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Four essays on firm size, Human Resource practices, and societal income inequality

By

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Contributions to the cumulative dissertation

1. Weissphal, M. (2022). The two sides of size: A review of large firms' Human Resource practices and their societal impact on income inequality. Working Paper.

2. Schneider, M., & Weissphal, M. (2022). Bureaucracies or superstar firms? Large employers and income inequality in a cross-country comparison. Working Paper.

3. Weissphal, M., & Wilke, C. M. (2022). Employment practices, institutional arrangements, and income inequality: A country comparison using fuzzy-set QCA. Working Paper.

4. Hellweg, T., & Weissphal, M. (2022). The effects of digitalisation and outsourcing on multitasking: Empirical evidence for Germany. Working Paper.

Synopsis

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1 Introduction

This dissertation cumulates four papers that all explore Human Resource Management (HRM) as a potential reason for societal income inequality. The papers comprise a systematic literature review (Weissphal, 2022), two analyses of country-level data, one relying on regression analysis (Schneider & Weissphal, 2022) and one using a configurational method (Weissphal & Wilke, 2022), and a final paper based on micro-level data from Germany (Hellweg & Weissphal, 2022). The first paper provides a new and encompassing knowledge base of how HRM can theoretically affect societal income inequality along empirically measurable concepts. The latter papers test this relationship by means of different empirical methods. In particular, this dissertation contributes to previous research by overcoming several difficulties in the interplay between theory development and a precise empirical operationalisation. Thereby, future research can identify effects of HRM on countrywide income inequality in a more robust manner and suggest well-targeted policy measures.

Addressing the question of how HRM affects societal income inequality is crucial. First, upward trends in income inequality have been identified for several decades (e.g. Foerster & Tóth, 2015; Ostry et al., 2014; Roser & Cuaresma, 2016). Especially in many OECD countries, income inequalities are on their highest level since data collection (Organisation for Economic Co-operation and Development, 2015). Research from across the spectrum of disciplines have explored the reasons for this and identified several main explanations such as globalisation, technological change or declines in unionisation and wage bargaining (e.g. Morris & Western, 1999). Yet, these explanations cannot fully explain empirical patterns in cross-country comparisons and for some country-specific trends (e.g. Lin & Tomaskovic-Devey, 2013). This allows for other factors proving their explanatory power (McCall & Percheski, 2010).

An especially compelling factor has become financialisation (Krippner, 2005) with independent effect sizes that are comparable to those of the main reasons mentioned above (Lin & Tomaskovic-Devey, 2013). By reshaping governance structures towards an orientation along financial assets and incomes (Krippner, 2011), financialisation may also change corporate strategy in a way that bares consequences especially for employees (van der Zwan, 2014). In fact, the share of income going to the poorer half of the population has significantly decreased (Alvaredo et al., 2018; OECD, 2015). As these individuals almost exclusively receive labour

income, firms' compensation and employment practices are likely to mediate the impact of financialisation on income inequality (Lin, 2016). Accordingly, seminal contributions on the explanatory power of formalised HRM in richer countries have gained significant attention in recent years (Bapuji et al., 2020; Cobb, 2016).

It is particularly important to address HRM as a new reason because it contrasts with the conventional reasons of neoclassical research. Traditional research on human capital has stressed unequal skills acquisition as the most important reason for income inequality (Lazear & Shaw, 2009). However, latest research shows that such "a singular focus […] is much too narrow" (Tomaskovic-Devey & Melzer, 2020). The fact that, in the United States, inequality has increased whereas the college-wage premium has remained stable is a first indication that organisational arrangements seem to be an important lever to constrain rising income inequality (Wilmers, 2019). In other words, income inequality is not the inevitable result of individuals' fortunes on the labour market. It is also a fabricated result of "conscious corporate strategy" (Schmitt, 2017). Given that, it is surprising that the role of employers and their HRM received little attention to explain income inequality (e.g. Dundon & Rafferty, 2018). Disregarding the responsibility of companies may disguise the potential fact that rising income inequality can be effectively addressed to a much higher degree. Since income inequality is found to have severe implications for citizens' well-being (Schneider, 2019) and also economic growth (Neves et al., 2016), it is doubtful whether HRM that leads to higher income inequality is an economically rational choice. In order to gain more clarity behind such statements, further research is needed.

First and foremost, a precise description of the current state of research is pending. Although HRM could have attracted more attention, a number of studies lay an important foundation. In terms of theory, early sociological research recognised that stratification takes place in organisations as they advance the structure of job positions (Baron & Bielby, 1980). Importantly, companies have a variety of ways how to do so. Different kinds of employment practices or even systems have been introduced (Jacoby, 2005; Lepak & Snell, 1999). Strikingly, it has been recently suggested that profound changes in the composition of these practices have taken place that may help to explain rising income inequality in countries in which formal employment is common (Cobb, 2016). Testing such suggestions at country level is, however, difficult as aggregated data on different kinds of employment practices are usually not collected (except for some employment forms with legal prescriptions such as non-standard

employment). At this point, the use of proxy variables that indicate the practices used by a country's firms is without alternatives.

Shifts in the composition of employment practices influence other basic company figures and the general corporate demography in a country. Important summaries have subsumed shifts of employment practices under the eroding of internal labour markets (Cappelli, 2001) and the disintegration of large firms (Davis, 2016). Firms have reduced their efforts to employ large numbers of workers internally and on a long-term basis. Instead, large firms engaged in massive downsizing activities, resulting in a "shrinking core" (Streeck, 2009). Therefore, the authors suggested basic empirical indicators for these trends such as declines in average job tenure (Cappelli, 2001) or decreasing employment in large firms (Davis & Cobb, 2010). This dissertation focusses on the latter aspect, i.e. employment-related firm sizes, in order to capture changing employment practices and their potential effects on income inequality at country level. The prime reason for that is that especially trends in firm size have been used as an explanation for societal income inequality in several studies including Davis and Cobb (2010).

The triparty between transforming HRM, declining firm sizes and rising income inequality seems to be a wide-ranging phenomenon apparent in many countries. But is there really uniform support for such a pattern? Even though the assumed trends may sound compelling, different perceptions of large firms and their role in generating income inequality can still coexist. Especially the first paper of this dissertation reveals that the previous literature has come up with extremely mixed perceptions. Often opposing perceptions stem from different disciplines. As summarised by Bernhardt et al. (2016), economists and management scholars argue that outsourcing helps to save on transactions costs (Williamson, 1975), leads to specialised jobs (Lepak & Snell, 1999) or may be necessary for company survival. Scholars such as Hamel (2009) also strongly promote outsourcing as a way to make hierarchies flatter. Flatter hierarchies seem to reduce societal income inequality because it is naturally higher *within* large firms. Sociologists such as Sørensen (2000) or Budros (1999), however, argue that rather than assuring company existence, companies use outsourcing as a common tool to eliminate rents for affected workers with less bargaining power and to thereby increase share prices (Jung, 2015, 2016). But also some economists had similar views early on (Miller, 1981). In line with above, decreasing income inequality within shrinking large firms is offset by higher inequality *between* firms. Which argumentation is correct?

Empirical research has found support that firm size can be associated with lower but also with higher societal income inequality. Hence, size seems to have two sides. Given this ambiguity and otherwise scarce data, how can it still be evaluated whether HRM matters for income inequality? An important connection within the triparty is also the one between certain Human Resource (HR) practices and firm size. Whereas early research has found a strong relationship between firm size and typical practices of internal labour markets such as staff-wide wage premia, this relationship has diminished over time (e.g. Cobb & Lin, 2017). As pointed out in the first paper, HR practices within today's large firms differ markedly and sometimes in very nuanced but important ways. So-called superstar firms may establish internal labour markets but their hiring efforts can still be very different. In essence, the connection between firm size and income inequality rests on different assumptions on large firms' HR practices.

The aim of this dissertation is to identify the explanatory power of HRM as a new reason for societal income inequality. This aim is pursued by revealing all possible connections, theoretically as well as empirically, within the triparty of HRM, firm size and income inequality. In other words, large firms may lead to higher or lower income inequality depending on the HR practices they use. This is an important approach because most of the already scarce literature has only focused on single connections. As a result, previous literature finds results that appear to be mutually exclusive. Therefore, it should be analysed whether these findings are really contradictory or just the result of a black box of different assumptions on company characteristics, particularly HR practices. As varying assumptions may arise from very different disciplines, this dissertation is the first to bring together work from all relevant ones. While some studies already draw lines between different disciplines such as sociology and HRM (Cobb, 2016), this project also includes latest economic research (e.g. on superstar firms). Thereby, it strives to provide a fully-fledged framework that acknowledges and structures the interplay between a variety of theoretical arguments, empirical indicators and evidences. The three empirical papers of this dissertation are intended to further support the appropriateness of such a framework and to provide evidence on selected links within the framework.

The main finding of this dissertation is that HRM matters. Analyses of the linkages between HR practices, firm size and societal income inequality support this. However, the linkages can take different directions as the framework developed in the first paper implies. The prime reason for that is the inaccuracy of the assumption that firm size continuously equals certain kinds of

HR practices. Of course, firm size is a convenient and accessible proxy for the HR practices commonly used by large firms. However, HR practices can also change within large firms. Therefore, firm size itself is a double-edged sword in terms of societal income inequality. Empirical evidence clearly shows that large firms in the United States were an institution contributing to egalitarian outcomes due to their use of internal labour markets. However, this is not the case any longer due to changing HR practices within the largest firms. Especially large service firms do not establish broad-based internal labour markets for their staff. Instead, they employ lower-level employees under non-standard employment relationships and pay them close to minimum wages. In addition, firm size cannot reflect nuanced differences in the kinds of HR practices between countries. In Germany, increasingly larger firms also contribute to higher societal income inequality, although large manufacturing firms still establish internal labour markets. What is characteristic about these firms, however, is that they are reluctant to expand their staff when revenues increase. This pattern is characteristic for superstar firms, which are able to gain exceptionally high market shares and profits by "extracting a lot of revenue out of their workforce" (Kehrig & Vincent, 2021). In both countries, HRM is clearly connected to higher societal income inequality, although leading to giant companies. Support that the shrinking of the largest firms is followed by lower societal income inequality could not be identified, which raises doubt on suggestions of some scholars (e.g. Hamel, 2009).

The three empirical papers of this dissertation yield further support for the identified linkages in the framework. The first two complement country-level analyses of firm size and income inequality with further indicators on HR practices such as non-standard employment, permanent employment and also sales concentration. The first paper applies regression analyses to new time-series data for OECD countries. First, it shows that, in a simple cross-sectional country comparison, firm size is clearly negatively associated with societal income inequality. However, when considering time trends within countries, also highly positive relationships are found for several countries. In line with theoretical arguments, firm size is negatively associated with income inequality within a country when followed by a higher share of full-time employment as a sign for internal labour markets. It is positively associated when followed by higher sales concentration as a sign for superstar firms.

The second paper conducts a cross-sectional country comparison using a configurational method, namely qualitative comparative analysis (QCA). Again, a clear negative relationship

between firm size and income inequality is confirmed: Countries with periods of high (lower) income inequality have relatively smaller (large) companies. This kind of analysis also allows to test configurational relationships to further important variables. Thereby, it is found that the presence of relatively small companies combines with a high prevalence of temporary employment, together indicating the absence of broad-based internal labour markets. In addition, the paper reveals that the absence of internal labour markets is a phenomenon prevalent in many countries with very different institutions but similar levels of income inequality. Hence, employment practices seem to serve well to explain income inequality in these countries. In sum, levels of firm size reflect the spread of organisational structures that developed over a long time such as internal labour markets. Trends of firm size within countries, by contrast, rather capture recent phenomena such as the rise of superstar firms.

The last paper analyses the consequences of superstar firm dynamics for employees in German establishments. As found in the first paper, Germany is a country where firm size is strongly positively associated with sales concentration and societal income inequality, indicating the rise of superstar firms (cf. Mertens, 2021). The paper focuses on two critical factors for the emergence of superstar firms: Besides digitalisation (Stiebale et al., 2020), also outsourcing seems to be a key practice that enables firms to concentrate on core competencies (Autor et al., 2020) and to save on firm-specific wage premia for peripheral activities (Goldschmidt & Schmieder, 2017). Specifically, we ask how these two factors affect the range of tasks performed by workers who remain at their employers. While early theoretical work by Lindbeck and Snower (2000) has argued that these two trends lead to a widening of task profiles, empirical relationships have been rarely tested. Although our analysis yields general support for these suggestions, we also point out a crucial difference: While it has been claimed that especially the tasks of workers in high-skilled occupations are affected by outsourcing (Lindbeck & Snower, 2000), we point out that this is much more the case in low-skilled occupations. This finding may be a sign that only because these employees are able to switch between a wider spectrum of tasks, firms can afford to concentrate on fewer occupations and thereby reduce costs. In addition, as these workers do not necessarily receive wage premia after outsourcing events (Ochsenfeld, 2018), earnings differences to high-skilled workers (Lochner et al., 2020) and to firms' shareholders (Mertens, 2021) may rise, contributing to higher societal income inequality.

Overall, the four papers show that transformations of HR practices as part of "conscious corporate strategy" (Schmitt, 2017) have contributed to the rise of income inequality in many countries. This raises doubts whether recent trends towards the disaggregation of organisations and the elimination of formal hierarchies should be promoted without any criticism as done by some management scholars (e.g. Hamel, 2009). The fact that the disintegration of the largest firms has been consistently found to be followed by higher income inequality clearly shows that internal labour markets within these firms were and still are an important institution contributing to lower societal income inequality. Thus, arguments that support the downsizing of large firms and the unwinding of internal labour markets can be criticised because they oversee that some interest groups may face worse outcomes resulting from corporate restructuring. Consequently, these findings might suggest that large expanding firms always reduce societal income inequality. However, this dissertation also reveals that caution is also required here: Large firms can substantially differ such that firm size is still a double-edged sword in terms of societal income inequality. Particularly large superstar firms, though capturing extraordinary market shares, only offer internal labour markets to a relatively small group of employees and thereby contribute to higher income inequality.

What would be an alternative approach to HRM? According to Rubery and Grimshaw (2016), it is important not only to provide inclusive employment systems for internal employees but also to enhance inclusive labour markets in general (Pulignano, 2019). Of course, expanding large-firm employment and a return to even larger conglomerates such as Tata group would be an obvious solution (Batt, 2018; Osterman, 2018). However, such a return is unlikely given competitive pressures from firms that continue to engage in cost reduction (cf. Vosko, 2010). Therefore, stronger regulation for hierarchical product markets should tackle opportunities of dominant buying companies to dictate terms of condition (Wilmers, 2018) and to press down wages via outsourcing despite collective bargaining (Doellgast et al., 2017). For example, a first step could be to prohibit that wages are lower after a transfer of undertakings (as could be implemented in §613 BGB in Germany). Thereby, buyers' efforts in cost reduction are complicated and this regulation can somehow take over the original role of internal labour markets with its fairness norms and administrative rules for the whole labour market.

Besides restricting the playing field for companies, public subsidies should be well targeted to companies that actually use these funds in order to expand employment. The case of superstar

firms demonstrates that firm size is an insufficient indicator for employment growth and thus should not be used in order to justify public subsidies. Of course, also addressing financialisation as one of the main triggers of changing corporate strategy is highly relevant. In fact, not transaction costs but financialisation and the rise of shareholder value principles are major reasons for broad-based downsizing in firms (Jackson, 2005; Jung, 2015; Lin, 2016) and for weakening aggregate employment growth (Crotty, 2003). Lastly, all this should be followed by a permanent persuasion of all companies that it is economically rational to follow a "collaborative and inclusive people management" (Dundon & Rafferty, 2018) that overcomes their fictional company walls.

All of these measures require empirical knowledge. More precise data should be collected that provide insights on the kind of HR practices large firms use. Of course, extensive surveys on the usage of outsourcing as for example conducted by Kalleberg and Marsden (2005) are very insightful. These surveys involve a lot of effort and costs. Therefore, this dissertation collects a first series of theoretically sound figures that companies seem to collect anyway. For example, the presence of broad-based internal labour markets in companies could be identified by wage premia for all employee groups (Cobb & Lin, 2017). Differences of such companies and superstar firms might also be revealed by tracking hiring behaviour after revenue gains (Kehrig & Vincent, 2021) or by analysing firms' employee composition in terms of their tasks in this dissertation (Hellweg & Weissphal, 2022). Ultimately, it would be ideal if HR practices are not only screened within dominant buying firms but also for firms along the whole supply chain (cf. Willman & Pepper, 2020). Then, observations of all firms that are part of the supply chain can be set into relation and their variation can be identified. For example, non-standard employment may be rare within buying firms but common practice along their suppliers. The same logic can also be applied to figures of income inequality. According to Willman and Pepper (2020), the degree of income inequality should be calculated for the whole supply chain and not only within firms' boundaries, thus also including firms and workers abroad. Thereby, firms that engage in outsourcing and predominantly employ high-income individuals will be exposed to much higher numbers. In general, such meso-level approaches that observe HR practices and calculate income inequality (both usually measured at firm or country level) along supply chains have a high potential to isolate societal impacts of HR practices more accurately. In sum, there are many fruitful avenues for practitioners in the companies and the ministries to track corporate activities in terms of HRM and their inequality outcomes.

2 Overview of the contributions

In the following, the four papers will be presented in more detail. First, this includes a presentation of their exact research question in light of the previous introduction and the respective preceding paper(s). Then, an explanation of the general methodology, of precise results and of how results contribute to the overall statements follows. Finally, the explanation of each paper is closed with an overview of the respective contributions of the authors, presentations of the papers at conferences and publication efforts.

2.1 Weissphal (2022)

The first paper seeks to answer the question under which conditions large firms foster or reduce societal income inequality in terms of HR practices. By answering this question, this paper seeks to give a first impression of the explanatory power of HR practices for income inequality arising from previous theoretical and empirical work. In order to answer that question, it reveals all identified connections between firm size, HR practices and income inequality. It is important to include firm size into this consideration, because direct relationships of HR practices to societal income inequality can be hardly assessed due to data unavailability of conceptually relevant HR practices on an aggregate scale. While there are inspiring approaches based on large-scale employer-employee data (e.g. Goldschmidt & Schmieder, 2017), most studies still use firm size as a proxy variable for certain HR practices.

Connections between firm size, HR practices and income inequality are identified by means of a review of important theoretical contributions and 46 empirical studies. These studies comprise mostly journal articles, book chapters but also some recent discussion papers, which have evolved over four decades (1984 to 2021) and stem from multiple disciplines. Importantly, studies that address all connections jointly are a clear exception (e.g. Song et al., 2019). Most of the studies address the linkage between firm size and either HR practices or income inequality. Therefore, it is crucial to sort the otherwise separate findings according to other similarities, which particularly are comparable contexts such as country and time.

The results of the paper point out that HR practices of large firms are decisive whether they foster or reduce societal income inequality. When large firms established internal labour markets, including generous remuneration and pronounced hiring efforts, particularly for lower-income employees (e.g. Cobb & Lin, 2017; Kehrig & Vincent, 2021), they reduced societal income inequality (e.g. Davis & Cobb, 2010). Hence, downsizing of such firms clearly increased societal income inequality (Davis & Cobb, 2010). However, firm size has been increasingly followed by higher income inequality as large firms refrained from such HR practices (e.g. Cobb & Lin, 2017; Davis & Cobb, 2010; Kehrig & Vincent, 2021). Overall, the review provides a conceptual framework of how HRM can theoretically affect societal income inequality. The major difference to similar contributions such as the one by Cobb (2016) is that this framework is structured along empirically measurable concepts.

Table 1

Overview of contributions, conference presentations and publication efforts

Weissphal (2022)	
Contributions	• Sole authorship • Feedback and comments by M. Schneider
Conference presentations	
Publication efforts	• 11/2021: Submission to the *Journal of Economic Literature* (rejection) • 02/2022: Submission to the *Human Resource Management Review* (rejection) • 2022: Submission to the *ILR Review* (planned)

2.2 Schneider & Weissphal (2022)

The second paper takes up the conceptual framework developed in the first paper and tests the two dominant logics, which differ in their inequality outcome. On the one hand, large firms can function as bureaucracies: When they grow, this could be a sign that they establish internal labour markets and create long-term employment relationships. On the other hand, it can be also possible that they are superstar firms, which seem to be on the rise in many countries (Autor et al., 2020). One of the most important characteristics of superstar firms is that their employment growth is outpaced by sales growth, thus indicating reduced hiring efforts.

Specifically, this paper asks whether variables related to internal labour markets and superstar firms mediate negative and positive relationships respectively between firm size and income inequality. This question is answered by means of an analysis of new cross-country panel data, covering 24 OECD countries across the years 1990 to 2015. Based on Davis and Cobb (2010), we measure firm size by a country's employment concentration defined as the employment share in the ten largest employers and income inequality in the form of the Gini coefficient. The potential mediators are the country's share of permanent employment indicating internal labour markets and the share of sales in the largest employers to the whole economy. The analysis comprises basic descriptive correlations between the variables of interest as well as a robustness test of these correlations by means of moderated mediation analysis (Preacher et al., 2007).

In general, we find both strongly negative and positive relationships between employment concentration and income inequality. Moreover, our descriptive findings reveal first support that permanent employment and sales concentration are potential mediators for negative and positive relationships, respectively. In contexts with a negative relationship, employment concentration predominantly correlates positively with permanent employment, thus apparently reflecting the prevalence of internal labour markets here. Hence, unwinding or evolving internal labour markets in large firms seem to be the reason for growing or decreasing inequality trends that are both present in these contexts. In contexts with a positive relationship between employment concentration and income inequality by contrast, employment concentration mostly correlates positively with sales concentration. Therefore, expanding superstar firms seem to explain inequality trends, which are exclusively rising in these contexts. Importantly, both explanations fail to explain trends in the respective other contexts as here, employment concentration correlates inconsistently with permanent employment and sales concentration.

The robustness of these descriptive findings is tested by means of moderated mediation analysis (Preacher et al., 2007) and in particular, by the subgroup-approach to this kind of analysis (Wegener & Fabrigar, 2000). Subgroups are built along the sign of the correlation between employment concentration and income inequality. Based on fixed-effects panel regressions, mediation in each subgroup is then assessed by means of the common causal steps procedure by Baron and Kenny (1986) and a more advanced approach that calculates mediation effects (Mackinnon & Dwyer, 1993) and their significance by means of bootstrapping (Preacher et al., 2007). With the latter method, mediation is moderated when mediation effects differ between the two subgroups (Edwards & Lambert, 2007). Moreover, a homogeneity test is conducted in order to identify the significance of this difference (Altman & Bland, 2003).

In line with the descriptive findings, mediation effects of permanent employment are substantial and significant in contexts with a negative but not with a positive correlation between employment concentration and income inequality. As mediation effects significantly differ between the two contexts, moderated mediation is apparent. Also in line with the descriptive findings, there is no mediation effect of sales concentration in countries with a negative relationship between employment concentration and income inequality. Whereas this mediation effect is clearly larger in countries with a positive correlation between employment concentration and income inequality, it is, however, still insignificant. Thus, the assumption of moderated mediation of sales concentration lacks statistical significance, although coefficient signs mostly point into the expected directions.

Still, the two dominant logics presented in the framework receive fairly strong support. Large employers compress income inequality as they become bureaucracies and they seem to foster it when they dominate as superstars. As these two types assumingly differ in their HR practices, these results yield some support for the explanatory power of HRM for recent trends in societal income inequality. Consequently, public subsidies to large firms should be granted under careful consideration of these important differences in terms of revenue situation and hiring efforts. Of course, given insignificant mediation effects of sales concentration, future empirical research needs to substantiate our results, particularly with regard to the measurement of superstar dynamics among large employers.

Table 2

Overview of authors' contributions, conference presentations and publication efforts

Schneider & Weissphal (2022)	
Contributions	• Development of the research question by M. Weissphal • Compilation of the theoretical framework and the literature review by M. Weissphal • Selection of items and compilation of the dataset by M. Weissphal • Application of statistical analysis (regression) by M. Weissphal • Joint interpretation of the results • Joint writing up of the paper
Conference presentations	• 05/2018: Presentation of an earlier version of the article at the International (Post-)Doctoral Workshop „Netzwerk Personal-, Bildungs- und Organisationsökonomik", Gersau, Switzerland • 10//2018: Presentation of an earlier version of the article at the Annual Meeting of the German Industrial Relations Association (GIRA), Darmstadt, Germany • 11/2018: Presentation at the Annual Workshop of the Faculty of Business Administration and Economics of Paderborn University, Paderborn, Germany • 03/2019: Presentation of an earlier version of the article at the Doctoral Colloquium with the chair of Prof. Dr. Uta Wilkens and Prof. Dr. Anja Iseke, Paderborn, Germany • 06/2019: Presentation of an earlier version of the article at the Annual Conference of the Society for the Advancement of Socio-Economics (SASE), New York City, USA • 09/2019: Presentation of an earlier version of the article at the European Congress of the International Labour and Employment Relations Association (ILERA), Duesseldorf, Germany • 09/2020: Presentation of an earlier version of the article at the Herbstworkshop of the WK Personal, Duesseldorf, Germany • 03/2022: Presentation of the latest version at the Colloquium on Personnel Economics (COPE), Herning, Denmark
Publication efforts	• 14/2020: Submission to *Socio-Economic Review* (rejection) • 2022: Submission to *Economy & Society* (planned)

2.3 Weissphal & Wilke (2022)

While in the second paper time series within countries are analysed in more detail, the third paper rather concentrates on cross-sectional differences between countries. In the study by Davis and Cobb (2010), a clear negative relationship between employment concentration and income inequality is identified for a wide range of countries in the year 2006. In the second paper, this is substantiated for 31 OECD countries in the year 2015. Based on the framework of the first paper, this negative relationship seems to arise from differences in the prevalence of internal labour markets between the countries. Thus, differences in the employment concentration should be followed by variables related to internal labour markets. In addition, a cross-country comparison allows us to identify the embeddedness of employment concentration into other important factors that also explain income inequality, most importantly, institutional arrangements (Davis, 2017).

The concrete question that we address is how employment concentration and related HR variables at country level combine to explain income inequality and how such links arise from institutional environments. The analysis of multiple complex connections between variables requires cross-country comparisons with a more case-oriented design, which is often addressed with qualitative comparative analysis (QCA) (e.g. Schneider et al., 2010). Using this method to cross-country panel data for 22 OECD countries between 1996 and 2012, we compute set-theoretic linkages to income inequality, also termed causal paths. Identical to the second paper, we operationalise firm size and income inequality with employment concentration and the Gini coefficient. Given that QCA allows to draw connections between multiple variables, we diverge from the second paper and use two variables to describe the absence of internal labour markets, namely countries' shares of part-time and temporary work. The institutional variables are selected according to the varieties of capitalism (VOC) approach (Amable, 2003; Hall & Soskice, 2001) as suggested by Davis (2017).

First of all, we reveal that high and lower employment concentration are sufficiently linked to lower and high income inequality, respectively. Moreover, high employment concentration seems to be an indicator for internal labour markets as it combines with less frequent temporary work when sufficiently explaining lower income inequality. The reverse pattern also holds for lower employment concentration (combining with frequent temporary work when explaining high income inequality, thus indicating the absence of internal labour markets). For part-time

work, however, we find ambiguous results that seem to hinge on country-specific legislation protecting part-time work. Given such legislation, part-time work may be compatible with internal labour markets and lower income inequality.

In general, the institutional environment matters for the applied employment practices and thus income inequality (Davis, 2017). In particular, we find that the link between employment concentration and income inequality often fits into the country models of the VOC approach (Amable, 2003): High income inequality and lower employment concentration are present in the market-based or the Mediterranean model; lower income inequality and high employment concentration are found in the social-democratic or the Continental European model (Davis, 2017). However, this is not always the case. Employment practices are also able to explain high income inequality in very diverse contexts, that is, not only in market-based but also in highly coordinated economies such as Germany.

Overall, especially the third paper reveals a very high explanatory power of employment practices for *levels* of income inequality. They seem to be a complementary reason why important institutional clusters reveal different levels of income inequality. In some cases, they even explain income inequality more consistently compared to institutional factors alone. In addition, the fact that we did not reveal a single case with high employment concentration and high income inequality suggests that the emergence of large superstar firms is rather suited to explain recent inequality trends within a series of countries as analysed in the second paper. Of course, it can be the case in future that high levels of income inequality are the result of giant companies dominating markets with relatively few workers or applying less equitable pay policies (or sometimes doing both such as Amazon). However, this paper suggests that, for now, it seems that the largest firms are still predominantly characterised by internal labour markets with long-term employment. Expanding employment among such firms would be the most effective solution to substantially reduce levels of income inequality. This is also in line with the findings on the mediating role of permanent employment for negative time-series relationships between employment concentration and income inequality in the second paper. However, if chances of such a solution are slim due to competition (Kalleberg & Vallas, 2018), our results suggest that also part-time work coupled with beneficial legislation or other forms of legislation protecting workers bargaining power across firms are promising alternatives (e.g. Doellgast et al., 2017).

Table 3

Overview of authors' contributions, conference presentations and publication efforts

Weissphal & Wilke (2022)	
Contributions	• Development of the research question by M. Weissphal • Transfer of the research question into set-theoretical analysis by C. M. Wilke • Compilation of the theoretical framework and the literature review by M. Weissphal • Joint selection of items and compilation of the dataset • Preparation and translation of raw data into set-theoretical concepts by C. M. Wilke • Application of the statistical analysis (fuzzy-set QCA) by C. M. Wilke • Joint interpretation of the results • Joint writing-up of the paper • Further revisions by M. Weissphal
Conference presentations	• 05/2019: Joint presentation of an earlier version of the article at the 2nd International QCA Summer Workshop, Antwerp, Belgium • 06/2019: Joint presentation of an earlier version of the article at the International (Post-)Doctoral Workshop „Netzwerk Personal-, Bildungs- und Organisationsökonomik", Salzburg, Austria • 07/2020: Joint presentation of an earlier version of the article at the Virtual Conference of the Society for the Advancement of Socio-Economics (SASE)
Publication efforts	• 14/2020: Submission to *Business & Society* (rejection)

2.4 Hellweg & Weissphal (2022)

While the second and third paper empirically provide macro-level support for suggestions that employment practices and the resulting shape of organisations are highly relevant determinants for levels and trends in societal income inequality (Bapuji et al., 2020; Cobb, 2016), the last paper focusses on the more detailed mechanisms taking place in firms. Thereby, it moves away from broad-based measures such as firm size that are more important at the aggregate level. Specifically, it uses individual-level data, which contains precise measures on two factors that drive trends towards lean management (Lindbeck & Snower, 2000) and the rise of superstar firms (Autor et al., 2020; Stiebale et al., 2020): digitalisation and outsourcing. In addition, it diverges from the previous three papers as it analyses the implications of these two factors not on incomes but on the number of task types performed by workers. Nevertheless, insights into the growing need of workers to perform multiple tasks seem to be an important explanation why very productive superstar firms "can extract a lot of revenue out of their workforce" (Kehrig & Vincent, 2021). Thus, multitasking also matters for rising income inequality.

Guided by early theoretical work of Lindbeck and Snower (2000), the paper asks how digitalisation and outsourcing affect the number of task types performed by workers who stay in firms that engage in such activities. The basis for answering this question is a German employee survey that contains detailed data on the actual tasks of employees and rare information whether the workplace of an employee is affected by outsourcing and digitalisation. In this dataset, employees stated which tasks they performed out of a list of twelve different tasks. To measure multitasking, we simply added the number of tasks employees indicated. By estimating fixed-effects panel regressions, we seek to identify in how far the number of task types employees perform increases when workplaces become influenced by outsourcing or digitalisation. Finally, our empirical analysis allows to sort out important differences between occupational groups, which has not been done yet (e.g. Bayo-Moriones et al., 2017).

In principle, we find that, on average, both digitalisation and outsourcing increase the number of task types. More specifically, we reveal that workers in low-skilled rather than high-skilled occupations face larger increases in tasks as a result of the two factors. Hence, this group of employees is, contrary to previous suggestions in the literature (Bayo-Moriones et al., 2017; Lindbeck & Snower, 2000), also of high importance for the spread of lean management and firms' specialisation efforts.

The fact that task profiles of employees in low-skilled occupations are also affected by digitalisation and outsourcing raises the question whether companies similarly support these workers in terms of training measures or wage adjustments. In additional analyses, we explore implications of multitasking for workers' employability and the provision of employer-funded training. First, we find that multitasking seems to generally increase workers' employability as task profiles become more similar to the average task profiles of the occupation and the whole labour market. Hence, it is likely easier for multitasking workers to change jobs. However, we also reveal that, on average, workers in low-skilled occupations do not receive training measures when their task profiles widen whereas their colleagues in high-skilled occupations do. This result can have further important implications. While workers in high-skilled occupations may be well prepared for and thus open to increases in task variety, their co-workers in low-skilled occupations may struggle and face increasing workloads or time pressure. This, in turn, can potentially decrease job satisfaction.

Besides training measures, companies can differently compensate for multitasking, thereby also contributing to higher income inequality. The dataset does not allow for analysing effects of digitalisation and outsourcing on wages. However, also using data for Germany, a recent study by Ochsenfeld (2018) shows that employees without a college degree do not necessarily earn more when their employers engage in outsourcing activities. Hence, when workers perform more tasks based on our results but their wages do not change, this likely increases their labour productivity. Consequently, this may increase earnings differences to other stakeholders who are better able to capture increases in productivity, i.e. high-skilled workers (Lochner et al., 2020) and also firms' shareholders (Mertens, 2021). Hence, the link between firms' specialisation efforts and increased multitasking may pose a further channel why digitalisation and outsourcing foster the rise of superstar firms and why such a trend is followed by higher societal income inequality as is the case in Germany (Mertens, 2021).

In terms of practical implications, this paper demonstrates that not only workers who are directly outsourced witness disadvantages in terms of wages (Goldschmidt & Schmieder, 2017) but also some remaining workers and particularly those in low-skilled occupations may face work intensification due to the combination of required multitasking and missing training measures. Consequently, employees in all areas should be eligible for employer-funded training and an adequate compensation when specialisation efforts directly affect their task profiles.

Table 4

Overview of authors' contributions, conference presentations and publication efforts

Hellweg & Weissphal (2022)	
Contributions	• Joint development of the research question • Compilation of the theoretical framework and the literature review by M. Weissphal • Joint selection of items and compilation of the dataset • Application of the statistical analysis (regression) by T. Hellweg • Joint interpretation of the results • Joint writing-up of the paper
Conference presentations	• 01/2022: Joint presentation of the latest version of the article at the virtual Research Colloquium with the chairs of Prof. Dr. Anja Iseke and Prof. Dr. Kirsten Thommes • 03/2022: Joint presentation of the latest version of the article at the virtual Doctoral Colloquium with the chair of Prof. Dr. Uta Wilkens • 05/2022: Joint presentation of the latest version of the article at the International (Post-)Doctoral Workshop „Netzwerk Personal-, Bildungs- und Organisationsökonomik", Riederau, Germany • 07/2022: Joint presentation of the latest version of the article at the Annual Conference of the Society for the Advancement of Socio-Economics (SASE), Amsterdam, The Netherlands (planned) • 09/2022: Joint presentation of the latest version of the article at the Herbstworkshop of the WK Personal, Berlin, Germany (planned)
Publication efforts	• 2022: Submission to *The International Journal of Human Resource Management* (planned)

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Contribution No. 1

The two sides of size: A review of large firms' Human Resource practices and their societal impact on income inequality

By
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2022
(Working paper)

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The two sides of size: A review of large firms' Human Resource practices and their societal impact on income inequality

Abstract

The impact of large firms on societal income inequality is controversial. Whereas large firms can reduce inequality due to their internal labour markets, they can also foster it as research on "superstar firms" assumes. The aim of this paper is to reconcile this controversy. By reviewing 46 related empirical studies, it reveals that differences in large firms' Human Resource practices systematically disentangle opposing inequality outcomes. Precisely, practices substantially differ in their extent as shown for internal staffing, hiring of lower-income individuals and generous remuneration for these employees. This implies that research and public policy should pay closer attention to these practices when determining societal impacts of employers.

1 Introduction

Modern societies are characterised by the ubiquity of large organisations and in particular big firms (Perrow, 1984). By creating job ladders and pay structures, firms shape social stratification (Baron & Bielby, 1980). Thus employers and their Human Resource (HR) practices are a potential reason for societal income inequality (Cobb, 2016), which has been rising in richer countries over several decades (e.g. Roser & Cuaresma, 2016). However, perceptions of large firms' societal impact on inequality are ambiguous. In some cases, they are seen in a positive light as their use of internal labour markets reduces income differences between individuals of a society (Davis & Cobb, 2010). In others, large firms are under careful observation due to their non-standard work arrangements (Katz & Krueger, 2019) or because of their extraordinary revenue and profit situation as "superstar firms" (Autor et al., 2020). Given this ambiguity, a systematic comparison of such opposing arguments is long overdue. The aim of this paper is to shed light on the two sides of size. By reviewing a variety of empirical studies, it identifies different characteristics of large firms in terms of their HR practices. Importantly, these differing HR practices matter for the direction of the link between firm size and income inequality.

This literature review focuses on HR practices because they have attracted much attention as a reason for income inequality. A recent study by Cobb (2016) highlights that the kind of HR practices that is predominantly used by a country's firms are an important reason for income inequality at societal level. Importantly, kinds of HR practices that theoretically lead to opposite inequality levels seem to be also associated with different firm sizes. For example, compensation practices that are assumed to reduce inequality are commonly used within large firms. Therefore, research suggests that the presence of large firms reduces societal income inequality and a series of empirical studies supports this (e.g. Davis & Cobb, 2010).

Although the notion of large firms as reducers of earnings dispersion is compelling, there is also a large number of empirical findings suggesting that firm size is followed by *higher* societal income inequality. These findings appear to be in line with a range of opposing perceptions, which trace back to early criticism that large firms provide a platform for managers to exploit pay-setting autonomy for their own benefit. In the United States, this criticism led to the implementation of antitrust laws that were supposed to increase product market competition and that limited firm size. Today, large firms still offer exceptionally high and strongly growing salaries for top-level employees (Song et al., 2019) and criticism against managerial autonomy pervades even among the world's leading income inequality experts (Piketty, 2014). While some recommend even stronger efforts to de-structure organisations in the future economy (e.g. Hamel, 2009), others proclaimed early concerns about the pay of workers affected by the first corporate downsizing waves in the United States (Miller, 1981).

Answering whether firm size has a positive or negative impact on income inequality is further complicated by changing HR practices within today's firms. Contrary to what the two adversarial views presented above assume, HR practices in firms do not remain constant. In many cases, large firms have strongly changed their HR practices over the past decades. They now apply practices that are assumed to increase income inequality (Cobb, 2016). First, large firms strongly tend to use compensation practices based on stock market performance for their top-level employees. Such practices can explain rising salaries (Song et al., 2019) and this apparently better than managers' mutual concessions of wage increases under bureaucratic rules (Willman & Pepper, 2020). Large firms also refrain from above-market wages for lower-wage employees (Cobb & Lin, 2017) and increasingly rely on institutional legislation to set pay for these workers (Willman & Pepper, 2020). Secondly, other large and growing firms that have

been termed “superstar firms” (Autor et al., 2020) might still use bureaucratic rules within their firm boundaries but they are more reluctant than firms in the past to hire new workers when revenues increase (Kehrig & Vincent, 2021). Instead, they also seem to heavily rely on externalising employment practices (Autor et al., 2020). Finally, large firms that provide wage premia increasingly consist of workers that are in the upper half of the overall income distribution, thereby increasing earnings inequality (Song et al., 2019).

The concrete consideration of HR practices rather than making assumptions along basic company figures such as firm size is becoming increasingly important with regard to these changing corporate structures. Therefore, this paper attempts to find the conditions of large firms' influence on income inequality in terms of their HR practices. For this, 46 empirical studies have been systematically reviewed. Each study draws a link between firm (or establishment) size and either HR practices or income inequality. After structuring them along their identified linkages, the main contribution of this paper is to point out that systematic differences in HR practices help to solve the underlying ambiguity as a unifying framework will reveal. Large firms can still be a highly important institution to reduce societal income inequality as it was the case in the past (Wilmers, 2019). In order for them to so, important conditions must be met: They have to use (well-managed) compensation practices, which raise wages for workers in the bottom half of the countrywide income distribution. Essentially, this group of workers has to be large in comparison to firms’ amount of sales. At least in the United States, both used to be the case but not anymore (Cobb & Lin, 2017; Kehrig & Vincent, 2021).

