et al.*, 2012; Burgoon, 2014), both lagged one year.[10] By including ex-ante levels of social spending we can account for possible diminishing marginal returns to redistribution, yielding a negative association between social spending and preferences for redistribution (Burgoon *et al.*, 2012). It could be that higher levels of social spending also affect the occupational distribution, for instance by leading to higher levels of public versus private employment. We expect that individuals favour higher levels of redistribution as means of insurance when unemployment is soaring. The unemployment rate might affect the occupational distribution when certain occupations are more severely affected by cyclical movements.

5.4 Empirical estimations

5.4.1 Model specification

We account for the fact that individuals are nested within countries by applying a multilevel model with random intercepts for countries, and we cluster standard errors at the country level.[11] Our dependent variable is categorical and ordered. We could analyse its determinants by applying ordered probit or ordinary least squares (OLS) estimation techniques. An ordered probit model has the advantages that predicted probabilities are restricted to the range of the dependent variable and it corrects for heteroskedasticity resulting from the categorical nature of the dependent variable. Yet, interaction effects in

10 Data for social spending for Switzerland in 2009 (linked to 2010 in our dataset) are missing. We impute this observation by linear interpolation; this does not affect our results.

11 As we will in our sensitivity tests, none of our results change when we use a crossed random effects model for occupations and countries.

nonlinear models cannot be directly interpreted (Ai and Norton, 2003; Greene, 2010). Moreover, in a more complicated multilevel setting, the models sometimes do not converge. A linear OLS model does not have these drawbacks, and we already correct for heteroskedasticity by clustering our standard errors at the country level. We estimate our equations using both techniques. Our results and even coefficients are very comparable. All predicted probabilities for our OLS tests fall neatly in the range of the dependent variable. Therefore, we follow Burgoon (2014) and show the results of our OLS estimations of which the interaction effects are easier to plot. We list the results for the multilevel ordered probit models in Appendix 5.2.

In our regressions we demean sectoral exposure and ln income. The only effect of this is that the RTI coefficient can be interpreted as the effect of RTI on redistribution preferences when income and sectoral exposure are at their mean, instead of when income and sectoral exposure are zero which is a substantively meaningless case.

5.4.2 Main results

The results of our estimation of the effects of RTI on redistribution preferences are presented in Table 5.3. We first briefly reflect on the coefficients of our control variables. These estimates are all consistent with previous findings in the literature. First, we find that poorer individuals favour higher levels of redistribution than richer. This is in line with our expectations based on the Meltzer-Richard model. The coefficient implies that a 1 per cent increase in income is associated with a 0.002 decrease in expressed redistribution preferences, or an individual with twice the income is predicted to have a 0.14 lower level of redistribution preferences, *ceteris paribus*. Furthermore, being lower educated, older, female, unemployed, and being a trade union member all increase the likelihood of approving that the government should reduce income disparities (*e.g.*, Rehm, 2009; Burgoon, 2014). The ordered probit models yield fully comparable estimations of the individual-level variables. The OLS models do not show signs of significant effects of social spending or the unemployment rate. The ordered probit models, however, point to positive associations for the unemployment rate. This is in line with the hypothesis that individuals favour more nonmarket protection when unemployment rates are higher.[12]

12 The difference between probit and OLS for the country-level variables potentially arises from the fact that probit models tend to require a larger number of countries than linear OLS models to derive reliable estimates. For our model which only includes random country intercepts, the bias of estimated country effects is limited as long as 15-20 countries are present (Stegmueller, 2013).

We now move to our main variables of interest. In model 1 we test for the direct effects of RTI on preferences for redistribution. Our findings indicate that RTI is positively associated with redistribution preferences. This result provides empirical support for our first hypothesis that individuals in routine occupations favour more redistribution to insure against the increased risk of job or income loss. As we will show in the sensitivity tests, the positive effect of RTI on redistribution preferences remains robust in different specifications and when other occupational risks are added. We will look into the size of the coefficient compared to other occupational risks in this section as well.

Table 5.3 RTI and redistribution preferences

	RTI	Interacted with sectoral exposure	Interacted with income	Both interactions
	(1)	(2)	(3)	(4)
RTI	0.042***	0.050***	0.043***	0.050***
	(0.000)	(0.000)	(0.000)	(0.000)
ln income	-0.202***	-0.197***	-0.195***	-0.191***
	(0.000)	(0.000)	(0.000)	(0.000)
Sectoral exposure		-0.180***		-0.172***
		(0.000)		(0.000)
RTI * sectoral exposure		0.144***		0.144***
		(0.000)		(0.000)
RTI * ln income			0.046***	0.042***
			(0.000)	(0.000)
Years of education	-0.027***	-0.028***	-0.027***	-0.027***
	(0.000)	(0.000)	(0.000)	(0.000)
Male	-0.189***	-0.172***	-0.188***	-0.172***
	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.002***	0.002***	0.002***	0.002***
	(0.009)	(0.009)	(0.007)	(0.007)
Trade union member	0.160***	0.159***	0.160***	0.159***
	(0.000)	(0.000)	(0.000)	(0.000)
Degree of religiosity	-0.006	-0.006	-0.006	-0.006
	(0.155)	(0.133)	(0.159)	(0.137)
Dummy unemployed	0.096***	0.098***	0.100***	0.101***
	(0.000)	(0.000)	(0.000)	(0.000)
Social spending in $\%GDP_{t-1}$	0.007	0.007	0.007	0.006
	(0.280)	(0.329)	(0.295)	(0.342)
Unemployment $rate_{t-1}$	0.000	0.000	0.000	0.000
	(0.965)	(0.966)	(0.953)	(0.956)
Constant	3.933***	3.941***	3.928***	3.936***
	(0.000)	(0.000)	(0.000)	(0.000)
Log likelihood	-111158.0	-111072.2	-111121.9	-111041.1
Intraclass correlation	0.082	0.083	0.083	0.083
N	78050	78050	78050	78050
Number of countries	23	23	23	23

Note Multilevel OLS model with random country intercepts and standard errors clustered at the country level. Sectoral exposure and ln income are demeaned. *P* values in parentheses, *p<0.1, **p<0.05, ***p<0.01

Having found a positive effect of RTI on redistribution preferences, we now enquire whether this relation is moderated by sectoral exposure. Following the insurance logic our second hypothesis was that the positive linkage between RTI and redistribution preferences increases for individuals working in sectors more exposed to RTI. Thus, we expect a positive sign for our inter-

action between sectoral exposure and the RTI index. Again, our empirical results support our theoretical expectations as can be concluded from model 2 in Table 5.3. We find positive associations between our dependent variable and the interaction of the RTI index and sectoral exposure. Additional tests where we also demean the RTI index (results not shown here) show that the constituent element of sectoral exposure itself is negative, whilst the constituent RTI index variable remains positive.[13] This seems to suggest that sectoral exposure is not an important driver of preferences for public insurance by itself. This finding corresponds to Rehm (2009) that occupational factors matter more for insurance motivations. Still, our results indicate that sectoral exposure accentuates the effects of occupational hazards on individual preferences for nonmarket protection.

Next, we address the role of income as a factor that can strengthen the association between RTI and preferences for redistribution (hypothesis 3). As we already stated, income itself is always negatively associated with preferences for redistribution. Yet, income can moderate the effects of RTI on preferences for redistribution, as richer individuals have relatively more to lose from job loss due to automation. Our empirical results from model 3 in Table 5.3 support this line of reasoning as indicated by a positive effect of the interaction effect of income and the RTI index on preferences for redistribution.

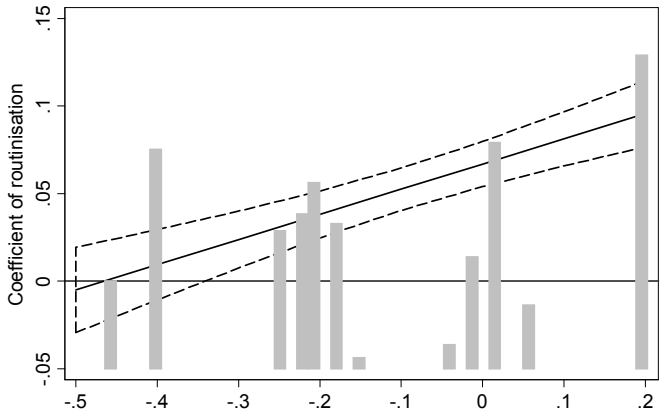
Having established that income and sectoral exposure strengthen the effects of RTI on redistribution preferences separately, we now move to a simultaneous estimation. In this way we test whether both interactions have explanatory power, or whether they are picking up a similar moderating pattern. We do this here by estimating both interactions in one equation as shown in model 4.[14] The two interactions and their constitutive parts remain significant, and the coefficients barely change. Thus, income and sectoral exposure have an independent moderating effect on the relationship between RTI and redistribution preferences. From this we can conclude that higher levels of RTI particularly translate into higher preferred levels of redistribution when individuals are working in exposed sectors and when they are richer. This does not necessarily mean that richer individuals have higher levels of redistribution preferences, as the level of income itself is still negatively associated with preferred levels of redistribution.

13 Demeaning the RTI index does not affect the constituent coefficient of sectoral exposure much, as the RTI-index is normalised.

14 Another way of simultaneously analysing the moderating effects of income and sectoral exposure on the relationship between RTI and redistribution preferences would be to estimate a triple interaction between these variables. We do this in Appendix 5.3; results confirm our findings presented here.

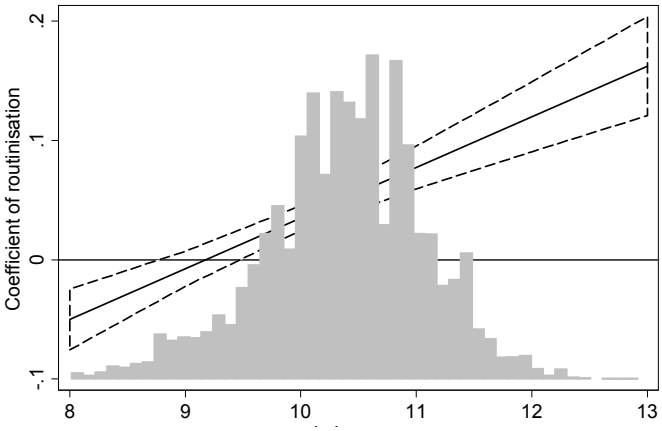
Figure 5.2 Effects of RTI on redistribution preferences conditional on sectoral exposure and income

5.2a Conditional on sectoral exposure



Degree of sectoral exposure

5.2b Conditional on income



ln income

Note Multilevel OLS model with random country intercepts and standard errors clustered at the country level. All continuous control variables are held at their mean and dummies at their median. The black line shows the coefficient of RTI on redistribution preferences (*y* axes) at different levels of sectoral exposure or ln income (*x* axes). The dotted lines are the 95 per cent confidence intervals. The grey histogram plots the distribution of observations across levels of sectoral exposure and ln income

To ease the interpretation, we evaluate the effect of RTI on redistribution preferences at different levels of sectoral exposure and income in Figure 5.2.[15] All continuous control variables are held at their mean and the dummies at their median value. We can see in Figure 2a that for individuals in sheltered sectors (with a sectoral exposure below -0.35, or 18 per cent of the sample) RTI is not a significant determinant of redistribution preferences. Above this threshold, the RTI index at the occupational level becomes an increasingly stronger determinant of preferences for redistribution.

We also see that the effects of RTI on redistribution preferences are monotonically increasing in the level of income (Figure 2b). For individuals with a very low income we find that RTI is associated with lower rather than higher levels of redistribution preferences, but this only holds for a minor part of our sample (5 per cent of the sample). For a slightly larger part of our sample the association between RTI and redistribution preferences is insignificant (15 per cent of the sample). Above this income threshold RTI becomes a positive and significant determinant of redistribution preferences. The size of the coefficient of RTI increases when the level of individual income goes up.

5.4.3 Sensitivity tests

We conduct a battery of sensitivity tests to examine the robustness of our results. In Table 5.4 we show the effects of these tests on the coefficients of the RTI index and its interactions with sectoral exposure and income for OLS.[16] In Appendix 5.2 we also display the results of these sensitivity tests for our multilevel ordered probit models. We conclude from these tests that the effects of RTI on redistribution preferences and the moderating effects of sectoral exposure and income are robust.

15 We show the effects for model 4, holding the other interaction effect constant. The marginal effects for models 2 and 3 with only one interaction effect at the time produce fully comparable results.

