Economic Studies 195

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The Mystery of Inequality

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Olle Hammar

The Mystery of Inequality

Essays on Culture, Development, and Distributions

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Abstract
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Essay I (with Daniel Waldenström): We estimate trends in global earnings dispersion across occupational groups by constructing a new database that covers 68 developed and developing countries between 1970 and 2018. Our main finding is that global earnings inequality has fallen, primarily during the 2000s and 2010s, when the global Gini coefficient dropped by 15 points and the earnings share of the world's poorest half doubled. Decomposition analyses show earnings convergence between countries and within occupations, while within-country earnings inequality has increased. Moreover, the falling global inequality trend was driven mainly by real wage growth, rather than changes in hours worked, taxes or occupational employment.

Essay II: I analyze the relationship between individualism and preferences for redistribution, using variation in immigrants' countries of origin to capture the impact of cultural values and beliefs on personal attitudes towards income redistribution and equality. Using global individual-level survey data, I find strong support for the hypothesis that more individualistic cultures are associated with lower preferences for redistribution. At the same time, cultural assimilation in this dimension seems to take place relatively fast.

Essay III (with Paula Roth and Daniel Waldenström): We provide new evidence on income inequality levels and trends in Sweden from 1968 to 2016. By combining data from tax and population registers, we construct a new dataset that includes the distribution of pre-tax total and post-tax disposable income for the full Swedish population since 1968. Our results indicate that the 1980s was the decade with the lowest level of overall income inequality in Sweden, while income inequality as measured by top income shares for the very top has increased steadily over the studied period.

Essay IV (with Katarzyna Burzynska): We apply a panel of 331 microfinance institutions from 37 countries to investigate the relationship between social beliefs and microfinance financial performance over the period of 2003–2011. We find that microfinance institutions in countries with higher levels of trust and more collectivist culture have lower operating and default costs and charge lower interest rates. These results provide the first large cross-country evidence that social beliefs are important determinants of microfinance performance.

Keywords: Inequality, Culture, Development

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For Emma, and all our kids

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To my wonderful children: Noa, Bill and Viola, the three of you are the reason this thesis has taken so long for me to write. You're also the best motivation for writing this thesis at all. You're the future, and you're the real values in life.

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Enskede, April 2021
Olle Hammar

Contents

Introduction

> "It's the mystery of iniquity,
> Said it's the history of inequity"
> —Lauryn Hill

The world in an unequal place. At the same time, the world has become a better place in many ways over the past half-century. But has it become more or less unequal? Who has been the winners and losers from this development? And how are views on equality and redistribution related to our culture? How do they change if you migrate from one country to another? In this thesis, I try to contribute to our understanding of some of these big questions related to inequality, culture, and development.

In order to study such broad questions, it would be hard (and most likely unethical) to conduct a random experiment that would allow us to perfectly identify the causal effect of x on y. Nevertheless, since I believe these are important issues, I think it is still important to investigate these kinds of descriptive questions. It is my hope and belief that descriptive work, such as the main part of this thesis, can push our understanding of these topics at least a small step further.

This thesis consists of four self-contained essays. The papers are primarily empirical, and use a wide variety of data sources ranging from global survey data to administrative records.

Global Inequality

In Chapter 1, **Global Earnings Inequality, 1970–2018**, Daniel Waldenström and I build on the pioneering work by Branko Milanovic (2015, 2016) and others studying the global distribution of incomes—that is, the levels and trends of global inequality among all citizens on this planet. By focusing on incomes from labor for different occupational groups around the world, our paper provides the first study of the global distribution of earnings and wages (Hammar and Waldenström, 2020). Doing so, we find that the level of global earnings inequality is high, but has fallen over the last 50 years. While the average inequality within countries has increased over this period, the decrease in inequality between countries has been larger. The main decline in global earnings inequality has taken place since the turn of the millennium,

and we find that it is mainly driven by high wage growth in China and India. Our results also imply that the main determinant of your position in the global earnings distribution is which country you live in.

Individualism–Collectivism, Attitudes to Redistribution, and Migrant Assimilation

In Chapter 2, **The Cultural Assimilation of Individualism and Preferences for Redistribution**, the area of study is still the world, but the question I now ask is on the relationship between individualistic–collectivistic cultures and people's attitudes to inequality and redistribution. The study of culture and its relationship with different social and economic outcomes is a relatively new field within economics. As found in the seminal work by Daron Acemoglu and James A. Robinson (2012), the institutional environment matters for development and many other outcomes. In their defining work on institutions, however, Douglass C. North (1991) and Oliver E. Williamson (2000) have often referred to culture has something relatively vaguely categorized into 'informal institutions' or the 'embeddedness level'. In this chapter, I thus focus on one specific cultural dimension, namely that of individualism versus collectivism. This cultural dimension has a long history within cultural psychology, but it is only more recently that is has gained attention within economics—through early theoretical work by Avner Grief (1994), and more recent empirical studies by Yuriy Gorodnichenko and Gérard Roland (2011, 2017). In a couple of very recent papers it has also been linked to migration (Knudsen, 2019) and political preferences (Bazzi, Fiszbein and Gebresilasse, 2020).

I try to expand this analysis by studying the relationship between individualism–collectivism and preferences for redistribution in a global sample of migrants, and how these preferences are related to the culture in the country of origin as well as destination. I find that people who come from more individualistic countries on average have lower preferences for redistribution, but also that people seem to adapt their preferences to the new cultural environment relatively fast. This latter finding also relates to recent work on cultural assimilation by Ran Abramitzky, Leah Platt Boustan and Katherine Eriksson (2017, 2020).

Top of the Global Distribution: Income Inequality in a Nordic Welfare State

In Chapter 3, **The Swedish Income Distribution, 1968–2016**, focus is shifted back to studying inequality levels and trends. In this chapter, Paula Roth, Daniel Waldenström and I focus on the income distribution of one very rich

country, Sweden, over the past 50 years. Has inequality within Sweden increased over this period—in accordance with the average within-country inequality that we saw in Chapter 1? To study this, we construct a new database covering detailed income records of all individuals and households in Sweden since 1968. Moreover, this extremely detailed administrative data allows us to study the very top of the global income distribution, such as the income share of the top 0.001% (that is, approximately the richest 100 persons in Sweden). We find that the income and household concepts one use, can make a big difference to the pattern found. In general, however, we see that income inequality in Sweden fell quite dramatically during the late 1960s and 1970s, was at its lowest level during the 1980s, and has increased since then. Comparing the levels of pre-tax total income inequality with post-taxes-and-transfers disposable income, we also document the redistributions that take place through the welfare system. Finally, this study is also related to a broader research project about income and wealth inequality around the world, through the *World Inequality Database* (WID.world). As such, it builds on a long tradition of measuring and studying income distributions, following the great work by Simon Kuznets, Tony Atkinson and, most recently, Thomas Piketty.

Culture and Microfinance in Developing Countries

While *Capital in the Twenty-First Century* (Piketty, 2014) has been an important inspiration for Chapter 3, inspiration for the final chapter first came from another book on capital, namely *The Mystery of Capital* by Hernando de Soto (2000). In response to poor people's lack of access to capital in many developing countries, microfinance has come across as a potential solution. Since Muhammad Yunus and the Grameen Bank won the Nobel Peace Prize for this idea and implementations, a lot of research has been conducted on studying the effects of microfinance, where it seems to work and where it does not.

In Chapter 4, **The Impact of Social Beliefs on Microfinance Performance**, the focus is thus shifted from Sweden to the other end of the global income distribution—that is, to people living in developing countries who do not have enough money or resources to get a formal bank loan. In this final chapter, Katarzyna Burzynska and I study to what extent informal institutions, or culture, can serve as a substitute for weak formal institutions, and whether or not social capital can work as a substitute for physical capital. Our results suggest that microfinance can work better in more collectivistic countries and countries with higher levels of trust (Berggren and Burzynska, 2015).

Concluding Remarks

To summarize, the overall takeaways from this dissertation is that the world remains an unequal place, but less so than it was 50 years ago. Culture seems to matter; but it is not deterministic. Hopefully this thesis has provided some new insights into the mysteries of inequality. More importantly, I hope it has spurred—and will continue to spur—many ideas for future research on these topics.

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1. Global Earnings Inequality, 1970–2018

with Daniel Waldenström

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The world economy has undergone tremendous change over the past decades and questions about distributional consequences are often heard: Has the world become a more or less equal place? What are the main patterns underlying this development? Answering questions about global inequality is difficult since distributional data around the world are not always well-measured or comparable across countries and time. Despite this, a small research literature has estimated a global household income distribution by combining available information from household surveys, national accounts and administrative tax records (Milanovic, 2002, 2005, 2016; Anand and Segal, 2008, 2015, 2017; Bourguignon, 2015; Lakner and Milanovic, 2015; Alvaredo *et al*., 2017).[1] The results so far are uncertain, but they suggest that global household income inequality (as measured by, for instance, the Gini coefficient) has decreased since the late 1990s, despite high income growth in the global top. They also find that a key driver behind this development has been an income convergence between poorer and richer countries.

In this paper, we construct a new global inequality dataset by using previously unexploited data on labour earnings in the working population that have been collected consistently around the world over the past fifty years. Our aim is to estimate the trend in *global earnings inequality* from 1970 to 2018 and to analyse underlying patterns and potential driving factors. Our contribution to the literature is threefold. First of all, we are the first to focus on labour earnings and wages among the global workforce, rather than on total incomes among households, when measuring global inequality. Second, we use data that were created with the explicit purpose to be comparable and consistent over both time and space, which contrasts with previously used global income datasets that are composed by mixing observations from distinct sources. Third, we observe labour market variables that allow us to decompose previously unexplored dimensions of global inequality, for example, by occupations and sectors, comparing real wage rate growth with changes in labour supply, and pre- versus post-tax differences.

Our new database is based on two main sources: earnings survey data from the Union Bank of Switzerland's (UBS) *Prices and Earnings* (1970–2018) reports and labour market statistics from the International Labour Organization (ILO). The earnings data have been collected by the UBS using the same methodology in a total of 89 cities around the world, every three years since 1970. These data contain homogenous information about earnings, working hours and taxes in a total of 19 different occupations in 68 countries, which represents about 80% of the world's population and over 95% of the world's gross domestic product (GDP). The UBS data also contain local prices

[1] These studies, as well as ours, focus on *relative* inequality. For a discussion on *absolute* inequality, see Niño-Zarazúa *et al*. (2017) and Ravallion (2018*b*). Moreover, we follow the general practice within this literature by taking a cosmopolitan (rather than nationalistic) view on global inequality, which means that we value all people equally regardless of where they live.

collected in the exact same location and time frame as the earnings data, which means that we can adjust for local price level differences. We create the global labour force by matching these UBS occupations to occupational employment statistics from the ILO (2010, 2018), using the *International Standard Classification of Occupations* (ISCO), together with unemployment data and country working age populations from the World Bank's (2018) *World Development Indicators* (WDI).

There are some important limitations with the UBS earnings data. First, in the UBS data, the observational units within a country are occupations, not individuals. This means that we will underestimate inequality both nationally and globally since we do not observe the individual earnings variation within each country-occupation.[2] A closely related problem is also that we only have earnings for a limited number of occupations and therefore lack variation both within and between missing occupations. Our main approach to examine how these issues affect our results is to compare our within-country series to corresponding microdata estimates for all countries with available data in the *Luxembourg Income Study* (LIS, 2017) and similar sources. These comparisons confirm that our levels of inequality are lower than the estimates using individual-level data, but also that we match the microdata-based within-country inequality trends remarkably well. Based on estimates from these comparisons, we are able to adjust our global inequality series for the missing dispersion within occupational groups (that is, both for missing occupations and for missing variation within occupations). We find that these adjustments increase our estimated level of global earnings inequality by relatively little (between one and four Gini points).

Second, another main limitation is that the UBS data have only been collected in major cities. The first implication of this urban coverage is that we lack certain rural-specific occupations, of which we add the most important one, namely agricultural sector earnings, from Freeman and Oostendorp's (2012) *Occupational Wages around the World* (OWW) database. The other implication is that we might still miss earnings variation, both within and between countries, if earnings levels within given occupations differ systematically between urban and rural areas. Our main approach to deal with this issue is to purchasing power parity (PPP)-adjust for urban prices at the local city level. Our (relatively strong) assumption is thus that any systematic differences in earnings between rural and urban areas would be fully captured by corresponding price differences. This assumption is supported by within-sample checks, where we compare price-adjusted earnings and inequality in cities of different sizes within the same country, and find no relationship between

[2] Note that the previous global inequality literature also uses grouped data but where, instead of country-occupations, their lowest level of observation is a country-decile or ventile. Since our baseline estimations include 20 occupations this means that the number of observational units are similar.

city population and earnings or inequality in our data. Nevertheless, it is still possible that, for example, urban earnings are relatively higher than rural earnings in developing, compared to developed, countries. If so, this would imply that we underestimate global inequality.

A third, and final, potential issue with the UBS data is limited coverage of top and bottom earnings. Comparisons with top earnings data from the *World Inequality Database* (WID, 2018) show that our data seem to cover top earnings reasonably well up to the top five percentiles. Moreover, when we add national top earnings from the WID to our data, we find that this has a very limited effect on our global earnings inequality estimates (which then increase by approximately one Gini point). At the lower end of the earnings distribution, we add the unemployed population in each country, which we assign zero earnings. However, our data and estimations do not include any earnings from the informal sector. While we cannot check the implications of this explicitly, we believe that it is plausible to assume that some of the workers who were officially registered as unemployed had some form of informal-sector earnings. If this is the case, this means that in our baseline analysis we ascribe them too low earnings and, as such, overestimate both country- and global-level earning inequality. In an alternative analysis, we therefore exclude the unemployed, instead focusing exclusively on the employed global workforce, finding that this yields only a slightly lower level of global inequality (approximately two Gini points lower).

Our main finding is that global earnings inequality has fallen during the past decades, after being stable at a high level from the 1970s until the 1990s. The decline occurred during the 2000s and 2010s, with the global Gini coefficient decreasing by 15 points (from 65 to 50) and the earnings share of the bottom half of the global distribution more than doubling (from 9% to 19%). Global inequality is lower for yearly earnings than for hourly wages, which suggests a negative relationship between earnings and hours worked at the global level. We also find that global post-tax inequality is approximately two Gini points lower than global pre-tax inequality. When decomposing global inequality into within- and between-country contributions, we find that earnings convergence across counties accounts for the entire fall in global inequality, primarily driven by high earnings growth in China and India. However, inequality within countries has increased since the 2000s, from representing about one-fifth to one-third of total global inequality. Counterfactual analyses, where we hold the 1970 values of different variables constant, show that the declining global inequality trend is driven mainly by relative changes in real wage rates rather than in labour supply, as reflected by hours worked and occupational employment shares, or in demographics. When we decompose the global earnings inequality trend across occupations and sectors, we find that the earnings growth of agricultural workers in China and low-skilled workers in India are particularly important and only slightly offset by rising managerial earnings in the United States. Finally, we observe a stronger earnings

convergence in the traditionally traded (industrial) sector than in the non-traded (services) sector. While such an analysis lies outside the scope of this paper, this could indicate that trade globalization matters for global inequality trends.

The results of the study are robust to a number of sensitivity checks and alternations, including using alternative samples, inequality measures, imputation methods, populations, and PPP-adjustments (see the accompanying Appendix for further details). Comparing our results with the previous literature, we find that global inequality in earnings and wages are lower than global inequality in total incomes. The trends are similar, but with a slightly larger inequality decline for global earnings. While these deviations could be due to capital incomes, pensions and other transfers included in total household incomes, the overall similarities suggest that labour market outcomes stand for most of overall global inequality.

The remainder of the paper is organized as follows. Section 1.1 describes the data and construction of our *Global Earnings Inequality Database*. Section 1.2 presents the main trends, Section 1.3 their decomposition in different dimensions, and Section 1.4 concludes. Further details and validations as well as sensitivity and heterogeneity analyses are presented in the supplementary Appendix.

1.1 Data and Estimation Procedure

Our analysis builds on previous attempts to estimate global inequality by constructing an income distribution of the global population. Early attempts to do so used population-weighted national per capita incomes to measure the global distribution of income (for example, Deaton, 2010). This "Concept 2" of international inequality (Milanovic, 2005) captures between-country inequality, but neglects inequality within countries.[3] The more recent literature has instead used household income and consumption surveys from different countries compiled into a unified global population (Anand and Segal, 2015, 2017; Lakner and Milanovic, 2015).[4] In this paper we follow this latter "Concept 3" approach of global inequality (Milanovic, 2005), albeit with a slightly different focus. That is, we build on the measurement approaches of, for example, Lakner and Milanovic (2015), but construct a unified global distribution of earnings and wages (rather than total incomes or consumption) among occupational groups (instead of household quantiles). As such, our dataset is constructed by combining earnings data from the UBS surveys with occupational

[3] A comparison of this "Concept 2" of international (between-country) inequality in terms of labour earnings versus total income is presented in Figure 1.C3 in the Appendix.

[4] A combination of the two concepts is used by, for example, Sala-i-Martin (2006). An overview of the early literature is provided in Anand and Segal (2008), whereas Ravallion (2018*a*) provides a review of two recent volumes by Bourguignon (2015) and Milanovic (2016).

employment statistics from the ILO and country populations from the World Bank.[5] This section briefly describes these data and the construction of our dataset. More detailed descriptions of the database are given in the Appendix.[6]

The key advantage of using the UBS earnings data is the comparability and consistency they offer across both time and space. Previous estimations of global inequality have merged household surveys from various countries and sources that often differ in sample definitions, observational unit (individuals or households), outcome measure (income or consumption), or time of measurement (Anand and Segal, 2008, 2015). Household surveys are also a fairly recent phenomenon which is why previous studies usually begin their analyses in the late 1980s. Our database covers a significantly longer time period as it includes the entire 1970s and 1980s as well as the most recent decade.[7]

Another advantage of the UBS data is that we can study global inequality along dimensions that have not been investigated before. For instance, we can compare the outcomes using yearly earnings versus hourly wages (that is, accounting for average weekly working hours) and pre- versus post-tax earnings. The previous global inequality studies differ from us in that they examine total income or consumption, which usually include earnings, pension income and also capital income, typically after taxes and transfers, and how they are distributed among all households including both working age adults and old-age pensioners. For this reason, if we were to encounter similar global inequality trends using our earnings data, this would quite plausibly rule out strong influences from top capital incomes, pensions or other transfers. Another motivation for focusing solely on earnings and wage rates could, for instance, be that these outcomes are more closely connected to the distribution of human capital. As for the limitations with our data and analyses, we discuss them in the following sections.

1.1.1 Earnings, Taxes, Working Hours and Prices

The *Prices and Earnings* reports, collected by the UBS every third year between 1970 and 2018, represent a standardized price and earnings survey conducted locally by independent observers in a large number of cities around the

[5] A database somewhat similar to ours is the University of Texas Inequality Project (UTIP), which contains data on pay inequality within and between different countries and regions around the world (see, for example, Galbraith, 2007). That project, however, differs from us by focusing primarily on industrial wages and comparing national inequality levels rather than estimating a global earnings distribution. Moreover, the UTIP project estimates inequality between different manufacturing branches, rather than occupations.

[6] Appendix 1.A contains details about the database and how we have constructed it. Appendix 1.B presents a number of validation tests where we compare our data and inequality estimations with those available from other sources. Finally, Appendix 1.C presents sensitivity analyses regarding the robustness of our findings.

[7] There are previous studies on global inequality that cover much longer time spans, but that use other data sources such as national accounts (for instance, Bourguignon and Morrisson, 2002, and Atkinson and Brandolini, 2010).

world. In the latest edition (UBS, 2018), more than 75,000 data points were collected for the survey evaluation. The UBS data have previously been used by, for example, Braconier *et al*. (2005) to construct measures of wage costs and skill premia, and of selected wage gaps by Milanovic (2012). To our knowledge, our study is the first to use these data to construct broader measures of earnings inequality.

The UBS data collection involved questions on salaries, income taxes (including employee social security contributions) and working hours for a number of different occupational profiles that represent the structure of the working population in Europe. The underlying individual data were collected from companies deemed to be representative, and the occupational profiles were delimited as far as possible in terms of age, family status, work experience and education. In total, the UBS survey provides an unbalanced panel of up to 89 cities in 68 countries (35 OECD members and 33 non-OECD countries) from 17 specific years covering a period of 48 years (that is, every third year between 1970 and 2018). The surveys cover four countries in Africa, 22 in Asia, 30 in Europe, eight in Latin America, two in Northern America and two in Oceania.[8] The data on gross and net yearly earnings in current United States dollar (USD) as well as weekly working hours cover 19 occupations in total (six from the industrial sector and 13 from the services sector), of which twelve occupations have available observations for all decades from the 1970s to the 2010s. For further description of the UBS *Prices and Earnings* data coverage, see Appendix 1.A.

Because we want to compare real earnings both within and across countries, we need to adjust these for any differences in local price levels, or PPP. Fortunately, the UBS has compiled a price level index based on a common reference basket of more than 100 goods and services collected locally in all surveyed cities and years (where prices in New York City = 100). By dividing our earnings data by that index and deflating all years for inflation in consumer prices for the United States using WDI data (World Bank, 2018), we obtain earnings in constant New York City PPP-adjusted 2015 USD for all available occupations, cities and years.[9]

As discussed in the introduction, the UBS earnings data come in the form of occupational units and not individuals. Since we thereby lack earnings variation both within and between different occupations within these occupational groups, this is likely to bias the earnings dispersion downwards both

[8] Throughout this paper, we use the United Nations' classification of macro geographical continental regions and geographical sub-regions (see Table 1.A1 in the Appendix).

[9] As our baseline, we use this UBS price level index excluding rent. In alternative specifications, we instead use price level data from the *International Comparison Program* (ICP) 2011 in the *Penn World Tables* (PWT) as an alternative PPP source, as well as the UBS price level index including rent. We also report our results without PPP-adjustments (using current market exchange rates). While the choice of PPP seems important, it does not affect our overall results (see Figure 1.C9 in the Appendix).

within countries and at the global level. We examine the extent of this bias by comparing the country-level earnings inequality estimates in our data with equivalent estimates constructed from actual microdata in the LIS, the *Integrated Public Use Microdata Series* (IPUMS) and other sources. These comparisons reveal two main patterns: i) occupational inequality is lower than individual inequality within countries, and ii) this wedge appears to be stable over time (see Sections 1.B.5 and 1.B.6 in the Appendix for comparisons in all countries with available microdata). We also apply Modalsli's (2015) correction method that adjusts for within-group inequality by imputing within-group dispersions, based on dispersion levels observed in the country microdata comparisons (see Section 1.3.4 below). This adjustment leads to an increase in the global Gini coefficient by a relatively small change, up to four points.

1.1.2 Occupational Employment Statistics

To construct population-wide measures of earnings inequality, such as the Gini coefficient, we combine the occupational earnings with information about the relative proportions of each occupational group in the labour force of each country and over time, which implies that we are able to account for the changing occupational structure within each individual country. Data on employment by occupation are available in the ILO (2010, 2018) databases *LABORSTA* and *ILOSTAT*, where the economically active population in each country is disaggregated by occupational groups according to the latest version of the ISCO available for that year. We match each of our 19 UBS occupations with the most relevant of the ISCO categories and assign that category's population to the corresponding occupation.[10] Since the ILO occupational employment statistics include both paid employees and self-employed, this means that we assume that the UBS full-time employment earnings are representative for both of these groups.[11]

Because the UBS data are built on surveys conducted in cities, our earnings data lack representation of rural earnings and, in particular, occupations assigned to the ISCO agricultural category. To adjust for this and to make our earnings data representative for the total workforce within each country, we do several things: First, we add the occupational category "agricultural workers", to which we assign the average agricultural sector earnings in the OWW database (Freeman and Oostendorp, 2012). This makes a total of 20 occupational groups with earnings and population data for our broad panel of

[10] See Table 1.A2 in the Appendix. We have at least one occupation with UBS earnings data for each ISCO category, except for the agricultural group.

[11] For example, if self-employed workers in developing countries earn less than those that are dependently employed (within the same occupation), while self-employed workers in developed countries earn more than their dependently employed counterparts, this would mean that we underestimate the level of global earnings inequality.

countries and years. Each country's occupational populations are then weighted so that they sum to the country's total employed working age population (aged 15–64), to which we also add an unemployed category with zero earnings (corresponding to the country's unemployed working age population), based on the World Bank's (2018) WDI.[12] Second, we PPP-adjust earnings using local city prices, collected at the same urban locations as the earnings. If, for example, urban earnings are higher than rural earnings, our assumption is thus that these differences will be captured by corresponding differences in prices. Finally, in the countries for which our UBS data cover more than one city, we compare earnings and inequality between cities of different sizes, and find no systematic relationship between city size and PPP-adjusted earnings or inequality (see Section 1.B.4 in the Appendix). However, there could still be urban-rural differences that we do not capture by these adjustments and tests. Our guess is that a potential remaining bias would be in the direction of underestimating global inequality, as we expect such a real urban-rural earnings gap to be relatively larger in developing countries.[13]

An implication of the limited number of occupations in the UBS data is that we do not have full coverage of the very top and bottom of the earnings distributions. In the case of missing top earnings, we can compare our data with administrative top earnings data in the WID. This comparison shows that our observed professions represent top earnings levels relatively well up to the 95th percentile, and adding national top earnings from the WID does not change our results (except for yielding higher earnings growth in the absolute top of the global distribution).[14] In the bottom of the distribution, we add the unemployed and assign them zero earnings. Related to this, an important category that we do not capture is informal-sector earnings. To the extent that these workers are part of the unemployed population in the official statistics, we underestimate their actual earnings and thus overestimate inequality both nationally and at the global level.[15] In one of the sensitivity analyses, we exclude the unemployed and focus exclusively on the employed global working age population, which results in a slightly lower global inequality (see Section 1.C.9 in the Appendix).

[12] For 2018, we use data from 2017, because the 2018 WDI data were not yet available to use. For Taiwan, which is not included in the WDI, we instead use data from National Statistics Taiwan (2018).

[13] Few studies have systematically examined urban-rural inequality gaps around the world, but Eastwood and Lipton (2000) conclude that urban-rural income gaps in developing countries seem to follow overall inequality at the country level but to be trendless at the global level.

[14] See Sections 1.B.2, 1.C.4 and 1.C.10 in the Appendix.

[15] Estimates of the informal sector and its development around the world are scarce, but a survey by Charmes (2012) suggests that its relative importance has not changed much since the 1970s.

1.1.3 Estimation Procedure

In the original UBS data (Sample I), we have 836 country-year observations (for our 20 occupations, that makes 16,720 country-year-occupation observations).[16] Because this is an unbalanced panel, we need to ensure that our findings about global earnings inequality are not driven by an increasing sample of countries over time.[17] To obtain a balanced panel, we extrapolate the missing country-occupation observations by the corresponding occupational earnings growth in neighbouring countries (or, more precisely, the average subregional or regional change for each occupation).[18] As such, we obtain full sample coverage with observations from all 68 countries for all 17 time periods, that is, every third year from 1970 to 2018 (Sample II). This gives a total of 1,156 country-year observations for each of the 20 occupations, and altogether 23,120 observations for each earnings and population measure.

In Table 1.1, we present the database coverage separating the two data samples just described.[19] Sample II covers approximately 80% of the world's population and over 95% of its GDP. Note that despite being smaller, the original observed UBS sample (Sample I) covers on average almost 60% of the global population and over 90% of the world's GDP.

[16] This coverage refers to country means of the included cities, after linear interpolation for missing values within a series, with full occupational coverage and including the added agricultural category. In the very raw UBS data we have 11,806 city-year-occupation observations.
[17] This kind of adjustment is not done by, for instance, Anand and Segal (2015) and Lakner and Milanovic (2015), who instead use their unbalanced country sample as the baseline and then include estimates based on a balanced, common sample over time as a robustness check. A similar approach to ours, however, is used by Modalsli (2017).
[18] For a more detailed description of this procedure, see Appendix 1.A. In alternative specifications, we instead extrapolate the missing observations with country GDP per capita growth, as well as using average and earliest or latest observed country-occupation growth rate, with similar results (Appendix Section 1.C.12).
[19] For coverage in all years, see Table 1.A4 in the Appendix.

Table 1.1. *Coverage of the Dataset.*

	Sample	1970	1994	2018	Mean
a) Number of countries represented in the database					
World	I	27	48	63	49.2
	II	68	68	68	68.0
Africa	I	1	4	4	3.1
	II	4	4	4	4.0
Asia	I	3	16	18	14.4
	II	22	22	22	22.0
Europe	I	16	19	30	21.8
	II	30	30	30	30.0
Latin America	I	4	6	7	6.5
	II	8	8	8	8.0
Northern America	I	2	2	2	2.0
	II	2	2	2	2.0
Oceania	I	1	1	2	1.4
	II	2	2	2	2.0
b) GDP (% of regional GDP represented in the database)					
World	I	82	92	94	90.5
	II	97	97	96	96.5
Africa	I	24	47	46	40.1
	II	53	47	46	47.7
Asia	I	44	87	92	82.0
	II	95	96	95	95.5
Europe	I	87	92	99	92.8
	II	100	100	99	99.4
Latin America	I	67	83	82	81.6
	II	84	89	90	87.0
Northern America	I	100	100	100	100.0
	II	100	100	100	100.0
Oceania	I	83	82	98	89.5
	II	97	96	98	97.1

	Sample	1970	1994	2018	Mean
c) Population (% of regional population represented in the database)					
World	I	25	51	75	59.3
	II	85	83	79	82.4
Africa	I	6	33	32	25.3
	II	34	33	32	33.2
Asia	I	5	46	81	58.3
	II	89	89	88	88.7
Europe	I	54	55	96	71.5
	II	97	95	96	95.9
Latin America	I	67	73	75	74.7
	II	80	81	80	80.5
Northern America	I	100	100	100	100.0
	II	100	100	100	100.0
Oceania	I	65	62	72	67.2
	II	79	75	72	75.1

Notes: First row for each region only includes the original UBS data (Sample I). Second row also includes the imputed data (Sample II). Last column shows average number of countries, current GDP and total population coverage over all years.
Sources: Authors' calculations based on data described in the text; World Bank (2018).

However, since our ultimate goal is to study global inequality, we also need to account for countries not in the original sample. We do this by imputing earnings for our missing countries, using GDP-per-capita-weighted average sub-regional or regional occupational earnings. This sample (Sample III) yields a total of 29,580 country-year-occupation observations for each of our different statistics (or 31,059 observations including the unemployed category), and has 100% global coverage. Sensitivity analyses show that our findings are not changed by excluding these latter imputations (see Figure 1.C13 in the Appendix).

From these earnings and population data, we estimate the inequality of global, regional and country earnings over the entire period 1970–2018. Our main index of inequality is the Gini coefficient, but we have also assessed the inequality trends using other measures, such as top earnings shares and generalised entropy (GE) indices. Finally, we also estimate our different inequality indices for gross and net, yearly and hourly earnings (where hourly earnings inequality corresponds to what we will refer to as wage inequality). We have also validated our data by comparing them with those from other sources, finding relatively strong correlations (see Appendix 1.B).

1.2 Main Results

The evolution of global earnings inequality between 1970 and 2018 is presented in Figure 1.1. Gini coefficients for three different earnings concepts are

shown: gross annual earnings, net annual earnings, and net hourly wages. The level of inequality in gross earnings is approximately two Gini points higher than the inequality in net earnings. Inequality in hourly wages is consistently higher than inequality in yearly earnings over this period, which suggests a negative correlation between earnings and hours worked at the global level (which is in line with the findings of Bick *et al*., 2018). Looking at the trends over the period, all three measures offer a similar picture. Global earnings inequality was virtually flat over the 1970s, 1980s and 1990s. During these three decades, the global net earnings Gini coefficient was stable around 65%. A large decline is then recorded during the 2000s and 2010s. The fall over this period is sizeable: the net earnings Gini dropped from 65% in 2000 to 50% in 2018, that is, by 15 points in two decades.

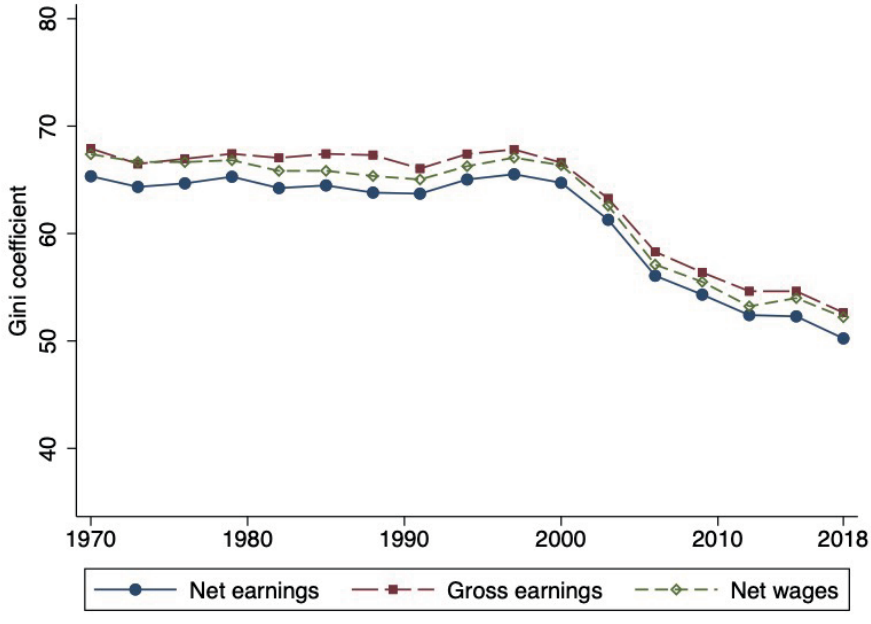

Figure 1.1. Global Earnings Inequality, 1970–2018.

Notes: Calculations based on PPP-adjusted earnings using UBS price levels in 2015 USD, weighted by working age populations and including the unemployed. Earnings refer to yearly earnings and wages to hourly earnings.
Source: Authors' calculations based on data described in the text.

As a complement to the Gini coefficient, we present in Figure 1.2 two other inequality measures which illustrate the evolution of global earnings inequality in different parts of the global distribution: the global earnings shares of

the global top decile and the global bottom 50%.[20] These series both display a decline in global earnings inequality, or an increase in global earnings equality, over the studied period. The top decile share trend looks similar to the Gini trend, except for some more volatility during the 1970s and 1980s as well as a flatter trend during the 2010s. The share of the bottom half has more than doubled, from 9% of global earnings in 1970 to 19% today. As such, these series also indicate that the overall decline in global earnings inequality comes both from a relative decline of the top and a relative increase of the bottom of the global earnings distribution.

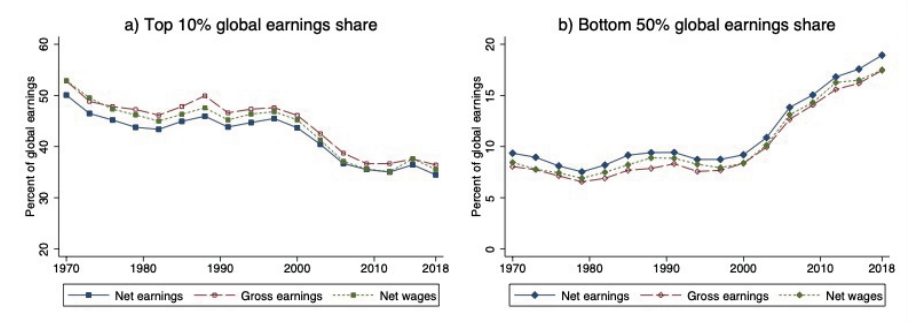

Figure 1.2. Top and Bottom Global Earnings Shares.

Notes: Calculations based on net yearly earnings (if nothing else specified), PPP-adjusted using UBS price levels in 2015 USD, and weighted by working age populations, excluding the unemployed. Earnings refer to yearly earnings and wages to hourly earnings.
Source: Authors' calculations based on data described in the text.

Next, we examine how our global earnings inequality series relate to other estimates of global inequality: Figure 1.3 contrasts our gross and net earnings and wage Gini coefficients with the Gini coefficients for global income or consumption, as presented by Lakner and Milanovic (2015), Bourguignon (2015), and Anand and Segal (2017).[21] Some interesting results emerge from this comparison. First, the level of inequality we find in earnings is markedly lower than in surveyed income and consumption, with Gini coefficients being approximately seven percentage points lower. One important explanation for this gap is that our focus on the working age population implies that we

[20] Figure 1.C1 in the Appendix also shows the global earnings inequality trend using two other inequality indices, namely the GE and Atkinson indices, which yields very similar results. Moreover, Figure 1.C2 presents another view of the evolution of inequality, depicting kernel densities of absolute earnings over this period.
[21] We use their inequality indices based on household surveys without imputed top income shares in order to increase the comparability across sources. While Anand and Segal (2017) PPP-adjust using the 2011 ICP round, Bourguignon (2015) uses the 2005 ICP round. As argued by Deaton and Aten (2017), using the ICP 2005 PPP is likely to overestimate global inequality. For Lakner and Milanovic (2015), we present their results using both the 2005 and 2011 ICP rounds.

exclude many low- or zero-earners such as students and retirees. Another reason is that our earnings data do not include incomes from capital, which are more unevenly distributed than income from labour, and transfers. Moreover, our data are based on occupational group averages instead of averages in income groups such as deciles.

Second, the trend in inequality is relatively similar and points in the same direction: A decrease in recent decades from high and relatively stable levels in the late 1980s and 1990s to a lower level in the late 2000s and early 2010s. A main takeaway from these comparisons is thus that the overall levels and trends of global inequality are strikingly similar when we only include labour earnings (that is, excluding incomes from capital, pensions and other transfers) among the global workforce instead of total incomes among households. Yet, looking at magnitudes, the decrease is larger in earnings than in total income and consumption. A plausible explanation for this difference could be an increasing role of capital that counteracts the convergence in earnings. Another possible explanation could be welfare system expansions in developing countries where, for example, old people do not have to work but instead get pensions (and hence lower incomes). A related analysis is also presented in Section 1.C.3 in the Appendix, where we compare the "Concept 2" of international inequality (Milanovic, 2005) using country-mean earnings versus GDP per capita to estimate between-country inequality for labour earnings and total incomes, respectively. This analysis confirms that the convergence between countries has also been larger for labour earnings than for GDP per capita.

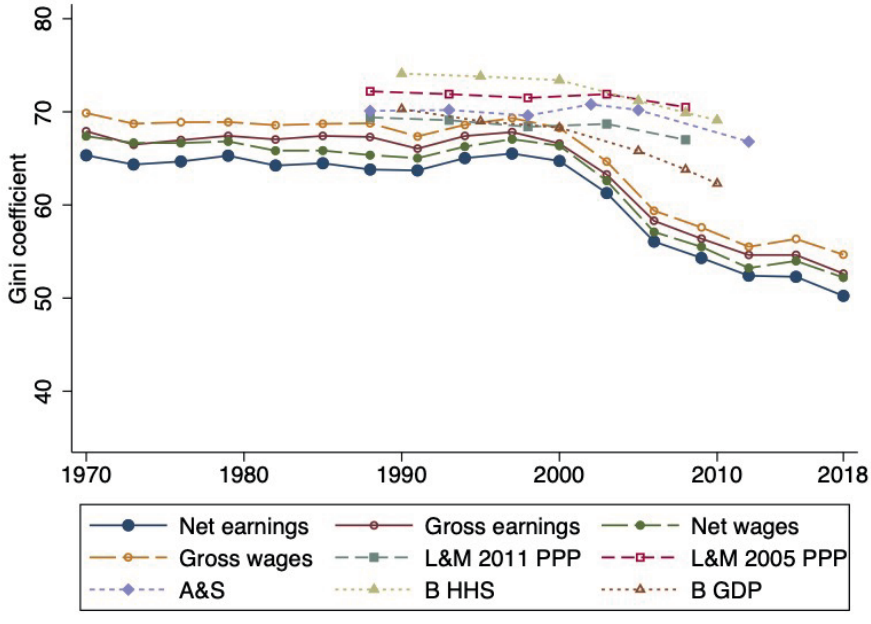

Figure 1.3. Global Earnings versus Income Inequality.

Notes: Net and gross earnings and wage inequality refer to this study and are based on yearly and hourly earnings, respectively, which are PPP-adjusted using UBS price levels in 2015 USD and weighted by working age populations including the unemployed. "L&M" refers to Lakner and Milanovic's (2015) estimations using the ICP 2005 and 2011 PPP, respectively. "A&S" refers to Anand and Segal's (2017) estimations without top incomes (using the ICP 2011 PPP). "B" refers to Bourguignon's (2015) estimations based on household surveys and data rescaled by GDP per capita, respectively (using the ICP 2005 PPP).
Sources: Authors' calculations based on data described in the text; Anand and Segal (2017); Bourguignon (2015); Lakner and Milanovic (2015).