The literature review is a collection of various findings from very different studies. It suggests that it is generally relevant to pay attention to this variety of results since otherwise adverse outcomes might result from recommendations. This is particularly crucial when these arguments are tied to public subsidies (cf. Miller, 1981). For example, granting minor subsidies to small firms and laying off low-paid workers in firms with bureaucratic rules in order to make hierarchies flatter (cf. Hamel, 2009) reduces within-firm but increases societal income inequality. Equally, even though large and also growing superstar firms offer cutting-edge HR practices, this likely applies to a privileged group of mostly high-paid workforces and not superstar firms’ third-party providers handling low-paid jobs. Public subsidies to firms with such a HR strategy are also highly misleading as they foster societal income inequality. Overall, industrial policy that is based on false premises or outdated fundamentals such as mere staff

size should be reconsidered. Such general implications clearly arise from a first systematic combination of different study results. However, in order to draw more accurate and robust conclusions, novel analyses should follow a synthesis of rather fragmented results. Future studies should examine large firms' HR practices and inequality trends in an integrated analysis and indeed, such studies using several rich datasets are emerging (e.g. Song et al., 2019). This comprehensive review of the findings to date provides a conceptual foundation for more of such empirical studies addressing societal impacts of large firms' HR practices.

The remainder of the paper is structured as follows. After an illustration of the underlying ambiguity with some basic data, the next chapter will explain how the approach of a systematic literature review can address this ambiguity. The subsequent presentation of empirical papers is then divided along the ambiguity. One chapter summarises literature finding negative associations between firm size and income inequality, and one finding positive ones. For both chapters, empirical results on HR practices will pose the basis in terms of theory and context. The findings of the two chapters are then summarised in the form of a unifying framework. The last section discusses limitations of such a framework but also how it can advise public policy and serve as a conceptual foundation for future research.

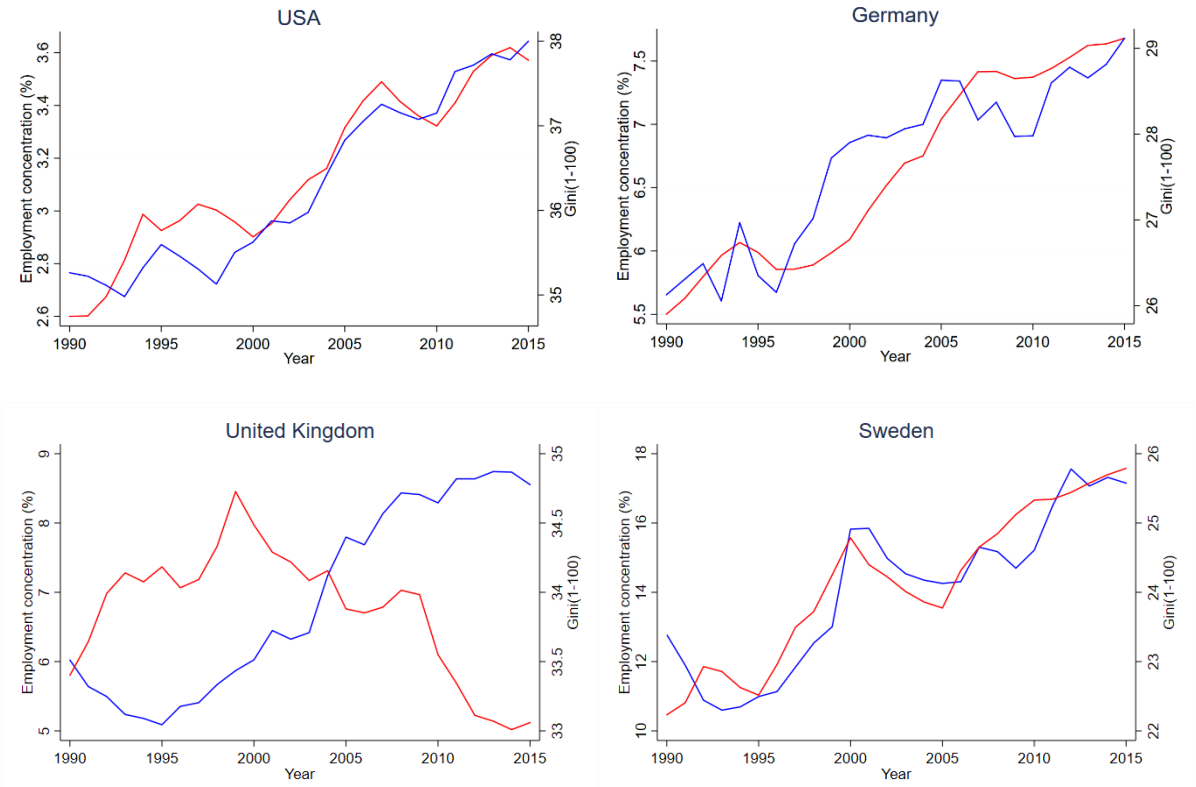
2 The ambiguity and the approach

That firm size can be either negatively or positively related to societal income inequality is very apparent in the United States. In a time series from 1950 to 2006, Davis and Cobb (2010) reveal an astonishingly strong negative relationship between the amount of large-firm employment and societal income inequality (p. 47). When large firms expanded their size in the 1960s, inequality was at its lowest levels. When these firms decided to downsize their workforces in the 1980s and 1990s, inequality increased strongly. However, in the same paper, one can also see that in the late 1990s, the relationship turned positive. Figure 1 presents findings for more recent years based on own calculations. In the upper left graph, the time series by Davis and Cobb (2010) for the United States is extended to the year 2015. While the relationship is at first highly negative, it turns strongly positive since the start of the 2000s and holds until 2015. Such pronounced positive relationships for more recent years are not a rarity as the graphs for Germany and Sweden reveal (right graphs of Figure 1). Nevertheless, strong negative relationships can still be found as for example in the United Kingdom (bottom left graph of Figure 1). Whether negatively or positively related, both variables seem to have an almost

mechanical relationship to each other (cf. Davis & Cobb, 2010). Of course, there must be factors that drive these mechanical relationships. Equally, some factors must influence the sign of the relationship. So what happened to large firms in the United States such that the relationship reversed? What is specific about firms that seem to increase income inequality in Germany and Sweden? And why is the relationship still negative in the United Kingdom?

Figure 1

Selected trends of large-firm employment and income inequality



Note: Blue line: Employment concentration defined as employment figures in the ten largest public companies of the country (Worldscope Global database; Thomson Reuters/Refinitiv) divided by the total labour force (World Bank). Red line: Gini coefficients based on net incomes (SWIID; Solt, 2016). The higher the Gini coefficient, the higher the level of income inequality.

Source: Based on Davis and Cobb, 2010, 47.

This paper conducts a literature review in order to identify reasons for such differing relationships between firm size and income inequality. Of course, various factors might influence the relationship. Research suggests that Human Resource (HR) practices are important. First, they can differ in ways that are of particular importance for societal income

inequality (Cobb, 2016). Secondly, differences in practices seem to share patterns with the size of firms (Davis & Cobb, 2010). Therefore, this paper makes a start by focusing on HR practices and by collecting empirical findings on the typical ones used by large firms. If HR practices differ strongly in the United States between early 1990s and 2000s, they are a highly promising reason why relationships differ. Large German firms (e.g. Volkswagen and Siemens) were and are still known for their use of internal labour markets, which are expected to reduce societal income inequality (Cobb, 2016). Given that, a strong positive relationship for Germany is particularly surprising. Hence, the case of Germany is either a strong counter example for such theoretical suggestions or HR practices differ in a more nuanced way. In both cases, HR practices may mediate the relationship between firm size and income inequality.

2.1 The precise methodology

Search efforts targeted empirical (as well as some theoretical) linkages between firm size, HR practices and income inequality. Studies that address all variables jointly within their analysis are upcoming but still very rare. Hence, it is necessary to also include studies that address *either* HR practices *or* inequality outcomes of large firms. As this relaxation led to a large plethora of works that, for example, study firm-size wage premia or different pay ratios in samples of large firms, search efforts concentrated on seminal and most recent papers, which provide conceptual bases in their respective literature strand. By conducting forward and backward search based on these seminal papers, a total number of 46 empirical studies were identified. These mostly comprise journal articles and book chapters but also some recent discussion papers that provide very innovative insights. The studies evolved over four decades (1984 to 2021) and stem from multiple disciplines (economics, sociology, business administration).

Given that variety of studies, it is important to systematically structure them along their context and approaches. Especially the data used can differ substantially. Analyses can be based on the size of establishments (so single production units) or of firms (legal entities consisting of one or more establishments), which are both included. In addition, measures of economic inequality can be based on different forms of income (overall income, labour earnings, wages or labour income shares). All forms are included in the review and will be discussed in different sections. Most importantly, income inequality can also be measured based on different underlying entities (regions, countries or firms). As firms (and establishments) are the primary focus of this study, there will be subchapters on within- and between-firm (establishment) inequality.

Overall, the literature is divided along the sign of the relationship between firm size and income inequality. The next chapter will deal with studies that find negative relationships; the subsequent chapter will elaborate positive ones. Empirical literature on HR practices is sorted into these two chapters according to a combination of three criteria: These practices are part of theoretical arguments (e.g. Cobb, 2016), they record similar associations to income inequality and most importantly, they share a similar context with analyses of firm size and income inequality.

3 Large firms as drivers of *lower* income inequality

This chapter elaborates the mechanisms why large firms are an institution that equalises incomes. Wilmers (2019) describes the general gist: Large firms usually establish personnel departments. These departments have the aim to standardise wages based on bureaucratic rules and fairness perceptions. This reduces not only income inequality within firms but also between them as firms copy procedures from other large firms. When large companies shrink and outsource production and services to smaller companies that do not use these procedures to a similar extent, standardisation disappears for affected workers and income inequality increases between firms and on a societal level. The following subchapters provide detailed empirical support for this reasoning.

3.1 Large firms and their typical HR practices

In a recent study, Cobb (2016) argues that the differentiation between organisational- and market-oriented practices (introduced by Jacoby, 2005) matters most for income inequality. Organisational-oriented practices are those that are typically implemented when firms establish an internal labour market (Doeringer & Piore, 1971). Workers that are part of this market are usually protected from employment consequences of short-term volatilities in company revenue (Cappelli, 2001). Therefore, they are employed under stable and long-term conditions and receive a pay that is to some extent decoupled from labour market dynamics. Rather than market forces, bureaucratic rules in the form of formal job evaluations are the basis for wage determination, which usually yields above-market wages for employees (Weil, 2017).

It is widely accepted that large firms of the past such as General Motors or AT&T relied on these practices (Cobb, 2016). Table A1 provides an important selection of broader empirical evidence. Early research for the United States shows that large *establishments* had more

formalised job descriptions (even for single tasks) and more pronounced career ladders with more promotion opportunities for internal applicants (Baron & Bielby, 1984; Kalleberg & Van Buren, 1996). In general, such associations also hold for large *firms* (Kalleberg & Van Buren, 1996) and in other countries such as the United Kingdom (Belfield & Wei, 2004).

Large establishments also paid more (Kalleberg & Van Buren, 1996). Such establishment-size wage premia for otherwise similar workers have been identified by multiple studies (Belfield & Wei, 2004; Wilmers, 2019). Interestingly, this establishment-size effect seemed to be largely driven by its connection to the use of internal labour market as coefficients become substantially smaller when the latter is included in regression models (Belfield & Wei, 2004; Kalleberg & Van Buren, 1996). Also large manufacturing firms paid more and particularly large firms provided more benefits (Kalleberg & Van Buren, 1996). Accordingly, substantial *firm*-size wage premia for earlier periods in the United States have been also revealed by later studies (Bloom et al., 2018; Hettler, 2007). A new feature of these studies is that they differentiate between explained and unexplained parts of this firm-size wage effect. Interestingly, they find that the unexplained part is pronounced. For example, Bloom et al. (2018) show that between 1980 and 1986, firm-fixed effects explained 70 percent of the firm-size wage premia and a strong connection between firm size and firm-fixed wage effects existed. Hence, large firms were somehow able to pay better wages and internal labour markets are a likely reason for that.

Are large firms still the better payers in the United States? Bloom et al. (2018) find that wage premia are present up to 2013. However, they also find that premia only continue to be very large in manufacturing firms. Interestingly, this pattern seems to be generally true as similar findings hold in an analysis of 17 OECD countries up to 2012 (Berlingieri et al., 2018). Aggregate trends for manufacturing-intensive Germany developed accordingly. Here, establishment-size wage premia are not only generally present but also increasing up to 2010 (Baumgarten et al., 2020; Lochner et al., 2020; Tomaskovic-Devey & Melzer, 2020). Accordingly, establishment size increasingly correlates with establishment-fixed wage effects (Lochner et al., 2020). This finding is substantially different from service-intensive United States, where this relationship has weakened strongly over time (as will be further elaborated in chapter 4).

The fact that large firms paid (and still pay) wage premia shows that a large portion of the workforce (have) benefited from higher wages. What is important beyond these premia are the dynamics of employment in large firms. What happens if large firms grow in terms of revenue? Do wages increase even more such that those privileged workers in large firms earn much more than in the rest of society? Or does employment grow with the result that more workers can actually benefit from wage premia? In general, it is believed that large firms in earlier days predominantly relied on expanding firm size, which, according to Budros (1999), was "the hallmark of successful management" (Jung, 2015). Table A2 summarises empirical research that supports this assumption. In the United States, increases in revenue were usually related to higher future firm employment (cf. Kalleberg & Van Buren, 1996; Lin, 2016). In this way, large establishments were less inclined to contract out (Abraham & Taylor, 1996; Harrison & Kelley, 1993) and to use employment intermediaries (Kalleberg & Marsden, 2005). A recent study by Kehrig and Vincent (2018) shows that a positive productivity shock had a linear effect on employment growth in US manufacturing establishments. Hence, employment became even more concentrated in the largest firms thus giving even more employees the opportunity to receive better wages. A recent study by Benmelech et al. (2020) shows how an increase of this employment concentration in large firms generally affects wage levels in industries. They find that a higher nationwide employment concentration in large firms is positively associated with average wages in regions where establishments of those large firms operate. Hence, very large and, importantly, growing firms seem to increase the wage floor for workers in general.

However, the stylised fact that large companies in earlier days relied on employment growth has disappeared. Even in those previously mentioned studies, first signs came up that large firms started to rely on downsizing and outsourcing of activities. Abraham and Taylor (1996) found that large establishments are not less likely to contract out janitorial activities, which may be considered as one of the first sectors to be outsourced. Kalleberg and Marsden (2005) argue that their result shows up because they included larger public and non-profit establishments, which (maybe by nature) were less likely to use employment intermediaries. Harrison and Kelley (1993) also find that large parent companies in the manufacturing sector were more inclined to engage in outsourcing, even in the years 1986 and 1987. A decade later, a study by Lazonick and O'Sullivan (2000) reports about various layoffs of large firms and finds that in the same years, 60 percent of the largest firms laid off workforce. Hence, a pronounced shift took place in large US companies. This shift has been well documented by a couple of studies.

Jung (2015) shows that even in a sample of US largest firms, the very largest were more likely to engage in downsizing. Today, large firms (and also establishments) are more likely to use contract labour provided by temporary help agencies (Cappelli & Keller, 2013). A highly innovative study for Germany also shows that larger establishments are more likely to outsource activities to smaller firms (Goldschmidt & Schmieder, 2017). Hence, large firms started to reduce their ambitions to offer organisational-oriented practices and wage premia for large parts of society.

What happens to workers that are laid off from large firms? While some workers get unemployed and struggle to find a new job (e.g. Osterman, 1999), others might work for a new firm. However, these workers probably loose wage premia and it is also likely that their employment relationship changes (Kalleberg et al., 2000). Specifically, market-oriented practices are the typological counterpart to organisational-oriented practices (Jacoby, 2005). When employed by practices of the market-oriented type, workers are no longer protected from markets. Instead, they are hired and fired on a more short-term basis and their pay is determined by labour market prices for their performance and skills. Market-oriented work arrangements are often non-standard with temporary contracts, limited working time or contracts administered by a third party (e.g. a labour agency) (Kalleberg, 2011).

There is first empirical evidence that with the downsizing of large firms, many organisational-oriented employment relationships turned into market-oriented ones. Large firms are still less likely to apply non-standard work arrangements within their companies.[1] Most obviously, employment practices change when large firms start to rely on contract labour (Cappelli & Keller, 2013). But when large firms outsource activities to simply other supplier firms (Goldschmidt & Schmieder, 2017), the form of employment practices in these probably smaller supplier firms is less clear. Nevertheless, there are some indications that employment relationships differ between the two of them. A series of studies yields support that part-time and temporary employment are more prevalent in small firms, which are more likely to hold a supplier function. A study by the Organisation for Economic Co-operation and Development (2015) finds that half of part-time and temporary employment is found in smaller firms. This empirical finding is largely supported by other studies. Eichhorst et al. (2013) also find that in

[1] Chapter 4 will deal with changing work arrangements within large firms.

Germany, part-time employment is more common in small firms. Somehow surprisingly, they find the opposite for temporary employment, which seems to be the result of strong individual dismissal protection. In other countries where this protection is less strict such as Portugal, larger firms are less likely to employ temporary workers (Portugal & Varejão, 2009). Similarly, marginal employment in Germany (so called mini-jobs with low pay or limited days of work), which receives less legislative protection (Hipp et al., 2015), is found more in small establishments (Hohendanner & Stegmaier, 2012). Moreover, Hohendanner and Stegmaier (2012) show that if large establishments use marginal employment, standard employment relationships also grow. Hence, marginal employment seems to serve as a screening instrument in large firms. This is not true for small establishments. Here, workers are rather hired and fired under marginal employment. Similar findings have been also found for temporary employment in Portugal (Portugal & Varejão, 2009), which might be also true in Germany.

What happens to wages when workers are outsourced to other firms and work under non-standard work arrangements? In general, significant pay penalties have been found for non-standard work arrangements. They may be as of high as 30 percent for part-time or temporary employment (International Labour Organization, 2016) and are also particularly pronounced for temporary help work (Katz & Krueger, 2019). In some countries such as Scandinavian ones, country-specific legislation may protect wages and also grant identical benefits for non-standard work arrangements. In others, however, non-standard work arrangements can also be excluded from organisational benefits as for example marginal employment in Germany (Hipp et al., 2015). Overall, such insights on the prevalence and characteristics of non-standard work arrangements yield some first insights how shrinking large firms may foster the rise of non-standard work arrangements and subsequent wage differences.

Nevertheless, empirical findings on non-standard work arrangements are still tentative in order to reveal consequences for workers that are outsourced. On the one hand, the findings stem from very fragmented analyses of different papers and should not be interpreted as causal effects. On the other hand, they are likely to underestimate effects because worse working conditions and lower pay levels can also arise in regular employment relationships in less productive supplier firms (e.g. Appelbaum, 2017). In line with this, it has been found for Spain that working conditions of permanently employed workers in outsourced sectors are similar to those of temporary employees (Banyuls & Recio, 2017). Highly robust findings that address

those issues come from Goldschmidt and Schmieder (2017). They show how large establishments in Germany are able to substitute high-paying work for low-paying work by outsourcing activities to smaller firms and temporary help agencies, thereby saving on firm-specific wage premia. In a similar study, Ochsenfeld (2018) shows how outsourcing activities, in some incidences, increase wages for workers remaining in the establishment. In sum, these empirical findings provide first insights that societal income inequality should be lower when workers are directly employed by large firms and not by smaller supplying firms. The next subchapters provide further detailed evidence on distributional consequences.

3.2 Large firms and lower income inequality *within* them

Theory assumes that large firms and their usage of organisational-oriented practices bring about a compressed income distribution within firms (Cobb, 2016). When employees in the HR department evaluate jobs, perceptions of fairness come into play (Dulebohn & Werling, 2007). As a result, labour earnings are often relatively higher for employees in the bottom half of the earnings distribution such that wages are compressed (Weil, 2017). In a recent article, Willman and Pepper (2020) also introduce the term "administered inequality". The previous chapter covered literature on firm-size wage premia. However, firm-size wage premia are only a first indication that employees somehow benefit. What is essential for lower within-firm inequality is that particularly lower-income workers receive higher wages.

Some first studies empirically reveal the income-equalising effects when internal labour markets are intact and influential in large firms (Table A3). An intriguing analysis by Cobb and Lin (2017) finds historically large firm-size wage premia for lower-wage employees in the United States. Another analysis by Wilmers (2019) supports this further considering the pay ratio between office and non-office workers. Strikingly, he finds that the ratio is lower in large establishments than in medium-sized ones. He argues that this might result from more pronounced internal labour markets and formalised compensation practices.

Moreover, HR practices may explain findings by Wilmers (2019) that differences in average earnings within firms but *between establishments* are lower the larger they are. As in their analysis establishments may belong to a single firm, these results also point to lower within-firm inequality of large firms. Similar results are found for US firms (Song et al., 2019) and for German establishments (Baumgarten et al., 2020; Lochner et al., 2020). However, such results

still have to be interpreted with caution. Small differences in average earnings between relatively large establishments of a firm can also be just a mathematical result: When a firm has larger establishments, earnings inequality within these establishments becomes more pronounced than inequality between them (if a firm consists of one large establishment, between-establishment inequality is zero). Such mathematical issues can also explain why the pay ratio between office and non-office workers is lowest in small establishments, which can simply be an artefact of a very narrow set of occupations (Wilmers, 2019) (if all establishments consist of one person, within-establishment inequality is zero). Of course, fairness perceptions can also be pronounced within these establishments. However, other studies even find that wage variance is higher in small German establishments (Baumgarten et al., 2020) and earnings variance was lower in large US firms in earlier decades (Song et al., 2019). Hence, wage- or earnings-equalising effects of firm size are more consistently found for large firms and that most notably for past firms in the United States.

In this review, income inequality is not limited to labour earnings. Income inequality is also result of capital incomes that are highly concentrated at the top five percent in the wealth distribution (Greenwald et al., 2019). The study by Benmelech et al. (2020) already showed how increasing large-firm employment seems to raise average wages in an industry. Correspondingly, large-firm employment might reflect the bargaining power of workers and thereby contribute positively to labour incomes relatively to capital incomes (Alvarez, 2015). In his study for France, Alvarez (2015) finds that, in a sample of large firms, the largest firms generally have higher wage shares, and that financialisation, defined as the corporate financial profits, has a smaller effect on the wage share in the largest firms. This suggests that also *income* inequality is lower within large firms.

What happens with within-firm inequality when large companies start to downsize their workforce and rely on outsourcing? As firms usually begin to outsource non-core activities, so those that are less productive and performed by low-paid employees, they probably increase the homogeneity of abilities and rewards in the remaining workforce (e.g. Rawley & Simcoe, 2010 for taxi cab industry) and thereby increase perceptions of fairness (Akerlof & Yellen, 1990). In line with this, Willman and Pepper (2020) show lower figures of pay ratios between CEOs and average workers in the largest British firms that operate in industries in which outsourcing is common.

While downsizing decreases within-firm earnings inequality, it does not seem to increase the bargaining power of remaining workers and thereby the labour income share. Beyer and Hassel (2002) show for 33 of Germany's 100 largest firms that downsizing (which can be found in companies placing a high focus on shareholder value) is likely followed by a lower labour income share. Firms, by contrast, that increased in staff size (those with a low focus on shareholder value), recorded increases in the labour income share, reflecting higher bargaining power, as mentioned above. Nevertheless, Beyer and Hassel (2002) also find that the fall of labour incomes due to downsizing is offset by increasing expenditures for remaining employees thus leading to a stable labour income share within these firms. That this has likely changed over time, shows the study by Ochsenfeld (2018), who identified only slight wage increases for remaining workers (though only including those without a college degree). Hence, downsizing appears to increasingly favour shareholders as initially claimed by Lazonick and O'Sullivan (2000). But still, even though shareholders and remaining employees likely benefit from downsizing (supposing revenues and work efforts remain similar), negative wage effects for workers affected by those reductions remain. Hence, lower income inequality within firms resulting from outsourcing enlarge income inequality between firms (Willman & Pepper, 2020). Again, due to the mathematical reasons laid out above, this relationship is also given when wages remain identical after outsourcing. As wages often change after outsourcing (Goldschmidt & Schmieder, 2017), the following chapter will elaborate how societies as a whole can benefit from large firms in terms of equality and how strongly they are affected by the downsizing of large firms.

3.3 Large firms and lower *between*-firm income inequality

In the previous chapter, some studies show that earnings inequality within firms is lowest in small firms, which might have something to do with strong fairness norms in these firms (Wilmers, 2019). Now, one might simply argue that downsizing and a high number of small firms could lead to more pronounced fairness norms and thus could decrease societal income inequality. While this is not per se false, it is very unlikely. What is important for this relationship to hold is that lower within-firm inequality is not more than offset by higher between-firm inequality. In other words, fairness norms between firms must not erode. The findings from the previous chapter suggest that they often do erode. Wage penalties for outsourced workers have been identified (Goldschmidt & Schmieder, 2017) and small firms generally pay lower wages to lower-wage workers (Cobb & Lin, 2017). Therefore, outsourcing

seems to increase between-firm inequality to such an extent that it also increases societal income inequality. Many authors claim that there is a clear connection between downsizing and increases in overall income inequality (Appelbaum, 2017; Batt, 2018; Lazonick & O'Sullivan, 2000; Weil, 2017) and indeed, the majority of the rise in US wage inequality is driven by between-firm inequality (Barth et al., 2016; Song et al., 2019). Hence, it is argued by Cobb (2016) that "strategies that likely decrease within-firm income inequality, such as outsourcing and layoffs, may increase societal-level inequality" (Cobb & Stevens, 2017).

In addition to a number of claims and suggestions, precise theoretical arguments have started to evolve. As within-firm and between-firm inequality may go in two different directions, it is important for theory development to "move outside the firm" (Wilmers, 2019). Concretely, it has been theorised that the presence of large firms leads to lower *societal* income inequality (Cobb, 2016; Davis & Cobb, 2010). Organisational-oriented compensation practices in larger firms lead to within-firm inequality but this inequality is lower than between-firm inequality, which would arise from market-oriented practices between smaller firms. Whereas fairness perceptions embedded in organisational structures within large firms compress income inequality, these perceptions are likely to erode outside firm boundaries. Workers care more about the wages of co-workers in the next cubicle rather than a person across the street (Weil, 2017). Hence, it is unlikely that firms also pay attention to workers in completely different firms. As a result, when firms opt for market-oriented employment practices such as contract labour, "the work group, with its attendant politics, fairness norms, and comparison groups, is thus receding in importance as a force mitigating wage inequality" (Wilmers, 2019).

Is there evidence for such societal outcomes of large firms and their HR practices? The findings in the previous chapter yield some important support (Table A4). Wilmers (2019) studies differences in average compensation across large establishments (cf. Lochner et al., 2020 for Germany). While this may comprise establishments within single firms (therefore mentioned above), it is more likely that establishments also belong to different firms. Therefore, his findings also support the assumption that the larger establishments are, the less inequality there is *between firms* (this is particularly true because results remain similar also after controlling for parent firm affiliation). However, as explained above, this can still be a mere mathematical result rather than the product of fairness norms. In order to address this issue, distributional differences between large and smaller firms should be measured on an aggregate level. Besides

also finding lower wage inequality between large establishments, Baumgarten et al. (2020) also analyse associations to the overall wage distribution. They find that establishment size reduces *overall* variance of daily wages, which is particularly the result of reduced within-firm variance and compressed differentials between high- and middle-wage workers. Similar results for differences in earnings inequality between very large firms and relatively smaller firms are also found for earlier decades in the United States (Song et al., 2019).

The previous studies yield some support that industries or economies with smaller firms would yield higher societal income inequality, though this support is still tentative. Only a first series of studies seeks to draw a more precise empirical connection between the distribution of firm sizes and industry- or economy-wide income inequality. One of the first approaches comes from Sorensen and Sorenson (2007). Their analysis for Denmark reveals that industry-regions with only one employer have lower wage inequality than those with two employers. Increasing the number of firms further is followed by higher wage inequality among employees (even after controlling for individual-, industry- and region-fixed effects).[2] Davis and Cobb (2010) extend the study of Sorensen and Sorenson (2007) by moving on the economy- or national-wide level and find corresponding results: A higher concentration of employment in large firms is associated with lower income inequality in a time series for the United States and in a cross-country comparison of a large number of countries. Particularly, they find that in the United States, employment has shifted away from large manufacturing firms, where firm-size wage premia are generally present (Bloom et al., 2018), thereby leading to lower employment concentration. In a later study, Cobb and Stevens (2017) confirm this relationship for US states. Lastly, one of the closest connections between outsourcing and the increase of wage inequality is again drawn by Goldschmidt and Schmieder (2017). They find that outsourcing of workers and corresponding wage penalties in cleaning, logistics, security and services can alone explain 10 percent of the increase in overall wage inequality in Germany.[3]

[2] The authors also analyse the variance of employment size within an industry-region. They find that a higher standard deviation is followed by lower wage inequality and argue that this might reflect a variety of employment practices that differ between small and large firms and thus favor different individuals. This would suggest that outsourcing might be beneficial to some extent. While this might be true, it is unclear how large standard deviations are driven. It is also plausible that very large firms, which might be rather the exception in a given multitude of small firms, drive high values. Therefore, this finding can again reflect the equalising effects of the presence of very large firms. Unfortunately, the authors do not provide the general distribution of firm sizes.

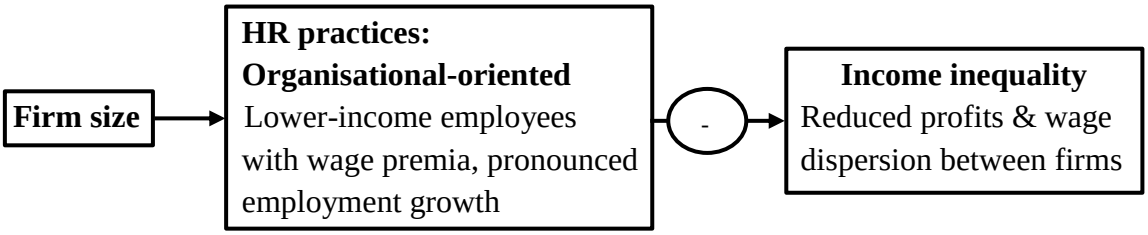
[3] Other studies also show this for temporary work (Cazes & Laiglesia, 2015; Pfeifer, 2012), though without connections to firm size.

Some first studies also address the link between firm size and the labour income share on a societal level. Lin and Tomaskovic-Devey (2013) find that industries in the United States that relatively shrink in full-time employment (which may indicate disappearing large firms) do not only tend to develop higher wage inequality but also lower labour income shares. Similarly, Autor et al. (2020) find a positive relationship between industrial employment concentration and labour income shares supporting initial claims by Lazonick and O'Sullivan (2000).

In sum, the presence of large firms can constrain income inequality between firms and thereby societal income inequality. This was the case in the United States (Davis & Cobb, 2010) and it currently seems to be in the United Kingdom (Figure 1), where internal labour markets led (and apparently still lead) to pronounced firm-size wage premia (Belfield & Wei, 2004). For the United States, by contrast, it is documented that large firms increasingly downsized their workforces with outsourced lower-income workers facing wage penalties. This trend has increased societal income inequality: Until 2013, the rise in US between-firm inequality can fully explain the increase of wage inequality of incomes that are below the 80th percentile of the total wage distribution (Song et al., 2019). Figure 2 summarises the main findings.

Figure 2

Large firms with internal labour markets and lower societal income inequality



Source: Own compilation.

While the previous findings indicate strong downsizing efforts, some empirical puzzles remain. Song et al. (2019) also find that, so far surprisingly, the largest US firms are not "atomising" into their smallest components and that the distribution of firm sizes remains fairly stable. Own calculations even show a pronounced growth of large-firm employment, similar to the United Kingdom (Figure 1). Moreover, Song et al. (2019) reveal that a substantial portion of the rise in overall wage inequality occurred within firms and that nearly exclusively in the largest firm.

These findings seem to be contradictory with all insights of this chapter. However, the next chapter will elaborate how large firms with increasing employment can still increase societal income inequality and how this can be reconciled with the insights from this chapter.

4 Large firms as drivers of *higher* income inequality

Earnings have become more unequal within the largest US firms (Song et al., 2019). While the previous chapter suggests that increasing within-firm inequality can potentially lead to lower *societal* income inequality, Song et al. (2019) also find that this rise in within-firm inequality contributed to a third of the overall increase in earnings inequality. Contrary to the previous chapter, this may suggest that employment growth in large firms with organisational-oriented practices is also a driver of higher income inequality. However, two empirical findings speak against such an interpretation of the finding. First, increasing within-firm inequality was not followed by firm growth. Secondly, increasing within-firm inequality did not outpace even stronger increases in between-firm inequality. Both trends were assumed in chapter 3 but do not hold any longer.

First, as Song et al. (2019) find that the distribution of firm sizes remains stable, a return to the giant companies of the past did not take place. This suggests that market-oriented practices have not been turned into organisational-oriented practices. Given that, the only reason for higher within-firm inequality in the largest firms is that HR practices seem to have changed. Two changes may have taken place: either organisational-oriented practices have lost their equalising effects in comparison to market-oriented practices or these companies have shifted to market-oriented practices that affect compensation without changing the organisational boundaries of a firm. The following subchapter will elaborate that the latter is more likely.

Secondly, increasing within-firm inequality was not followed by lower between-firm inequality. Two-thirds of the overall increase in US earnings inequality can be traced back to a rise in between-firm inequality (Song et al., 2019). Again, this rather suggests that market-oriented practices, as for example outsourcing activities between companies, have become more important. But how can such a rise in outsourcing activities be aligned with stable employment sizes? Again, two heavily discussed phenomena can occur, which can explain this finding even under the assumption that employment slightly increases in large firms (as found in own calculations in Figure 1). One reason is that revenues have shifted in an extraordinary way

towards specific firms. A recent line of research finds rising market concentration among large firms, so-called superstar firms (Autor et al., 2020). What is characteristic about superstar firms is that they grow much more in terms of revenue rather than employment, something that is different from chapter 3 (e.g. Lin, 2016). Especially via mergers and acquisitions, superstar firms seem to be able to grow in revenue but also to downsize certain activities. Hence, employment growth and downsizing are not mutually exclusive. The second reason why between-firm inequality increased without an atomisation of large firms is that workers have been reshuffled in a way that low-wage workers sort into low-wage firms and high-wage workers work in high-wage firms (Song et al., 2019). Again, when firms engage in sorting, outsourcing of low-wage work does not necessarily lead to smaller firms.

The next subchapters will elaborate in detail how HR practices of large firms have shifted in a way that can explain higher societal income inequality. The aforementioned practices highly differ in their mechanisms and they either mostly affect within- (eroding internal labour markets) or between-firm inequality (reduced hiring efforts of superstar firms and sorting). Therefore, the practices will be described in different subchapters, which are all followed by a further subchapter on the inequality effects of the respective practices.

4.1 Large firms and eroding internal labour markets *within* them

In light of the previous chapter, increasing earnings inequality within large firms suggests that organisational-oriented practices may have lost their function in comparison to market-oriented practices. According to Willman and Pepper (2020), it is possible that managers establish compensation practices in a way that increases their earnings even more than market forces would do. Hence, administered inequality can also lead to higher inequality. As there is not much empirical support for this suggestion, they also argue that it falls short in explaining extraordinary wage growth for managers. More plausible for them is that large firms have shifted to market-oriented compensation practices. Hence, a first reason why increasingly large firms lead to higher income inequality is that they limit or abandon internal labour markets *within* their boundaries. Instead, firms start to rely on external criteria for compensation, termed "outsourced inequality" (Willman & Pepper, 2020). Willman and Pepper (2020) mention two important examples for outsourced inequality: manager compensation based on market forces such as stock market performance and compensation based on external institutions such as minimum wages. When firms use these practices, they are rather pay-takers than -setters.

Table A5 provides some empirical evidence for these suggestions. First, manager compensation based on stock market performance is a practice that is commonly followed by large firms. Song et al. (2019) show that especially large US firms rely on these schemes as higher stock market performance is followed by much more higher earnings for CEOs in the largest firms. Secondly, even though salaries for managers are increasing, firm-size wage premia are widely decreasing in large US firms and even disappear in some cases (e.g. between firms with 1,000 to 2,500 and 10,000 to 15,000 employees) (Bloom et al., 2018). Whereas firm-size wage premia were an indicator of internal labour markets in the previous chapter, the fact that they decrease is a sign that large firms increasingly refrain from internal labour markets and rather behave as pay-takers. In line with this, Bloom et al. (2018) find that disappearing firm-size wage premia are exactly driven by drops in firm-fixed wage effects (i.e. the disconnect between firm size and firm-fixed wage effects accounts for 87 percent of the decline in large-firm wage premia). These findings are most apparent in the largest employers and a general phenomenon as 80 percent of the decline in firm-size wage premia occurred within industries (one exception is the US manufacturing sector as elaborated above).

That pay policies in large firms have changed can be particularly seen in large service firms. Whereas in the past, manufacturing firms were the biggest, this changed with employers such as Walmart or McDonald's (c.f. Davis & Cobb, 2010) for the United States. These companies do not really offer broad-based internal labour markets (at least not in the same way as Ford or General Motors did in early years) as they rather employ non-standard workers (Katz & Krueger, 2019) and pay wages close to national minimum wages (Willman & Pepper, 2020). In general, large service firms do not necessarily pay wage premia as also found for other countries (Berlingieri et al., 2018). Together, both market-oriented practices should increase the wage differential between lower-level employees and managers within large firms.

4.1.1 Large firms and *higher* income inequality within them

Table A6 summarises a series of evidences that especially large firms have become more unequal. In the United States, two-thirds of the increase in within-firm inequality occurred in firms with more than 10,000 employees besides being stable in firms with less than 1,000 employees (Song et al., 2019). Whereas firm size was negatively associated with within-firm inequality in earlier days, it is now positively associated due to these strong increases (Song et al., 2019). Moreover, there is some evidence that the previously mentioned practices (i.e.

compensation based on stock markets or legislation) contributed to higher wage inequality. Willman and Pepper (2020) show that the larger the firms, the larger the CEO to average worker ratio. Besides such a focus on CEO salaries, Song et al. (2019) analyse salaries for all workers in firms. They point out that increasing salaries for the top 50 or top 5 employees in the earnings distribution only make up 3 or respectively 1 percent of the rise in within-firm inequality in these largest firms. It is rather the increases for employees receiving the ten percent highest earnings that account for half of the rise in within-firm inequality in the largest firms**.**

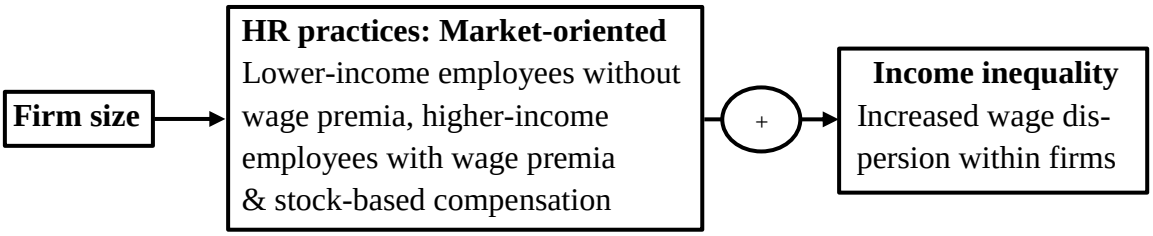
While wages are increasing at the top, they are falling for workers in the lower half of the wage distribution in large firms. The decrease of firm-size wage premia has been also identified by Cobb and Lin (2017). Strikingly, they show for which employees firm-size wage premia disappeared. While decreasing firm-size wage premia could also reflect decreasing wages for high-wage workers, Cobb and Lin (2017) show that the decline of the historical firm-size wage premia exclusively affected lower- and middle-wage workers, meaning that internal equity norms have become less important. In line with this, Song et al. (2019) show that this decline of wages for lower- and middle-income employees is particularly pronounced in the largest firms and explain about a third of the rise in within-firm inequality of these firms. Further, they show that firm-size earnings premia have fallen much more for individuals without degree-awarding tertiary education (21 percentage points against 6 percentage points). This trend seems to hold in other countries, too. Baumgarten et al. (2020) find for Germany that the wage differential between workers in the 50^{th} and the 15^{th} percentile of the wage distribution within firms increases with establishment size, though this wage differential has only slightly increased in Germany. Mueller et al. (2017) show for the United Kingdom that pay ratios within higher hierarchy levels and between higher and lower hierarchy levels increase with firm size. Moreover, these pay ratios increase when firms grow in their employment.