16 Signs and significance of the control variables are unaffected by these amendments (available upon request).

Table 5.4 Robustness checks for our OLS results

		RTI	ln income	Sectoral exposure	RTI * sectoral exposure	RTI * ln income
	Original results	0.050***	-0.191***	-0.172***	0.144***	0.042***
(1)	Dummy RTI from Oesch (2013)	0.081***	-0.212***	-0.313***	0.352***	0.050***
(2)	Sectoral definitions from Wren and Rehm (2014)	0.045***	-0.190***	-0.101***	0.044***	0.042***
(3)	Standardised ln income	0.050***	-0.141***	-0.173***	0.140***	0.034***
(4)	Equivalised ln income	0.051***	-0.196***	-0.176***	0.143***	0.037***
(5)	Skill specificity	0.047***	-0.189***	-0.199***	0.122***	0.043***
(6)	Offshoring	0.061***	-0.188***	-0.118***	0.120***	0.037***
(7)	Logic of task groups	0.072***	-0.175***	-0.131***	0.070***	0.035***
(8)	Foreign ratio	0.055***	-0.187***	-0.184***	0.146***	0.043***
(9)	Occupational unemployment rate	0.031***	-0.173***	-0.156***	0.134***	0.043***
(10)	Left-right scale	0.046***	-0.168***	-0.153***	0.119***	0.040***
(11)	All individuals	0.042***	-0.167***	-0.153***	0.107***	0.044***
(12)	Only employed	0.050***	-0.205***	-0.188***	0.146***	0.042***
(13)	Excluding Eastern Europe	0.052***	-0.189***	-0.211***	0.157***	0.045***
(14)	Excluding 2012	0.049***	-0.195***	-0.170***	0.137***	0.041***
(15)	Binary dependent variable	0.020***	-0.074***	-0.060***	0.060***	0.017***
(16)	Redistribution	0.050***	-0.191***	-0.171***	0.144***	0.042***
(17)	Gini market income	0.050***	-0.193***	-0.170***	0.143***	0.042***
(18)	EPL index	0.049***	-0.191***	-0.173***	0.149***	0.042***
(19)	UB replacement rate	0.050***	-0.194***	-0.173***	0.144***	0.042***
(20)	Crossed effects	0.077***	-0.159***	-0.155***	0.074***	0.024***

Note Multilevel OLS model with random country intercepts and standard errors clustered at the country level. Sectoral exposure and ln income are demeaned. *p<0.1, **p<0.05, ***p<0.01

First we use alternative measures of technological change and the moderating variables.[17] We use the Oesch (2013: 156) coding to generate a dummy variable for routine occupations (model 1). With this indicator the effects of RTI on redistribution preferences become stronger. The same holds for the moderating effects of sectoral exposure. We also use a different coding scheme to examine sectoral exposure to technological change (model 2). Wren and Rehm (2014) distinguish between four types of sectors on the basis of their exposure to information and communications technology and tradability. We follow their suggestions and generate a dummy equal to 1 for the sectors characterised by high rates of information technology intensity (the traditional sectors and technology-intensive services), and to 0 for other sectors (non-technology intensive services and welfare and government services). Signs and significance levels do not change. Furthermore, we employ alternative definitions for real income. First, we standardise income across countries to make sure that results are not driven by differences in average income across countries (model 3). Also equivalising income using the square root of the household size to correct for differences in household composition does not affect our results (model 4).

Next, we include other occupational risks into our regression model. We can see from Table 5.4 that this does not influence the significance of our

17 Plotting the interactions with these moderating variables yield results very comparable to the ones shown in Figure 5.2 (available upon request).

coefficients of interest. A first alternative occupational risk is skill specificity (Iversen and Soskice, 2001; Cusack *et al*., 2006). We use the measure of relative skill specificity as also used by Rehm (2009).[18] This is a time-invariant measure available at the 2-digit ISCO-88 level. Second, we rely on Walter's binary index of offshoring (2010; 2014; Dancygier and Walter, forthcoming). This index is defined at the 4-digit ISCO-88 level.[19] We already argued that RTI substantively differs from skill specificity and offshoring. This is also reflected in modest correlations (0.15-0.21). We find that individuals whose occupations require more specific skills favour more insurance (model 5; *e.g.*, Iversen and Soskice, 2001; Cusack *et al*., 2006). Interestingly, individuals in offshorable occupations decrease rather than increase their preferred level of redistribution (model 6). This finding is also reported by Walter (2014). Walter argues that exposure to offshoring increases risk perceptions among low-skilled, whereas high-skilled or the 'globalisation winners' lower their preferred levels of redistribution, which can explain the negative coefficient of offshoring on redistribution preferences.[20]

Furthermore, we include dummies for the technical and interpersonal task logic from Kitschelt and Rehm (2014). Dummies are defined at the 4-digit ISCO level. We find that these two groups have higher preferences for redistribution compared to the baseline group with an organizational task logic (model 7), as predicted by Kitschelt and Rehm. In fact, including these dummies almost doubles the size of the RTI index coefficient. We do not show the results if we include dummies for the logic of authority or the combined groups, as they eat up much of the variation given that one dummy captures all routine occupations (plus more, as shown in Appendix 5.1). If we were to include these dummies, then all interaction effects remain comparable, but RTI itself becomes insignificant.

In the literature more occupational risks have been discerned that substantively differ from RTI, but might still be seen as confounding factors. Burgoon *et al*. (2012) identify migration as an occupational risk. We follow their empirical strategy and include the number of foreign born as a percentage of the population, which is available at the 2-digit ISCO-88 level from the OECD migration database (OECD, 2008b). Data refer to around 2000. We find that individuals within occupations with higher ratios of foreigners have higher levels of redistribution preferences (model 8), as also found by Burgoon *et al*. (2012). More importantly, the significance of our variables of interest is not affected by including this occupational hazard.

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18 The measure is taken from http://www.people.fas.harvard.edu/~iversen/SkillSpecificity.htm. This website also contains information regarding its measurement.

19 We are grateful to Stefanie Walter for sharing her coding with us. We cannot use ESS wave 2012 as the ISCO-08 definitions cannot be recoded into ISCO-88 at the 4-digit ISCO level.

20 Following Walter (2014), the negative association between offshoring and preferences for redistribution disappears when an interaction effect between offshoring and years of education is included.

Next, we include the occupational unemployment rate from Rehm (2009; model 9).[21] This is a stringent test, since our argument is that RTI leads to an increased job or wage loss risk, and because of this, to higher levels of preferred nonmarket protection. We lag the occupational unemployment rates by one year as information for 2012 is missing. Unfortunately, data are only available at the 1-digit occupational level. The occupational unemployment rate and the RTI index are positively correlated (0.22).[22] As expected, including the occupational unemployment rate decreases the size of the RTI index coefficient on redistribution preferences, though it remains significant at the 1 per cent. The occupational unemployment rate positively affects the preferred level of redistribution.

Our main analysis does not include the left-right inclination of individuals, as we state that redistribution preferences, which we seek to explain, are a key element of expressed ideology (Rueda *et al.*, 2014). Nevertheless, left-right self-placement might constitute an independent determinant of redistribution preferences (see *e.g.*, Margalit, 2011). Our estimates are robust to the inclusion of left-right self-placement measured on a scale of 1-10 (model 10). Evidently, individuals that consider themselves more leftist prefer higher levels of redistribution.

Furthermore, we test the robustness of our results to the sample definition. First, we expand our sample by 67 per cent by including all individuals for which information is available (model 11). We insert an additional dummy for people not active in the labour market. Second, we repeat our estimations for only employed individuals, which reduces our sample size by 6 per cent (model 12). Both of these sample amendments do not affect our main results. Furthermore, results might be driven by the country and time sample. Excluding the Eastern European countries (model 13) or leaving out 2012 which is based on another occupational coding scheme (model 14) does not affect our results either.[23]

By applying OLS and ordered probit estimation to a categorical dependent variable, we implicitly make the proportional lines assumption that the effect of the independent variables is constant for each answer category of our dependent variable (see also Busemeyer and Garritzmann, 2014). This assumption can be relaxed by transforming our categorical dependent variable into a dummy equal to 1 when an individual prefers or strongly prefers redistribution (model 15). This does not affect the signs and significance of our variables of interest for our multilevel OLS and probit estimations.

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21 We thank Philipp Rehm for sharing his occupational information. Unfortunately, no high-quality data are available at the two-digit level. Data for Luxembourg are missing.

22 The correlations between the occupational unemployment rate and the other occupational risks we discuss are significantly weaker.

23 More generally, dropping countries, years, or occupations one by one does not affect signs or significance levels.

We also account for other factors at the country level. We again lag all these factors by one year. Support for redistribution might decrease when present levels of redistribution are high. Higher levels of redistribution might lead to stronger disincentive effects (Thewissen, 2014), and individuals potentially take this into account when forming their redistribution preferences. Individuals might also use actual levels of redistribution as a benchmark when answering the question about whether the government should reduce income differences (Rueda *et al*., 2014). Furthermore, we include the ex-ante level of market inequality (Burgoon *et al*., 2012). Individuals potentially favour more redistribution when levels of inequality are higher. We include the absolute level of redistribution and the level of market inequality from the Solt (2014) database (models 16 and 17).[24] Adding these factors does not affect our coefficients of interest. For OLS both country factors are insignificant, but for the ordered probit model the preferred level of redistribution is negatively associated with the existing level of redistribution, and positively with the level of market inequality.

Two other country factors might be important as they could decrease the level of redistribution individuals favour by providing insurance (Gingrich and Ansell, 2012). We include the overall employment protection legislation (EPL) index and the summary measure of OECD unemployment benefit replacement rates (OECD, 2014f; 2014g). The EPL index is never significant, whilst the ordered probit models provide support for our hypothesis that higher unemployment benefit replacement rates decrease preferred levels of nonmarket protection (models 18 and 19). More importantly, the country factors do not affect our coefficients of interest.

Last, we test for robustness to our model specification. We model occupations as a separate level in addition to the country level to account for the hierarchical nature of our data. Here, we use a crossed random effects model, since occupations are not nested within countries but can be seen as a distinct level. Our OLS results remain firm (model 20). The RTI coefficient increases while the coefficients of the interaction terms decrease slightly. Unfortunately, this specification does not converge for the ordered probit model.

5.4.4 Interpretation of the size of the coefficients

Having found a positive association between RTI and preferences for redistribution, we now interpret its size. We do this in a comparative fashion, by running the regression with both interactions, where we include the two other occupa-

24 We calculate unweighted averages per country-year observation for our sample from the Solt database. Unfortunately, within our multilevel framework we cannot take standard errors of the levels of inequality and redistribution into account.

tional risks discussed in the theoretical section, skill specificity and offshoring.[25] We calculate the effects when one of these three occupational risks increases by one standard deviation. In substantive terms, for the RTI index this is roughly comparable to an occupational switch from models, salespersons, and demonstrators to other crafts and related trades (0.11 to 1.08). For the relative skill specificity this is approximately equivalent to an individual switching from physical and engineering science associate professionals to sales and services elementary occupations (4.3 to 7.7). Last, for offshoring, it can be interpreted as an occupational switch from metal, machinery, and related trades workers to general managers (0.50 to 0.95).

We evaluate the effects of RTI on redistribution preferences at three levels: with ln income and sectoral exposure at their average value, one standard deviation below, and one standard deviation above this. This approximately implies that we evaluate the effects of the RTI index for an individual with an annual real income of 15003 dollar working in transport, storage, and communication (one standard deviation below), 31242 dollar in mining (average), and 65061 dollar in financial intermediation (one standard deviation above).

Table 5.5 Effects of an increase of one standard deviation on redistribution preferences

	Occupational risk	Sectoral exposure and ln income	Effect on redistribution preferences	Minimum (95% confidence interval)	Maximum (95% confidence interval)
(1)		Minus one standard deviation	0.010	-0.008	0.028
(2)	RTI	Average	0.056***	0.043	0.070
(3)		Plus one standard deviation	0.103***	0.080	0.125
(4)	Offshoring	-	-0.053***	-0.066	-0.039
(5)	Skill specificity	-	0.034***	0.024	0.044

Note Multilevel OLS model with random country intercepts and standard errors clustered at the country level. *p<0.1, **p<0.05, ***p<0.01

From Table 5.5 we can conclude that a one standard deviation increase of the RTI index at average ln income and sectoral exposure has a roughly 1.5 times stronger effect than a comparable increase in skill specificity on the favoured level of redistribution. An *F* test indicates that the effect of RTI on redistribution preferences is stronger than the effect of skill specificity at the 1 per cent significance level. The effect of the RTI index becomes a factor three larger than skill specificity if ln income and sectoral exposure are one standard deviation above their means. On the other hand, RTI is no longer a significant determin-

25 We also conducted an estimation where we included the foreign ratio and occupational unemployment rate. The coefficient for the RTI index at average ln income and sectoral exposure decreased slightly to .040. The effect of a one standard deviation increase in foreign ratio on redistribution preferences is much lower, 0.022, whilst not surprisingly, the effect for the occupational unemployment rates is larger: 0.084. The coefficient for the RTI index when ln income and sectoral exposure are one standard deviation above is higher (0.10), though an *F* test indicates that the difference in size is not statistically significant.

ant of nonmarket protection preferences for low levels of ln income and sectoral exposure. As found earlier, offshoring has a negative association with redistribution preferences. Its (absolute) size is comparable to the size of the RTI index coefficient at average values of income and sectoral exposure.

5.5 CONCLUSIONS

Current technological innovations in information technology involve a substantial employment risk for individuals holding routine occupations by facilitating the ease of automation. We find that individuals in routine occupations respond to this risk by preferring higher levels of redistribution as a means of nonmarket insurance. Even though technological change is widely considered to be a key occupational driver with large distributive effects, whether it influences the preferred level of redistribution has not been subject of inquiry in the comparative political economy thus far. Indeed, our analysis suggests that on average the routine task intensity of an occupation has a larger positive effect on the preferred level of redistribution than other risks described in the literature, in particular offshoring and skill specificity.