Growth incidence curves (GIC), showing the rate of earnings growth across the distribution, offer another way of examining the evolution of inequality (Ravallion and Chen, 2003). Figure 1.4 depicts a so-called non-anonymous GIC by country-occupation, measured as the average annual percentage growth of each country-occupation's mean earnings between the 1970s and 2010s, ordered according to their initial 1970s rank in the global earnings distribution. To facilitate interpretation, we have marked some country-occupations that illustrate the earnings dispersion both within and across countries. During this long period, on average, global real (PPP-adjusted) earnings grew by approximately 1% annually. However, seen over the entire earnings distribution in the 1970s, the growth rates differ considerably. The lower half of the global distribution recorded mostly above-average earnings growth. In contrast, earnings growth in the upper half of the distribution was more often below average and, quite notably, for some country-occupations, real PPP-

adjusted earnings growth was zero or even negative.[22] The anonymous GIC,[23] depicted in Figure 1.C4 in the Appendix, shows a similar pattern with above-average growth in the lower part of the global earnings distribution and below-average growth in its upper part. Because the UBS data are likely to lack observations in the very top of the distribution, we have also done this analysis adding national top earnings from the WID, which generates a pattern similar to Lakner and Milanovic's (2015) "elephant curve" with relatively high growth rates in the very top of the global distribution (see Section 1.C.4 in the Appendix).

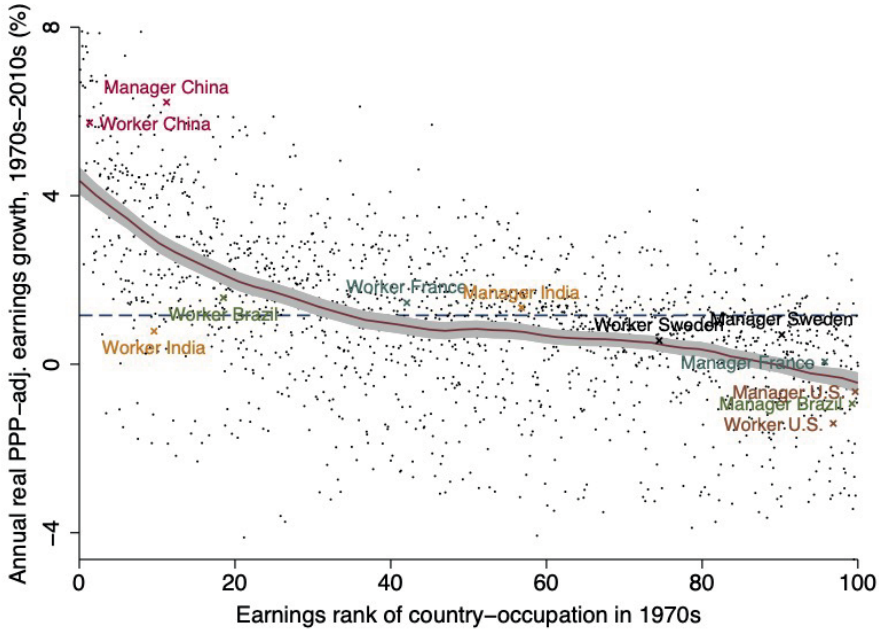

Figure 1.4. Non-Anonymous Growth Incidence per Country-Occupation, 1970s–2010s.

Notes: Average annual country-occupation growth rate 1970s–2010s in net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD), where each observation represents a country-occupation. Dashed line shows average annual earnings growth rate 1970s–2010s for all country-occupations, and solid line a smoothed local polynomial. Horizontal axis ranked according to country-occupation earnings ranks in 1970s. Decade averages for 1970s and 2010s correspond to the years 1970–1979 and 2009–2018, respectively. "Manager" refers to department managers and "Worker" to construction workers.
Source: Authors' calculations based on data described in the text.

[22] While perhaps surprising, a recent study by Sacerdote (2017) similarly found that, since the 1970s, the growth of real wage rates in the United States has been close to zero (with some variation due to the choice of price index).
[23] The corresponding GIC for global incomes or consumption, as depicted in Lakner and Milanovic (2015), is sometimes referred to as the "elephant curve" (Corlett, 2016; Lakner and Milanovic, 2016).

1.3 Decomposing Global Inequality Trends

The next part of our analysis is to account for the potential drivers of the global earnings inequality trends, as documented above. Our approach to this is to study how different sub-components contribute to this evolution. We begin by statistically estimating the relative contributions from inequality within and between countries and world regions and, for the first time in this literature, occupational groups and sectors. Then we do counterfactual analyses by holding different factors and variables constant at their 1970 value in order to isolate their relative importance for the trends over time. Finally, we examine how global earnings inequality responds to simulating earnings dispersion within the occupational groups within countries. Some further analyses and more fine-grained decompositions, for instance, depicting the evolution of earnings inequality within each of the different regions as well as within the different occupations, are presented in Appendix 1.C.

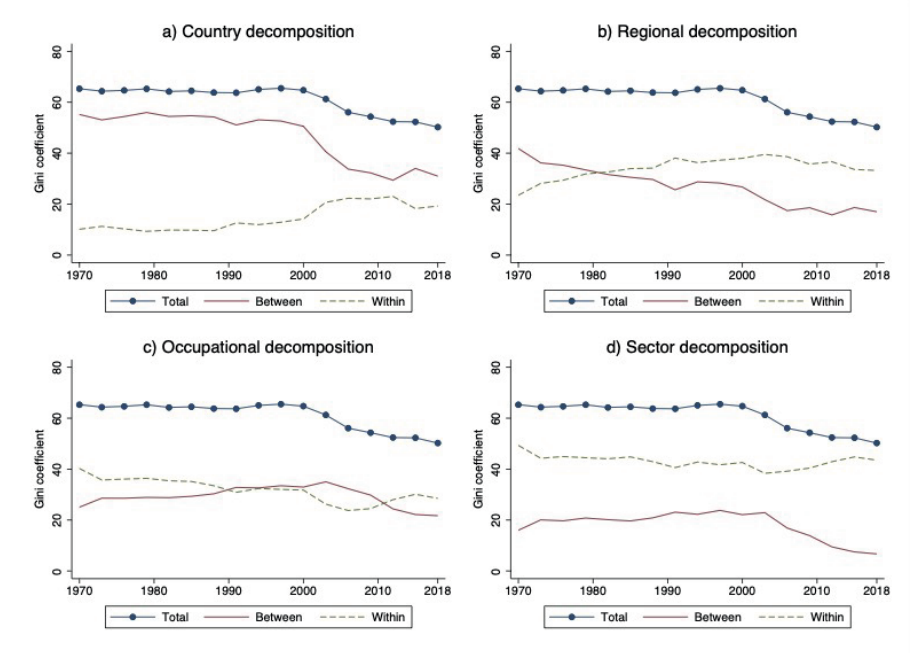

Figure 1.5. Decomposing Inequality by Countries, Regions, Occupations and Sectors.

Notes: Calculations based on net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD) and weighted by working age populations including the unemployed. Gini decompositions calculated using Yitzhaki and Lerman's (1991) method as described in Frick *et al*. (2006), with overlapping index included in "within". Decompositions calculated excluding the unemployed but scaled by total global Gini coefficient including the unemployed. b) Regional decomposition refers to Africa, Asia, Europe, Latin America, Northern America and Oceania. d) Sector decomposition refers to agricultural, industrial and services sectors.
Source: Authors' calculations based on data described in the text.

1.3.1 Country and Regional Decompositions

The two upper panels of Figure 1.5 present Gini decomposition results with respect to countries and regions, respectively.[24] Looking first at the country-based decomposition in Figure 1.5a, the major part of the inequality can be attributed to earnings differences between countries. Over time, however, this between-inequality component has become less important, while the relative importance of the within-country component has increased. Over the investigated period, between-country inequality fell by 24 Gini points while, at the same time, within-country inequality increased by nine points, leading to the total decrease in global earnings inequality of 15 Gini points. Note also that since our earnings data are based on occupational group averages and thus lack within-group dispersion, the within-country inequality is likely to be underestimated (see Section 1.3.4). Analysing the decomposition trends within and between world regions, we can also see in Figure 1.5b that the between-region component seems to be driving most of the falling global earnings inequality trend, although it has a lower level than the within-region counterpart.

1.3.2 Decompositions by Occupations and Sectors

A unique aspect of our global database is its labour market variables. We exploit them to decompose global earnings inequality by occupations (Figure 1.5c) and sectors (Figure 1.5d). Both within- and between-occupation inequality have decreased over this period, and the decline in within-occupation inequality accounts for most of the fall in global earnings inequality. Between 1970 and 2018, inequality within occupations fell by twelve Gini points, and between-occupation inequality by three points. This result goes well with the country-based analysis, since the large within-occupation inequality also reflects large earnings differences across countries.[25] The sectoral decomposition divides the world's workers into the agricultural, industrial and services sectors. It shows that the within-sector component dominates the between-sector level of inequality, but that most of the fall in the inequality trend can be explained by earnings convergence between sectors.

1.3.3 Counterfactual Analysis

An alternative way to examine the role of explanatory factors is by counterfactual analysis. We do this by keeping different components of the global

[24] Gini decompositions calculated using Yitzhaki and Lerman's (1991) method as described in Frick *et al*. (2006), with the overlapping term included in the within component. For an alternative decomposition method, see Modalsli (2017). Theil index decompositions give qualitatively the same results (Appendix Table 1.A7).

[25] For the evolution of earnings inequality within each different occupation, see Figure 1.C7 in the Appendix.

earnings inequality trend fixed at their initial 1970 value, one at a time, and then analyse the difference between the actual global inequality outcome and the counterfactual outcome if this factor had not changed during the 1970–2018 period. The results in Figure 1.6 show that the most dominant component behind the fall in global earnings inequality is changes in earnings, or more exactly, gross hourly wages. If gross wages had remained at their 1970 values during this period, the global net earnings inequality trend would have been essentially flat. Changes in prices, influencing through their role for PPP-adjustments, matter during some periods, but less when considering the full period impact. Within-country occupational employment shares (that is, changes in the occupational structure) have also contributed to the fall in global inequality since the mid-1990s, albeit to a relatively small extent. Changes in country-level populations have a small but opposing impact, driving the inequality trend upwards. Changes in taxes and working hours have almost no impact on the global trend. The 2018 difference between the actual outcome and the counterfactual is minus 15 Gini points for wages, minus four points for prices, minus two points for occupational employment and plus one points for country populations. Since changes in gross hourly wages thus seem to be the main driver behind the global earnings inequality decline, in the rest of this section we focus solely on that dimension.

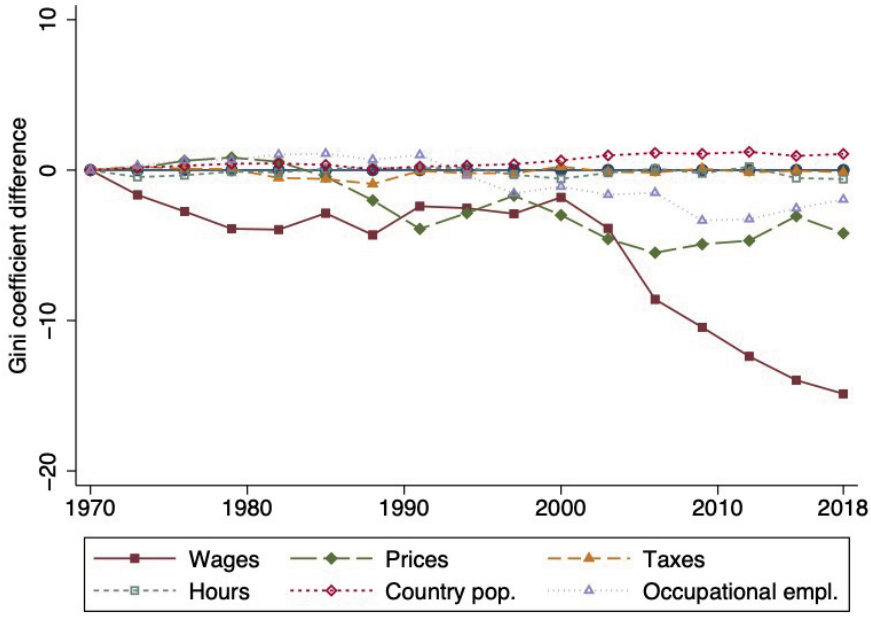

Figure 1.6. Counterfactual Analysis: Impact of Holding Factors Constant at 1970 Values.

Notes: Figure shows difference between actual baseline global earnings inequality and counterfactual inequality keeping 1970 values fixed for the different variables. Calculations based on net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD), weighted by working age populations and including the unemployed.
Source: Authors' calculations based on data described in the text.

As a next step, we keep the 1970 wages fixed for the different regions, countries, sectors and occupations, one at a time. Figure 1.7 shows differences between the actual global inequality outcome and each of these inequality counterfactuals holding gross hourly wages constant. As clearly illustrated by this figure, earnings changes in Asia are by far the most important regional driver behind the fall in global earnings inequality. If Asian gross wages had remained constant since 1970, global inequality would have been 27 Gini points higher today. The most important countries are China and India, whose wage changes, ceteris paribus, have reduced global inequality by twelve and eight Gini points, respectively. Wage changes in the United States, and Northern America, have had the opposing effect, driving global inequality up by three Gini points. Among the sectors, all three sectors contribute to the global inequality decrease, although their relative importance has changed over time. During the 1970s and 1980s, wage changes in the agricultural sector contributed most to the global inequality decline, while during the late-1990s and early-2000s industry was the dominant sector, followed by services during the most recent decade. Wage changes among agricultural and construction

workers represent the most important occupational groups, implying a global inequality decrease of six and five Gini points, respectively, while changes among department managers have had an upward-driving impact on global inequality. Doing the same analysis for each country-occupation separately further emphasises the special role played by agricultural workers in China and construction workers in India (see Figure 1.C8 in the Appendix).

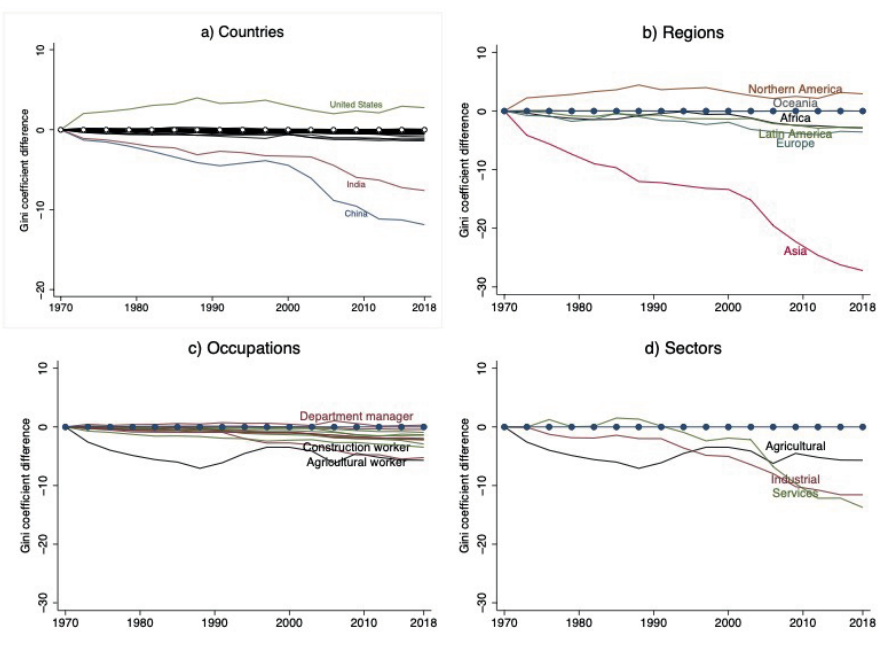

Figure 1.7. Difference between Actual Gini and Counterfactual Gini with Fixed 1970 Wages.

Notes: Figure shows difference between actual global earnings inequality and counterfactual inequality with 1970 gross hourly wages held constant. Calculations based on net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD), weighted by working age populations and including the unemployed.
Source: Authors' calculations based on data described in the text.

To summarize, cross-country convergence and real wage growth, especially in China, seem to account for most of the global earnings inequality trend and, in particular, the fall in global inequality since the turn of the millennium. We check the robustness of these findings by conducting a variety of sensitivity and heterogeneity analyses (presented in Appendix 1.C).[26] Overall, these checks show that our results seem to be robust, but that the early-period estimates are associated with a higher degree of uncertainty.

[26] These include, but are not limited to, analyses using different PPP-adjustments, workforce and population definitions, top-earnings and gender-gap adjustments, as well as alternative samples and imputations.

1.3.4 Within-Group Dispersion Adjustment

Finally, we examine how sensitive our results are for the lack of earnings dispersion within the country-occupational groups. Because our data emanate from occupational averages, they do not capture any earnings differences among workers within the same occupation in the same country, nor between the occupations included and not included in our data.[27] While we cannot know exactly how large the bias from this omitted within-group dispersion is at the global level, Modalsli (2015) suggests a correction method to adjust for this (applied to historical social tables). His method imposes a number of distributional assumptions, but could still be informative about plausible implications of our missing within-group dispersion.

The method begins by assuming a log-normal distribution within each group. It then assigns a within-group dispersion in terms of the coefficient of variation (CV), given by the standard deviation divided by the mean.[28] In order to estimate the size of this within-group dispersion, we use the country-level microdata available from Krueger *et al*. (2010), the LIS (2017) and IPUMS International (Minnesota Population Center, 2018). Comparing the levels of microdata-estimated inequality with our estimations based on occupational groups, we find that the former is, on average, eleven Gini points higher for earnings (and five Gini points higher for wages), for the 41 countries available in the microdata sources (see Figure 1.B6 in the Appendix). If we assume that this difference corresponds to the mean inequality within the country-occupational groups,[29] the corresponding within-group CVs would be approximately 0.2 for earnings and 0.1 for wages (thus indicating a positive relationship between earnings and hours worked within country-occupations). Constructing comparable country-inequality series by calculating mean earnings per ISCO group from the LIS microdata yields some support for this assumption and do not show any systematic trend in this within-group dispersion (see Section 1.B.6 in the Appendix).

Figure 1.8 presents global earnings inequality adjusted for within-country occupational-group dispersion using this method.[30] As is immediately visible,

[27] Note that this problem is not unique to our dataset, as essentially all studies of global inequality are based on grouped data (usually in the form of country-deciles or ventiles) and, in this regard, also underestimate within-country-group dispersion.

[28] Modalsli (2015) finds that most modern-day social groups have coefficients of income variations between 0.5 and 1 (corresponding to within-group Gini coefficients of 26% and 44%, respectively). However, since earnings are generally less dispersed than income, and since occupational groups might be more narrowly defined than other social groups, it is plausible that the within-group dispersion in our data would rather be somewhere between the lower CV of 0.1 (corresponding to a within-group Gini coefficient of 6%) and 0.5.

[29] We thus assume that our occupational data capture the within-country between-occupations inequality and that the microdata estimations capture the total within-country inequality (both within and between occupations), while the overlap category is assumed to be negligible.

[30] We first compute the adjustments excluding the unemployed, then weight total inequality (with the unemployed) by the ratio between the adjusted estimates and our unadjusted measures of inequality (without the unemployed).

assuming a within-group CV of 0.1 does not change the global Gini coefficients at all, while CVs of 0.2 and 0.5 increase the global earnings inequality by approximately one and four Gini points, respectively. Even if this suggests that total earnings inequality is somewhat higher than our baseline estimates show, it does not change the overall picture that global earnings inequality has decreased over time.

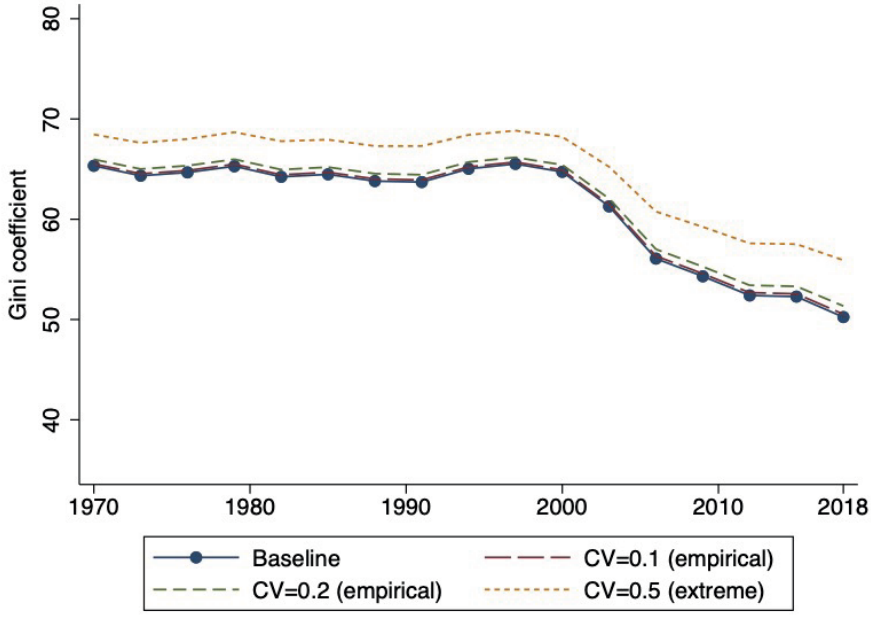

Figure 1.8. Within-Group Dispersion Adjustments.

Notes: Calculations based on net yearly earnings, PPP-adjusted using UBS price levels in 2015 USD, and weighted by working age populations including the unemployed. CV implies that country-occupations are assigned within-group earnings distributions with CVs of 0.1, 0.2 and 0.5, respectively. For the adjustment method applied, see Modalsli (2015).
Sources: Authors' calculations based on data described in the text and using Modalsli's (2015) correction method.

1.4 Conclusions

The purpose of this study has been to shed further light on global inequality by studying new and previously unexploited data on occupational earnings in a large panel of countries covering the past fifty years. Our focus on the global distribution of labour earnings and wages appears to be a unique contribution to the literature, and it also allows us to decompose global inequality and its trend in various dimensions that have not been analysed before.

Our main finding shows that global earnings inequality was stable during the 1970s–1990s, after which it fell during the 2000s–2010s. In 2018, the global earnings Gini coefficient was 15 points lower than it was in 1970, which accounts to a fall by around one quarter. Decomposing this inequality decline, we found that it was mainly driven by earnings convergence between developed and developing countries. Over the same period, within-country dispersion increased and counteracted the convergence impact (that is, while between-country inequality fell by 24 Gini points, within-country inequality rose by 9 points). When decomposing inequality trends across occupational and sectoral dimensions, we found that the inequality decline was largely driven by rising earnings among agricultural and low-skilled industrial workers, especially in China and India, while rising earnings among American and European top-earnings professions only slightly offset this equalization. Moreover, industry-sector occupations experienced stronger earnings convergence than those in services, which suggests that trade could potentially have an important impact on global inequality. To identify the determinants of global inequality more rigorously would require complementary data and other analytical approaches, which lies beyond the scope of the present study. In ongoing work, we hope to shed further light on these and related issues. What we have shown in this study, however, is that it seems to be real wage growth rather than changes in labour supply or demographics that dominates the global inequality trend. To conclude, we thus find that, over the investigated period, global earnings and wage growth has been pro-poor.

Altogether, we hope that our study and the new database that we have constructed will spur further analysis on the links between national, regional and global labour markets and their role for global distributional outcomes.

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Appendix 1.A Constructing the Database

In this section, we provide a more detailed description of the data used in the paper and our procedure for constructing the *Global Earnings Inequality Database*.

1.A.1 UBS Earnings Data

The UBS recently released their data as open data on https://www.ubs.com/. However, for some countries and years, these data were incomplete. Our analysis is thus based on the original data published in the printed versions of the *Prices and Earnings* reports (UBS, 1970–2015). For 2018, however, we have used the UBS online dataset (version: 13 September 2018), since the 2018 version of the report (with data collected between January and April, 2018) was only available in electronic form. For 1970–2015, we have also validated the data in the printed reports with those available online. The coverages of these data are presented in Tables 1.A1 and 1.A2. For a graphical illustration, see Figure 1.A1. Countries with full 1970–2018 coverage are Argentina, Australia, Austria, Belgium, Brazil, Canada, Colombia, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Japan, Luxembourg, Mexico, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, the United Kingdom and the United States.

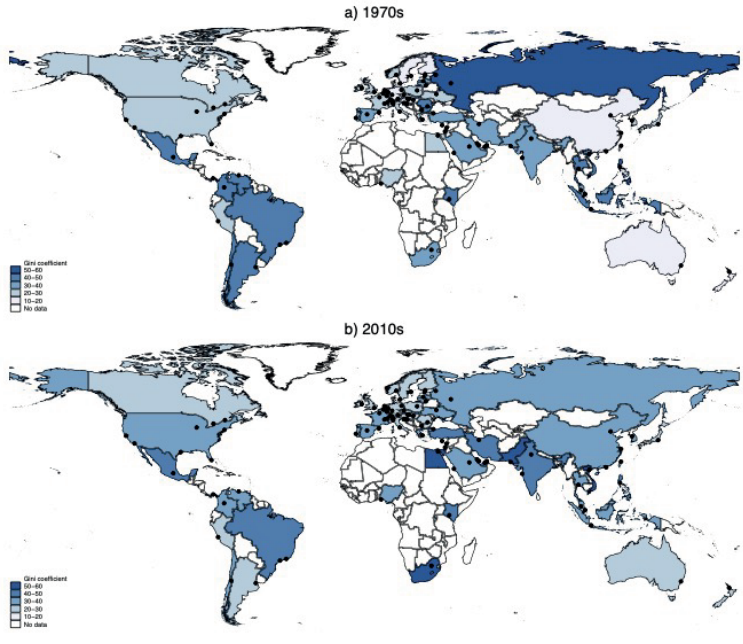


Figure 1.A1. Average Country Earnings Inequality around the World, 1970s and 2010s.

Notes: Average country-level Gini coefficients based on net yearly earnings, weighted by occupational group populations, and including the unemployed. Decade averages for 1970s and 2010s correspond to the years 1970–1979 and 2009–2018, respectively. Cities included in the UBS data are marked as points.
Sources: Authors' calculations based on data described in the text.

The UBS data on earnings, taxes and working hours cover 19 occupations in total, of which twelve occupations are covered in all decades from the 1970s to the 2010s. The included occupations are bank credit clerks, bus drivers, call centre agents, car mechanics, carpenters, construction workers, cooks, department managers, engineers, female factory workers, female sales assistants, financial analysts, medical doctors, hospital nurses, doctor's assistants, primary school teachers, product managers, secretaries, and skilled industrial workers. For a detailed description of the different occupational profiles and their background characteristics, see Table 1.A3. To these occupations we also add agricultural workers from Freeman and Oostendorp's (2012) OWW database (see Section 1.A.4), which gives us a total of 20 occupations.

Table 1.A1. *Countries Included in the UBS Data.*

Country	Cities	Years
Africa		
Eastern Africa		
Kenya	Nairobi	1988–2018
Northern Africa		
Egypt	Cairo	1982–1991, 2000, 2009–2018
Southern Africa		
South Africa	Johannesburg	1970–2018
Western Africa		
Nigeria	Lagos	1985–1994, 2003, 2018
Asia		
Eastern Asia		
China	Beijing, Shanghai	1997–2018
Hong Kong	Hong Kong	1970–2018
Japan	Tokyo	1970–2018
South Korea	Seoul	1982–2018
Taiwan	Taipei	1991–2018
South-Eastern Asia		
Indonesia	Jakarta	1979–2018
Malaysia	Kuala Lumpur	1985–1991, 1997–2018
Philippines	Manila	1976–2018
Singapore	Singapore	1973–2009
Thailand	Bangkok	1979–1988, 1994–2018
Vietnam	Hanoi	2018
Southern Asia		
India	Mumbai, New Delhi	1973, 1982–2018
Iran	Tehran	1976–1979
Pakistan	Karachi	2003
Western Asia		
Bahrain	Manama	1976–1988, 1994–2018
Cyprus	Nicosia	1988–2000, 2006–2018
Israel	Tel Aviv	1973–2003, 2009–2018
Lebanon	Beirut	1970–1973
Qatar	Doha	2009–2018
Saudi Arabia	Jeddah, Riyadh	1979–1988, 2018
Turkey	Istanbul	1973–1988, 1997–2018
United Arab Emirates	Abu Dhabi, Dubai	1979–1988, 1994–2018

Country	Cities	Years
Europe		
Eastern Europe		
Bulgaria	Sofia	2003–2018
Czechia	Prague	1994–1997, 2003–2018
Hungary	Budapest	1994–2018
Poland	Warsaw	1997–2018
Romania	Bucharest	2003–2018
Russia	Moscow, Saint Petersburg	1997–2018
Slovakia	Bratislava	2003–2018
Ukraine	Kiev	2003–2018
Northern Europe		
Denmark	Copenhagen	1970–2018
Estonia	Tallinn	2003–2018
Finland	Helsinki	1970–2018
Ireland	Dublin	1976–2018
Latvia	Riga	2003–2018
Lithuania	Vilnius	2003–2018
Norway	Oslo	1970–2018
Sweden	Stockholm	1970–2018
United Kingdom	London	1970–2018
Southern Europe		
Croatia	Zagreb	2018
Greece	Athens	1970–2018
Italy	Milan, Rome	1970–2018
Portugal	Lisbon	1970–1976, 1982–2018
Slovenia	Ljubljana	2003–2018
Spain	Barcelona, Madrid	1970–2018
Western Europe		
Austria	Vienna	1970–2018
Belgium	Brussels	1970–2018
France	Lyon, Paris	1970–2018
Germany	Berlin, Düsseldorf, Frankfurt, Munich	1970–2018
Luxembourg	Luxembourg	1970–2018
Netherlands	Amsterdam	1970–2018
Switzerland	Basel, Geneva, Lugano, Zurich	1970–2018

Country	Cities	Years
Latin America		
Central America		
Mexico	Mexico City	1970–2018
Panama	Panama City	1976–2000, 2018
South America		
Argentina	Buenos Aires	1970–2018
Brazil	Rio de Janeiro, São Paulo	1970–2018
Chile	Santiago de Chile	2000–2018
Colombia	Bogotá	1970–2018
Peru	Lima	2003–2018
Venezuela	Caracas	1973–2012
Northern America		
Northern America		
Canada	Montreal, Toronto	1970–2018
United States	Chicago, Houston, Los Angeles, Miami, New York City, San Francisco	1970–2018
Oceania		
Australia and New Zealand		
Australia	Sydney	1970–2018
New Zealand	Auckland	2000–2018

Source: UBS (1970–2018).

1.A.2 UBS Prices Data

The UBS price level index is based on a standardized basket of 128 goods and services, representing the monthly consumption habits of a European three-person family (UBS, 2018). When products were not available or deviated too far, local representative substitutes were used. Changes in consumer habits stemming from technological developments were also accounted for. For 1970 and 1973, the UBS does not report any composite index, so we instead use their index for food prices. When there are earnings observations from more than one city in a country and year, we first PPP-adjust at the city level and then calculate population-weighted country-level averages for each occupational group using city population data (agglomeration averages) from the United Nations Statistics Division's (2018) *Demographic Statistics Database*. This is the case for eleven countries: Brazil, Canada, China, France, Germany, India, Italy, Russia, Spain, Switzerland and the United States. To obtain our PPP-adjusted earnings in constant New York City 2015 USD, we divide our nominal earnings by the UBS price index and then deflate for United States inflation in consumer prices using data from the WDI (World Bank, 2018). For 2018, we deflate using the consumer price index of 2017 since the 2018

inflation statistics were not available yet. For alternative PPP-adjustments, see Section 1.C.8 in Appendix 1.C.

Table 1.A2. *Occupations Included in the UBS Data.*

Occupation	Years	ISCO-58	ISCO-68	ISCO-88	ISCO-08
Industrial sector					
Managers					
Department manager	1973–2018	1	2	1	1
Professionals					
Engineer	1979–2015	0	0–1	2	2
Craft and related trades workers					
Skilled industrial worker	1976–2018	7–8	7–9	7	7
Carpenter	2018	7–8	7–9	7	7
Plant and machine operators and assemblers					
Female factory worker	1976–2015	7–8	7–9	8	8
Elementary occupations					
Construction worker	1976–2018	7–8	7–9	9	9
Services sector					
Managers					
Product manager	2003–2018	1	2	1	1
Professionals					
Primary school teacher	1970–2018	0	0–1	2	2
Financial analyst	2012	0	0–1	2	2
Hospital nurse	2015–2018	0	0–1	2	2
Medical doctor	2018	0	0–1	2	2
Technicians and associate professionals					
Bank credit clerk	1970–2015	2	3	3	3
Doctor's assistant	2018	0	0–1	3	3
Clerical support workers					
Secretary	1970–2018	2	3	4	4
Call centre agent	2006–2018	6	3	4	4
Services and sales workers					
Female sales assistant	1979–2018	3	4	5	5
Cook	1979–2018	9	5	5	5
Craft and related trades workers					
Car mechanic	1970–2018	7–8	7–9	7	7
Plant and machine operators and assemblers					
Bus driver	1970–2018	6	7–9	8	8

Occupation	Years	ISCO-58	ISCO-68	ISCO-88	ISCO-08
Agricultural sector (added from OWW)					
Skilled agricultural, forestry and fishery workers					
Agricultural worker	1983–2008	4–5	6	6	6

Note: Agricultural worker earnings added from Freeman and Oostendorp's (2012) OWW database.
Sources: Freeman and Oostendorp (2012); ILO (2010, 2018); UBS (1970–2018).

1.A.3 ILO Occupational Employment Data

Using the ILO (2010, 2018) databases LABORSTA and ILOSTAT, we categorize each of the 19 UBS occupations (as well as the added OWW agricultural occupation) into the most relevant of the nine (or ten, depending on year) ISCO categories and assign that category's employment, or economically active population, to the corresponding occupation. If there is more than one occupation assigned to the same ISCO category, we assign them equal proportions of that category's population. For the cases where ISCO level 2 data were available, we have also tried weighting them by their relative proportions using the second level of the ISCO data instead, which gave very similar results (available upon request). If there is more than one ISCO categorization for the same year, we use their average. If there are missing values, we first use linear interpolation and, second, extrapolation where we let the country-occupation with missing observations follow the occupational employment trend of (in order of priority): its sector within the same country, its country average, its occupation within the same sub-region or region, or its occupation average, depending on which data that are available. As an alternative extrapolation approach, we have also extrapolated missing observations using the earliest or latest available observation, assuming it to be constant over the missing period and finding that this does not change the results (see Figure 1.C12 in Appendix 1.C). For Taiwan, which lacks employment data for four occupations, we add these using sub-regional employment by occupation averages. For 2018, we use data from 2017 since the 2018 ILO data were not yet available to use.

Table 1.A3. *Description of Occupational Profiles in the UBS Data.*

Industrial sector
Department manager
Head of production department with more than 100 employees in a sizable company in the metal processing, machinery, or tool-making industry. Full vocational training and considerable professional experience. Approximate age and status: 40, married, two children.
Engineer
Employed by an industrial firm in the electrical equipment, electric power, or similar industry. Completed studies at a university or institute of higher technical education. At least five years of practical experience. Approximate age and status: 35, married, two children.
Skilled industrial worker
Skilled mechanic with vocational training and considerable experience with a large company in the metal-working and tool industry. Approximate age and status: 35, married, two children.
Carpenter
Unskilled or semi-skilled worker in a carpentry. Approximate age and status: 25, single.
Female factory worker
Unskilled or semi-skilled operator in a medium-sized plant in the textile industry. Approximate age and status: 25, single.
Construction worker
Unskilled or semi-skilled labourer without technical training. Approximate age and status: 25, single.

Services sector
Product manager
Manager in pharmaceutical, chemical or food industry, about five years of experience, tertiary educational degree, middle management. Approximate age and status: 35, married.
Primary school teacher
Teaching for about 10 years in government-operated schools. Approximate age and status: 35, married, two children.
Financial analyst
Employed at a major bank with completed studies (university, technical institute, possibly also an institute of higher technical education) and at least 5 years of work experience. Approximate age and status: 30-35, single.
Hospital nurse
Completed apprenticeship or studies, at least 10 years of experience. Approximate age and status: 35, married, two children.
Medical doctor
General practitioner in a public hospital with completed M.D. or equivalent and at least 10 years of experience. Approximate age and status: 35-40, married, two children.
Bank credit clerk
Completed apprenticeship, at least 10 years of experience. Approximate age and status: 35, single.
Doctor's assistant
Practice assistant to medical doctor in a private medical practice with finished bachelor's degree and five years of work experience. Approximate age and status: 30, single.
Secretary
Secretary of a department manager in an industrial firm, at least five years of experience. Knowledge of PCs and one foreign language. Approximate age and status: 25, single.
Call centre agent
Trained agent at an inbound call/service centre in the telecommunications or technology sector. Approximate age and status: 25, single.
Female sales assistant
Sales in the ladies' apparel department of a large department store, specialised training in sales, several years of experience. Approximate age and status: 25, single.
Cook
Cook in a kitchen with a fairly large staff in a respected restaurant or hotel, deputy of the head chef or chef de partie, who supervises two to three cooks, has completed vocational training as a cook, about 10 years of experience. Approximate age and status: 30, single.
Car mechanic
Completed training or apprenticeship, at least five years of experience. Approximate age and status: 25, single.
Bus driver
Employed by a municipal transport system, at least 10 years of driving experience. Approximate age and status: 35, married, two children.

Notes: There are some minor variations in the exact occupational description between different editions of the UBS *Prices and Earnings* reports. The descriptions above are taken from the 2012–2018 editions.
Source: UBS (1970–2018).

1.A.4 OWW Agricultural Earnings Data

The OWW database contains normalized occupational wage data derived from the ILO (2010) by Freeman and Oostendorp (2012) from 1983 to 2008. The data are given for hourly and monthly wages (where we convert the monthly wage rates to yearly earnings by multiplying them by twelve). We use these data for the agricultural workers, to which we assign the average earnings within the agricultural production, plantation, forestry, logging, and deep-sea and coastal fishing industries. When there are missing observations within this period, we use the same imputation methods as for the UBS occupational earnings data, that is, linear interpolation and extrapolation using the sub-regional or regional earnings growth by occupation (see Section 1.A.5). For missing countries (France, Greece, Hong Kong, Israel, Lebanon, Luxembourg, Panama, Qatar, Saudi Arabia, South Africa, Spain, Switzerland, Taiwan, Thailand, the United Arab Emirates and Vietnam), we use GDP-per-capita-weighted sub-regional or regional averages. For the years before 1983 and after 2008, we extrapolate the series by letting them follow the country's GDP-per-capita trend. In two alternative specifications, we impute missing observations by using the weights and trends of country mean earnings (instead of GDP per capita), as well as by the earnings of elementary occupations, finding that this does not change the overall results (see Figure 1.C12 in Appendix 1.C). For our observed observations, the correlation between agricultural earnings and GDP per capita is 83%, and between agricultural and construction worker earnings 84% for gross earnings (and 85% for gross wages). Finally, we convert gross earnings to net earnings by using either the country mean or the construction worker tax rate, depending on specification. Note that, similarly to the UBS data, our use of mean earnings per occupational group (in this case, agricultural sector workers) is likely to underestimate inequality as it neglects within-group earnings dispersion (we try to adjust for this bias: see Section 1.3.4 in the main paper).

1.A.5 Imputations and Estimation Procedure

Our *Global Earnings Inequality Database* is constructed as follows: First, we use the UBS (to which we later also add the OWW) data on yearly earnings before (gross) and after (net) taxes and employee social security deductions, as well as weekly working hours, for our 19 different occupational profiles and all cities, countries and years available in the UBS *Prices and Earnings* reports. We check for potential errors in the original data by calculating the change in city-occupational earnings between all consecutive periods. Doing so, we identify three cases where the three-year change in earnings is tenfold or more and where the city-occupation trend and the overall country earnings trend suggest that there is a zero missing at the end of the earnings figure. The three earnings observations that we thus adjust accordingly are for car

mechanics and construction workers in Hong Kong in 1994 and skilled industrial workers in Jakarta in 1991. In a robustness check, we also try adjusting for more outliers, finding that this does not affect the results (see Figure 1.C12 in Appendix 1.C).

Second, if a gross or net earnings observation is missing, we linearly interpolate the tax rate (calculated as the difference between gross and net earnings divided by gross earnings) and then use that to compute the missing earnings observation. For 2015 and 2018, the UBS only report taxes and working hours as city averages. We thus assume that the distributions of tax rates and working hours among the different occupations within a city were the same in 2015 and 2018 as they were in 2012, but weighted by changes in the city's average tax rate and hours worked. Twelve of the occupations are available from the 1970s, while product managers and call centre agents are added during the 2000s, and financial analysts, hospital nurses, carpenters, medical doctors and doctor's assistants are added during the 2010s. Moreover, some of the occupations that have data from the 1970s lack data during the earliest years and some during the latest (see Table 1.A2), which we then extrapolate with the corresponding change in average earnings for that occupation's sector in each city. If an occupation is missing completely for a city, we use sub-regional (or regional) averages for that city-occupation, weighted by the relative difference in mean sector earnings. In alternative specifications, instead of extrapolating all occupation to cover the full period, we also exclude the "new" occupations that are added during the 2000s and 2010s and, alternatively, include these "new" occupations gradually as they are added to the data. We find that this does not affect the overall results (see Figure 1.C12 in Appendix 1.C).