The changes in within-firm inequality can affect societal income inequality. While again findings by Mueller et al. (2017) might be a mathematical result of firm size itself, it appears that they shape macro-level wage inequality. Mueller et al. (2017) find for several countries that average employment in the top 50 or 100 firms is, on average, positively associated with wage inequality. The authors assume that these findings are related to their results for UK pay ratios. However, also other reasons might explain an average positive association and the association can still be negative for the United Kingdom (Figure 1). Song et al. (2019) provide

robust evidence that such a relation holds in the United States: In contrast to earlier days, *overall* earnings inequality among larger firms have become larger than among smaller firms. Of this overall increase among larger firms, 42 percent can be traced back to higher within-firm inequality (in comparison to 16 percent among small and medium-sized firms). In terms of a countrywide effect, it can be calculated that changes within the largest firms can explain roughly a quarter of the overall increase in earnings inequality.[4] Similarly, Cobb and Lin (2017) find that decreasing firm-size wage premia for lower- and middle-wage workers can explain 20 percent of the increase in overall wage inequality. Figure 3 summarises the findings.

Figure 3

Large firms without internal labour markets and higher societal income inequality



Source: Own compilation.

Not only wages have become more spread within the largest firms but also capital incomes make up a higher share of the cake. First studies show that especially within the largest firms labour income shares are conspicuously low (Autor et al., 2020; Hartman-Glaser et al., 2019), which is in stark contrast to the findings of the previous chapter (Alvarez, 2015). Such firms have been termed superstar firms. What is special about these firms and what kind of HR practices they use, will be described in the following subchapter.

4.2 Large firms becoming superstars

Superstar firms (sometimes also called mega firms or "shooting stars") are very productive firms with extraordinary market shares (Autor et al., 2020). They can explain why societal income inequality increases even though large firms hire new workers from the bottom half of the income distribution, which earn more in these firms than before. At first sight, this seems

[4] Given that one third of the increase of overall earnings inequality is due to changes in within-firm inequality and two-thirds of the increase in within-firm inequality occurred in the largest firms.

to be contradictory to the suggestions by Davis and Cobb (2010) but there is an explanation. The reason why these firms increase societal income inequality is that they only employ relatively few workers in comparison to their revenues. Whereas in the previous chapter it was stated that revenue size is generally related to higher future employment (e.g. Lin, 2016), superstar firms grow much more in terms of revenues than in the number of employees.

4.2.1 The phenomenon

Several empirical studies find broad support for growing superstar tendencies among many large firms (Table A7). The originators of the notion of superstar firms find that average employment in the sales-related largest US firms increased by 60 percent (Autor et al., 2020). However, they also find that average sales of these firms tripled in size, particularly among the very largest firms. As an illustration, the 20 largest US firms account for sales of $3.4 trillion, the equivalent of Germany's gross domestic product (Mayer et al., 2017). These patterns also hold in single US sectors (Autor et al., 2020) and other countries (Cortes and Tschopp, 2020), where sales concentration has increased more strongly than large-firm employment. In general, the rise of large superstar firms is also a European phenomenon with increasing productivity-size premia (Bighelli et al., 2020) and particularly pronounced among manufacturers due to the use of industrial robots (Stiebale et al., 2020).

While technological change is an important driver of superstar firms, Autor et al. (2020) also highlight the importance of employment practices. Employment practices are a potential reason why superstar firms "can extract a lot of revenue out of their workforce" (Kehrig & Vincent, 2018). Usually, highly productive leading firms are able to implement costly HR practices for their employees (cf. Beyer & Hassel, 2002). However, it is possible that these firms still rely on market-oriented practices that affect their boundaries. In actual fact, research suggests that not only large but traditional lead companies most intensively engage in outsourcing (Goldschmidt & Schmieder, 2017) and that the largest firms are considered to still resort to outsourcing of routinised and less-paid work (Katz & Krueger, 2019; Song et al., 2019).

It is somehow surprising that large and expanding firms are those that most heavily engage in outsourcing. But first studies yield some empirical indications (Table A7). Willman and Pepper (2020) argue that the huge gap between average earnings in the largest British companies and average earnings in the United Kingdom is a result of outsourcing. Another important factor

that can explain why employment growth and downsizing are not mutually exclusive are mergers and acquisitions (M&A). In particular, M&A affect both market shares and relative employment at the same time. Generally, M&A, which accelerated in many countries over the last decades (Jackson & Miyajima, 2007), are intended to expand market shares while reducing costs (Batt, 2018). In line with that, Grullon et al. (2019) find that industries with increasing product market concentration record more profitable M&A. Moreover, cost reduction is often achieved by downsizing as more than 60 percent of the M&A of large US firms are followed by downsizing (Jung, 2015) and generally strong correlations exist (Jackson, 2005). Hence, with M&A, a disproportionate increase of market shares over staff size takes place.

When superstar firms rely less on employment and "scale without mass" (Brynjolfsson et al., 2008), where does the additional income flow to? A first suggestion could be that wages increase for the disproportionally small group of workers.[5] Somehow relatedly, this pattern was already found by Beyer and Hassel (2002) for large German firms, which decreased employment but increased personnel expenditures (the only difference is that superstar firms do not decrease absolute but relative employment to sales). But is this generally the case? The previous subchapter suggested that firm-size wage premia and firm-fixed effects declined in the United States (Bloom et al., 2018). Manufacturing firms are an exception but latest research does not find support for the rise of superstars for them (Kehrig & Vincent, 2021). Rather manufacturing establishments can only be a superstar for a short time and are therefore termed "shooting stars". More importantly, these shooting stars do not provide systematically different wages. Accordingly, average wages are not different in increasingly concentrated industries (Autor et al., 2020). Nevertheless, this may be different in other countries. As elaborated above, firm-size wage premia have increased for German establishments and only decreased slightly in the most recent years (Lochner et al., 2020). Moreover, firm-size wage premia are generally pronounced in many European manufacturing firms (Berlingieri et al., 2018) and it is likely that some of them are superstar firms (Stiebale et al., 2020).

A second suggestion where additional revenues flow to are profits, which is particularly the case in the United States. The focus of research on US superstar firms is on profits and falling

[5] It is also possible that consumers benefit. However, large firms in terms of assets and growing firms in terms of sales have higher price mark-ups. High-mark ups are also result of mergers and acquisitions (Blonigen & Pierce, 2016).

labour income shares. As mentioned above, labour income shares are low within large firms (Autor et al., 2020; Hartman-Glaser et al., 2019). Still, latest research for Germany shows that the largest companies pay above-average wages but exactly those largest companies pay (increasingly) lower wages than their marginal labour market productivity (Mertens, 2021). Therefore, today's increases in revenue per worker actually flow more extensively to shareholders, contrary to earlier findings (Beyer & Hassel, 2002). The relationship between sales concentration and labour income share also holds on an industry level. Autor et al. (2020) find that in the United States, industries with more pronounced increases in sales concentration experienced larger falls in labour income shares, which is also supported by Lin and Tomaskovic-Devey (2013) and to some extent also holds for a number of European countries (Autor et al., 2020). Given this strong relationship, the above-mentioned research (Hartman-Glaser et al., 2019; Kehrig & Vincent, 2021) goes so far as to define mega or "shooting star" establishments by having a low labour income share. This assumption lays the floor for further empirical investigations concerning HR practices (e.g. Kehrig and Vincent (2021) analysed wage differences along similar firms though with different labour income shares).

4.2.2 Large superstar firms and their reduced hiring efforts

Until now, it has been assumed that superstar firms are actually the largest firms. Autor et al. (2020) show that they must be larger along theoretical considerations and provide some evidence that large firms in terms of high industry shares have lower labour income shares. Therefore, they empirically concentrate on the four or 20 largest firms of an industry in terms of their sales. In an analysis of the whole firm-size distribution, Hartman-Glaser et al. (2019) show that exactly the largest firms (though in terms of assets) are those that emerged as superstar firms with a larger output share and notably a high capital income share. Kehrig and Vincent (2021), by contrast, find that initially larger US manufacturing establishments (in terms of market share) do not record a pronounced decline of the labour income share. However, they also provide important insights on the employment and wage dynamics within "shooting star" establishments (those with a low labour income share). As mentioned above, they do not find significant wage growth for them. Interestingly, they find that in early days, "shooting star" establishments in the US manufacturing sector were more inclined to hire new workers than similar but less productive establishments (peers), which lead to a subsequent increase of labour income shares in these establishments. This is in line with findings of the previous chapter (e.g. Lin, 2016). However, they find that this has changed significantly. In later periods, "shooting

star" establishments do not differ in their hiring efforts than their peers and even relied less on employment growth before reaching low labour income shares. Similarly, increases in total factor productivity are not significantly followed by more employment in these later periods (Kehrig & Vincent, 2018). Therefore, the most successful superstar firms must not to be the largest employers as is the case for Facebook or Google. However, they can still be as a first study for German superstar firms finds that they are also the largest employers (Mertens, 2021).

Low labour income shares can also themselves be a sign that firms are saving on wage-premia by means of outsourcing. This connection is based on a traditional theoretical model on monopsony power by Kalecki ([1954]2009). According to the model by Kalecki ([1954]2009), there is a clear theoretical connection between a monopsony status of a firm and its labour income share (Karanassou & Sala, 2013). Therefore, the promotion of very large corporations (Karanassou & Sala, 2013) might reflect high monopsony power, a strong reliance on outsourcing and thus low labour income shares as found in superstar firms. With half of organisations purchasing goods or services from other organisations (Kalleberg & Marsden, 2005) and currently about half of the workers needed for the production of manufactured goods being employed outside the manufacturing sector (Timmer et al., 2015), the labour income shares in superstar firms are likely an artefact of buyer power and outsourcing.

Several studies yield support for these connections. Elsby et al. (2013) find a strong negative relationship between offshoring in the form of import exposure and pay roll shares in US industries. Boehm et al. (2019) find that intermediate input imports decreased US manufacturing employment and thereby increased profits per worker of remaining production companies (Kehrig & Vincent, 2021). Two intriguing analyses reveal very detailed support. Wilmers (2018) shows that dependence on large buyers lowers wages in supplying firms. The analysis by Benmelech et al. (2020) shows that monopsony power in the form of local-level employment concentration (in contrast to national employment concentration as described above) leads to lower wage levels in an industry. Hence, "dominant buyers shape employment relations in putatively separate firm" (Wilmers, 2018) and in particularly those that exclusively supply other companies, so-called "Original Equipment Manufacturer" (Davis & Cobb, 2010). Thereby, these buyers keep their labour income shares low. Interestingly, both studies Wilmers (2018) and Benmelech et al. (2020) find that average industry wages are particularly low when large buyers and employers respectively engage in M&A activity.

Of course, labour income shares are decreasing within large firms. In fact, the part that arises from different shares within firms comes primarily from larger firms (Autor et al., 2020). However, this also suggests that the decline is not a result from a general decline of labour income shares across firms of different sizes. Rather the aggregate decline of the labour income share is mainly driven by a decrease of the between-firm component (e.g. completely in the US manufacturing sector) as found for the United States. Hence, revenues reallocate from firms with higher to lower labour income shares and accordingly, a strong relationship between sales concentration and this between-firm component of the labour income share is identified in the United States (Autor et al., 2020). Further evidence comes from Kehrig and Vincent (2021), who find that reallocation of sales to "shooting star" establishments can entirely explain the decline of the labour income share in the US manufacturing sector. Hartman-Glaser et al. (2019) also find that the US aggregate labour income share is largely determined by the labour income shares of the largest US companies. The importance of the between-firm component is also found for six European countries (Autor et al., 2020). Therefore, the rise of superstar firms rather explains increasing income inequality between firms.

4.2.3 Large superstar firms and *higher* between-firm income inequality

Overall, the rise of large superstar firms, rising wage premia and the fall of labour income shares should increase income inequality between firms. Although strongly believed (Autor et al., 2020), empirical studies yielding robust support are scarce. Nevertheless, some tentative support exists for labour earnings, wages and also income inequality in general (Table A8).

First of all, how can potential wage growth in superstar firms still increase income inequality despite slight employment growth? Suppose a superstar firm hires a group of initially lower-paid workers and pays these workers a wage premium. Ceteris paribus, this employment growth should not increase wage inequality, in line with Davis and Cobb (2010). However, ceteris paribus is a strong assumption. At the same time, the firm has gained new market shares and pays the rest of the workers uncommonly high salaries. These salaries should then lead to increased wage inequality between firms. Research finds general support for such a pattern: A reallocation of revenues leads to increased wage inequality between firms as differences in nominal revenue productivity (sales or value-added per worker) closely explain differences in wages (Barth et al., 2016). In other words, the firm-size wage effect becomes very large and the relatively small group of workers at large firms earn much more than in the rest of society.

Then, a more unequal distribution of pay premia where superstar firms can share increased profits whereas others cannot could be a reason for higher wage inequality between firms. Importantly, wage growth was of a minor concern in the previous chapter as revenues were predominantly followed by employment growth.

The previous insights on firm-size wage premia already indicated that employees in large superstar firms (mostly in manufacturing) benefit more in Germany than in the United States. Therefore, superstar firms seem to be a good reason for increased *wage* inequality in Europe but only to a lesser extent in the United States. Indeed, Song et al. (2019) find for the United States that firm-fixed effects alone do not explain much of the rise of between-firm earnings inequality. Accordingly, inconclusive relationships between sales concentration and wage inequality in the 2000s are also found by Lin and Tomaskovic-Devey (2013).[6] In contrast to that, establishment-fixed wage effects generally account for a quarter of the rise in wage inequality in Germany (Card et al., 2013). Further studies analyse the role of size for German wage inequality based on decomposition analyses. For example, one of the first studies by Antonczyk et al. (2010) shows a small effect. Baumgarten et al. (2020) find no effect of size and thus doubt superstar firm dynamics in Germany. However, these studies only use broad and very small size categories. A study by Ohlert (2016) uses the absolute number of employees and finds that establishment size is the most important factor in accounting for wage dispersion across establishments. Similarly, Lochner et al. (2020) find that wage dispersion between establishments within size groups increased due to a higher variance of establishment-fixed effects. Hence, the rise of firm-size wage premia was followed by higher wage dispersion due to a more unequal distribution of pay premia, pointing to the rise of very large superstar firms in Germany. Besides Mueller et al. (2017), Cortes and Tschopp (2020) also show a direct positive relationship between employment concentration (and also market concentration) and wage dispersion between firms for nine European countries, including Sweden (as in Figure 1).

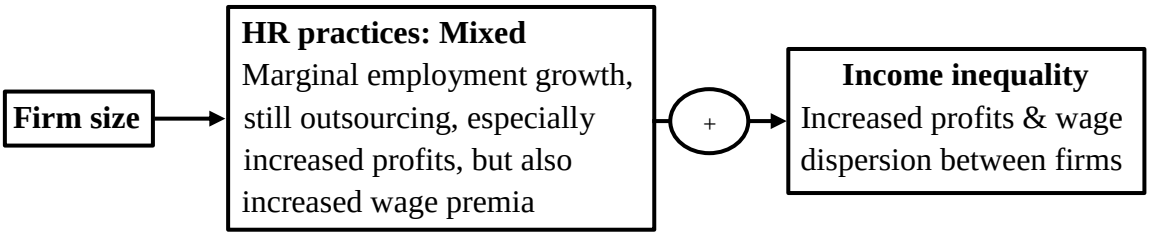
In the United States, superstar firms seem to mostly affect inequality between labour and capital incomes. While several studies dealt with wages or labour earnings, there is only general evidence for increasing income inequality. In general, it is believed that including business income to analyses of wage inequality amplify identified effects (Song et al., 2019). The fall of

[6] Interestingly, they find a negative relationship between 1970 and 1997, so the period when sales concentration roughly equals employment concentration. This is in line with findings by Davis and Cobb (2010) in chapter 3.

labour income shares, which results from the rise of superstar firms, is found to have effects on societal income inequality (Bengtsson & Waldenstroem, 2018; Karanassou & Sala, 2013) as capital incomes are highly concentrated at the top five percent in the wealth distribution (Greenwald et al., 2019). Moreover, the study by Mertens (2021) shows that inequality would be much higher if wages would equal their marginal product (thus also including capital incomes). Still, more research is needed to analyse the link between the rise of large superstar firms and aggregate societal income inequality. Figure 4 summarises the findings on superstar firms.

Figure 4

Large superstar firms with reduced hiring efforts and higher societal income inequality



Source: Own compilation.

4.3 Large firms and their sorting efforts

The next phenomenon that can explain rising earnings inequality despite increasingly larger firms are changes in worker composition. The crucial question is who enters the firm? In the third chapter, it was assumed that a group of lower-income workers enters the large firm. In general, it is found that this is rather the rare case. Large firms seem to reorganise in a way that allows for focussing on core competencies and a narrower set of occupations (Handwerker & Spletzer, 2016). This clustering of high-wage workers in some firms and low-wage workers in other firms has been referred to as employee segregation (Song et al., 2019). With segregation, it is assumed that wages and firm rents are similar among firms. However, multiple evidence on, for example, firm-size wage effects suggests that workers who already earn above average can earn even more when they enter large firms. When high-wage workers increasingly work in high-wage firms and low-wage workers in low-wage firms, this is subsumed under a different type of reallocation, which is called employee sorting (Song et al., 2019). Table A9 provides some evidence that sorting increased in large firms. A first indication are higher associations

between worker-fixed and firm-size wage premia, which have been identified for the United States and which explain eight percent of the increase in firm-size wage premia (Bloom et al., 2018). Lochner et al. (2020) also find similar results for Germany, which also attenuate recent declines in firm-size wage premia. Presumably, sorting of high-wage workers is common in superstar firms though empirical evidence of such a linkage is missing (Autor et al., 2020). The same applies to sorting of low-wage workers in large service firms.

Naturally, sorting is also a result of the outsourcing of low-paid workers (as otherwise large firms would substantially grow) (Song et al., 2019). The study by Ochsenfeld (2018) already revealed that workers without a college degree, in several cases, receive wage premia when their firms more heavily rely on subcontracting. Supposedly, this effect is even more pronounced for workers with a college degree (cf. Song et al., 2019). In contrast to that, subcontracted workers usually loose wage premia (Goldschmidt & Schmieder, 2017). Accordingly, counterfactual wage distributions with establishment-fixed effects for all workers in cleaning, logistics and security services reveal a lower covariance between establishment- and person-fixed effects. Therefore, outsourcing has contributed to sorting.

4.3.1 Sorting in large firms and *higher* between-firm income inequality

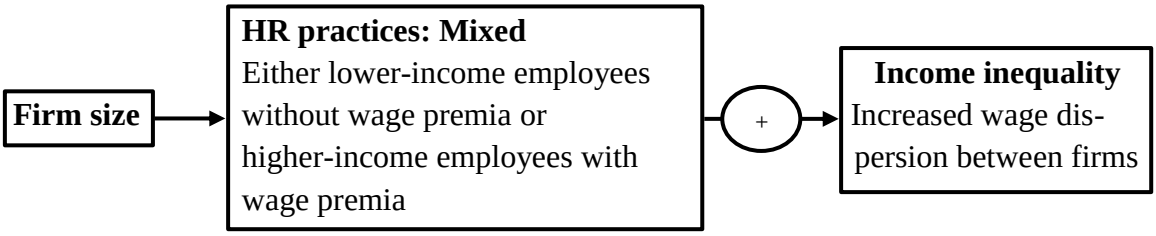
As rents are skewed towards high-wage workers, sorting increases between-firm inequality and thereby societal income inequality. Two important studies are listed in Table A10. Even tough superstar firms do not seem to have contributed much to increased earnings inequality in the United States, Song et al. (2019) still find that between-firm earnings inequality accounts for the majority of the increase in earnings inequality and that also among the largest firms. Crucially, they also identify the most important factor for that, which is sorting as measured by the covariance of worker and establishment effects.[7] Card et al. (2013) also show that this is the case for Germany. In addition, Lochner et al. (2020) find that sorting (and also segregation[7]) increased wage dispersion across size groups. Hence, sorting increased not only wage inequality in the form of outsourcing of low-paid work to smaller firms (Goldschmidt & Schmieder, 2017) but also by pronounced wage premia for many high-wage workers in some of the largest firms.

[7] Only a little less can also be explained by segregation of workers (the variance of worker-fixed effects in a firm). However, societal income inequality remains equal as increases in between-firm inequality due to segregation are offset by decreasing within-firm inequality. Nevertheless, segregation can still foster unequal wage growth (Song et al., 2019) as work experiences are only exchanged between similar groups of workers (Abowd et al., 2018). Handwerker and Spletzer (2016) find that occupational segregation can also explain rising wage inequality.

Figure 5 summarises findings on sorting efforts of large firms.

Figure 5

Sorting in large firms and higher societal income inequality



Source: Own compilation.

5 Summary of findings

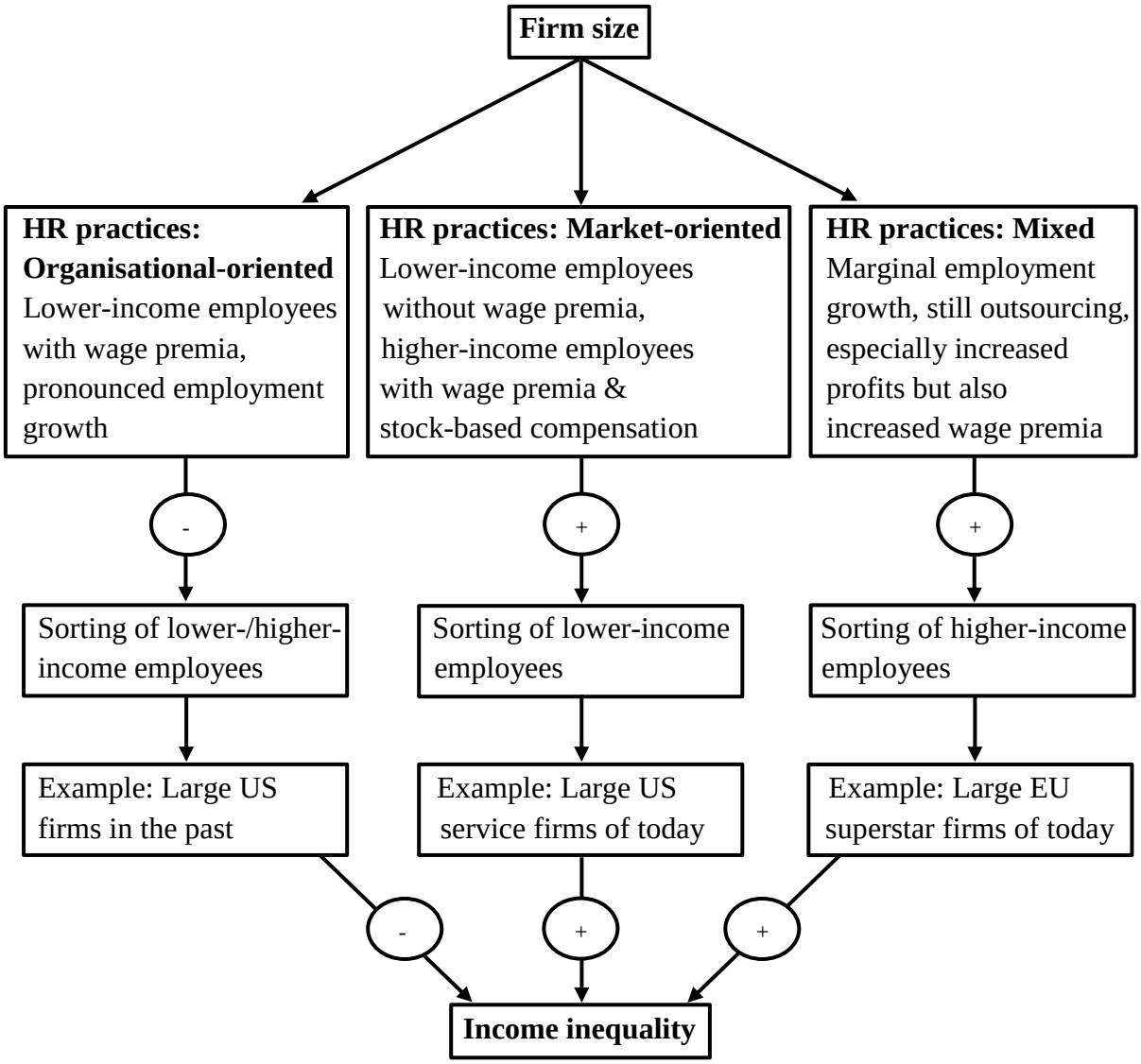
Figure 6 summarises all collected linkages between firm size, HR practices and income inequality. All of these linkages have been theoretically elaborated and empirically supported. It becomes clear that opposing linkages between firm size and income inequality systematically arise from different assumptions on the HR practices used by large firms. When large firms use organisational-oriented practices, they are expected to decrease societal income inequality (Cobb, 2016). However, two further HR practices are necessary for this to hold. First, when large firms gain market shares, they must employ new staff. Secondly, the workforce must consist of a large group of lower-income individuals that can benefit from wage premia. When large firms under these assumptions start to downsize workforce as for example US firms in the past, then this increases societal income inequality (Davis & Cobb, 2010).

Positive linkages between firm size and income inequality are based on contrary HR practices. Today, many of the largest employers in the United States are now in services (Davis & Cobb, 2010). Firms like Walmart employ millions of workers under market-oriented HR practices and do not offer wage premia for them. Accordingly, firm-size wage premia have generally eroded in the United States (Bloom et al., 2018) and as this decline has exclusively affected lower-income workers, income inequality increased (Cobb & Lin, 2017). In Germany, by contrast, firm-size wage premia are relatively stable as the largest employers are still in manufacturing. However, many large manufacturing firms in Europe have been identified as superstar firms

(Stiebale et al., 2020). Superstar firms may also use organisational-oriented HR practices within their company but they rely less on employment growth when revenues and market shares increase. Instead, they increase profits or to some extent wages, which increases wage gaps (Cortes & Tschopp, 2020) and income inequality in general (Mertens, 2021).

Figure 6

Framework why large firms contribute to societal income inequality



Source: Own compilation.

The use of market-oriented HR practices is not limited to large service firms. Many large firms (and most likely superstar firms) increasingly base their salaries for top-level employees on stock market performance and not fairness perceptions of the HR department. These extraordinary salaries in large firms also shape societal income inequality as found for the United States (Song et al., 2019). In addition, the rise of service and superstar firms are both followed by trends in employee sorting. As mentioned above, large service firms focus on the employment of lower-paid workers without offering wage premia for them. Superstar firms mostly employ higher-paid workers and provide them with wage premia. Hence, sorting breaks with the assumption that large firms with organisational-oriented practices employ a large group of lower-income individuals.

6 Discussion

This paper has juxtaposed different explanations why the presence and evolution of large firms might reduce or foster societal income inequality. At first sight, these explanations seem to be contradictory. However, by comprehensively reviewing the findings to date, this paper has shed light on this ambiguity and the important blind spots of these explanations respectively. The previous chapters presented a variety of different assumptions on the HR practices of large firms and showed that systematic differences in these assumed practices are a prime reason for opposing linkages between firm size and income inequality.

When large firms employ a high percentage of low-income workers, pay these workers wage premia and hire even more when revenues increase, this naturally decreases societal income inequality. This is the reason why societal income inequality was as its lowest levels when large US firms like Ford dominated economies (Davis & Cobb, 2010). Similarly, firms like Unilever might explain robust negative associations between large-firm employment and income inequality in the United Kingdom (Figure 1). Unilever pays a real living wage to its UK staff (Dundon & Rafferty, 2018), which appears to keep up earlier firm-size wage premia (Belfield & Wei, 2004). When such firms decrease its employment, societal income inequality increases.

Today, large service employers dominate the US economy in terms of employment. These firms still employ many low-paid workers but they do not provide wage premia for these workers. Consequently, societal income inequality is at its highest levels since several decades. In many European countries such as Germany or Sweden, manufacturing firms dominate as employers

and as superstar firms. For Germany, it has been shown that large establishments pay wage premia (Lochner et al., 2020) but also that their hiring efforts are scaled down and increasingly concentrated on high-income workers, while efforts to outsource low-income workers are pronounced (Goldschmidt & Schmieder, 2017). While wage inequality is lower among these establishments (Baumgarten et al., 2020), large superstar firms lead to higher societal income inequality (Mertens, 2021), which is highest in many European countries (Organisation for Economic Co-operation and Development, 2015).

Still, societal income inequality can arise from extraordinary salaries for top-level employees that are the result from managerial power and the exploitation of organisational-oriented practices. Hence, conflicting perceptions on the equalising effects of such practices persist. However, empirical support for the view that organisational-oriented practices foster societal income inequality could not be identified. In essence, there is clear support that downsizing of large firms as a measure to constrain managerial power is followed by *higher* and *not lower* societal income inequality. Accordingly, research finds that even if the top-level managers in large firms could mutually increase their salaries, this would only have a marginal effect on societal income inequality (Song et al., 2019). Of course, it is important to address such exploitation, but it seems that managerial power was only a minor factor for increasing income inequality (Willman & Pepper, 2020). The empirical reality rather suggests that downsizing and the promotion of market-oriented HR practices is more detrimental than the danger that organisational-oriented HR practices could be exploited.

These results have wide-ranging policy implications. They clearly reveal under which circumstances recommendations lead to adverse outcomes. Recommendations seeking to make hierarchies flatter by breaking up firms (cf. Hamel, 2009) often come at the cost of increased societal income inequality. Granting subsidies or tax relaxations to large superstar firms does not support low-paid workers across the supply chain but only a privileged group of mostly high-paid workers and firms' shareholders. Hence, the production system with all its stakeholders does not benefit as claimed by neoclassical dogmas and conservative parties. Industrial policy that neglects important firm characteristics such as hiring behaviour denigrates taxpayers' money. Moreover, such policy might hamper economic growth as a consequence of increased income inequality (Neves et al., 2016). This raises doubts if the HR strategy of superstar firms really is the economically best solution for the whole society but also for these

firms themselves. Famous industrialists like Henry Ford or Robert Bosch also recognised this potential downside of cost reduction and strictly decided to take action against it. And they did so out of self-interest: “I don’t pay good wages because I have a lot of money; I have a lot of money because I pay good wages” (Robert Bosch). As today’s executive boards and business consultants do not pay much attention to such a strategy but rather advocate recommendations based on neoclassical dogmas (Hamel, 2009), legislation should address the downsides of their decisions. In particular, legislation should limit opportunities of companies to reduce labour costs although receiving the same work performance. Such legislation includes higher minimum wages and laws that address wage penalties after outsourcing events and particularly transfer of undertakings (as regulated by §613 BGB in Germany). Ultimately, increasing marginal tax rates for higher incomes might disincentivise their efforts to benefit from labour cost reduction (Willman & Pepper, 2020).

This literature review is a first attempt to sort out different mechanisms why large firms lead to higher or lower income inequality. Of course, such a broad approach goes with several limitations and there are many ways to arrive at more robust findings and policy recommendations. First, as this review concentrated on seminal papers and their linkages to other studies within the most fundamental strands of literature, it might have missed further important works within these strands but also completely different strands that may turn out to be highly relevant. Future reviews that dive deeper into single strands could further test the claims made in this overarching paper. In this way, empirical studies showing that the evolution of smaller firms can also be followed by *lower* income inequality might be revealed. Secondly, when comparing results from different literature strands, the context can differ. Some unique findings have only been tested once as for example hiring efforts of “shooting stars” in the US manufacturing sector (Kehrig & Vincent, 2021). Future empirical studies should fill such gaps and for example, test hiring efforts of large firms in other countries where the rise of superstar firms seems to be a proper explanation for increasing income inequality such as Germany.

Finally, important findings stem from very fragmented analyses. Although trends in employee sorting are an important factor for rising wage inequality in the United States (Song et al., 2019) and Germany (Card et al., 2013), it is still unclear whether this phenomenon is linked to the emergence of large service or superstar firms (Autor et al., 2020). Future studies could explore in detail the rising homogeneity of workers in large firms and also the increasing use of market-

oriented compensation practices leading to differently pronounced wage premia. Whereas service firms are already known for their use of such practices, also large superstar firms can be very inclined to use stock-based compensation for a large group of their employees, which increases earnings inequality (Song et al., 2019). Hence, there are multiple avenues for future research to connect initially separated research objects in an integrated analysis that allows more precise statements.

The grand challenge is to include aggregate trends of income inequality into integrated analyses. So how do different characteristics of large firms drive societal income inequality? This may start with the question of what kind of firms dominate in certain countries. As already laid out, the largest employers are more likely superstar firms in Germany (Mertens, 2021) than in the United States where the largest employers are not the most popular superstar firms such as Facebook and Google but service firms like United Parcel Service or Yum Brands. As claimed in seminal papers (Autor et al., 2020), linking the rise of superstar firms with rising income inequality is a crucial objective of future research and inspiring approaches for such integrated analyses already exist (Song et al., 2019). All of these routes for future research are crucial to resolve the two sides of size and to further explore the explanatory power of Human Resource Management as a constituting reason for societal income inequality (Cobb, 2016). Given that income inequality is likely an endogenous phenomenon that is made by man and particularly management, it is vital that corporate leaders and policy-makers are informed about the explorations to date and all upcoming ones.

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Appendix

Table A1: *General HR practices in large firms & firm-size wage premia*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Baron & Bielby (1984)	USA: 415 establishments in California 1959 to 1979	Establishment size (factor analysis)	% number job titles to tasks	Regression	+	
			% jobs in promotion schemes		+	
			Length of ladder for average job		+	
			% bottom & entry level jobs		-	
Kalleberg & Van Buren (1996)	USA: 727 establishments 1991	Establishment / firm size	Descriptive use of rules & procedures	Correlation	+	
			Managers' perception of promotion	Correlation	+	
			Annual income of workers	Regression	+	Insignificant when mangers' perception of promotion included
						Firm size: Only manufacturing
			Fringe benefits of workers		+	Firm size: Higher coefficient
			Workers' perception of promotion		+	
Belfield & Wei (2004)	UK: 2,191 establishments 1998	Establishment size	Preferred use of internal recruitment	Correlation	+	
			Hourly wage of workers	Regression	+	Lower coefficient when preferred use of internal recruitment included
Wilmers (2019)	USA: ~21,000 establishments 6 years within 1968 to 1977	Establishment size classes (1-19 to >=500)	Average annual compensation of establishment	Regression (variance function)	+	
Hettler (2007)	USA: 53,713 individuals 1996 to 2003	Firm size classes (1-999, >=1,000)	Hourly wage of individual	Decomposition analysis	+	Unexplained % of wage premium amounts to 36.5%
Bloom et al. (2018)	USA: All employees 1980 to 2013	Firm size classes (1-10 to >15,000)	Ratio of average annual earnings to total average earnings	Descriptive comparison	+	1980-1986: Large wage premium
						1980-2013: Large wage premium only in manufacturing
				Regression (FE) by classes	+	1980-1986: 70% of wage premium due to firm-fixed effects
		Firm size	Firm-fixed wage effects	Regression	+	1980-1986

Berlingieri et al. (2018)	17 countries: Manufacturing & service firms 1994 to 2012	Firm size categories (1-9 to >250)	Average wage of firm	Regression by industry	+	Strongly significant in manufacturing
Tomaskovic-Devey & Melzer (2020)	GER: ~20,000 establishments & their full-time employees 1995 to 2010	Establishment size	Daily earnings of employees	Regression	+	
Baumgarten et al. (2020)	GER: ~5,000 establishments & their full-time employees 1996 to 2010	Establishment size classes (1-4 to >=5,000)	Daily wage of employees	Mean across size categories	+	Wage differences increased along establishment size
Lochner et al. (2020)	GER: Large N full-time employees 1985 to 2017	Establishment size (full-time employees)	Daily wage of employees	Regression	+	Until 2010: Increasing
			Establishment-fixed effects	Regression	+	Over time: Increasing
			Daily wage of employees	Regression (FE) by size	+	Firm-fixed effects explain (rising) differences

Source: Own compilation.

Table A2: *Changing HR practices of large firms & wage implications*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Lin (2016)	USA: 833 firms (Fortune 500) 1982 to 2005	Total revenue	Domestic firm size	Regression (error-correction)	+	
Abraham & Taylor (1996)	USA: 2,700 manufacturing establishments 1979, 83, 86/87	Establishment size classes (50-99, 100-249, >=250)	Use of contracting of five services (janitorial, machine maintenance services, engineering and drafting, accounting, computer services)	Regression (probit)	-	Janitorial services are an exception
Kalleberg & Marsden (2005)	USA: 1,002 establishments 1996 to 1997	Establishment size (full-time employees)	Use of an employment intermediary for specific activity	Regression (logistic)	-	However, larger establishments tend to be public and non-profit
Harrison & Kelley (1993)	USA: 1,015 manufacturing establishments 1986 to 1987	Establishment size	Common use of contracting out	Regression (logistic)	-	Size measured by number of machining occupations
		Firm size			+	
Kehrig & Vincent (2018)	USA: Large N manufacturing establishments 1967 to 1977	Total factor productivity shocks	Employment growth	Non-parametric regression	+	Linear relationship
Benmelech et al. (2020)	USA: Large N manufacturing establishments 1978 to 2016	Employment concentration by industry-region	Average wage of establishment	Regression	+	Firm employment Concentration measured by Herfindahl-Hirschman Index (HHI)
Lazonick & O'Sullivan (2000)	USA: ~9,500 major firms 1996 to 1997	Firm size classes (incl. >=10,000)	Occurrence of lay-offs	Descriptive comparison	+	Almost 60% of firms with 10,000 and more employees laid off
Jung (2015)	USA: 714 firms (Fortune 500) 1981 to 2006	Firm size	Dummy variable for downsizing announcement	Regression (event history analysis)	+	Announcements in newspaper articles

Cappelli & Keller (2013)	USA: Large N firms 2011	Firm size classes (incl. 25-99, >100)	Use of temporary agency or leased workers	Descriptive comparison	+	Larger firms are twice as likely
	USA: ~2,000 establishments 2000 to 2001	Establishment size classes (<50 to >1,000)	% different types of non-standard work arrangements in establishment	Regression (tobit)	+	
Goldschmidt & Schmieder (2017)	GER: Large N establishments 1975 to 2009	Establishment size	Outsourcing event: Establishment loses the last worker in four service occupations	Linear probability regression	+	
OECD (2015)	28 ctrys: Large N employees 2013	Firm size classes (<19, 20-49, >=50)	Part-time and temporary employment	Descriptive comparison by size category	-	~50% employed in smaller firms (ctrys = countries)
Eichhorst et al. (2013)	GER: Large N workers 2005 to 2011	Firm size classes (<10 to >=2,000)	Part-time employment	Regression (logistic, RE)	-	
			Fixed-term employment		+	Apparently, due to individual dismissal protection
Portugal & Varejão (2009)	POR: 12,079 firms & 80,840 employees 2002 to 2003	Firm size classes (incl. 500-999 & >=1,000)	Use of fixed-term contracts in a firm	Regression (beta-nominal)	-	
Hohendanner & Stegmaier (2012)	GER: ~6,000 establishments 2011	Establishment size classes (1-9 to >=100)	Marginal employment of worker	Descriptive comparison	-	
		No. marginal contracts	Size of larger establishments	Regression (FE)	+	Complementary effect
			Size of smaller establishments		-	Substitutive effect
Goldschmidt & Schmieder (2017)	GER: Large N establishments in four service sectors and temp agencies 1975 to 2009	Outsourcing: Change of employer but not location	Daily wage of worker	Regression (FE)	-	~10-16% lower
						Establishment-fixed effect drops by ~10%
		Outsourcing: Change to service provider			-	~9-26% lower
						Establishment-fixed effect drops by ~7%

Ochsenfeld (2018)	GER: 10,546 establishments & their non-college full-time employees 2002 to 2008	% temporary agency workers	Daily wage of worker	Regression (FE)	+	Establishment-fixed effect remains stable or increases
		Outsourcing or closing of business unit			+	

Source: Own compilation.