In this chapter we show that the degree of routine task intensity of an occupation becomes a particularly influential determinant of redistribution preferences when two moderating factors are present. First, if an individual is employed in a sector exposed to technological change, and second, when an individual has more to lose from automation, that is, when his or her income is higher, the impact of routine task intensity on preferences for nonmarket protection increases. By introducing sectoral exposure as a moderating variable we combine an occupational and sectoral side of risk exposure. Moreover, the role of personal income in shaping redistribution preferences becomes fundamentally different. Even though richer individuals on average might favour lower levels of redistribution, the routine task intensity of their occupation becomes a more important determinant of their favoured level of redistribution preferences. This view of income can be seen as more nuanced than existing perspectives where income only has a direct effect, which might be negative because of material self-interest (Meltzer and Richard, 1981), or positive when insurance is a normal good (Moene and Wallerstein, 2001).

This study's empirical work is built on survey data, rather than an experiment where individuals are randomly assigned to occupations. One might argue that individuals self-select into occupations, leading to possibly confounded causal interpretations of our results. This reasoning would imply that risk-averse persons who already have higher preferences for provision of public insurance choose occupations less exposed to risk. Second, it could be that individuals in routine occupations increased their redistribution preferences, lost their jobs because of automation, and moved to non-routine occupations whilst keeping higher levels of preferred nonmarket protection. Unfortunately

we cannot directly test for this as we do not have micro panel data at our disposal. Yet, both of these arguments predict a negative association between the degree of routine task intensity and the preferred level for redistribution, militating against our statistically significant findings of a positive association. It might be, however, that because of these counteracting effects we underestimate the effect of routine task intensity on preferences for redistribution.

In this chapter we allow the risk of automation to differ across occupations, depending on their degree of routine task intensity. We devote less attention to country-specific patterns, depending on for instance the amount of investment in research and development, or qualitative educational factors that potentially shape how individuals cope with technological change. This would be an interesting line of future inquiry. More generally, our analysis only begins to explore how risks of technological change shape actual redistribution and the welfare state. An extension of this study would be to consider whether exposure to risk of automation affects voting behaviour, and party and policy agendas, and ultimately, actual welfare state policies. Such a research agenda could follow the quantitative lines as applied in this chapter, or it could involve historical accounts of policies adopted by welfare states in response to risks resulting from technological change.

In the meantime, our findings point toward the possibility of cross-class coalitions between low-wage individuals in non-routine occupations and high-wage individuals holding routine occupations in support of a redistributive welfare state (Hausermann *et al*., 2014). This potentially has implications for our understanding of insider-outsider politics and political mobilisation. Whether these coalitions materialise should be subject to further research.

APPENDIX 5.1 – DIFFERENCES BETWEEN KITSCHELT AND REHM AND THE RTI INDEX

In this appendix we more closely compare the Kitschelt and Rehm (2014) dummies (KR dummies) based on Oesch (2006), which are said to capture routine occupations, to the continuous RTI index from Goos *et al*. (2014). We will argue here that the RTI index is substantively and empirically superior to the KR dummies if one's ambition is to examine the routine task intensity of occupations. First, the RTI index is continuous and provides significantly more variation across occupational groups. This holds even though the KR dummies are defined at the more detailed 4-digit ISCO-88 occupational level. Second, the KR dummies do not measure the degree of routine task intensity but follow educational and income lines. Third, we have slightly more (8 per cent) observations at our disposal for the RTI index.

KR distinguish between four *a*-groups which capture a vertical 'logic of authority' dimension or the degree of discretionary space: professionals; associate professionals; skilled routine; and unskilled routine. In addition, KR generate a second 'logic of tasks' dimension with three groups (the *t*-groups) depending on whether tasks are more or less clearly defined: organisational; technical; or interpersonal task logics. This dimension does not have any linkages with RTI. The four *a* and three *t*-groups are combined and merged into four *c*-groups:

1. Skilled organisational: Professionals and associate professionals with an organisational logic of task structure, who are against redistribution;
2. Skilled technical: Professionals and associate professionals with a technical task structure, with more uncertainty and loose horizontal structures, who are less opposed to redistribution;
3. Skilled interpersonal: Professionals and associate professionals with interpersonal task structure, who have a considerable generosity to accept redistribution;
4. Routine: The skilled and unskilled routine workers in all three aforementioned task structures are grouped. This group is hypothesised to be in favour of redistribution.

Table A5.1 shows the mean values for all KR dummies for occupations at the 2-digit ISCO-88 level, where we sort occupations by their level of RTI. Only eight occupations at the 2-digit level for the *a*-groups, and even only four occupations for the *c*-groups are *not* fully captured by a dummy (marked in bold). Thus, the more detailed 4-digit level at which the KR dummies are defined barely produce additional variation at a more aggregated level. In fact, the variation is significantly decreased because of the dichotomous way of measuring.

Second and more importantly, substantively the KR dummies are intended to measure 'unskilled routine' (a4) or 'routine' groups (c4) as compared to 'authoritarian' (a1-3) or 'skilled' groups (c1-3) – not to demarcate routine from

non-routine occupations. Kitschelt and Rehm (2014) stress that they are interested in discretionary space rather than the intensity of routine tasks per occupations. The 'unskilled routine' group a4 captures all occupations whose ISCO-codes start with an 8 and 9 (plant and machine operators and assemblers, and elementary occupations), almost all occupations with a 5 and 6 (service workers and shop and market sales workers, and skilled agricultural and fishery workers for which we do not have RTI data), and parts of occupations starting with 4 and 7 (clerks, and craft and related trades workers). The 'routine' c4 group combines groups a3 and a4. It includes all occupations of which the ISCO-88 code begins between 4-9, thus all occupations *except* legislators, senior officials and managers, professionals, or technicians and associate professionals. This group is very large, covering almost twice the number of observations as the c1-c3 groups combined for our sample.

Table A5.1 Comparing the continuous RTI index to the Kitschelt and Rehm dummy classifications

		Logic of authority groups				Logic of tasks groups			Combined groups			
		Profe-ssio-nals	Assoc-iate profe-ssio-nals	Skil-led rout-ine	Uns-killed rout-ine	Orga-nisat-ional	Tech-nical	Inter-pers-onal	a1t1 + a2t1	a1t2 + a2t2	a1t3 + a2t3	a3 + a4 for all *t*-groups
ISCO	RTI	a1	a2	a3	a4	t1	t2	t3	c1	c2	c3	c4
13	-1.52	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00
83	-1.50	0.00	0.00	**0.54**	**0.46**	0.00	**0.65**	**0.35**	0.00	0.00	0.00	1.00
22	-1.00	1.00	0.00	0.00	0.00	0.00	**0.12**	**0.88**	0.00	**0.12**	**0.88**	0.00
21	-0.82	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
12	-0.75	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00
24	-0.73	**0.82**	**0.19**	0.00	0.00	**0.53**	0.00	**0.47**	**0.53**	0.00	**0.47**	0.00
51	-0.60	0.00	0.00	**0.33**	**0.67**	0.00	0.00	1.00	0.00	0.00	0.00	1.00
34	-0.44	0.00	1.00	0.00	0.00	**0.81**	**0.03**	**0.16**	**0.81**	**0.03**	**0.16**	0.00
31	-0.40	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
32	-0.33	0.00	**0.90**	**0.11**	0.00	0.00	**0.09**	**0.91**	0.00	**0.09**	**0.80**	**0.11**
71	-0.19	0.00	0.00	**0.89**	**0.11**	0.00	1.00	0.00	0.00	0.00	0.00	1.00
91	0.03	0.00	0.00	0.00	1.00	0.00	**0.05**	**0.95**	0.00	0.00	0.00	1.00
52	0.05	0.00	0.00	**0.03**	**0.97**	0.00	0.00	1.00	0.00	0.00	0.00	1.00
81	0.32	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
93	0.45	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
72	0.46	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
82	0.49	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
74	1.24	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
42	1.41	0.00	0.00	**0.23**	**0.77**	1.00	0.00	0.00	0.00	0.00	0.00	1.00
73	1.59	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
41	2.24	0.00	0.00	**0.92**	**0.08**	1.00	0.00	0.00	0.00	0.00	0.00	1.00

Group a4 and c4 do not measure the degree of routine task intensity of occupations contrasted to non-routine abstract or manual task intensive occupations, but closely follow educational and income lines. We can see this in particular for group c4, which indeed contains all occupations with a positive RTI index, but also includes for instance occupations 51 (personal and protective services workers) and in particular 83 (drivers and mobile plant operators). As we argue and empirically show, it is not true that all low-skilled occupations are routine (Michaels *et al.*, 2014; Goos *et al.*, 2014). Moreover, as all KR categories are measured as dummies, they do not do justice to the fact that certain occupations are significantly more or less routine than others. The KR dummies

distinguish between large groups that largely following educational and income lines – this might include an element of RTI, but it will capture most certainly more, indeed, all (unobserved) differences between these groups.

APPENDIX 5.2 – MULTILEVEL ORDERED PROBIT RESULTS

Here we show the regression results of our multilevel ordered probit models, with random country intercepts and standard errors clustered at the country level. The equivalent of Table 5.3 estimated using multilevel ordered probit is shown in Table A5.2. The sign and size of coefficients for our variables of interest are all very comparable. The only difference is that the unemployment rate at country level becomes positive and significant.

Table A5.2 RTI and redistribution preferences for multilevel ordered probit

	RTI	Interacted with sectoral exposure	Interacted with income	Both interactions
	(1)	(2)	(3)	(4)
RTI	0.042***	0.048***	0.041***	0.047***
	(0.000)	(0.000)	(0.000)	(0.000)
ln income	-0.209***	-0.206***	-0.205***	-0.201***
	(0.000)	(0.000)	(0.000)	(0.000)
Sectoral exposure		-0.172***		-0.165***
		(0.000)		(0.000)
RTI * sectoral exposure		0.135***		0.135***
		(0.000)		(0.000)
RTI * ln income			0.042***	0.039***
			(0.000)	(0.000)
Years of education	-0.028***	-0.029***	-0.027***	-0.028***
	(0.000)	(0.000)	(0.000)	(0.000)
Male	-0.192***	-0.171***	-0.189***	-0.171***
	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.003***	0.002***	0.003***	0.002***
	(0.001)	(0.002)	(0.000)	(0.001)
Trade union member	0.147***	0.180***	0.143***	0.180***
	(0.000)	(0.000)	(0.000)	(0.000)
Degree of religiosity	-0.007*	0.000	-0.007	0.000
	(0.085)	(0.951)	(0.112)	(0.940)
Dummy unemployed	0.141***	0.135***	0.139***	0.138***
	(0.000)	(0.000)	(0.000)	(0.000)
Social spending in $\%GDP_{t-1}$	-0.006*	0.000	-0.009**	-0.000
	(0.054)	(0.987)	(0.025)	(0.991)
Unemployment $rate_{t-1}$	0.016***	0.019***	0.018***	0.019***
	(0.000)	(0.001)	(0.000)	(0.001)
Log pseudolikelihood	-102337.1	-102620.4	-102353.4	-102598.2
Country variance component	0.036***	0.227***	0.048***	0.228***
N	78050	78050	78050	78050
Number of countries	23	23	23	23

Note Multilevel ordered probit model with random country intercepts and standard errors clustered at the country level. Sectoral exposure and ln income are demeaned. *P* values in parentheses, *p<0.1, **p<0.05, ***p<0.01

We also run our sensitivity tests using multilevel ordered probit. The equivalent of Table 5.4 is shown in Table A5.3. Again, the signs and sizes of the coefficients are very comparable. Also the added variables themselves yield comparable estimates (results not shown). Unfortunately, we cannot show results for a crossed effects model as this does not converge.