Third, after PPP-adjusting at the city level, we calculate city-population-weighted country-occupation averages. We then balance our sample: In the original country-level UBS data, we have 827 country-year observations. For a few countries, there are missing observations within the country's time trend, and we linearly interpolate them, increasing our sample size to 836 country-year observations (16,720 country-year-occupation observations for our sample of 20 balanced occupations). To obtain a balanced panel, we then extrapolate the missing country-occupation observations by the corresponding average sub-regional (or regional) change for each occupation. In all such imputations, we always use average data on the sub-regional level if they are available and regional level averages only when we do not have any observations at the sub-regional level (using the United Nations' classification of geographical regions). As such, we obtain full sample coverage with observations from all 68 countries for all 17 time periods, that is, every third year from 1970 to 2018, which gives a total of 1,156 country-year observations for each of the 20 occupations (23,120 observations for each of our earnings, taxes, working hours, and the matched ILO occupational population measures). The coverages of the original and balanced data samples are presented in Table 1.A4. In addition to adding agricultural worker earnings from the OWW, we

also add an unemployed category with zero earnings and populations given by the country's unemployed working age population from the World Bank's (2018) WDI. Based on population data from the WDI, we also weight each country's occupational populations so that they sum to the country's total employed working age population (aged 15–64 years). Weighting this by total, instead of working age, country populations does not alter the results (see Figure 1.C12 in Appendix 1.C). Because the 2018 WDI data were not yet available to us, for 2018 we use data from 2017.

Table 1.A4. *Coverage of the Dataset.*

	World		Africa		Asia		Europe		L. America		N. America		Oceania	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Number of countries represented in the database														
1970	27	68	1	4	3	22	16	30	4	8	2	2	1	2
1973	32	68	1	4	7	22	16	30	5	8	2	2	1	2
1976	36	68	1	4	9	22	17	30	6	8	2	2	1	2
1979	40	68	1	4	13	22	17	30	6	8	2	2	1	2
1982	41	68	2	4	13	22	17	30	6	8	2	2	1	2
1985	43	68	3	4	14	22	17	30	6	8	2	2	1	2
1988	45	68	4	4	15	22	17	30	6	8	2	2	1	2
1991	46	68	4	4	16	22	17	30	6	8	2	2	1	2
1994	48	68	4	4	16	22	19	30	6	8	2	2	1	2
1997	51	68	4	4	17	22	21	30	6	8	2	2	1	2
2000	53	68	4	4	17	22	21	30	7	8	2	2	2	2
2003	63	68	4	4	18	22	29	30	8	8	2	2	2	2
2006	62	68	4	4	17	22	29	30	8	8	2	2	2	2
2009	63	68	4	4	18	22	29	30	8	8	2	2	2	2
2012	62	68	4	4	17	22	29	30	8	8	2	2	2	2
2015	61	68	4	4	17	22	29	30	7	8	2	2	2	2
2018	63	68	4	4	18	22	30	30	7	8	2	2	2	2
Mean	*49.2*	*68.0*	*3.1*	*4.0*	*14.4*	*22.0*	*21.8*	*30.0*	*6.5*	*8.0*	*2.0*	*2.0*	*1.4*	*2.0*

	World		Africa		Asia		Europe		L. America		N. America		Oceania	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
GDP (% of regional GDP represented in the database)														
1970	82	97	24	53	44	95	87	100	67	84	100	100	83	97
1973	85	97	26	51	65	96	87	100	75	86	100	100	80	96
1976	84	96	21	51	66	95	87	100	80	86	100	100	86	97
1979	87	96	21	48	79	95	87	100	80	85	100	100	84	96
1982	86	96	31	48	76	95	86	99	80	85	100	100	86	97
1985	87	96	41	43	73	95	86	99	80	84	100	100	85	97
1988	89	97	44	44	84	97	88	100	81	86	100	100	81	96
1991	90	97	41	41	85	94	90	100	84	89	100	100	86	97
1994	92	97	47	47	87	96	92	100	83	89	100	100	82	96
1997	95	97	49	49	93	96	98	99	83	89	100	100	84	97
2000	96	97	48	48	94	96	98	99	86	88	100	100	97	97
2003	96	97	47	47	94	96	99	99	85	85	100	100	98	98
2006	95	96	47	47	91	95	99	99	87	87	100	100	98	98
2009	95	96	45	45	91	95	99	99	88	88	100	100	98	98
2012	94	95	51	51	90	95	99	99	89	89	100	100	98	98
2015	93	95	52	52	91	95	99	99	79	87	100	100	98	98
2018	94	96	46	46	92	95	99	99	82	90	100	100	98	98
Mean	*90.5*	*96.5*	*40.1*	*47.7*	*82.0*	*95.5*	*92.8*	*99.4*	*81.6*	*87.0*	*100.0*	*100.0*	*89.5*	*97.1*

	World		Africa		Asia		Europe		L. America		N. America		Oceania	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Population (% of regional population represented in the database)														
1970	25	85	6	34	5	89	54	97	67	80	100	100	65	79
1973	41	85	6	34	33	90	54	97	72	80	100	100	65	79
1976	43	85	6	34	36	89	54	96	72	80	100	100	64	79
1979	47	84	6	34	44	89	53	96	72	80	100	100	64	78
1982	48	84	15	34	44	89	53	96	73	81	100	100	64	77
1985	50	84	30	34	45	89	53	96	73	81	100	100	63	76
1988	50	83	34	34	45	89	53	96	73	81	100	100	63	76
1991	51	83	34	34	46	89	52	95	73	81	100	100	63	75
1994	51	83	33	33	46	89	55	95	73	81	100	100	62	75
1997	75	82	33	33	81	89	81	95	73	81	100	100	62	74
2000	75	82	33	33	81	88	82	95	76	81	100	100	74	74
2003	79	81	33	33	84	88	95	95	81	81	100	100	73	73
2006	76	81	32	32	80	88	95	96	81	81	100	100	73	73
2009	75	80	32	32	80	88	95	96	81	81	100	100	72	72
2012	75	80	32	32	80	88	95	96	81	81	100	100	72	72
2015	74	79	32	32	79	88	95	96	76	80	100	100	72	72
2018	75	79	32	32	81	88	96	96	75	80	100	100	72	72
Mean	*59.3*	*82.4*	*25.3*	*33.2*	*58.3*	*88.7*	*71.5*	*95.9*	*74.7*	*80.5*	*100.0*	*100.0*	*67.2*	*75.1*

Notes: First column for each region only includes the original UBS data (Sample 1). Second column also includes the imputed data (Sample 2).
Sources: Authors' calculations described in the text; World Bank (2018).

Fourth, we obtain full global coverage by imputing occupational earnings for the countries that are not in our original sample. We do this last imputation by using the average sub-regional or regional earnings levels of each occupation, weighted by the GDP per capita of the excluded countries relative to that of the whole sub-region or region. This sample has 100% global coverage and includes a total of 29,580 country-year-occupation observations (31,059 including the unemployed category) for each of our different statistics.

Finally, the last step in our estimation procedure is to compute the different inequality measures using these earnings and population data, where our hourly wage measure is calculated as yearly earnings divided by weekly working hours times 52. For average country-level Gini coefficients of the different measures, see Table 1.A5. For country inequality trends, see Table 1.A6. Finally, the main global and regional inequality measures are presented in Table 1.A7.

Table 1.A5. *Average Earnings Inequality per Country.*

	Gini coefficient (%)		
Country	Net earnings	Gross earnings	Net wages
Sweden	17.8	20.0	18.3
Denmark	18.1	19.7	17.7
Switzerland	19.9	21.1	20.6
Norway	20.0	21.2	19.5
Netherlands	20.6	22.3	20.9
Finland	20.9	23.4	21.6
Czechia	22.3	23.1	22.6
Australia	22.6	24.7	22.5
New Zealand	22.8	24.2	22.6
Slovenia	23.7	24.9	24.8
Japan	23.8	24.1	23.2
Belgium	23.9	26.4	24.0
Austria	24.7	26.6	24.8
Germany	25.1	26.2	25.1
Hong Kong	25.4	26.5	27.2
Hungary	25.6	28.5	25.7
United Kingdom	25.9	26.7	26.4
Italy	26.0	27.5	26.0
Croatia	26.1	26.7	26.9

Country	Net earnings	Gross earnings	Net wages
Ireland	26.6	28.0	27.4
Greece	28.2	29.4	28.2
Taiwan	28.3	29.1	29.3
Luxembourg	28.7	29.3	29.7
South Korea	28.7	29.1	30.3
Estonia	28.7	29.3	29.0
Poland	28.9	29.5	28.6
Nigeria	29.2	29.1	30.4
China	29.4	29.9	30.2
Portugal	29.8	31.9	31.6
Canada	29.9	31.4	29.9
United States	30.1	30.9	29.8
France	30.6	31.7	30.4
Peru	31.4	33.1	32.9
Spain	32.2	33.6	32.6
Ukraine	32.2	33.6	32.9
Saudi Arabia	32.9	33.0	33.8
Singapore	32.9	34.1	33.7
Israel	34.1	37.1	34.0
Cyprus	34.6	35.9	35.6
Slovakia	35.4	36.7	35.0
Malaysia	35.6	37.0	37.2
Romania	36.6	38.5	36.5
Mexico	37.1	38.7	39.3
Latvia	37.7	37.8	37.6
Bulgaria	38.1	39.2	37.7
Turkey	38.5	39.1	38.9
Iran	38.6	40.9	38.7
Lithuania	39.0	39.3	39.5
Indonesia	39.1	39.7	41.7
Argentina	39.6	40.1	39.8
Egypt	39.7	40.6	43.2
Chile	39.9	41.1	40.6
Venezuela	40.2	41.2	40.0

Country	Net earnings	Gross earnings	Net wages
Bahrain	40.9	40.8	41.9
Colombia	41.2	43.5	41.9
India	41.6	43.2	42.5
United Arab Emirates	42.3	42.3	42.9
Thailand	42.5	43.1	42.6
Qatar	44.1	44.0	46.3
Brazil	44.9	46.9	45.5
Russia	45.1	46.1	45.3
Pakistan	45.5	46.9	45.4
South Africa	45.6	48.4	46.3
Panama	45.9	46.6	47.4
Lebanon	46.0	46.2	46.2
Philippines	47.5	48.7	47.9
Vietnam	49.7	49.7	49.5
Kenya	50.3	50.6	51.0

Notes: 1970–2018 averages. Calculations based on earnings weighted by occupational group populations including the unemployed. Earnings refer to yearly and wages to hourly earnings.
Source: Authors' calculations based on data described in the text.

Table 1.A6. *Country Earnings Inequality, 1970–2018.*

	Gini coefficient, net earnings (%)																
Country	1970	1973	1976	1979	1982	1985	1988	1991	1994	1997	2000	2003	2006	2009	2012	2015	2018
Argentina	44.9	45.4	43.4	45.1	44.3	35.9	43.6	45.8	47.1	43.9	45.9	48.4	36.2	29.3	24.7	21.8	26.6
Australia	15.6	17.6	16.6	20.6	23.9	22.4	23.0	25.4	26.7	25.9	23.7	21.9	23.4	26.1	23.9	24.3	22.9
Austria	26.8	27.8	23.7	22.5	20.0	22.7	24.2	26.1	25.5	25.0	23.8	24.6	23.9	27.3	25.6	24.3	25.7
Bahrain	*43.9*	*37.6*	39.5	39.1	36.5	36.3	34.8	38.5	48.1	46.7	46.7	45.2	45.2	41.8	32.9	41.7	41.6
Belgium	20.2	20.2	23.0	23.5	26.0	27.5	26.9	25.5	26.2	29.4	25.8	25.3	24.2	21.7	21.4	19.6	19.0
Brazil	47.0	44.5	40.3	42.7	43.0	43.9	39.2	45.8	47.9	52.1	48.2	46.3	44.5	45.2	41.9	45.6	45.8
Bulgaria	*45.6*	*45.7*	*47.5*	*48.0*	*49.3*	*40.4*	*33.4*	*39.3*	*41.0*	*38.7*	*37.7*	31.1	30.8	24.5	32.4	31.9	30.8
Canada	29.1	28.6	29.6	29.9	32.6	32.9	29.9	33.0	30.7	31.2	27.8	30.5	29.5	28.8	27.5	29.0	28.3
Chile	*42.0*	*42.3*	*42.9*	*41.3*	*44.9*	*41.3*	*43.5*	*41.7*	*43.3*	*40.2*	43.3	45.4	34.4	37.4	31.7	29.3	33.1
China	*14.9*	*15.3*	*17.2*	*19.8*	*20.4*	*20.0*	*23.3*	*23.6*	*34.0*	39.1	44.4	57.4	39.4	41.8	34.6	26.6	27.5
Colombia	47.9	42.9	45.0	39.2	34.1	37.5	42.9	47.1	40.1	43.8	48.1	42.6	38.4	39.0	35.9	39.0	36.1
Croatia	*23.8*	*23.2*	*17.2*	*15.9*	*17.5*	*20.5*	*27.8*	*27.3*	*29.1*	*31.4*	*34.6*	*29.9*	*27.4*	*26.0*	*32.7*	*31.1*	28.6
Cyprus	*54.5*	*46.5*	*39.5*	*26.0*	*27.2*	*30.0*	26.4	29.8	30.4	32.2	31.7	33.5	34.7	33.1	38.7	39.5	34.5
Czechia	*21.3*	*20.9*	*23.3*	*24.0*	*24.5*	*22.5*	*21.4*	*24.6*	24.7	26.5	24.1	21.6	19.1	22.5	22.8	18.0	17.2
Denmark	15.4	13.7	17.0	17.4	20.6	17.5	22.0	19.2	18.2	16.2	15.1	15.5	17.9	18.8	20.1	21.8	21.0
Egypt	*22.8*	*23.9*	*23.6*	*26.4*	26.5	25.4	28.9	36.0	39.9	45.9	48.2	55.0	56.7	55.0	61.9	50.8	48.1
Estonia	*25.5*	*26.2*	*26.9*	*26.2*	*26.2*	*26.9*	*28.2*	*27.6*	*33.9*	*34.5*	*34.6*	31.9	25.4	29.6	31.7	27.8	25.0

Country	1970	1973	1976	1979	1982	1985	1988	1991	1994	1997	2000	2003	2006	2009	2012	2015	2018
Finland	17.6	17.8	18.1	19.7	19.5	17.5	18.1	19.5	24.8	24.2	23.9	23.0	23.6	23.2	20.8	22.5	21.4
France	25.7	27.0	26.8	26.5	25.5	31.4	31.4	27.0	35.0	34.2	32.6	36.2	34.0	33.6	32.5	29.7	30.5
Germany	19.0	19.6	21.3	19.8	23.0	26.3	25.0	26.4	28.6	27.6	25.9	29.0	28.1	27.2	26.6	26.7	27.0
Greece	24.3	22.2	22.3	21.6	19.4	23.6	28.9	28.8	25.3	27.4	30.8	32.9	27.0	26.1	38.8	39.8	40.3
Hong Kong	35.9	36.1	32.2	25.4	31.7	23.9	21.7	20.1	17.5	17.9	18.8	29.6	24.8	22.9	27.2	23.0	22.5
Hungary	*18.6*	*18.7*	*19.7*	*19.8*	*20.2*	*22.9*	*24.5*	*30.5*	30.3	26.8	25.2	31.9	27.8	32.6	31.6	28.0	25.4
India	*26.7*	40.6	42.0	37.9	35.6	29.6	32.6	48.4	44.9	44.5	48.1	47.9	55.5	46.9	48.7	40.7	37.0
Indonesia	*47.2*	*51.7*	*35.1*	35.5	25.7	31.1	40.4	46.1	38.0	45.2	42.8	48.6	34.6	38.3	39.5	31.8	32.4
Iran	*27.3*	*26.2*	34.7	41.7	*44.4*	*45.0*	*35.7*	*35.9*	*36.7*	*31.1*	*36.7*	*41.1*	*44.0*	*43.9*	*50.1*	*41.7*	*39.5*
Ireland	*19.3*	*19.7*	25.4	22.8	26.8	29.0	29.1	31.0	32.1	28.4	24.8	26.0	24.5	27.7	33.2	27.5	24.1
Israel	*40.0*	29.9	30.9	27.0	32.7	33.1	31.9	37.6	36.3	35.8	36.8	41.0	36.4	33.6	33.3	31.9	31.3
Italy	25.3	26.2	24.9	22.3	24.0	25.8	26.0	25.7	26.3	26.9	26.7	24.9	23.1	24.3	31.3	29.5	28.9
Japan	25.3	21.8	21.9	22.0	20.9	23.4	22.9	21.5	23.3	25.9	25.1	27.9	25.7	23.4	25.4	24.0	24.3
Kenya	*45.3*	*45.6*	*44.1*	*41.3*	*51.1*	*47.7*	46.0	63.5	59.6	59.9	58.7	52.0	43.3	46.3	47.3	45.5	58.2
Latvia	*36.6*	*36.4*	*39.5*	*38.6*	*40.9*	*41.0*	*40.0*	*44.5*	*42.9*	*41.7*	*39.2*	37.5	39.8	36.6	31.7	29.4	24.7
Lebanon	49.0	48.7	*50.4*	*45.3*	*45.3*	*47.0*	*46.7*	*49.1*	*49.6*	*48.1*	*47.8*	*46.6*	*43.9*	*40.4*	*41.5*	*40.5*	*41.7*
Lithuania	*38.6*	*39.8*	*41.3*	*39.9*	*40.3*	*40.3*	*39.8*	*40.8*	*44.3*	*42.0*	*40.6*	39.6	31.9	40.6	35.5	34.7	32.7
Luxembourg	21.9	23.1	24.7	26.2	22.1	30.4	24.2	28.6	30.2	30.1	29.5	28.4	32.4	31.9	35.6	34.4	33.8
Malaysia	*34.3*	*36.0*	*32.9*	*27.1*	*31.4*	37.2	37.2	36.5	43.1	45.1	39.8	39.2	38.5	36.4	30.7	29.3	29.9
Mexico	48.7	47.8	48.8	43.7	34.5	22.5	18.5	18.4	37.0	37.3	33.4	32.2	39.5	46.1	42.6	46.8	32.8

Country	1970	1973	1976	1979	1982	1985	1988	1991	1994	1997	2000	2003	2006	2009	2012	2015	2018
Netherlands	18.2	18.5	19.2	18.3	23.3	25.8	24.6	20.7	24.6	23.5	22.3	20.6	22.3	19.8	20.2	13.6	14.0
New Zealand	*17.3*	*17.9*	*20.5*	*19.6*	*24.4*	*20.2*	*23.6*	*28.9*	*27.7*	*25.4*	23.7	22.9	21.6	22.9	23.7	23.7	22.9
Nigeria	*21.0*	*26.2*	*19.9*	*22.9*	*21.6*	24.2	23.9	23.8	30.7	31.9	36.3	37.4	33.1	32.7	39.4	36.2	35.4
Norway	21.1	23.2	21.3	19.7	19.7	19.2	16.6	18.1	21.9	21.7	18.5	18.7	19.0	19.3	20.7	21.3	21.0
Pakistan	*27.0*	*45.2*	*36.4*	*40.7*	*37.0*	*34.3*	*36.5*	*47.0*	*41.2*	*43.6*	*41.6*	61.9	*69.9*	*63.1*	*60.0*	*45.8*	*42.2*
Panama	*48.9*	*45.7*	46.9	43.8	43.1	46.6	49.2	47.2	49.3	49.5	49.0	48.1	45.6	43.7	41.6	40.9	41.6
Peru	*26.4*	*25.7*	*26.4*	*35.2*	*33.6*	*41.5*	*41.1*	*39.4*	*37.9*	*30.0*	*28.3*	29.7	29.8	27.9	30.3	23.5	26.3
Philippines	*54.7*	*59.3*	52.4	49.1	52.3	53.6	45.9	39.0	46.1	45.3	44.5	43.1	45.0	37.0	37.0	47.2	55.5
Poland	*22.2*	*23.3*	*27.9*	*29.7*	*33.0*	*26.6*	*23.6*	*32.7*	*32.9*	28.6	30.0	32.3	31.5	27.2	28.7	29.2	32.0
Portugal	34.7	33.1	27.8	27.9	26.9	25.2	30.3	28.0	26.9	32.3	29.8	28.5	33.5	28.3	33.2	30.6	30.2
Qatar	*45.0*	*34.5*	*36.1*	*34.4*	*36.9*	*39.2*	*41.5*	*46.2*	*50.7*	*52.4*	*51.4*	*52.2*	*48.6*	47.1	45.6	41.5	45.6
Romania	*40.0*	*41.1*	*43.8*	*45.5*	*48.1*	*42.3*	*36.7*	*39.1*	*33.1*	*37.1*	*35.6*	42.2	36.8	21.0	26.0	27.4	27.1
Russia	*53.3*	*52.8*	*54.5*	*54.8*	*55.8*	*49.2*	*43.9*	*40.0*	*42.2*	44.2	65.5	49.9	39.6	33.4	28.7	27.8	30.9
Saudi Arabia	*40.0*	*31.0*	*31.5*	25.8	30.6	37.2	34.7	32.7	32.8	32.4	32.4	32.8	32.5	32.0	32.9	33.8	34.6
Singapore	*38.6*	34.0	32.7	29.5	29.8	32.1	37.2	35.2	30.5	30.1	33.8	34.0	36.4	33.4	*31.4*	*29.0*	*32.1*
Slovakia	*37.0*	*36.5*	*37.9*	*38.4*	*39.8*	*34.1*	*30.1*	*34.6*	*35.5*	*37.2*	*41.1*	36.0	34.9	32.6	33.6	33.3	28.6
Slovenia	*28.6*	*27.7*	*21.2*	*19.1*	*19.8*	*21.5*	*26.0*	*24.4*	*22.4*	*23.5*	*24.8*	23.8	21.8	25.0	28.7	23.2	20.6
South Africa	36.5	36.6	35.4	35.3	36.5	48.3	44.5	47.8	42.2	41.7	49.6	56.8	51.0	49.9	49.5	58.2	55.5
South Korea	*22.6*	*27.5*	*22.9*	*23.3*	23.6	27.3	24.4	23.4	25.4	25.7	28.5	38.7	34.3	35.3	38.2	33.8	32.9
Spain	40.9	41.0	21.8	24.3	24.3	25.8	29.8	32.8	36.8	34.3	30.8	32.8	30.5	34.4	39.0	36.1	32.1

Country	1970	1973	1976	1979	1982	1985	1988	1991	1994	1997	2000	2003	2006	2009	2012	2015	2018
Sweden	16.0	15.6	15.0	15.5	15.8	15.2	16.4	14.8	20.6	17.6	17.1	17.2	21.3	21.4	22.1	21.1	20.4
Switzerland	15.7	15.7	16.7	17.7	17.4	19.4	20.4	18.8	24.0	23.2	22.4	22.7	22.6	19.3	19.5	22.4	21.3
Taiwan	*26.2*	*28.2*	*25.1*	*26.7*	*28.0*	*28.1*	*25.5*	22.9	30.0	23.5	24.4	31.9	26.9	32.3	32.9	35.7	33.4
Thailand	*45.4*	*50.1*	*42.7*	39.7	47.9	42.0	37.3	43.9	43.9	49.4	44.7	41.1	41.7	44.7	37.2	34.9	35.2
Turkey	*34.7*	38.6	37.1	23.4	35.9	32.2	44.8	37.9	38.4	38.3	34.8	47.4	38.3	40.2	40.5	49.0	42.4
Ukraine	*25.1*	*26.3*	*29.1*	*30.8*	*33.0*	*30.1*	*30.2*	*36.7*	*32.3*	*39.1*	*37.3*	40.4	29.9	34.2	28.6	32.9	31.7
United Arab Emirates	*38.1*	*40.4*	*39.0*	36.8	34.3	37.4	35.9	43.3	47.3	40.5	41.3	41.8	45.0	46.1	50.6	49.7	51.9
United Kingdom	20.2	19.8	22.6	23.2	27.3	27.5	27.8	29.8	29.0	27.9	27.5	25.1	23.9	26.2	28.2	28.4	25.5
United States	30.7	29.9	30.2	28.3	31.8	31.3	30.0	31.0	29.2	28.6	26.9	29.6	26.8	32.1	30.2	33.5	31.7
Venezuela	*42.7*	43.0	42.6	39.8	37.7	54.8	48.1	50.6	41.5	33.2	35.7	44.9	34.3	31.8	35.4	*31.8*	*36.4*
Vietnam	*54.1*	*57.7*	*47.6*	*38.9*	*40.5*	*41.1*	*44.7*	*52.5*	*51.0*	*55.8*	*56.0*	*54.3*	*48.0*	*57.3*	*50.9*	*46.9*	47.7

Notes: Calculations based on net yearly earnings weighted by occupational group populations including the unemployed. Imputed observations in italics.
Source: Authors' calculations based on data described in the text.

Table 1.A7. *Global Earnings Inequality, 1970–2018.*

a) Global inequality						
	Gini coefficient (%)			GE index (%)		
	Net earnings	Gross earnings	Net wages	GE(0) Theil-L (MLD)	GE(1) Theil-T	GE(2)
1970	65.3	67.9	67.4	80.3	78.7	138.7
1973	64.3	66.5	66.7	79.6	73.4	117.1
1976	64.7	67.0	66.7	81.3	72.6	109.0
1979	65.3	67.4	66.8	84.3	73.3	105.5
1982	64.2	67.0	65.8	78.9	69.8	100.2
1985	64.5	67.4	65.8	77.3	71.3	107.0
1988	63.8	67.3	65.4	74.0	71.0	111.1
1991	63.7	66.1	65.0	73.1	68.3	102.4
1994	65.0	67.4	66.3	78.6	71.5	108.4
1997	65.5	67.8	67.1	81.8	72.3	110.6
2000	64.7	66.6	66.4	79.0	69.4	102.6
2003	61.3	63.3	62.6	67.2	60.0	84.9
2006	56.1	58.3	57.1	52.5	49.2	68.1
2009	54.3	56.4	55.5	47.4	45.4	62.7
2012	52.4	54.6	53.2	43.4	42.2	58.9
2015	52.3	54.6	54.0	42.6	43.2	63.5
2018	50.2	52.6	52.2	39.0	39.2	56.6
1970–2018 change (%)	-23.1	-22.5	-22.5	-51.4	-50.2	-59.2

b) Regional Gini indices (%)						
	Africa	Asia	Europe	Latin America	Northern America	Oceania
1970	45.3	47.1	46.2	51.2	31.2	21.2
1973	47.2	55.5	46.6	51.4	30.1	23.1
1976	46.0	59.0	46.0	47.3	30.5	21.6
1979	45.2	63.1	46.7	45.8	28.7	25.6
1982	49.6	60.4	48.0	43.0	32.2	30.5
1985	46.7	58.9	51.2	46.2	31.6	29.3
1988	48.1	56.1	52.8	44.5	30.2	29.2
1991	55.8	59.8	52.1	48.1	31.4	30.8
1994	62.1	60.3	53.3	46.6	29.4	31.4
1997	60.1	61.8	52.6	50.4	29.3	31.9
2000	58.9	62.5	50.3	48.9	27.4	31.2
2003	55.9	61.2	43.7	49.4	29.9	36.1
2006	54.6	55.5	39.9	44.8	27.4	37.1
2009	54.1	51.9	36.6	44.6	32.1	40.3
2012	56.7	49.6	37.4	41.6	30.5	39.5
2015	54.9	46.3	37.4	44.2	33.3	39.2
2018	55.2	44.2	38.2	41.7	31.7	38.3
1970–2018 change (%)	21.9	-6.2	-17.4	-18.4	1.7	80.8

c) Global Theil index decomposition within and between countries and occupations (%)						
	GE(1) by countries			GE(1) by occupations		
	Within country	Between country	Between (%) contribution	Within occupation	Between occupation	Between (%) contribution
1970	15.7	62.9	80.0	44.8	33.9	43.0
1973	15.9	57.5	78.3	39.2	34.2	46.6
1976	14.4	58.1	80.1	39.9	32.6	44.9
1979	13.3	60.0	81.9	42.0	31.3	42.7
1982	13.4	56.4	80.9	39.5	30.3	43.4
1985	13.7	57.6	80.7	39.1	32.2	45.2
1988	13.5	57.5	81.0	38.9	32.1	45.2
1991	16.3	52.0	76.1	35.4	32.9	48.2
1994	16.1	55.4	77.5	38.1	33.4	46.7
1997	17.1	55.2	76.3	38.0	34.3	47.4
2000	18.2	51.2	73.8	37.3	32.0	46.2
2003	23.4	36.6	61.0	29.2	30.8	51.3
2006	22.3	26.9	54.7	22.7	26.5	53.9
2009	20.5	24.9	54.9	22.3	23.1	50.9
2012	20.5	21.8	51.5	23.5	18.7	44.3
2015	17.1	26.1	60.4	25.6	17.5	40.6
2018	16.7	22.5	57.3	22.8	16.3	41.7
1970–2018 change (%)	6.3	-64.3	-28.3	-49.1	-51.7	-3.1

d) Global percentile earnings shares and average net yearly earnings (in PPP-adjusted 2015 USD)						
	Top and bottom earnings shares (%)			Top and bottom earnings (2015 USD)		
	Bottom 50%	Top 10%	Top 1%	Bottom 50%	Top 10%	Top 1%
1970	9.4	50.1	8.8	1,957	52,822	130,618
1973	9.0	46.5	8.5	2,247	59,082	133,108
1976	8.1	45.2	8.2	1,924	53,747	110,977
1979	7.5	43.8	8.2	1,779	53,540	98,311
1982	8.2	43.4	8.2	1,677	44,549	83,842
1985	9.2	44.9	7.1	2,049	51,570	99,682
1988	9.4	45.9	9.0	1,955	47,844	96,994
1991	9.4	43.8	8.8	1,976	46,284	93,324
1994	8.8	44.7	8.9	2,015	52,118	104,365
1997	8.7	45.5	6.6	1,860	48,391	106,296
2000	9.2	43.7	8.7	2,088	50,862	95,721
2003	10.9	40.4	7.7	3,040	57,830	112,722
2006	13.8	36.7	6.8	3,952	52,093	106,791
2009	15.0	35.5	7.0	4,872	57,921	113,946
2012	16.8	35.0	7.0	6,384	67,121	134,435
2015	17.6	36.4	7.3	5,782	60,786	121,724
2018	18.9	34.5	6.9	5,827	53,403	107,040
1970–2018 change (%)	102.4	-31.1	-21.9	197.7	1.1	-18.1

Notes: Calculations based on net yearly earnings (if nothing else specified), which are PPP-adjusted using UBS price levels in 2015 USD and weighted by working age populations. Earnings refer to yearly earnings and wage to hourly earnings. Gini indices include the unemployed; GE indices and percentiles exclude the unemployed.
Source: Authors' calculations based on data described in the text.

Appendix 1.B Validating the Data

In this section, we present comparisons and correlations between our data and those from other sources. Overall, we regard the correspondence between our new earnings inequality database and previous evidence from other sources as good. In the cases of deviations, most of the discrepancies seem to be level differences potentially explained by the within-occupational-group dispersion that was omitted in our original data.

1.B.1 Cross-Country Correlations with Other Datasets

Figure 1.B1 shows country-average correlations between our data and other sources for incomes, prices and inequality. In Figure 1.B1a, we plot average country-level gross earnings in the UBS data against the mean level of GDP per capita income from the WDI, which shows a strong positive correlation (90%). In Figure 1.B1b, we compare the country-average price levels based on the UBS data with prices based on the ICP 2011, which also shows a strong correlation (79%). Note, however, that the indices here have different base values, where the ICP price index is relative to the United States' average price level in 2015, while the UBS price index is relative to the 2015 prices in New York City. In Figure 1.B1c, we plot average country-level Gini coefficients for our net earnings measure against those for income or consumption in Milanovic's (2016) *All the Ginis* (ALG) dataset. Again, there is a positive and significant correlation, although this is somewhat weaker than the others (59%). The level of inequality is generally lower for earnings than for income or consumption. This is as expected since earnings do not include income from capital, which is generally more skewed than income from labour. Finally, there is also a relatively strong correlation (61%) between the average country-level top 10% earnings in our dataset and the corresponding figures in the WID (2018), as shown in Figure 1.B1d.

Figure 1.B1. Cross-Country Correlations: Earnings, Prices and Inequality.

Notes: a) Country-level earnings and income per capita averages for 1970–2018 in current USD. UBS gross yearly earnings weighted by occupational group populations, including the unemployed. b) Country-level price levels in 2015. For UBS, prices excluding rent (where New York City 2015 = 100). For ICP 2011, prices from the WDI (where the United States 2015 = 100). c) Country-level inequality averages for 1970–2018. UBS net yearly earnings inequality refers to this study with calculations based on net yearly earnings weighted by occupational group populations, including the unemployed. ALG income inequality refers to interpolated values of Milanovic (2016) ALG dataset. d) Country-level top 10% gross yearly earnings averages for 1970–2018 in current USD. "UBS top 10% mean gross yearly earnings" refers to this study with calculations based on gross yearly earnings weighted by occupational group populations, excluding the unemployed. "WID top 10% mean earnings" refers to the WID.
Sources: Authors' calculations based on data described in the text; Milanovic (2016); WID (2018); World Bank (2018).

The country-level pairwise correlations (using all available years) between our measures of inequality, earnings and prices, and income inequality in the ALG dataset, GDP per capita incomes from the WDI and price levels from the ICP 2011, respectively, are shown in Table 1.B1.

Table 1.B1. *Country-Level Pairwise Correlations: Inequality, Earnings and Prices.*

a) Inequality correlation (%)	ALG income inequality
Gini net earnings inequality	48.2***
	(814)
b) Income and earnings correlation (%)	GDP per capita
Gross earnings	91.3***
	(1,156)
c) Price levels correlation (%)	ICP 2011 PPP
UBS PPP	84.3***
	(680)

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Number of observations in parentheses. Mean earnings and inequality calculations weighted by occupational group populations including the unemployed. a) Country-level inequality measured by Gini coefficient. ALG refers to interpolated values of Milanovic (2016). b) GDP per capita and gross yearly earnings in current USD. c) For UBS, prices excluding rent, where New York City 2015 = 100. For ICP 2011, prices from the WDI using the 2011 ICP round, where United States 2015 = 100.
Sources: Authors' calculations based on data described in the text; Milanovic (2016); World Bank (2018).

1.B.2 Top Earnings Correlations

Figure 1.B2 shows some further correlations between top occupation earnings in our data and the WID top earnings data. The correlations indicate that the highest-earnings occupations in the UBS data (managers and medical doctors), except for some outliers (particularly Qatar), have earnings around or even above the mean in the WID top decile and, in many cases, also the top ventile. This means that we have fairly good coverage in the top, although the very top (above the top 5%) may still not be well covered in our data. In one of our robustness analyses, we have therefore added the national top earnings from the WID to our baseline data, finding that this does not change our results (see Section 1.C.10 in Appendix 1.C).

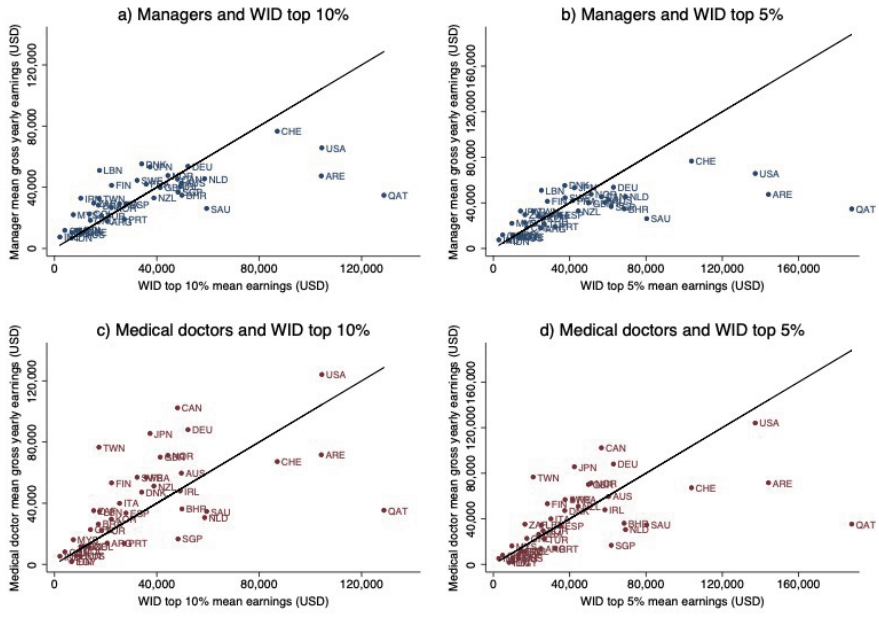


Figure 1.B2. Top Earnings Cross-Country Correlations.

Notes: Correlations between top earnings in the WID and top occupation earnings in the UBS data, with gross yearly earnings averages for 1970–2018 in current USD. Solid line indicates 45-degree line, with equal earnings in the WID and the UBS data; observations above this line indicate higher mean earnings in the UBS than in the WID data. Medical doctors refer to general practitioners, and managers to department and product managers.
Sources: Authors' calculations based on data described in the text; WID (2018).

1.B.3 Occupational Earnings Correlations

Next, we also check how well the UBS occupational earnings correspond to another international dataset of occupational wages, namely Freeman and Oostendorp's (2012) OWW database. In Figure 1.B3, we thus plot the occupational gross hourly wages in the UBS versus OWW datasets (where each observation represents the earnings of an occupation in a country and year) for all occupations that are available for the full 1970s–2010s period. The occupations are matched as follows (in the UBS and OWW datasets, respectively): bank credit clerks with bank tellers; bus drivers with motor bus drivers; car mechanics with automobile mechanics in the repair of motor vehicles industry; construction workers with labourers in the construction industry; cooks with cooks; department managers with supervising or general foremen in the manufacture of industrial chemicals industry; engineers with electronics engineering technicians; female factory workers with labourers in the spinning, weaving and finishing textiles industry; female sales assistants with salespersons in the retail trade (grocery) industry; primary school teachers

with first-level education teachers; secretaries with office clerks in the printing, publishing and allied industries industry; and skilled industrial workers with mixing- and blending-machine operators in the manufacture of industrial chemicals industry. For wage correlations per occupation, see Figure 1.B4.