Table A3: *Lower within-firm income inequality in large firms*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Cobb & Lin (2017)	USA: Large N workers 1989 to 2014	Firm size classes (<100 to >=1,000)	Hourly wage	Regression (quantile, RIF)	+	1989: Large wage premia, esp. for lower & middle-wage workers
Wilmers (2019)	USA: ~21,000 establishments 6 years within 1968 to 1977	Establishment size classes (1-19 to >=500)	Ratio compensation for office to non-office production employees	Regression	-	Large relative to medium-sized
					+	Larger relative to small
			Average annual compensation of similar establishments (regression residuals)	Regression (variance fctn.)	-	Larger establishments have lower variance of average compensation
Song et al. (2019)	USA: ~72.6mn workers & 477k firms p.a. 1978 to 2013	Firm size classes (incl. 20-10,000 and >10,000)	Between-firm variance of annual earnings	Decomposition analysis	-	
			Within-firm variance of annual earnings		-	In the 1980s
Baumgarten et al. (2020)	GER: ~5,000 establishments & their full-time employees 1996 to 2010	Establishment (Est) size classes (1-4 to >=5,000)	Between-Est variance of daily wages	Descriptive comparison	-	
			Within-Est variance of daily wages	Decomposition analysis (RIF)	-	Base group: Establishments with 200–499 workers
			15–50 wage differential within Est		-	
Lochner et al. (2020)	GER: Large N employees 1985 to 2017	Establishment size (full-time employees)	Between-establishment variance of daily wages of full-time employees	Decomposition analysis	-	Earlier periods: Linearly decreasing in size
Alvarez (2015)	FRA: 6,980 large firms 2004 to 2013	Firm size	Labour share of income	Regression (FE)	+	
Willman & Pepper (2020)	UK: 93 FTSE 100 firms 2015	Standard Industry Classification	Ratio mean CEO pay to total remuneration	Descriptive comparison	+	Lower ratios in firms operating in industries where outsourcing is common
Beyer & Hassel (2002)	GER: 33 of 100 largest firms 1992 to 1998	Shareholder value index	Firm size	Descriptive comparison	-	
			Labour share of income		-	Stable in firms with low index (as personnel expenditures increase)

Source: Own compilation.

Table A4: *Lower between-firm income inequality among large firms*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Wilmers (2019)	USA: ~21,000 establishments 6 years within 1968 to 1977	Establishment size classes (1-19 to >=500)	Average annual compensation of similar establishment (residuals from regression)	Regression (variance function)	-	Also controlling for parent company affiliation, thus reflecting between-firm inequality
Baumgarten et al. (2020)	GER: ~5,000 establishments & their full-time employees 1996 to 2010	Establishment size classes (1-4 to >=5,000)	Variance of daily wages	Descriptive comparison	-	
				Decomposition analysis (RIF)	-	Base group: Establishments with 200–499 workers
Song et al. (2019)	USA: ~72.6mn workers & 477k firms p.a. 1978 to 2013	Firm size classes (incl. 20-10,000 and >10,000)	Overall variance of annual earnings	Descriptive comparison	-	In the 1980s
Sorensen & Sorenson (2007)	DEN: Industry-regions and all their employees 1992 to 1998	Only one firm	Standard deviation of wages	Regression	-	
		Number firms		Regression	+	High number reflects smaller firms
			Standard deviation of wages across similar individuals (regression residuals)	Regression (hierarchical)	+	
		Standard deviation (SD) of firm size	Standard deviation of wages	Regression	0	
			Standard deviation of wages across similar individuals (regression residuals)	Regression (hierarchical)	-	Authors argue that SD reflects beneficial variety in HR practices
Davis & Cobb (2010)	USA: Largest firms 1950 to 2006	Employment concentration: % in (mostly) 10 largest firms	Gini coefficient of gross household monetary income	Correlations	-	Correlation is -0,80
				Regression	-	Various forms of lagged variables
	53 countries: Largest firms 2006			Correlation	-	Correlation is -0,47 Sometimes largest firms by revenue

Cobb & Stevens (2017)	USA: 48 states & (most of) their establishments 1978 to 2008	Large-firm employment	Gini coefficient of gross income	Regression (FE)	-	IV: Workers at establishments with firm-level employment of >=10,000
		Employment concentration			-	IV: % large-firm employment in state
Goldschmidt & Schmieder (2017)	GER: Large N establishments & their full-time employees in 3 service sectors 1975 to 2009	Outsourced workers: Working at service provider	Variance of actual daily wages Counterfactual variance of daily wages where workers receive constant establishment-fixed effects	Descriptive comparison	+	Variance of counterfactual distribution 10% lower (for men; 7% for women)
Lin & Tomaskovic-Devey (2013)	USA: 1,345 industry-years 1970 to 2008	% full-time employment to whole economy	Variance of annual earnings	Regression	-	
			Labour share of income		-	
Autor et al. (2020)	USA: 6 major sectors & their firms 1982 to 2012	Employment concentration: % in 4/20 largest firms	Labour share of income	Regression	+	However, insignificant IV: Also Herfindahl-Hirschman Index (HHI)

Source: Own compilation.

Table A5: *Changing HR practices within large firms & wage implications*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Song et al. (2019)	USA: ~72.6mn workers & 477k firms p.a. 1978 to 2013		Firm size	Distribution	0	Distribution relatively stable
		Firm size classes (100-1,000 to >10,000)	Change of annual CEO earnings	Regression for each firm size category	+	Coefficient substantially higher in larger firms
		Change S&P 500				
Bloom et al. (2018)	USA: All employees 1980 to 2013	Firm size classes (1-10 to >15,000)	Ratio average earnings for each firm size category to total average earnings	Descriptive comparison	Less +	Between 1987 and 2013: Strong decline of wage premium
				Regression (FE) by classes	-	Falling wage premium due to drop of firm-fixed effect in large firms
		Firm size	Firm-fixed wage effects	Regression	Less +	Relationship declined
		Firm size classes (100 and 10,000)	Ratio of average to total average earnings	Decomposition analysis (within- & between-industry)		Within-industry changes account for 80% of decline of wage premium
		Nine industry categories	Overall industry employment			
Berlingieri et al. (2018)	17 countries: Manufacturing & service firms 1994 to 2012	Firm size classes (1-9 to >250)	Average wage of firm	Regression by industry		Positive relationship lower in services

Source: Own compilation.

Table A6: *Higher within-firm income inequality in large firms*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Song et al. (2019)	USA: ~72.6mn workers & 477k firms p.a. 1978 to 2013 (Master Earnings File)	Firm size classes (incl. 20-10,000 & >10,000)	Within-firm variance of annual earnings	Decomposition analysis	+	In later periods
			Overall variance of annual earnings	Descriptive comparison	+	
			% within-firm variance in overall variance of annual earnings	Decomposition analysis by class	+	42% for large firms against 16% for smaller and medium-sized firms
		Firm size classes (100-1,000 to > 10,000)	Change in earnings for top earners at different positions in firms	Regression by class	+	
		Change S&P 500				
	(Current Population Survey)	Firm size classes (incl. <100 & >1,000)	Mean earnings with high-school degree	Descriptive comparison	Less +	Wage premia decreased by 21 percentage points
			Mean earnings with college degree or higher		Less +	Wage premia decreased by 6 percentage points
Willman & Pepper (2020)	UK: 94 FTSE 100 firms 2015	Firm size	Ratio mean CEO pay to total remuneration	Correlation	+	
Cobb & Lin (2017)	USA: Large N workers 1989 to 2014	Firm size classes (<100 to >= 1,000)	Hourly wage	Regression (quantile, RIF)	Less +	After 1989: Wage premia declined for lower & middle-wage workers
			90-50 and 90-10 wage differential Counterfactual wage differential without firm-size wage premia	Descriptive comparison	+	Firm-size wage premia contributed to a 20% higher wage differential

Baumgarten et al. (2020)	GER: ~5,000 establishments & their full-time employees 1996 to 2010	Establishment size classes (1-4 to >=5,000)	50–15 wage differential within establishments	Decomposition analysis (RIF)	+	Base group: Establishments with 200–499 workers
Mueller (2017)	UK: 880 public firms 2004 to 2013	Firm size	Average pay ratios within and between different hierarchical levels within firm	Regression for each ratio (36)	+	Within higher levels and between higher and lower levels
				Regression (FE)	+	
	15 countries: Largest public firms >5 years within 1983 to 2010	Firm size: Average no. full-time employees in 50/100 largest firms	90–10 wage differential within country	Regression (FE)	+	
				Regression (FE, incl. time trend)	+	Adding firm size reduces coefficient of time trend by 36% (50 firms) and 40% (100 firms)

Source: Own compilation.

Table A7: *Superstar firms and their HR practices*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Autor et al. (2020)	USA: 500 largest public firms (sales) 1972 to 2015		Average firm size (employment)	Descriptive comparison		Increase of 60% for employment, 200% for sales
			Average firm size (sales)			
	USA: 6 major sectors & their firms 1982 to 2012		Employment concentration: % in 4/20 largest firms	Descriptive comparison		Larger increase for SC Dep. variable: Also Herfindahl-Hirschman Index (HHI)
			Sales concentration (SC): % in 4/20 largest firms			
		Industry's average wage	SC	Regression	+	However, insignificant and only manufacturing sector analysed
		Firm's share in industry sales	Firm's labour share of income (LS)	Regression	-	
		SC	LS	Regression	-	
			Between-firm component of LS	Descriptive comparison		Between-firm component drives the decrease
		SC	Within-firm component of LS	Regression	-	Between-firm
			Between-firm and within-firm components of LS (shift-share analyses)	Descriptive comparison		Within-firm component also important (driven by larger firms)
		SC		Regression	-	Within-firm (large firms)
	14 countries: All industries & their firms 2000 to 2012	Average sales concentration: % in 10 largest firms	Average LS in industry	Regression for each country	-	However, often insignificant
	6 countries: Pub mfg firms 2003 to 2010		Between-firm component of LS	Descriptive comparison		Between-firm component drives the decrease (Pub mfg = Public manufacturing)
			Within-firm component of LS			
Cortes & Tschopp (2020)	14 countries: All industries & their firms 1996 to 2016		Employment concentration: % in largest 1% firms	Descriptive comparison		Stronger increase for sales concentration
			Sales concentration: % in the top 1% firms			

Willman & Pepper (2020)	UK: 94 FTSE 100 firms 2015		Average pay	Descriptive comparison		Average pay is twice as large
			Average earnings in the UK			Authors ascribe this to outsourcing
Jung (2015)	USA: 714 firms (Fortune 500) 1981 to 2006	No. completed M&A deals	Dummy variable for downsizing announcement	Regression (event history analysis)	+	Announcements in newspaper articles
Jackson (2005)	22 countries: Public firms 1991 to 1995	Average value of completed M&A deals	Average % of firms laying off >=10% of total employment	Cross-country correlations	+	
Kehrig & Vincent (2021)	USA: Large N manufacturing establishments 1967 to 2012	Labour share of income (LS)	Average establishment wage relative to average wage of peer establishments	Regression	0	No systematic differences
		5% lowest LS	Wage growth		+	However, small and insignificant
			Actual LS of establishment Counterfactual LS of establishment with market share equal to initial value	Descriptive comparison		Initially larger establishments do not record a pronounced LS decline Initial value of 1982
		5% lowest LS	Employment growth	Regression	+	1967-1977: Substantial connection
					0	2002-2012: No connection
			% aggregate value added for each 10 percentage-point-bin of LS distribution	Descriptive comparison		Over time, strong shift to low-LS-establishments
			Same % as above without establishments with 5% lowest LS	Descriptive comparison		Higher LS and no significant decline
Kehrig & Vincent (2018)	USA: Large N manufacturing establishments 1977 to 2012	Total factor productivity shocks	Employment growth	Regression (non-parametric)	0	
Hartman-Glaser et al. (2019)	USA: Large N public firms 1960 to 2014	Firm size percentiles (total assets)	Capital share of income	Descriptive comparison	0	To 1970
					+	To 2010: Strongly increasing
Mertens (2021)	GER: Large N mfg firms 1995 to 2016	Ventiles in firm size	Firm average wage	Descriptive comparison	+	(mfg = manufacturing)
			Firm average wage minus marginal revenue product of labour		-	Pronounced and increasing in the very largest firms

Lin & Tomaskovic-Devey (2013)	USA: 1,345 industry-years 1970 to 2008	SC: % in 3 largest firms	Labour share of income	Regression	-	(SC = Sales concentration)
Elsby et al. (2013)	USA: Major industries 1993 to 2010	Import exposure	Labour share of income	Descriptive comparison	-	
				Regression	-	
Boehm et al. 2020	USA: Large N mfg firms 1997, 2002, 07	Intermediate input imports	Domestic employment	Regression	-	Cross-sectional
				Regression (industry-FE)	-	(mfg = manufacturing)
Wilmers (2018)	USA: Large N public firms 1978 to 2014	Duration of contracting	Average firm wage	Regression (FE)	-	7% decline between 1 and >6 years
		Revenue % by large buyers			-	10 percentage-point increase followed by 1.2% lower wages
		Interaction revenue % & no. buyers		Regression (FE)	-	Relationship twice as large when comparing 1 against multiple buyers (though insignificant)
		Revenue % by large buyers		Regression (FE, instrumental variable)	-	1st stage: Merger increases share 2nd stage: Instrumented revenue share followed by even lower wages (though less significant)
		Instrument: Buyer merger				
Benmelech et al. (2020)	USA: Large N manufacturing establishments 1978 to 2016	Local concentration establishment employment by industry-region	Average wage of establishment	Regression	-	Local concentration measured by Herfindahl-Hirschman Index (HHI) Same result when controlling for firm employment concentration
		Instrument: No. establishments (employees) switching firm ownership		Regression (instrumental variable)	-	1st stage: Ownership changes lead (increasingly) to concentration 2nd stage: Instrumented concentration followed by even lower wages

Source: Own compilation.

Table A8: *Superstar firms and higher between-firm income inequality*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Song et al (2019)	USA: ~72.6mn workers & 477k firms p.a. 1978 to 2013	Firm size classes (incl. 20-10,000 & >10,000)	% between-firm variance in overall variance of annual earnings	Decomposition analysis	(-)	58% for large firms against 84% for smaller firms
		Firm-fixed effects	Between-firm variance of annual earnings		0	
Lin & Tomaskovic-Devey (2013)	USA: 1,345 industry-years 1970 to 2008	SC: % in 3 largest firms	Variance of annual earnings	Regression	-	Between 1970-1997 (SC = Sales concentration)
					0	1999-2008
Antonczyk et al. (2010)	GER: ~20,0000 establishments & their full-time employees 2001 to 2006	Establishment size classes (10-99 to 2,000-9,999)	Hourly wage	Decomposition analysis (sequential, quantile regression)	+	However, small coefficient
Baumgarten et al. (2020)	GER: ~5,000 establishments & their full-time employees 1996 to 2010	Establishment size classes (1-4 to >=5,000)	Between-establishment variance of daily wages	Decomposition analysis (RIF)	0	Base group: Establishments with 200–499 workers
			50–15 & 85-50 wage differential of mean establishment wages		0	
Ohlert (2015)	GER: Large N establishments & their full-time employees	Establishment size	Variance of daily earnings	Decomposition analysis (Fields method, FE)	+	Cross-sectional change: Size explains 10%
						Panel data: Size explains 18%
Lochner et al. (2020)	GER: Large N full-time employees 1985 to 2017	Variance of establishment-fixed effects	Variance of daily wages	Decomposition analysis	+	

Cortes & Tschopp (2020)	14 countries: All industries and their firms 1996 to 2016	Employment concentration: % in 1% largest firms	90-10 wage differential of mean firm wages	Regression	+	
		Sales concentration: % in the top 1% firms		Descriptive comparison	+	
				Regression	+	Same result for other measures of ind. and dep. variable
			Mean firm wages at higher percentiles of wage distribution	Regression	+	
			Mean firm wages at lower percentiles of wage distribution		-	
			90-10 wage differential of mean firm wages	Regression for each country	+	In 9 out of 13 countries
Mertens (2021)	GER: Large N manufacturing firms 1995 to 2016		Distribution of wages	Descriptive comparison		Distribution of marginal revenue product of labour more dispersed
			Distribution of marginal revenue product of labour			

Source: Own compilation.

Table A9: *Sorting in large firms*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Bloom et al. (2018)	USA: All employees 1980 to 2013	Firm size	Worker-fixed effects	Regression	+	Slightly increasing relationship pointing to sorting
Lochner et al. (2020)	GER: Large N ft employees 1985 to 2017	Establishment size (ft employees)	Worker-fixed effects	Regression	+	Increasingly larger relationship (ft = full-time)
Goldschmidt & Schmieder (2017)	GER: Large N establishments & their full-time employees in 3 service sectors 1975 to 2009	Outsourced workers: Working at service provider	Variance of actual daily wages Counterfactual variance of daily wages where workers receive constant establishment-fixed effects	Descriptive comparison	+	Variance of establishment-fixed effects & covariance between establishment- and worker-fixed effects are lower in counterfactual distribution

Source: Own compilation.

Table A10: *Sorting in large firms and higher between-firm income inequality*

Authors (yr)	Data	Ind. variable	Dep. variable	Method	Result	Notes
Song et al (2019)	USA: ~72.6mn workers & 477k firms p.a. 1978 to 2013	Firm size classes (incl. 20-10,000 & >10,000)	% between-firm variance in overall variance of annual earnings	Decomposition analysis	(-)	58% for large firms against 84% for smaller firms
		Covariance of worker- and firm-fixed effects	Between-firm variance of annual earnings	Decomposition analysis	+	Covariance (sorting of workers) explains 35% of the rise
Lochner et al. (2020)	GER: Large N ft employees 1985 to 2017	Size deciles	Covariance of worker- and establishment-fixed effects	Decomposition analysis for each decile	+	Covariance increased in largest size decile pointing to sorting (ft = full-time)

Source: Own compilation.

Contribution No. 2

Bureaucracies or superstar firms? Large employers and income inequality in a cross-country comparison

By

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(Working paper)

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Bureaucracies or superstar firms? Large employers and income inequality in a cross-country comparison

Abstract

For a long time, large US employers were assumed to reduce societal income inequality because of their bureaucratic, equitable pay policies and internal labour markets. However, this negative relationship between large-firm employment and income inequality has turned positive in recent years. Eroding pay policies within large firms seem to explain the switching correlation in the United States. We propose a different explanation for positive relationships in other countries: "superstar" firms. These firms generate large revenues but hire few regular workers whom they pay well, in addition relying on outsourcing and irregular employment. As a result, such large firms contribute to higher inequality. Hence, large-firm employment is positively associated with societal income inequality when superstar firms prevail in an economy, and negatively when bureaucracies with their internal labour markets are dominant. Cross-country evidence that disentangles these opposing mechanisms is provided based on a panel of 24 OECD countries across the period 1990-2015. We find that the negative association found in some countries and time periods is fully mediated by the share of permanent jobs, indicating the dominance of the bureaucratic-firm mechanism. Conversely, the positive association in other countries and time periods appears to be mediated by sales concentration, which indicates the dominance of the superstar-firm mechanism, though here the evidence is far from robust.

1 Introduction

Firms' employment policies and employment systems are crucial for understanding wage dispersion at the societal level (Bapuji et al., 2019; Cobb, 2016). In recent decades, many firms have dismantled their internal labour markets with career paths and generous pay schemes, moving instead to practices such as contract work and the outsourcing of labour services to other firms (Cappelli & Keller, 2013; Weil, 2014). By measuring the extent of employment in the largest US firms, earlier empirical research found first support that these practices appear to have contributed to higher income inequality (cf. Cobb & Stevens, 2017 for US states; Davis & Cobb, 2010).

The findings by Davis and Cobb (2010) rest on the assumption that large firms practice employment systems with a formal wage structure that grant relatively generous pay to workers at the bottom of the distribution, thereby reducing societal income inequality (Cobb, 2016). The fact that the correlation analysed by Davis and Cobb (2010) turned positive in the very late years of the US time series, indicates that this assumption may not be warranted any longer. Recent work by Cobb and Lin (2017) provide a potential explanation: They find that large firms' traditional wage premia for lower-wage workers have disappeared over time and thus have contributed to higher aggregate wage inequality.

Evidence for other countries suggest that an additional mechanism linking large-firm employment and income inequality can be at work. In particular, the recent US experience is not the only case in which large firm employment and aggregate wage inequality are correlated positively; it also shows in a number of other countries (e.g. Mueller et al., 2017). One of them is Germany, and here wage dispersion within large establishments did not increase (Baumgarten et al., 2020) as Cobb and Lin (2017) would predict. As this strongly suggests, the relationship between large-firm employment and wage inequality can be driven by a mechanism other than the internal-labour-market-effect. It is important to study this because systematic evidence for affluent economies other than the United States is still largely missing, and income inequality has not developed uniformly, with some countries even experiencing decreasing inequality over the last decades (Cobb, 2016).

In this paper, we extend the work by Cobb and Lin (2017) and Davis and Cobb (2010) by theorising and testing a second mechanism by which large employers influence aggregate income inequality. More specifically, we build on the work on the rise of superstar firms (Autor et al., 2020). Superstar firms are large and very successful firms that pay well but that also often employ small core workforces and rely on outsourcing. This diminishes their labour income share and ultimately increases societal income inequality. Interestingly, the prior view on the role of large firms (Cobb & Lin, 2017; Davis & Cobb, 2010) has not engaged in any debate with this new research and vice versa; there is hardly any cross-referencing.

Overall, the main aim of this paper is to reconcile both views and to produce robust cross-country evidence on the underlying mechanisms for the role of large firms for societal income inequality. In Section 2, the two streams of literature are juxtaposed and it is argued that

countries' largest firms can predominantly develop into either bureaucracies with internal labour markets or superstar firms, thereby contributing to lower or higher income inequality, respectively. Of course, firms can also reduce their role as generous employers as shown for the United States (Cobb & Lin, 2017) but it is difficult to empirically track large firms' pay generosity for a number of countries. Section 3 introduces data and methods. A number of panel regressions including mediated moderation models are conducted with a cross-country panel covering 24 OECD countries across the years 1990 to 2015. Section 4 presents results. We find strong support that negative relationships between large-firm employment and income inequality are mediated by the share of permanent employment, indicating the importance of internal labour markets. Descriptive findings show that positive relationships are followed by increasing sales concentration among firms, but a statistically significant and robust mediation effect of sales concentration could not be identified. In Section 5, the contribution of our analysis and major limitations are discussed.

2 Literature and theory development

2.1 Large employers reduce income inequality as bureaucracies with internal labour markets

Modern societies are characteristic of large organisations and firms (Perrow, 1984). By creating job ladders and pay structures, large firms shape social stratification (Baron & Bielby, 1980). It is therefore surprising that the employment systems of big firms have largely been ignored in accounts of cross-country analyses of income inequality (Cobb, 2016; Dundon & Rafferty, 2018; Song et al., 2019).

Cobb (2016) and Davis and Cobb (2010) are important exceptions. The authors argue that rising income inequality is heavily influenced by large firms' employment systems. These can be described as either more market-oriented or more organisational-oriented (Cobb, 2016; Delery & Doty, 1996; Jacoby, 2005). With an organisational orientation companies establish an internal labour market (Doeringer & Piore, 1971), in which workers are employed on a long-term basis and are thereby protected from short-term volatilities of the product and the labour market (Cappelli, 2001). Employees receive pay determined by bureaucratic rules including formal job evaluations and career paths. In internal labour markets, equity concerns are important (Dulebohn & Werling, 2007) and wages are compressed, thus being relatively high

for lower-level employees (Cobb & Lin, 2017; Weil, 2014; Wilmers, 2019). In market-oriented employment systems, by contrast, workers are hired and fired on a more short-term basis, and their pay more closely tracks market developments.

The main proposition regarding income inequality is obvious: An economy whose large firms operate organisational-oriented employment systems will have lower income inequality than economies whose firms operate market-oriented systems, other things being equal (Cobb, 2016).

This proposition sheds light on rising income inequality at the aggregate level. Many large firms have shifted from organisational-oriented to market-oriented employment systems, thereby levelling up wage dispersion in a number of ways. The largest firms have downsized their core workforces (Jung, 2015; Lazonick & O'Sullivan, 2000; Weil, 2014), instead relying more on externalising employment practices such as the use of contract workers provided by temporary help agencies or the outsourcing of labour services to legally independent firms (cf. Cappelli & Keller, 2013; Goldschmidt & Schmieder, 2017). Downsizing has been suspected to increase societal income inequality (Appelbaum, 2017; Batt, 2018; Lazonick & O'Sullivan, 2000; Weil, 2014), and there is some supportive evidence: Downsizing increases the number of firms within an industry (Sorensen & Sorenson, 2007), and it reduces large-firm employment (Cobb & Stevens, 2017) as well as the total number of full-time employment (Lin & Tomaskovic-Devey, 2013), all of which is related to higher income inequality.

The shift to market-oriented employments systems varies between economies and periods. In order to test whether and how it has affected societal income inequality, Davis and Cobb (2010) suggest a convenient and effective proxy measure: a country’s employment concentration defined as the employment share of the ten largest firms in the economy. The authors find surprisingly strong negative correlations of employment concentration with the Gini coefficient, both for a US time series across the period 1950 through 2000 and for a cross-section of 53 countries in the year 2006. It appears that large internal labour markets are related to a more equal income distribution.

2.2 Large employers foster income inequality by using less equitable pay structures

In the analysis by Davis and Cobb (2010), the correlation within the US time series has turned positive between 2000 and 2006. Recent studies show that in many other countries, the relationship also is, on average, positive (Cortes & Tschopp, 2020; Mueller et al., 2017). These findings have been explained in various ways. Davis and Cobb (2010) pointed out that service companies such as Walmart and McDonalds surpassed the giant manufacturers of the past in terms of their employment. These companies typically do not offer broad-based internal labour markets (at least not in the same way as Ford or General Motors did in earlier years) and instead employ more non-standard workers (Katz & Krueger, 2019). In line with this, tenure rates have generally decreased within large firms (Bidwell, 2013) and firm-size wage premia particularly eroded in the service industry (Bloom et al., 2018). This erosion of firm-size wage premia has occurred exclusively by lower pay levels for lower- and middle-wage employees, reflecting the decline of internal labour markets within large firms (Cobb & Lin, 2017). Thus, the positive correlation between employment concentration and Gini coefficient can be explained by employment concentration becoming a rather bad proxy for internal labour markets *within* firms. In fact, the increase of earnings inequality within the largest firms has strongly contributed to the overall increase in US wage inequality (Cobb & Lin, 2017; cf. Song et al., 2019).

Mueller et al. (2017) argue that, for other countries too, the growing wage dispersion within large firms is the reason for an average positive relationship between large-firm employment and wage inequality. However, they only analyse wage dispersion within large firms in the United Kingdom and do not empirically link their findings to aggregate trends, as previous studies did for the United States. Contrary to their assumption that the findings in the United Kingdom also hold in the remaining countries, studies for Germany show that firm-size wage premia are relatively stable (Lochner et al., 2020) and that wage dispersion within large establishments did not increase, although aggregate wage inequality did (Baumgarten et al., 2020). This clearly suggests that a mechanism other than an increased within-firm wage dispersion is at play.

2.3 New proposition: Large employers foster income inequality as superstar firms

A study by Cortes and Tschopp (2020) is the first to show that, in industries of several European countries, rising concentration in terms of employment but also sales is followed by higher wage dispersion. Hence, revenues seem to increasingly concentrate in large firms. Today, many firms are vast in term of revenues. The 20 sales-wise largest US firms account for sales of $ 3.4 trillion, the equivalent of Germany's gross domestic product (Mayer et al., 2017). While it is likely that increases in sales are generally followed by higher employment (Cortes & Tschopp, 2020), employment in these firms has grown to a much smaller extent (Autor et al., 2020). Firms in the United States and elsewhere that are highly productive in terms of sales per worker have been termed "superstar firms" (Autor et al., 2020). Superstar firms seem to pay well – but only the disproportionately few workers they employ. There is evidence for the United States that certain firms have increased wage inequality as wages usually track nominal revenue productivity (Barth et al., 2016). Hence, when superstar firms are also the largest in terms of employment, employment concentration may indeed be linked to *more* wage dispersion.

An important factor how firms become superstar firms are their employment practices. They are able to generate large revenues and to dominate industries without increasing workforces to the same extent (Kehrig & Vincent, 2021). A potential explanation for this is that they seem to strongly externalise routinised and less-paid work (Autor et al., 2020; Katz & Krueger, 2019; Song et al., 2019). Moreover, superstar firms are often created through mergers and acquisitions as they also expand market shares (Grullon et al., 2019) while reducing costs in the form of strong downsizing initiatives (Batt, 2018; Jackson, 2005; Jung, 2015). Thus, also the proposal based on superstar firms suggests that employment concentration is a rather bad proxy for *broad-based* internal labour markets. However, it differs from previous explanations in the sense that it focusses on hiring efforts.

Another key (and often defining) characteristic of superstar firms are their declining labour income shares (Autor et al., 2020; Hartman-Glaser et al., 2019; Kehrig & Vincent, 2021). Hence, sales are decoupled not only from employment but also from the wage bill. As capital incomes are highly concentrated at the top five percent in the wealth distribution (Greenwald et al., 2019), the rise of superstar firms and aggregate declines of labour income shares likely contribute to higher income inequality (e.g. Bengtsson & Waldenstroem, 2018). Recent

evidence shows that superstar dynamics are pronounced among large German employers as their employees receive wages that are substantially lower than their marginal products, thus contributing to higher income inequality (Mertens, 2021).

2.4 Hypotheses: Large employers and societal income inequality

The two literatures each describe a separate causal mechanism that links employment concentration with income inequality. If an economy's largest employers overwhelmingly use organisational-oriented employment systems, higher employment concentration will contribute to *lower* income inequality. This *bureaucratic-firm* mechanism (*BFM*) implies that large employers are generous and beneficial for the labour market and society as a whole. By contrast, if an economy's largest employers are superstar firms that only establish relatively small core workforces while sourcing many intermediate products and services externally, higher employment concentration will contribute to *higher* income inequality. This *superstar-firm* mechanism (*SFM*) implies that large employers take most rents while sharing less with workers and fellow citizens.

Both mechanisms can be at work for different firms in one country: Some employers are bureaucracies with internal labour markets and others superstar firms. In addition, single giant employers can exert a substantial effect on societal income inequality. While it is possible that both mechanisms exactly offset each other in an economy, we argue that one mechanism will dominate as markets and companies practices often converge. Important institutional considerations work towards a consistent pattern in one country across a longer period. Employment policies of large firms are often influenced by national institutions such as laws, the strength of unions, the influence of consulting firms and think tanks. In general, these influences work towards a strong conformity between large firms in terms of their employment policies (Hall & Soskice, 2001). Furthermore, practices of large successful establishments are often blueprints for their peers and competitors (Wilmers, 2019).

In empirical terms, this suggests that the relationship between employment concentration and income inequality within a country should be either strongly negative or strongly positive. However, this does not imply that the relationship cannot change at all. As the case of the United States has shown, the dominant orientation of employers and thus the sign of the correlation can swap within a longer period. We therefore posit:

Hypothesis 1: In each country, either the bureaucratic firm or the superstar-firm mechanism will prevail such that a strongly negative or strongly positive correlation between employment concentration and income inequality will be observed for a certain period.

The sign and size of the correlation measure the potential effects of the two mechanisms. In order to explore whether the mechanisms really are at work, we seek to identify variables that reflect the two mechanisms and test whether these variables mediate the relationship between employment concentration and income inequality. By comparing mediation effects of each variable for contexts with both negative and positive relationships, we can also test whether the two mechanisms are distinct, in line with *Hypothesis 1*.

More concretely, in countries (or time periods within them) where the *BFM* seems to prevail, that is, those with a negative relationship between employment concentration and income inequality, large employers should overwhelmingly use organisational-oriented systems. A key ingredient of this type of employment system is a long-term employment relationship (Cobb, 2016). Therefore, the extent of permanent employment in an economy is considered a mediator for negative relationships between employment concentration and income inequality. This mediation effect should not be observed in countries where the *SFM* is seemingly dominant, that is, those with a positive relationship between employment concentration and income inequality.[1] Hence, both mediation effects should significantly differ between both contexts.

Hypothesis 2: The share of permanent employment mediates negative relationships between employment concentration and income inequality, thus reflecting the bureaucratic-firm mechanism. It fails to mediate positive relationships such that mediation effects between both contexts significantly differ.

[1] At the core of the *superstar-firm mechanism* is that revenues and particularly capital incomes grow much stronger in such firms than in the rest of society. In the short term, this can lead to reductions in permanent employment as a result of downsizing initiatives after mergers and acquisitions (M&A). However, M&A are only one reason for the rise of superstar firms. In the long term, permanent employment may also decrease because of shrinking market shares of competitors or pronounced cost reductions at supplier firms (cf. Autor et al., 2020). However, such developments may take more time. Permanent employment is not the main driver of this evolving effect.

In countries (or periods) where the positive relationship between employment concentration and income inequality indicates that the *SFM* is dominant, superstar dynamics among the largest employers should be visible. The main properties of superstar firms are their growing revenues relative to the whole industry or economy (Autor et al., 2020). Hence, we use sales concentration in the largest employers as a mediator for positive relationships between employment concentration and income inequality. This effect should not be observed in countries where the *BFM* appears to prevail.[2] Thus, significant differences between the mediation effects of both contexts should exist.

Hypothesis 3: Sales concentration mediates positive relationships between employment concentration and income inequality, thus reflecting the superstar-firm mechanism. It fails to mediate negative relationships such that mediation effects between both contexts significantly differ.

3 Data and methods

3.1 Construction of key variables

The analysis focuses on 24 OECD countries in the years 1990 through 2015. The beginning of our observation period is a critical watershed. At least in the United States, many firms began to downsize their workforce (Lazonick & O'Sullivan, 2000) and to outsource services to external suppliers (Abraham & Taylor, 1996). A number of OECD countries were excluded because important employment data were not available. Furthermore, information on permanent employment was missing in New Zealand and for the majority of years in Chile and the United States. The latter countries were retained in the main analysis and only dropped in some robustness checks.

Income inequality was measured by the *Gini* coefficient, in line with previous work such as Davis and Cobb (2010). As in more recent literature (Antonelli et al., 2019; Tridico, 2018), the Gini of net incomes (after taxes and transfers) serves as dependent variable. Robustness tests

[2] At the core of the *bureaucratic-firm mechanism* is that workers are brought into stable employment relationships. This increase in hiring efforts can be explained by growing sales concentration among large employers (Davis, 2009). However, these employers can still decide to increase their staff without pronounced increases in revenues. Sales concentration is not the main driver of the effect.

also include models with the Gini of gross incomes (before taxes and transfers) as in Davis and Cobb (2010) and Roser and Cuaresma (2016). Data for the Gini coefficients were taken from the Standardized World Income Inequality Database (SWIID) (Solt, 2016). For illustrative purposes, Gini coefficients are multiplied by 100, thus ranging from 0 to 100.

Employment concentration was measured for each country-year by the employment share of the ten largest publicly listed companies. This employment share is the number of employees reported for the ten largest companies divided by the total working population (also multiplied by 100). Data on employment by the largest companies were retrieved from Worldscope Global database (Thomson Reuters/Refinitiv). Information on total working population was taken from the World Bank. The figure comprises employed and unemployed persons.

Measuring the employment figures for the largest companies deserves some comments. It could be argued that ten firms only represent a small fraction of firms, and the structure of the population of firms in an economy may be quite different. But Davis and Cobb (2010) show for the United States that the share of the ten largest firms correlates strongly over time with that of the 25 or 50 largest firms. Our measure focuses on companies listed on the stock market, which usually are also the largest employers in the economy. The measure works best when several companies continually make up the top in each economy. But the composition of the top-ten firms often changes as a result of mergers and acquisitions (M&A). A number of decisions had to be taken to construct the measure.[3] First, we did not take into account the employment figures of firms if they were recorded in the database for merely a few years (such as Arcelormittal in the Netherlands) and if they disappeared from the database though still operating (such as Vivendi in France). By dropping such firms, we smoothed out fluctuations in the measure and arrived at a more consistent indicator. Second, we dropped from the analysis firms that only appeared in the database because the name or the location of headquarters shifted in the merger process. Third, we intra- or extrapolated the employment figures of firms that existed but, for reasons unknown to us, were not recorded in some single years. In all other cases, companies that enlarged due to M&A counted towards the employment figures. This is important because a general growth of companies by M&A is in line with the notion of superstar firms.

[3] For Greece, it was not possible at all to arrive at such a measure. Thus, it was excluded from the analysis.

In addition to M&A activity, employment abroad also called for decisions. A company was assigned to the country in which its headquarters is located. For the United States, Davis and Cobb (2010) identified a high correlation between domestic and foreign employment (cf. Lin, 2016). But in our dataset, some countries with the highest employment concentration are home to many international service providers such as Accenture in Ireland, Securitas in Sweden or ISS AS in Denmark.[4] These companies employ many people outside their home country. We decided to include the employment figures of these companies and controlled the effect by inserting foreign direct investment in the regressions. Furthermore, we checked the robustness of our findings by leaving out some large multinationals from mostly smaller countries. Finally, we did not count in the employment concentration the figures for large employment agencies with rapid employment growth such as Randstad and USG People in the Netherlands.

Total sales concentration was measured by the total sales of the ten largest employers divided by the gross domestic product (both in local currencies). This approach is similar to Autor et al. (2020). Their main analysis is based on industry level but they also calculate measures for the whole US economy. In addition, they considered the largest firms in terms of revenues and not employment, an important difference we will discuss when presenting our findings. Data on total sales were again retrieved from Worldscope Global database (Thomson Reuters/Refinitiv). Data on gross domestic products came from the World Bank, and data on the share of *permanent employment* in dependent employment from the OECD.

All regression models include a *redistribution* variable as control variable. This variable measures the degree to which gross income is corrected through tax policies and social security systems, which is necessary when the Gini coefficient of net incomes is analysed. Based on Solt (2016), we use the relative distance between the Gini coefficients of net incomes to those of gross incomes (multiplied by 100). Robustness tests will include estimations with the Gini coefficient of *gross* incomes without this variable.

Additional regression models are estimated that include further control variables. First, we include variables that Davis and Cobb (2010) consider to be relevant. We include the *unemployment rate* measured by harmonised figures provided by the World Bank. *Union*

[4] For Luxembourg, employment abroad led to an implausibly high measure. Thus, it was excluded from the analysis.

density is included because unionisation is generally considered as an important institutional factor shaping income inequality (Jacobs & Myers, 2014). Collective bargaining coverage may be a better measure for union influence on pay dispersion but data on this measure are not available on an annual basis. Following Barradas (2019), we therefore measure unionisation by trade union density with data compiled from three databases: "Institutional Charateristics of Trade Unions, Wage Setting, State Intervention and Social Pacts" (ICTWSS) by Visser (2015), the "Employment database" of the OECD and data provided by the International Labor Organization. The *total workforce* in natural logs is included because income inequality may be an artefact of country size (Schneider & Paunescu, 2012). The share of *manufacturing employment* controls for the shift to service industry, which has been shown to be an important alternative explanation for positive relationships between employment concentration and income inequality in the United States (Cobb & Lin, 2017; Davis & Cobb, 2010). Furthermore, *FDI outflow (% of GDP*) is included to account for the fact that in countries with a lot of foreign direct investment, the workforces of the largest companies may include a lot of employment abroad. Data for all these variables come from the World Bank. Descriptive statistics and correlations are summarised in Table 1. Variables are not standardised as they have similar natural units, i.e. percent, and standard deviations (around 6). Multicollinearity is of no concern in the data as all correlations between independent variables are lower than 0.8 (Barradas, 2019; Studenmund, 2005) and the variance inflation factors are all below four.