Table A5.3 Robustness checks for the multilevel ordered probit models

		RTI	ln income	Sectoral exposure	RTI * sectoral exposure	RTI * ln income
	Original results (multilevel ordered probit)	0.047***	-0.201***	-0.165***	0.135***	0.039***
(1)	Dummy RTI from Oesch (2013)	0.074***	-0.221***	-0.323***	0.360***	0.041**
(2)	Sectoral definitions from Wren and Rehm (2014)	0.043***	-0.206***	-0.098***	0.043***	0.038***
(3)	Standardised ln income	0.049***	-0.148***	-0.173***	0.139***	0.032***
(4)	Equivalised ln income	0.048***	-0.202***	-0.172***	0.134***	0.033***
(5)	Skill specificity	0.046***	-0.197***	-0.201***	0.117***	0.040***
(6)	Offshoring	0.059***	-0.203***	-0.130***	0.116***	0.031***
(7)	Logic of task groups	0.072***	-0.183***	-0.121***	0.059**	0.029***
(8)	Foreign ratio	0.056***	-0.195***	-0.184***	0.147***	0.042***
(9)	Occupational unemployment rate	0.032***	-0.186***	-0.165***	0.128***	0.038***
(10)	Left-right scale	0.050***	-0.184***	-0.148***	0.118***	0.039***
(11)	All individuals	0.040***	-0.167***	-0.151***	0.106***	0.043***
(12)	Only employed	0.048***	-0.226***	-0.187***	0.147***	0.037***
(13)	Excluding Eastern Europe	0.053***	-0.198***	-0.206***	0.157***	0.043***
(14)	Excluding 2012	0.046***	-0.209***	-0.162***	0.128***	0.035***
(15)	Binary dependent variable	0.055***	-0.232***	-0.159***	0.176***	0.039***
(16)	Redistribution	0.051***	-0.203***	-0.168***	0.141***	0.039***
(17)	Gini market income	0.049***	-0.202***	-0.166***	0.140***	0.038***
(18)	EPL index	0.047***	-0.208***	-0.156***	0.143***	0.037***
(19)	UB replacement rate	0.048***	-0.200***	-0.179***	0.140***	0.037***

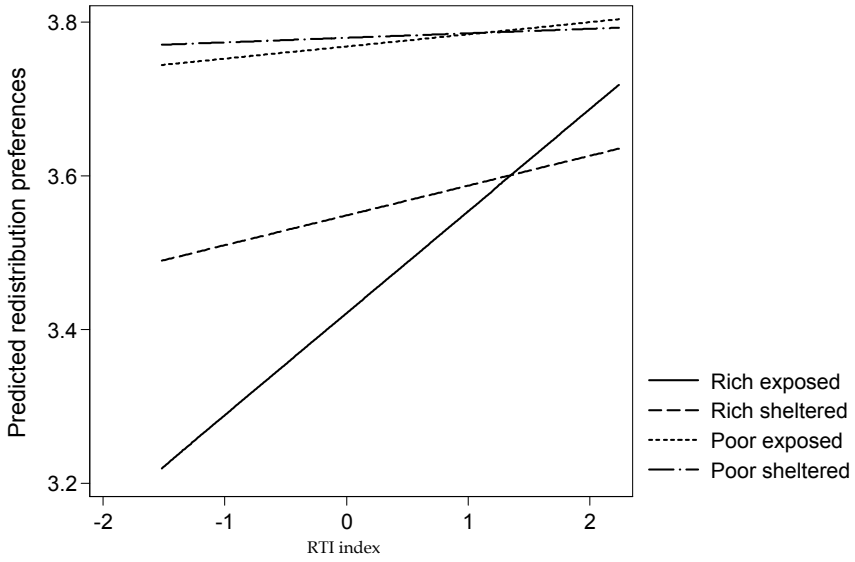
Note Multilevel ordered probit model with random country intercepts and standard errors clustered at the country level. Sectoral exposure and ln income are demeaned. *p<0.1, **p<0.05, ***p<0.01

Appendix 5.3 – A triple interaction

Another way of testing the moderating effects of income and sectoral exposure on the relationship between RTI and preferences for redistribution simultaneously is to run a triple interaction model. We run this model with OLS estimation, as our ordered probit model does not converge. We include all constitutive elements. Again, our results remain robust across model specifications and whether or not we include other occupational risks. For ease of interpretation we evaluate the predicted level of redistribution preferences for four groups: rich and exposed, rich and sheltered, poor and exposed, and poor and sheltered. Rich and poor are defined as one standard deviation above and below mean income. The same holds for sheltered and exposed sector. We evaluate their redistribution preferences at the minimum and maximum values of the RTI index.

Figure A5.1 supports our main hypotheses. We find that higher levels of RTI are associated with higher levels of preferred redistribution, as indicated by positive slopes. Second, we find that the poor always have higher predicted levels of redistribution than the rich. Third, for the poor, preferred levels of redistribution are reasonably stable across different levels of sectoral exposure and RTI. The interesting part concerns the rich, who have relatively more to lose from automation. The difference in predicted levels of redistribution preferences between individuals in non-routine versus routine occupations is substantial for the rich. This particularly holds for the exposed rich. Their predicted preferred level of redistribution rises substantially when they move from a non-routine to a routine occupation (from below 3.2 to around 3.7).

Figure A5.1 Predicted levels of redistribution preferences for a triple interaction



Note Multilevel OLS model with random country intercepts and standard errors clustered at the country level

We can also more formally test for the differences in effects of RTI on redistribution preferences (or the slopes) of these different groups, as we do in Table A5.4. The p values, however, are not adjusted for the fact that we conduct post-hoc tests. A very conservative interpretation would be to multiply these p values by the number of post-hoc tests (six). If we were to do so, we can still safely conclude that effects of RTI on redistribution preferences differ for rich exposed compared to every other group. We cannot conclude that there is a significant difference in effects of RTI on redistribution preferences for the poor exposed compared to the poor sheltered or compared to the rich sheltered.

Table A5.4 Post-hoc tests (unadjusted)

Groups	Coefficient	Standard deviation	z score	p value
Rich exposed vs. rich sheltered	0.093	0.013	7.18	0.000
Poor exposed vs. poor sheltered	0.024	0.013	1.89	0.059
Rich exposed vs. poor exposed	0.117	0.014	8.43	0.000
Rich exposed vs. poor sheltered	0.034	0.012	2.83	0.005
Rich sheltered vs. poor exposed	0.010	0.012	0.85	0.395
Rich sheltered vs. poor sheltered	0.127	0.014	9.17	0.000

Note Multilevel OLS with random country intercepts and standard errors clustered at the country level

6 Falling back on old habits?

A comparison of the social and unemployment crisis reactive policy strategies in Germany, the UK and Sweden[1]

ABSTRACT

Although long-term processes of welfare state development have been investigated frequently, there is a surprising gap in knowledge on short-term reactions of states to sudden events. This article aims to fill this gap by examining the reactive policies, i.e. immediate policy responses to urgent social matters, of governments to the current economic crisis. We focus on social and unemployment policies of the three welfare regime ideal types of Esping-Andersen's typology, namely Germany, the UK and Sweden. We apply long-term policy development theories, most notably the convergence and path dependence theories, to understand the choices made in the different reactive policy strategies of these countries. In addition, we scrutinise whether we find similarities between the reactive policies and the converging structural welfare state developments. We use comparable data from various European and national data sources for the two years directly following the recent crisis, namely 2008 and 2009. Our analysis shows that, at least for the three countries under investigation, countries seem to have fallen back on 'old habits' by adopting social and unemployment reactive policies that can be identified based on their institutional legacies. This suggests that reactive policy strategies can be explained by different dynamics than the more structural long-term policy developments, and in our case we find evidence in support for the path dependence theory.

6.1 INTRODUCTION

The years 2008 and 2009 were characterised by worldwide financial and economic turmoil. The financial crisis quickly spread throughout the world

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1 This chapter is published as Chung, H., Thewissen, S. (2011) Falling back on old habits? A comparison of the social and unemployment crisis reactive policy strategies in Germany, the UK and Sweden, *Social Policy & Administration* 45(4): 354-370 and in Greve, B. (ed) (2012) *The times they are changing? Crisis and the welfare state*, Chichester: Wiley-Blackwell: 23-39. The chapter is reprinted with permission. The paper was runner up for the 2012 Social Policy & Administration Early Stage Career Research Prize. We would like to thank Margo Trappenburg and others who commented on the previous version of this article for their help in improving it.

and began to affect the real economies in the form of massive redundancies and bankruptcies. This crisis caused a need for urgent state interventions. Many governments provided credit supplies and guarantees for financial institutions or even nationalised distressed banks. In addition, social and unemployment policies were adopted as an attempt to stimulate the economy and to respond to the sudden increase in redundancies. Germany for instance modified a tripartite agreement on short-term unemployment, whilst the UK implemented subsidies for employers to hire employees.

An interesting question that stems from this is how to understand the reactive policies, i.e. the immediate responses of welfare states to urgent societal matters, of countries to sudden economic shocks. These policies differ in a number of aspects from structural policy-making processes such as grand welfare reforms. Reactive policies are meant to provide quick relief to an urgent crisis, the decision-making time is limited, and they only apply for a limited amount of time or are stopped when the urgent need is met. Although structural processes of welfare state development have been investigated frequently, there is a surprising gap in knowledge on reactive policies (Vis, 2009; Castles, 2010).

This article aims to fill this gap by examining the reactive policies of three countries best representing the different welfare state regime typologies, namely Germany, the UK and Sweden. Our main question is how we can explain the strategies countries follow in their social and unemployment reactive policies. Due to the lack of theories that address the subject of short-term reactions of the welfare state, we turn to structural policy development theories, namely the convergence theories and path dependence theories. From a convergence perspective we would expect similar policy solutions to the crisis, due to similarities found in the nature of the problem and in the constraints of possible solutions. However, the rivalling path dependence theory entails that specific national institutional legacies are the most decisive cause in welfare state development. It could be expected that in times of abrupt turmoil and when there is little time to react, countries are more likely to fall back on their institutional legacies. By examining the reactive policies of the three countries, we can see if the choices made by governments can be understood with similar frameworks used for structural long-term policy developments. An emphasis is placed on social and unemployment policies, as the discussion of convergence versus path dependence notably took place in this policy field, and we focus on reactive policies that took place during 2008 and 2009.

This article is structured as follows. Section 6.2 explains the theoretical framework of the crisis literature, and the convergence and path dependence theories. We derive general expectations from these theories as a framework to compare the reactive policy strategies. In Section 6.3, the methodology of this article is explained. Section 6.4 consists of the empirical description of the implemented responses of Germany, the UK and Sweden. Section 6.5

compares and interprets the national strategies, after which we discuss our conclusions in Section 6.6.

6.2 THEORETICAL FRAMEWORK

6.2.1 Reactive policy strategies of welfare states and the impact of crises

Reactive policies are the immediate responses of welfare states to urgent societal matters. The comprehensive plan behind the implemented reactive policies can be referred to as the reactive policy strategy. Specific crisis situations, such as the current financial crisis, have been a topic of investigation. Yet, most studies focus on causes or consequences of the crisis (e.g. Datz, 2009; Eichhorst *et al.*, 2010; Castles, 2010), providing short descriptions of what governments have done (e.g. Clegg, 2010), or only focus on specific policy areas such as family policies (e.g. Richardson, 2010). In the welfare state literature, there are no studies yet that provide insights in understanding the reactive policy strategies countries take in times of crises.

In agenda-setting theories the impact of crises on policy-making is examined more frequently. Here, crisis situations are understood as 'windows of opportunities' (Kingdon, 1964) or 'critical junctures' (Capoccia and Kelemen, 2007). For instance, Boin *et al.* (2009) stress that crises can be politically exploited by pushing forward certain policy answers by actors. Vis (2009) finds evidence for this stance in welfare state research, by claiming that deteriorating socio-economic situations are a necessary condition for unpopular welfare state reforms. As we can see, the key focus of these studies is in understanding the role of crises in changing the political dynamics of welfare reform. They teach us that crises can be used to implement radical changes. However, they do not provide us insight what *kind* of reactive policy strategies one can expect during crises in different countries. For this reason, we turn to theories on structural policy-making, namely the convergence and path dependence theories. Even though these theories refer to structural reforms and long-term policy-making, we use them as theoretical frameworks to reflect on when examining reactive policy strategies. In addition, applying long-term policy theories allows us to scrutinise whether we find similarities between the reactive policies and the structural welfare state developments in our country cases.

6.2.2 Path dependence theory and reactive policy strategies

In the path dependence theory, it is believed that the history or institutional legacy of a country strongly influences the policies it will adopt in the future (Pierson, 2000). Changes happen, but they are bounded or incremental, rather

than being institutional overhauls (Starke, 2006: 105–6). A number of reasons are put forward to argue why welfare states developments are unequivocally path dependent. First, radical changes are difficult to accomplish and relatively expensive. Many institutions contain veto-points and have high set-up costs (Bonoli, 2001: 238), and politicians have a short time horizon in which they need to show outcomes (Pierson, 2000: 258–62). Second, existing institutional settings shape the expectations and behaviour of citizens, politicians, and pressure groups. This could entail that radical welfare reforms are likely to meet opposition from various interest groups. In addition, as the 'varieties of capitalism' literature (Hall and Soskice, 2001) argues, different institutional settings can also lead to comparative institutional advantages. These advantages act as powerful inducements to replicate existing institutions.

Central to the path dependence theory is that a number of welfare regimes or trajectories can be discerned, based on their institutional legacies. One of the most influential typologies of welfare states in this respect comes from Esping-Andersen (1990). He discerns three ideal type welfare regimes, which are the liberal, conservative and social democratic regime. Although this typology has been criticised by scholars for various reasons, there seems to be a consensus in the classification of the classic examples of the ideal types, namely Germany, the USA (and to a lesser extent, the UK) and Sweden (Arts and Gelissen, 2002).

The path dependence framework can be applied to reactive policies as follows. First, since reactive policies are used to address urgent crises in a short time frame, radical changes may be even more difficult to accomplish. Second, as argued in the varieties of capitalism approach, it could be that certain responses are expected by citizens and by pressure groups such as employer and employee organisations. For instance, there could be a demand for policies that enable society to do as much 'business as usual' as possible. Using these arguments, we should expect that countries stay close to their institutional legacies in times of crises, by using instruments that were in place or that have been used before. We would then expect distinctive differences in reactive policy strategies reflecting the countries' institutional legacies, and we would not expect policy innovation to take place.