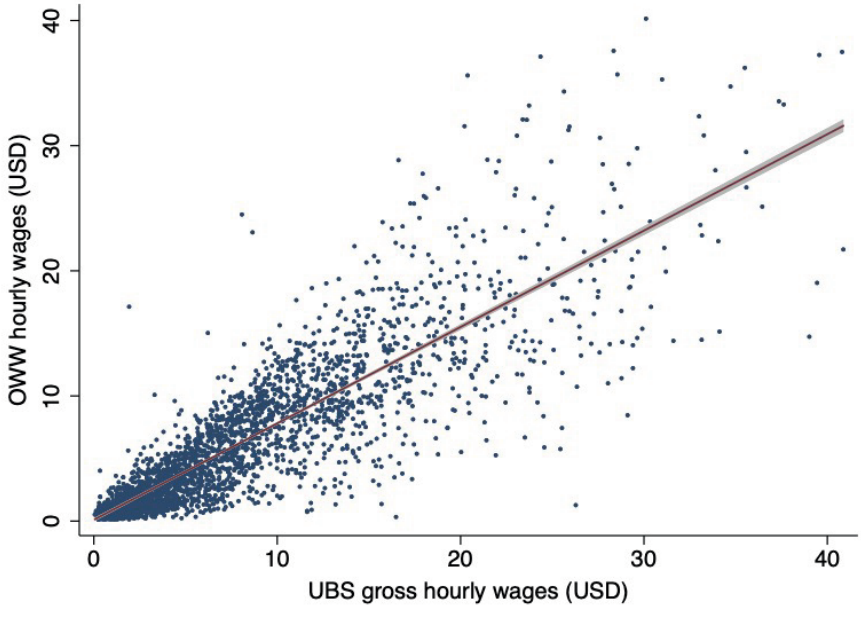
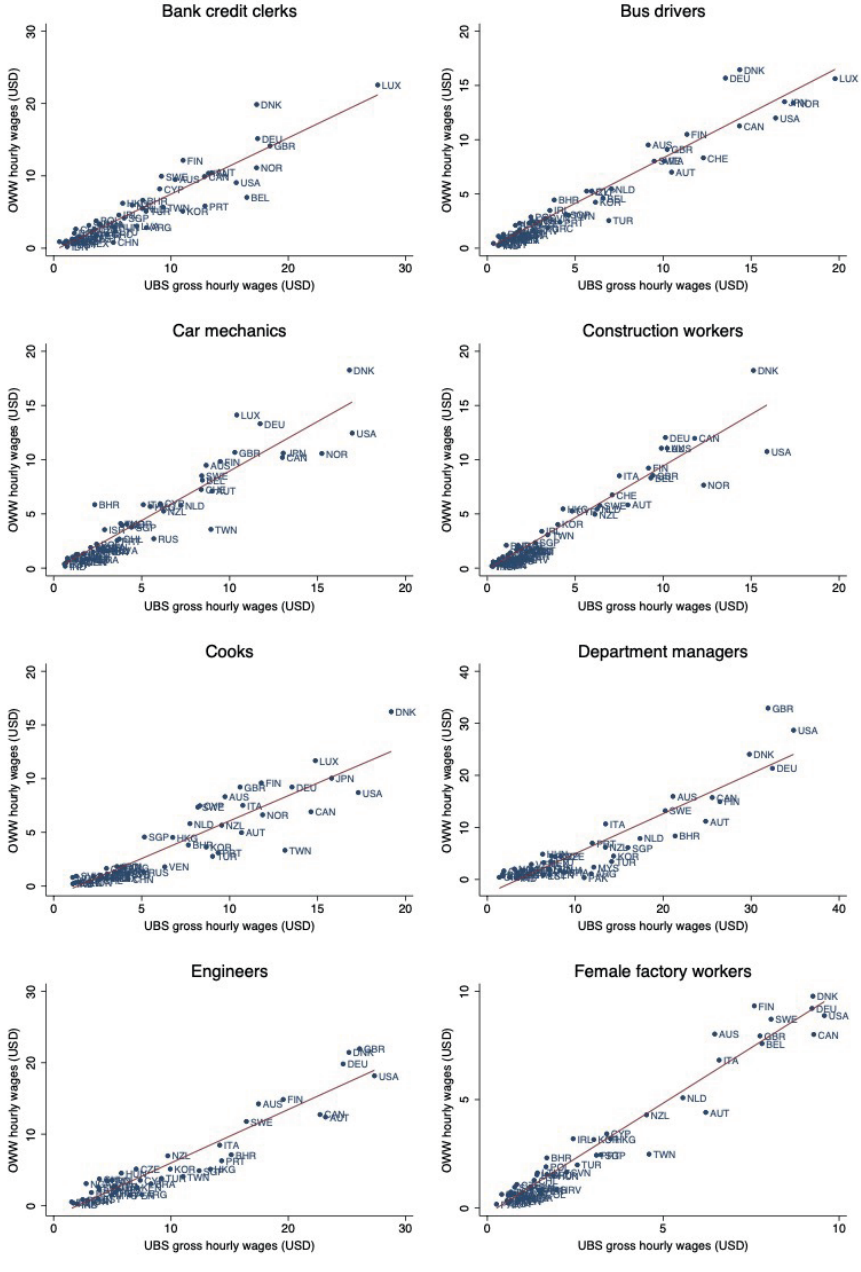


Figure 1.B3. Occupational Earnings Correlations.

Notes: Country-occupation gross hourly wages in current USD in the UBS and the OWW datasets. Each point corresponds to an occupation in a country in a specific year.
Sources: Authors' calculations based on data described in the text; Freeman and Oostendorp (2012).

The correlation between occupational hourly wages in the two datasets is very high (88%), and similarly for yearly earnings (86%). We can also see that, on average, the wages and earnings levels are slightly higher in the UBS than in the OWW data. A potential explanation for this is that the UBS data are only collected in cities and, as such, lack rural wages and earnings, which are likely to be lower than their urban counterparts. To deal with this limitation, we PPP-adjust at the local city level for urban price levels instead of a mix of rural and urban prices.


Bank credit clerks
Bus drivers
Car mechanics
Construction workers
Cooks
Department managers
Engineers
Female factory workers
OWW hourly wages (USD)
UBS gross hourly wages (USD)

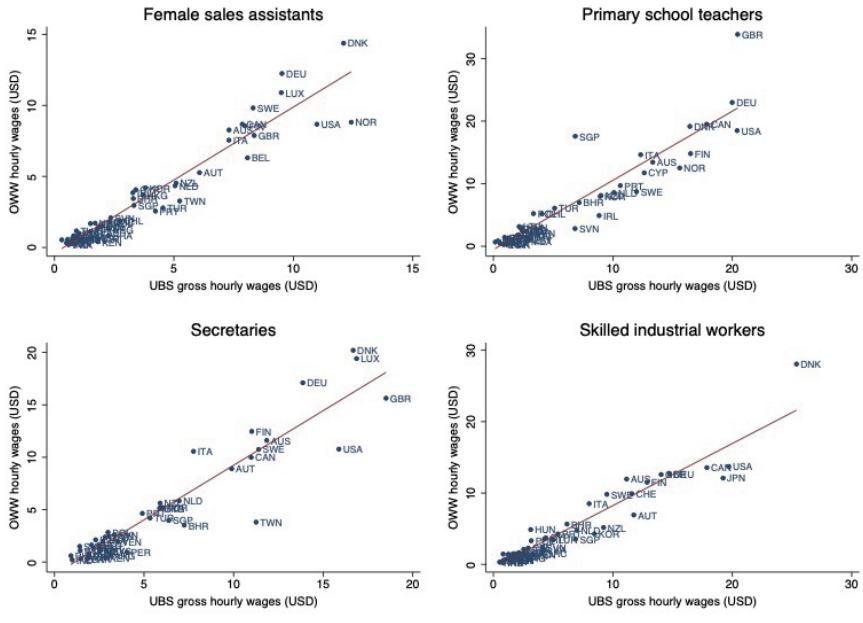


Figure 1.B4. Earnings Correlations per Occupation.

Note: Country-occupation gross hourly wages averages for 1970–2018 in current USD in the UBS and the OWW datasets.
Sources: Authors' calculations based on data described in the text; Freeman and Oostendorp (2012).

1.B.4 City Size, Earnings and Inequality

To check our assumption about local price adjustments, we do a within-sample test using the city-level data within countries (Figure 1.B5). By comparing all within-country between-city pairs available in our data (that is, the countries for which we have earnings data from more than one city in the same year), we see that after PPP-adjusting at the city level, average earnings within one city in a country seems to be strongly correlated with earnings in another city within the same country (Figure 1.B5a). The same also seems to be the case for city earnings inequality (Figure 1.B5b). While some earlier studies have argued for a potential relationship between inequality and city size (for example, Glaeser *et al*., 2009, who find this association to be negative, and Baum-Snow and Pavan, 2013, who find it to be positive), we do not see such within-country correlation between city population and earnings inequality in our data (Figure 1.B5d). Nor do we see any significant within-country correlation between city size and average earnings, after PPP-adjusting at the city level (Figure 1.B5c). It should be noticed, however, that this analysis only covers a limited sample of (relatively large) cities. It could still be the case that there is a real earnings gap between urban and rural areas that we do not

capture with our data and local price adjustments. In one of our heterogeneity analyses, we hence focus exclusively on global urban earnings inequality (see Section 1.C.9 in Appendix 1.C).

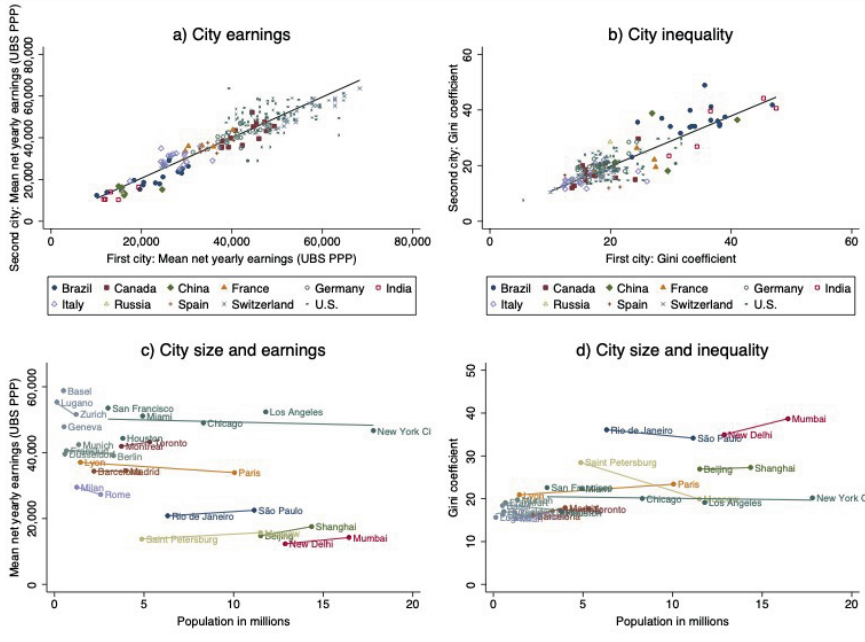


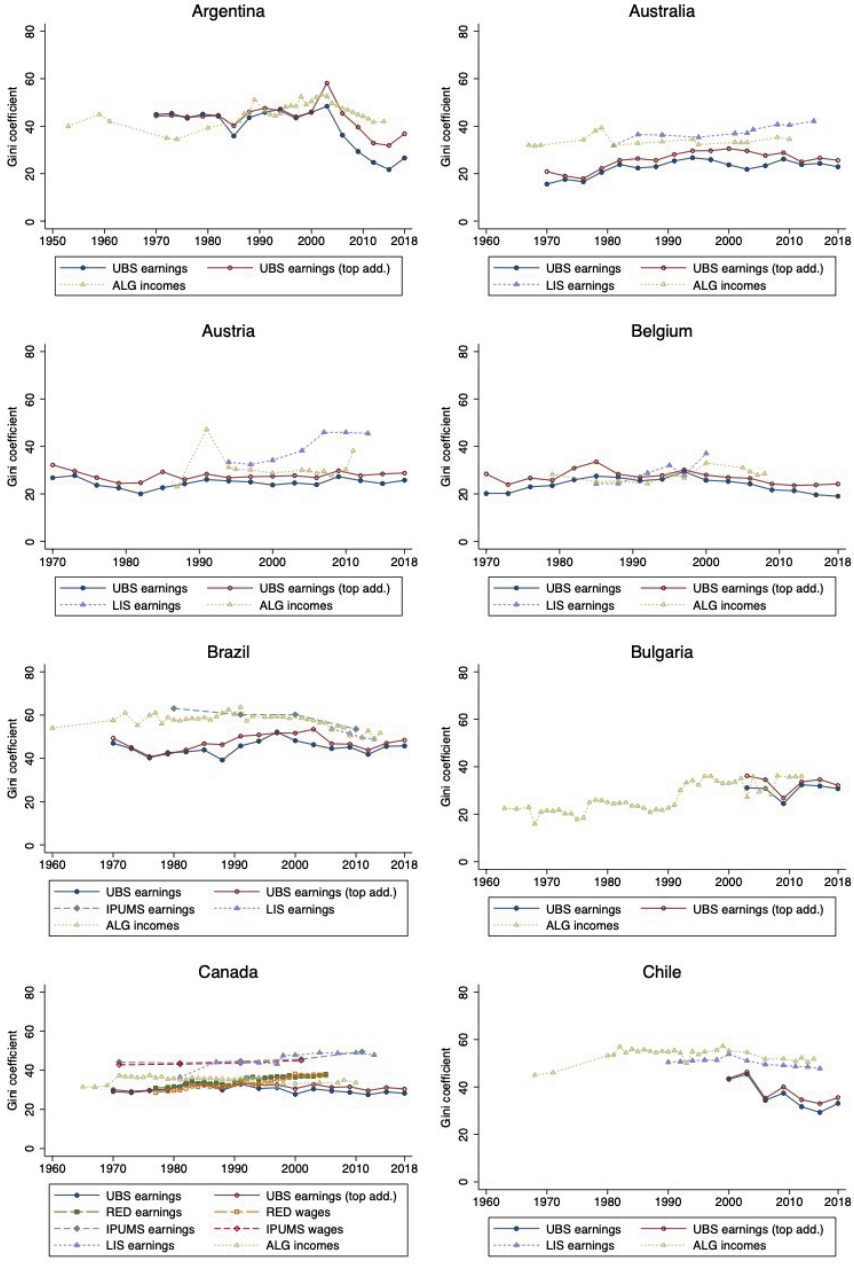
Figure 1.B5. Within-Country Between-City Correlations: Earnings, Inequality and City Size.

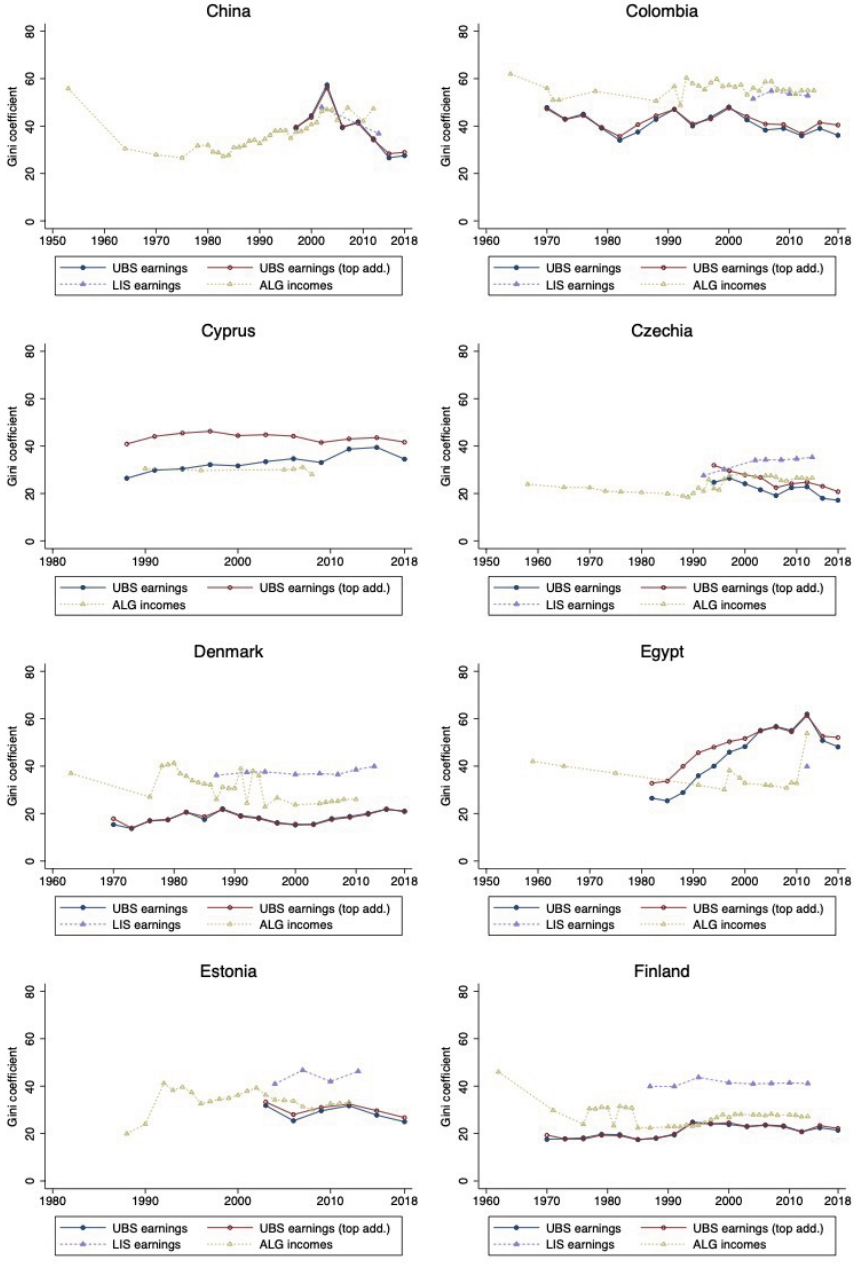
Notes: a) Average net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD) correlations for each within-country between-city pairs in our data. b) Average net yearly earnings inequality correlations for each within-country between-city pairs in our data. c) Within-country correlations between city population and average net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD), excluding the unemployed, for all countries with more than one city in our data. d) Within-country correlations between city population and average net yearly earnings inequality excluding the unemployed, for all countries with more than one city in our data.
Source: Authors' calculations based on data described in the text; UN (2017).

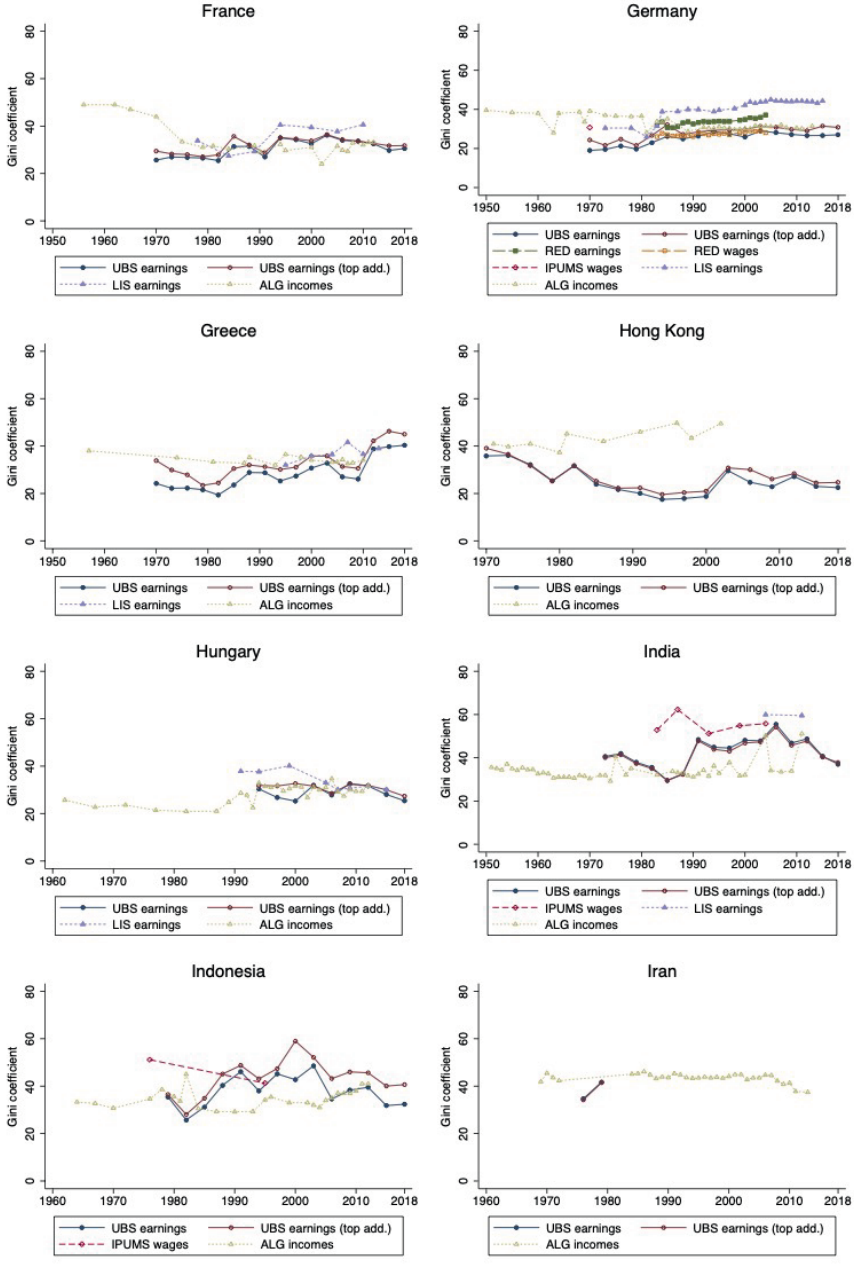
As a validity check of using the OWW agricultural earnings data for missing data on rural earnings, we have also compared the ratio between OWW agricultural and UBS mean gross earnings in China to the corresponding rural/urban fiscal income ratio as provided for China by the WID. Over the available period, the mean ratio between agricultural earnings in the OWW and mean urban (industrial and services) earnings in the UBS data for China is 35%, and the mean WID rural/urban income ratio for China is 38%. Although these two measures are not fully comparable, we can at least see this as indication that the relation between our urban earnings data from the UBS and the added agricultural earnings data from the OWW seems reasonable in the case of China.

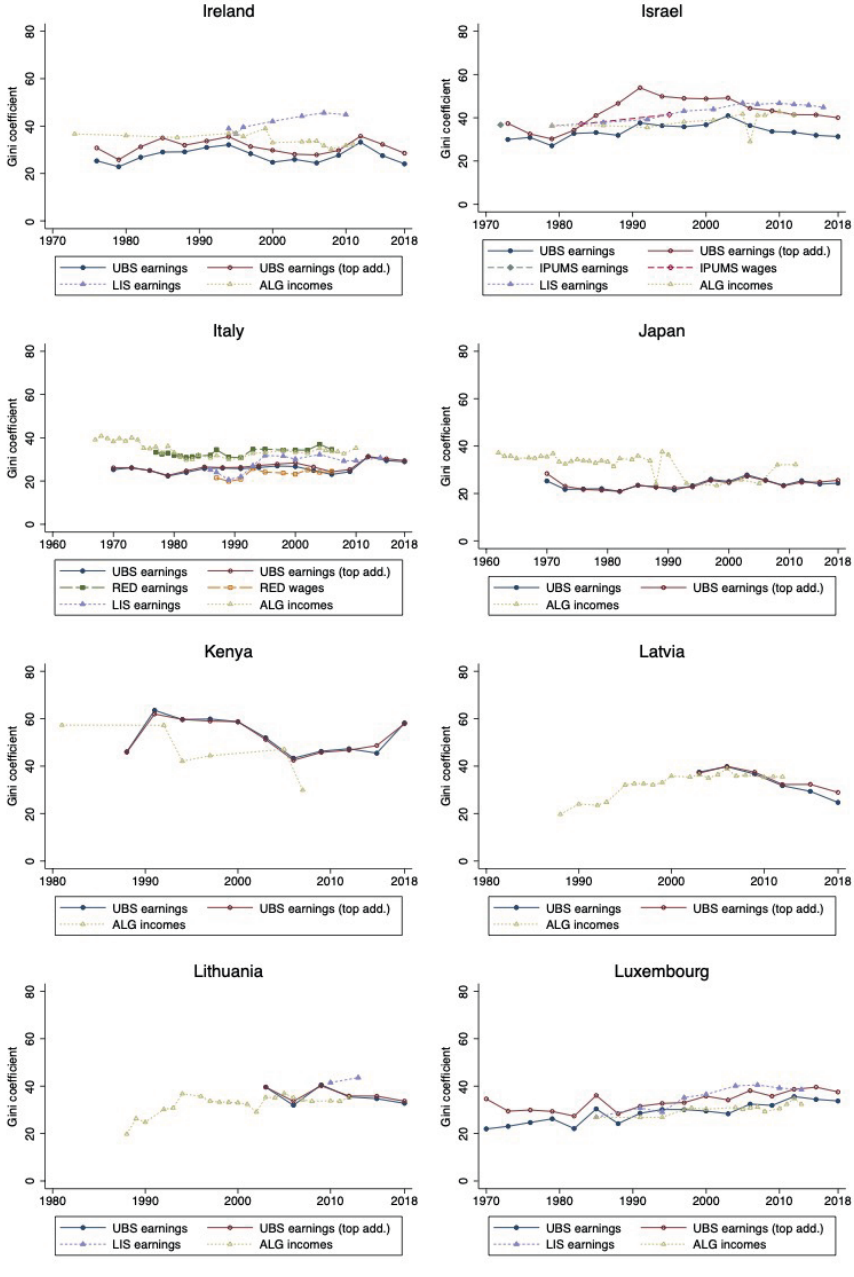
1.B.5 Country Inequality Time-Series Comparisons

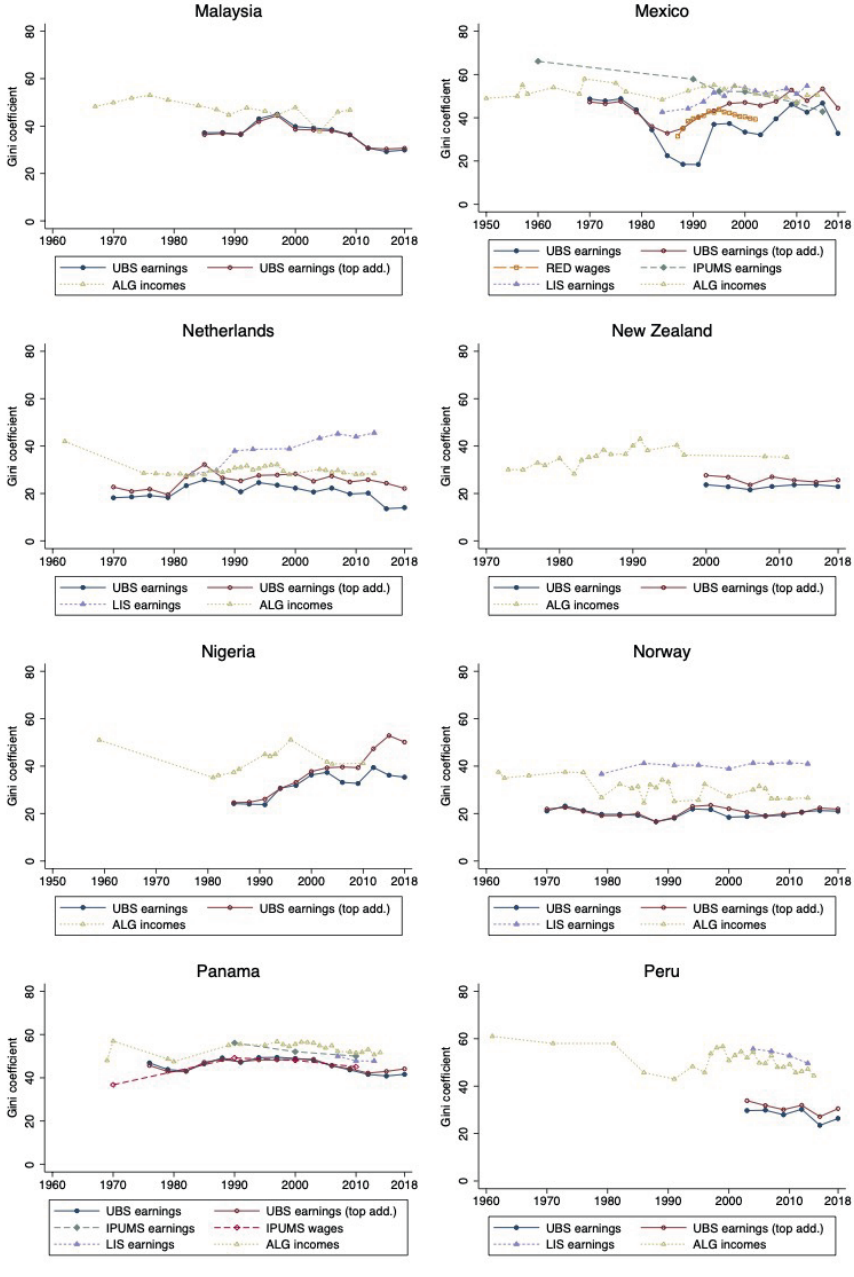
Another consistency check is to compare the levels and trends of our country-level earnings Gini coefficients with other microdata sources. Figure 1.B6 presents such comparisons for 41 countries with available series from three other, microdata-based, sources for country-level earnings and wage inequality: i) Krueger *et al*.'s (2010) special issue of the *Review of Economic Dynamics* (RED) containing earnings and wage inequality series for nine countries (for an earlier compilation of long-run trends in earnings dispersion in rich countries, see Atkinson, 2008); ii) estimates based on microdata over earned income, wages and salaries available for ten countries from the Minnesota Population Center's (2018) IPUMS International; and, iii) estimates based on harmonized microdata for 39 countries from the LIS (2017) database, using person-level data on labour income for all individuals with positive earnings. For comparison, our earnings inequality trends here also include the series with top 5% earnings added from the WID (see Section 1.C.10 in Appendix 1.C). Moreover, Figure 1.B6 also includes comparisons with country-level income or consumption inequality series from various sources, as collected by Milanovic (2016) and reported in the ALG dataset, which are available for 60 of our 68 covered countries (the ALG dataset lacks data for Bahrain, Lebanon, Qatar, Saudi Arabia and the United Arab Emirates, while Croatia, Pakistan and Vietnam only have been included in the UBS for one year). Overall, our estimated earnings inequalities are reassuringly similar to those available in the other sources in both levels and trends. However, there are several examples of imperfect overlaps, but notably not only between our series and the others, but also between the other estimates. Some discrepancy is also expected given that the series might differ in the definitions of population, and possibly due to the omitted within-occupational-group dispersion in our data.

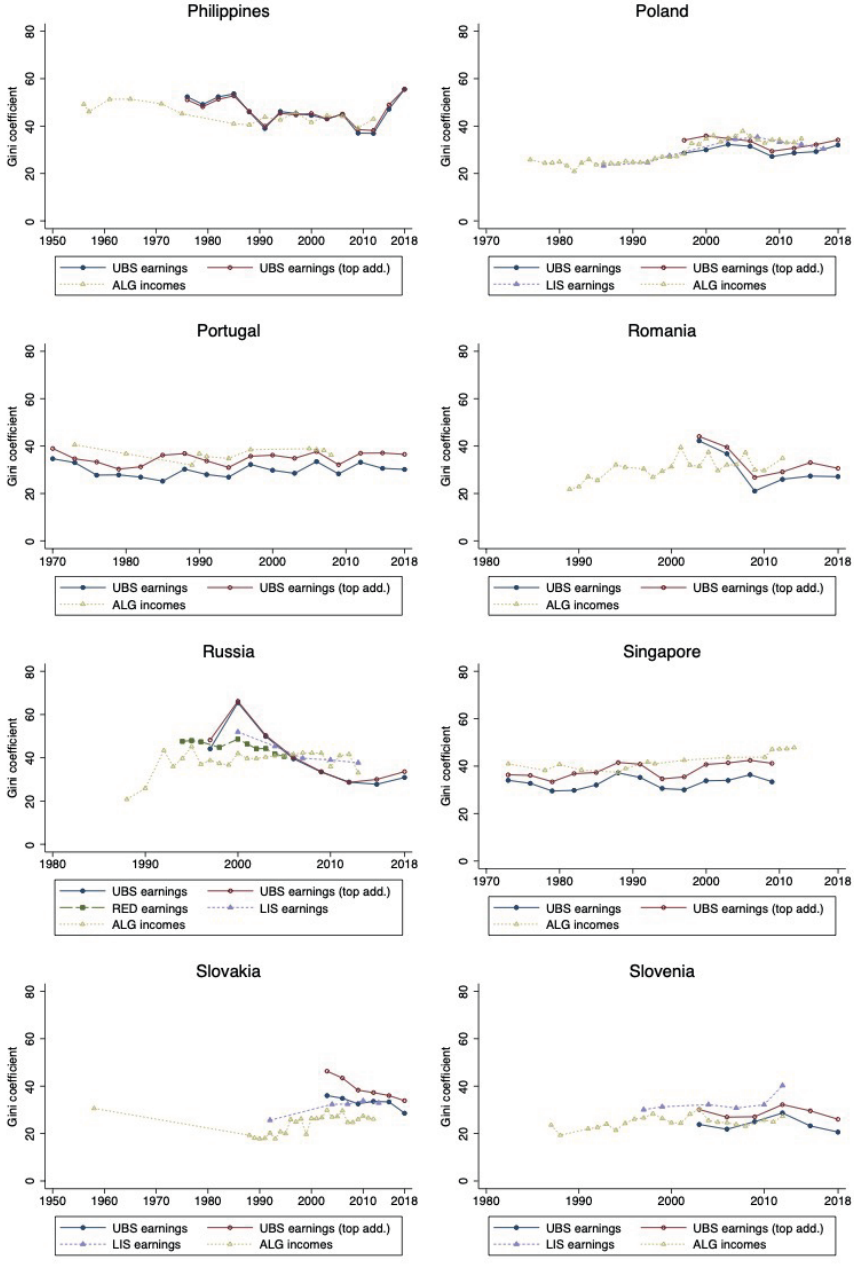

Argentina
Gini coefficient
0
20
40
60
80
1950
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Australia
Gini coefficient
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
Austria
Gini coefficient
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
Belgium
Gini coefficient
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
Brazil
Gini coefficient
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
IPUMS earnings
LIS earnings
ALG incomes
Bulgaria
Gini coefficient
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Canada
Gini coefficient
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
RED earnings
RED wages
IPUMS earnings
IPUMS wages
LIS earnings
ALG incomes
Chile
Gini coefficient
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes

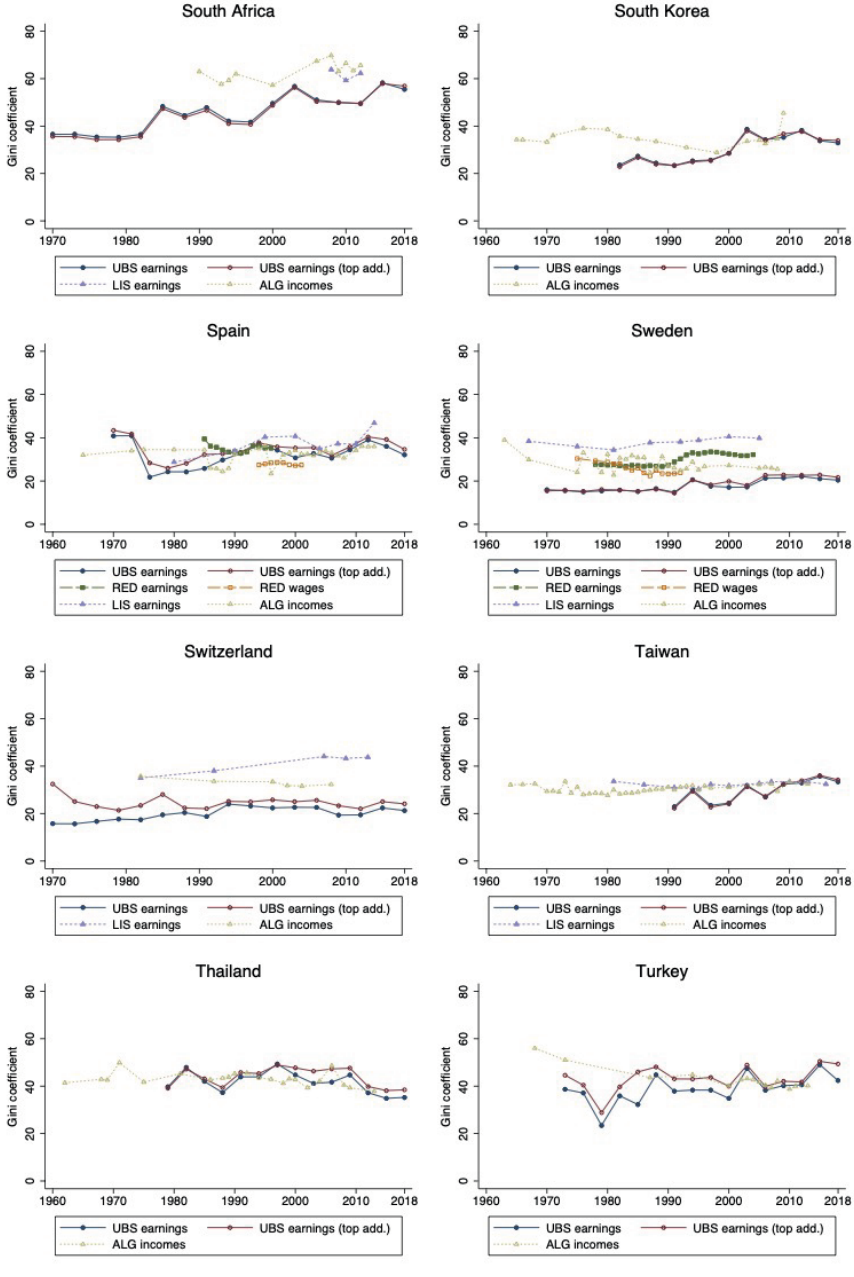

China
Colombia
Cyprus
Czechia
Denmark
Egypt
Estonia
Finland
Gini coefficient
0
20
40
60
80
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes


France
Germany
Greece
Hong Kong
Hungary
India
Indonesia
Iran
Gini coefficient
UBS earnings
UBS earnings (top add.)
RED earnings
RED wages
IPUMS wages
LIS earnings
ALG incomes


Ireland
Gini coefficient
0
20
40
60
80
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
Israel
Gini coefficient
0
20
40
60
80
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
IPUMS earnings
IPUMS wages
LIS earnings
ALG incomes
Italy
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
RED earnings
RED wages
LIS earnings
ALG incomes
Japan
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Kenya
Gini coefficient
0
20
40
60
80
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Latvia
Gini coefficient
0
20
40
60
80
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Lithuania
Gini coefficient
0
20
40
60
80
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
Luxembourg
Gini coefficient
0
20
40
60
80
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes


Malaysia
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Mexico
Gini coefficient
0
20
40
60
80
1950
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
RED wages
IPUMS earnings
LIS earnings
ALG incomes
Netherlands
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
New Zealand
Gini coefficient
0
20
40
60
80
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Nigeria
Gini coefficient
0
20
40
60
80
1950
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
ALG incomes
Norway
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
Panama
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
IPUMS earnings
IPUMS wages
LIS earnings
ALG incomes
Peru
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes


Philippines
Poland
Portugal
Romania
Russia
Singapore
Slovakia
Slovenia
Gini coefficient
UBS earnings
UBS earnings (top add.)
ALG incomes
LIS earnings
RED earnings


South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Thailand
Turkey
Gini coefficient
0
20
40
60
80
1960
1970
1980
1990
2000
2010
2018
UBS earnings
UBS earnings (top add.)
LIS earnings
ALG incomes
RED earnings
RED wages

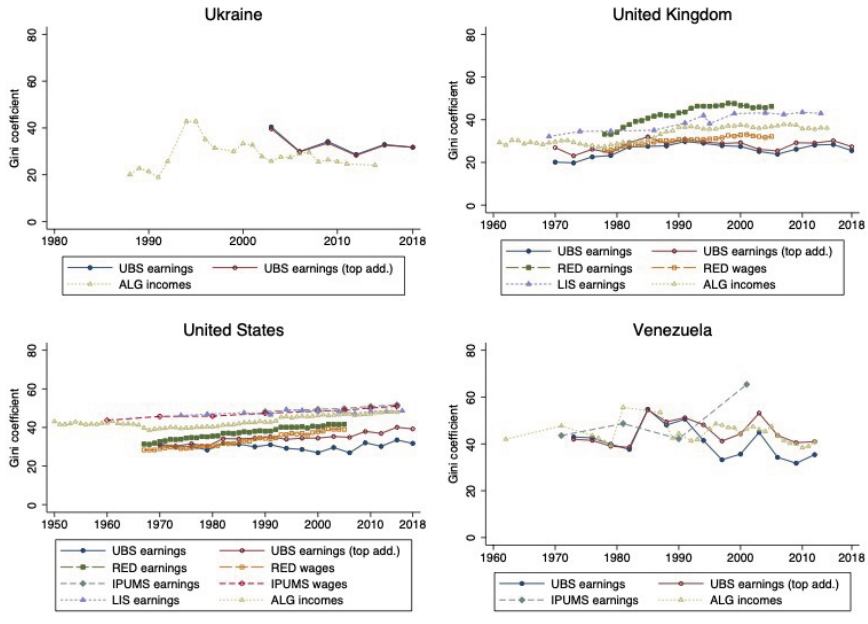


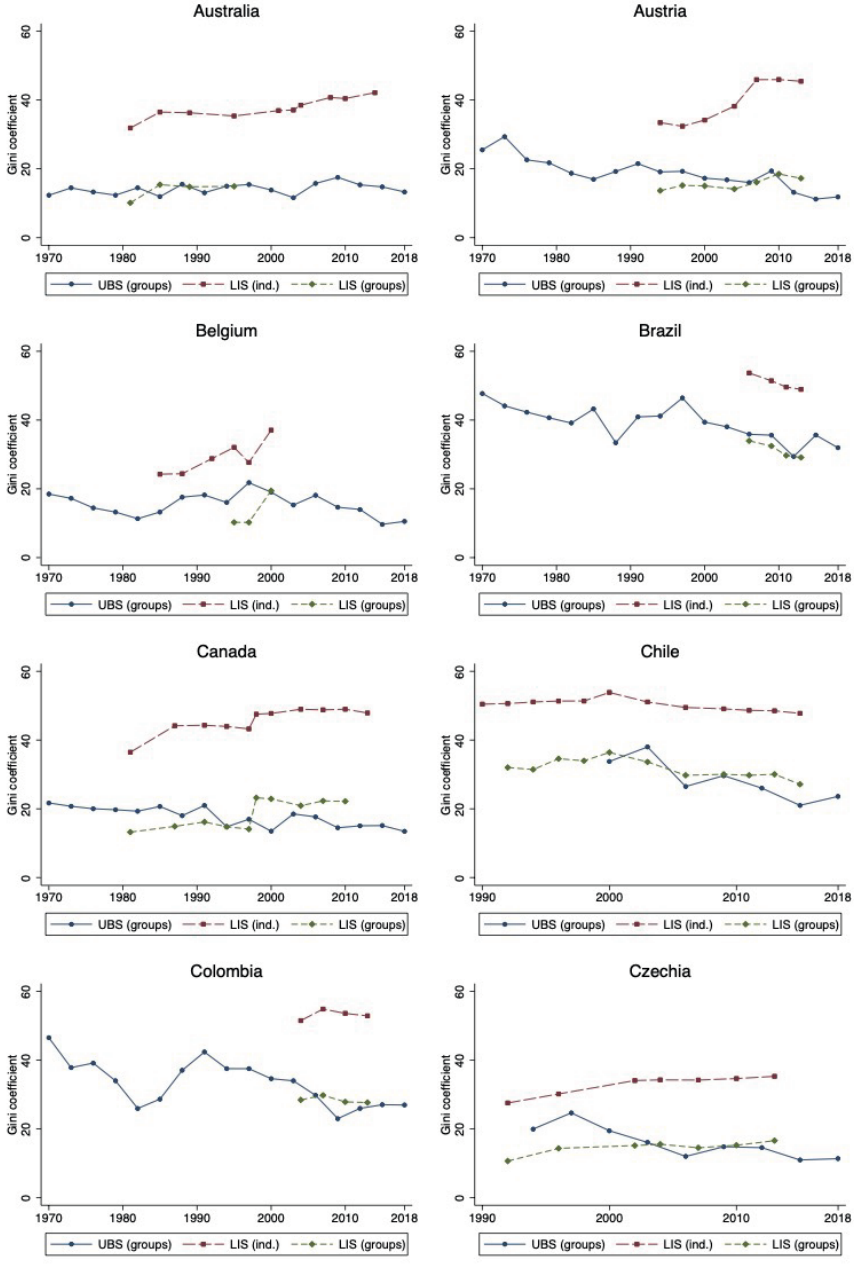
Figure 1.B6. Country-Specific Inequality Trends and Time-Series Comparisons.