3.2 Analytical procedures

The empirical analysis starts with some graphical illustrations. *Hypothesis 1* rests on the simple correlation, either positive or negative, between employment concentration and the Gini coefficient over a certain period. Relating this to how the Gini coefficient for each country (or identified period) changed over time allows us to see whether each of the two mechanisms contributed to a rise or fall in income inequality. *Hypotheses 2* and *3* theorise mediation effects. For these to hold, the independent variable must be statistically related to the dependent variable, and the independent variable to the mediator (Baron & Kenny, 1986).

To test hypotheses, we compute several regression models that tracks the model used by Davis and Cobb (2010). As mentioned above, the *Gini* coefficient of *net* incomes is the dependent variable and *employment concentration* the main independent variable. Both enter the model with the same year (Davis & Cobb, 2010). Therefore, coefficients can be interpreted in terms

Table 1

Summary statistics and bivariate correlations

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Gini (net incomes)	31.53	6.78	1									
2. Redistribution	32.16	13.83	-.85**	1								
3. Empl. concentration	7.57	6.54	-.50**	.51**	1							
4. Sales concentration	3.52	2.75	-.38**	.38**	.79**	1						
5. Permanent empl.	86.73	6.61	-.29**	.36**	.26**	.15**	1					
6. Unemployment	7.20	3.71	.03	.15**	-.10**	-.12*	-.35**	1				
7. Union density	31.51	20.36	-.58**	.63**	.38**	.21**	.28**	.05	1			
8. Workforce (log)	16.18	1.20	.37**	-.38**	-.49**	-.37**	-.14*	.00	-.58**	1		
9. Mfg. empl.	25.38	4.46	-.09†	-.00	-.31**	-.33**	-.06	.06	-.02	.13**	1	
10. FDI out (% GDP)	4.22	7.87	-.21**	.26**	.41**	.53**	.01	-.08	.06	-.18**	-.20**	1

Note: Empl. = Employment; Mfg. = Manufacturing; N=624 (n=24, T=26); Permanent employment (N=476, n=23, T-bar=20.67).

Levels of significance: † p<0.05; * p<0.01; ** p<0.001.

Source: Own calculations.

of the absolute change in the Gini coefficient in response to a one-percentage point increase in the variable of interest. The baseline regression model only includes the *redistribution* variable. Further models include the control variables described above.

These regression models are estimated with a fixed-effects panel regression method. Econometrics models of income inequality usually include a lagged dependent variable directly (Roser & Cuaresma, 2016). In fixed-effects estimations, this inclusion can lead to biases such that more complex methods such as the Generalized Method of Moments (GMM) are necessary. However, these methods require a panel with a higher N than T (e.g. Stockhammer, 2017), which is not met in our dataset. Therefore, we include clustered standard errors that correct for serial correlation and heteroscedasticity. A Hausman test applicable to clustered errors (Stata command: xtoverid) substantiates the use of the fixed-effects estimation.

Based on these fixed-effects regression models, moderated mediation analysis is used in order to test our hypotheses (Preacher et al., 2007). Moderated mediation analysis seeks to identify a conditional mediation (or indirect) effect defined as the "magnitude of an indirect effect at a particular value of a moderator" (Preacher et al., 2007). There are different approaches to moderated mediation analysis (Edwards & Lambert, 2007). We use the subgroup-approach,

which splits the sample based on the value of a moderator (Wegener & Fabrigar, 2000). We split the sample based on the prevailing mechanism, that is, along the sign of the correlation between employment concentration and income inequality. Naturally, in this way we force coefficients of employment concentration to point into the expected direction. However, the focus of our analysis is whether the suggested mechanisms drive and the corresponding variables mediate these two constructed directions. In order to assess mediation within each subgroup, we first follow the causal steps procedure by Baron and Kenny (1986). The second approach to assess mediation is to calculate mediation effects and their significance by means of bootstrapping techniques (Preacher et al., 2007). More information on both approaches will be provided when presenting results.

4 Results

4.1 Two groups of countries / periods

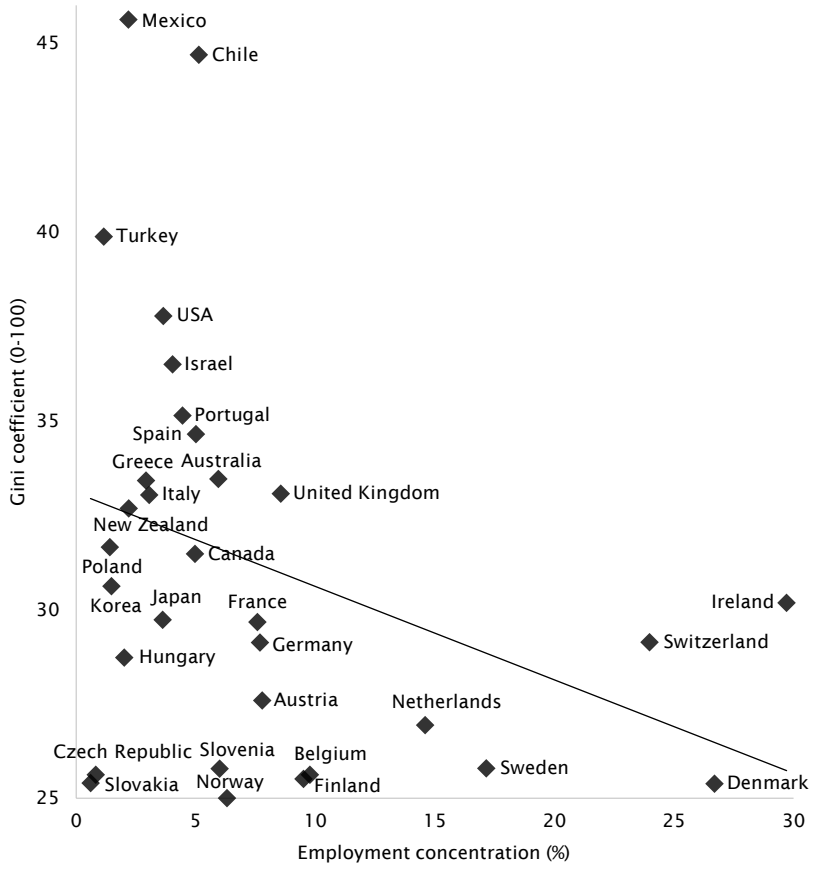
In Figure 1, recent evidence supports the point that Davis and Cobb (2010) make. In 2015, there is a negative correlation (r.=-0.34) between employment concentration and the Gini coefficient for a cross-section of 31 OECD countries. In countries with high employment concentration, indicating strong internal labour markets, income inequality is low; a good example is Denmark. Conversely, in countries with low employment concentration such as the United States, income inequality is high.

The seemingly clear empirical pattern becomes more complicated when we compare longitudinal trends across different countries. In Figure 2, the x-axis measures how employment concentration and Gini coefficient correlate over time in a number of countries. Against this, the y-axis plots the absolute changes of the Gini coefficient. As expected, in some countries, the sign of the correlation coefficient switched during the observation period, resulting in overall correlations of close to zero.[5] A similar pattern applies to absolute changes of the Gini coefficient, suggesting that the same mechanism may work in both directions within a single country (as for example in the Netherlands). For all affected countries, we included in Figure 2 separate values for the two periods up to and after the year 2000.

[5] This is particularly the case in France (r.=0.0042), New Zealand (r.=-0.0426) and to a minor extent in Switzerland (r.=-0.1832)

Figure 1

OECD cross-section between employment concentration and income inequality in 2015



Note: The employment concentration is calculated by dividing the employment figures in the ten largest public companies of a country (Worldscope Global database; Thomson Reuters/Refinitiv) by the total labour force (World Bank). Gini coefficients of net incomes are derived from the Standardized World Income Inequality Database (SWIID; Solt, 2016).

The cross-section yields a correlation of -0.34.

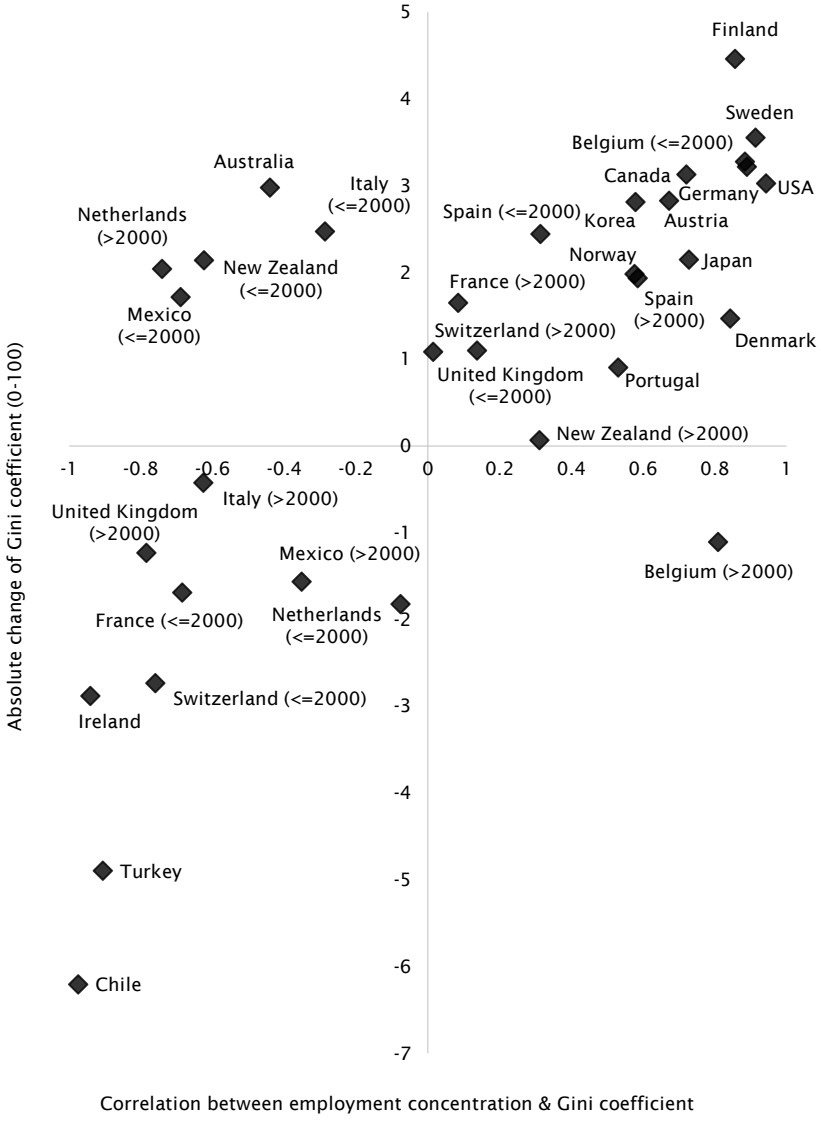
Source: Based on Davis and Cobb, 2010: 50.

The findings indicate that *Hypothesis 1* is plausible. There is a large group of countries or periods[6] with clearly negative correlations (left-hand side of Figure 2), which is compatible with findings by Davis and Cobb (2010). However, in about half of the 24 countries included in the data, there are strong *positive* correlations (right-hand side), in line with more recent research (Cortes & Tschopp, 2020; Mueller et al., 2017). Another important finding that differs from the results of Davis and Cobb (2010) are changes in income inequality. The majority of

[6] For the sake of brevity, mentioning countries will always include respective periods.

Figure 2

Correlations between employment concentration and Gini coefficient against absolute changes of Gini coefficient



Note: The employment concentration is calculated by dividing the employment figures in the ten largest public companies of a country (Worldscope Global database; Thomson Reuters/Refinitiv) by the total labour force (World Bank). Gini coefficients of net incomes are derived from the Standardized World Income Inequality Database (SWIID; Solt, 2016). Data points reflect the combination of the correlation between employment concentration and Gini coefficient and the absolute changes of the Gini coefficient. For some countries, correlations and changes are separately calculated until and after 2000 as correlations or trends in income inequality reverse around this year.

Source: Own compilation.

countries with a negative correlation records decreases in income inequality (bottom-left quadrant). This would suggest that internal labour markets in these countries became stronger rather than weaker. Countries with a positive correlation nearly exclusively record increasing income inequality, supporting explanations by Cobb and Lin (2017) but also our proposal for the *SFM*. In sum, it appears to be true that at least within a certain period, one mechanism dominates.

4.2 Two distinct mechanisms

4.2.1 Descriptive findings

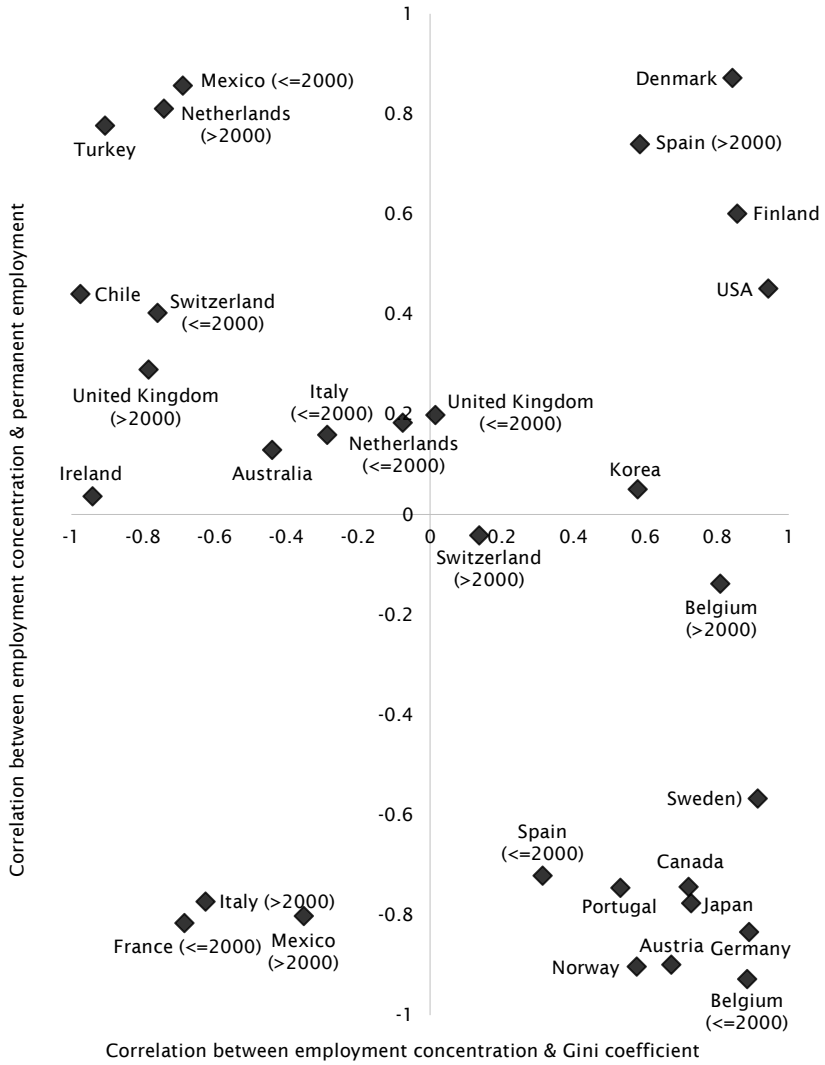
Figures 3 and 4 provide first evidence on the plausibility of the mediators. Figure 3 plots the correlation between employment concentration and the Gini coefficient against the correlation between employment concentration and permanent employment. Countries in which the *BFM* seems to prevail (so forth*: BFM countries*) are located on the left-hand side of Figure 3. For these, we expect *Hypothesis 2* to hold. The descriptive evidence is largely supportive. More than three quarters of countries are located in the upper-left quadrant, where employment concentration is correlated positively with permanent employment. This potential mediation implies that employment concentration is a good measure for the prevalence of internal labour markets in these countries.

Figure 3 also suggests that employment concentration mediated by permanent employment are related to absolute changes of income inequality, which were depicted in Figure 2. For example, increasing trends in employment concentration and permanent employment seem to explain why income inequality has decreased in less affluent OECD countries such as Turkey or Chile but also in some European countries before 2000 such as Switzerland or the Netherlands. Moreover, decreasing trends of both variables seem to explain why trends in income inequality reversed in the Netherlands after 2000 and why it increased over the whole period in Australia.

Countries in which the *SFM* seems to prevail (so forth: *SFM countries*) are located on the right-hand side of Figure 3. *Hypothesis 2* suggests that permanent employment should fail to mediate the relationship. Accordingly, less than two-thirds of observations are located in the bottom-right quadrant. However, patterns are not absolutely clear-cut. France (<=2000), Italy (>2000) and Mexico (>2000) are outliers but difficulties in splitting the time period may explain this finding (for example, Mexico has only four observations in this period).

Figure 3

Correlations between employment concentration and permanent employment / Gini coefficient



Note: The employment concentration is calculated by dividing the employment figures in the ten largest public companies of a country (Worldscope Global database; Thomson Reuters/Refinitiv) by the total labour force (World Bank). Data on the share of permanent employment come from the OECD. Calculations for Chile, Mexico (before 2000) and the USA are based on very few observations on permanent employment. Gini coefficients of net incomes are derived from the Standardized World Income Inequality Database (SWIID; Solt, 2016). For some countries, correlations are separately calculated until and after 2000 as correlations between employment concentration and the Gini coefficient reverse around this year.

Source: Own compilation.

Figure 4 plots the correlation between employment concentration and Gini coefficient against the correlation between employment concentration and sales concentration. In line with

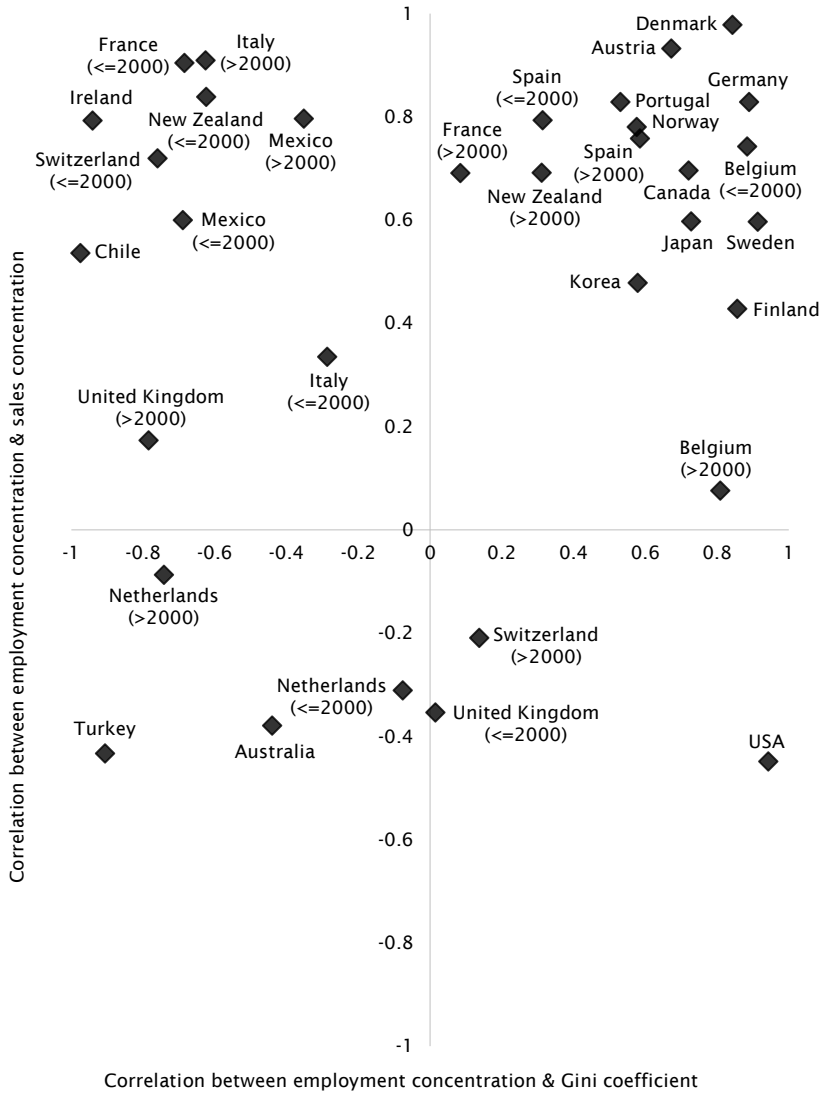
Hypothesis 3, *SFM countries* on the right-hand side are located in the upper-right quadrant. Here, employment concentration is correlated positively with sales concentration, indicating superstar dynamics among the largest employers. Thus, trends in employment and sales concentration seem to explain rising income inequality in a series of European countries but also Asian countries (Figure 2). An important example is Germany, where large employers are most likely superstar firms (Mertens, 2021) and where establishment size is a highly decisive factor for the rise in wage inequality (Ohlert, 2016). For other European countries, it has been shown that superstar firms also exist (Autor et al., 2020; Bighelli et al., 2020) and are particularly present among large manufacturers (Stiebale et al., 2020).

On the left-hand side, a lot of *BFM countries* are located in the upper quadrant. This is in line with suggestions by Davis (2009) that sales concentration was an important prerequisite for the establishment of internal labour markets in the United States (Deeg, 2012). Indeed, not only concentration in the largest US firms in terms of employment (Davis & Cobb, 2010) but also in terms of sales was actually followed by lower income inequality between 1970 and 1997 (Lin & Tomaskovic-Devey, 2013). But still less than three quarters are located in the upper-left quadrant. Moreover, the number drops to two-thirds by only changing the split year for the United Kingdom to 1999 as it is then clearly located in the bottom-left quadrant. Thus, observations on the left-hand side are still more spread in the upper and bottom quadrants than on the right-hand side, which is in line with *Hypothesis 3*.

There are three observations that contradict *Hypothesis 3*, located in the lower-right quadrant. Findings for the United Kingdom (<=2000) and Switzerland (>2000) seem to be again the result of the sample split (both have very low positive correlations between employment concentration and Gini coefficient). In contrast to that, the United States is clearly located in this quadrant. This is in line with earlier research, which proposes an alternative explanation for positive relationships between employment concentration and income inequality, that is, eroding internal labour markets within the largest firms (e.g. Cobb & Lin, 2017). Although superstar firms have been first identified for the United States (Autor et al., 2020), the typical superstar firms (e.g. Facebook, Google and Apple) are not necessarily the very largest employers. Hence, as indicated above, the difference between considerations of the largest employers in terms of revenues versus employment matters. Overall, the three hypotheses receive strong face-value support from the descriptive findings.

Figure 4

Correlations between employment concentration and sales concentration / Gini coefficient



Note: The employment (total sales) concentration is calculated by dividing the employment (total sales) figures in the ten largest public companies of a country (Worldscope Global database; Thomson Reuters/Refinitiv) by the total labour force (gross domestic product) (World Bank). Gini coefficients of net incomes are derived from the Standardized World Income Inequality Database (SWIID; Solt, 2016). For some countries, correlations are separately calculated until and after 2000 as correlations between employment concentration and the Gini coefficient reverse around this year.

Source: Own compilation.

4.2.2 Regression results

The first regression in Table 2 tests the relationship between employment concentration and permanent employment as the mediator. Specifications (1) and (2) report results for *BFM countries*. Specifications (3) and (4) report results for *SFM countries*. Specifications (1) and (3) are the baseline model. Specifications (2) and (4) include several control variables.

Table 2

Regression results of permanent employment on employment concentration

	Periods with negative correlation between employment concentration & Gini coefficient (BFM countries)		*Periods with positive correlation between employment concentration & Gini coefficient (SFM countries)*	
	Permanent employment		*Permanent employment*	
	(1)	(2)	(3)	(4)
Employment concentration	**0.213**	**0.447*** **	**0.0408**	**0.234*** **
	(0.259)	(0.028)	(0.113)	(0.052)
Unemployment		0.235		-0.049
		(0.146)		(0.180)
Union density		-0.084		0.363
		(0.095)		(0.174)
Constant	86.2***	107.0	85.7***	28.6
	(2.2)	(63.2)	(0.93)	(134.6)
Observations	167	167	309	309
Countries	10	10	16	16
R^2 (within)	0.047	0.624	0.003	0.220
F	0.68	649.8	0.13	0.89
Rho	.869	.961	0.911	0.947

Note: Further control variables: manufacturing employment, workforce (log), foreign direct investment outflow (% of GDP).
Levels of significance: * p<0.05; ** p<0.01; *** p<0.001; standard errors in parentheses.
Source: Own calculations with Stata 15 (xtregar, fe).

The coefficients in specifications (1) and (2) generally support the descriptive evidence. Both yield a large positive coefficient, which especially holds in the model with control variables. In *BFM countries*, an increase of the employment concentration by one percentage point goes along with a statistically significant increase of permanent employment by 0.45 percentage points. In specification (3) for *SFM countries*, the coefficient is small and highly insignificant,

which is consistent with our propositions. However, the coefficient also becomes larger and highly significant in specification (4). Nevertheless, a substantial difference between the coefficients remains, indicating that, in *BFM countries*, employment concentration is a better indicator of this mechanism.

Table 3 reports regression results of sales concentration on employment concentration. Here, a clear pattern arises that supports our suggestions. A large and highly significant coefficient is found in *SFM countries* (now specifications (1) and (2)). In *BFM* countries, coefficients differ and are highly insignificant. Overall, regressions of the mediators on employment concentration yield clear support for *Hypotheses 2* and *3*.

Table 3

Regression results of sales concentration on employment concentration

	Periods with positive correlation between employment concentration & Gini coefficient (SFM countries)		*Periods with negative correlation between employment concentration & Gini coefficient (BFM countries)*	
	Sales concentration		*Sales concentration*	
	(1)	(2)	(3)	(4)
Employment concentration	**0.371*** **	**0.351*** **	**0.116**	**-0.010**
	(0.023)	(0.025)	(0.104)	(0.045)
Unemployment		0.024		-0.015
		(0.057)		(0.039)
Union density		0.038		0.013
		(0.038)		(0.014)
Constant	0.47*	4.275	3.1**	-37.7*
	(0.17)	(30.2)	(0.81)	(16.0)
Observations	394	394	230	230
Countries	17	17	11	11
R^2 (within)	0.470	0.524	0.053	0.343
F	265.5	95.2	1.24	49.2
Rho	.586	.797	0.836	0.959

Note: Further control variables: manufacturing employment, workforce (log), foreign direct investment outflow (% of GDP).
Levels of significance: * p<0.05; ** p<0.01; *** p<0.001; standard errors in parentheses.
Source: Own calculations with Stata 15 (xtregar, fe).

The prior regressions only yield partial support for mediation effects. The causal steps procedure allows for a more thorough test of mediation effects (Baron & Kenny, 1986). At the core of this procedure are three regression models as for example summarised by Wahba and Elsayed (2015). The first model regresses the mediator variable on the independent variables, which we just carried out. The second regresses the dependent variable on the independent variables. The third regresses the dependent variable on both the independent variables and the mediator. Full mediation occurs when the independent variable of interest, in our case employment concentration, is significant in the first two models but insignificant in the third model. The mediator variable in the third model needs to be significant. Finally, mediation is considered to be moderated when its presence differs between the two subgroups (Edwards & Lambert, 2007).

In line with *Hypothesis 2*, Table 4 shows strong mediation effects of permanent employment. Specifications (1) to (4) show results for *BFM countries.* The first two specifications are the baseline model. Specification (1) regresses the Gini coefficient on employment concentration. In line with the building of the subgroup, the coefficient for employment concentration is negative and significant. However, when including permanent employment in specification (2), the coefficient of employment concentrations becomes positive and insignificant, whereas the coefficient of permanent employment is significantly negative. In terms of effect size, mediation is substantial as the coefficient is half the coefficient of redistribution, which has a mechanical relationship to the Gini coefficient. A similar pattern can be found in specifications (3) and (4), which include further control variables. The coefficient of employment concentration becomes positive and insignificant in specification (3) but also other important control variables perform poorly in terms of size and significance.

Also in line with *Hypothesis 2*, in *SFM countries*, mediation effects are not present as specifications (5) to (8) indicate. The coefficient for employment concentration is, as constructed, significantly positive in both baseline specifications (5) and (6). The coefficient of permanent employment is only insignificantly negative and substantially smaller. Surprisingly, the redistribution variable performs poorly. In specifications (7) and (8), many coefficients of important variables including the employment concentration are insignificant except redistribution. It seems that the model is too loaded. However, the pattern of interest remains, as adding permanent employment does not change coefficients of employment concentration.

Table 4

Mediation results of permanent employment based on causal steps procedure

	Periods with negative correlation to employment concentration (BFM countries)				*Periods with positive correlation to employment concentration (SFM countries)*			
	Gini (net incomes)				*Gini (net incomes)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Redistribution	-0.199*	-0.473***	-0.401*	-0.445*	-0.031	-0.010	-0.182*	-0.175**
	(0.065)	(0.095)	(0.168)	(0.144)	(0.094)	(0.104)	(0.066)	(0.059)
Empl. concentration	**-0.090***	**0.119**	**0.058**	**0.169***	**0.155*****	**0.158*****	**0.050**	**0.055**
	(0.038)	(0.068)	(0.067)	(0.067)	(0.038)	(0.031)	(0.024)	(0.027)
Permanent empl.		**-0.277***		**-0.203*****		**-0.082**		**-0.018**
		(0.088)		(0.029)		(0.072)		(0.044)
Unemployment			-0.089	-0.0392			0.075	0.073
			(0.061)	(0.054)			(0.056)	(0.056)
Union density			-0.0262	-0.037			-0.063	-0.056
			(0.048)	(0.031)			(0.045)	(0.047)
Constant	40.7***	71.1***	182.1**	199.4***	28.6***	34.8***	10.5	11.4
	(1.65)	(8.95)	(42.8)	(38.0)	(3.63)	(8.28)	(14.08)	(14.11)
Observations	167	167	167	167	309	309	309	309
Countries	10	10	10	10	16	16	16	16
R^2 (within)	0.258	0.413	0.679	0.756	0.226	0.266	0.587	0.589
F	21.3	137.3	184.1	920.5	9.24	10.12	31.56	31.86
Rho	.945	.953	0.995	0.997	.972	.974	0.968	0.966

Note: Empl. = Employment. Further control variables: manufacturing employment, workforce (log), foreign direct investment outflow (% of GDP).

Levels of significance: * p<0.05; ** p<0.01; *** p<0.001; standard errors in parentheses.

Source: Own calculations with Stata 15 (xtregar, fe).

Table 5 repeats the same regressions as in Table 4 for sales concentration. Contrary to descriptive findings and previous regressions, support for *Hypothesis 3* is present but much less pronounced. Specifications (1) to (4) show results for *SFM countries*. In line with *Hypothesis 3*, the coefficient of employment concentration is reduced and becomes insignificant when sales concentration is included in specification (2). However, the reduction of the coefficient of employment concentration is small and the coefficient of sales concentration is insignificant. A low overall significance of the model (see F-test) could be an important explanation.

Specifications (3) and (4) with further control variables improve the overall significance of the model but many coefficients are insignificant. Thus, the model again appears to be too loaded.

Table 5

Mediation results for sales concentration based on causal steps procedure

	Periods with positive correlation to employment concentration (SFM countries)				*Periods with negative correlation to employment concentration (BFM countries)*			
	Gini (net incomes)				*Gini (net incomes)*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Redistribution	-0.045	-0.047	-0.214**	-0.215**	-0.095	-0.080	-0.070	-0.065
	(0.090)	(0.088)	(0.065)	(0.064)	(0.101)	(0.122)	(0.187)	(0.190)
Empl. concentration	**0.208***	**0.174**	**0.041**	**0.056**	**-0.212**	**-0.214**	**-0.159**	**-0.162**
	(0.079)	(0.086)	(0.027)	(0.034)	(0.121)	(0.121)	(0.098)	(0.099)
Sales concentration		**0.092**		**-0.042**		**-0.052**		**-0.059**
		(0.098)		(0.077)		(0.114)		(0.088)
Unemployment			0.063	0.065			-0.060	-0.061
			(0.059)	(0.057)			(0.106)	(0.105)
Union density			-0.081*	-0.079			-0.101	-0.101
			(0.038)	(0.038)			(0.057)	(0.056)
Constant	28.9***	29.0***	-22.5	-22.3	40.1***	40.0***	165.4*	163.4*
	(3.2)	(3.3)	(19.4)	(19.6)	(1.9)	(2.08)	(52.0)	(52.4)
Observations	394	394	394	394	230	230	230	230
Countries	17	17	17	17	11	11	11	11
R^2 (within)	0.224	0.231	0.652	0.653	0.259	0.261	0.541	0.543
F	3.51	2.53	14.9	29.9	7.51	4.75	20.9	64.5
Rho	.960	.959	0.988	0.988	.961	.962	0.994	0.993

Note: Empl. = Employment. Further control variables: manufacturing employment, workforce (log), foreign direct investment outflow (% of GDP).

Levels of significance: * p<0.05; ** p<0.01; *** p<0.001; standard errors in parentheses.

Source: Own calculations with Stata 15 (xtregar, fe)

In *BFM countries*, mediation effects of sales concentration are even less apparent (specifications (5) to (8)). The models are again less robust. However, the coefficients of employment concentration remain stable between the relevant specifications and sales concentration has a smaller insignificant coefficient. This pattern is in line with *Hypothesis 3*.

According to Zhao et al. (2010), the procedure of Baron and Kenny (1986) is too narrow (Wahba & Elsayed, 2015). The significant relationship between the independent variable of interest and dependent variable must not be given as is the case in several specifications. The essential requirement for mediation (whether full or partial) is that the mediation effect is significant. The mediation effect can be simply calculated via the difference between the coefficients of the independent variable, that is, employment concentration, between the regression models of income inequality with and without the mediators (Mackinnon & Dwyer, 1993). The calculation of the significance of mediation effects is best conducted by means of bootstrapping (Preacher et al., 2007). In order to check for moderated mediation effects, the difference of the mediation effects between the two subgroups should be calculated (Edwards & Lambert, 2007). A homogeneity test can provide the significance of this difference (Altman & Bland, 2003). Table 6 summarises the important coefficients of the prior regression results that seek to identify permanent employment as a mediator. Based on these coefficients, it also reports the mediation effects and their significance by means of bootstrapping analyses with 5000 replications (Preacher et al., 2007).

Columns (4) and (8) in Table 6 report mediation effects of permanent employment in *BFM countries* and *SFM countries*, respectively. It is worth noting that 0.1 significance levels are also reported because generally lower significance levels are a problem when performing analyses based on the subgroup-approach (Edwards & Lambert, 2007). The mediation effect based on the baseline model is negative and substantial in *BFM countries*. In *SFM countries*, there is no effect. However, both coefficients are insignificant, although a large difference in significances exists (p-value of 0.211 versus 0.944). In the controlled model, the mediation effect in *BFM countries* becomes smaller but now significant. In *SFM countries*, again no effect is present. This pattern is line with *Hypothesis 2*.

In order to further test *Hypothesis 2*, the difference of the mediation effects between the two subgroups is calculated, which demonstrates moderated mediation effects (Edwards & Lambert, 2007). Column (9) reports this difference and also provides its significance based on a homogeneity test (Altman & Bland, 2003). In the baseline model, the difference between the two groups of countries is substantial and also the significance is only slightly above 0.1 (p-value of 0.117). In the controlled model, the difference is smaller but this time significant. Hence, *Hypothesis 2* receives strong support from these calculations.

Table 6

Moderated mediation effects of permanent employment based on bootstrapping

	Periods with negative correlation to employment concentration (BFM countries)				*Periods with positive correlation to employment concentration (SFM countries)*				*Comparison*
	PE ~ EC	Gini ~ EC without PE	Gini ~ EC with PE	Med. effect of PE	PE ~ EC	Gini ~ EC without PE	Gini ~ EC with PE	Med. effect of PE	Diff. of med. effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Baseline	0.213	-0.090*	0.119	**-0.209**	0.0408	0.155***	0.158***	**-.0032**	**-0.206**
Controls	0.447***	0.058	0.169*	**-0.11**†	0.234***	0.050	0.055	**-0.005**	**-0.106**†
EC (trim)	1.098**	-0.218*	0.0759	**-.294**	-0.320	0.433***	0.420***	**0.012**	**-0.307**†
Gini (gross)	0.213	0.133	0.211***	**-0.078**	0.0408	0.278*	0.281*	**-0.003**	**-0.075**
Few data	0.213	-0.0899	0.117	**-0.207**	0.0415	0.156**	0.159***	**-0.003**	**-0.204**

Note: EC = Employment concentration. PE = Permanent employment. Med. = Mediation. Baseline model as in Table 4/5. Controls as in Table 4/5. EC (trim) = Employment concentration without large multinationals. Gini coefficient based on gross incomes. Few data on permanent employment. Chile, United States and Switzerland excluded because less than ten observations.

Levels of significance: † p<0.1; * p<0.05; ** p<0.01, *** p<0.001.

Source: Own calculations with Stata 15 (xtregar, fe).

Table 6 also includes important coefficients, mediation effects and their difference based on several robustness tests using the baseline model. As noted earlier, high values of employment concentration are sometimes driven by large multinationals that predominantly employ workers abroad. Thus, we left out large multinationals in the calculation of the employment concentration (row: EC (trim)), thereby holding domestic employment more constant. Using this recalculated employment concentration yields a result that is most consistent with *Hypothesis 2*. In the next row (Gini (gross)), results of regressions are reported that use the Gini coefficients of gross incomes as dependent variable and that leave out the redistribution variable as control variable. Moderated mediation effects are lower and insignificant but they still point into the expected directions. The last row (few data) shows estimations in which countries are dropped that have less than 10 observations on permanent employment (Chile, United States and Switzerland). This does not affect the results of the baseline model. Overall, support for *Hypothesis 2* is predominantly robust.

Tables 7 summarises important coefficients of prior regressions analysing sales concentration as mediator. Again, columns (4) and (8) report mediation effects for *SFM countries* and *BFM countries*, respectively. Column (9) calculates the difference of these mediation effects and its significance. Overall, calculations slightly improve support for *Hypothesis 3*. When using the baseline model, the mediation effect is small in *SFM countries*. Nevertheless, in *BFM countries*, the mediation effect is even smaller. Thus, the sign of the difference is principally in line with *Hypothesis 3* but also small and insignificant. As mentioned above, low overall significance of the model may explain missing statistical significance. In addition, expected directions clearly break down in the model with further control variables, which seems to be too loaded.

Table 7

Moderated mediation effects of sales concentration based on bootstrapping

	Periods with positive correlation to employment concentration (SFM countries)				*Periods with negative correlation to employment concentration (BFM countries)*				*Comparison*
	SC ~ EC	Gini ~ EC without SC	Gini ~ EC with SC	Med. effect of SC	SC ~ EC	Gini ~ EC without SC	Gini ~ EC with SC	Med. effect of SC	Diff. of med. effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Baseline	0.371***	0.208*	0.174	**0.034**	0.116	-0.212	-0.214	**0.002**	**0.032**
Controls	0.351***	0.041	0.056	**-.015**	-0.010	-0.159	-0.162	**0.003**	**-0.018**
EC (trim)	0.480**	0.552***	0.477***	**0.074**	-0.0574	-0.423	-0.435	**0.013**	**0.062**
Gini (gross)	0.371***	0.362	0.301	**0.06**	0.116	0.0478	0.0296	**0.018**	**0.042**

Note: EC = Employment concentration. SC = Sales concentration. Med. = Mediation. Baseline model as in Table 4/5. Controls as in Table 4/5. EC (trim) = Employment concentration without large multinationals. Gini coefficient based on gross incomes. Levels of significance: † p<0.1; * p<0.05; ** p<0.01, *** p<0.001.

Source: Own calculations with Stata 15 (xtregar, fe).