Based on Esping-Andersen's (1990) typology, we can derive specific hypotheses of the national reactive policy strategies from a path dependence perspective. We expect Germany to have adopted a conservative strategy, with a strong inclination to maintain traditional status relations. This implies that its main focus would be to keep insiders in their jobs to preserve their industrial and firm-specific skills, combined with a low emphasis on activation. The UK should follow a liberal laissez-faire crisis response strategy, characterised by reliance on market forces with only residual engagement in social policies. For Sweden we expect a social democratic strategy. This is characterised by a combination of focus on activation, whilst securing income by universal and generous social benefits.

6.2.3 Convergence theory and crisis response policies

Contrary to the understanding of path dependence theorists, convergence theory claims that all welfare states are converging into a common model. Two important reasons are put forward why countries are slowly opting for more similar policy solutions (Starke *et al.*, 2008). First, internationalisation and global competition weaken the freedom of action of national states. Due to the increase in the dynamic nature of private economic forces, such as flows of capital and labour across national borders, governments are no longer capable of deviating much from other countries in their regulations and taxes. Second, countries are facing similar problems and have comparable constraints in their methods to deal with these problems. Low economic growth and unfavourable demographic changes restrict states to pay for extensive social policies (Pierson, 2002; Korpi and Palme, 2003). There is consistent evidence that Western European countries have chosen similar strategies in response to this permanent austerity in their structural policy development, which are retrenchment and stimulation of employment. The sickness, work accident and unemployment benefits have been lowered in most countries in terms of both their proportion in spending, as well as in terms of replacement rates (Korpi and Palme, 2003; Allan and Scruggs, 2004; Adelantado and Calderón, 2006). There has also been an increasing emphasis on activation and employability (Dingeldey, 2007), including the development of various family policies to stimulate the employment of women (Mandel and Semyonov, 2006; Lewis *et al.*, 2008). However, this process of convergence and retrenchment seems to be a very gradual development, largely without radical reforms (Pierson, 2002; Starke, 2006).

Using the logic of the convergence theory, there are several reasons why we would expect countries to have chosen similar reactive policy strategies to the crisis. First, our country cases are all members of the EU and their financial sectors are strongly internationalised. Second, the financial and economic crisis presented comparable problems of lower demands, bankruptcies and threats of mass unemployment. Taking all this into account, we could expect similar reactive policy strategies in all of the three countries under investigation, regardless of their institutional heritages.

6.3 Methods and data sources

Based on Esping-Andersen's framework, we compare the three classic examples of welfare regimes, which are Germany, the UK and Sweden. These three countries differ maximally in their institutional legacies, yet they share a number of important extraneous variables. First, all three countries have experienced a sudden economic shock in terms of bankruptcies, decrease in demands, leading to drops in GDP growth rates and increase in unemployment

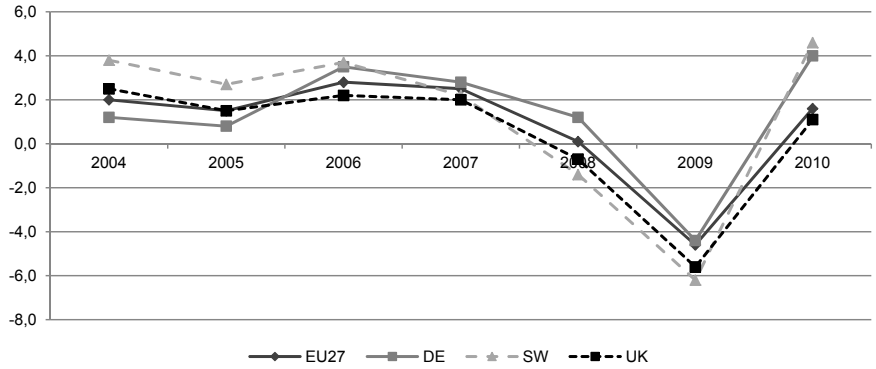
due to the crisis. This aspect is substantiated in the next section. Second, all countries are EU member states, and all implement European Monetary Union (EMU) policies, although Germany is the only one with the euro as its currency. Third, all countries have financial sectors that are strongly internationalised. These countries, however, differ in a number of important aspects, besides their institutional legacy, which are the affiliation of the government and the composition of their economies. During the crisis, Germany and Sweden were governed by a centre right cabinet, whilst the centre left Labour Party was in office in the UK. Unfortunately, there are no alternative countries that could represent the ideal types of the regime typologies as well as the UK and Sweden, which satisfied the other requirements. Second, our country cases differ in their national economic composition, although this could also be understood as part, or a consequence, of the institutional legacies in the development of the welfare state. In other words, it is endogenous to the characteristics of the welfare regimes. These points will be taken up later in our discussion section.

A second methodological consideration is the type of policies under investigation. Although we also examine the general economic and financial policies to provide background information on how the crisis has been managed in each country, we concentrate on social and unemployment policies. We choose these policies because we are interested in welfare state policies and because the discussion of convergence versus divergence notably took place in this policy field (Vis, 2009). In addition, we focus on state-level policies, although we also refer to some of the important sectoral and company level policies. The third consideration is the period under investigation. We focus on reactive policies, which are short-term measures in reaction to the crisis. Therefore, our focus is on the years 2008 and 2009. Concerning the choice of data, we rely on comparable data from various European data sources, such as the European Industrial Relations Observatory (EIRO) and the European Commission's (EC) joint employment reports, supplemented by various documents from national sources.

6.4 The crisis and reactive policies

After years of relatively stable economic development, the crisis caused a severe and sudden decline in GDP in all European states. The crisis struck in a roughly similar fashion in Germany, the UK and Sweden. In 2007, the real GDP growth rates in the three countries were approximately 2 per cent (see Figure 6.1). This reversed to an average decline of approximately minus 5 to 6 per cent in 2009.

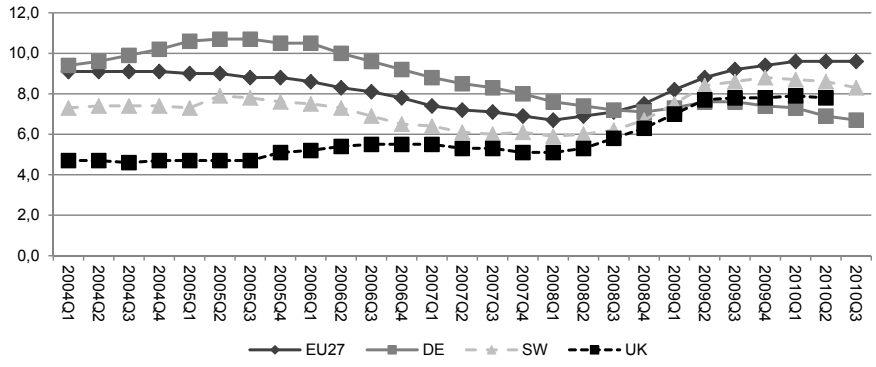
Figure 6.1 Real GDP growth rates



Note Figures for 2010 are forecast projections
Source Eurostat (2010)

The unemployment rate shows a similar course, as is evident from Figure 6.2. The unemployment rate was rather different until the first quarter of 2006, but it shows a converging pattern around the first and second quarter of 2008. In the third quarter of 2008, we can see an increase of unemployment in all countries, which continues until the third quarter of 2009. The exceptional case is Germany, which has not shown a stark increase in unemployment rates. This can be attributed to its reactive policies, which focused on keeping people in their jobs. We explain this in detail in the next section. Despite the fact that there are some deviations, it is clear that all countries faced the problem of bankruptcies, sharp decrease in demand, and a threat of mass redundancies. In the following sections, we examine what types of policies were implemented to address these issues in the three countries under investigation.

Figure 6.2 Unemployment rate per quarter



Source Eurostat (2010)

6.4.1 Conservative considerations – the case of Germany

It has been noted that Germany departed from its conservative tradition before the crisis started. During the Hartz reforms in 2003–04, unemployment and social assistance benefits were lowered and activation became an essential element in German employment policies (Seeleib-Kaiser and Fleckenstein, 2007). In addition, Germany has moved away from the male breadwinner model through implementing family policies to stimulate the employment of women (Lewis *et al.*, 2008).

Despite a favourable starting position, Germany was severely affected by the collapse in worldwide demand as a consequence of its reliance on exports (EC, 2009). From September 2008 onwards, the centre right cabinet of CDU/CSU (the Christian alliance) and FDP (the Liberals) turned to an active response strategy. The most important policies were the 'Package of Measures to Reduce Tax Burdens, Stabilise Social Insurance Contributions and Invest in Families', of October 2008, and two economic stimulus packages. The first package, 'Securing Jobs by Strengthening Growth', stimulated the economy with a government investment of € 31 billion. Its main goal was to support the viability of the financial sector, but it also consisted of Keynesian investments in long-term public goods and support to the manufacturing industry. The second stimulus package, the 'Pact for Employment and Stability in Germany', of circa € 50 billion, was used to relieve tax burdens, recuperate consumer demands, and to stimulate investments (EC, 2009).

The main German strategy in social and unemployment measures was to keep insiders in their jobs to preserve their skills by active state interventions. A number of measures were adopted to achieve this strategy. First, an existing tripartite agreement on short-term unemployment was extended and financially modified (ILO, 2009). The agreement entailed that in case of temporary shortage of orders, employers could lower labour costs by reducing working time and wages of employees. This reduced wage was paid out by the government as partial unemployment benefits so that workers did not see a remarkable decrease in their wages. The measure enabled employers to maintain their trained and skilled workers, whilst in return the employees' employment was safeguarded, occasionally supplemented with extra training. The short-time work allowances consisted of replacement rates of 60 per cent for employees without children, and 67 per cent for those with children. Before the crisis, the short-time work allowances were paid out of social security contributions of social partners, as part of the unemployment benefit scheme. Yet as a crisis measure, it was decided that the allowances were paid out of general taxes. In addition, the drawing period was temporarily extended from six to 24 months until 2009 (EIRO, 2009a; 2009b; 2009c; 2009d). Over 3 per cent of all employees were participating in short-time work schemes in 2009 (OECD, 2010: 52). This extensive use of short-term allowance schemes is the main reason why the overall unemployment rate in Germany did not rise as significantly

as in other countries in Europe (see Figure 6.2), regardless of the overall decrease in demands as shown in its GDP growth patterns. The measure especially helped to preserve jobs in the male-dominated manufacturing industry (Eichhorst *et al.*, 2010; EIRO, 2010).

A second measure that provided relief to insiders was the extension of the phased early retirement scheme for older employees (EC, 2009: 24). This scheme aimed at facilitating a gradual transition of employees over 55 into retirement, subsidised by the state, to generate new positions to be replaced. When an employee over 55 cut his working time in half, the employers were to pay 70 per cent of the employee's reduced wage and contribute to the pension schemes, whilst the Federal Government bore the additional expenses (EIRO, 2009e). Third, Germany eased the burden of employers and employees by significantly lowering both their unemployment insurance contributions (from 6.5 to 2.8 per cent until 1 December 2010 and 3 per cent after that) and health insurance contributions (from 15.5 to 14.9 per cent from July 2009 onwards) (German Federal Ministry of Economics and Technology, 2008).

Germany also agreed on a number of complementary policies. In order to stimulate activation, the second stimulus package also consisted of investment on training on-the-job and job-to-job placements. In addition, the tax rate of the first income bracket was lowered from 15 to 14 per cent and the personal allowance was increased to € 7,834 from 2009, as an attempt to reduce the unemployment trap. Lastly, it adopted a number of family policies as part of the packages. For example, the universal child benefit and tax-free child allowance were raised by 4.3 per cent (German Federal Ministry of Economics and Technology, 2008) and parents received a non-recursive € 100 child bonus (EC, 2009: 24).

6.4.2 Liberal legislation – the case of the UK

Although the UK can still be characterised as a residual welfare state with a relatively low degree of social protection by the state, more recently the state has become increasingly involved in several aspects. First of all, there has been an increase in active labour market policies to stimulate employability of its workers (Dingeldey, 2007). In addition, the state has taken an active role by both developing new family policies and increasing the amount of public investment spent on these policies (Lewis *et al.*, 2008).

The UK was one of the first European countries to be heavily hit by the global crisis. Its strong ties with the financial sector in the USA made the UK vulnerable to financial shocks (Hodson and Mabbett, 2009). In 2007, Barclays Bank received two financial injections and mortgage lender Northern Rock was nationalised in 2008. The financial sector was further supported by a bailout package of £500 billion (€ 575 billion) of liquidity support, government guarantees of bank issuances, and the purchase of (toxic) bank equities. In

responding to the negative effects of the financial crisis on the real economy, the Labour government implemented a number of additional policies. Most of these measures, for an amount of roughly £20 billion (€ 23 billion), were announced in the Pre-Budget Report 2008 (HM Treasury, 2008). Supplementing measures were taken in the Budget Report 2009 (HM Treasury, 2009). Many of these measures aimed to stimulate the economy, by means of Keynesian investments in infrastructure, support to the manufacturing industry and the severely afflicted housing market, and by temporary tax relief for businesses or consumers. The most important measure was a temporary cut in the value added tax (VAT) on consumption from 17.5 per cent to 15 per cent for 13 months (Clegg, 2010).