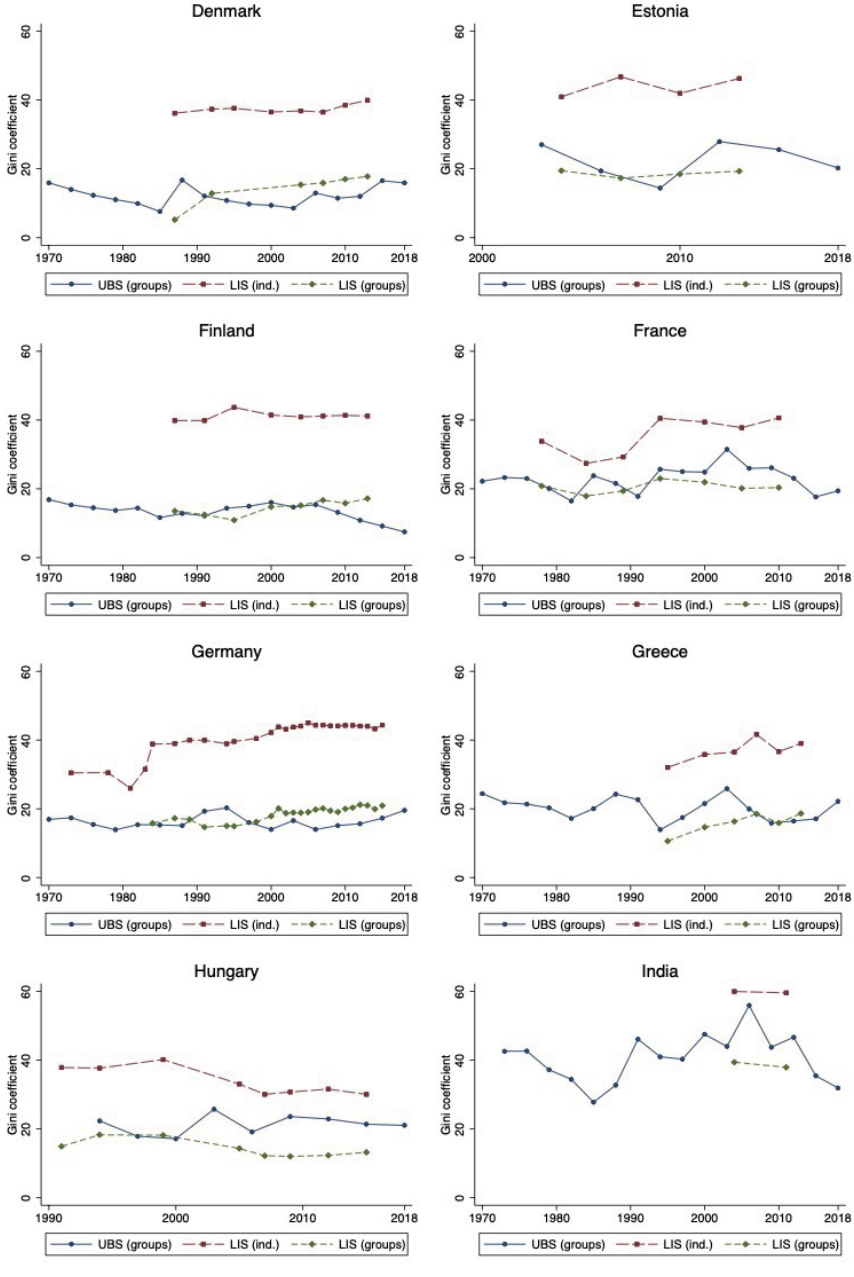
Notes: UBS earnings refer to this study and are country-level Gini coefficients based on net yearly earnings weighted by occupational group populations including the unemployed, where "top add." means that the top 5% earnings are added from the WID. Extrapolated years are excluded. RED earnings and wages refer to the country-level microdata studies available in the RED special issue "Cross-sectional facts for macroeconomists" (Krueger *et al*., 2010). IPUMS earnings and wages, and LIS earnings, refer to the authors' own calculations based on microdata available in the IPUMS International and LIS databases, respectively. ALG incomes refer to Milanovic's (2016) estimations and compilation of country-level income and/or consumption inequality.
Sources: Authors' calculations based on data described in the text; Binelli and Attanasio (2010); Blundell and Etheridge (2010); Brzozowski *et al*. (2010); Domeij and Flodén (2010); Fuchs-Schündeln *et al*. (2010); Gorodnichenko *et al*. (2010); Heathcote *et al*. (2010); Jappelli and Pistaferri (2010); LIS (2017); Milanovic's (2016); Minnesota Population Center (2018); Pijoan-Mas and Sánchez-Marcos (2010); WID (2018). Source data for IPUMS International are provided by the following national statistical offices: Institute of Geography and Statistics for Brazil, Statistics Canada, Ministry of Statistics and Programme Implementation for India, BPS Statistics Indonesia, Central Bureau of Statistics for Israel, National Institute of Statistics, Geography, and Informatics for Mexico, Census and Statistics Directorate for Panama, Bureau of the Census for United States, and National Institute of Statistics for Venezuela.

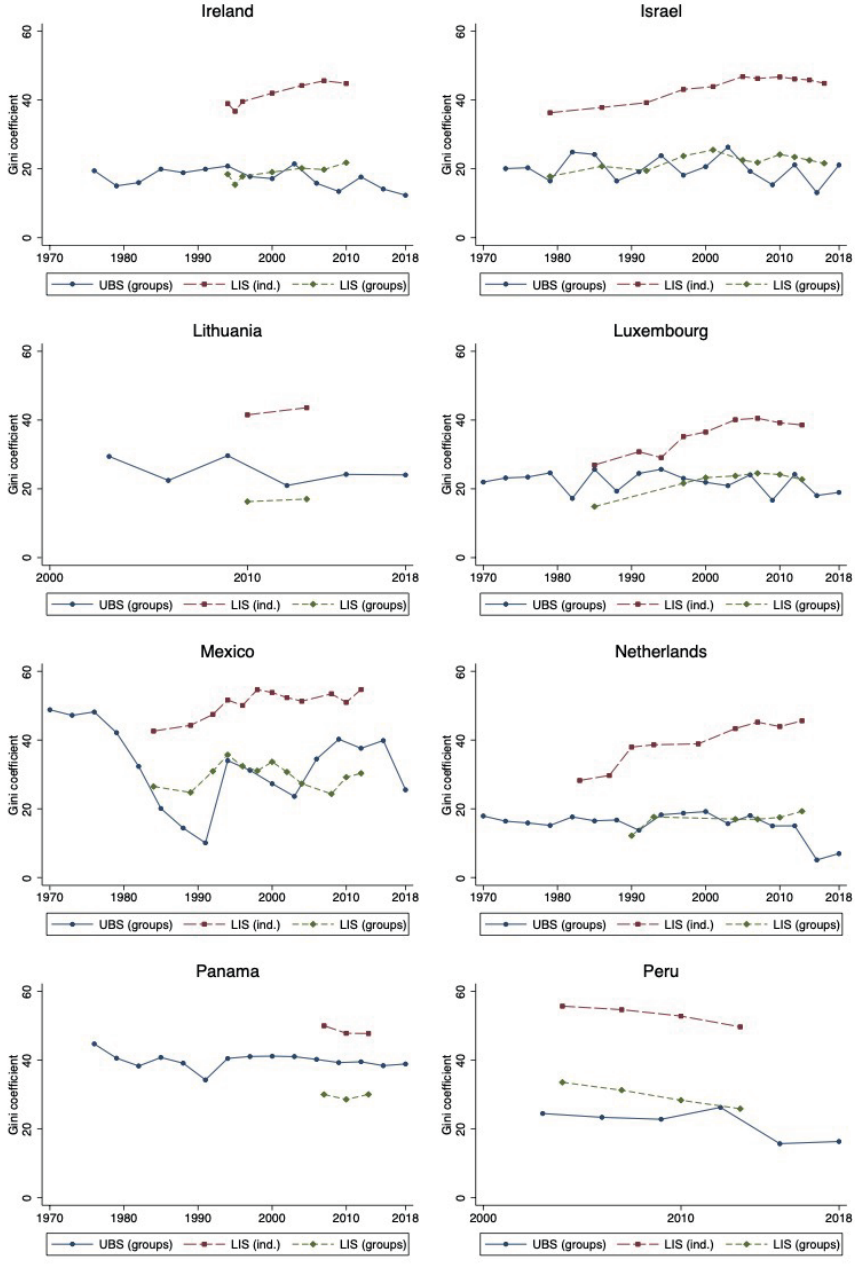
1.B.6 LIS Occupational-Means Inequality Time-Series Comparisons

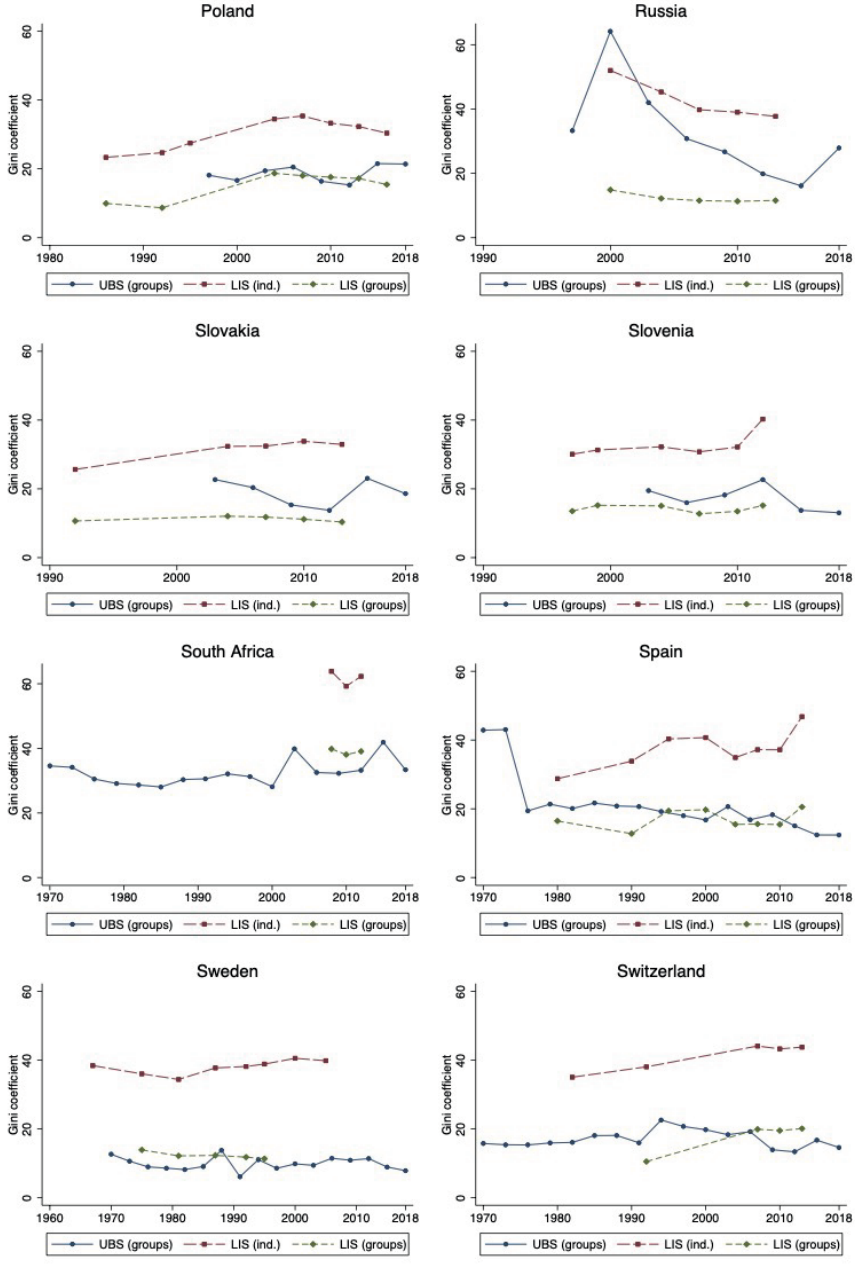
As an attempt to estimate the size of the omitted within-occupational-group dispersion in our data, we also use the LIS (2017) microdata to estimate comparable country-level earnings inequality series, using occupational-group averages instead of individual-level earnings data. Using the harmonized person-

level microdata from the LIS, we thus compute weighted average labour income for each of the nine ISCO categories (see Table 1.A2 in Appendix 1.A) in each of the 35 of our countries for which these data are available in the LIS. We then re-estimate the country-level earnings inequality series using occupational group means instead of the individual-level data from the LIS. To make these series as comparable as possible, we only include working age (ages 15–64) individuals with positive earnings from the LIS, and only the employed population's earnings from occupations that are not added to the data during the 2000s–2010s from the UBS. In Figure 1.B7, we compare our country-level earnings inequality series with these comparable estimates from the LIS database. The microdata estimates seem to be highly consistent with our series, both in terms of levels and trends. Our occupational-group-based trends follow the individual-based trends very well, and the level difference that exists seems to be due to the omitted within-group dispersion among the occupations-based estimates. As such, we also do an analysis where we adjust our global inequality estimates for such within-group dispersion (see Section 1.3.4 in the main paper).


Australia
Austria
Belgium
Brazil
Canada
Chile
Colombia
Czechia
Gini coefficient
0
20
40
60
1970
1980
1990
2000
2010
2018
UBS (groups)
LIS (ind.)
LIS (groups)


Denmark
Estonia
Finland
France
Germany
Greece
Hungary
India
Gini coefficient
UBS (groups)
LIS (ind.)
LIS (groups)


Ireland
Israel
Lithuania
Luxembourg
Mexico
Netherlands
Panama
Peru
Gini coefficient
0
20
40
60
1970
1980
1990
2000
2010
2018
UBS (groups)
LIS (ind.)
LIS (groups)


Poland
Russia
Slovakia
Slovenia
South Africa
Spain
Sweden
Switzerland
Gini coefficient
UBS (groups)
LIS (ind.)
LIS (groups)

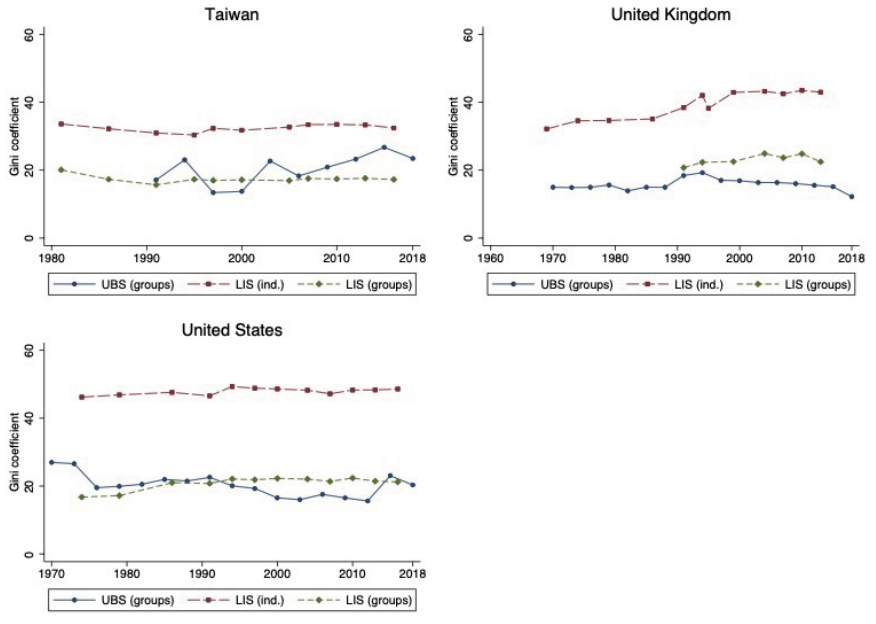


Figure 1.B7. Country Earnings Inequality Comparisons using Occupational-Group Averages.

Notes: "UBS (groups)" refers to this study and are country-level Gini coefficients based on net yearly earnings, weighted by occupational group populations, excluding the unemployed and "new" occupations that are added to the UBS data during the 2000s–2010s. Extrapolated years are excluded. "LIS (ind.)" refers to the authors' own calculations based on person-level labour income microdata available in the LIS database, weighted by the working age populations (ages 15–64) with positive labour income, and "LIS (groups)" implies that average labour income for the ISCO occupational groups 1–9 are used instead of the individual-level data.
Sources: Authors' calculations based on data described in the text; LIS (2017).

The average difference between our country-level earnings inequality series and the corresponding series based on the LIS in only one Gini point (see Figure 1.B8), which in turn could be due to the fact that our series are based on 13 rather than nine occupational groups. Moreover, the data do not show evidence of any consistent trend in the difference between our and the LIS estimates over time, why we assume this dispersion to be constant over time in our adjustments. As further illustrated in Figure 1.B8, our estimations using occupational group means in the UBS and the LIS data are on average 20 and 21 Gini points lower than the corresponding estimations using individual-level microdata from the LIS. Comparisons between all microdata sources (that is, the IPUMS, LIS and RED) and our baseline country-level earnings inequality (that is, now including the unemployed and all UBS occupations) show that our inequality estimations are on average eleven Gini points lower than those using individual-level data. For wage inequality, the corresponding difference is five Gini points. We use these numbers as empirical examples when we

adjust our global estimates for the omitted within-country occupational-group dispersion (see Section 1.3.4 in the main text).

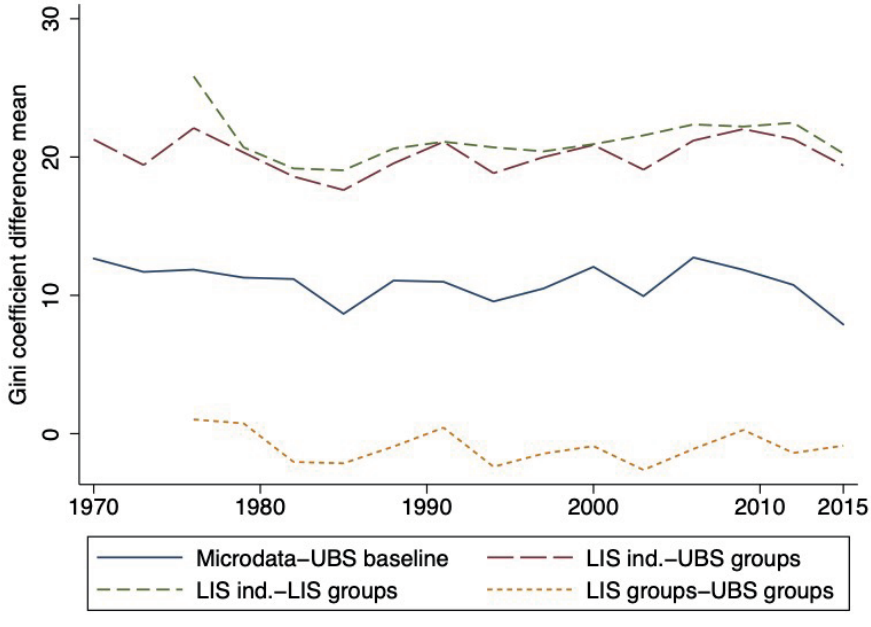


Figure 1.B8. Microdata Comparisons: Mean Earnings Inequality Differences.

Notes: Average country-level Gini coefficient differences between different microdata sources. Solid line shows the mean difference between individual-level earnings inequality in the IPUMS, LIS and RED microdata sources and our baseline net yearly earnings inequality, weighted by occupational group populations and including the unemployed. Dashed lines show comparisons between earnings inequality estimated from the LIS data, where "LIS groups" implies that occupational group means (that is, average labour income for the ISCO occupational groups 1–9) are used instead of individual-level data, and our UBS data estimations of net yearly earnings inequality weighted by occupational group populations (where, for comparability, our "UBS groups" exclude the unemployed and the "new" occupations that are added to the UBS data during the 2000s–2010s).
Sources: Authors' calculations based on data described in the text; Krueger *et al*. (2010); LIS (2017); Minnesota Population Center (2018).

Appendix 1.C Robustness Checks, Sensitivity and Heterogeneity Analyses

In this section, we present various robustness checks, sensitivity and heterogeneity analyses of the results in our main paper. In summary, we find that our results are robust to numerous alternations.

1.C.1 Alternative Inequality Indices

Figure 1.C1 presents the global earnings inequality trend using two other inequality indices instead of the Gini coefficient. Figure 1.C1a shows GE indices, GE(a), where a higher parameter a reflects a higher sensitivity to disparities in the top of the distribution, and where GE(0) corresponds to the mean log deviation (MLD), GE(1) to the Theil-T index and GE(2) to half the squared CV. Figure 1.C1b shows Atkinson indices, A(e), where e is society's aversion to inequality and makes the index more sensitive to earnings differences at the bottom of the distribution. The levels of inequality vary across these measures, which is as expected since the specific parameter values differ, but the trends are quite similar to our baseline global Gini coefficient trend, showing a decline in global earnings inequality over the studied period.

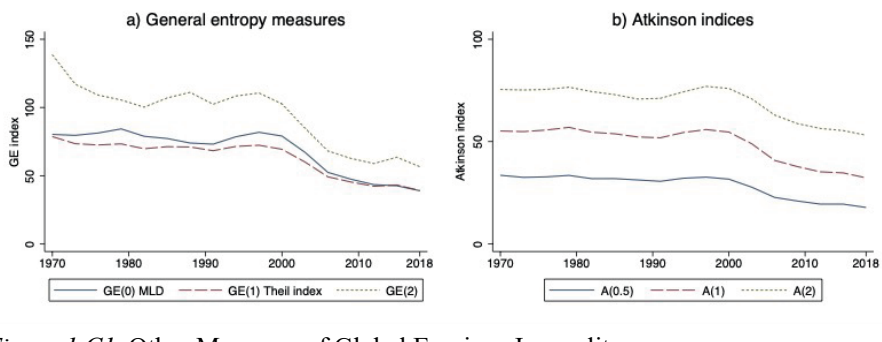


Figure 1.C1. Other Measures of Global Earnings Inequality.

Notes: Calculations based on net yearly earnings, PPP-adjusted using UBS price levels in 2015 USD, and weighted by working age populations, excluding the unemployed.
Source: Authors' calculations based on data described in the text.

1.C.2 Kernel Densities

Figure 1.C2 presents the evolution of earnings inequality in a different way, depicting kernel densities of absolute earnings of occupations across countries in 1970, 1994 and 2018. Comparing these densities over time shows that the distribution has drifted upwards, especially since 1994, signalling an overall increase in real earnings across the world during this period. The relatively thick left tail (that is, sizeable mass of low-earners) is especially visible in

1970 and 1994, but is then almost gone in 2018 when earnings instead became more concentrated around the centre (or lower middle) of the distribution. This once again underlines the decline in global earnings inequality. Other studies of the global income distribution over time have found that it was bimodal before 1970 and then became unimodal between 1980 and 2000 (for example, Moatsos *et al*., 2014). We see a similar trend for the global earnings distribution.

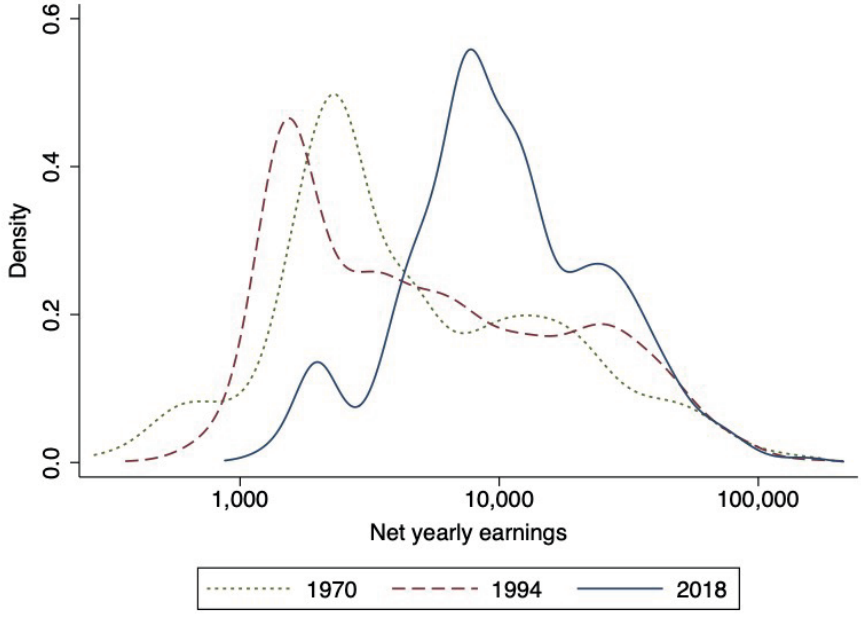


Figure 1.C2. Kernel Densities over Time.

Notes: Density of log net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD) and weighted by working age populations, excluding the unemployed. Horizontal axis in log scale. Gaussian smoothing.
Source: Authors' calculations based on data described in the text.

1.C.3 International Earnings and Income Inequality

Milanovic (2005) defines world inequality in terms of three different concepts: "Concept 1" is unweighted international inequality, "Concept 2" is population-weighted international inequality, and "Concept 3" is the "true" global inequality (which includes both within- and between-country inequality). While most of our analysis in this paper focuses on the "Concept 3" of global inequality, it could also be informative to compare the "Concept 2" of international (that is, between-country) inequality for labour earnings versus total incomes. Such a comparison is illustrated in Figure 1.C3, in which we have estimated population-weighted international inequality using average

country-level i) net yearly earnings from the UBS data, and ii) GDP per capita from the PWT 9.1 (Feenstra *et al*., 2015). For the former we use our baseline sample, population-weights and PPP-adjustments, and for the latter a balanced sample of the 156 countries with available GDP per capita, population and PPP (ICP 2011) data for the 1970-2017 period.

First, comparing the series in Figure 1.C3 shows that ignoring within-country inequality results in lower levels of inequality. This is shown by the lower level of "international earnings inequality" than the level of "global earnings inequality" (our baseline). Second, over this period, the fall in international inequality has been much larger for earnings than for total income. That is, between countries, average earnings levels have converged more than GDP per capita, and today, the difference is almost 12 Gini points. A possible explanation for this could be an increased role of capital income (which is included in GDP but not in labour earnings) in richer countries.

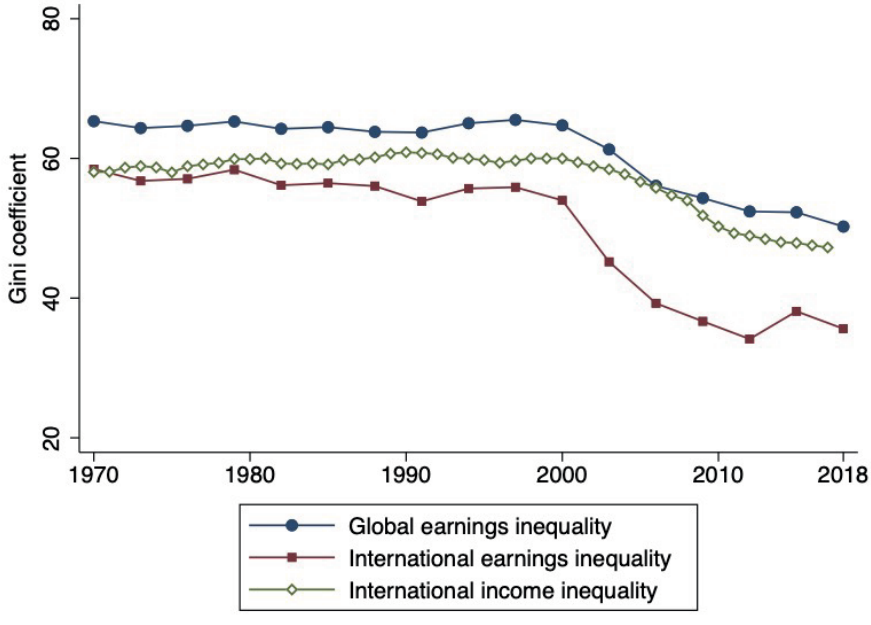


Figure 1.C3. Comparing International Earnings versus Income Inequality.

Notes: Global earnings inequality includes both within- and between-country inequality, and is based on net yearly earnings using the UBS and ILO data, which are PPP-adjusted using UBS price levels in 2015 USD and weighted by working age populations including the unemployed. International inequality only includes between-country inequality, which is estimated using population-weighted country averages, where earnings inequality is based on average net yearly earnings (using the UBS and ILO data), and income inequality on GDP per capita (using data from the PWT 9.1 with ICP 2011 PPP-adjustments, for a balanced sample of 156 countries).
Sources: Authors' calculations based on data described in the text; Feenstra *et al*. (2015).

1.C.4 The "Elephant Curve" of Global Earnings

Figure 1.C4 shows an anonymous GIC, depicting the average annual earnings growth of each percentile of the global earnings distribution between the 1970s and 2010s. This figure corresponds to Lakner and Milanovic's (2015) anonymous GIC, sometimes referred to as the "elephant curve", but here for global earnings instead of income or consumption (note also that our figure covers a longer time period). Because the UBS data are likely to lack very top earnings, here we have also included our results with national top earnings added from the WID (see Section 1.C.10). When national top earnings are included, the GIC pattern that we find is strikingly similar to that found by Lakner and Milanovic (2015, 2016), in particular to their quasi non-anonymous GIC. If anything, compared to income or consumption, the global earnings growth that we find seems to be even more concentrated to the bottom half, as well as to the more extreme top (that is, the top 0.1%–0.2%), of the global distribution. Potential explanations for this could be incomes from pensions and capital, which are included in Lakner and Milanovic's (2015) measure of global income or consumption but not in our labour earnings.

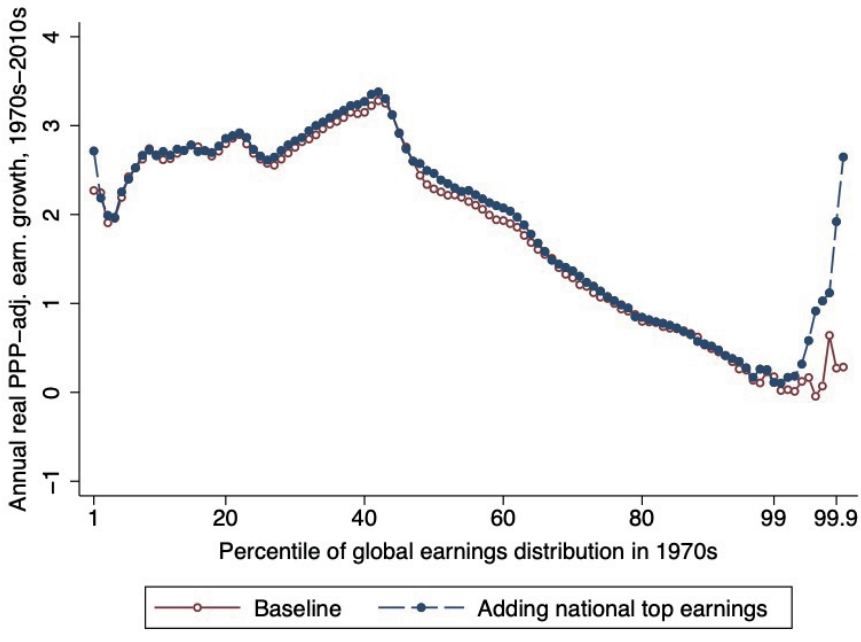


Figure 1.C4. Anonymous GIC, 1970s–2010s.

Notes: Average annual percentile growth rate 1970s–2010s in net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD), weighted by working age populations excluding the unemployed. Horizontal axis ranked according to percentile earnings ranks in 1970s. Top percentile divided into ten groups. Decade averages for 1970s and 2010s correspond to the years 1970–1979 and 2009–2018, respectively. "Adding national top earnings" implies that the national top 5% earnings are added from the WID.
Sources: Authors' calculations based on data described in the text; WID (2018).

1.C.5 Regional Earnings Inequality

Figure 1.C5 displays regional earnings inequality trends in Africa, Asia, Europe, Latin America, Northern America and Oceania (see Table 1.A1 in Appendix 1.A for country coverage in each of the regions). A similar regional inequality analysis, albeit for total incomes instead of labour earnings, has for instance been conducted by Ravallion (2014), however, focusing only on the developing world. As illustrated in Figure 1.C5, there is a large heterogeneity in both levels and trends of earnings inequality across continents. Asia and Europe experienced lowered inequality, with the latter experiencing almost a level shift in the 2000s. Regional decomposition shows that both of these inequality decreases were due to falls in between-country inequality, which might be explained by exceptionally high earnings growth rates among the low-income Asian countries and earnings convergence among European countries, for example, with the expansion of the European Union and the introduction of the euro. Africa and Latin America also have high levels of

regional earnings inequality, where the level in Latin America and the increasing trend in Africa are more dominated by the within- than between-country inequality. The smaller regions, Northern America and Oceania, have lower levels of initial regional earnings inequality and exhibit flat and increasing trends, respectively.

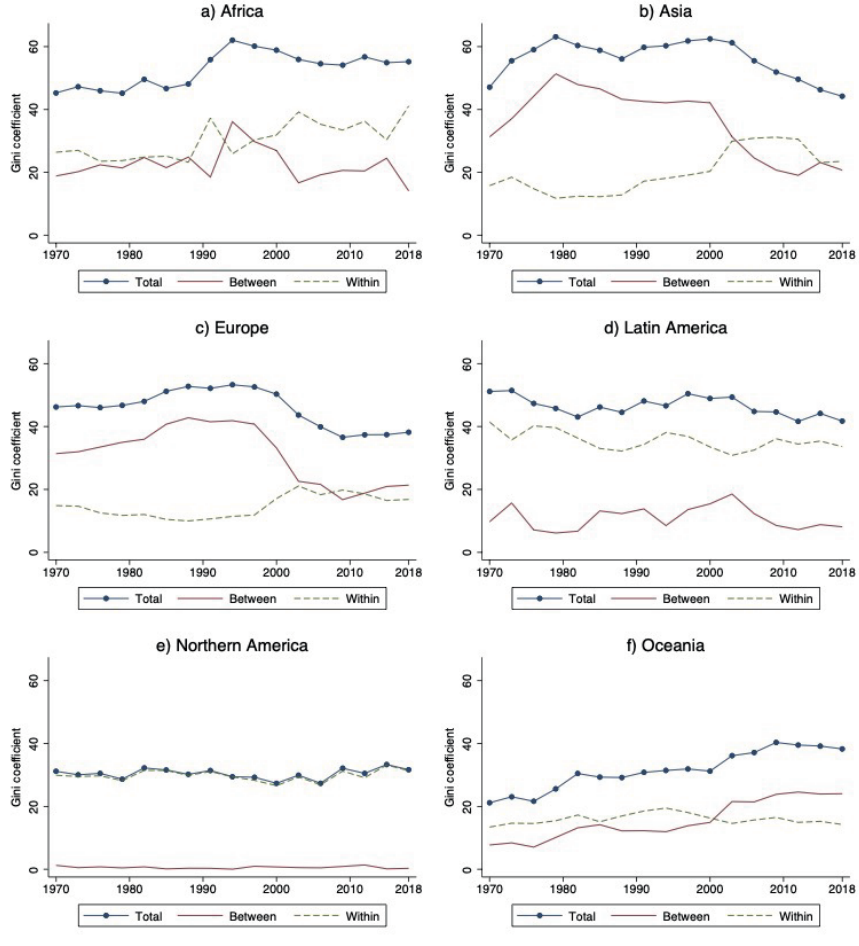


Figure 1.C5. Earnings Inequality in World Regions and Their Country Decompositions.

Notes: Calculations based on net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD) and weighted by working age populations including the unemployed. Gini decompositions calculated using Yitzhaki and Lerman's (1991) method as described in Frick *et al*. (2006), with overlapping index included in "within". Decompositions calculated excluding the unemployed but scaled by total global Gini coefficient including the unemployed.
Source: Authors' calculations based on data described in the text.

The regional earnings inequality trends for our different sub-regions are further illustrated in Figure 1.C6 (missing sub-regions according to the United Nations' geographical classification are Middle Africa, Central Asia, Caribbean, Melanesia, Micronesia, and Polynesia).

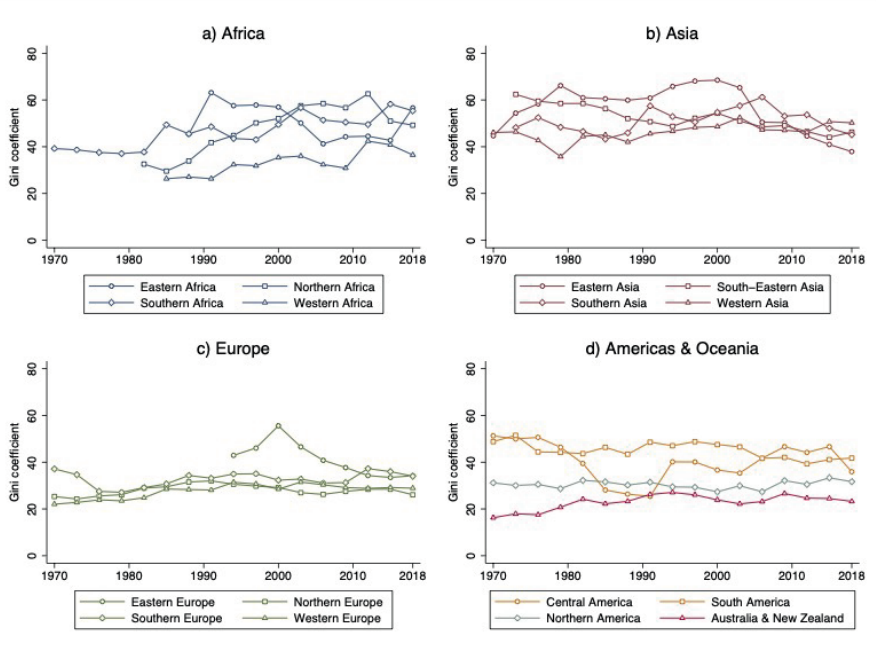


Figure 1.C6. Earnings Inequality in Sub-Regions around the World.

Notes: Calculations based on net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD) and weighted by working age populations including the unemployed. Sub-regions defined according to the United Nations' classification of macro geographical sub-regions. Extrapolated sub-regional observations are excluded.
Source: Authors' calculations based on data described in the text.

1.C.6 Occupational Earnings Inequality

In Figure 1.C7, we examine the earnings inequality between countries within different occupations in the industrial, agricultural and services sectors. We document a large variation in the level of earnings inequality across occupations. For example, there is larger earnings dispersion among the world's construction workers than among the department managers of the world, and secretaries in the world are more homogenously paid than primary school teachers. Looking at trends, almost all occupations (except for bank credit clerks) have experienced decreased global occupational inequality over this period, which matches the overall global trend. However, the decrease is more pronounced in the industrial sector than for the services professions. A possible explanation for this might be trade globalization: Since the industrial sector

has typically been more exposed to international competition, industrial earnings would then have become more compressed by globalization. By contrast, services sector earnings might to a larger extent have been determined by national conditions and, therefore, responded less to rising globalization. Further analyses (which are outside the scope of this paper), however, are needed in order to test this hypothesis.