The robustness tests provide some additional support for *Hypothesis 3*. Estimations based on the recalculated employment concentration and the Gini coefficient of gross incomes reveal larger mediation effects of sales concentration, and the difference between both groups of countries also becomes larger. However, all coefficients are still insignificant. Hence, *Hypothesis 3* receives less robust but in principal supportive evidence as mediation effects of sales concentration often point into the expected direction, as clearly do the descriptive findings.

5 Conclusions

The paper theorised that two separate mechanisms can explain an empirical association between an economy's employment concentration and the Gini coefficient of the income distribution. A "bureaucratic-firm mechanism" is based on the observation that large firms often implement equitable pay policies. When such firms are dominant and grow, they will reduce societal income inequality (Davis & Cobb, 2010). The "superstar-firm mechanism" is based on the observation that large employers often capture extraordinary market shares with relatively low levels of regular employment (Autor et al., 2020). When such large firms dominate and grow, they will widen societal income inequality (cf. Cortes & Tschopp, 2020). In a moderated mediation analysis on data for 24 OECD countries from 1990 to 2015, this paper also made a first attempt at disentangling the two mechanisms.

Our paper contributes in three particular ways to the literature that follows the empirical work of Davis and Cobb (2010) in examining how large firms' employment practices influence societal income inequality. First, we extend the empirical findings by Davis and Cobb (2010), who first focused on the relationship between the amount of large-firm employment and aggregate income inequality in a US time series. We provide broader evidence. Among the 24 OECD countries in our study, many showed strongly negative correlations confirming the mechanism detected by Davis and Cobb (2010). But for other OECD countries (or for certain time periods in some of them), we found strongly positive correlations. As a second contribution, we propose and demonstrate that another mechanism is at work by engaging with the literature on superstar firms (Autor et al., 2020) and based on first empirical indications (Cortes & Tschopp, 2020). The mechanism generating positive relationships in many OECD countries provides an explanation for rising inequality that differs from, and complements, the one suggested for the United States, namely that wage inequality increased within large firms (Cobb & Lin, 2017). Third, the moderated mediation analysis allowed for a more detailed consideration whether opposite relationships are linked to different mechanisms. Thereby, we were able to substantiate the initial suggestions by Davis and Cobb (2010) and to demonstrate that negative relationships are likely driven by the bureaucratic-firm mechanism. For example, in Turkey and Chile, rising employment concentration and an increasing share of permanent employment appear to have contributed to decreased societal income inequality in the period 1990 to 2015. In Australia, the exact opposite occurred during this time, that is, employment concentration and permanent employment decreased while income inequality increased. We

also found slight support that positive relationships appear to be mediated by sales concentration, though estimations clearly lack statistical significance. At least in descriptive terms, the superstar-firm mechanism seems to explain increased income inequality in many countries and particularly in Europe. This is for example in line with recent micro-level evidence for Germany (Mertens, 2021).

Our paper also has important policy implications. By documenting strong associations between employment concentration and the Gini coefficient in many countries, it implies that policy makers seeking to reduce societal income inequality should closely track large firms' employment and pay policies. Our main point, the existence of two separate mechanisms, calls for nuanced policies towards large firms. As a first example, when public subsidies are aimed at, or at least tied to the condition of, stimulating regular employment, it seems problematic to grant such subsidies to large firms per se. They should be targeted to bureaucracies with internal labour markets. Only such large employers, when they grow, will significantly expand their staff, hire lower-income individuals on a regular basis, and provide them with generous pay. The danger of granting subsidies to superstar firms is a real one. For the largest 30 stock-listed companies in Germany, it was demonstrated that between 2009 and 2020, they substantially increased dividends and reserves but only marginally personnel expenditures (Sennholz-Weinhardt et al., 2021). As a second example, stronger regulation could limit extractive capacities of superstar firms. In particular, regulation could curb the opportunity of such firms to reduce labour costs by means of outsourcing, an example that was also discussed with reference to German firms (Doellgast et al., 2017; Goldschmidt & Schmieder, 2017).

Some limitations of our study invite future research. First, some measurement issues were resolved in a practical manner in this paper. For example, future work should further explore the implications of foreign employment for the employment concentration measure. In the United States, the share is found to be rather stable (Davis & Cobb, 2010; Lin, 2016), but this might be different in Europe (Deeg, 2009; Jackson & Miyajima, 2007). Similarly, less robust findings for the superstar-firm mechanism call for alternative and perhaps more accurate measures for this mechanism. Employment concentration and sales concentration were highly correlated (0.79), which might still cause problems of multicollinearity when models include both variables (although distinct problems were not identified in such models). While this measure is certainly useful to identify the largest superstar firms in terms of sales in an

economy, it is likely to be inappropriate to identify nuanced superstar dynamics among the largest employers. Analyses based on firm level are more suited to uncover such trends and also to yield insights in terms of employment and pay policies (Kehrig & Vincent, 2021; Mertens, 2021). In general, analyses on the industry or firm level could improve on small sample sizes of country-level data, which were amplified in this paper by taking the subgroup approach to mediation analysis (Edwards & Lambert, 2007). Consequently, regression models were less stable and sensitive to additional control variables. Nevertheless, variables at the macro level might still perform well. For example, in a post-hoc analysis, we examined the trade share of a country as an alternative mediator. It was found to strongly mediate the link between employment concentration and higher income inequality, which suggests that it is more able to capture the extraordinary success of large employers (Table A1 in the appendix). Since it is difficult to integrate this into our theoretical framework, we did not follow this trace (though, there appear to be connections to important contributions on globalisation: Behringer & van Treeck, 2021; Delgado et al., 2002; Helpman et al., 2010).

Secondly, although our panel analysis extended the empirical scope of work on employment concentration and the Gini coefficient, our estimation models neglected a systematic comparison of cross-country differences in levels, which might also be suitable to particularly test the bureaucratic-firm mechanism as the cross-sectional correlation between employment concentration and Gini coefficient is negative (Figure 1).

The final important limitation follows from the decision to conduct a cross-country analysis. While drawing a broad picture of developments, the aggregate level of analysis comes at the cost of failing to capture within-firm developments. Hence, we do not empirically take into account increasing wage inequality within large firms as an important alternative explanation for positive relationships between large-firm employment and income inequality (Cobb & Lin, 2017; Song et al., 2019). Our descriptive findings yield further support that this explanation seems to be more appropriate for large US employers as these firms recorded decreasing sales concentration over the observation period. While within-firm wage inequality did not increase in Germany (Baumgarten et al., 2020), it may be the case that this explanation serves well in other countries, as Mueller et al. (2017) theorise. Beyond that, both explanations can also combine and large superstar firms may also apply less equitable pay policies. Amazon is the most striking example, which, however, did not belong to the largest US employers up to the

end of our study period but now ranks second. Thus, an ongoing empirical assessment of employment concentration and its link to income inequality is vital in future studies.

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Appendix

Table A1: *Moderated mediation effects of trade share based on bootstrapping*

	Periods with positive correlation to employment concentration (SFM countries)				*Periods with negative correlation to employment concentration (BFM countries)*				*Comparison*
	TS ~ EC	Gini ~ EC without TS	Gini ~ EC with TS	Med. effect of TS	TS ~ EC	Gini ~ EC without TS	Gini ~ EC with TS	Med. effect of TS	Diff. of med. effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Baseline	2.510*	0.208	0.0670	**0.141***	2.666	-0.212	-0.211	**-0.001**	**0.143**†

Note: EC = Employment concentration. TS = Trade share. Med. = Mediation.

Levels of significance: † p<0.1; * p<0.05; ** p<0.01, *** p<0.001.

Source: Own calculations with Stata 15 (xtregar, fe).

Contribution No. 3

Employment practices, institutional arrangements, and income inequality:

A country comparison using fuzzy-set QCA

By

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(Working paper)

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Employment practices, institutional arrangements, and income inequality: A country comparison using fuzzy-set QCA

Abstract

Theory suggests that societal income inequality depends on the type of employment practices firms use and that countries' institutions mainly determine this choice. Based on fuzzy-set QCA and panel data for 22 OECD countries between 1996 and 2012, we find strong empirical support for these suggestions. Our analysis reveals how employment-related variables reflecting two different types of employment practices can explain levels of income inequality and how this linkage interacts with countries' institutional arrangements. Precisely, the two different types of employment practices, organisational- versus market-oriented ones, are able to discriminate between high and lower income inequality. However, we also find that important exceptions for part-time work remain, and that market-oriented practices explaining high income inequality not only arise from certain institutional contexts but also pervade very diverse contexts. Thus, firms' employment practices help to understand income inequality in these cases.

1 Introduction

Scholars increasingly argue that changes in organisational policies and structures are crucial for understanding inequality at societal level (Bapuji et al., 2020). Within this research stream, Cobb (2016) makes a plausible case how a well-documented trend towards more market-oriented employment practices may contribute to higher societal income inequality. These practices comprise externalising employment practices such as outsourcing or contract labour (Bidwell et al., 2013) and other non-standard work arrangements (Cappelli & Keller, 2013b). A first important series of studies support the inequality effects of either externalising employment practices (Cobb & Stevens, 2017; Davis & Cobb, 2010; Goldschmidt & Schmieder, 2017; Handwerker & Spletzer, 2015) or non-standard work arrangements such as temporary work (Cazes & Laiglesia, 2015; Pfeifer, 2012).

Moreover, employment practices seem to be a highly relevant factor for income inequality in comparison to other well-established factors. In particular, they seem to explain why different

levels of income inequality arise from countries' institutions. Institutional arrangements are traditionally constituting factors for income inequality (e.g. Rueda & Pontusson, 2000) as empirically supported by latest research (Antonelli et al., 2019). Based on this, Davis (2017) now argues that employment practices are a crucial mechanism for this relationship. In a simple cross-country comparison, he shows that differences in the employment concentration, a proxy variable measuring the amount of large-firm employment and thus tracking the degree of organisational- versus market-oriented employment practices, seem to explain why common institutional clusters record different levels of income inequality.

Although all of these studies yield first important indications, more robust empirical support for the suggestions by Cobb (2016) and Davis (2017) is pending. To gain that, the following two points should be addressed. First, analyses based on country level require proxy variables in order to capture the use of market-oriented employment practices (Batt & Appelbaum 2017). Whereas studies at firm level are able to provide very precise measures of outsourcing (Goldschmidt & Schmieder, 2017), analyses at country, state or industry level use rather crude proxy variables such as the employment concentration (Davis & Cobb, 2010). Because this proxy variable can be potentially flawed, its validity should be addressed more accurately. Indeed, recent research for the United States shows that employment concentration as used by Davis (2017) may not be a good proxy for organisational-oriented practices as equitable pay practices have eroded *within* large firms (Cobb & Lin, 2017). Drawing on available country-level data on other market-oriented employment practices such as non-standard work arrangements can be an important starting point for testing the validity of such proxy variables.

Secondly, descriptive comparisons such as the one by Davis (2017) should be followed by more fine-grained analyses. Especially configurational methods based on set theory are useful to test the claimed relationships between variables and particularly their levels. Moreover, these methods have the important advantage that they can deal with complex causality between many variables. Previous research has scrutinised inequality effects of several interconnected institutional factors with configurational methods (Judge et al., 2014). Nevertheless, this study only paid little attention to employment practices and organisational structures, leaving many questions regarding their explanatory power concerning income inequality, their interconnectedness between different but conceptionally related employment variables and major institutional arrangements open (c.f. Bapuji et al., 2020).

In this paper, we therefore address the question of how externalising employment practices and non-standard work arrangements combine to explain income inequality and how such links arise from institutional environments. As outlined, theory implies that firms' employment practices interact with a multitude of institutional factors when affecting income inequality. Given this type of complex causality, we apply fuzzy-set qualitative comparative analysis (fs/QCA), a method that has been used before to uncover causal links in cross-country data (Pajunen, 2008; Schneider et al., 2010). Similar to our study, it has been recently applied to analyse the role of entrepreneurial activity as a further important factor in explaining income inequality and its embeddedness in different institutional contexts (Lewellyn, 2018).

Based on panel data for 22 OECD countries between 1996 and 2012, we compute causal paths to income inequality as measured by a country's Gini coefficient of gross incomes. We track firms' employment practices by means of the employment concentration (Davis & Cobb, 2010), and aggregate data on the use of part-time and temporary work. The institutional arrangements of employment practices are selected according to the varieties of capitalism approach (Amable, 2003; Hall & Soskice, 2001) as suggested by Davis (2017). Unfortunately, although research has been motivated by trends in the United States, missing data on non-standard work arrangements led us to exclude it from the analysis. Nevertheless, first empirical indications and intensive qualitative documentations already show a clear direction of potential results. As evidence is missing for other countries, an overarching analysis for them is pending.

Our findings support several propositions made in the literature but also give rise to question some arguments. Most remarkably, we find that employment practices do matter: Lower employment concentration is a necessary condition and the core of all sufficient configurations explaining high income inequality; high employment concentration is found in most of the paths leading to lower income inequality. Moreover, lower (high) employment concentration, in many cases, combines with frequent (less frequent) temporary work, underlining employment concentration's validity as an indicator for internal labour markets with long-term employment. In contrast to that, our results for part-time work do not point into one direction as a frequent use can be found in countries with high or lower income inequality. This finding seems to hinge on country-specific legislation on their organisational advantages (Hipp et al., 2015). Given this legislation, we suggest that part-time work may also function as an enabler of large-firm employment under equitable pay policies.

In general, we find that different employment practices seem to arise from the institutional clusters based on Amable (2003): High income inequality and lower employment concentration are present in the market-based or Mediterranean model; lower income inequality and high employment concentration are found in the social-democratic or the Continental European model. However, special cases remain suggesting that employment practices leading to high income inequality can occur irrespective of the major institutional landscape, which is particularly the case in Germany. This result suggests that employment practices seem to be a further important indicator for capturing trends of liberalisation in different countries with highly diverse institutions (Thelen, 2014). For policy makers seeking to reduce income inequality this means that they should closely observe firms' employment practices and counteract with legislation strengthening collective representation in inter-firm production networks (e.g. Doellgast et al. , 2017).

The remainder of the paper is structured as follows: The first two sections elaborate on the theoretical underpinning of the linkages between employment practices, institutional arrangements and income inequality. Based on this, three configurational propositions are laid forward. These are subsequently tested by means of a country comparison using fs/QCA. First, the general procedure of this method, the calibration strategy and the applied data are introduced. Results and further supplementary robustness tests, including a panel fs/QCA approach, are then reported. The following discussion not only draws implications in light of the formulated propositions but also sets up two new theoretical propositions and discusses them in terms of policy measures. The paper ends with an elaboration of major limitations, thereby revealing further research opportunities.

2 Income inequality and employment practices

Empirical research has shown that across the last three decades, income inequality has increased in most developed countries (Foerster & Tóth, 2015; Ostry et al., 2014; Roser & Cuaresma, 2016). In many of them, income inequality is at its highest level since data collection (Organisation for Economic Co-operation and Development, 2015). In addition to this overall trend, stark variation between countries and differences in country-specific changes remain (Alvaredo et al., 2013; Roser & Cuaresma, 2016). These differences in levels of income inequality are the focus of our country comparison.

The increase in income inequality in most OECD countries has largely occurred in terms of wages and salaries, which account for 75 percent of household incomes of working-age adults (Organisation for Economic Co-operation and Development, 2011). This places the focus on the contribution of employers to rising trends and persistent cross-country differences of income inequality. Analysing employers' role in the creation of income inequality, scholars of early organisational sociology and today's economists both have pointed to employment practices as being highly responsible for increasing income inequality (Baron & Bielby, 1980; Song et al. 2019). Despite of that, only few scholars from business research and particularly Human Resource Management have addressed this important topic theoretically as well as empirically.

One study that has systematically theorised the linkage between employment practices and income inequality is Cobb (2016). Basically, Cobb argues that income inequality has increased because firms have dismantled their internal labour markets and have adopted an employment strategy based on externalising employment practices such as outsourcing or contract labour and other non-standard work arrangements. In terms of empirics, the rise of such employment practices has been well documented in sample analyses for both externalising employment practices (Cappelli & Keller, 2013a; Goldschmidt & Schmieder, 2017; Kalleberg & Marsden, 2005) and non-standard work arrangements (Brady & Biegert, 2018; Katz & Krueger, 2019). However, the empirical recording on the country level is still a major challenge. While data is available for the prevalence of non-standard work arrangements (OECD, 2015), the measurement of externalised employment has only been addressed via proxy variables because the degree of outsourcing in a country remains to be an empirical black box (Batt & Appelbaum 2017; Bernhardt et al., 2016). Besides proxy variables such as occupational concentration (Handwerker & Spletzer, 2015), again, a study by Davis and Cobb (2010) also suggests a measure: the employment concentration of a country. Both the theoretical suggestions and the employment concentration will be subsequently presented in more detail, yielding our first two theoretical propositions.

The employment practices of firms have been characterised as being either following a market or an organisational orientation (Jacoby, 2005). Based on this, Cobb (2016) theorises that an economy whose firms use organisational-oriented employment practices will have lower income inequality than economies whose firms rely on market-oriented employment practices, other things being equal. Companies that follow an organisational orientation establish an

internal labour market (Doeringer & Piore, 1971). In such a market, fairness perceptions are present, leading to the use of formal job evaluations (Dulebohn & Werling, 2007). As a result, wage structures are compressed, thus raising the income of lower-level employees (Weil, 2014). By contrast, with market-oriented employment practices equity norms and job evaluations are not present any longer. Instead, workers are paid based on competitive market prices for their performance, skills and references, which leads to wages being closer to workers' marginal productivity (Weil, 2014). In fact, significant wage penalties have been identified for externalising employment practices and non-standard work arrangements (Goldschmidt & Schmieder, 2017; International Labour Organization, 2016; Katz & Krueger, 2019). First studies also show how wage inequality is increased due to penalties for outsourcing (Goldschmidt & Schmieder, 2017; Handwerker & Spletzer, 2015) and temporary work (Cazes & Laiglesia, 2015; Pfeifer, 2012).

To track the degree of firms' use of externalising employment practices within a country, Davis and Cobb (2010) suggest a convenient measure: the employment concentration. This measure is defined as the employment share of the ten largest firms in a country. Although ten firms only represent a tiny fraction of a country's firms, it is supposed to be an indicator for a broad-based trend towards relatively larger companies. Accordingly, Davis and Cobb (2010) show for the United States that the share of the ten largest firms correlates strongly with that of the 25 or 50 largest firms. Given that, they suggest that the employment concentration captures the presence of internal labour markets because they were traditionally implemented in large firms (Cobb & Lin, 2017; Kalleberg & Van Buren, 1996). However, both the unwinding of internal labour markets with significant downsizing (Jung, 2015) and the adoption of externalising employment practices have exactly taken place in large firms (Bidwell et al., 2013; Cappelli & Keller, 2013a; Goldschmidt & Schmieder, 2017). Therefore, the increasing use of externalising employment practices should be captured by lower employment concentration.

Finally, Davis and Cobb (2010) yield support for the claims that are later made by Cobb (2016): Countries with lower employment concentration show higher income inequality in terms of a higher Gini coefficient in 2006, and a time series for the United States between the years 1950 to 2006 shows a strong negative correlation between employment concentration and the Gini coefficient (cf. Cobb & Stevens, 2017 for US states). Correspondingly, this leads us to our first configurational proposition:

*Proposition 1: High (lower) employment concentration sufficiently explains lower (high) income inequality (*C→~G; ~C→G).

Although previous results reveal strong relationships between employment concentration and income inequality, it is still unclear whether lower employment concentration generally reflects an increase in market-oriented employment practices such that further empirical tests are crucial. Of course, qualitative documentations for the large US companies as in Davis and Cobb (2010) show that this was likely the case. However, a more recent study by Cobb and Lin (2017) also reveals that internal labour markets, though traditionally strong, have been declining *within* the largest US companies and thus contributing to higher aggregate wage inequality. A likely reason for that is a shift in the economy towards large service firms as Davis and Cobb (2010) have also started to point out. The largest US employers are now, for example, Walmart or McDonalds. As these companies are known for their use of market-oriented practices and particularly non-standard work arrangements, employment concentration in the United States is likely to be an increasingly ambiguous proxy for the use of internal labour markets and thus may be also linked to higher income inequality. As this observation is contrary to *Proposition 1*, it clearly demonstrates the need to test the validity of such a proxy variable. Nevertheless, it can also be possible that the United States is an outlier in this respect. Average data for OECD countries show that fifty percent of temporary and part-time work in the OECD area are exactly found in smaller firms (OECD, 2015). Thus, it may be still reasonable to assume that employment concentration is able to reflect internal labour markets that are characterised by full-time and long-term employment (Cappelli, 2001) and thus less prevalent part-time and temporary employment. Accordingly, we propose:

Proposition 2: High (lower) employment concentration combines with less frequent (frequent) non-standard work arrangements when sufficiently explaining lower (high) income inequality (C*~(PT+T)→~G; ~C*(PT+T)→G).

3 Employment practices and institutional arrangements

Davis (2017) suggests that employment practices arise from their institutional environments. Institutions may enlarge or constrain the availability of business strategies (Brewster et al., 2006). Based on the suggestions by Davis (2017), this chapter elaborates which kind of

institutional arrangements may be important for firms' use of employment practices and thereby also for income inequality.

The institutional landscape of a country is vast. Therefore, scholars usually compare countries in a more holistic way with respect to their organisational arrangements of production regimes and the underlying institutional environment. Here, different frameworks of national economic organisation have been offered and used in applied inequality research. In this paper, we use the varieties of capitalism (VOC) approach (Hall & Soskice, 2001). Next to the business system approach (Whitely, 2000) used by Judge et al. (2014) and Lewellyn (2018), the VOC approach was one of the first to be linked to income inequality (Rueda & Pontusson, 2000) and is still in use in recent work (Antonelli et al., 2019). The basic rationale of the VOC approach is the differentiation between two forms of efficiently working economies that primarily differ in their degree of non-market coordination: coordinated market economies (Germany as prime example) and liberal market economies (United States as prime example) (Hall & Soskice, 2001). Overall, the institutional arrangements in liberal market economies will produce higher income inequality (Rueda & Pontusson, 2000), which is clearly supported by recent work (Antonelli et al., 2019).

In subsequent work, further country groupings have been introduced (Amable, 2003). These are market-based capitalism (Australia, United Kingdom, United States and Canada), Asian capitalism (Japan and Korea), Continental European capitalism (Switzerland, the Netherlands, Ireland, Germany, France, Norway, Belgium and Austria), social-democratic capitalism (Denmark, Finland and Sweden) and Mediterranean capitalism (Greece, Italy, Spain and Portugal). Recent research shows that these clusters actually bring about different levels of income inequality (Antonelli et al., 2019). Importantly, Davis and Cobb (2010) indicate that the link between employment concentration and income inequality seems to integrate well into these country groupings. In line with these statements, we propose:

> *Proposition 3: High employment concentration and less frequent non-standard work arrangements leading to lower income inequality are primarily found in the social-democratic, the Continental European model and in the Asian model. Lower employment concentration and frequent non-standard work arrangements leading to high income inequality are found in the Mediterranean and the market-based model.*

In addition, Davis (2017) argues that the five domains that the VOC approach suggests might have an influence on employment practices and thus income inequality: labour market regulation, educational system, product market competition and capital market structure.[1] Recent research has obviously addressed some of the linkages between institutional arrangements, employment practices and income inequality that we want to study. This can be seen most clearly for the direct relationships between institutions and income inequality: Labour market regulation is recognised to inhibit a crucial role to reduce wage inequality (Koeniger et al., 2007). The same applies to the education system as it lowers skill premia received by a small group of highly skilled employees, generally increases productivity and thus leads to a larger amount of higher paying jobs (Roser & Cuaresma, 2016). Income inequality is also high in countries where firms predominantly rely on external financing via stock markets rather than credit financing via banks (Lewellyn, 2018), and the deregulation of product markets has been found to be an important factor for higher income inequality (Antonelli et al., 2019).

Research also provides some insights on the relationship between these institutions and the type of employment practices companies usually use. Most obviously, employment protection legislation as a form of labour market regulation is intended to create open-ended full-time jobs that are common in large firms (Hipp et al., 2015). Workers with lower levels of education have the highest and workers with high levels the lowest share in non-standard work arrangements (OECD, 2015). The increasing financialisation of non-finance firms and an alignment of their corporate governance to the demands of financial markets (Krippner, 2005; van der Zwan, 2014) are also believed to lead to more market-oriented employment practices (Cobb, 2016). In line with that, several studies yield support for a positive relationship between financialisation and workforce downsizing (Goergen et al., 2009; Jackson, 2005; Jung, 2015; Lin, 2016). Finally, the deregulation of product markets and a corresponding increase in product market competition encourages firms to adopt a market orientation (Jacoby, 2005) and thus market-oriented employment practices such as non-standard work arrangements (Kalleberg, 2011). According to Davis (2009), extensively regulated product markets made the emergence of large-scale monopoly-like companies in the United States possible and it was the aim of deregulation to increase product market competition and to limit firm sizes (Deeg, 2012). Thus, outsourcing is mainly found in hypercompetitive and volatile markets (Bernhardt et al., 2016).

[1] The fifth domain is the social security system. We do not consider this domain as our focus is on the distribution of gross incomes.

Although the previous explanations may sound compelling and thus could be the basis for further configurational propositions, some opposing argumentations coexist. For example, research has identified an inconclusive connection between the overall strictness of employment protection legislation (EPL) and the prevalence of non-standard work arrangements (Hipp et al., 2015). The reason for this is that the overall EPL, which is also used in our analysis, can be strongly shaped by increasing protection for permanent workers and less by decreasing protection for temporary workers. Under this form of partial deregulation, strict overall EPL can also encourage and actually increase the use of temporary employment (Organisation for Economic Co-operation and Development, 2010). Accordingly, it has been found that strict EPL for permanent workers combined with weak protection for temporary workers leads to a high incidence of temporary or part-time work (Lee, 2013).[2]

Another example for an ambiguous theoretical argumentation is the emerging phenomena of superstar firms, which are extraordinarily productive and capture high market shares (Autor et al., 2020). Superstar firms arise from highly competitive product markets that still allow for monopolistic trends due to winner-take-most dynamics. Given this dominance in terms of sales and profit concentration and the fact that sales growth outweighs employment growth (cf. Kehrig & Vincent, 2021), they are perceived to be a highly important reason for increasing income inequality (Autor et al., 2020). The possibility of superstar firms has important implications for our theoretical propositions: While product market competition is again linked to higher income inequality (cf. Antonelli et al, 2019), it may, contrary to the assertations made by Davis (2009), also foster the emergence of superstar firms with larger staff sizes and thus higher employment concentration. Indeed, latest research for Germany shows that large superstar firms are also the largest employers (Mertens, 2021). Hence, superstar firms are a further explanation besides large service companies why, contrary to *Proposition 1*, employment concentration may be linked to higher income inequality in certain institutional contexts. Similar to service firms, also superstar firms seem to heavily rely on market-oriented employment practices outside their firm boundaries (Autor et al., 2020), which may confound *Proposition 2*.

[2] Accordingly, Hipp et al. (2015) find that research is unanimous about the relationship between decreasing EPL for and increasing use of temporary workers.

Given these theoretical ambiguities and the fact that we address linkages between multiple institutional arrangements and employment practices, we refrain from a long series of a priori configurational propositions that would even arise under crude theoretical simplification. Instead, we will directly turn to our empirical analysis and findings, which will, of course, reflect an even more pronounced complexity between the measured concepts. Afterwards, we seek to interpret these findings in light of our basic configurational propositions but also with regard to more detailed insights. This includes the insights that we have just sketched before but also new ones (e.g. on equalising effects of part-time work). This comparison between previous and our findings also allows to point out important differences of our results, which are the basis for an explorative effort to making our own theoretical propositions. In terms of methodology, qualitative comparative analysis is a well-suited method to be used for such an endeavour.

4 Qualitative Comparative Analysis

We employ fuzzy-set qualitative comparative analysis (fs/QCA) in order to examine the configurational propositions formulated so far and to elaborate new configurational propositions. As applied in other cross-country data analyses (Pajunen, 2008; Schneider et al., 2010), this set-theoretic method is well suited to analyse levels of variables, which are the focal interest of our country comparison.

Most importantly, fs/QCA is able to explore the complex interconnectedness between the relevant variables and their levels. In contrast to that, regression analyses, which are usually applied in the field of income inequality, seek to identify inequality effects that are net of other control variables. However, when multiple variables are interconnected, the search for net effects may be misleading as actual effects can be much larger. For example, financialisation triggers staff downsizing (Jackson, 2005; Lin, 2016) and poses a major factor for income inequality (Lin & Tomaskovic-Devey, 2013). Controlling for financialisation would substantially reduce the actual effect of downsizing. While there are careful approaches using regression analyses and several interaction terms (Antonelli et al, 2019; Behringer & van Treeck, 2021), previous research has already analysed the inequality effects of several interconnected institutional factors by means of fs/QCA (Judge et al., 2014). Beyond that, more recent research has also started to apply fs/QCA in order to explore empirical connections between firm-related variables, institutional contexts and income inequality. In this way,

Lewellyn (2018) uses these empirical explorations as a basis for new configurational propositions on the role of entrepreneurial activity in generating income inequality.

In terms of procedure, fs/QCA is able to explore complex causality because it analyses set-theoretic linkages between variables' levels in terms of sufficiency and necessity (Ragin, 2000, 2008). These linkages are then referred to as causal paths. The procedure of fs/QCA brings further important advantages. Importantly, it enables that differing causal paths may produce the same outcome – something that is not possible with linear effects in regression analysis. Thereby it also allows for asymmetric causation – the causal paths explaining high income inequality may include other factors than paths explaining lower income inequality. In order to reveal set-theoretic linkages, variables are first translated into sets using further knowledge about the concepts under examination. Fs/QCA then searches for single conditions or configurations of conditions that are sufficiently (respectively necessarily) related to the outcome.

4.1 Calibration strategy

Calibration is the translation process from raw data into set membership values for each country-year observation (cases). The calibration strategy for nearly all sets in this analysis is driven by a comparison between the data used and a larger dataset containing nine more countries and up to nine further periods (1990 to 2015). We use the minimum, the 75th percentile (as we are searching for high values of each set) and the maximum of this larger dataset as anchors for set membership scores of 0.05, 0.5 and 0.95, respectively. As literature does not offer any scheme for defining anchors for most of the sets (especially income inequality), we employ this strategy in order to meet literature's demand to use knowledge external to the data at hand (Schneider & Wagemann, 2012). Only the set for "financialisation" is calibrated with 1 as 0.5 anchor, as suggested by Lewellyn (2018)[3], resulting in the anchors depicted in Table 1.

[3] Values higher than 1 indicate that the market capitalisation of listed companies is higher than domestic bank credits provided to the private sector (Lewellyn, 2018).

Table 1

Descriptive statistics of raw variables, sets and their calibration anchors

Variable / Set	Mean	Std. Dev.	Min	Max	TFNM	0.5 anchor	TFM
Gross Gini	0.48	0.04	0.39	0.60	0.30	0.49	0.60
G	0.46	0.15	0.17	0.95			
Employment concentration	6.66	5.52	0.51	26.26	0.40	7.03	26.77
EC	0.37	0.26	0.05	0.95			
Share of part-time work	15.28	7.41	2.79	37.62	1.59	19.20	38.55
PT	0.36	0.23	0.06	0.95			
Share of temporary work	34.19	16.01	3.72	76.24	3.72	44.62	78.24
T	0.36	0.24	0.05	0.94			
Employment protection legislation	2.35	0.67	1.10	4.58	0.26	2.65	4.83
E	0.41	0.17	0.12	0.93			
Human capital investments	3.11	0.43	1.88	3.72	1.80	3.47	3.74
H	0.41	0.22	0.05	0.94			
Product market competition	0.37	0.08	0.27	0.62	0.15	0.40	0.62
P	0.43	0.20	0.18	0.95			
Financialisation	0.84	0.61	0.01	5.05	0.01	1.00	5.05
F	0.34	0.20	0.05	0.95			

Note: TFNM = threshold of full non-membership. TFM = threshold of full membership.

Source: Own calculations.

4.2 Outcome set and conditions

Data for countries' Gini coefficients of gross incomes (before taxes and transfers) are derived from the Standardized World Income Inequality Database (Solt, 2016). The first two rows of Table 1 summarise the variable Gross Gini and the outcome set "high income inequality" (G). With a gross Gini coefficient of only 0.39, Switzerland in the year 2000 has the lowest membership value of 0.17 in the set of countries yielding high income inequality, while Hungary in the year 2012 displays a gross Gini coefficient of 0.6 and has the highest membership value in the set G (0.95).

We employ two groups of conditions: three sets that represent aggregate employment practices of a country's firms and four sets that resemble the institutional arrangements of a country. The first group consists of the sets "high employment concentration" (EC), "frequent part-time work" (PT) and "frequent temporary work" (T). The employment concentration is defined as the share of the working population of a country working in the ten largest companies of that

country (Davis & Cobb, 2010). Data for the employment figures in the ten largest listed companies of a country are collected from Worldscope Global Database (Thomson Reuters/Refinitiv). A focus on listed firms is appropriate as these firms are more inclined to engage in downsizing initiatives (Jung, 2015; Lin, 2016). A problem, however, is that the underlying employment figures also include foreign employment. Therefore, our measure excludes employment figures of several internationally expanding companies in countries with a rapidly growing employment concentration and figures of international employment agencies. Finally, we intentionally dropped Luxembourg due to its extreme level of employment abroad. Data for the labour force are obtained from the World Bank and include employed persons and job-seekers. We use OECD data for the shares of part-time and temporary work. The OECD defines temporary work as dependent employment with a pre-determined termination date and part-time work as main jobs of employed persons (including self-employed) that are performed less than 30 hours per week.

The second group consists of four conditions, which aim to identify the institutional arrangements of a country, namely its employment protection legislation (E), its human capital investments (H), its level of product market competition (P) and its degree of financialisation (F). Human capital investments are measured by the Human Capital Index of the Penn World Tables 9.0 (Feenstra et al., 2015). This measure is based on average years of schooling and on estimated returns to education, thereby capturing the quantity and quality of human capital investments. We employ a measure for the reliance of economies on equity financing versus bank lending in order to gain an understanding of the degree of financialisation in a country. By following Hotho (2014) and Lewellyn (2018), we divide the market capitalisation of domestic companies as the percentage of the gross domestic product by the share of domestic bank credits to the private sector. Data are retrieved from the World Bank.[4] The strictness of employment protection legislation is measured using the overall Employment Protection Legislation Index provided by the OECD. This index varies between zero and six and reflects the degree of legislative protection for regular employment, temporary employment and collective dismissal. We opted for this measure because we do not want to restrict our analysis either to regular or to temporary work. Although the deregulation of product markets could also be measured by means of a common OECD index, we refrained from this measure due to data

[4] We use slightly different World Bank data on domestic bank credits based on Judge et al. (2014). However, our measure is highly correlated with the one employed by Hotho (2014) and Lewellyn (2018) (r.=0.87).

availability. Instead, we approached the actual degree of product market competition using the labour income share (the part of national income accruing to wages) as a proxy, following recent arguments by the OECD (Pike, 2018). These arguments trace back to Autor et al. (2020), who show that higher product market competition leads to increased product market concentration, where some highly productive firms (termed superstar firms) dominate markets and capture high profits. In turn, they identify a negative relationship between product market concentration and the labour income share within industries. In this way, we are also able to test the above-mentioned claims whether employment concentration can be linked to *high* income inequality due to the presence of superstar firms and lower labour income shares. Following the conception of Pike (2018), the inversion of the labour share (1 - labour income share, i.e. the capital income share) is used to measure the strength of product market competition.[5] Data for the labour income shares are retrieved from the OECD.

In total, our sample contains data from 22 OECD countries and 17 subsequent periods (1996-2012). Unfortunately, our sample does not exactly match the country groupings suggested by Amable (2003). To compensate for limited data availability for Ireland, Canada, South Korea and the United States, we included three countries from East Europe (Czech Republic, Hungary and Poland), which also form a separate institutional cluster in more recent research (Antonelli et al., 2019). We also included two less affluent OECD countries (Mexico and Turkey). The difficulties in the calculation of the employment concentration for earlier years in Eastern European countries determined 1996 as our starting year. In actual fact, the 1990s are a critical period where many firms began to downsize their workforce as a result of a shareholder value orientation (Lazonick & O'Sullivan, 2000), to outsource services to external suppliers (Kalleberg & Marsden, 2005) and to more frequently apply non-standard work arrangements (Hipp et al., 2015). Besides Luxembourg, further OECD countries could not be included because of measurement difficulties beyond this year (Baltic States, Iceland, the Slovak Republic and Slovenia) and missing data on further conditions (Chile and Israel). Descriptive statistics and calibration anchors can be obtained from Table 1.

[5] Besides that, the labour income share is considered to be an important mediating factor between aggregate national income and its personal income distribution. It is highly correlated with different measures of income inequality including Gini coefficients (Bengtsson & Waldenstroem, 2018).

5 Results

5.1 Analysis of necessary conditions

The analysis of necessary conditions for high income inequality surprisingly reveals four necessary conditions. These are the absence of high employment concentration (~EC), the absence of frequent part-time work (~PT), the absence of strict EPL (~E) and the absence of high financialisation (~F). These results are robust to the relevance tests suggested by Schneider and Wagemann (2012, p. 236) and to a check for skewed membership (Schneider & Wagemann, 2012, p. 246).

The absence of high employment concentration being necessary for high income inequality is highly in line with *Proposition 1*. The result for the absence of strict EPL is also in line with common research findings (Koeniger et al., 2007). A more detailed discussion is relevant for ~PT and especially for ~F. The absence of part-time work being necessary for high income inequality contradicts the first intuition asserted by Cobb (2016) and thus *Proposition 2*. A potential reason for this finding could be that part-time work is not necessarily precarious (Kalleberg et al., 2000, p. 273). Instead, it can also offer opportunities for participating in the labour market (Hipp et al., 2015). Therefore, its absence might inhibit such opportunities, potentially increases unemployment and thus income inequality.

Even more puzzling is the finding concerning the absence of high financialisation. Many authors deem a grown financialisation to be a prominent driver of corporate downsizing activities. In contrast to that, our results suggest that *lower* financialisation seems to be the trigger of high income inequality. The results of our necessity analysis are robust regarding relevance tests (Schneider & Wagemann, 2012), but consistency and coverage values of <1 indicate that not each case is covered by this solution (Table 2). The following analysis of sufficiency will further clarify these surprising findings. It will disentangle the impacts of part-time employment between countries and their different institutions. Also, it will reveal that financialisation is still an important trigger of income inequality, but other pathways to high income inequality coexist (which can also have the *presence* of strict EPL at its core).

Table 2

Necessity of conditions for high income inequality

Condition	Consistency	Coverage	Relevance	Condition	Consistency	Coverage	Relevance
EC	0.58	0.72		**T**	0.63	0.79	
~EC	**0.91**	**0.66**	**0.63**	**~T**	0.88	0.63	
PT	0.62	0.78		**H**	0.70	0.78	
~PT	**0.91**	**0.66**	**0.62**	**~H**	0.88	0.68	
E	0.77	0.85		**P**	0.73	0.77	
~E	**0.91**	**0.71**	**0.71**	**~P**	0.88	0.70	
~F	**0.94**	**0.65**	**0.6**				
F	0.62	0.82					

Note: Thresholds for necessity: 0.9 in consistency, 0.5 in coverage and 0.5 in relevance.
Source: Own calculations.

5.2 Analysis of sufficient conditions

With respect to the findings of necessary conditions we applied the Enhanced Standard Analysis (Schneider & Wagemann, 2012). This procedure is used to avoid untenable assumptions about logical remainders. After applying a frequency threshold of 2 and a symmetry threshold of 0.75, we obtain the final truth table presented in Table A1 in the appendix. Using a symmetry threshold instead of a raw consistency threshold is meant to exclude paradoxical truth table rows from the solution, so that no configuration that would also lead to the negation of the outcome, can bias the results. Of 128 possible truth table rows 40 rows remain, which implies a limited diversity of 31.25 percent.[6]

After implementing the simplifying assumptions derived from the theoretical propositions, the analysis results in four causal paths (see Table 3), which constitute the enhanced most parsimonious solution. The solution term is sufficiently consistent (0.98) and empirically relevant (0.64) for further analysis. Each of these paths is a country-specific configuration leading to high income inequality.[7] None of them consists of only one condition, which points to complex causality. Only the absence or presence of multiple employment-related and institutional conditions are sufficient to produce the outcome.