Although the British government was an active crisis manager in the financial sector, it chose a highly laissez-faire strategy in social and unemployment crisis policies. It was quite unwilling to improve, even temporarily, its already low supportive unemployment policies (Clegg, 2010: 5). Almost all that the British government implemented as reactive measures were demand-led labour market measures to stimulate activation. Most importantly, from January 2009 onwards employers received a subsidy of £2,500 (€ 2,900) when recruiting a person who has been unemployed for over six months (HM Treasury, 2009). Next to this demand-driven stimulus, activation was encouraged through increasing income tax allowances, except for high income groups (HM Government, 2009). The administration also raised its funding for programmes designed to get the unemployed back to work. A total amount of £3 billion (€ 3.4 billion) was invested in 2009 in initiatives such as 'Jobcentre Plus', 'Train to Gain', and 'Local Employment Partnerships'. Additionally, it mediated for apprenticeships tendered by private parties, and tried to enhance training possibilities for unemployed people (HM Government, 2009; EIRO, 2009f). Minimum engagements were observed in terms of passive labour market programmes as well. There was a slight increase in the maximum statutory redundancy pay for the middle and high income earners (HM Treasury, 2009: 13), a marginal non-recurring bonuses for pensioners of £60 (€ 69) and for families with children £22 (€ 25), and a temporary increase of the child allowance (HM Treasury, 2008: 6-7).

This laissez-faire approach by the government resulted in involvement from the social partners. Social partners signed collective agreements concerning the reduction of working hours and respective wages to save jobs (EIRO, 2009g). In 2009, the median pay settlement dropped to 1 per cent (EIRO, 2009h). Moreover, occupational pensions have been cut in the hardest affected sectors (EIRO, 2009h).

6.4.3 Social democratic strategies – the case of Sweden

Although even Sweden has implemented cutbacks in its welfare state in recent times (Vis, 2009), it is still exemplified by its generous social policies combined with supply-stimulus activation by public interventions and a large public sector employment. As Sweden was faring well before the crisis started, the centre-right four-party coalition was relatively late in its crisis reaction. The initial point of interest was the viability of the financial sector and the real economy (e.g. Swedish Ministry of Finance, 2008a). The Swedish Central Bank supported the long-term credits with a loan facility of SEK 60 billion (€ 6.3 billion). Keynesian investments were implemented in education, infrastructure, and research and development (e.g. Swedish Ministry of Finance, 2008b). Moreover, the corporate tax rate was lowered from 28 per cent to 26.3 per cent.

Sweden was also relatively active in adopting social and unemployment reactive policies, compared to our other country cases. In total, the state has adopted crisis policies of SEK 45 billion in 2009 and SEK 60 billion in 2010 (€ 4.7 billion and € 6.3 billion; Swedish Ministry of Finance, 2009a). Its strategy consisted of a combination of striving for full employment, whilst at the same time providing income security and cushioning temporary unemployment (Swedish Prime Minister's Office, 2008: 1).

The centre-right coalition adopted many activation programmes (the 'work-first principle'). The Swedish government provided relief and employment incentives for employers and employees by lowering payroll tax and unemployment contributions (EIRO, 2008). Both of these contributions were reduced even more for young employees, who were amongst the hardest hit during the crisis in Sweden (Swedish Ministry of Finance, 2008b; EIRO, 2008). Another incentive introduced by the Swedish government to increase employment was the reduction in the employment tax by half for employers hiring long-term unemployed persons. In the crisis package announced in December 2008, the administration also focused on creating jobs and education possibilities. To this end, the student grant for people over 25 was profoundly increased to 80 per cent of the total study allowance (EIRO, 2009i), and more was spent on different employment programmes. One of these programmes, *Lyft* ('boost'), consisted of 40,000 temporary job positions in (semi-) public sectors (Swedish Ministry of Finance, 2009b; EIRO, 2009j).

Alongside the activation incentives, the government tried to cushion temporary unemployment by means of expanding its already rather generous passive labour market programmes. The conditions to receive unemployment benefits were relaxed by reducing the qualifying period, and the complete abolishment of the requirement of a work history (Swedish Ministry of Finance, 2008b; EIRO, 2008). To ensure that these welfare programmes could be financed, municipalities received increasing grants of SEK 5 billion per year (€ 520 million), and a supplementary SEK 7 billion (€ 730 million) in 2010 (Swedish

Ministry of Finance, 2008b). Income security was also provided through changes in tax benefits. The in-work tax credit was lowered, whilst the income tax deduction was raised. The lower threshold for state income tax was also raised to increase personal allowance. Combined, these measures entailed a tax reduction of over SEK 1,000 per month (€ 105) for 97 per cent of full-time employees (Swedish Ministry of Finance, 2008b). Additionally, taxes for pensioners with marginal income-based pensions were lowered, which affected up to 90 per cent of the country's pensioners (Swedish Ministry of Finance, 2008b).

Although Sweden was active in stimulating employment whilst providing income security for individuals, it did not directly intervene in the labour market relations to protect jobs and salaries as seen in the German case. The negotiations concerning jobs and terms of employment in Sweden are bipartite and often sectoral (Van Ruysseveldt and Visser, 1996). In these negotiations between social partners, historical agreements have been made in 2008 and 2009. Although comprehensive temporary layoffs were not officially provided as an instrument for employers, social partners have agreed upon agreements concerning temporary dismissals in many sectors to avoid massive redundancies (EIRO, 2009l; 2009m; 2009n). In the manufacturing industry for instance, an agreement was reached in 2009 that salaries and working hours can be cut in case of decrease in orders, in exchange for no or less layoffs, sometimes complemented with training possibilities for employees (EIRO, 2009k). Additionally, agreements have been made at the local level concerning cuts in holiday allowances, bonuses, and wage freeze.

6.5 Comparison of the reactive policy strategies

Our comparison of the reactive policies of Germany, the UK and Sweden shows that there are remarkable differences in their reactive strategies, as is shown in Table 6.1.

Table 6.1 Overview of national social and unemployment policies

	Germany	United Kingdom	Sweden
	(1)	(2)	(3)
Employment policies: activation programmes	State investments in training-on-the-job, job-to-job placements	State investments in mediating for jobs Training possibilities for unemployed, esp. young persons Bonus for employers when recruiting long-term unemployed	Places created for temporary work in (semi-) public sectors Student grant people over 25 increased Employer tax for hiring long-term unemployed decreased
Employment policies: passive programmes	Extension of drawing period for short-time work allowances out of general taxes. State reimburses expenses of employers	Increase in maximum weekly pay to calculate statutory redundancy benefit	Qualifying period reduced, demand of work history dropped for unemployment benefits
Tax cuts/social security contribution cuts	Tax rate first bracket lowered Allowances in personal income tax increased Social security contributions lowered Health insurance contributions lowered	Allowances in personal income tax increased, except for high incomes	First threshold income tax raised In-work tax credit lowered Income tax deduction raised Social security contributions lowered, especially for young people Payroll tax contributions lowered, especially for young people
Pensions, retirement	Partial retirement scheme for older employees, subsidised by state	Marginal non-recursive pension bonus	Tax rate of pensioners lowered
Family policies	Increased child benefit, child allowance, child bonus	Marginal non-recursive child bonus and child allowance	

The German reactive policies can be interpreted as being designed to keep insiders in the labour market to preserve their skills, and provide companies with skill maintenance, through active state interventions. This was done by using short-time unemployment on a massive scale, subsidised by the state, which ensured that insiders, skilled workers, stayed in their specific jobs. This maintenance of jobs and firm- or sectoral-specific skills plays a crucial role in corporatist countries, such as Germany, to keep their competitive advantages in the global market (e.g. Hall and Soskice, 2001). Germany also implemented a phased early retirement scheme for older employees, subsidised by the state. This scheme was designed to make space for new people, without insiders bearing any of the costs. Furthermore, the implemented tax cuts are typically conservative, due to the fact that the cuts, mostly found in health insurance and social benefit contributions, provided relief for employers and already employed, who are the insiders in the labour market. The active crisis labour market programmes were also made to benefit and maintain the insider

market, by providing training mostly for workers with employment. Due to this, it has been noted that job losses during the crisis have been seen mostly in the margin, thus the temporary workforce (Eichhorst *et al.*, 2010). In addition, it has been noted that the recovery packages have mostly been aimed towards male-dominated sectors, whilst no national plans were made to prevent a decline in female employment (EIRO, 2010). Overall, Germany's social and unemployment reactive policy strategy shows conservative characteristics, as its strategy has a profound inclination to maintain traditional status relations in labour markets.

The social and unemployment reactive policy strategy of the UK can be largely typified by passively relying on market forces, with a low degree of government intervention and targeted residual social policies leading to low decommodification. The unwillingness of the British government to improve its low supportive unemployment policies led to involvement at the company level to set up agreements concerning reduction of working hours and wages, but it also ended in mass redundancies. The only passive labour market programme implemented was a modest increase in the statutory redundancy pay for medium and high earners, and marginal non-recurrent bonuses targeted to pensioners and families with children. Almost all policies that the UK government did implement can be characterised as demand stimulations, such as a stimulus for employers for new hires and a stimulus for consumers by the VAT decrease. This market system reliance and demand-driven policies, along with its residual welfare state approach can be considered typically liberal, reflecting its past legacies.

The Swedish reaction is exemplified by its strong emphasis on activation, combined with the provision of income security. Sweden stimulated activation in the labour market by cutting income and employment taxes, and by actively creating places for temporary work in the (semi-) public sector to keep a skilled workforce. In addition, it has expanded its already generous income protection programmes for the general public and universal social policies. Whilst the Swedish government was very active in providing income security and stimulating activation, it did not so much directly protect jobs and salaries of employees as the German government did. Therefore, cuts in jobs, working hours and wages have occurred frequently through bipartite sectoral agreements. This approach of Sweden of providing generous universal income protection, and employment via the public sector, whilst focusing on activation can be understood as the typical socio-democratic approach.

6.6 Conclusions and discussion

This article aims to fill the gap in the research on short-term policy responses, by examining the reactive policy strategies of three welfare states, namely Germany, UK and Sweden. Our article shows that even though the crisis

presented sudden and severe problems to the economies of all our three country cases, the reactive social and unemployment policy strategies of the three countries are remarkably different. These differences in reactive policy strategies can be understood largely by the different institutional legacies of the three countries as argued by Esping-Andersen (1990). Germany's strategy shows conservative characteristics by maintaining the traditional status relations, as well as focusing on keeping the key skilled male workforce in their jobs. The UK, however, chose a liberal strategy, relying on market forces whilst providing residual policies to targeted groups. Sweden on the other hand adopted strong activation measures combined with generous passive labour market schemes to provide universal income security, which is typically socio-democratic in character. In addition, our study shows that the reactive policies adopted by the national governments were essentially not new, but can be seen as a succession or extension of existing ideas and paradigms from their institutional legacies. Therefore, the degree of policy innovation was limited. In their immediate reactions, our country cases seem to have fallen back on their old habits by using the tools they know best.

As the adopted national reactive policy strategies can be largely explained by the countries' institutional legacy, it suggests that the path dependence theory is applicable to reactive policies. This result is even stronger when we consider the fact that the centre-right cabinet of Sweden used a social democratic strategy, whilst the Labour Party in the UK largely relied on liberal rationales. Still, it is difficult to assess whether the policy responses would be the same when other political affiliations would be in office. Although the UK's response was essentially based on a laissez-faire approach, it has intervened in market forces, for instance by fiscally stimulating employers to hire the long-term unemployed. Perhaps we can see here the leftist inclination, but it could also be due to the fact that the UK is less of a classic liberal example than for instance the USA (Arts and Gelissen, 2002).

In addition, our study suggests that reactive policy strategies are affected by different dynamics than structural long-term policy developments. We do not find evidence for a further process of convergence in reactive policy strategies, whereas a gradual process of retrenchment and employability in structural policy-making has been noted in long-term policy developments of the welfare states under investigation (Dingeldey, 2007). This suggests that countries fall back on their institutional legacy in the first 'fire fighting' phase of social and unemployment crisis management. In addition, our study shows that in the immediate phase, this crisis was not used to implement cutbacks or reforms, as could be expected from agenda-setting theories. Whether this crisis will be used to implement major reforms in a later state, and whether the general process of retrenchment continues then, remains to be seen.

There are some limitations to this study. It should be noted here that because of the strategic most-similar systems design case study with non-representative cases, the generalisability of the study is relatively marginal.

We have compared the archetypical European examples of the different regimes, whereas other scholars have noted that other countries are more difficult to classify using Esping-Andersen's framework (Arts and Gelissen, 2002). It would be interesting to extend this study and look at the crisis response policies of more countries, including more ambiguous cases.