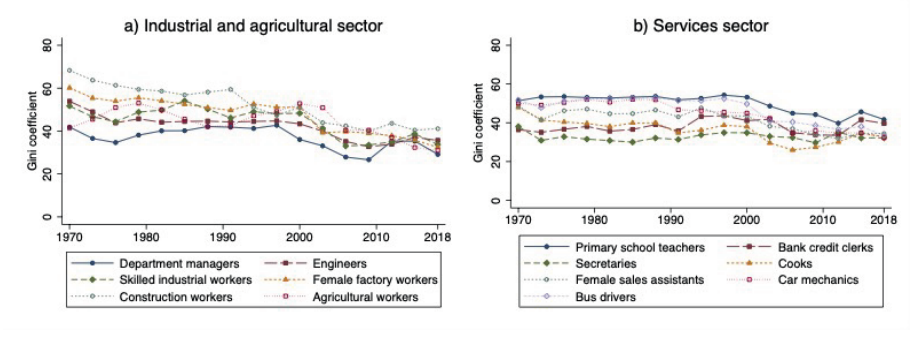


Figure 1.C7. Occupational Inequality.

Note: Calculations based on net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD) and weighted by working age populations, excluding the unemployed.
Source: Authors' calculations based on data described in the text.

1.C.7 Counterfactual Analysis by Country-Occupation

Figure 1.C8 shows the differences between the actual global Gini coefficient and the counterfactual Ginis with fixed 1970 gross hourly earnings for each of the different country-occupations. The most important country-occupations are agricultural workers in China and construction workers in India, whose gross wage changes, ceteris paribus, have reduced global inequality by four and one Gini points, respectively. Wage changes among department managers in the United States have had a smaller but opposing impact, driving global inequality up by 0.3 Gini points.

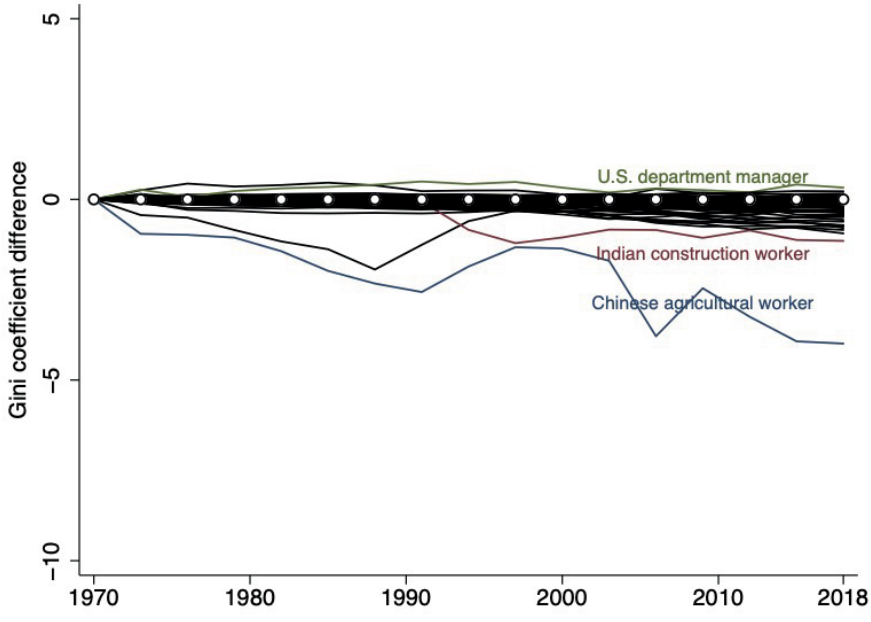


Figure 1.C8. Counterfactual: Impact of Different Country-Occupations on Global Inequality.

Notes: Difference between actual global earnings inequality and counterfactual with gross hourly wages held constant for each country-occupation separately. Calculations based on net yearly earnings (PPP-adjusted using UBS price levels in 2015 USD), weighted by working age populations and including the unemployed.
Source: Authors' calculations based on data described in the text.

1.C.8 Using Different PPP-Adjustments

Next, we examine how global earnings inequality responds to the following robustness checks and alterations: using different PPP-adjustments, restricting the analysis to the urban and employed populations, adding top earnings from other sources, and simulating between-gender earnings dispersions within country-occupations. These results are presented in Figure 1.C9.

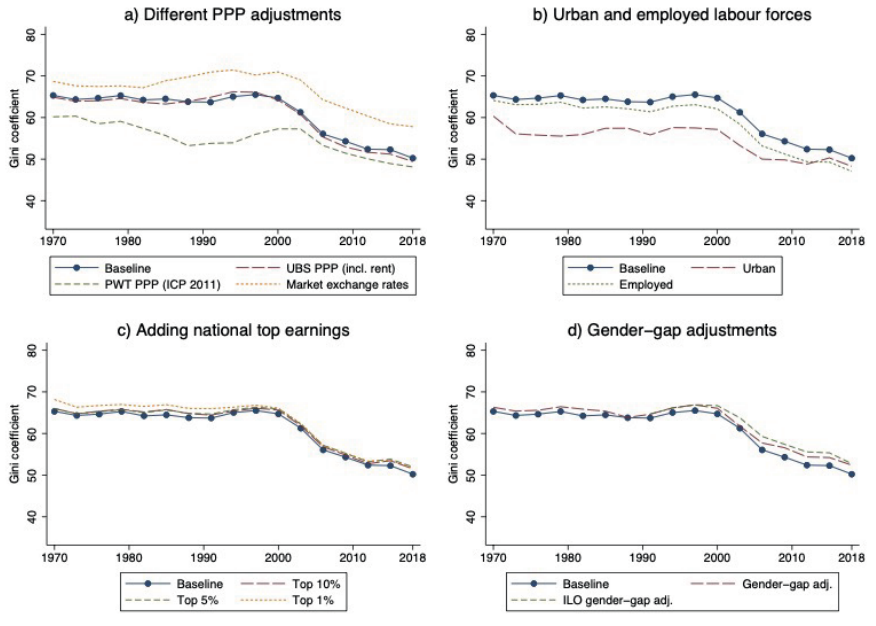


Figure 1.C9. Prices, Populations, Top Earnings and Gender-Gap Adjustments.

Notes: Calculations based on net yearly earnings, PPP-adjusted using UBS price levels in 2015 USD (if nothing else specified), and weighted by working age populations including the unemployed (if nothing else specified). a) Baseline implies UBS PPP excluding rent. For PWT PPP, prices are compared across countries using the 2011 ICP round. Market exchange rates imply no PPP adjustments. b) Baseline implies total rural and urban working age population. Urban means that urban working age populations are used as country population weights instead of total working age populations and that the agricultural sector is not included. Employed means that the unemployed are excluded. c) National top earnings are added from the WID (not added in baseline). d) Gender-gap adjustment means that UBS sectoral earnings gender gaps are used, and ILO gender-gap adjustment that ILO occupational earnings gender gaps (1992–2017) are used.
Sources: Authors' calculations based on data described in the text; Feenstra *et al*. (2015); ILO (2018); WID (2018); World Bank (2018).

Previous studies have found that adjusting incomes for PPP has a large impact on global inequality assessment (see, for example, Deaton, 2010; Deaton and Heston, 2010; Almås, 2012; Deaton and Aten, 2017). In Figure 1.C9a, we therefore re-estimate the global earnings Gini coefficients using different price indices. The results show that it does not make a big difference whether we include or exclude rents in our UBS price index. Furthermore, we find that our preferred adjustment, based on local prices collected homogenously by the UBS for all cities and years in direct correspondence with the earnings information, delivers a long-run pattern that is somewhat similar to, although generally higher than, what we obtain when using the ICP 2011 PPPs from Feenstra *et al*.'s (2015) PWT 9.0 (if there are missing values, we use the same imputation methods as above, namely by linear interpolation and sub-regional

means extrapolation). The main difference when using this alternative PPP source is that the global earnings inequality trend then gets a lower level during the 1970s–1990s. Note, however, that the ICP price index adjusts for average country (and not city) prices. This mix of urban and rural prices in the ICP should bias our results since the UBS earnings are given for urban areas only. Finally, as expected the global earnings inequality in current market prices (that is, using market exchange rates and no adjustments for local price differences) is consistently higher than our PPP-adjusted measures of global earnings inequality, but still follows a relatively similar declining trend.

1.C.9 Restricting the Analysis to Global Urban and Working Populations

Heterogeneity analyses with respect to populations, where we focus exclusively on the global *urban* and global *employed* earnings inequalities, are presented in Figure 1.C9b. Weighting each country by its urban, instead of total, working age population and excluding our added agricultural workers yields lower levels of earnings inequality. Moreover, the global urban workforce has experienced a somewhat smaller inequality decline during this period. When instead excluding the unemployed populations, we obtain a lower level, but similar trend, of global earnings inequality. That is, as expected earnings inequality among the global labour force participants is lower than inequality among the total global workforce. The difference between including and excluding the unemployed has increased over this period, suggesting that global unemployment has increased, or that the relative labour force participation in developed countries, relative to that in developing countries, has increased.

1.C.10 Adding Top Earnings

One potential concern with our earnings data is their insufficient coverage of earners at the very top of the distribution. Correlations between our data and the WID top earnings data are positive and significant, and we seem to cover the top decile and ventile relatively well (see Figure 1.B2 in Appendix 1.B). Still, we know that by construction (since we do not have full occupational coverage), we are likely to miss the very highest-paid professions and their earnings in our estimations. Hence, to account for earnings in the highest income top, in the next analysis, we have added national top earnings using data from the WID.

Our method for adding national top earnings data from the WID is as follows: First of all, because our analysis focuses on earnings, we only include the top incomes in the WID that come from wages, salaries and labour income, or corresponding estimates. That is, we adjust the recorded national top total incomes into earnings by using evidence on earnings shares in the WID. We

separately add the national top 1%, 5%, and 10%, treat them as their own occupational group and reduce the other employed working age population by the corresponding percentage. When missing, we impute these data using the same methods as for our baseline data, by linear interpolation and sub-regional or regional extrapolation. In total, there are 42 countries with data both in our sample and top earnings data in the WID. For countries that are not included in the WID, we use sub-regional or regional means, weighted by the country-to-region relative mean GDP per capita. Similarly, we use country mean taxes to calculate net yearly earnings. We have also done these top adjustments in various alternative ways, by adding national top incomes instead of earnings, by adding the top 1%, 5% and 10% simultaneously and on top of all the other earnings and population data, as well as by regression imputations, finding very similar results (available upon request).

The results from the top earnings additions are shown in Figure 1.C9c, and do not seem to make a big difference to our baseline results. The Gini coefficient increases somewhat, from 50 to 52 in 2018, and this relatively small effect appears to be roughly the same regardless of whether we add the national top 1%, 5% or 10% earnings. In our GIC analysis, however, we find that adding national top earnings from the WID does make a difference to the growth rate that we find in the very top (top 0.1%) of the global earnings distribution (see Section 1.C.4).

1.C.11 Gender Composition Adjustment

Furthermore, we have also done an analysis where we adjust our main series for the lack of within-group between-gender earnings dispersion, arising from the gender composition in our country-occupational data. That is, instead of having male earnings for some occupations and female earnings for other occupations, we separate each country-occupational group into a male and a female group of workers. In contrast to studies using income data on the household level, we are thus able to make a gender-gap adjustment to our inequality estimations.

We make this within-occupation between-gender inequality adjustment as follows. First, we use the gender composition in ILO's (2010, 2018) data on employment by sex and occupation. That is, after separating each occupational group into its male and female components, we weight the population of each group by the male/female employment share of that particular country-year-occupation. For missing observations, we use the same approach as for the other ILO occupational population data (linear interpolation and extrapolation using sectoral and regional changes). Second, we use the sectoral gender earnings gap in the UBS data. These UBS gender earnings gaps are estimated by using the earnings ratio of occupational groups that are similar in terms of skills, experience, education, age and family status but differ in terms of gender. The industrial (and agricultural) sector gender earnings gap is calculated

as the mean earnings of male construction workers divided by the mean earnings of female factory workers, and the services sector gender earnings gap as the mean earnings of male secretaries and car mechanics divided by the mean earnings of female sales assistants. We then weight the earnings of each male and female country-year-occupational group by the corresponding earnings ratio. Because the UBS male-female earnings gap is only available on the sectoral level, as an alternative, we also use three-year averages of ILO's (2018) data on earnings by sex and occupation to estimate occupational-level gender earnings gaps (using the same imputation approach as above). These ILO occupational earnings data, however, are only available for the years 1992–2017.

Figure 1.C9d shows the global earnings inequality trend adjusted for this within-group between-sex earnings dispersion, using the UBS and the ILO sources of the gender earnings gaps. As we can see, this adjustment has a small but slightly increasing effect on global earnings inequality. Our two measures of the global gender earnings gap are further illustrated in Figure 1.C10, where we can see that the between-gender earnings inequality has fallen over this period.

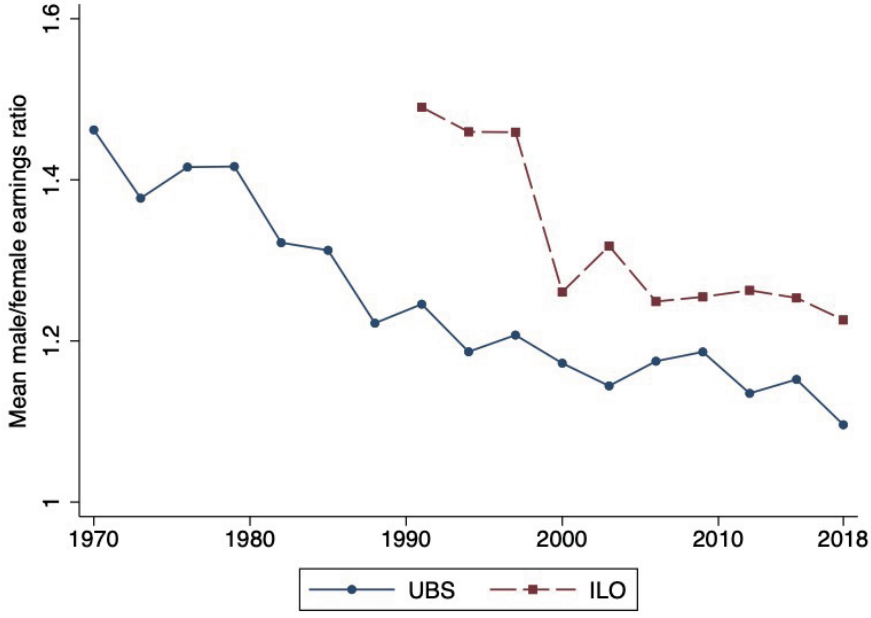


Figure 1.C10. Global Gender Earnings Gap.

Notes: "UBS" refers to the mean UBS sectoral net yearly earnings gender gap, where the industrial earnings gender gap is calculated as the average earnings of male construction workers divided by the average earnings of female factory workers, and the services gender earnings gap as the average earnings of male secretaries and car mechanics divided by the average earnings of female sales assistants. "ILO" refers to the mean ILO occupational earnings gender gap.
Sources: Authors' calculations based on data described in the text; ILO (2018).

1.C.12 Robustness Checks Using Alternative Imputations

Finally, in this section, we present some further robustness checks where we use alternative extrapolations, imputations and samples when generating the database. As shown in Figures 1.C11 and 1.C12, our baseline results seem to be robust to using various alternative extrapolation and imputation approaches. Extrapolating missing earnings observations using only observed within-country information (that is, the earliest or latest observed country-occupation growth rate, as well as the mean observed country-occupation growth rate), yields a slightly higher global earnings inequality level during the first half of the covered period, but a similar decline during the second half (in this analysis, we exclude Croatia, Iran, Lebanon, Pakistan and Vietnam because they have none or only one observed growth period and, in the first case, we also censor negative growth rates at zero). Similarly, extrapolating missing observations with changes in the country's GDP per capita instead of subregional changes also yields a slightly higher level of global earnings inequality during the 1970s–1990s, but then yields a very similar trend from the mid-1990s onwards (see Figure 1.C11). This indicates that the inequality decline that we observe might actually be even somewhat larger than what our baseline estimates suggest.

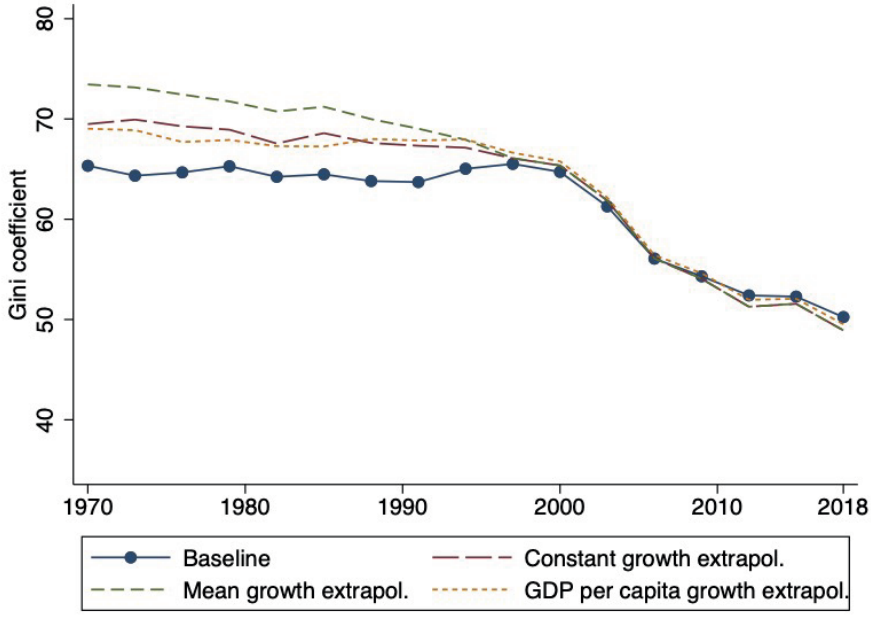


Figure 1.C11. Robustness Checks: Extrapolations.

Notes: Calculations based on net yearly earnings, PPP-adjusted using UBS price levels in 2015 USD, and weighted by working age populations including the unemployed. For "constant growth extrapolation", missing earnings observations are extrapolated using the first or last observed country-occupation growth rate for the previous or following periods, where negative growth rates are censored at zero and only countries with observations from more than two three-year periods are included. For "mean growth extrapolation", missing earnings observations are extrapolated using average observed country-occupation growth, and only countries with observations from more than two three-year periods are included. For "GDP per capita growth extrapolation", missing earnings are extrapolated using GDP per capita growth.
Sources: Authors' calculations based on data described in the text; World Bank (2018).

Figure 1.C12 shows robustness checks using a number of alternative imputations, which all seem to have very little impact on our baseline results. This includes using total instead of working age country population weights; gradually including or excluding the "new" occupations that are added to the UBS data during the 2000s and 2010s; extrapolating the agricultural earnings that we add from the OWW by using country mean earnings or unskilled elementary occupational earnings instead of GDP per capita; as well as extrapolating missing occupational employment observations by using the earliest or latest available observation instead of sectoral and regional changes. Finally, we also check that our results are not driven by extreme outliers by excluding all earnings observations that have changed by more than 100% over a three-year period, and instead linearly interpolate these observations, finding that this does not affect the results either.

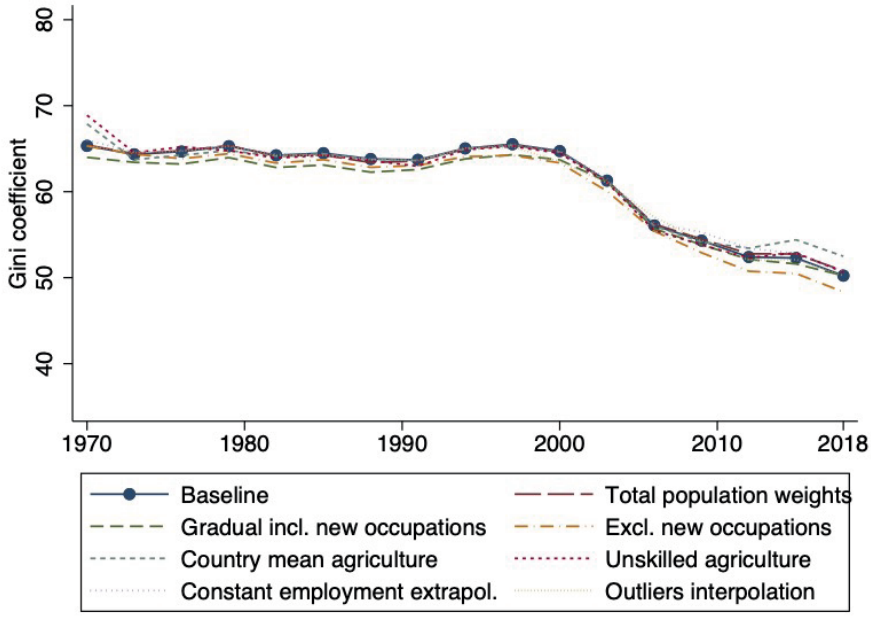


Figure 1.C12. Robustness checks: Imputations.

Notes: Calculations based on net yearly earnings, PPP-adjusted using UBS price levels in 2015 USD, and weighted by working age populations including the unemployed (if nothing else specified). "Total population weights" imply that total country populations are used as weights instead of working age populations. "New occupations" refer to occupations that are added to the UBS data during the 2000s and 2010s (that is, product managers, call centre agents, financial analysts, hospital nurses, carpenters, medical doctors and doctor's assistants), where gradual inclusion means that they are gradually included as they are being added to the data, and excluding means that they are excluded altogether. "Country mean agriculture" and "Unskilled agriculture" mean that the agricultural earnings that we add from the OWW are extrapolated by using country mean earnings or unskilled construction worker earnings, respectively, instead of GDP per capita. "Constant employment extrapolation" means that missing occupational employment observations are extrapolated using the earliest or latest available observation, assuming it to be constant over the missing period. "Outliers interpolation" implies that we drop all earnings observations with a three-year change larger than 100%, and instead interpolate these observations linearly.
Sources: Authors' calculations based on data described in the text; World Bank (2018).

Finally, Figure 1.C13 shows some more robustness checks, using different samples. First of all, we can see that whether or not we include our GDP-per-capita-weighted regional proxies for the countries that are not in the original UBS data (that is, to get global coverage by using Sample III) does not seem to have an important impact on our results. Moreover, we find that using only the balanced non-extrapolated sample of country-occupations available for the full 1970–2018 period yields a significantly lower level and flatter trend of global earnings inequality. This, however, is as expected since this sample only includes 26, mainly developed, countries and five occupations (see

Tables 1.A1 and 1.A2 for country and occupational period coverage). If we instead use the balanced 1997–2018 sample, which for instance includes both China and agricultural workers, we find a global earnings inequality trend that is very similar to our baseline estimation.

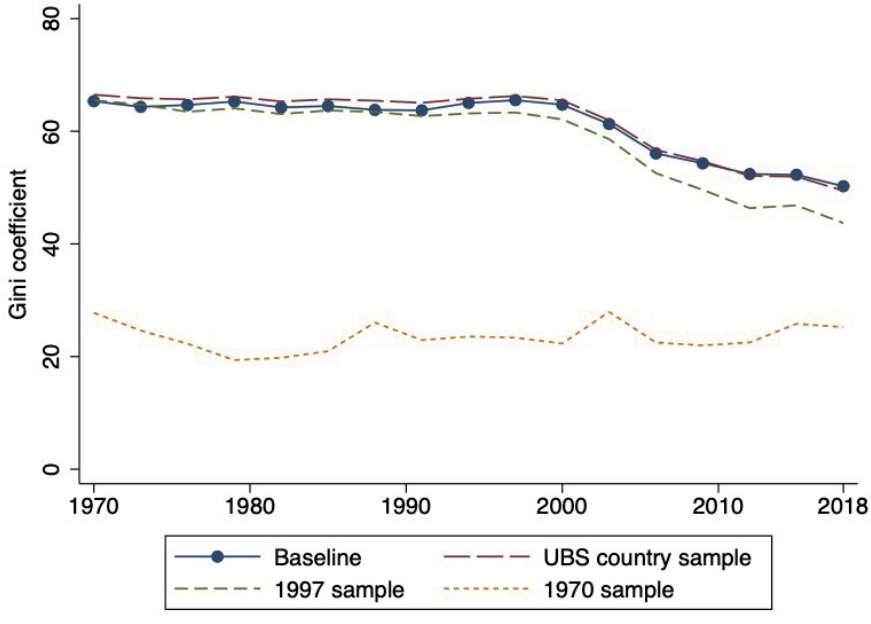


Figure 1.C13. Robustness checks: Samples.

Notes: Calculations based on net yearly earnings, PPP-adjusted using UBS price levels in 2015 USD, and weighted by working age populations including the unemployed. "UBS country sample" means that countries not included in the UBS data are not imputed. "1970 sample" only includes the balanced non-extrapolated sample of country-occupations available for the full 1970–2018 period. "1997 sample" includes the balanced sample of country-occupations observed for the full 1997–2018 period.
Sources: Authors' calculations based on data described in the text.

Appendix References

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2. The Cultural Assimilation of Individualism and Preferences for Redistribution

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2.1 Introduction

There is large variation in the amount of income equality and redistribution people support around the world, both on the individual and country level (Alesina and Angeletos, 2005; Almås *et al*., 2020). Recent studies have found culture[31] to be an important determinant of such variations in preferences for redistribution (Luttmer and Singhal, 2011; Alesina and Giuliano, 2015). Less studied, however, is which cultural dimensions that affects our preferences and attitudes towards equality and redistribution? In this study, I will focus on the relationship between one particular cultural dimension, individualism versus collectivism, and preferences for redistribution.

In a recent paper by Bazzi, Fiszbein and Gebresilasse (2020), they find that the expansion of the U.S. border fostered "rugged individualism", i.e., a combination of individualism and opposition to government intervention and redistribution. In this paper, I will empirically test whether this combination of individualism and opposition to redistribution is a more general phenomenon that also holds among a global sample of migrants around the world today. To my knowledge, this study is the first to test this relationship on a broader scale.

A second, related question is what happens with people's preferences after they have migrated into a new culture. Will their preferences and attitudes converge with the new cultural environment and, if so, how fast? By analyzing people that migrated at different ages and have lived differently long in their country of destination, I will study the cultural assimilation of individualism and preferences for redistribution by comparing the cultural origin versus cultural destination impact over the life course of migrants.

While individualism versus collectivism has been considered a main dimension of cross-country cultural variation in the psychology literature since long (see, e.g., Hofstede *et al*., 2010; Heine, 2020), and although Greif (1994) argued for its economic importance more than 25 years ago, it is only more recently that this cultural dimension has gained recognition in empirical economics (e.g., Gorodnichenko and Roland, 2011, 2017, 2020). Also, most previous studies on individualism highlight its (positive) correlation with, for instance, economic growth (e.g., Gorodnichenko and Roland, 2011). At the same time, however, whether a society is more individualistic or collectivistic, i.e., whether people's self-image is defined in terms of "*I*" or "*we*", is also likely to affect how individuals value equality. This potential link, I believe, is something that has not been investigated before, and studying this relationship is thus important for our understanding of the cultural roots of preference

[31] In this paper, I will follow Fernández (2011) and Alesina and Giuliano (2015) use of the term culture when referring to, e.g., social values and beliefs. This concept, however, is also closely related to what, e.g., North (1991) and Williamson (2000) refer to as informal institutions. Culture can be defined as "the set of values and beliefs people have about how the world (both nature and society) works as well as the norms of behavior derived from that set of values" (Gorodnichenko and Roland, 2017).

differences. Moreover, these preferences will eventually also have implications for actual redistribution and welfare around the world.

In order to test whether individuals from more individualistic cultures prefer less income redistribution,[32] I will use variation in immigrants' country of origin to capture the impact of culture on individual preferences (i.e., using the so-called "epidemiological" approach), using individual-level survey data from a large set of countries around the world using the integrated *World Values Survey* (WVS, 2016) and *European Values Study* (EVS, 2016), and the *European Social Survey* (ESS, 2016). As robustness checks, I will also apply matching estimators as well as an instrumental variables (IV) approach where I use the pronoun drop dummy from Abdurazokzoda and Davis (2016)'s new linguistic dataset as an instrument for collectivism. Doing so, I find a robust and statistically significant negative relationship between individualism and preferences for redistribution. Heterogeneity analyses confirm this association for both individuals born in another country and with another citizenship, while there seems to be assimilation into the new cultural environment over time as the impact is not persistent for second- generation immigrants. When individuals have spent approximately half their life in the new country, the impact of the country-of-residence culture starts to dominate that of their country of origin. Moreover, I find no statistically significant impact of the culture of origin if migration took place before the age of 10.

The rest of the paper is organized as follows. In the next section I will give a brief overview of some previous empirical research that has been conducted on this topic. Thereafter, I will present the empirical approach and data used in this paper, followed by its main results, including an analysis of cultural assimilation. Finally, I will also present some robustness and heterogeneity analyses, before I conclude.

2.2 Previous Research and Hypothesis

Quite a few earlier studies have tried to use cross-country data to analyze the determinants of preferences for redistribution or equality. However, a problem with many of these studies is that they use too aggregated data and thereby risk averaging away potentially important individual determinants of preferences. Also, the relationships could be different on the cross-country and individual levels. As a response to this, more recent studies have instead used individual-level survey data and, as such, been able to also take individual characteristics into account. Yet, when trying to establish causal relationships

[32] While there is a difference between preferences for redistribution and preferences for equality, both conceptually and empirically, in my main analysis I will use these concepts interchangeably as the survey data that I use include measures of both. In the sensitivity analysis, however, I will make a distinction between these two questions.

a number of problems, including endogeneity issues such as reverse causality, simultaneity and omitted variables, remain. As a potential solution to some of these problems, the so-called epidemiological approach has become popular over the last years. In such a study, Luttmer and Singhal (2011) find that immigrants' redistributive preferences are positively related to the average preference in their birth countries, and that cultural determinants of preferences for redistribution are persistent across generations. This means that redistributive preferences cannot be fully explained by economic self-interest or by the current economic, political or social environment. In other words, culture seems to matter. But which aspects of culture are important in shaping preferences for redistribution and equality? This is an important question that remains yet to be answered.

The individualism-collectivism cleavage is one such particular aspect of culture, which has been claimed to be the most important cross-country dimension in cultural psychology (Heine, 2020), as well as the primary cultural dimension affecting long-run economic growth (Gorodnichenko and Roland, 2011, 2012, 2017). While individualism emphasizes personal freedom and achievement, collectivism emphasizes embeddedness of individuals in larger groups. Because an individualistic culture implies stronger preferences for personal freedom, it seems plausible that individuals in such a culture should prefer less income redistribution, and possibly also less income equality. A collectivistic culture, on the other hand, is associated with considerations beyond the individual self, i.e., for the group, and is thus likely to imply more egalitarian preferences. My hypothesis is thus that more individualistic societies should foster preferences for more income inequality, and vice versa.

Other potential determinants of redistributive and equality preferences that have been found significantly (and negatively) associated with preferences for redistribution in previous studies include the individual characteristics of age, being male, income, right-wing ideology, education and employment (Alesina and Giuliano, 2011). Moreover, preferences for redistribution have also been found to be affected by country-level and time-specific determinants such as political regimes (Alesina and Fuchs-Schündeln, 2007), macroeconomic shocks (Giuliano and Spilimbergo, 2014) and changes in income inequality (Olivera, 2015; Schmidt-Catran, 2016). Finally, social trust has been found to affect income equality in previous studies (e.g., Bergh and Bjørnskov, 2014), and a potential mechanism for this relationship could be via redistributive preferences.

2.3 Data and Empirical Approach

2.3.1 Epidemiological Approach

The idea behind the epidemiological approach is that culture affects prior beliefs, which in turn affect economic outcomes (Guiso *et al*., 2006). As such, it analyzes the variation in outcomes across different (first- or second-generation) immigrant groups residing in the same country, thus making it possible to separate the impact of culture from the, otherwise endogenously determined, economic and institutional environment. The assumptions underlying this approach is that cultural beliefs vary across immigrant groups in a systematic fashion reflecting culture in the country of origin, and that individuals who live in the same country face similar economic and formal institutional environments (Fernández, 2011). As an example of the epidemiological approach, Alesina and Giuliano (2011) and Luttmer and Singhal (2011) have found that culture, as measured by the mean preferences for redistribution in the immigrants' country of origin, appears to be an important determinant of preferences for redistribution.

Following this approach, my baseline estimation equation is given by:

$$Preferences_{ijct} = \beta_0 + \beta_1 IDV_c + \beta_2 Z_c + \beta_3 X_i + \gamma_j + \mu_t + \epsilon_{ijct}$$

where $Preferences_{ijct}$ is the preferences for redistribution of individual i, living in country j and coming from country c ($c \neq j$); in year t; IDV_c is the individualism index in the individual's country of origin; Z_c is a vector of country-of-origin-level controls; X_i is a vector of individual controls; γ_j and μ_t are country of residence and year fixed effects, respectively; and ϵ_{ijct} is an error term. The country of residence fixed effect captures the institutional environment and all other unobserved characteristics that apply to all individuals living in that country. It also implies that the cultural variable captures the difference between the social beliefs in the individual's country of origin relative to the country of residence (i.e., the cultural component; see, e.g., Dinesen, 2012). The regressions are run using ordinary least squares (OLS), but using ordered logistic or probit regressions yields qualitatively the same results. The results are shown with robust standard errors clustered on country of origin, but the results also hold with country-of- residence clustering.

In a robustness analysis, I will also use propensity score matching to compare individuals with an individualistic culture to similar individuals with the main difference being that they have a collectivistic culture instead. This approach has previously been used in a similar context by, e.g., Dinesen (2012) comparing the level of trust of migrants and comparable non-migrants. Moreover, I will also use an IV approach as an alternative identification strategy trying to disentangle the effect of individualism from other cultural

components. As instrument for individualism-collectivism I will then use a linguistic measure of the grammatical rule on pronoun drop, which was first collected by Kashima and Kashima (1998) and recently expanded by Abdurazokzoda and Davis (2016). As an example of such a pronoun drop you can, e.g., in Spanish say both "*yo hablo*" ("*I speak*") or only "*hablo*" (dropping the subject pronoun "*yo*"), while such a pronoun drop is not permitted in, e.g., English. The intuition behind this instrument is that more individualistic societies tend to emphasize the importance of the individual in the context of speech and thus have kept the pronoun, while more collectivistic societies more often have dropped it. Previous studies using the pronoun drop as similar instrument are Licht, Goldschmidt and Schwartz (2007), Tabellini (2008) and Alesina and Giuliano (2010). This linguistic feature is then assumed to affect preferences for redistribution only through its relationship with individualism.

2.3.2 Global Survey Data

Most previous studies analyzing the determinants of preferences for redistribution or equality only use data from one specific survey, country or region. I broaden this approach by using a combined dataset of the integrated *World Values Survey* (WVS, 2016) and *European Values Study* (EVS, 2016) and the *European Social Survey* (ESS, 2016), thus obtaining a wide set of countries and individuals from all around the world. The coverage of this dataset is shown in Table 2.1. In the full sample, the WVS (2016) includes 341,271 individuals in 98 countries over the years 1981–2014, the EVS (2016) includes 164,997 individuals in 46 countries for 1981–2009, and the ESS (2016) includes 336,964 individuals in 36 countries for 2002–2014.

Table 2.1. *Coverage of the Dataset.*

	Individuals	Residence countries	Origin countries	Years
Migrant sample: other cultural origin	63,511	46	214	2002–2014
First-generation immigrants				
Other citizenship	15,310	45	174	2002–2014
Other country of birth	35,383	45	204	2002–2014
Second-generation immigrants				
Other origin mother	44,654	46	204	2004–2014
Other origin father	45,790	46	198	2004–2014
Full sample: both migrants and non-migrants	843,232	108	214	1981–2014

Note: Other cultural origin is defined as having another citizenship, another country of birth or both parents having another country of birth than the country of residence. One individual can belong to multiple groups. Origin countries also include regions.
Sources: ESS (2016); EVS (2016); WVS (2016).

Most of my analysis will focus on the sample of all individuals with another cultural origin than their country of residence, in which I will include both first-generation immigrants (i.e., individuals with another nationality or country of birth) and second- generation immigrants (i.e., individuals whose mother and/or father has another country of origin). In some heterogeneity analyses, however, I will also compare and analyze these different samples and datasets separately.

As dependent variable, I will use individuals' responses to the survey question on income equality values, i.e., self-selection on a 10-point scale ranging from "*We need larger income differences as incentives*" to "*Incomes should be made more equal*" (EVS, 2016; WVS, 2016). In the ESS (2016), this question is phrased slightly differently, namely as "*The government should take measures to reduce differences in income levels*", with selection on a 5-point scale ranging from "*Agree strongly*" to "*Disagree strongly*". Conceptually, the EVS/WVS question is thus closer to the concept of income equality preferences, while the ESS question is closer to that of preferences for income redistribution. In my baseline analysis, I will use both sources and thus recode this variable into an index ranging from 0 to 100, where a higher value indicates stronger preferences for income equality or redistribution, and vice versa. Sensitivity analyses, however, show that the results do not depend on the wording of this question and hold for each survey separately. Country coverage and the average preferences for redistribution are illustrated in Figure 2.A1 in the Appendix.

The individualism-collectivism explanatory variable is collected from Hofstede, Hofstede and Minkov (2010) and their later extensions,[33] whose individualism index is the most commonly used empirical measure of this cultural dimension (Alesina and Giuliano, 2015; Gorodnichenko and Roland, 2017). This dimension has also been included in recent research using the epidemiological approach, albeit looking at other outcomes (Berggren *et al*., 2019; Ljunge, 2017). The individualism index is given at the country level for 102 countries (see Figure 2.1 for country coverage and individualism values) and assumed to be constant over the analyzed time period, which should be reasonable given that cultures usually change only slowly over time (Williamson, 2000). The index is based on factor analysis using survey questions (initially for IBM employees, but later expanded) and has been validated in a number of studies (see, e.g., Gorodnichenko and Roland, 2017; Hofstede *et al*., 2010).[34] It ranges from 0 to 100, with 0 representing maximum collectivism,

[33] Available at https://geerthofstede.com.

[34] The index formula used by Hofstede, Hofstede and Minkov (2010) to calculate the individualism index (IDV) is given by: $IDV = 35(MeanQ4 - MeanQ1) + 35(MeanQ9 - MeanQ6) + Constant$, where $MeanQX$ is the mean score of question X in the following: "*In choosing an ideal job, how important would it be for you to: 1) have sufficient time for your personal or home life; 4) have security of employment; 6) do work that is interesting; 9) have*

i.e., "a society in which people from birth onwards are integrated into strong, cohesive in-groups, which continue to protect them throughout their lifetime in exchange for unquestioning loyalty", and 100 maximum individualism, i.e., "a society in which the ties between individuals are loose: a person is expected to look after himself or herself and his or her immediate family only" (Hofstede and Minkov, 2013). In the main analysis, immigrants are assigned the individualism index value of their country of origin (i.e., country of nationality, country of birth, mother's or father's country of origin, if different than country of residence).[35] In the heterogeneity analysis, however, I analyze these different samples separately.

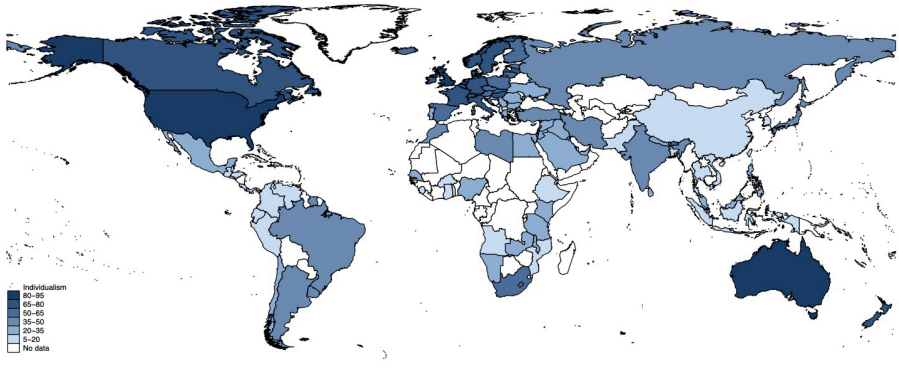

Figure 2.1. Individualism versus Collectivism around the World.

Source: Hofstede *et al*. (2010).