[6] Caveat: Due to the Enhanced Standard Analysis there are more truth table rows used for minimisation, but they do not have observations.
[7] The four paths resemble country-specific configurations implying high income inequality. While most other cases do not contradict their statements, they nevertheless do not have high membership scores in the outcome set. This result is attributed to the quite exclusive anchor setting and the size of the dataset.

Table 3

Causal paths sufficiently related to high income inequality

Conditions / Paths	**1**	**2**	**3**	**4**
High employment concentration (EC)	⊗	⊗	⊗	⊗
Frequent part-time work (PT)	⊗	●	⊗	●
Frequent temporary work (T)	●	⊗	●	●
High human capital investments (H)	⊗		⊗	●
Strict employment protection legislation (E)	⊗	⊗	●	●
High product market competition (P)		⊗	⊗	⊗
High financialisation (F)	●	●	⊗	⊗
Raw coverage	0.4	0.39	0.48	0.38
Unique coverage	0.03	0.08	0.07	0.02
Consistency	1	0.99	0.99	1
Cases	Poland (02-07)	United Kingdom (96-01)	Portugal (05-12)	Germany (04, 09, 10)
Solution consistency	0.98			
Solution coverage	0.64			

Note: Hollow circles mark the absence of a condition while full circles mark the presence of a condition.

Source: Own calculations.

All paths towards high income inequality have the absence of high employment concentration in common. This reveals strong support for *Proposition 1*, suggesting that large service firms or superstar firms do not seem to shape high *levels* of income inequality outside the United States. Furthermore, in three of the paths, the absence of high employment concentration is, in

line with *Proposition 2*, found in combination with frequent temporary work.[8] Hence, lower employment concentration does seem to indicate the absence of internal labour markets with long-term employment.

For part-time work, the findings now reveal a highly ambivalent character. In the United Kingdom and Germany, frequent part-time work is related to high income inequality as stated in *Proposition 2*. Given that temporary work is less frequent in the United Kingdom, Germany is the only case where *Proposition 2* exactly fits. In contrast to these findings, less frequent part-time work is related to high income inequality in Portugal and Poland. The analysis of necessity has shown that this finding is very robust and a missing opportunity-generating function of part-time work might be a reason for high income inequality in these countries. The following consideration of institutional linkages provide further support for such an interpretation and in general an explanation for the dual-face character of part-time work.

The four paths display interesting patterns concerning the interaction between employment practices and institutions. Starting with the connection between EPL and temporary work, two contrasting linkages can be found as theoretically argued (Hipp et al., 2015). On the one hand, the absence of strict EPL seems to drive results in Poland and the United Kingdom.[9] On the other hand, the two paths for Portugal and Germany are determined by strict EPL in combination with frequent temporary work. Partial deregulation is the likely reason here. In particular, Portugal is one of the countries that scores highest in overall EPL (3.56 in 2012) but has little legislation regarding temporary work (1.94 in 2012) and Germany also witnessed pronounced partial deregulation for temporary work (Hipp et al., 2015). In addition, both countries have country-specific legislations that exclude temporary agency workers from collective bargaining (Hipp et al., 2015).

The linkages between EPL and part-time work are less clear as every path differs. This means that both variables combine in every combination that is possible (equal to four paths). Hence,

[8] In the United Kingdom, income inequality is high despite less frequent temporary work. Cazes and Laiglesia (2015) provide a potential reason for this finding. For the countries of the three paths, they find that in Germany, wage-inequality is particularly high within the group of temporary workers and that temporary work is highly concentrated in low-paid work in Poland and Portugal. Importantly, both sources of inequality due to temporary work are not present in the United Kingdom.

[9] Less strict EPL also explains why there is less use of frequent temporary work in the United Kingdom as workers can be anyway more easily dismissed (Cazes & Laiglesia, 2015).

EPL is not suitable to explain the identified ambivalence of part-time work. However, a closer observation of country-specific legislation helps. The United Kingdom and Germany, even though different in their EPL, both have some country-specific legislation in common, as they legally exclude part-time workers from organisational advantages (Hipp et al., 2015).[10] For Portugal and Poland, by contrast, a consideration of legislation is not necessarily insightful as frequent part-time work is absent. However, the next institutional domain may shed more light on this puzzle.

In Portugal and Poland, high human capital investments are absent. This absence of high human capital investments exactly combines with the absence of frequent part-time work. This suggests that less frequent part-time work seems to particularly fuel income inequality when general access to education is missing. Complementarily to the literature on its opportunity-generating function, the absence of frequent part-time work may then lead to limited labour market opportunities and less possibilities for upward mobility.

Nevertheless, our results also suggest that education does not seem to be the ultimate solution to reducing income inequality. In other countries such as Germany, high human capital investments can also be related to high income inequality. Hence, the rise of externalising employment practices and non-standard work arrangements leading to high income inequality can occur irrespective of educational levels in certain countries. In line with this, Brady and Biegert (2018) show that higher incidences of non-standard work arrangements in Germany cannot be explained by the education or skills of employees.

Whereas inequality effects of financialisation are clearly rejected based on the analysis of necessity, the sufficient paths now reveal a more nuanced picture.[11] In particular, our results reveal a highly interesting pattern, which is the quasi-substitutability between sets E and F. In Poland and the United Kingdom, the absence of strict EPL appears only in combination with the presence of high financialisation. Hence, financialisation is still an important factor for high income inequality, which causes flexible labour markets and a pronounced reliance on

[10] In Germany, marginal part-time employees ("Minijobber") are excluded from organisational fringe benefits and public social insurance systems (Hipp et al., 2015).

[11] Thus, cases that are part of the solution do contradict the statement of ~F being necessary for G. The same also holds for ~EPL.

outsourcing in the form of a lower employment concentration. However, financialisation does not have to be present for changes in the labour market to take place that lead to high income inequality. The paths for Portugal and Germany display the opposite to Poland and the United Kingdom: strict EPL and the absence of high financialisation. Here, partial deregulation and heavy use of temporary work (and also part-time work in Germany) as well as an equally common use of outsourcing lead to high income inequality.

High product market competition in the form of a lower labour income share is absent in nearly all paths. Hence, high *levels* of income inequality can also be the result of a higher dispersion in labour income rather than a high share of capital incomes caused by concentrated product markets as for example in the United Kingdom (Dundon, 2019). These results also suggest that countries' economies are clearly not dominated by a couple of large superstar firms taking all profits in the form of capital income. But still, recent trends might gradually approach to such a scenario as addressed in the second contribution of this dissertation (Schneider & Weissphal, 2022).

Although we were obliged to drop several countries that Amable (2003) considered in his work, some prime examples are still part of the dataset. With the United Kingdom and Portugal, we have prime examples for the market-based and Mediterranean models. In line with *Proposition 3*, exactly these two models are related to high income inequality. An Eastern European model has not been introduced by Amable (2003), but more recent work by Antonelli et al. (2019) finds support for such a separate institutional cluster. Their analysis reveals that this cluster has, on average, lower levels of inequality in *net* incomes. However, Poland (and also Hungary) record higher inequality of net *and* gross incomes than their neighbouring countries. Similar to our results, Tridico (2018) finds that Poland exhibits high income inequality as a result of high financialisation and less strict EPL. Consequently, this finding indicates that countries might deviate from their institutional clusters in terms of income inequality. The case of Germany substantiates this further: Although being the prime example of the coordinated market model common in central European countries, the solution for Germany clearly breaks with *Proposition 3*. Hence, income inequality of *gross* incomes can also be high in countries that are highly coordinated. Unfortunately, the less affluent OECD countries do not appear in the solution.

In sum, the analysis of high income inequality as outcome set reveals the following: While the identified pathways include countries from four different institutional clusters based on Amable (2003), our analysis shows that they share very similar characteristics in terms of employment practices. This particularly holds for lower employment concentration and frequent temporary work as a sign for less spread internal labour markets (part-time work seems to have a dual-face character that might be described by country-specific legislation and also missing educational opportunities). Hence, there seem to be different institutional contexts enabling employment practices that lead to high income inequality. Some contexts are characterised by strong financialisation such as the United Kingdom, others by strict EPL coupled with partial deregulation for temporary workers as for example Germany. The next subchapter further examines the robustness of these findings. By computing causal paths to *lower* income inequality, we particularly test the main finding of our analysis, which is the extraordinarily high explanatory power of employment practices.

5.3 Analysis of lower income inequality

In a next step, we search for causal paths leading to lower income inequality (negation of set G: ~G). Our analysis detects no single necessary condition for the negated outcome. The analysis of sufficiency results in six paths, constituting an overall consistent (0.97) and empirically relevant (0.65) solution term (see Table 4).[12] First of all, four paths contain the *presence* of high employment concentration. In combination with the findings from the previous subchapter, this result underlines the high explanatory power of employment concentration for high and lower income inequality in line with *Proposition 1*. Additionally, three paths include the *absence* of frequent temporary work and therefore indicate the presence of internal labour markets with long-term employment as stated in *Proposition 2*. Contrary to *Proposition 2*, in three paths, frequent part-time work drives lower inequality parallel to the results found earlier, again substantiating its opportunity-generating function (Hipp et al., 2015). Importantly, the combination between high employment concentration and frequent part-time work suggests that firms might be particularly large because they are able to employ large parts of society by means of part-time work. This seems to reduce income inequality because in this way the success of large firms and the benefits of their internal labour markets are spread among many part-time workers rather than relatively fewer full-time employees.

[12] As a result of our anchor setting, unique coverage is again quite low but still above zero in every path.

Table 4

Causal paths sufficiently related to lower income inequality

Condition / path	**1**	**2**	**3**	**4**	**5**	**6**
High employment concentration (EC)	●	●	●	●		
High share of part-time work (PT)	●	⊗			●	●
High share of temporary work (T)				⊗	⊗	⊗
High human capital investments (H)	●	⊗	⊗		⊗	
Strict employment protection legislation (E)			●			
High product market competition (P)	⊗	⊗	⊗	⊗		●
High financialisation (F)	●		⊗	●	⊗	⊗
Raw coverage	0.34	0.46	0.4	0.39	0.49	0.47
Unique coverage	0.02	0.03	0.003	0.003	0.01	0.02
Consistency	0.98	0.98	1	0.98	0.99	0.99
Cases	Switzer-land (97-12)	Finland (96-12) Belgium (96-12) France (99-09) Sweden (96-10) Austria (05-11) Denmark (96-08)	Nether-lands (96, 02-06, 08-12)	Finland (99-08) Belgium (98-01, 04-07, 10, 12)	Australia (08, 11, 12) Norway (96-05) Nether-lands (96, 02-06, 08)	Australia (08, 11, 12) Norway (96, 97, 00-12)
Solution consistency			0.97			
Solution coverage			0.65			

Note: Hollow circles mark the absence of a condition while full circles mark the presence of a condition.

Source: Own calculations.

Again, the identified paths display interesting patterns concerning the interaction between employment practices and institutions. For example, each path with high employment concentration contains the absence of high product market competition. This now yields support for the suggestions by Davis (2009). The absence of high product market competition seems to enable firms to expand their staff sizes and to establish internal labour markets.

This time, also the missing relevance of an institution appears insightful. Particularly, we do not find evidence that less frequent temporary work leading to lower income inequality is achieved by certain strictness levels of EPL. An even more interesting connection can be also seen in terms of country-specific legislation. Whereas unfavourable legislation seems to explain why frequent part-time work is connected to high income inequality in Germany, favourable legislation in Scandinavian countries (Hipp et al., 2015) might be the reason why the opposite holds in these countries. So again, the findings for lower income inequality support the interpretations of the previous analysis with *high* income inequality as outcome set.

While single institutional particularities between the identified paths differ (i.e. high financialisation or high human capital investments), it is generally the case that members of this solution mainly come from two institutional clusters, namely social-democratic capitalism common in Scandinavian countries and Continental European capitalism, which are predicted to have lower income inequality according to *Proposition* 3. In particular, the Scandinavian countries dominate our solution as they also do in other analyses (Antonelli et al., 2019). In addition, Switzerland and the Netherlands have been identified before to be closer to this Scandinavian model (Davis & Cobb, 2010). Despite that, Australia now clearly breaks with its belonging to the market-based cluster, which was assumed to have high income inequality. Favourable employment practices (PT*~T) seem to mitigate income inequality even when product market competition in the form of high capital incomes is present. Unfortunately, Japan as a prime example for the Asian model does not appear in the identified paths to lower income inequality.

To summarise, what can be learnt from both analyses? The level of income inequality is strongly shaped by the employment concentration in combination with the incidence of temporary work. Together, these variables seem to be an indicator for the absence or presence of internal labour markets. Part-time work, given that organisational advantages are granted, is

compatible with and maybe even supportive for the evolution of large firms with internal labour markets and its absence may limit opportunities to enter labour markets. Other institutional arrangements can hardly substitute for internal labour markets to reduce income inequality (e.g. pronounced education) nor can they reveal clear-cut connections to the applied employment practices in several cases. Of course, in many cases, employment practices are a further explanation why certain institutional cluster bring about different levels of income inequality. This is particularly the case in social-democratic capitalism having lower income inequality but also market-based and Mediterranean capitalism recording higher inequality. However, exemptions remain (Poland, Germany and Australia). In these cases, employment practices help to explain their level of income inequality.

6 Supplementary analysis

6.1 Recalibration

Due to a quite exclusive calibration using the 75th percentile of the calibration dataset, our first results are prone to skewness and a low number of cases that show membership scores higher than 0.5 in the solution *and* in the outcome set. Therefore, we conduct a second analysis using the mean of the global dataset as 0.5 anchor as a robustness test.[13]

In this approach, all necessary conditions for high income inequality except the absence of high employment concentration vanish. The absence of high employment concentration in combination with the absence of high human capital investments is also part of most sufficient paths in this solution. This again confirms *Proposition 1* and emphasises the importance of employment concentration for the explanation of income inequality. Overall, the solution of the robustness test did not deliver results that severely contradict our results in the main analysis.

6.2 Panel fs/QCA

The configurations found so far are prone to critique with regard to their coverage and unique coverage. We cannot fully reject this critique for our pooled analysis, but we are able to expand our view on the consistency and empirical relevance of our findings with respect to a further dimension. Thus, we want to assess if our results are robust to temporal developments.

[13] The exact results of the following robustness and time-consistency test can be obtained from the authors via e-mail.

Our panel dataset enables us to evaluate the important question whether the relationships we found so far are consistent over time and within countries. The development of time-sensitive QCA-variants is still in progress, but there are already inspiring approaches. Thus, by employing the panel approach to fs/QCA developed by Garcia-Castro and Ariño (2016), we hope to gain a glance at the time- and country-specific developments underlying the paths to high income inequality. We now briefly sketch the developments of consistencies and coverages of the configurations within countries over years (Within-Consistency / -Coverage) and between years over all countries (Between-Consistency / -Coverage) (Garcia-Castro & Ariño, 2016).

Our calculations of Between-Consistency for the paths from Table 3 show that each of the paths is highly consistent between years. No time effects seem to harm the consistency of these paths. Paths 1 and 2 have a drop in Between-Coverage in year 2008. Such kinks in empirical relevance are often observed in this year, which raises the presumption that they are effects of the global financial crisis (both paths include high financialisation). The solution based on the mean calibration displays time-independent consistency in a similar manner and a coverage kink in the years around the financial crisis as well. These results show that the results of our main sufficiency analysis are not the product of time effects. In other words, the consistency of the solution is not challenged by time-varying effects of unobserved conditions.

Concerning the Within-Consistency, while the statement of consistency holds for all cases, there are differences in the Within-Coverage between countries. A high Within-Coverage of a path for a country indicates that the statement of sufficiency manifests itself empirically in this country (Garcia-Castro & Ariño, 2016). Naturally, the relevance of different paths differs highly between countries. For the sake of a robustness test, this information is not described further. Subsequent analysis could use this information to gain a better understanding of the comparability of different countries with respect to the conditions under observation. The Within-Consistency results for the mean solution are similarly stable and mostly consistent. Nearly no country changed its membership in a path over time. These results indicate that the statements of sufficiency found in the solutions are stable. Overall, the panel fs/QCA developed by Garcia-Castro and Ariño (2016) is a helpful tool suited for gaining an overview of large-N datasets containing a time component. It revealed that all the paths we found are consistent over time and within countries.

7 Discussion

7.1 Main points and implications

By means of a country comparison using fs/QCA, we sought to identify important empirical linkages between countries' institutional arrangements, common employment practices and their level of income inequality. Our results speak to previous literature: We found a lot of support for earlier theoretical propositions but we also suggest some new propositions. The most important insight of our analysis is the identification of the employment concentration inhibiting the highest and clearest explanatory power: It sufficiently explains high *and* lower income inequality when absent or present, respectively (*Proposition 1*). Measuring the degree of large-firm employment of a country, this proxy variable is intended to capture the national scope of internal labour markets (Davis & Cobb, 2010). In support of this, high employment concentration combines with less frequent temporary work and vice versa (*Proposition 2*). Hence, employment practices and the resulting shape of organisations are a highly relevant determinant for the level of income inequality (Bapuji et al., 2020; Cobb, 2016; Davis, 2017).

While non-standard work arrangements are generally perceived to lead to higher income inequality (Cobb, 2016), our analysis reveals that this is not necessarily the case for part-time work. Of course, there are still examples where frequent part-time work is related to higher income inequality. Particularly in countries with less protection for part-time workers as for example in Germany, part-time work might concentrate in smaller, less productive firms and thereby might lead to higher income inequality. However, results for Scandinavian countries show that the opposite can also hold, especially given that there is strong legislative protection. This suggests that part-time work can also be part of internal labour markets, enabling a high share of the workforce to work in large firms and to benefit from organisational advantages (in contrast to *Proposition 2*). While these findings complement research showing that the overall links between non-standard work arrangements, precariousness and income inequality are not empirically clear-cut (Cazes & Laiglesia, 2015; Kiersztyn, 2018), they provide the basis for our first own theoretical proposition:

Proposition 4: Given that part-time work is legally protected, high (lower) employment concentration combines with less frequent (frequent) temporary work and frequent (less frequent) part-time work when sufficiently explaining lower (high) income inequality (C*~T*PT→~G; ~C*T*~PT→G).

Our analysis also supports important claims that employment practices and the institutional environment combine to explain high and lower income inequality (Davis, 2017). Overall, employment practices mostly fit into the institutional clusters by Amable (2003) as suggested by Davis (2017): High income inequality is present in the market-based or the Mediterranean model; lower income inequality is found in the social-democratic or the Continental European model (*Proposition 3*). However, some countries seem to be special cases where linkages are not as definite as theoretically proposed. In particular, Germany records the maybe most surprising findings. It is the only case where both frequent temporary and part-time work combine with lower employment concentration to explain high income inequality (*Proposition 2*), which strongly suggests that internal labour markets are missing on a broad scale. This is, of course, surprising because Germany is the most common example for coordinated market economies, which are believed to record lower income inequality, and its largest companies such as Volkswagen and Siemens are famous for their internal labour markets. However, the data clearly show that this impression does not hold in aggregate terms.

In general, the presence of cases such as Germany is also in line with literature seeking to explain rising income inequality and liberalisation as its reason in diverse institutional clusters (Thelen, 2014). This literature argues that liberalisation can take different form, that is, not only pure deregulation but also dualisation as it is found for Germany (Brady & Biegert, 2018). Together with some studies (Cazes & Laiglesia, 2015; Hipp et al., 2015; Lee, 2013), our findings for EPL clearly substantiate this: Both looser and strict legislation are important determinants of limited availability of internal labour markets for some privileged workers and of frequent use of temporary work, which also help to explain income inequality in these special cases.

These inconsistencies could be also seen in other institutional arrangements. Financialisation and human capital investments were not able to discriminate between high and lower income inequality. Therefore, more differentiated arguments on the inequality effects of single aspects

of financialisation and a shareholder value orientation are appropriate as suggested by Cobb (2016). Similarly, a single focus on high human capital investments is not necessarily the most promising solution to reduce inequality as the case of Germany has demonstrated. Instead, the use of market-oriented employment practices can traverse these diverse institutional contexts. This leads us to our second theoretical proposition[14]:

> *Proposition 5: The employment practices resulting from diverse institutional contexts can better explain income inequality than the institutional arrangements themselves.*

What are the implications for policy-makers? First, our findings suggest that part-time work coupled with employee-friendly legislation is likely to reduce income inequality. Given this kind of protection, increasing part-time work in countries such as Poland and Portugal might be favourable for reducing income inequality. Second, the most broad-based solution would be the development of larger companies and the reduction of temporary work. However, the changing of employment practices might be highly impaired due to global competition. According to Vosko (2010), the chances are slim to ever return to standard employment relations common in larger firms (Kalleberg & Vallas, 2018). Moreover, catching-up countries (such as Portugal and Poland) cannot simply establish large firms but have to rely on smaller start-ups that address certain market niches, again contributing to higher income inequality (Lewellyn, 2018). In case of such an inability to establish large-scale firms in these countries, our results suggest that no configuration of observed institutional conditions is so far able to substitute for the presence of high employment concentration. Given that, these results call for alternative forms to inhibit employers to circumvent collective representation via outsourcing (Batt, 2018; Doellgast et al., 2017). In general, the use of organisational- versus market-oriented employment practices should be closely tracked on an aggregate scale as the case of Germany shows.

7.2 Limitations and future research

While our analysis gives first and robust insights into the overall relationships, it neglects the more specific causal relationships towards many other factors of importance as the total number

[14] The findings of two auxiliary examinations support this proposition: Institutional configurations alone are neither sufficiently related to high income inequality nor to the presence / absence of high employment concentration or frequent non-standard work arrangements. This implies that an institutional consideration alone can neither explain income inequality nor certain employment practices in these countries.

of variables in fs/QCA is limited. For example, it stands out from our analysis that a separation of the EPL Index for permanent and temporary employment is superior to the overall index (Lee, 2013). Moreover, a series of further important institutional variables may still condition inequality effects of employment practices. Besides union strength, collective bargaining, minimum wages and the degree of trust (Davis & Cobb)[15], the presence of informal social networks (Deeg & Jackson, 2007) might be particularly important as industry-wide collective bargaining falls short when employment is externalised between different industries (Sako & Jackson, 2006). Other important factors could be the unemployment rate or female labour market participation, which might reveal inequality-reducing effects of temporary work. But also relationships to other common macro-economic factors such as export growth can be insightful as they also prove to be relevant for rising inequality in coordinated market economies (Behringer & van Treeck, 2021). Finally, it would be also highly interesting to analyse how the welfare state corrects for the use of market-based employment practices with redistributive measures. While our analysis is based on the Gini coefficient of gross incomes, further research could also draw on net incomes and add variables for the extent of redistribution or active labour market policies (Mai, 2018). In sum, such factors might reveal further important insights of why certain institutional clusters inhibit certain levels of income inequality.

In general, the identified paths to high income inequality in our main analysis (75^{th} percentile) are only present in a limited number of countries. In particular, they only represent a fourth of all cases with high income inequality. For example, our solution is not able to identify consistent determinants of high income inequality in Hungary (1996-2012) or Mexico (2008-2012), although they exhibit parts of the solution paths. Future research could improve on the validity of our results by means of a deeper investigation of within-country mechanisms at the firm or industry level, which can substantially vary as revealed in the panel fs/QCA approach.

Finally, we suggest a *time-differencing* fs/QCA approach as inequality research is strongly concerned with rising trends of income inequality in many countries (also Scandinavian). This approach could also address conceptions that increasingly larger firms might contribute to

[15] Trust might be an explanation why some Eastern European (former socialist) countries such as Czech Republic (included in our analysis but not showing up in the identified paths) exhibit low income inequality and low employment concentration (Davis & Cobb, 2010).

rising income inequality based on the notion of superstar firms (Autor et al., 2020). But still, our analysis has shown that employment practices help to understand countries' *levels* of income inequality. Thereby, they are a fruitful basis for policy actors to invent new institutions that help to address one of the most puzzling social questions of our time.

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Appendix

Table A1: *Truth tables for high income inequality*

EC	PT	T	H	E	P	F	No. of cases	G	Raw consist.	PRI consist.	SYM consist.
0	0	1	0	0	1	1	4	1	1.000	0.978	0.978
0	0	1	0	1	0	0	11	1	0.988	0.814	0.821
0	1	1	1	1	0	0	4	1	0.997	0.818	0.818
0	0	1	0	0	0	1	2	1	0.997	0.787	0.787
0	0	1	0	0	1	0	5	1	0.988	0.617	0.771
0	1	0	1	0	0	1	7	1	0.989	0.765	0.768
0	1	0	0	0	0	1	3	1	0.994	0.764	0.764
0	0	0	0	0	0	1	6	0	0.982	0.626	0.626
1	1	1	1	1	0	0	6	0	0.988	0.579	0.579
0	0	0	0	1	0	0	38	0	0.945	0.517	0.521
0	0	0	0	1	0	1	7	0	0.986	0.482	0.482
0	0	1	1	1	0	0	7	0	0.986	0.476	0.476
0	0	0	0	0	0	0	42	0	0.917	0.460	0.468
0	0	0	0	0	1	0	14	0	0.941	0.449	0.455
0	0	0	0	1	1	0	2	0	0.968	0.436	0.436
0	1	0	1	0	0	0	7	0	0.946	0.428	0.428
1	1	0	1	0	0	0	9	0	0.937	0.399	0.399
0	0	0	1	1	0	0	1	X	0.961	0.399	0.399
0	0	0	0	0	1	1	25	0	0.953	0.338	0.368
0	0	1	0	0	0	0	20	0	0.956	0.298	0.312
0	1	0	0	0	1	1	3	0	0.989	0.275	0.275
0	0	0	1	1	1	0	14	0	0.930	0.266	0.266
0	1	0	1	0	1	1	6	0	0.985	0.238	0.238
0	1	0	0	0	0	0	2	0	0.955	0.199	0.199
1	1	0	0	0	0	1	2	0	0.963	0.187	0.187
1	0	1	0	0	0	0	13	0	0.964	0.169	0.178
1	1	1	1	0	0	0	1	X	0.936	0.176	0.176
1	0	0	0	0	0	1	19	0	0.947	0.140	0.144
1	0	0	0	1	0	1	6	0	0.981	0.115	0.115
1	0	0	0	0	0	0	21	0	0.936	0.104	0.108
1	1	0	0	0	0	0	3	0	0.939	0.104	0.104
0	1	0	0	0	1	0	3	0	0.954	0.067	0.067
0	1	0	1	0	1	0	2	0	0.937	0.064	0.064
1	0	1	0	0	0	1	12	0	0.954	0.053	0.053
1	1	0	0	0	1	0	8	0	0.942	0.048	0.048
1	1	0	1	0	1	0	6	0	0.919	0.045	0.045
1	1	1	0	1	0	0	4	0	0.975	0.037	0.037
1	1	0	0	1	0	1	6	0	0.966	0.029	0.029
1	1	0	0	1	0	0	7	0	0.948	0.016	0.016
1	1	1	1	0	0	1	16	0	0.895	0.010	0.010

Note: For variable descriptions (e.g. EC = employment concentration), see Table 1. *Source*: Own calculations.

Contribution No. 4

The effects of digitalisation and outsourcing on multitasking:

Empirical evidence for Germany

By

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2022

(Working paper)

Table of contents

The effects of digitalisation and outsourcing on multitasking: Empirical evidence for Germany

Abstract

Companies often digitalise their own processes and outsource activities, thereby concentrating on their core competencies. As this paper demonstrates, when firms focus on fewer tasks in this way, this does not imply fewer tasks for individual employees. Instead it is argued that workers who are affected by digitalisation and outsourcing will have to perform more tasks. Based on a detailed German panel dataset covering the period 2007 to 2010, we find first robust support that digitalisation and outsourcing foster multitasking. Importantly, we also provide new insights that this is particularly the case in low-skilled occupations. This finding has important implications. While additional analyses show that multitasking generally increases employability, they also reveal that increased multitasking of workers in low-skilled occupations is not followed by training measures. Therefore, future research should illuminate further implications for workloads, wage adjustments or job satisfaction.

1 Introduction

While managerial innovations such as lean management have led to companies specialising in fewer occupations (Cortes & Salvatori, 2019; Handwerker & Spletzer, 2016), they appear to have had an opposite effect on tasks profiles (Lindbeck & Snower, 2000). Specifically, employees who stay in firms engaging in such restructuring processes do not seem to specialise in fewer tasks but rather have to handle multiple tasks. Analysing these trends towards multitasking is vital because they likely affect other important work characteristics such as job quality and satisfaction. However, research has generally suggested that the connection between the tasks of a job and its quality may differ between occupations and positions in the labour market (e.g. Findlay et al., 2013). Thus, in some cases, multitasking may be followed by higher workloads and less job satisfaction. Such negative consequences should be precisely identified and prevented politically. Knowing whether, to what extent and for whom multitasking is actually increasing because of specialisation measures is a first important step into this direction.

In this paper, we test the empirical relationships between multitasking and two important factors that usually drive specialisation processes: digitalisation and outsourcing (Lindbeck & Snower, 2000). Besides using panel data and direct replies from employees in German establishments (Bayo-Moriones et al., 2017), our analysis advances previous literature in three important ways.

First, we track details on the kind of tasks workers actually perform in line with the task-based approach. In general, there is no empirical literature analysing multitasking with regard to outsourcing (Cortes & Salvatori, 2019; Ochsenfeld, 2018) and only scarce literature that addresses digitalisation. The few exceptions that exist have so far relied on the perceived task variety of affected workers or their managers (Arnold et al., 2016; Bayo-Moriones et al., 2017). Thus, by using the task-based approach, we complement this prior work and arrive at additional insights.

Secondly, this is the first study that tests the effects of both digitalisation and outsourcing simultaneously. Usually, economists see both factors highly related. According to this view, new information and communication technologies facilitate outsourcing by reducing costs of market transaction and monitoring (Bernhardt et al., 2016). Although there is some empirical support for this assumption (Abramovsky & Griffith, 2006), recent research has also shown that outsourcing can as well be motivated by firms' rent-seeking (Goldschmidt & Schmieder, 2017). Therefore, we not only compare effects of digitalisation, namely new information and communication technologies (ICT) and advanced manufacturing technologies (AMT) (Bayo-Moriones et al., 2017), but we also seek to identify independent effects of outsourcing on multitasking.

Lastly and most importantly, our analysis overcomes an important gap in previous work (Bayo-Moriones et al., 2017): It allows us to determine the type of occupations whose tasks are most affected by increasing multitasking as a result of digitalisation and outsourcing. This is particularly important because, as mentioned, perceptions of multitasking may differ between certain groups of employees (Findlay et al., 2013). Previous research has suggested that particularly the tasks in high-skilled occupations have been widening due to digitalisation and outsourcing (Bayo-Moriones et al., 2017; Lindbeck & Snower, 2000). This might explain why the respective authors have assumed positive perceptions of changing task profiles as workers in these occupations generally acquired better education (Lindbeck & Snower, 2000). Hence,

if effects are limited to workers in high-skilled occupations, there may be clear benefits of specialisation measures and resulting multitasking for companies and workers.

The findings of our paper clearly show that the range of tasks performed by individual workers has on average increased. Fixed-effects regressions substantiate that individual increases in multitasking are driven by digitalisation and also to an important extent by outsourcing. Moreover, we also reveal important insights into differences between occupations. In line with previous statements, we find that the introduction of AMT significantly affected workers in high-skilled but not in low-skilled occupations. However, contrary to earlier suggestions, our main finding is that new ICT and outsourcing only significantly widened tasks of employees in low-skilled occupations. This finding is highly relevant: Given that workers in such occupations generally receive less training (Organisation for Economic Co-operation and Development, 2019, 2021), they might be less capable of and less positively inclined to multitasking. Thus, changes in their work profiles may pose a hidden price of specialisation.

Whether workers truly perceive multitasking as a price or a benefit rests on further important implications. In this paper, we provide additional analyses on two important factors. First, we show that multitasking generally increases workers' employability as their task profiles match with those of other workers in their occupation and the whole labour market. This could be a potential advantage of multitasking. However, multitasking may also be the reason why, for example, new ICT increase work pressure (Atanasoff & Venable, 2017). As this might particularly hold when important skills and abilities are missing, a second important factor we analyse are training measures. We find that, on average, employees in high-skilled occupations receive training when they perform more task types. Critically, this is not the case for employees in low-skilled occupations. Consequently, this might have further consequences for workloads and job satisfaction. Similarly, analysing wage adjustments is crucial because they can potentially compensate for increased multitasking. Another study by Ochsenfeld (2018) shows that workers without a college degree do not necessarily receive higher wages after outsourcing events. Hence, specialisation efforts and the resulting need to perform more tasks seem to have ambiguous effects on further important job characteristics. Testing these implications of widening task profiles more accurately and for different employee groups is a fruitful avenue for future research.

The remainder of the paper is structured as follows: The next chapter provides the theoretical framework, resulting in five hypotheses. In the third chapter, the empirical analysis of these hypotheses is presented, starting with a description of the data and some first descriptive results. Afterwards, the regression analysis is explained and results, including some robustness tests, are reported. The fourth chapter shows empirical implications of multitasking on workers' employability and training measures. The penultimate chapter discusses our results in light of other research. The last one concludes.

2 Theoretical foundation

2.1 Effects of new ICT and AMT on multitasking

The empirical analysis of this paper is guided by the theoretical suggestions of Lindbeck and Snower (2000). Although this study has received less attention than other popular contributions on changing task profiles, we believe it is particularly important for understanding how work tasks will change in the future. While frequently considered theories, such as the routine-biased technological change approach by Autor et al. (2003), focus primarily on the substitution of tasks and thus the elimination of jobs through digitalisation, Lindbeck and Snower (2000) seek to explain how the tasks of jobs that remain will change (Eisele & Schneider, 2020). In this study, we also focus on workers who keep their jobs and stay employed in their establishment.

Lindbeck and Snower (2000) basically predict a shift from Tayloristic to holistic organisations. At the core of these two categories are employees' task profiles. When the workforce heavily specialises on few tasks, the organisation is described to be Tayloristic. Contrary to that, employees in holistic organisations are responsible for a broader range of tasks (Lindbeck & Snower, 2000). Empirical studies yield support for this predicted shift. For example, early findings for the United States show that task profiles of jobs were rather narrow. Particularly in the largest firms, some job titles referred to single tasks, which have been also placed into career ladders (Baron & Bielby, 1984). However, exactly these organisational structures eroded (Cappelli, 2001) and instead, holistic organisations have increasingly emerged. Consequently, the organisational structures of holistic organisations are flatter than those of Tayloristic ones.

Lindbeck and Snower (2000) also discuss the factors that drive the reorganisation process towards holistic organisations and thus multitasking of employees. At the centre of their study

is digitalisation taking place in two forms. First, they suggest that new information and communication technologies (ICT) can increase multitasking as they foster the involvement of workers in their colleagues' tasks. Second, as advanced manufacturing technologies (AMT) become more capable in performing different tasks, workers who control these technologies may similarly need to cope with a wider spectrum of tasks.

While there is a lot of empirical research based on the theoretical suggestions by Autor et al. (2003) (e.g. Goos et al., 2014; Spitz-Oener, 2006; Vries et al., 2020), the suggestions by Lindbeck and Snower (2000) have not been included in many empirical studies. In general, studies seeking to find a broad-based effect of digitalisation on individual work characteristics are very scarce (Bayo-Moriones et al., 2017; Winkelhaus et al., 2022). A recent review by Wang et al. (2020) seeks to clarify the effect of ICT. However, they do not pay much attention to task composition. Instead, they analyse work characteristics such as job autonomy or job demands. Nevertheless, a connection to our research question can be drawn here, as increasing demands could be the result of multitasking. Also for the German context, a study by Meyer et al. (2019) points out empirical studies that test the relationship between digitalisation and work intensification (Ahlers, 2018; Holler, 2017; Meyer & Huenefeld, 2018). Importantly, they also highlight one study that explicitly addressed multitasking: Arnold et al. (2016) show that interviewed employees express their need to perform multiple tasks due to new technologies. A survey with similar findings has been conducted for police agencies in the United Kingdom (Davis & Hufnagel, 2007). Nevertheless, these studies do not test the robustness of the relationships by means of more sophisticated methods such as regression analysis. An important exception is the paper by Bayo-Moriones et al. (2017). For Spanish manufacturing establishments, they reveal a possible connection between digitalisation and task variety of production employees as stated by their managers, though with less robust findings. Eisele and Schneider (2020) arrive at similarly insignificant results on the relationship between computer use and the degree of repetitiveness perceived by employees in the United Kingdom. Overall, though the links put forth by Lindbeck and Snower (2000) are highly plausible, robust empirical evidence is still missing. Thus, we will test the following hypothesis:

> *Hypothesis 1a: Both new information and communication technologies (ICT) and advanced manufacturing technologies (AMT) increase multitasking.*

Whereas Lindbeck and Snower (2000) argue that ICT and AMT are both important forms of digitalisation, Bayo-Moriones et al. (2017) are the first to suggest that the effects of both technologies on multitasking may diverge depending on the type of workers who are affected by the respective technologies. Based on Wall et al. (1992), they argue that, for low-skilled machine operators, AMT should have a lower effect on multitasking as production technologies may also take on several tasks leading to more Tayloristic task profiles. Bayo-Moriones et al. (2017) were not able to reveal support for their suggestions but we follow them and hypothesise:

> *Hypothesis 1b: In low-skilled occupations, new information and communication technologies (ICT) increase multitasking more strongly than advanced manufacturing technologies (AMT) do.*

Given that Bayo-Moriones et al. (2017) were unable to find robust support for their hypotheses, they assume that particularly the effects of ICT should be stronger for other high-skilled occupations such as those in commercialisation or management. Moreover, they argue that AMT should have strong impacts on the task profiles of high-skilled occupations such as programmers and engineers (Bayo-Moriones et al., 2010). Consequently, they underline the need for empirical findings that distinguish between different occupations, which are not yet available (cf. Absenger et al., 2016; Haertwig & Sapronova, 2021). We hypothesise:

> *Hypothesis 1c: Both new information and communication technologies (ICT) and advanced manufacturing technologies (AMT) increase multitasking of workers in high-skilled occupations more than of those in low-skilled occupations.*

2.2 Effects of outsourcing on multitasking

The framework suggested by Lindbeck and Snower (2000) has also important implications for decisions to substitute certain jobs. If workers are able to perform a wide range of tasks that pervades several traditional occupations, it is likely that companies will reduce the number of different occupations and specialise on certain occupations. Hence, the shift to holistic organisations seems to be inherently connected to firms' specialisation measures. In other words, firms seem to specialise on multitaskers. The most common measure to increase specialisation is outsourcing as Peter Drucker states it: "Do what you do best and outsource the rest". Consequently, outsourcing increases the homogeneity of tasks within firms (Rawley &

Simcoe, 2010) and flattens hierarchical structures. Lindbeck and Snower (2000) emphasise digitalisation but they also argue that managerial innovations such as lean production foster multitasking. Moreover, they sketch that the expansion of international trade and offshoring are important factors that particularly lead to holistic organisations in richer countries.

In fact, economists widely believe that trends in digitalisation and outsourcing are clearly related: New ICT were a key reason for increasing outsourcing because these technologies reduce market transaction and monitoring costs (Bernhardt et al., 2016), which is also empirically supported by Abramovsky and Griffith (2006). If this is true and outsourcing is the result only of technological change, its effect on task profiles should be fully absorbed by the effect of technological change. However, recent research has shown that outsourcing can also be motivated by firms' saving on firm-specific wage premia (Goldschmidt & Schmieder, 2017). Thus, an independent effect of outsourcing on individual tasks is still plausible.