A second downside of the most-similar systems design is the problem of possible extraneous variables. The countries roughly share a number of important characteristics, including their geography, their membership of the EU, and, to a certain extent, the consequences of the financial and economic crisis. Other characteristics differ, including the political affiliation and the economic composition of the three countries. For instance, Germany can be characterised by its manufacturing industry and export-driven economy, whereas the UK has a large global financial sector. Sweden is also an open economy that relies heavily on foreign markets. The differences in economic composition influenced the impact of the crisis on the national economies to a certain extent (Eichhorst *et al.*, 2010). However, we can see that industrial differences do not seem to explain the dissimilarities we find in the reactive social and unemployment policy strategies as well as the path dependence theory of institutional legacies does. In addition, the industrial differences and composition are in some ways integral parts of the legacies of these welfare states, by reflecting their institutional advantages (Hall and Soskice, 2001). In order to assess the influence of the political persuasion, more countries need to be compared. If data are available, it would also be interesting to compare previous crises responses, to see whether the conclusions made in our article can actually be applicable for different crises at different periods of time.

7 Conclusions

In this final chapter I summarise the main findings of the previous chapters. Subsequently, I reflect on how these findings contribute to the academic literature and on their societal relevance in more general terms. Finally, I indicate a number of directions for future research.

7.1 Putting things together

This dissertation consists of a collection of five chapters aiming to provide insight into determinants and political and economic consequences of rising levels of income inequality and social policy development in affluent countries.

Chapter 2 maps trends in intrasectoral inequality in 19 sectors across 8 OECD countries between 1985 and 2005 based on micro data from LIS. These trends are contrasted with differences in exposure to international trade, technological change, and labour market institutions. The chapter points to the importance of taking note of sectoral trends for our understanding of earnings inequality. On average, the levels of intrasectoral inequality within countries vary as much as the levels of country-level inequality between countries. Moreover, sectors differ widely in their level of exposure to international trade and technological change. Levels of intrasectoral inequality went up in most sectors on average over time. A decomposition shows that intrasectoral inequality developments are significantly more important than earnings differences between sectors for the level of inequality at the country level. Cross-sectional pooled time-series analyses do not provide evidence for associations between total international trade or technological change and intrasectoral earnings inequality. Nevertheless, there are signs of shrinkage of employment in sectors exposed to international trade. The decrease of trade union power at the country level is associated with higher levels of intrasectoral inequality.

Chapter 3 delves into the effects of imports from China in more detail. Given its large volume of low-wage labour, the rapid rise of China on the global economic stage might have inequality-enhancing effects in developed countries. The empirical part of this chapter is based on wage and employment shares across skill groups in 17 sectors for 18 countries between 1990 and 2007. Particular attention is paid to the effects of competition with China in foreign export markets, a channel that has been ignored thus far in comparative

political economy studies. The analysis shows that employment declines in sectors that are more exposed to imports from China. Chinese import competition and competition in foreign export markets have a disadvantageous impact on low-skilled workers, whilst high-skilled workers gain from competition in foreign export markets. This results in higher levels of intrasectoral earnings inequality for sectors more exposed to Chinese import competition. Technological change has no effects on the overall employment size of sectors. Yet, technological innovation contributes to negative employment and wage effects for low-skilled workers whilst the high skilled benefit from it.

Subsequently, Chapter 4 differentiates between multiple channels through which income inequality and redistribution might affect economic output levels in advanced democracies. Inequality as such and the redistribution of taxes and transfers might have opposing or reinforcing effects on economic growth. Inequality might for instance affect growth when it lowers opportunities for people to invest in human capital, or it might push people to put forth additional effort, as relative gains are higher. Redistribution could lower growth by reducing the incentives for individuals to gain income, whilst it might also lower any negative impacts of inequality on growth. Ideally, one would distinguish between these two channels. At least, data should be used that consistently distinguish between income distribution before and after government intervention. The empirical analyses do not point to robust associations between generic measures of income inequality and economic growth, nor between redistribution and economic growth for 25 countries between 1975 and 2009. However, there are positive associations between the share of income held by the top end of the distribution and economic growth, although the coefficients are small.

Chapter 5 comprises an examination of the possible political effects of an often-mentioned culprit suspected of increasing earnings inequality, technological change. Current advancements in information technology involve risks for individuals holding routine intensive task occupations, as these occupations can be automated relatively easily. The chapter finds evidence that supports the implications of a simple theoretical framework in which risk-averse individuals prefer insurance against occupational hazards when markets cannot provide such insurance. As social protection arrangements that offer such insurance are redistributive, this will translate into higher redistribution preferences for individuals more exposed to occupational risks. This analysis is conducted for 21 occupations across 23 European countries between 2002 and 2012. The degree of routine task intensity of an occupation is a significant determinant of the redistribution preferences of individuals. Moreover, the preferences for redistribution resulting from risks of technological change are accentuated by two factors: first, whether individuals are employed in sectors that are more exposed to technological change, and second, whether an individual's income level is higher.

Chapter 6 is a case study of social and unemployment policy development in three countries, namely, Germany, the UK, and Sweden. It aims to add to our understanding of short-term reactions of states to sudden events by analysing the policy strategies adopted by these three countries in response to the Great Recession in 2008 and 2009. These particular countries seem to have fallen back on old habits by adopting social and unemployment reactive policies that can be identified based on their institutional legacies, indicating path dependence. This suggests that reactive policy strategies can be explained by different dynamics than the more structural long-term policy developments that show signs of convergence.

7.2 Societal and scientific relevance

Recently, international organisations and public policy makers have emphasised the importance of improving our understanding of the causes and consequences of the widespread trend towards rising earnings dispersion in affluent countries (IMF, 2007; OECD, 2011a; Cingano, 2014). Examining the causes and consequences of inequality is important from a societal perspective, as a widening of the income differences might evoke social unrest, potentially could affect total economic output, or can be deemed unfair from a normative perspective. Also when rising inequality would be a consequence of changes in labour market landscapes due to technological change or international trade rather than a deliberate political choice, an examination of its causes, consequences, or social policy developments is societally relevant. An improved understanding of who gains or loses from what development, what the consequences may be, and what social policy answers are available will add to our understanding of what is taking place, what can be done about it, and whether redistribution as income compensation for groups that are losing out would make sense. Still, acting in itself by means of redistribution clearly is a political choice.

The empirical findings in this dissertation are in line with theories predicting inequality-enhancing effects of labour market institutions, technological change, and international trade. The bargaining coverage rate of trade unions is associated with a more equal distribution of earnings, but the influence of trade unions in wage bargaining has decreased in most countries over time. Furthermore, international trade, in particular Chinese import competition and competition in foreign export markets, is negatively related to the employment size. Trade competition with China has distributive effects as the high skilled benefit whilst wage shares and hours worked of low skilled employees go down. Governments can choose to compensate the low skilled employees when their disadvantageous labour market position is considered to be undesirable. Furthermore, the influence of trade unions in wage bargaining could be

enforced by states as a means to equalise wages in line with the concept of pre-distribution (Hacker, 2011).

No support is found for negative effects of rising levels of income inequality on economic growth, though clearly, the empirical validity of this finding must be assessed whilst taking into account the complexity of such endeavour. This could imply that a growing dispersion in incomes does not have a clear relation with the total size of the income pie. Of course, inequality can still be considered as undesirable, or the opposite for that matter, on the basis of normative judgement. Furthermore, this dissertation provides evidence for political consequences of labour market trends associated with rising inequality. Individuals in routine jobs who have a higher risk of job loss due to automation prefer higher levels of redistribution. Thus, skill-biased technological change could potentially translate into higher levels of actual redistribution.

Academically, I aim to contribute to the field of comparative political economy in specific ways that are discussed in more detail in the separate chapters. Here I discuss what I consider the two most fundamental contributions. First, in multiple chapters I seek to move beyond generic country level measures of the variables of interest by combining sectoral, occupational, and country level data to sketch a more detailed picture. The analysis is based on multiple measures of income and earnings inequality, and employment and wage shares across skill groups. By doing so, I explicitly regard the significant variation in inequality patterns across sectors, but also the sectoral and occupational differences in exposure to possible causes of earnings dispersion, in particular technological change and international trade.

A second contribution to the field of comparative political economy is the simultaneous and more extensive analysis of potential causes and political consequences of rising wage inequality. In this doctoral thesis a prominent role is played by technological change, which has received considerable attention in labour economics but much less so in comparative political economy. Technological change is a difficult concept to grasp and measure, but the analyses presented here indicate that it can have distributive effects and also influence the redistribution preferences of individuals. This doctoral study also broadens the scope of examining international trade, by analysing the effects of total trade as well as trade competition with China in local and foreign export markets. China's surge in the global economy has not been covered in detail in the comparative political economy literature on wage inequality. Moreover, the competition in foreign export markets has been neglected thus far in this strain of literature, whilst I find it to positively affect the employment and wages of high-skilled employees whereas it has a disadvantageous impact on low-skilled workers. Compared to the labour economics literature on wage inequality with sectoral designs this thesis devotes a relatively large amount of attention to the role of labour market institutions. In this way I hope to contribute to bridging the gap between labour economics and comparative political economy.

7.3 FUTURE DIRECTIONS

A number of lines of future inquiry can be discerned, which are described in greater detail in the different chapters. First, this doctoral thesis only begins to explore sectoral and occupational elements concerning inequality and social policy development. In particular, shifts of individuals between sectors and occupations resulting from exposure to international trade or technological change are not measured, as the analyses are based on time series rather than micro panel data. Also for our understanding of economic and political consequences a micro panel design would be beneficial. For instance, individuals and their redistribution preferences moving away from exposed occupations and sectors are now attributed to non-exposed occupations and sectors. As micro panel data are starting to become available for a larger set of countries and years, this would be an interesting avenue to further explore inequality and its dynamics.

Second, in this doctoral thesis economic growth only enters the analysis as a dependent variable in the examination of effects of inequality on growth. Arguably, the real societal challenge is how to ensure that economic growth delivers prosperity for the population at large. This issue of inclusive growth or trickling down requires an analysis of living standards across the distribution over time, rather than only looking at an average measure of economic progress such as real GDP per capita (Stiglitz *et al.*, 2009; OECD, 2014h). An analysis of inequality measures that only capture relative wage differences, such as Gini indices, also do not reveal trends in absolute living standards of different groups. Such a research agenda might depart from evaluations of periods of inclusive growth across countries over time, which can be contrasted with trends in technological change, international trade, labour market institutions, and social policies in place.

A third and arguably more ambitious research agenda would be to move away from income as the yardstick to evaluate the distribution of living standards and to consider how the resulting income distribution came to be in the first place. Income is an outcome measure. It captures the amount of money a person or household has managed to gather within a certain reference period. Income does not necessarily reveal whether people were in the same exogenously given position to begin with to attain this income, regardless of the educational level of their parents, their race or gender, for instance. Studies of inequality of opportunities try to differentiate between inequality of opportunity and inequality of effort (Ferreira and Gignoux, 2011; Niehues and Peichl, 2014). Conducting such a decomposition requires a definition of what factors cannot be influenced individually as well as quality data that contain extensive information on individual characteristics in addition to income. Yet, for our understanding of the effects of inequality on economic growth, for instance, such a decomposition might be valuable. It is possible that inequality of opportunity hampers growth whilst inequality of effort can provide a boost

by incentivising people. Also for the political issue whether individuals should be compensated via redistribution because of rising inequality it seems important to know whether the distribution is by and large a consequence of rising circumstantial differences or due to a difference in personal effort or productivity.

A final recommendation for future research results from limitations of the study presented here. Although in this thesis income inequality and social policy development are viewed through a magnifying glass, this glass is inevitably blurred. The most fundamental issues stem from the non-experimental character of the research conducted, which is arguably always a problem for research in the field of comparative political economy. Clearly, progress that can be made in order to better differentiate between causes and consequences would be greatly advantageous to constructing effective policies. In the meantime, this thesis points out directions for more detailed examinations of income inequality and social policy development in affluent countries.

Samenvatting (Dutch summary)

Uit elkaar gegroeid: De politieke economie van inkomensongelijkheid en de ontwikkeling van sociaaleconomisch beleid in welvarende landen

Tot het uitbreken van de financiële crisis in 2007 is gedurende de laatste decennia het besteedbaar inkomen per hoofd van de bevolking in ontwikkelde landen toegenomen. Van deze inkomensgroei heeft echter niet iedereen in dezelfde mate geprofiteerd. In de meeste ontwikkelde landen is de inkomensongelijkheid gestegen. Voor een significant deel was dit het gevolg van gestegen loonongelijkheid, met name tussen laag- en hoogopgeleide werknemers.