The individual-level control variables taken from the WVS (2016), the EVS (2016) and the ESS (2016) include the (recoded) survey measures of trust (1 meaning that the individual answered "*Most people can be trusted*", in contrast to 0 "*Can't be too careful*"), satisfaction with life (ranging from 0 "*Dissatisfied*" to 100 "*Satisfied*"), self positioning in political scale (ranging from 0 "*Left*" to 100 "*Right*"), highest educational level attained (ranging from 0 "*Inadequately completed elementary education*" to 100 "*University with degree*"), employment status (where 0 means "*Unemployed*", 1 "*Other*" and 2 "*Employed*"), monthly household income (in constant euros), a sex dummy (where 0 indicates male and 1 indicates female), age, and number of years lived in country (grouped into less than 1 year, 1–5 years, 6–10 years, 11–20 years, and more than 20 years).

a job respected by your family and friends", ranked on a 5-point scale, ranging from 1 "*of utmost importance*" to 5 "*of very little or no importance*".

[35] If an individual has both another nationality and country of birth, I simply use their average. Similarly, for second-generation immigrants, I use the average value of both parents. If an individual is both a first- and second-generation immigrant, I use the value of his or her own country of origin.

In the baseline specification, I will control for the level of inequality and income in the country of origin and use fixed-effects for the country of residence. In alternative specifications, however, I will control for a broader set of variables in the country of origin, including the mean level of social trust and equality preferences, ethnolinguistic fractionalization and democratic rights. The sources for these country-level control variables are the following: the actual level of income inequality is measured by the Gini coefficient as collected by Milanovic (2016)'s *All the Ginis* (ALG) dataset; the country-level income is measured by the log of GDP per capita (in PPP-adjusted constant 2011 international dollars) taken from the World Bank (2016)'s *World Development Indicators* (WDI); the average ethnic, linguistic and religious fractionalization is measured by Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2003); and, as an indicator of democracy and autocracy, I use the revised combined polity score (rescaled into a 0–100 index) from the Polity IV Project (Marshall *et al*., 2016). Moreover, as further controls, the survey values for social trust and equality preferences above are averaged at the country level. The pronoun drop instrument is taken from Abdurazokzoda and Davis (2016) new linguistic dataset (where 1 indicates that the language allows pronoun drop and 0 that it does not), covering 56 languages in 94 countries (the country-level averages of this dummy is illustrated in Figure 2.A2 in the Appendix). Some summary statistics for the different variables and samples are presented in Table 2.2.

Table 2.2. *Summary Statistics*.

	Obs.	Mean	Std. Dev.	Min	Max
Migrant sample					
Preferences for redistribution	61,729	68.91	28.46	0	100
Individualism index (origin country)	56,891	50.00	19.76	6	91
Gini coefficient (origin country)	62,777	34.65	6.13	23	66
GDP per capita (origin country)	63,078	20,745	12,395	636	90,302
Fractionalization (origin country)	63,276	34.45	15.53	1	84
Polity score (origin country)	63,155	65.24	26.10	0	100
Trust value	51,086	0.49	0.50	0	1
Life satisfaction value	63,070	67.52	24.24	0	100
Political left-right scale	52,137	49.88	23.05	0	100
Education level	53,033	51.43	30.54	0	100
Employment status	63,071	1.43	0.63	0	2
Household income	46,826	2,326	2,409	10	14,000
Sex	63,469	0.55	0.50	0	1
Age	63,202	46.20	17.88	13	114
Time in new country	34,862	3.18	1.08	0	4
Years in new country	18,812	27.96	19.45	0	95
Life share in new country	18,677	54.52	28.36	0	100
Pronoun drop dummy	51,482	0.30	0.46	0	1
Full sample					
Preferences for redistribution	773,092	58.08	32.74	0	100
Individualism index (residence country)	772,505	52.41	21.62	6	91
Gini coefficient (residence country)	722,150	34.73	8.43	18	67
GDP per capita (residence country)	799,042	25,952	16,391	858	126,145
Fractionalization (residence country)	837,520	34.09	17.49	1	83
Polity score (residence country)	818,655	86.78	23.13	0	100
Trust value	750,745	0.37	0.48	0	1
Life satisfaction value	834,459	65.38	25.58	0	100
Political left-right scale	654,227	51.34	24.13	0	100
Education level	664,594	50.37	30.98	0	100
Employment status	827,513	1.44	0.63	0	2
Household income	330,466	2,213	2,335	0	14,728
Sex	838,071	0.53	0.50	0	1
Age	836,838	44.38	17.70	13	123
Pronoun drop dummy	513,796	0.51	0.50	0	1

Sources: Alesina *et al*. (2003); ESS (2016); EVS (2016); Hofstede *et al*. (2010); Marshall *et al*. (2016); Milanovic (2016); World Bank (2016); WVS (2016).

From Table 2.2, the immigrant sample seems fairly representative for the full sample, even though it covers a smaller sample of residence countries and years. Pairwise correlations for the individual and country-of-origin-level characteristics are presented in Table 2.A1 in the Appendix. These correlations indicate that, on the individual level, preferences for more equal income distributions seem to be correlated with higher trust, lower life satisfaction, more left-wing political preferences, lower educational, employment and income levels, time spent in the new country, and being female and older. On the country level, focusing on the cultural component, individual preferences for redistribution and equality seem to be negatively related to individualism, social trust, actual income equality, GDP per capita, fractionalization and democratic rights in the immigrants' country of origin. The correlation between individualism index in country of origin and individual preferences for redistribution is illustrated in the binned scatterplot in Figure 2.2 (corresponding correlations separated into the different immigrant samples are shown in Figure 2.A3 in the Appendix). However, these are only simple correlations and, hence, I turn now to the regression results.

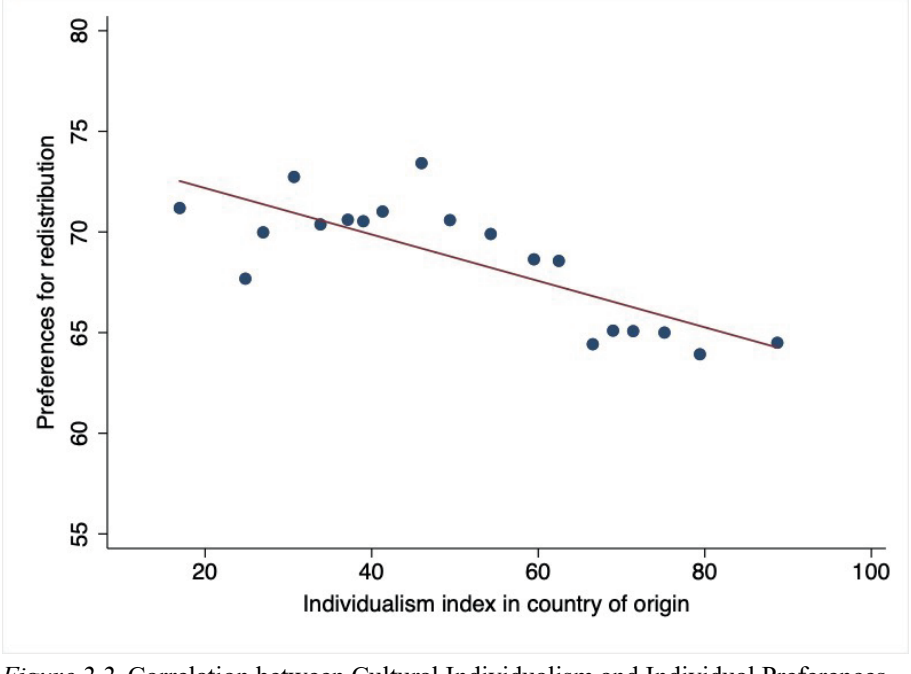

Figure 2.2. Correlation between Cultural Individualism and Individual Preferences for Redistribution: Binned Scatterplot.

Sources: ESS (2016); EVS (2016); Hofstede *et al*. (2010); WVS (2016).

2.4 Main Results

2.4.1 Relation between Individualism and Redistributive Preferences

I first run a standard OLS regression estimating individuals' preferences for redistribution by the level of individualism in their country of residence (including the full sample of both immigrants and non-immigrants) and a set of individual and country-level controls. These results are presented in Table 2.A2 in the Appendix (together with the same estimation using ordered logistic and ordered probit regressions, respectively, instead of OLS), and show a negative and statistically significant relationship between individualism and preferences for redistribution also when controlling for a large number of individual and country-of-residence-level characteristics. Most of the individual variables also remain statistically significant and in the same direction as the pairwise correlations, except for trust, which is now found to have a negative conditional correlation with redistributive preferences. When controlling for the other variables, income inequality in the country of residence is positively related to preferences for redistribution and equality, while country- of-residence-level income has a positive, but not statistically significant, association with preferences for income redistribution.

However, since all individuals living in a country are assumed to have the same individualism-collectivism cultural beliefs in the regression above, I cannot control for country fixed effects, and this specification could potentially suffer from a number of endogeneity issues. Thus, I now turn to the epidemiological approach, exploiting variation in immigrants' country of origin to better capture variation in the cultural dimension of individualism versus collectivism within the country of residence, i.e., applying country-of-residence fixed effects to control for the economic and institutional environment in which these individuals live. In particular, this should solve for any unobservable characteristics at the country-of-residence level, as well as for potential reverse causality since the individual preferences of a person living in a new country are not very likely to affect the individualism-collectivism ranking of his or her country of origin. These OLS regression results are presented in Table 2.3.[36]

[36] Running ordered logit or probit regressions instead of OLS yields qualitatively the same results (results available upon request).

Table 2.3. *Baseline OLS Regression Results, Immigrant Sample.*

Preferences for redistribution	*(1)*	*(2)*	*(3)*	*Std. Coef.*
Origin country				
Individualism index	–0.057***	–0.068***	–0.081***	–0.049***
	(0.018)	(0.025)	(0.027)	(0.017)
Gini coefficient		–0.074	–0.015	–0.003
		(0.057)	(0.079)	(0.015)
Log GDP per capita		0.672	–0.597	–0.014
		(0.568)	(0.879)	(0.020)
Mean social trust			0.052	0.023
			(0.035)	(0.015)
Mean preferences for redistribution			0.015	0.004
			(0.049)	(0.014)
Fractionalization			–0.064*	–0.030*
			(0.038)	(0.018)
Polity score			0.030	0.024
			(0.023)	(0.019)
Individual characteristics				
Trust value		1.219	1.133	0.017
		(0.838)	(0.862)	(0.013)
Life satisfaction value		–0.054***	–0.060***	–0.047***
		(0.014)	(0.014)	(0.011)
Political left–right scale		–0.175***	–0.174***	–0.128***
		(0.019)	(0.019)	(0.014)
Education level		–0.080***	–0.078***	–0.074***
		(0.013)	(0.013)	(0.012)
Employment status		–0.674*	–0.809**	–0.016**
		(0.384)	(0.388)	(0.007)
Household income		–0.001***	–0.001***	–0.052***
		(0.000)	(0.000)	(0.014)
Time in new country		1.243***	1.184***	0.039***
		(0.331)	(0.337)	(0.011)
Sex	2.584***	1.847***	1.929***	0.029***
	(0.207)	(0.472)	(0.480)	(0.007)
Age	0.107***	0.050***	0.048***	0.029***
	(0.014)	(0.018)	(0.018)	(0.010)
Residence country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Number of obs.	55,085	12,143	11,805	11,805
R-squared	0.117	0.153	0.158	0.158

Notes: Robust standard errors clustered on origin country in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.
Sources: Alesina *et al*. (2003); ESS (2016); EVS (2016); Hofstede *et al*. (2010); Marshall *et al*. (2016); Milanovic (2016); World Bank (2016); WVS (2016).

The results in Table 2.3 show a negative and statistically significant relationship between individualistic cultural beliefs in the country of origin and immigrants' preferences for income redistribution, even after controlling for their country of residence. That is, more individualistic cultures seem to be associated with less egalitarian values, where an increase of 10 percentage points on the individualism index is associated with a decrease of approximately 0.6–0.8 percentage points on the preferences for redistribution scale. Also, preferences for redistribution are found to be statistically significantly related to having lower life satisfaction, political preferences more to the left, lower levels of education, employment and income, more years spent in the new country, and being female and old. It could also be noted that none of the other country-of-origin-level variables are statistically significant (except for fractionalization, which is marginally significant), when controlling for the cultural individualism impact. The last column of Table 2.3 shows the same results but where the values of all variables have been standardized to having mean 0 and standard deviation 1. In other words, a one standard deviation increase of the individualism index (which corresponds, e.g., to the difference between Sweden with an individualism index value of 71 and the United States with a value of 91) is associated with a 0.05 standard deviation decrease of the preferences for redistribution measure (corresponding roughly to, e.g., the difference between the average redistributive preferences value in Sweden, which is 62.3, and in Poland, which is 60.6). This standardized coefficient magnitude is similar to that of household income and the life satisfaction measure, and the only variables with larger standardized coefficients are political preferences and the education level.

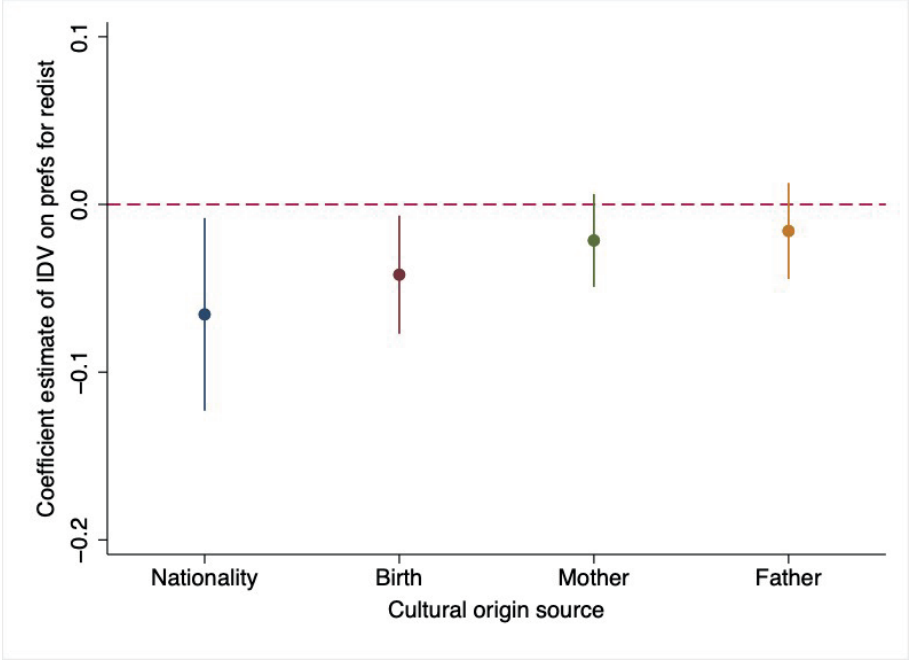

Figure 2.3. Estimated Impact of Individualism on Preferences for Redistribution by Immigrant Sample.

Note: Estimated standardized coefficients for individualism on preferences for redistribution, with 95 percent confidence intervals, controlling for origin country characteristics, individual characteristics, residence country and year fixed effects.
Source: See Table 2.A5 in the Appendix.

2.4.2 Cultural Assimilation Analysis

Separating the sample into first- and second-generation immigrants (see Section 2.5.2), the association between country-of-origin individualism and individual preferences for income inequality is not found statistically significant among second-generation immigrants. The corresponding results for an even finer division of the immigrant subsamples are shown in Table 2.A3 in the Appendix, and the standardized estimated coefficients of these regressions are illustrated in Figure 2.3. A potential explanation for this is that, with time spent in the new cultural environment, immigrants might also adapt the culture of their new country of residence (i.e., direct horizontal socialization, as opposed to vertical parental socialization; see, e.g., Bisin and Verdier, 2011). In order to further check whether or not this seems to be the case, I will, instead of the country-of-residence fixed effects, include the country-of-residence individualism index as well as income and inequality controls in my baseline regression. Because such cultural assimilation is also likely to depend on the relative time that the individual has lived in the new environment, I will calculate the country-of-residence life-share as the total number of years lived in the

country-of- residence divided by the individual's age. Since the number of observations for each year lived in the country is quite limited, I will group this variable into three categories: those immigrants that have lived i) less than one third, ii) between one and two thirds, and iii) more than two thirds of the life in the new country of residence. The results for these three groups are presented in Table 2.4 and illustrated by their standardized coefficient estimates in Figure 2.4.

Table 2.4. *Comparing Country-of-Origin versus Country-of-Residence Cultural Impact.*

Preferences for redistribution				*Life share in residence country*		
	(1)	*(2)*	*(3)*	$< 1/3$	$1/3 < 2/3$	$> 2/3$
Origin country						
Individualism index	–0.083***	–0.070**	–0.070*	–0.142***	–0.098*	–0.038
	(0.017)	(0.029)	(0.036)	(0.050)	(0.052)	(0.053)
Gini coefficient		–0.092	–0.092	–0.345***	–0.228*	–0.130
		(0.061)	(0.075)	(0.112)	(0.130)	(0.126)
Log GDP per capita		0.619	–0.275	0.929	2.039	–0.385
		(0.818)	(0.976)	(1.459)	(1.586)	(1.519)
Mean social trust			–0.010			
			(0.047)			
Fractionalization			–0.079*			
			(0.044)			
Polity score			0.027			
			(0.028)			

Residence country						
Individualism index	–0.203***	–0.138***	–0.123***	–0.113	–0.180**	–0.267***
	(0.031)	(0.037)	(0.043)	(0.073)	(0.083)	(0.061)
Gini coefficient		0.696***	0.627***	0.589*	0.694***	0.318**
		(0.121)	(0.119)	(0.328)	(0.224)	(0.156)
Log GDP per capita		–2.746	–3.070	–6.501*	1.278	3.347
		(1.962)	(2.134)	(3.611)	(4.492)	(3.648)
Mean social trust			–0.001			
			(0.039)			
Fractionalization			0.020			
			(0.030)			
Polity score			–0.054			
			(0.099)			

Individual characteristics						
Trust value		1.664**	1.775**	2.477	–1.485	–0.400
		(0.753)	(0.782)	(1.696)	(1.091)	(1.119)
Life satisfaction value		–0.064***	–0.069***	–0.010	–0.049**	–0.043
		(0.015)	(0.016)	(0.039)	(0.024)	(0.038)
Political left–right scale		–0.175***	–0.171***	–0.209***	–0.176***	–0.137***
		(0.019)	(0.020)	(0.036)	(0.032)	(0.026)
Education level		–0.085***	–0.082***	–0.010	–0.081***	0.002
		(0.015)	(0.015)	(0.027)	(0.023)	(0.024)
Employment status		–1.353***	–1.533***	–1.366	0.594	–2.800**
		(0.446)	(0.443)	(1.057)	(1.160)	(1.077)
Household income		–0.001**	–0.001**	–0.001***	–0.001***	–0.001*
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time in new country		0.872**	0.864**			
		(0.336)	(0.327)			
Sex	2.669***	1.637***	1.727***	2.623	1.877	1.986*
	(0.218)	(0.612)	(0.630)	(1.582)	(1.254)	(1.024)
Age	0.125***	0.061**	0.054**	0.008	0.079	0.071*
	(0.013)	(0.025)	(0.025)	(0.071)	(0.052)	(0.039)
Residence country FE	No	No	No	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	52,767	8,759	8,470	1,211	1,503	1,960
R-squared	0.068	0.136	0.139	0.188	0.196	0.281

Notes: Robust standard errors clustered on origin country in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

While these cultural assimilation results are admittedly crude, I believe that they do give some support to the idea that immigrants are assimilated or adapted to their new cultural environment quite "rapidly", i.e., after spending approximately the same amount of time in the new country as spent in the origin country. Moreover, the country of residence impact seems to be relatively stronger, with a coefficient size that is almost the double, compared to the culture of origin impact.

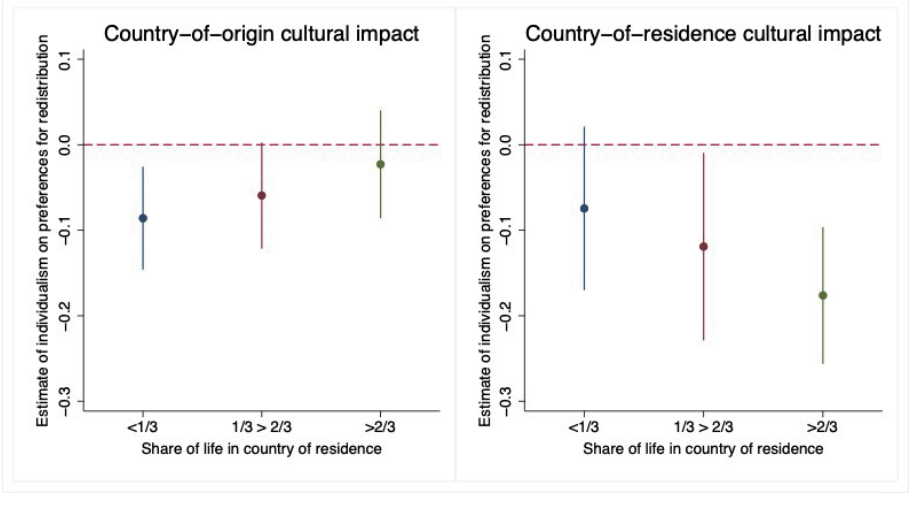

Figure 2.4. Comparing Country-of-Origin versus Country-of-Residence Impact of Individualism on Preferences for Redistribution.

Note: Estimated standardized coefficients for individualism on preferences for redistribution, with 95 percent confidence intervals, controlling for origin country characteristics, residence country characteristics, individual characteristics and year fixed effects.
Source: See Table 2.7.

Finally, I will also perform the same cultural assimilation analysis as above, but instead separating the sample by the individuals' age when they migrated. These results are presented in Figure 2.5, and indicate that there seems to be no statistically significant impact of the culture of origin on current preferences for redistribution if migration took place approximately before the age of 10. Culture in the current country of residence, however, seems to have a statistically significant impact regardless of the age at migration.

2.5 Robustness Checks

2.5.1 Pronoun-Drop IV Approach

Although none of the included country-of-origin controls are significant in the OLS regressions above, it could still be the case that there are some other omitted or unobserved variables driving the results. As an alternative strategy, I will thus use the pronoun-drop dummy as an instrument for individualism versus collectivism, i.e., to check whether it is actually individualism, rather than some other cultural variable in the country of origin, that drives the results. The assumption here is that the grammatical rule on pronoun drop affects preferences for redistribution only through its language-culture relationship, i.e., through its association with individualistic-collectivistic cultural beliefs. The results from these two-stage least squares (2SLS) regressions are shown in Table 2.5, where I have used the individual responses to the "language at home" question in the WVS (2016), the EVS (2016) and the ESS (2016), combined with pronoun-drop information from Abdurazokzoda and Davis (2016)'s new linguistic dataset.

Table 2.5. *IV Regression Results, Immigrant Sample.*

	Individualism (origin)	Preferences for redistribution	Individualism (origin)	Preferences for redistribution
	(1)	*(1)*	*(2)*	*(2)*
	1st stage	*2nd stage*	*1st stage*	*2nd stage*
Individualism (origin)		–0.355***		–0.279***
		(0.065)		(0.098)
Pronoun drop dummy	–12.168***		–9.483***	
	(4.085)		(3.100)	
Residence country				
Gini coefficient			–0.593***	0.656***
			(0.214)	(0.146)
Log GDP per capita			12.188***	–6.457***
			(2.943)	(2.134)
Individual characteristics				
Trust value			0.515	–0.889
			(0.664)	(0.545)
Life satisfaction value			0.030*	–0.036***
			(0.016)	(0.011)
Political left–right scale			–0.002	–0.179***
			(0.011)	(0.023)
Education level			0.014	–0.044***
			(0.024)	(0.010)
Employment status			–0.483	–0.450
			(0.482)	(0.443)
Household income			0.000***	–0.001***
			(0.000)	(0.000)
Sex			–0.210	1.618***
			(0.438)	(0.569)
Age			0.106***	0.129***
			(0.034)	(0.022)
Number of obs.	45,129	45,129	13,130	13,130
R-squared	0.079		0.195	

Notes: Robust standard errors clustered on origin country in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. Individualism index (IDV) measured in country of origin, and pronoun drop dummy for home language.
Sources: Abdurazokzoda and Davis (2016); ESS (2016); EVS (2016); Hofstede *et al*. (2010); Milanovic (2016); World Bank (2016); WVS (2016).

The 2SLS regression results in Table 2.5 show that i) the pronoun drop seems to be a valid instrument for individualism-collectivism in the respect that it is negatively and statistically significantly related to the individualism index, and ii) using this instrument confirms the baseline results of a statistically significant negative association between individualism and an individual's preferences for redistribution. Here, the estimated impact is even stronger than for the OLS results, indicating that an increase of 10 percentage points on the individualism index is associated with a decrease of approximately 3 percentage points on the preferences for redistribution scale. Moreover, since the baseline results are confirmed also when using this alternative individualism-collectivism measure, potential measurement error in the main survey-based individualism index does not seem to be driving the results.

2.5.2 Heterogeneity Analyses

Using the epidemiological approach, another robustness check includes analyzing the different surveys separately (see Table 2.A4 in the Appendix). The results hold for both surveys separately, but the individualism coefficient size is somewhat larger for the integrated EVS (2016) and WVS (2016) sample than for the ESS (2016). Since the wording of the survey question differs between these two samples, this indicates that the association between individualism and preferences for equality is slightly stronger than the association with preferences for redistribution.

Furthermore, I can also analyze the impact within different immigrant subsamples. These results are presented in Table 2.6.

Table 2.6. *Heterogeneity Analysis, Different Immigrant Samples.*

Preferences for redistribution	*More individualist origin*	*More collectivist origin*	*Between-region migration*	*Within-region migration*	*1st-generation immigrant*	*2nd-generation immigrant*
Origin country						
Individualism index	–0.180***	–0.069**	–0.078***	–0.065*	–0.065**	–0.035
	(0.046)	(0.034)	(0.029)	(0.038)	(0.026)	(0.032)
Gini coefficient	–0.139	–0.047	0.009	–0.042	–0.067	0.016
	(0.148)	(0.058)	(0.067)	(0.116)	(0.054)	(0.084)
Log GDP per capita	6.255***	0.395	–0.803	1.451	0.510	0.321
	(1.551)	(0.547)	(0.737)	(1.663)	(0.572)	(0.698)

Individual characteristics						
Trust value	0.360	1.453	2.179**	0.727	1.085	–0.092
	(0.837)	(0.995)	(0.973)	(1.083)	(0.786)	(0.588)
Life satisfaction value	–0.077**	–0.047***	0.008	–0.085***	–0.058***	–0.084***
	(0.031)	(0.014)	(0.023)	(0.020)	(0.013)	(0.014)
Political left–right scale	–0.206***	–0.165***	–0.146***	–0.196***	–0.179***	–0.187***
	(0.026)	(0.025)	(0.023)	(0.022)	(0.019)	(0.025)
Education level	–0.086***	–0.075***	–0.045***	–0.092***	–0.086***	–0.085***
	(0.021)	(0.015)	(0.014)	(0.016)	(0.011)	(0.012)
Employment status	–0.320	–0.783	–1.011	–0.512	–0.787*	–0.570
	(0.625)	(0.483)	(0.674)	(0.399)	(0.439)	(0.477)
Household income	–0.001**	–0.001***	–0.001***	–0.001*	–0.001***	–0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time in new country	0.629	1.362***	2.166***	0.898**		
	(0.492)	(0.445)	(0.511)	(0.407)		
Sex	2.771***	1.717***	1.405	2.004***	1.930***	2.730***
	(0.951)	(0.549)	(0.881)	(0.557)	(0.411)	(0.526)
Age	0.073*	0.054**	0.010	0.065**	0.097***	0.100***
	(0.038)	(0.023)	(0.027)	(0.024)	(0.015)	(0.018)
Residence country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	3,349	8,736	3,919	8,224	13,161	10,705
R-squared	0.206	0.139	0.156	0.157	0.160	0.182

Notes: Robust standard errors clustered on origin country in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

The results in Table 2.6 show that the negative relation between individualism and preferences for income redistribution is robust to looking separately on immigrants who have emigrated from a more individualistic culture relative to their country of destination, as well as from a relatively more collectivistic culture, respectively; from another country within the same geographical region, and those who have emigrated from another geographical region, respectively.[37] The relationship, however, is strongest among those who have migrated from one region to another, and to a relatively more collectivist region. The association is also robust to looking only on the sample of first-generation immigrants (i.e., those with another nationality and/or country of birth than their country of residence). Analyzing the sample of second-generation immigrants separately, however, there seems to be no statistically significant impact of individualism in the parents' country of origin on their children's preferences for redistribution. These results again indicate the existence of an assimilation or integration process such that the cultural impact of individualism on redistributive preferences is not persistent across generations and possibly weakens off with time spent in the new institutional and cultural environment. Notably, this insignificant relationship among the second-generation immigrants is in contrast to what has been found by, e.g., Luttmer and Singhal (2011).

2.5.3 Matching Estimators

As a final sensitivity analysis, I will also check if the results are robust to using matching as an alternative estimation strategy. I hence use the propensity-score matching method, where I compare individuals that are similar in a number of observable characteristics but differ in their individualism versus collectivism cultural belonging. I thus create a dummy variable in which I define individuals that have a country-of-origin individualism index value above 50 as individualists and those with a value below 50 as collectivists. For a comparison of the mean values in the two samples, see Table 2.A5 in the Appendix. The estimation results when matching and comparing immigrant individualists to collectivists are shown in Table 2.7.

[37] Using the United Nations' classification of regions.

Table 2.7. *Propensity-Score Matching Results, Immigrant Sample.*

Preferences for redistribution	*ATE*
Individualist dummy	–1.267**
	(0.569)
Number of obs.	26,743

Notes: Average treatment effects (ATE). Robust standard errors in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. Matching variables are individual-level trust value, life satisfaction value, political left–right scale, education level, employment status, household income, sex, age, and residence country FE.
Sources: ESS (2016); EVS (2016); Hofstede *et al*. (2010); Milanovic (2016); World Bank (2016); WVS (2016).

As seen in Table 2.7, using this matching method I also find a negative and statistically significant relationship between individualism and preferences for redistribution. More specifically, the average treatment effect of having an individualistic, as opposed to collectivistic, culture is a reduction of approximately 1.3 percentage points on the preferences for redistribution scale.

2.6 Conclusion

In this study, I have analyzed the association between individualism versus collectivism and individuals' preferences for income redistribution and equality, using variation in immigrants' country of origin to separate the effect of culture from the otherwise endogenously determined institutional environment. Doing so, I have found strong support for a negative relationship between individualistic cultural beliefs and redistributive preferences, i.e., individualistic societies seem to foster preferences for income inequality. These results were confirmed using matching estimators as well as the grammatical rule on pronoun drop as a linguistic instrument for individualism-collectivism. Heterogeneity analyses also showed that the cultural impact of individualism on redistributive preferences is not significantly persistent over generations. Moreover, the impact of cultural origin only seems to be statistically significant if migration took place after the age of 10. More research would be needed in order to better understand the workings of such cultural adaption and its relation to institutional and cultural change. It would also be interesting to analyze the association between other cultural dimensions and egalitarian preferences, as well as the impact of individualism on actual redistribution and income equality.

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Appendix 2.A

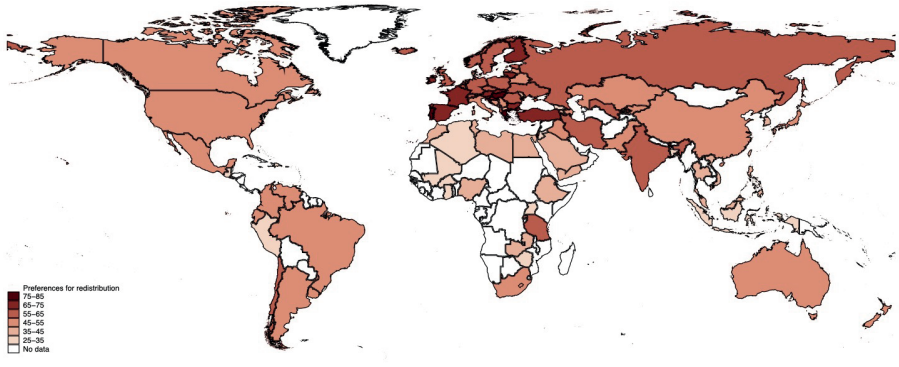

Figure 2.A1. Mean Preferences for Redistribution around the World.

Sources: ESS (2016); EVS (2016); WVS (2016).

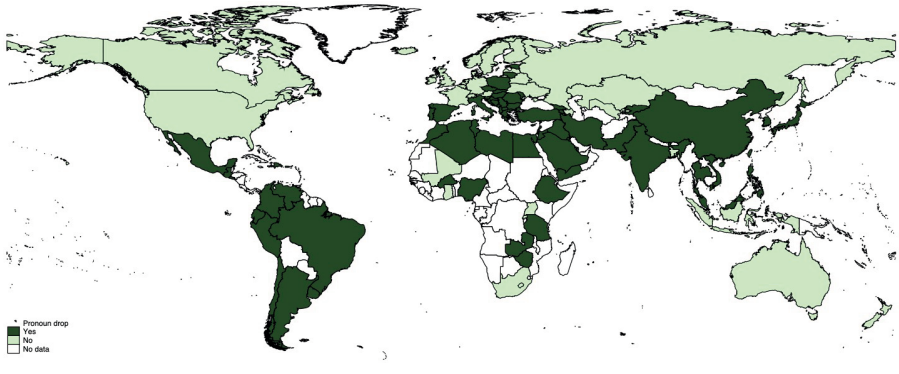

Figure 2.A2. Mean Pronoun Drop around the World.

Source: Abdurazokzoda and Davis (2016).

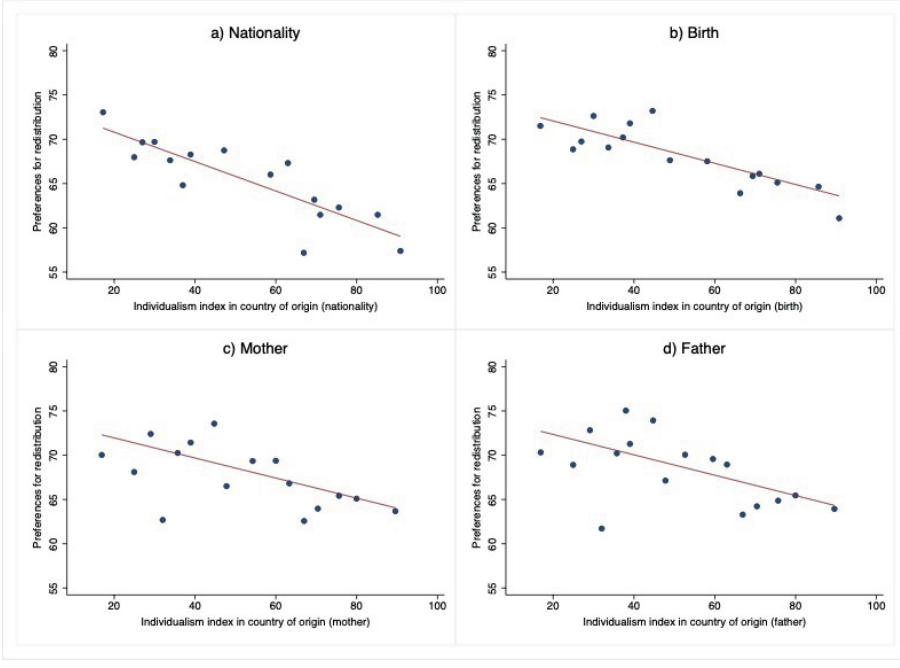

Figure 2.A3. Correlation between Individualism and Preferences for Redistribution by Cultural Origin Source: Binned Scatterplots.

Note: Bins based on a) 13,374, b) 28,806, c) 37,119 and d) 37,963 observations in total.
Sources: ESS (2016); EVS (2016); Hofstede *et al*. (2010); WVS (2016).

Table 2.A1. *Correlation Matrix.*

	Pref's for redist.	IDV (origin)	Mean social trust (origin)	Mean pref's for redist (origin)
Origin country				
Individualism index	–0.080***			
Mean social trust	–0.081***	0.608***		
Mean pref's for redist.	0.002	0.119***	0.225***	
Gini coefficient	0.015***	–0.237***	–0.353***	–0.227***
Log GDP per capita	–0.068***	0.706***	0.600***	0.475***
Fractionalization	–0.018**	–0.234***	–0.112***	–0.347***
Polity score	–0.091***	0.612***	0.496***	0.414***
Individual characteristics				
Trust value	0.054***	0.134***	0.196***	–0.020***
Life satisfaction value	–0.051***	0.148***	0.138***	0.004
Political left–right scale	–0.131***	–0.016***	0.007	–0.037***
Education level	–0.143***	0.057***	0.106***	–0.018***
Employment status	–0.069***	0.029***	0.055***	0.026***
Household income	–0.089***	0.168***	0.188***	0.041***
Time in new country	0.077***	0.031***	0.068***	0.017***
Sex	0.050***	–0.011***	0.003	–0.005
Age	0.122***	0.055***	0.035***	0.019***

Note: $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.
Sources: Alesina *et al*. (2003); ESS (2016); EVS (2016); Hofstede *et al*. (2010); Marshall *et al*. (2016); Milanovic (2016); World Bank (2016); WVS (2016).

Table 2.A2. *OLS, Ordered Logistic and Ordered Probit Regression Results, Full Sample.*

Preferences for redistribution	*OLS*	*Ordered logit*	*Ordered probit*
Residence country			
Individualism index	–0.144***	–0.010***	–0.006***
	(0.006)	(0.000)	(0.000)
Gini coefficient	0.262***	0.017***	0.010***
	(0.018)	(0.001)	(0.001)
Log GDP per capita	0.362	–0.006	0.006
	(0.229)	(0.015)	(0.009)
Individual characteristics			
Trust value	–0.395**	–0.045***	–0.024***
	(0.156)	(0.010)	(0.006)
Life satisfaction value	–0.089***	–0.007***	–0.004***
	(0.004)	(0.000)	(0.000)
Political left–right scale	–0.181***	–0.012***	–0.007***
	(0.003)	(0.000)	(0.000)
Education level	–0.111***	–0.007***	–0.004***
	(0.003)	(0.000)	(0.000)
Employment status	–1.148***	–0.075***	–0.044***
	(0.130)	(0.009)	(0.005)
Household income	–0.001***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Sex	2.656***	0.154***	0.092***
	(0.144)	(0.009)	(0.006)
Age	0.055***	0.004***	0.002***
	(0.004)	(0.000)	(0.000)
Residence country FE	No	No	No
Year FE	Yes	Yes	Yes
Number of obs.	147,110	147,110	147,110
R-squared	0.146	0.037	0.036

Notes: Robust standard errors in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. *Sources:* ESS (2016); EVS (2016); Hofstede *et al*. (2010); Milanovic (2016); World Bank (2016); WVS (2016).

Table 2.A3. *Sensitivity Analysis, Different Immigrant Samples.*

Preferences for redistribution	*Citizen-ship*	*Birth country*	*Mother's origin*	*Father's origin*
Origin country				
Individualism index	–0.098**	–0.065**	–0.035	–0.026
	(0.043)	(0.027)	(0.023)	(0.024)
Gini coefficient	–0.165**	–0.062	–0.040	–0.048
	(0.082)	(0.060)	(0.056)	(0.058)
Log GDP per capita	0.597	0.574	0.535	0.229
	(1.232)	(0.639)	(0.573)	(0.583)
Individual characteristics				
Trust value	0.499	1.142	0.476	0.163
	(1.016)	(0.752)	(0.615)	(0.750)
Life satisfaction value	–0.062***	–0.055***	–0.066***	–0.070***
	(0.022)	(0.012)	(0.016)	(0.014)
Political left–right scale	–0.201***	–0.176***	–0.168***	–0.170***
	(0.025)	(0.019)	(0.020)	(0.021)
Education level	–0.091***	–0.084***	–0.085***	–0.081***
	(0.013)	(0.012)	(0.012)	(0.013)
Employment status	–0.096	–0.699*	–0.466	–0.597
	(0.516)	(0.396)	(0.372)	(0.420)
Household income	–0.001***	–0.001***	–0.001***	–0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Sex	1.512**	1.976***	2.117***	2.568***
	(0.719)	(0.482)	(0.383)	(0.408)
Age	0.107***	0.087***	0.080***	0.081***
	(0.019)	(0.018)	(0.015)	(0.014)
Residence country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Number of obs.	5,662	12,110	15,976	16,360
R-squared	0.173	0.153	0.168	0.163

Notes: Robust standard errors clustered on origin country in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.
Sources: ESS (2016); EVS (2016); Hofstede *et al*. (2010); Milanovic (2016); World Bank (2016); WVS (2016).