While previous studies analysed the effects of lean management on job characteristics (Parker, 2003), they focus on changes taking place within firms such as the reconstellation of teams. Analyses on the effects of outsourcing as an inter-firm change are missing. A recent study by Cortes and Salvatori (2019) has identified a linkage between domestic outsourcing and higher specialisation in the form of an increasing occupational concentration within UK firms. They find broad-based support for the statements mentioned above (Rawley & Simcoe, 2010) and underline that not only international offshoring as suggested by Lindbeck and Snower (2000) but also domestic outsourcing matter. Moreover, they point out that future research should address the potential implications of an increasing specialisation and thus firms' outsourcing activities for individual workers. While wages of German employees have been addressed already, empirical research for other work characteristics such as task profiles is pending (Ochsenfeld, 2018). Correspondingly, we hypothesise:

Hypothesis 2a: Outsourcing increases multitasking of remaining workers.

In line with the skill-biased international trade thesis, Lindbeck and Snower (2000) also expect that firms mainly outsource activities that require less skill. Thus, high-skilled workers are those who primarily remain in the firm and whose task profiles probably widen most. Of course, empirical analyses for different occupations are equally missing. We propose:

Hypothesis 2b: Outsourcing particularly increases multitasking of workers in high-skilled occupations.

Table 1 summarises all five hypotheses.

Table 1

Hypotheses on the effects of specialisation measures on multitasking

Specialisation measure	Multitasking		
	Overall	High-skilled occupations	Low-skilled occupations
New ICT	+	▶	▼
New AMT	+	▶	▼
Outsourcing	+	▶	

Note: ▶ = larger effect at the left side of the triangle.

ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

Source: Own compilation.

3 Empirical analysis

3.1 Data and variables

In order to test the theoretical hypotheses, we use the German employer-employee survey WeLL (*Berufliche Weiterbildung als Bestandteil Lebenslangen Lernens*; Further Training as a Part of Lifelong Learning) provided by the Institute for Employment Research (IAB). This dataset is particularly suitable because it contains detailed individual-level information on the actual tasks employees perform. Besides data on the digitalisation of employees' workplaces, it also includes scarce information on whether employees are affected by outsourcing activities.

The dataset has a panel structure and comprises four survey waves in 2007, 2008, 2009 and 2010. In the original survey, 6,400 employees from 149 establishments were interviewed. In order to obtain a representative picture of German labour market structures, the establishments

for the survey were selected on the basis of establishment size, sector and regional location. For the selected establishments, a random sample of employees was drawn rather than a full survey. We only use balanced data, meaning that only those respondents who were interviewed in all four survey waves are considered. As this implies, we only focus on respondents who remain in the company over the survey period. After excluding employees in occupations with very few observations (e.g. in agriculture and fisheries), data for 2,076 employees remain.

The dependent variable of our analysis is the degree to which workers need to perform multiple task types (multitasking). To operationalise the degree of multitasking, information on the kind of tasks workers perform is used. This task-based operationalisation is expected to provide higher validity than subjective assessments by workers or their supervisors (Bayo-Moriones et al., 2017). For twelve different task types, workers were asked whether they frequently, rarely or never perform each of them (Table 2). We use the sum of tasks workers perform as a measure of the degree of multitasking. A task is considered to be performed if respondents indicated that it occurs (frequently or rarely) in their work. Consequently, this sum ranges from 0 to 12 and reflects low or high levels of multitasking, respectively.

Table 2

Survey question on task types

Question: I will now list some selected activities. Please indicate how often (possible answers: frequently (2), rarely (1), never (0), don't know) these activities occur in your work.
- Fabricating and producing goods
- Supervising and controlling machines
- Nursing, serving and healing
- Repairing, patching
- Gathering information and investigating
- Developing and researching
- Measuring, controlling and quality checks
- Buying, providing and selling
- Informing and advising
- Organising and planning
- Negotiating
- Training, teaching and educating

Source: WeLL data by Institute for Employment Research (IAB).

The two main independent variables are digitalisation and outsourcing. Digitalisation is measured by two variables (Table 3) as it basically takes place in two forms (Lindbeck & Snower, 2000). The first variable asks whether work has been affected by the introduction of new production techniques and accordingly covers AMT (New AMT). The second variable asks whether the equipment of workplaces with ICT changed or whether workers use new software (New ICT). As suggested by Bayo-Moriones et al. (2017), we include both variables simultaneously in the regressions in order to examine independent effects.

Table 3

Survey question on digitalisation

Advanced manufacturing technologies (New AMT)	Question: Has your work situation changed due to operational conditions? Has your work been affected by the introduction of new production techniques, machines, materials? (0/1)
Information and communication technologies (New ICT)	Has the equipment of your workplace with information and communication technologies changed or do you use new software? (0/1)

Source: WeLL data by Institute for Employment Research (IAB).

Outsourcing is measured based on the following question: "Was your work affected by outsourcing activities to other companies or by bringing back outsourced activities to your company?". Thus, we consider task profiles of employees who are indirectly affected by outsourcing measures but remain in the company. Whereas earlier research usually concentrates on employees who are themselves outsourced (Goldschmidt & Schmieder, 2017), a recent study by Ochsenfeld (2018) analyses effects of firms' outsourcing activities on workers who stay.

Moreover, the variable includes both the outsourcing and the bringing back of activities. This clearly makes the variable less precise. However, one might argue that, given the trends towards lean management (Lindbeck & Snower, 2000) and away from internal- towards market-based employment relationships (Cobb, 2016), it is more likely that firms outsource activities rather than re-establishing traditional organisational structures (Vosko, 2010). Moreover, the fact that data on outsourcing are scarce at firm level (Cortes & Salvatori, 2019) and not directly available at individual level (Bernhardt et al., 2016) still makes this variable very valuable. Although there are complex approaches to identify individual workers who are outsourced (Goldschmidt

& Schmieder, 2017), such methods cannot be applied to workers who stay. Most importantly, we will include robustness tests that combine this variable with another variable that captures employees' perceived probability that outsourcing will take place within the next 12 months.

The later regression models include some control variables that should have a substantial impact on the number of task types. First, it is important to control for the official working hours (contractually agreed number of working hours excluding overtime). If workers are employed for more hours, it is more likely that they perform a wider range of tasks. Given this information, we are not obliged to limit our sample to a homogenous group of employees (i.e. full-time employees) as done in other studies (Baumgarten et al., 2020; Ochsenfeld, 2018). Second, workers who are permanently employed may be particularly capable to handle multiple tasks and switch between them. Therefore, we control whether workers have a temporary contract (reference category: permanent contract). Following the same conception, we finally control for employees in marginal employment, i.e. those with gross earnings of 400€ (reference categories: employee, worker, other). These workers may only accomplish a very narrow range of tasks but their task profiles may still change. In general, by estimating the effects of these variables, we also further probe into the plausibility of our constructs and the regression model. Plausible coefficients of main and control variables can then be compared to assess effect sizes.

Table 4

Descriptive statistics

Variable	Observations	Mean	Std. dev.	Min	Max
Number of task types	114,180	7.113391	2.721331	0	12
New AMT	112,082	0.191119	0.3931843	0	1
New ICT	97,766	0.4289426	0.4949276	0	1
Outsourcing	111,636	0.2151636	0.4109376	0	1
Working hours	111,048	35.76716	7.934143	0	78.5
Temporarily employed	112,077	0.0351455	0.1841483	0	1
Marginally employed	112,060	0.0146172	0.1200152	0	1

Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

Descriptive statistics and correlations are summarised in Table 4 and 5. Multicollinearity seems to be of no concern as correlations between the independent variables are small (though statistically significant). Importantly, correlations between dependent variable and independent variables all point into the theoretically expected directions (column 1 of Table 5).

Table 5

Correlation matrix

Variables	1	2	3	4	5	6	7
1. Number of task types	1.000						
2. New AMT	0.161***	1.000					
3. New ICT	0.092***	0.149***	1.000				
4. Outsourcing	0.082***	0.169***	0.057***	1.000			
5. Working hours	0.162***	0.088***	0.023***	0.070***	1.000		
6. Temporarily employed	-0.053***	-0.021***	-0.056***	-0.036***	-0.050***	1.000	
7. Marginally employed	-0.124***	-0.041***	-0.031***	-0.057***	-0.368***	0.056***	1.000

Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

Levels of significance: * p<0.1; ** p<0.05; *** p<0.01.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

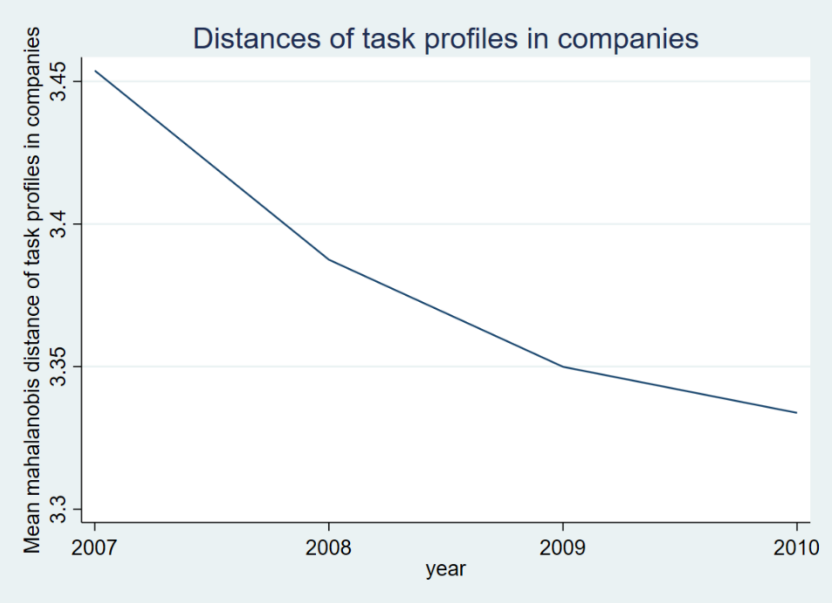
3.2 Descriptive results

First of all, we want to show that the general patterns that have been identified in previous literature can also be observed in our dataset. An important starting point of the literature are firms' specialisation efforts, which have been found to reduce the variety of occupations (Cortes & Salvatori, 2019; Handwerker & Spletzer, 2016) and to increase the homogeneity of tasks within firms (Rawley & Simcoe, 2010). Our dataset does not allow for insights into the occupational composition of establishments because it only includes a survey of a small fraction of employees who stay within the firm and probably in their occupation. However, it allows providing insights on the homogeneity of task profiles of employees in companies since information on company affiliation is available.

In Figure 1, we see that, on average, task profiles within companies have become more and more aligned. More precisely, the average distance of task profiles, i.e. the averaged Mahalanobis distance of the task profile of individual employees to other employees in the company, has decreased significantly over time. The Mahalanobis distance is used because it is suitable for calculating distances between points in a multidimensional vector space, here consisting of different task types (Mahalanobis, 1936).

Figure 1

Increasing homogeneity of task types within establishments



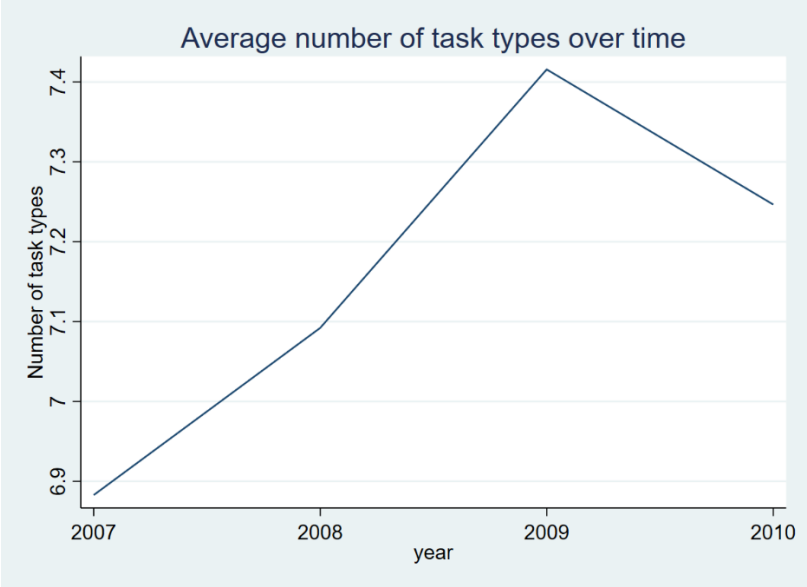
Note: The Mahalanobis distance used here measures the distance of the employee's task profile from the task profiles of other colleagues and is finally averaged over the individual companies. For details on the distance measure see: Mahalanobis (1936).

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

A first explanation of the convergence of task profiles could be that the range of tasks of workers became narrower. Since companies increasingly concentrate on fewer occupations (e.g. Cortes & Salvatori, 2019), it is likely that employees also focus on a smaller range of tasks. Specialisation would then also occur at the individual level. However, it is also possible that the range of tasks became similarly broader in line with trends towards multitasking and holistic organisations (Lindbeck & Snower, 2000): Then, all employees became more and more multitaskers. Figure 2 shows that the latter explanation appears to hold. The average number of task types performed by all employees increased over time.

Figure 2

Workers perform more task types on average



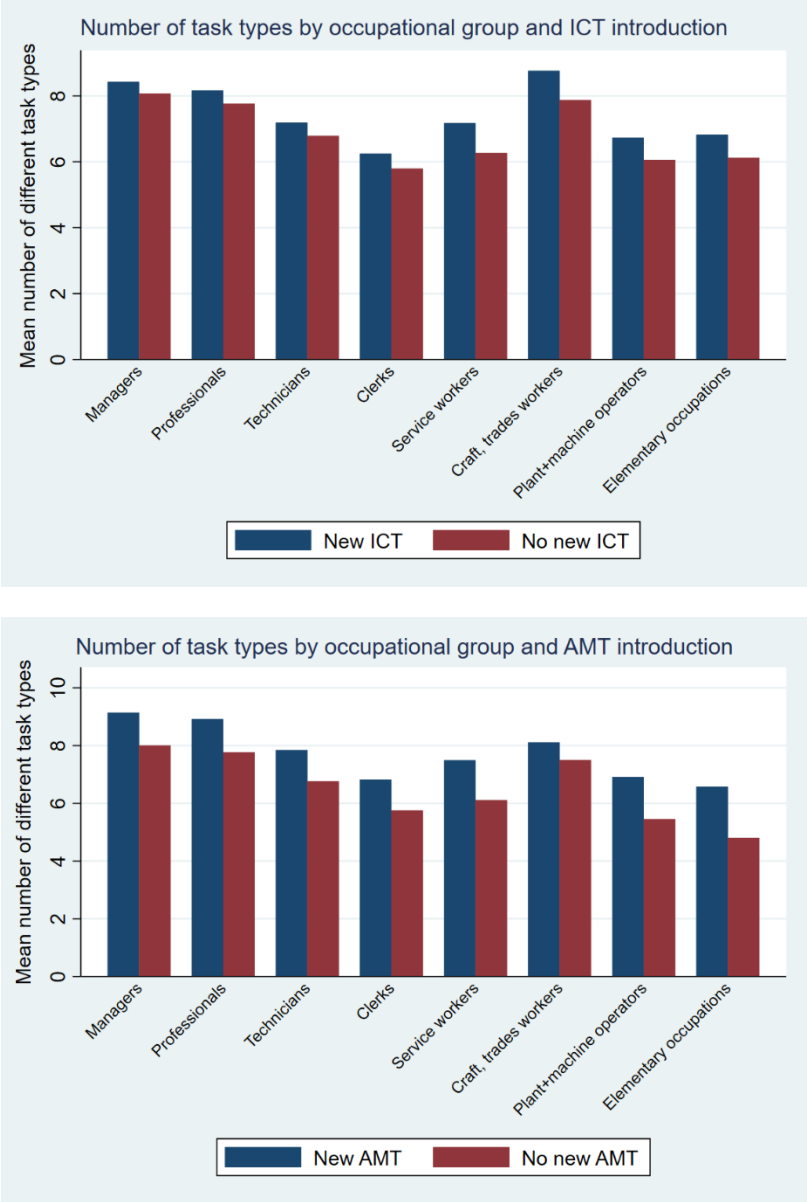
Note: Average number of task types for which workers indicated that they frequently but also rarely perform them.
Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

In a next step, we reveal some descriptive support that the two fundamental explanations, digitalisation and outsourcing, seem to have increased multitasking. Figure 3 provides cross-sectional results showing that, on average, workers who are affected by digitalisation perform a higher number of task types. This is in line with *Hypothesis 1a*.

Moreover, Figure 3 splits findings for different occupational groups providing first evidence on *Hypotheses 1b* and *1c*. *Hypothesis 1b* states that in low-skilled occupations, new ICT will increase multitasking more than new AMT do. In the descriptive findings, substantial differences between the potential effects of new ICT and AMT cannot be clearly identified for low-skilled occupations, located on the right side of the two figures (those requiring a low level of education and task complexity, i.e. a low ISCO skill level). *Hypothesis 1c* says that new ICT and AMT increase multitasking more among workers in high-skilled occupations than among those in low-skilled occupations. This hypothesis also receives less support from the findings. Potential effects of digitalisation are not substantially higher for high-skilled occupations on the left side of the figures (high ISCO skill level). For new ICT, they are in fact substantially lower.

Figure 3

Workers affected by digitalisation perform more task types



Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

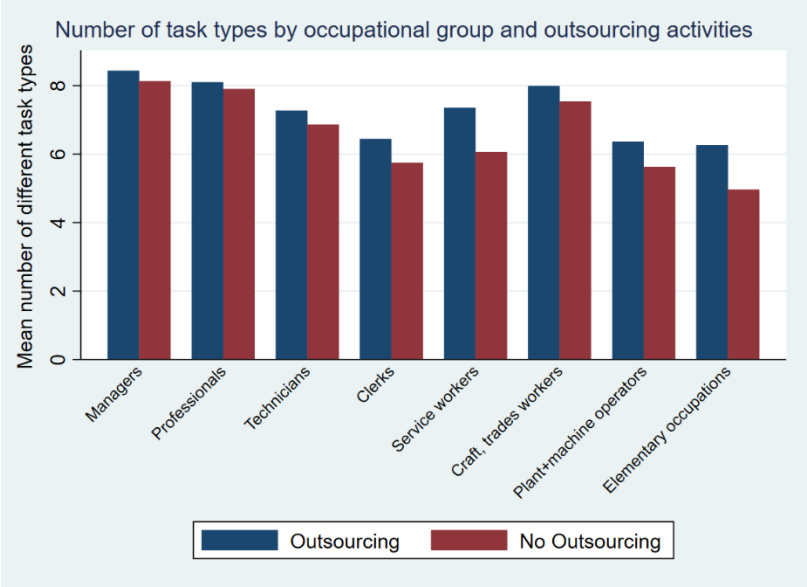
Cross-sectional comparison across survey periods. Occupational groups based on one-digit ISCO-88. Descending order of occupations in terms of their ISCO skill levels towards the right direction.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

Figure 4 replicates the results for outsourcing. In line with *Hypothesis 2a*, workers who are affected by outsourcing clearly perform a higher average number of task types. Contrary to *Hypothesis 2b*, which states that outsourcing particularly increases multitasking in high-skilled occupations, it seems that effects of multitasking are stronger in low-skilled occupations.

Figure 4

Workers affected by outsourcing perform more task types



Note: Cross-sectional comparison across survey periods. Occupational groups based on one-digit ISCO-88. Descending order of occupations in terms of their ISCO skill levels towards the right direction.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

In sum, the descriptive findings show that generally, digitalisation and outsourcing may increase multitasking. However, they also suggest that, contrary to what is expected by the existing literature, potential effects apply more strongly to workers in low-skilled occupations.

3.3 Regression analysis

This chapter provides more causal evidence for the descriptive findings based on fixed-effects panel regressions. First, we briefly present the model. Afterwards, the main regression results and further results of important robustness tests will be reported.

3.3.1 Regression model

We conduct a fixed-effects panel analysis that is frequently used in research to control for measured and unmeasured time-varying aspects. In this way, we try to provide a degree of causality as high as possible. However, it must be considered that the fixed-effects model is not able to provide information on time-constant variables, which is why only time-varying effects can be examined here. The following equation illustrates the model used:

$$Number\ of\ task\ types_{ti} = \beta_{0i} + \beta_{1i} * New\ AMT_{ti} + \beta_{2i} * New\ ICT_{ti} + \beta_{3i} * Outsourcing_{ti} + \beta_{mi} * Control\ variables_{ti} + d_t + e_{ti}\ where\ d_t = \text{wave}\ dummy, e_{ti} = error\ term$$

3.3.2 Regression results

In Table 5, the regression results show that workers who were affected by new ICT (0.163***) and those who were affected by new AMT (0.200***) perform, on average, a significantly higher number of different work tasks (model 1). Employees who were affected by outsourcing (0.133**) also perform significantly more tasks on average. Hence, the two explanations appear to be important such that *Hypotheses 1a* and *2a* are empirically supported.

Table 5

Effects of digitalisation and outsourcing on multitasking

Number of task types	(1)	(2)	(3)	(4)
New AMT	**0.200*** **	**0.194*** **	**0.191*** **	**0.193*** **
	(0.0700)	(0.0696)	(0.0694)	(0.0694)
New ICT	**0.163*** **	**0.148*** **	**0.144*** **	**0.143*** **
	(0.0493)	(0.0489)	(0.0488)	(0.0488)
Outsourcing	**0.133** **	**0.133** **	**0.133** **	**0.125** **
	(0.0611)	(0.0613)	(0.0613)	(0.0613)
Working hours		0.0380***	0.0378***	0.0337***
		(0.00801)	(0.00794)	(0.00783)
Temporarily employed			-0.296	-0.297
			(0.186)	(0.186)
Marginally employed				-0.874***
				(0.313)
Waves	✓	✓	✓	✓
Constant	7.277***	5.916***	5.931***	6.090***
	(0.0402)	(0.291)	(0.288)	(0.285)
Number of observations	96,464	96,464	96,464	96,464
Number of groups	1,938	1,938	1,938	1,938
R^2 (within)	0.0262	0.0352	0.0360	0.0381
R^2 (between)	0.0390	0.0478	0.0488	0.0498
R^2 (overall)	0.0276	0.0450	0.0454	0.0471

Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

Levels of significance: * p<0.1; ** p<0.05; *** p<0.01; standard errors in parentheses.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

Control variables are gradually added in models 2 to 4. As expected, adding one hour official working time significantly increases the number of performed tasks (0.0380***). Changing into a permanent contract increases the number of task types, which is in line with our expectations though insignificant (-0.2969 for temporary employment). As assumed, working under marginal employment significantly reduces the number of task types (-0.874***). Consequently, the applied variables and the regression model seem plausible.

Importantly, the coefficients for digitalisation and outsourcing do not change substantially when adding these control variables (model 4). Moreover, they appear to be substantial in comparison to the coefficients of the control variables. For example, the effect of new AMT roughly equals the effect of adding six working hours per week (0.193/0.0337). For new ICT and outsourcing, this relative effect amounts to four working hours.

In order to test the remaining three hypotheses (*1b*, *1c*, *2b*), the following regressions in Table 6 split the sample into subsamples of occupations with high and low skill levels, respectively. The classification of respondents into the two groups is based on their ISCO-88 one-digit occupational group, which can be assigned to ISCO skill levels. This classification rests on the complexity and scope of the tasks and duties to be performed in the occupation. There are four different skill levels where skill level 1 is considered low, 2 is medium and 3 and 4 are regarded high. In model 1, only occupations with an ISCO skill level of 1 or 2 (low and medium skill level) and in model 2, those with ISCO skill levels of 3 or 4 (high skill level) are examined.

Starting with low-skilled occupations (model 1), the results show a strong and highly significant effect of the new ICT on the number of task types (0.289***). In contrast to that, the coefficient of new AMT is substantially smaller and insignificant (0.113). This pattern is in line with *Hypothesis 1b*, which states that in low-skilled occupations, new ICT increase multitasking more than new AMT do. The coefficient of outsourcing is larger than the coefficient of new AMT but insignificant (0.177).

Model 2 focuses on high-skilled occupations. The effect of new AMT on the number of task types is large and highly significant (0.243***). Thus, the coefficients are quite different between the two models. This is in in line with *Hypothesis 1c*, which says that new AMT increase multitasking more in high-skilled than in low-skilled occupations.

Table 6

Effects of digitalisation and outsourcing on multitasking for different skill levels

Number of task types	(1) Low-skilled occupation	(2) High-skilled occupation
New AMT	**0.113**	**0.243*** **
	(0.121)	(0.0840)
New ICT	**0.289*** **	**0.0729**
	(0.105)	(0.0537)
Outsourcing	**0.177**	**0.0934**
	(0.109)	(0.0738)
Working hours	0.0323**	0.0348***
	(0.0152)	(0.00899)
Temporarily employed	-0.448	-0.240
	(0.296)	(0.240)
Marginally employed	-1.018**	-0.836*
	(0.445)	(0.488)
Waves	✓	✓
Constant	5.922***	6.165***
	(0.564)	(0.325)
Number of observations	32,828	62,087
Number of groups	716	1,190
R^2 (within)	0.0501	0.0352
R^2 (between)	0.0386	0.0617
R^2 (overall)	0.0428	0.0523

Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.
Skill level based on ISCO classification of occupational groups (Elias, 1997).
Levels of significance: * p<0.1; ** p<0.05; *** p<0.01; standard errors in parentheses.
Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

However, some results in model 2 are clearly incompatible with the hypotheses. The coefficient of new ICT is small and insignificant (0.0729). Thus, a clear difference to the coefficient in model 1 (0.289***) exists, which is not in line with *Hypothesis 1c*. In addition, the coefficient of outsourcing is also even smaller (0.0934) than in model 1 (0.1777) such that *Hypothesis 2b* also cannot be supported. Sample sizes do not explain these differences, as they are larger for high-skilled occupations.

Table 7 summarises the findings of the main analysis.

Table 7

Identified effects of specialisation measures on multitasking

Specialisation measure	Multitasking		
	Overall	High-skilled	Low-skilled
New ICT	+		
New AMT	+		
Outsourcing	+		(a)

Note:  = identified effect larger at the left side of the triangle (as expected).

 = identified effect larger at the right side of the triangle (different than expected).

ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

Levels of significance: a = p>0.1; otherwise = p<0.1. *Source*: Own compilation.

3.4 Robustness tests

We test the robustness of our findings by means of further estimations including a recalculated outsourcing variable (Table 8) and workers' earnings as another control variable (Table 9). First, as mentioned above, the outsourcing variable used includes both the outsourcing of activities and the reintegration of outsourced activities. To corroborate that the results refer to outsourcing activities, we take information of a second outsourcing variable and combine this variable with the initial one. The second variable asks how employees assess the likelihood that their work will be affected by outsourcing within the next 12 months. The new variable that combines both items takes the value 1 if respondents also indicated a medium to high probability (Outsourcing probability). Thereby, it is likely that they refer to the outsourcing and not the reintegration of activities in the initial item.

Models 1 to 3 in Table 8 show results for the whole sample and the two subsamples based on ISCO skill levels. For the whole sample, the coefficient of the new variable is similar in terms of sign and size. It is, however, now insignificant, which may be the result of a smaller sample size. The coefficients for the two subsamples show an interesting pattern: Although both are still insignificant, the coefficient for low-skilled occupations is now substantial and the one for high-skilled occupations is marginal. Thus, they correspond even less to *Hypothesis 2b*.

Table 8

Robustness tests with a recalculated outsourcing variable

Number of task types	(1) Whole sample	(2) Low-skilled occupation	(3) High-skilled occupation
New AMT	0.200***	0.0514	0.301***
	(0.0754)	(0.128)	(0.0932)
New ICT	0.142***	0.312***	0.0652
	(0.0507)	(0.110)	(0.0563)
Outsourcing	-	-	-
Outsourcing probability	**0.112**	**0.221**	**0.0458**
	(0.0854)	(0.172)	(0.0947)
Working hours	0.0338***	0.0310*	0.0339***
	(0.00806)	(0.0161)	(0.00916)
Temporarily employed	-0.309	-0.513	-0.215
	(0.195)	(0.314)	(0.248)
Marginally employed	-0.983***	-1.236***	-0.842*
	(0.320)	(0.470)	(0.489)
Waves	✓	✓	✓
Constant	6.073***	5.946***	6.184***
	(0.293)	(0.596)	(0.331)
Number of observations	89,288	29,729	58,095
Number of groups	1,930	711	1,188
R^2 (within)	0.0395	0.0544	0. 0355
R^2 (between)	0.0477	0.0283	0.0664
R^2 (overall)	0.0465	0.0340	0.0577

Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies. Skill level based on ISCO classification of occupational groups (Elias, 1997).

Levels of significance: * p<0.1; ** p<0.05; *** p<0.01; standard errors in parentheses.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

Secondly, increasing earnings may compensate for additional tasks after specialisation efforts. Therefore, we also seek to control for changes in respondents' monthly earnings (Table 9). The variable is only included in robustness tests because it is measured in broad categories of 500€-intervals (e.g. 500-1,000€). Hence, particularly in fixed-effects regressions, increasing earnings are unlikely to change the earnings category. In Table 9, the item is included as a continuous variable in regressions based on the whole sample and the two subsamples. As expected due to the measurement, the coefficients are small and insignificant. Most importantly, the inclusion of this variable does not affect the robustness of the coefficients for our variables of interest.

Table 9

Robustness tests with earnings as a control variable

Number of task types	(1) Whole sample	(2) Low-skilled occupation	(3) High-skilled occupation
New AMT	**0.204*** **	**0.116**	**0.263*** **
	(0.0698)	(0.120)	(0.0850)
New ICT	**0.145*** **	**0.297*** **	**0.0745**
	(0.0491)	(0.107)	(0.0541)
Outsourcing	**0.103***	**0.147**	**0.0762**
	(0.0620)	(0.112)	(0.0738)
Earnings	**0.0225**	**-0.0214**	**0.0437**
	(0.0495)	(0.0961)	(0.0600)
Working hours	0.0344***	0.0356**	0.0339***
	(0.00793)	(0.0156)	(0.00905)
Temporarily employed	-0.304	-0.404	-0.242
	(0.189)	(0.301)	(0.245)
Marginally employed	-0.812***	-0.854**	-0.783
	(0.302)	(0.422)	(0.497)
Waves	✓	✓	✓
Constant	5.916***	5.918***	-0.103*
	(0.417)	(0.804)	(0.0566)
Number of observations	94,672	32,215	60,924
Number of groups	1,934	713	1,189
R^2 (within)	0.0396	0. 0505	0.0364
R^2 (between)	0.0603	0.0329	0.0676
R^2 (overall)	0.0543	0.0360	0.0595

Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies. Skill level based on ISCO classification of occupational groups (Elias, 1997).

Levels of significance: * p<0.1; ** p<0.05; *** p<0.01; standard errors in parentheses.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

4 Analysis of further implications of multitasking

Our analysis showed that specialisation measures by companies (digitalisation and outsourcing) contribute to an increase in multitasking. In this chapter, we analyse two important implications of increased multitasking, namely the employability of workers and the provision of employer-financed training. First, we consider linkages to workers' employability. In order to identify the employability, we again calculate the (Mahalanobis) distance of the task profiles as in Figure

1. However, this time we do not calculate distances and their averages within establishments. Instead, we calculate individual distances of task profiles to those of the whole sample or workers' own occupational group. A lower distance means that task profiles better match task demands on the labour market such that workers can change jobs more easily. Table 10 shows regression results of fixed-effects panel regressions of individual distances of task profiles on the number of task types.

Table 10

Effects of multitasking on workers' employability

Low Employability	Workers' own occupational group		Whole sample	
	(1)	(2)	(3)	(4)
Number of task types	**-0.184*** **	**-0.185*** **	**-0.196*** **	**-0.197*** **
	(0.00958)	(0.00957)	(0.00927)	(0.00927)
New AMT	-	**0.0307**	-	**0.0231**
		(0.0349)		(0.0342)
New ICT	-	**0.0355**	-	**0.0324**
		(0.0266)		(0.0260)
Outsourcing	-	**0.0771** **	-	**0.0708** **
		(0.0310)		(0.0302)
Working hours	0.00518*	0.00504	0.00618**	0.00606**
	(0.00312)	(0.00312)	(0.00296)	(0.00295)
Temporarily employed	-0.178*	-0.170*	-0.178*	-0.171*
	(0.0991)	(0.0986)	(0.0978)	(0.0973)
Marginally employed	0.232	0.246	0.257	0.270
	(0.168)	(0.169)	(0.164)	(0.166)
Waves	✓	✓	✓	✓
Constant	1.055***	1.040***	1.161***	1.147***
	(0.127)	(0.126)	(0.121)	(0.121)
Number of observations	94,555	94,555	94,555	94,555
Number of groups	1,906	1,906	1,906	1,906
R^2 (within)	0.1189	0.1207	0. 1243	0.1258
R^2 (between)	0.0304	0.0320	0.0525	0.0544
R^2 (overall)	0.0518	0.0541	0.0646	0.0667

Note: ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

Employability is measured using the Mahalanobis distance. Here, it measures the distance of the employee's task profile from the task profiles of other employees in the same occupation or in the whole labour market. The higher the distance, the lower the employability. For details on the distance measure see Mahalanobis (1936).

Levels of significance: * p<0.1; ** p<0.05; *** p<0.01; standard errors in parentheses.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

In models 1 and 2, the distances are calculated to workers' own occupational group based on one-digit ISCO-88. A highly significant negative coefficient of the number of task types is identified. Thus, multitasking decreases the distance and correspondingly increases employability. The effect of multitasking also seems to be substantial, as performing one further task decreases the distance by roughly 17 percent compared to the intercept (e.g. 0.184/1.055).

In model 2, the variables for digitalisation and outsourcing are added. The size of the coefficient of the number of task types remains virtually identical. The small and insignificant coefficients of digitalisation suggest that working with new technologies does not per se increase employability. With a positive and significant coefficient, outsourcing decreases employability of remaining workers. However, when these workers handle more task types after the outsourcing event, they can seemingly attenuate this decreasing effect of outsourcing (though a more detailed empirical analysis of these connections is pending). In models 3 and 4, the distance is calculated to the whole sample and coefficients of the number of task types remain similar.

In Table 11, we test the link between multitasking and the probability of employer-financed training by means of fixed-effects panel regressions and for high- and low-skilled occupations separately. A clear discrepancy is identified: Workers in high-skilled occupations are, on average, more likely to receive training after increases in multitasking, which is not the case in low-skilled occupations. A similar pattern is also found for digitalisation. Notably, new AMT has a statistically significant negative effect on training in low-skilled occupation since it may replace tasks. Outsourcing has no effect in both subsamples.

5 Discussion

Our analysis based on the task-approach shows that digitalisation and outsourcing are both distinctive factors for increasing multitasking in German establishments. In addition, it reveals new insights on differences between occupational groups. In line with suggestions of previous literature, we find that the introduction of advanced manufacturing technologies (AMT) increases multitasking of workers in high-skilled occupations much more than of those in low-skilled occupations, in which the effect of new information and communication technologies (ICT) clearly dominates.

Table 11

Effects of multitasking on training measures

Employer-financed training (0/1)	(1) High-skilled occupation	(2) Low-skilled occupation
Number of task types	**0.00638****	**-0.00327**
	(0.00313)	(0.00201)
New AMT	**0.0278***	**-0.0208****
	(0.0150)	(0.0104)
New ICT	**0.0303*****	**0.00627**
	(0.00948)	(0.0105)
Outsourcing	**-0.00207**	**-0.00256**
	(0.0127)	(0.0115)
Working hours	-0.000437	-1.00e-04
	(0.00112)	(0.000854)
Temporarily employed	-0.0212	-0.00373
	(0.0210)	(0.0102)
Marginally employed	-0.0455	0.0398
	(0.0344)	(0.0496)
Waves	✓	✓
Constant	0.0751*	0.0939***
	(0.0436)	(0.0359)
Number of observations	61,645	32,768
Number of groups	1,190	716
R^2 (within)	0.0040	0.0027
R^2 (between)	0.0235	0.0000
R^2 (overall)	0.0083	0.0008

Note: Employer-financed training = 1 if employees reported training and 0 otherwise.

ICT = Information and communication technologies. AMT = Advanced manufacturing technologies.

Skill level based on ISCO classification of occupational groups (Elias, 1997).

Levels of significance: * p<0.1; ** p<0.05; *** p<0.01; standard errors in parentheses.

Source: Own calculations based on WeLL data by Institute for Employment Research (IAB).

Contrary to earlier suggestions, our main finding is that the effect of new ICT and outsourcing is only present for workers in low-skilled occupations. Hence, it seems to be the case that developments in ICT and outsourcing, which have arguably impacted multitasking in high-skilled occupations in earlier years (Lindbeck & Snower, 2000), appear to have passed through to low-skilled occupations. Thus, firms may have been only able to focus on fewer occupations (Cortes & Salvatori, 2019) because especially employees in low-skilled occupations are able to perform a wider range of tasks.

The fact that workers in low-skilled occupations particularly face increased multitasking as a result of specialisation measures has important implications. In our study, we have shown that being able to handle multiple tasks generally increases the employability on the labour market. This holds across all analysed occupations. However, we identified an important discrepancy between high- and low-skilled occupations in terms of training measures. Increases in multitasking place a high need on training measures given that changes in task profiles rather seem to be long-lasting. We found that workers in low-skilled occupations, who face the largest increases in multitasking due to new ICT and outsourcing, do not receive training when they need to perform more task types. These findings are in line with research by the Organisation for Economic Co-operation and Development (2019, 2021), which also highlights that low-skilled workers are most in need of training but receive less training on average. Consequently, this calls for support for employees in all areas (Haertwig & Sapronova, 2021).

Given that multitasking is not necessarily followed by training measures, further important implications are plausible. We sketch three of them and thereby invite future research. A first crucial consequence is the workload. When training measures do not occur, it becomes more likely that the workloads of employees increase. In line with that, it has been shown that the introduction of new information and communication technologies can be followed by increased time pressure and work speed (Atanasoff & Venable, 2017). Thus, in accordance with our findings on training measures, it has been suggested that the digital load can differ between occupational groups (Haertwig & Sapronova, 2021). Therefore, future research should identify occupation-specific linkages between multitasking and workloads.

Increasing workloads are also likely to affect a second factor, namely job satisfaction. While handling multiple tasks can be a valuable enrichment and preferred by workers in high-skilled occupations (Lindbeck & Snower, 2000), more recent research shows that this assumption cannot be generalised (Wegman et al., 2018). Consequently, also the link between changing task profiles and job quality in general is highly dependent on the occupation (Findlay et al., 2013), again requiring further empirical analyses.

Finally, multitasking should be considered in the wage setting process. If workers take over tasks that were initially performed within other occupations that have been outsourced (Cortes & Salvatori, 2019), this should be compensated. However, it has been found for Germany that

again workers without a college degree do not necessarily earn more when their employer outsources activities (Ochsenfeld, 2018). Testing such implications for each occupational group and based on newer data with more encompassing lists of task types is vital in order to say whether some workers pay a hidden price of firms' specialisation efforts.

6 Conclusion

While outsourcing and digitalisation in companies lead to specialisation in a few occupational groups, our results reveal that for individual employees, they are accompanied by an increase in task types, meaning they increasingly lead to multitasking. Since, contrary to earlier expectations, this effect is particularly evident for employees in occupations requiring a low-skill level, possible consequences for this employee group should receive special attention. By looking at the effect of multitasking on employability and the provision of training, two first important factors have been considered in this paper. While the increase in employability due to multitasking can be beneficial to workers, we see that, especially for those in low-skilled occupations, the increase in task types is not accompanied by an increase in employer-financed training. This lack of training may mean that the additional tasks are more likely to result in a lack of skills and an increasing workload. Therefore, effects of multitasking on workloads but also other factors such as earnings and job satisfaction should be investigated by upcoming literature. The findings presented can help to counteract possible disadvantages caused by digitalisation and outsourcing, for example through support in the form of training that is especially targeted to workers in low-skilled occupations.

Note: The data basis of this paper is the practically anonymised data of the panel "WeLL" – Employee Survey for the project "Further Training as a Part of Lifelong Learning", wave 1-4. The data were accessed via a scientific use file provided by the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB). (Project number: 102188). For further information on the dataset see Huber and Schmucker (2012) or Bender et al. (2009).

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