In dit proefschrift probeer ik inzicht te verschaffen in determinanten en politieke en economische gevolgen van toegenomen inkomensongelijkheid en ontwikkelingen in sociaaleconomisch beleid in internationaal-vergelijkend perspectief. Dit proefschrift bestaat naast een inleiding en conclusie uit een verzameling van vijf zelfstandig te lezen hoofdstukken. Vier van deze hoofdstukken zijn in coproductie tot stand gekomen. In de hoofdstukken over oorzaken en gevolgen van ongelijkheid beperk ik me tot informatie over inkomen en werkgelegenheid. De empirische analyses in deze hoofdstukken zijn kwantitatief en omvatten lidstaten van de Organisatie voor Economische Samenwerking en Ontwikkeling (OESO) tussen grofweg 1970 en 2012. In het bijzonder wordt er gebruik gemaakt van data op beroeps- en sectoraal niveau. Het laatste hoofdstuk gaat over de implementatie van sociaaleconomische crisismaatregelen als directe reactie op de financiële crisis in 2008 en 2009. In dit hoofdstuk wordt onderzocht of er sprake is van convergentie of padafhankelijkheid in crisisbeleid. Hiertoe worden de genomen crisismaatregelen in Zweden, Duitsland en het Verenigd Koninkrijk met elkaar vergeleken. In de politicologische literatuur worden de genoemde landen gezien als schoolvoorbeeld van een sociaaldemocratische, een conservatieve, respectievelijk een liberale verzorgingsstaat. De landen werden alle drie sterk geraakt door de crisis.

Hoofdstuk 2 en 3 gaan over determinanten van ongelijkheid. In de politieke economie en arbeidseconomie worden vooral veranderingen in arbeidsmarktinstituties, internationale handel en technologische ontwikkeling genoemd als oorzaken van toegenomen loonongelijkheid. Ten eerste is gedurende de laatste decennia het belang van bepaalde arbeidsmarktinstituties met een nivellerend karakter, zoals de invloed van vakbonden in loonbepaling, afgenomen. Ten

tweede is in deze periode de handel met lagelonenlanden sterk gestegen. Blootstelling aan internationale handel kan leiden tot verplaatsing van productie en werkgelegenheid naar het buitenland. Aangezien toegenomen import uit lagelonenlanden in het bijzonder effecten kan hebben op lonen en werkgelegenheid van laaggeschoolde werknemers in ontwikkelde landen, kan dit hebben bijgedragen aan een stijging in de loonongelijkheid. Ten derde maken recente ontwikkelingen in technologie automatisering van routinematig werk relatief goedkoper. Dit kan negatieve effecten hebben voor individuen in beroepen met een meer routinematig karakter. Deze beroepen bevinden zich met name in het midden- en lagere segment van de loonverdeling. De arbeidsmarktpositie van individuen met een meer abstract beroep met gemiddeld hogere lonen wordt juist door deze technologische ontwikkelingen versterkt.

De empirische analyse in hoofdstuk 2 bestaat uit een vergelijking van inkomensongelijkheidsniveaus binnen sectoren in acht landen gebaseerd op LIS-microdata uit de periode 1985-2005. Uit een decompositie van ongelijkheid op nationaal niveau komt naar voren dat ongelijkheid binnen sectoren – de intrasectorale ongelijkheid – een veel grotere invloed heeft op het niveau en de toename van ongelijkheid op nationaal niveau dan loonverschillen tussen sectoren. In de meeste sectoren nam de intrasectorale ongelijkheid in de loop van de tijd toe. Sectorale verschillen in blootstelling aan internationale handel en technologische vooruitgang bieden geen significante verklaring voor deze wijdverspreide stijging in intrasectorale ongelijkheid. De afname in dekkingsgraad van collectieve loononderhandelingen toont wel een significant verband met intrasectorale ongelijkheid.

In hoofdstuk 3 wordt nader ingegaan op effecten van import uit China op de loonongelijkheid in ontwikkelde landen. China heeft een groot volume aan laagbetaalde werknemers. Niet alleen wordt er aandacht besteed aan de mate van blootstelling aan Chinese import in verschillende sectoren in ontwikkelde landen, maar ook wordt getracht in kaart te brengen in hoeverre handelscompetitie met China in buitenlandse exportmarkten is toegenomen. Bestaande studies in de politieke economie nemen handelscompetitie in buitenlandse exportmarkten niet mee in hun analyses. Lonen en werkgelegenheidsmogelijkheden van laaggeschoolde werknemers in ontwikkelde landen kunnen immers ook onder druk komen te staan wanneer dit land minder kan exporteren naar andere landen, omdat het voor deze andere landen aantrekkelijker wordt om Chinese goederen te importeren.

Voor het empirische gedeelte van hoofdstuk 3 wordt gebruik gemaakt van informatie over het aandeel van arbeidsuren en lonen van laag- en hooggeschoolde werknemers op sectoraal niveau in 18 landen tussen 1990 en 2007. Blootstelling aan Chinese import en competitie met China in buitenlandse exportmarkten hebben negatieve effecten op de werkgelegenheid en lonen van laaggeschoolde werknemers. Hooggeschoolden profiteren daarentegen van concurrentie in buitenlandse exportmarkten. Dit komt overeen met eerder onderzoek voor Groot-Brittannië dat laat zien dat toegenomen handelsconcur-

rentie leidt tot meer innovatie en productiviteit in exporterende industrieën waar hooggeschoolde werknemers van profiteren. Er is bewijs voor een negatief verband tussen technologische vooruitgang en de arbeidsmarktpositie van laaggeschoolde werknemers, terwijl technologische vooruitgang positief lijkt uit te werken voor hooggeschoolde werknemers. Zoals eerder onderzoek voor de VS heeft uitgewezen, heeft import uit China negatieve effecten op de sectorale werkgelegenheid als percentage van de totale werkgelegenheid op nationaal niveau. Technologische vooruitgang heeft echter alleen effecten op de werkgelegenheidsverdeling tussen laag- en hooggeschoolden.

Na in hoofdstuk 2 en 3 ingegaan te zijn op de oorzaken, richten hoofdstukken 4 en 5 zich op de mogelijke gevolgen van inkomensongelijkheid. Hoofdstuk 4 concentreert zich daarbij op economische groei. Het is mogelijk dat inkomensverschillen in de algehele populatie andere effecten hebben op de specifieke toename in loonaandelen in de top van de loonverdeling. Inkomensverschillen in de algehele populatie kunnen bijvoorbeeld scholingskansen negatief beïnvloeden, of juist economische groei stimuleren wanneer mensen worden geprikkeld door de relatief grotere loonverschillen. Grotere loonaandelen aan de top kunnen gunstig zijn voor private investeringen, of juist de groei belemmeren wanneer deze aandelen worden aangewend om te lobbyen om voordelen via de politiek te bewerkstelligen. De analyse van effecten van ongelijkheid op economische groei wordt verder bemoeilijkt door het feit dat herverdeling ook en wellicht tegengestelde effecten kan hebben op economische groei. In de economische wetenschap is de hypothese dat herverdeling loonprikkels en daarmee groei negatief beïnvloedt gezaghebbend.

Het is methodologisch ingewikkeld om een strikt onderscheid te maken tussen effecten van inkomensongelijkheid en herverdeling op economische groei. In ieder geval is het van belang om gebruik te maken van data waarin een onderscheid wordt gemaakt tussen ongelijkheid voor of na herverdelende belastingen en overdrachten. Wanneer gegevens van 25 landen tussen 1975 en 2009 worden geanalyseerd, worden met betrekking tot ongelijkheids- en herverdelingsmaatstaven die de gehele bevolking omvatten geen significante verbanden met economische groei gevonden. Wel is er een positieve relatie tussen het loonaandeel van de topinkomens en de economische groei, maar de coëfficiënten zijn klein.

Hoofdstuk 5 beschrijft een onderzoek naar mogelijke politieke consequenties van inkomensongelijkheid. Meer specifiek wordt er een analyse uitgevoerd of individuen die meer blootgesteld zijn aan technologische vooruitgang – zoals reeds besproken een veelgenoemde oorzaak van ongelijkheid – meer herverdeling prefereren als publieke verzekering tegen het toegenomen risico op baanverlies. Publieke verzekeringen tegen bijvoorbeeld werkloosheid hebben herverdelende effecten. Huidige technologische ontwikkelingen maken automatisering van routinematig werk relatief eenvoudiger. Op basis van microdata in 23 landen tussen 2002 en 2012 blijken individuen in routinematige beroepen meer herverdeling te prefereren. Deze relatie wordt sterker voor individuen

die werkzaam zijn in sectoren die zijn blootgesteld aan technologische vooruitgang, en voor mensen met een hoger inkomen aangezien zij meer te verliezen hebben in geval van baanverlies.

Tot slot omvat hoofdstuk 6 een casestudy van sociaaleconomisch crisisbeleid in Duitsland, het Verenigd Koninkrijk en Zweden als reactie op de financiële crisis in 2008 en 2009. Deze landen worden gekenmerkt door een verschillende institutionele geschiedenis. Zweden wordt gezien als een typische sociaaldemocratische verzorgingsstaat, terwijl Duitsland en het Verenigd Koninkrijk worden beschouwd als vertegenwoordigers van respectievelijk conservatieve en liberale verzorgingsstaten. Vaak wordt gesteld dat op de lange termijn deze institutionele verschillen lijken te verkleinen aangezien het sociaaleconomisch beleid tekenen van convergentie vertoont. Als directe reactie op de financiële crisis op de korte termijn daarentegen lijken de landen padafhankelijk te reageren. De crisisbeleidsstrategieën van de landen kunnen namelijk verklaard worden door verschillen in de institutionele geschiedenis. Dit suggereert dat beleidsstrategieën op de korte termijn verklaard kunnen worden door andere dynamieken dan beleidsontwikkelingen op de lange termijn.

Uit dit proefschrift komt het belang naar voren om op meer gedetailleerd sectoraal- en beroepsniveau dan in plaats van alleen overkoepelend nationaal niveau te kijken naar ontwikkelingen in inkomensongelijkheid. Er is substantiële variatie in niveaus van ongelijkheid, loonaandelen en werkgelegenheid tussen sectoren binnen landen. Aldus kan een meer gedetailleerd beeld verkregen worden van trends in ongelijkheid. Bovendien verschilt binnen landen de blootstelling aan mogelijke oorzaken van inkomensongelijkheid sterk tussen sectoren en beroepen. Dit kan worden gebruikt om meer inzicht te krijgen in mogelijke oorzaken – en daarmee indien gewenst mogelijke beleidsoplossingen – van ongelijkheid.

Een tweede bijdrage aan de politieke economie omvat de meer uitgebreide analyse van oorzaken en politieke gevolgen van inkomensongelijkheid. Binnen de politieke economie is de impact van technologische vooruitgang nog weinig onderzocht, terwijl de huidige technologische innovaties ongelijkheidsversterkende effecten hebben en tevens de herverdelingspreferenties van individuen beïnvloeden. Bovendien wordt in dit proefschrift aandacht besteed aan internationale handel, importcompetitie specifiek uit China en handelscompetitie met China in buitenlandse exportmarkten. Deze laatste twee factoren zijn eveneens nog weinig onderzocht maar blijken positieve effecten voor hoogopgeleide werknemers, maar negatieve effecten voor laagopgeleide werknemers in ontwikkelde landen te hebben.

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Curriculum vitae

Stefan Thewissen (1987) was born in Nijmegen, the Netherlands. From 2005 to 2009 he studied Public Administration at the Radboud University Nijmegen. He finished his undergraduate studies by interning at the Social and Economic Council in The Hague. After this, he started the two-year master's programme Research in Public Administration and Organisational Science, a collaboration between the universities of Utrecht, Rotterdam and Tilburg. In 2011 he received his master's degree (MSc) with honours. He wrote his master's thesis during an internship at the OECD in Paris. Subsequently, also in 2011, he started his PhD at the Economics Department of Leiden University. During his PhD he followed multiple PhD courses in Economics and attended summer schools, as well as presenting his research at various conferences. In 2014 Stefan spent a term at Nuffield College, University of Oxford as junior visiting scholar. In the same year he won the Aldi Hagenaars Memorial Award for the best LIS working paper written by a researcher under the age of 40 for a working paper co-authored with Chen Wang and Olaf van Vliet. He has published in *Socio-Economic Review* and *Social Policy & Administration*.

While doing his PhD, Stefan was vice-president and treasurer of the Dutch National Association for PhD Candidates, PNN (2012-2013). He co-founded the World Healthcare Forum on healthcare innovation, which was held in The Hague between 30 November and 2 December 2014. Stefan was an external consultant for the OECD as part of the OECD Network on Fiscal Sustainability of Health Systems in 2013. As of January 2015, Stefan acts as a research fellow (postdoctoral researcher) in the Employment, Equity, and Growth research programme of the Institute for New Economic Thinking at the Oxford Martin School and the Department of Social Policy and Intervention at the University of Oxford. He is an associate member of Nuffield College. In addition, he is a short-term consultant for the World Bank.

In the range of books published by the Meijers Research Institute and Graduate School of Leiden Law School, Leiden University, the following titles were published in 2013, 2014 and 2015

MI-224 A.F. Rommelse, *De arbeidsongeschiktheidsverzekering: tussen publiek en privaat. Een beschrijving, analyse en waardering van de belangrijkste wijzigingen in het Nederlandse arbeidsongeschiktheidsstelsel tussen 1980 en 2010*, (diss. Leiden), Leiden: Leiden University Press 2014, ISBN 978 90 8728 205 9, e-ISBN 978 94 0060 170 3

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