Table 2.A4. *Robustness Analysis, Different Surveys.*

Preferences for redistribution	*Incomes more equal (EVS & WVS)*	*Government redistribution (ESS)*
Origin country		
Individualism index	–0.110**	–0.059**
	(0.046)	(0.029)
Gini coefficient	–0.305***	–0.038
	(0.094)	(0.065)
Log GDP per capita	0.165	0.669
	(1.441)	(0.677)
Individual characteristics		
Trust value	1.350	–0.434
	(1.148)	(0.673)
Life satisfaction value	–0.023	–0.033***
	(0.031)	(0.011)
Political left–right scale	–0.136***	–0.191***
	(0.034)	(0.020)
Education level	–0.094***	–0.049***
	(0.028)	(0.010)
Employment status	–0.573	–0.388
	(0.991)	(0.395)
Household income	–0.001	–0.001***
	(0.001)	(0.000)
Time in new country	0.351	1.566***
	(1.267)	(0.320)
Sex	3.131**	1.736***
	(1.189)	(0.545)
Age	0.057	0.045**
	(0.035)	(0.020)
Residence country FE	Yes	Yes
Year FE	Yes	Yes
Number of obs.	2,355	9,788
R-squared	0.145	0.139

Notes: Robust standard errors clustered on origin country in parentheses; $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.
Sources: ESS (2016); EVS (2016); Hofstede *et al*. (2010); Milanovic (2016); World Bank (2016); WVS (2016).

Table 2.A5. *Means Comparison, Immigrant Sample.*

	Individualists ($IDV > 50$)			Collectivists ($IDV < 50$)		
	Obs.	*Mean*	*Std. Dev.*	*Obs.*	*Mean*	*Std. Dev.*
Preferences for redistribution	29,645	66.64	28.47	31,841	70.99	28.32
Individualism index (origin)	25,714	68.98	10.23	30,925	34.23	9.10
Trust value	24,589	0.54	0.50	26,303	0.43	0.50
Life satisfaction value	30,202	71.16	22.62	32,617	64.10	25.19
Political left–right scale	26,645	49.31	22.44	25,264	50.35	23.61
Education level	25,071	52.19	30.63	27,762	50.73	30.48
Employment status	30,131	1.44	0.62	32,690	1.42	0.64
Household income	23,348	2,660	2,562	23,320	1,988	2,193
Sex	30,332	0.55	0.50	32,885	0.56	0.50
Age	30,211	46.78	17.89	32,739	45.76	17.85

Sources: ESS (2016); EVS (2016); Hofstede *et al*. (2010).

3. The Swedish Income Distribution, 1968–2016

with Paula Roth and Daniel Waldenström

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3.1 Introduction

The Swedish income distribution has attracted considerable attention among researchers and policymakers alike over the recent years. The interest stems partly from reports about rising inequality since the 1980s and discussions about the role of market liberalizations, privatizations and lowered tax progressivity in this increase.[38]

One problem with the data underlying most estimates of income inequality trends in Sweden is that the comparability over time has not always been perfect for several reasons. First, the official income distribution series produced by Statistics Sweden (SCB) begins only in 1975 and there are no annual observations until the 1980s. Second, relatively small population samples have been surveyed in order to generate the estimates up until the 2010s, which could give rise to measurement errors related to sample size and top or bottom coverage. Third, several variables in the Swedish income tax registries are not fully comparable over time, which creates inconsistencies unless accounted for. For example, imputed income from owner-occupied housing was imputed in total taxable income according to a progressive scale up to 1990 but it was not imputed at all from 1991 onwards. Non-taxable benefits were not recorded before 1978 and some of them have been added gradually in the 1980s, 1990s and 2000s, potentially causing problems with the comparison of disposable income over time. Fourth, the 1991 tax reform brought several breaks in both variable definitions and collection routines, which potentially affected income inequality levels and trends.

In this paper, we present a new Swedish income distribution database that covers the full Swedish population in all years since 1968, the first year with electronic administrative registries in Sweden. The main contribution of the study is the development of this new population-wide registry database with individual and household incomes during 1968–2016. The database expands the current set of income inequality statistics by almost a decade, and adds over four decades of full-population inequality statistics. To construct our new database, we compile population and tax registers from the onset of electronic registers in 1968, covering both non-working spouses and children, which allows us to compute proper consumption households. Finally, we homogenize income, tax and transfer variables over all years in order to obtain consistent income inequality estimates. Naturally, some of these estimations contain problematic aspects, and we point out a number of areas where further work is needed.

Using our new database, we compute and present some preliminary results on Sweden's income inequality trends over the past decades. The results are preliminary in the sense that the database is still not complete in all respects,

[38] See, for example, Björklund and Freeman (1997), Lindbeck (1997), Björklund and Palme (2000), Roine and Waldenström (2008, 2010), and Björklund and Jäntti (2019).

with some additional adjustments and robustness checks of the measurement of a few income components are needed. The first main result is that our series confirm the main, U-shaped pattern of Swedish income inequality over the past half-century. The Gini coefficient for disposable income of equivalized households fell from 28 in 1968 down to 18 in 1983, increased in the early 1990s to 25 and thereafter further to 32 in 2007, a level around which it has remained ever since. The main factor driving the falling Gini coefficient in the 1970s was an equalization of labor earnings, which in turn was driven by increased female labor force participation and more equal earnings among all workers.[39] The increase in inequality around the economic crisis of the early 1990s seems more driven by a smaller redistributive effect of taxes than by increased inequality in labor earnings. The inequality increase from 1995 onwards is primarily driven by increased weight of relatively unequally distributed capital incomes, muted somewhat by a slight fall in labor earnings inequality. Taxes reduced the Gini coefficient by around ten Gini points in all years since 1990, but with an increasing trend in the Gini coefficient this means that the relative redistributive effect of taxes decreased during this period. Cash benefits, taxable and non-taxable, has not contributed significantly to the evolution of the Swedish disposable-income Gini coefficient in any period during the past half-century.

We also examine the evolution of Swedish top incomes, previously studied by Roine and Waldenström (2008, 2010, 2012). Our series corroborate the previous patterns, but extend them in several dimensions. We offer the first series of top disposable income shares that are based on the same measurement approach as the previous pre-tax income shares. The results suggest a strong similarity in the evolution of pre- and post-tax top income shares, which is largely explained by the fact that capital incomes, and especially realized capital gains, are part of both income concepts. During the last decades, top income shares were at low levels in the 1970s and 1980s, but increased rapidly in the 1990s and 2000s due to large increases in top capital incomes. As a token of the size of our new database, we even measure the share of incomes going to the top 100,000th in the population in terms of income, which is the 80–100 highest-earning individuals. Their share increased from about 0.1 (100 times the average income) before 1990 to 0.3–0.6 (300–600 times average income) in the latter part of the period.

The remainder of the paper is organized as follows. Section 3.2 describes the main sources of the database and computation approaches used. Section 3.3 outlines the main results of the income inequality trends, and Section 3.4 presents comparisons between our new series and previous series from Statistics Sweden and other researchers. Finally, Section 3.5 concludes.

[39] We are at this point unable to separate between the relative role of wage compression and equal working hours, but the analysis in Björklund and Freeman (1997) suggests that hours mattered more.

3.2 Database Construction

n this section, we describe the main steps in the construction of our new full-population individual database of income distribution statistics.

3.2.1 Population: Individuals and Households

Up until the 2010s, the official Swedish income distribution data were based on household surveys in the so-called HINK (*Inkomstfördelningsundersökningen*), and later HEK (*Hushållens ekonomi*), surveys. These surveys sampled 10,000–20,000 adult individuals (about 0.2–0.4 percent of the population) and added all household members to the surveyed individuals. Income and tax information was collected from the Swedish tax register. From this, income inequality measures were estimated.

Our database covers everyone registered as living in Sweden, which consists of both citizens and non-citizens. We start out by compiling the full tax and population registers in order to construct homogeneous individual and household populations for each year since 1968. It is crucial to include both tax and population records since otherwise there would be serious coverage gaps for women, children and old-age retirees. Sweden had a relatively low female labor force participation up until the 1980s. In fact, before 1971, most married couples filed taxes jointly and only primary-earners were noted as taxpayers. Children did typically not file taxes before the 1990s when the tax reform changed the rules. Some old-age pensioners with only basic pension income (*folkpension*), were for administrative reasons not recorded as income earners in the tax registers despite receiving taxable pension income. The total Swedish population and its age distribution over the study period is shown in Figure 3.1.

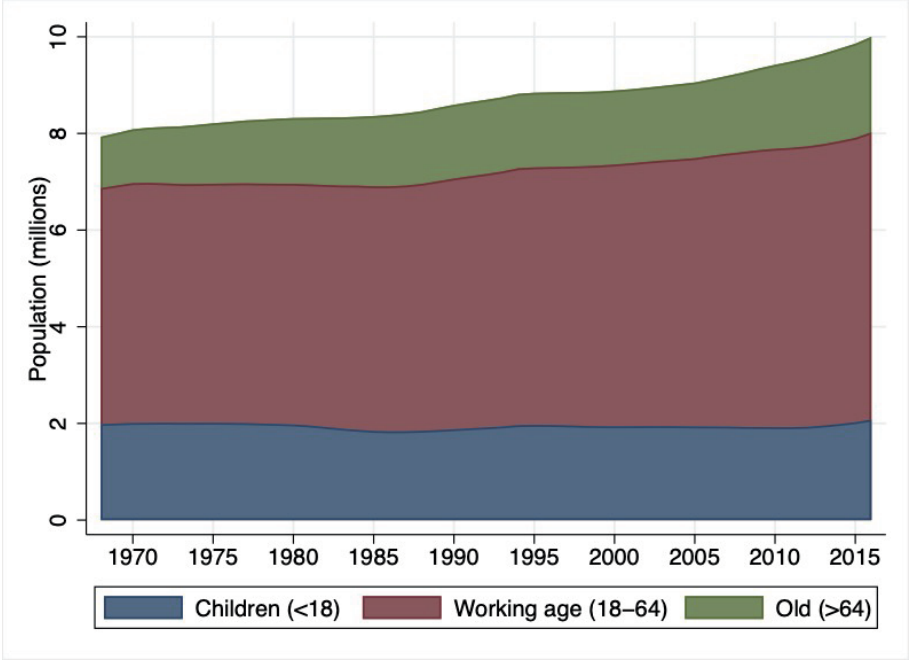

Figure 3.1. Total Individual Population in Sweden, by Age, 1968–2016.

Note: Population data from the total population register (RTB), Censuses (*Folk- och bostadsräkningar*) and complementing household information from the income and tax register (IoT).

A specific contribution is the construction of households over the entire period. In the early decades, only tax-unit households (consisting of married couples, and their children) are directly observed in the registers. In these households non-married couples are treated as separate households, and adult children living at home are treated as a separate household from the parent's household. As such, there are many challenges to constructing households from Swedish administrative registers before 2011, when the current Census-based "dwelling household" (or housekeeping units, basically consisting of all individuals that lives in the same house or apartment) was started being recorded thanks to the new apartment register, and especially before 1998, when a new household concept, the family-unit household (*RTB-familj*), was introduced. The family-unit household has the advantage of also identifying non-married couples with joint children, as well as adult children still living with their parents, within the same household. To improve these household definitions, and to construct a consistent series of both tax- and family-unit households, we use data from the real property register (*Fastighetsregistret*), the multi-generation register (*Flergenerationsregistret*), the population Censuses in 1970, 1975, 1980, 1985, 1990 and 2011, as well as the apartment register (*Lägenhetsregistret*) since 2012. Our preferred household concept is the

family-unit household, since it has the advantages discussed above, and since it is observed over the whole period. In the following series, if nothing else is mentioned, this household definition will be our baseline.

The total number of households as well as the average household size in Sweden between 1968 and 2016 are shown in Figure 3.2. The database consists of 7.9 million individuals and 3.5 households in 1968, and 10.0 million individuals and 5.3 million households in 2016. In total, our dataset includes 428 million observations.

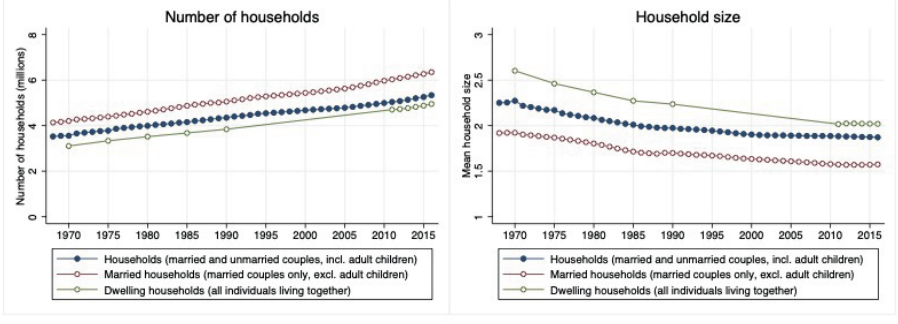

Figure 3.2. Total Swedish Household Population and Mean Household Size.

Note: Population data from the total population register (RTB), Censuses (*Folk- och bostadsräkningar*), the income and tax register (IoT), the real property register (*Fastighetsregistret*), the multi-generation register (*Flergenerationsregistret*) and the apartment register (*Lägenhetsregistret*).

Equivalizing households is common in income distribution analysis and equivalized family households are our primary income-earning unit when analyzing income inequality (we will study adult individuals when doing comparisons with old top-income series, and in future analyses of labor earnings and gender decompositions). The reason to use equivalized households is that scale advantages prevail in household economics, which means that the average incomes of multi-person households are higher than what a simple per-capita adjustment would suggest. When equivalizing household incomes, we use the common square-root equivalence scale, which means that the summed household income is divided by the square root of the number of household members (including children), and we then distribute this income equally to all household members.[40]

[40] We have also used the equivalence scale that Statistics Sweden uses (based on a 2004 household consumption survey analysis), as well as the OECD scale, which consist of somewhat different weightings of children. The results are practically identical to the ones we present. See Figure 3.A1 in the Appendix.

3.2.2 Incomes, Taxes and Transfers

We use data from the Swedish income tax registries to study three main income concepts: i) pre-tax factor income, ii) pre-tax market income, and iii) post-tax-and-transfers disposable income. All of these income concepts include all labor, business and capital incomes. Factor income is total income before all cash-based taxes and transfers, meaning that it also includes social security contributions, but excludes pensions and any benefits (taxable and non-taxable).[41] Market income is pre-tax income after social security contributions, meaning that it instead includes pensions and taxable benefits.[42] Finally, disposable income is income after all taxes, and including any transfers (that is, both taxable and non-taxable benefits).[43] In addition to these three main income concepts, we can also study their different sub-components, such as labor earnings or capital incomes (with or without realized capital gains), separately. The average, per-capita income for our different income concepts are shown in Figure 3.3.

Constructing comparable income concepts from the Swedish micro registries over the period 1968–2016 is difficult. The reason is that incomes are defined according to legal requirements and tax-collection procedures rather than economic principles. The tax reform of 1991 brought several changes with respect to the collection of income micro data. For example, in-kind earnings remunerations (free meals, company car usage) were typically excluded from taxable earnings before 1991 but included thereafter. Realized capital gains were only partially taxable before the reform (long-term holdings were partly or fully exempt) but fully taxable thereafter. Income from owner-occupied housing was imputed in the official income measure before the reform but not afterwards. Income from interest earnings and dividends was not reported separately before 1988, and interest payments were split up and reported together with the different income sources to which they adhered (mortgage rent payments were deducted from housing income, farm loan expenses from farm income, other interest payments from capital income).[44]

There are also gaps in the availability of various register variables during certain periods that need to be addressed. Unemployment and sickness insurance transfers are not reported before 1974. For disposable income, non-taxed benefits are not reported in micro registries prior to 1978 and in subsequent years new benefits are added gradually with a timing that sometimes corresponds more to administrative collection routines than when the benefits in questions were actually introduced. For these components, we collect

[41] Factor income = Capital income + Business income + Wages and salaries + Social security contributions.
[42] Market income = Factor income – Social security contributions + Pensions + Taxable benefits.
[43] Disposable income = Market income – Taxes + Non-taxable benefits.
[44] In future extensions of this work, we plan to examine these definitional changes and their impact on the distributional outcomes.

information about macro sums in the government budget each year. Moreover, in some cases, the statutory rules for allocating these transfers are known. To allocate these components at the individual level, we use the macro sums and statutory rules.

We have thus made a number of adjustments to make incomes comparable over all years in our study period. While we have managed well in most of the major variables, some unresolved issues remain. One problem is the income-definition changes of the 1990–1991 tax reform. This reform extended the definition of taxable income and made previously non-taxed and non-reported benefits from meals and company cars and tax-exempt savings accounts a part of the income tax base. We are in the process of incorporating these pre-reform non-counted components into the incomes. Another case is imputed income from owner-occupied housing which we are in the process of calculating homogeneously over the entire period.

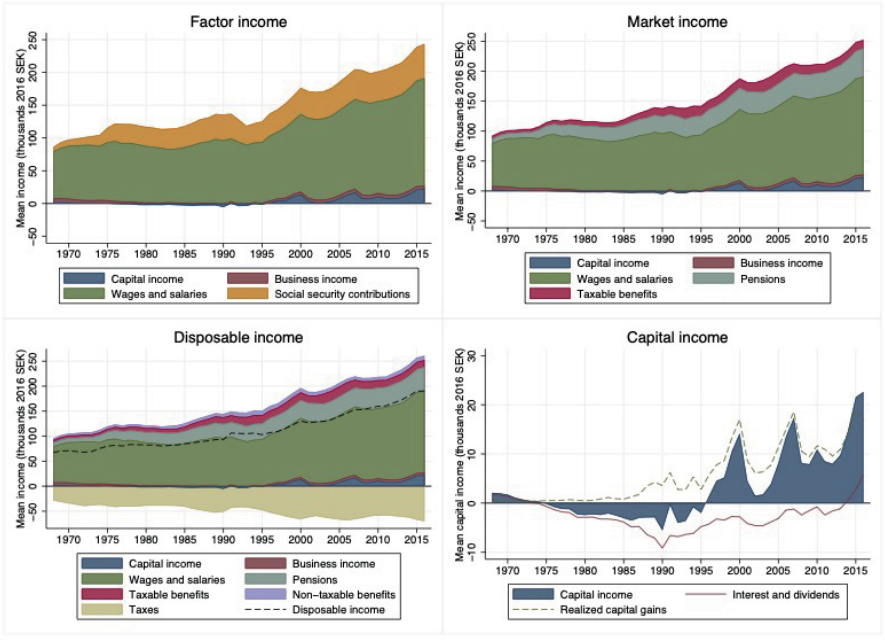

Figure 3.3. Average Incomes in Sweden, 1968-2016.

Note: Income data from the income and tax register (IoT). Total Swedish population averages (per capita). Inflation-adjusted incomes.

3.3 Results

This section presents income inequality trends in Sweden, 1968–2016. We begin with presenting the broad trends for the Gini coefficient among

equivalized family household incomes, for both disposable and pre-tax incomes. We then decompose the Gini coefficients into their different income components. Thereafter, we present results for different top income shares, and their decompositions.

3.3.1 Inequality Trends

Figure 3.4 shows the evolution of the Swedish income distribution measured as the Gini coefficient for disposable income of equivalized family households. This figure shows that Sweden experienced a relatively drastic equalization of incomes from the late 1960s until the early 1980s, with the Gini coefficient dropping ten points, from 28 to 18. The 1980s was a relatively stable period, with the Gini coefficient hovering around 20 over several years. The early 1990s saw a period of economic turmoil, resulting in the profound economic and financial crisis in 1991–1993, during which unemployment increased from two percent to twelve percent over just a couple of years. The Gini coefficient increased somewhat during this era, from 20 to 23–24 Gini points. However, the period from 1995 to 2007 saw the sharpest increase in the Swedish disposable income Gini coefficient of almost ten points, from 23 to 32. From the late 2000s until 2016, the Gini coefficient has been at a stable level a bit above 30 Gini points.

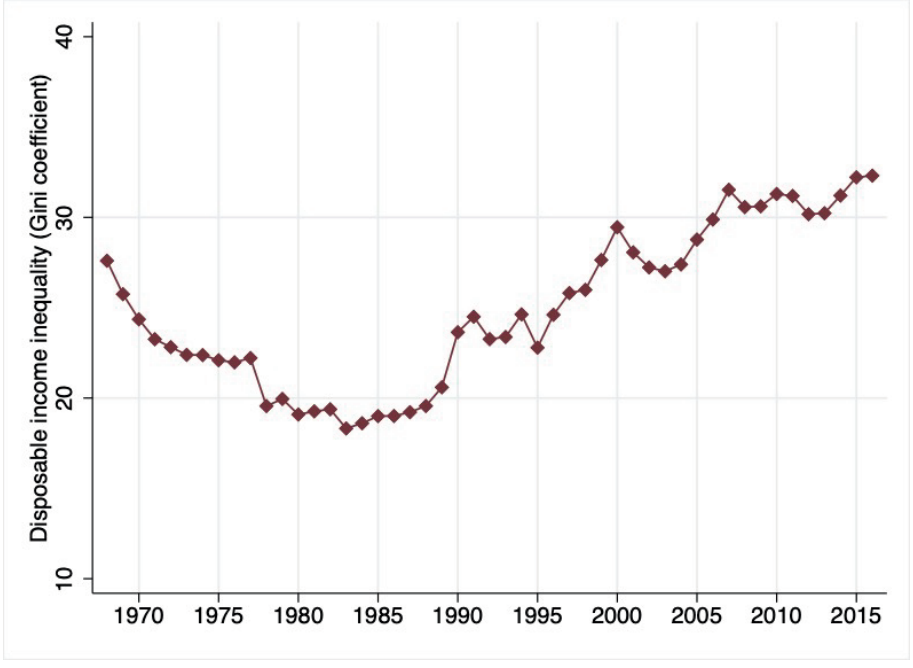

Figure 3.4. Income Inequality in Sweden, 1968–2018.

Note: The figure shows full-population Gini coefficients for equivalized households in Sweden. Disposable income is defined as the sum of pre-tax labor, business and capital income (including realized capital gains) plus all taxed and non-taxed transfers and benefits, minus all personal taxes.

As mentioned above, the computation of households in the Swedish population registers is one of our important contributions when building this new full-population database. Our main household concept consists of families including both adult children living at home and non-married couples with joint children (regardless if their children still live at home or not). Adult individuals would be another possible income-earning unit, which is the main unit in the Swedish tax system and also a unit that is sometimes used in inequality research. Figure 3.5 shows the Gini coefficient for disposable income when adult individuals is used. The level of inequality is markedly higher in the individual distribution during the entire period, which is in line with prior expectations. The difference is relatively large in the 1960s and 1970s when the Gini coefficient for individuals falls more than the Gini coefficients for households, which is partly explained by increased female labor force participation. In Figure 3.5 we also see the difference between using our modern family-household concept compared to the older married-household definition. The level of disposable income inequality is consistently lower for family households, and since the 1990s the difference between the two household definitions is almost as large as that between family households and individuals.

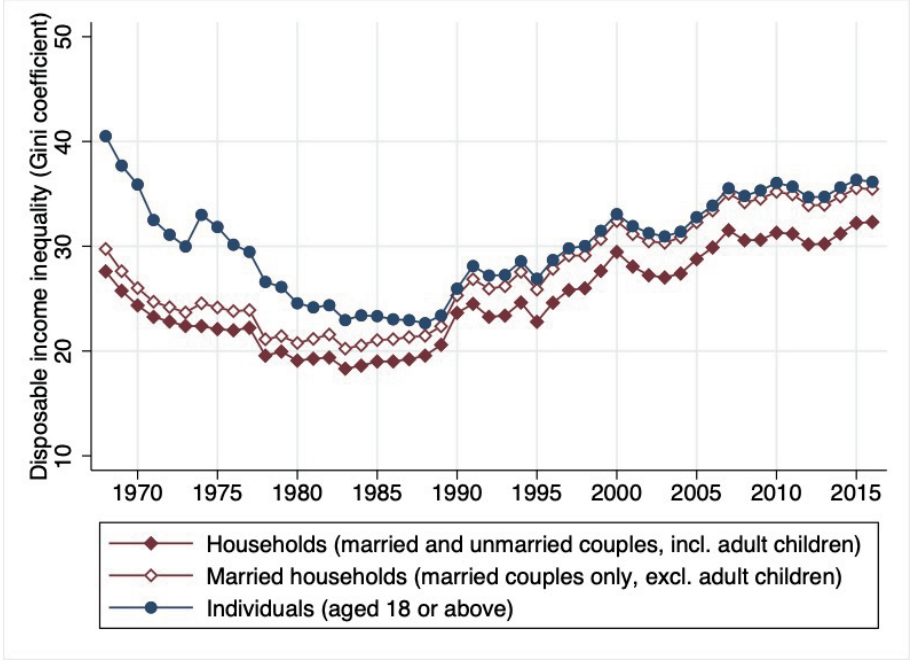

Figure 3.5. Income Inequality in Sweden: Individuals versus Households.

Note: Disposable income is defined as the sum of pre-tax labor, business and capital income (including realized capital gains) plus all taxed and non-taxed transfers and benefits, minus all personal taxes.

Turning to the pre-tax income distribution, Figure 3.6 displays Gini coefficients for our three main income concepts. Factor income is the sum of pre-tax labor earnings, including social security contributions and payroll taxes, business and capital incomes. Market income is the sum of pre-tax labor income, excluding social security contributions and payroll taxes but instead including pensions and taxable benefits, business and capital incomes. Looking at the graph, the trends in the Gini coefficient are quite different across income concepts. The factor-income Gini coefficient increases steadily during the 1970s and the 1980s, but then stabilizes at a high level from the 1990s to the 2010s. The market-income Gini coefficient is relatively flat during the 1970s and 1980s, and then increases gradually from the 1990s to the 2010s. The disposable-income Gini coefficient is lower than both pre-tax income Gini coefficients, but follows a similar trend as the market-income Gini coefficient, even if it exhibits a clearer decrease in the 1970s and a sharper increase in the 1990s and 2000s.

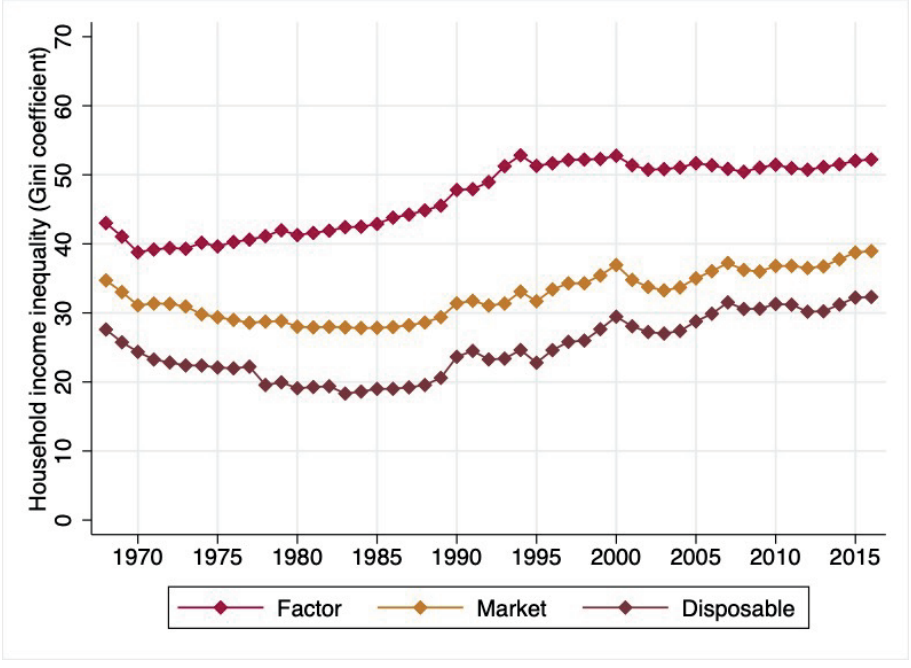

Figure 3.6. Inequality in Three Income Concepts: Factor, Market and Disposable Income.

Note: Factor income is pre-tax labor (including social security contributions and payroll taxes), business and capital incomes. Market income is pre-tax labor (excluding social security contributions and payroll taxes, but including pensions and taxable benefits), business and capital incomes. Disposable income is post-tax market income plus non-taxable benefits.

3.3.2 Gini Coefficient Decompositions

We now turn to decomposing the Gini coefficient into the relative contribution of different income sources (earnings, business and capital income, pensions, taxes and transfers). We use the decomposition methodology of Frick *et al.* (2006) and Lerman and Yitzhaki (1985) and run the analysis on each of the three main income concepts studied above: factor income, market income and disposable income, for the full population of equivalized households. Figure 3.7 shows the factor income decomposition, where the Gini coefficient was increasing during the 1970s and 1980s. The decomposition shows that this increase was driven by labor earnings, mainly through higher social security contributions. The flat inequality level from the early 1990s masks a gradual decline in the contributions of labor earnings, shown in the contributions from both wages and salaries and from social security contributions, and a gradual increase in the contribution from capital income.

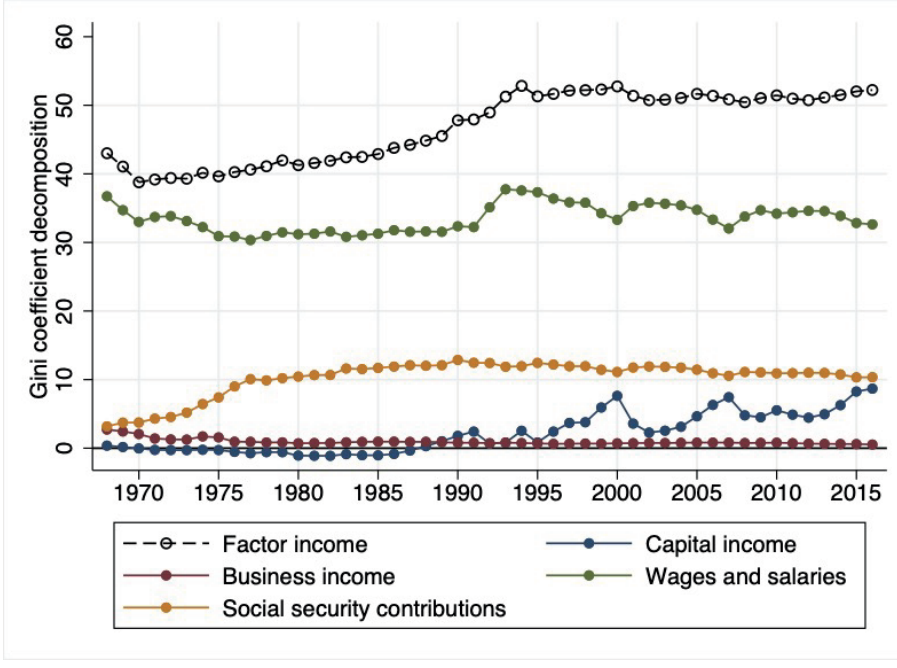

Figure 3.7. Factor Income Inequality Decomposition.

Note: The figure shows decomposition of the Gini coefficient in factor incomes of equivalized households in the full Swedish population using the method of Frick *et al*. (2006).

The market income Gini coefficient decreased in the 1970s and its decomposition in Figure 8 shows that it was mainly due to the contribution from earnings and in the early years also from business incomes. The increase in the Gini coefficient during the 1990s and 2000s are mainly driven by an increasing inequality-contribution from capital incomes, but to a small extent also from labor earnings. Pensions have on average a small contribution to the market income Gini coefficient, but it is interesting to note that it had an equalizing effect in the middle of the 1970s but a clearly disequalizing effect from the 1990s onward. Whether this shift is associated with a higher relative importance of occupational pensions, increasingly in defined-contribution plans, is a question worthy of further inquiry.[45]

[45] See Roine and Waldenström (2012) for an analysis of the role of realized capital gains for Swedish top income shares.

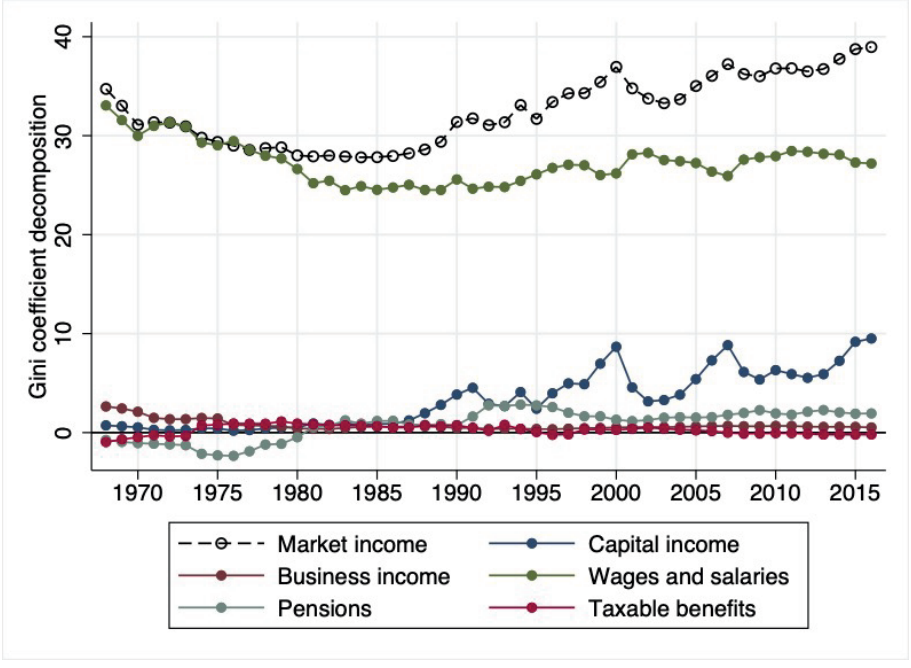

Figure 3.8. Market Income Inequality Decomposition.

Note: he figure shows decomposition of the Gini coefficient in market incomes of equivalized households in the full Swedish population using the method of Frick *et al*. (2006).

The decomposition of the Gini coefficient for disposable income, our main income concept of interest, is shown in Figure 3.9. Its time-series patterns resemble those of the market income Gini coefficient decomposition, with the decreasing trend in the 1970s being largely driven by earnings and business income contributions and the increase in the post-1990 period largely reflecting the contribution from capital incomes. However, in addition to these general trends, Figure 3.9 reveals several other interesting results. One is that the redistribution contribution from income (and some other) taxes has been relatively constant over the entire 50-year period, hovering between a reducing effect on the Gini coefficient between 15 and 20 points. A notable jump in the contribution from taxes on the Gini coefficient is 1991, when it went from reducing the Gini coefficient by 20 points in 1990 to 12–13 points in 1991. This decreasing redistributive effect has been discussed previously, reflecting the intentions of the progressivity-reducing tax reform of 1991 in combination with the large realization of capital gains that are taxed by a flat 30 percent rate, even for high-income earners, instead of a much higher marginal income tax rate in 1990. Another result is the marginal importance of benefits, taxable as well as non-taxable, for the overall disposable income Gini coefficient. Non-taxable benefits are always redistributive, having a negative marginal contribution to the Gini coefficient in all years (although only around 2–3 Gini

points). By contrast, taxable benefits, mainly unemployment and sickness insurance income, has had a slight positive impact on the Gini coefficient in several years and zero effect during several periods. Pensions have also had a small relative contribution, except around the early 1990s when it became notable and positive, raising the Gini coefficient by around five points (at this time the Gini was between 20 and 25).

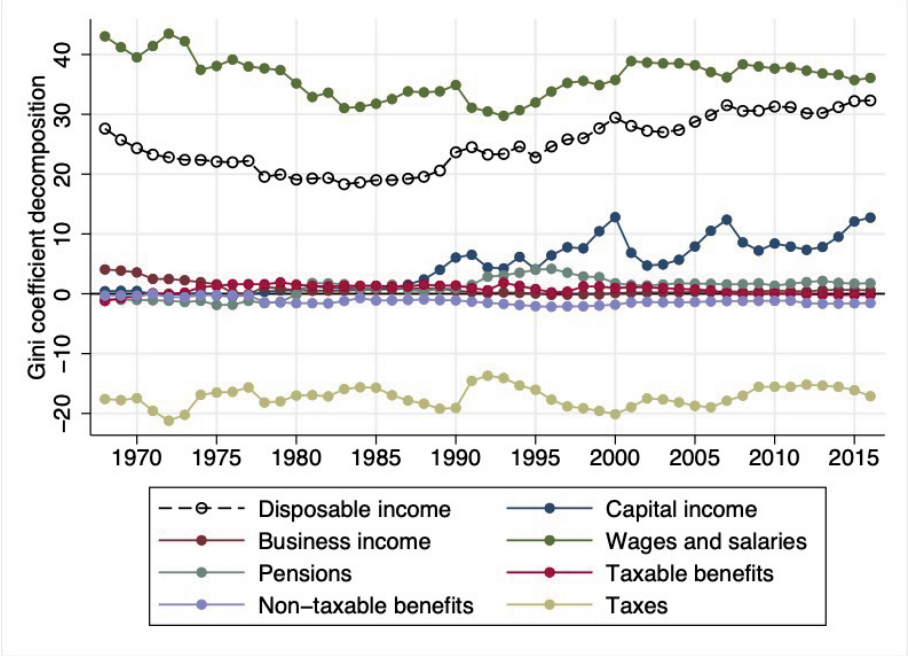

Figure 3.9. Disposable Income Inequality Decomposition.

Note: The figure shows decomposition of the Gini coefficient in disposable incomes of equivalized households in the full Swedish population using the method of Frick *et al*. (2006).

Digging deeper into the different income components, we can also look separately on the role played by realized capital gains as a part of capital incomes. Realized capital gains is sometimes included and sometimes excluded from the income concept in studies of income inequality. However, to include realized capital gains in studied incomes is problematic for several reasons. Most importantly, realized capital gains are highly transitory, reported on tax returns in a single year despite the fact that they often refer to incomes accruing during a longer period. In the case of sales of primary homes, this period can amount to several decades. Compressing such gradual capital gains into a single year's income can result in a boost of the income of households and move them from the bottom or middle of the distribution to its very top during that single year. This results in larger income inequality during single years, and it can also

lead to spurious increasing trends in cross-sectional inequality just because the aggregate amounts of capital gains is increasing.[46]

Figure 3.10 shows the Gini coefficient for pre-tax market incomes when these either exclude or include realized capital gains. The reason for using market incomes at this stage is that subtracting both realized capital gains and the capital income taxes they are associated with is more difficult in the pre-1991 period when all incomes were jointly taxed. We plan to make such calculations in future versions of the paper. The figure shows that realized capital gains have little impact on the pre-tax Gini coefficient in the 1970s and 1980s, which relates to the low overall levels of asset price gains in the housing and financial markets during this period. By contrast, the 1990s, 2000s and 2010s are periods of considerable price increases in asset markets and in aggregate realized capital gains. The pre-tax Gini coefficient is clearly higher during this period when realized capital gains are included, between 2 and 5 Gini points, which roughly represents a 10 percent increase of the Gini coefficient.

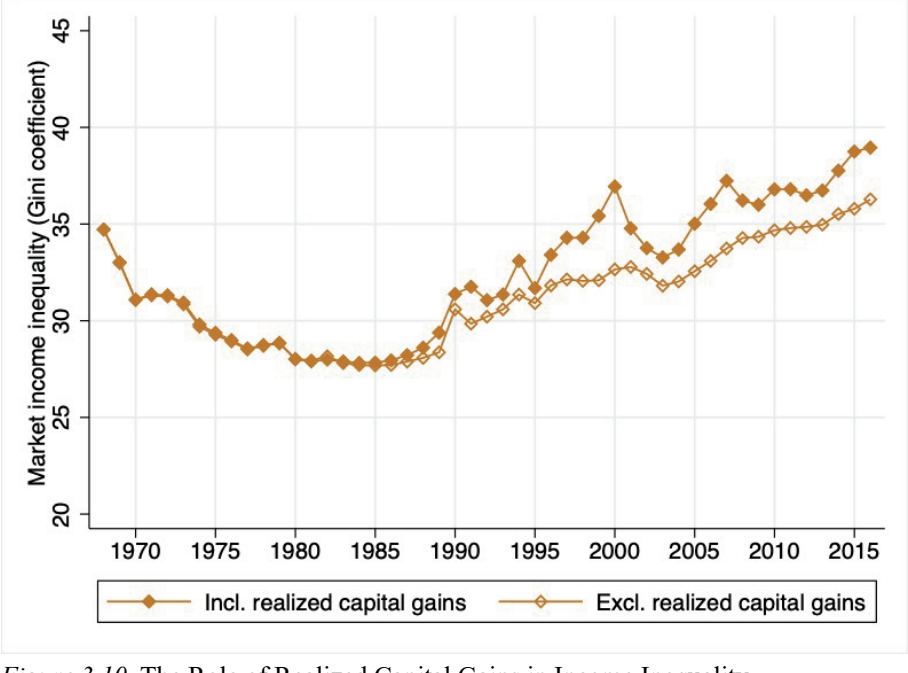

Figure 3.10. The Role of Realized Capital Gains in Income Inequality.

Note: Total pre-tax market income consists of the sum of pre-tax labor, business and capital incomes plus taxed transfers (mainly unemployment and long-term sickness insurance income). The figure is for equivalized family households.

[46] See Roine and Waldenström (2012) for an analysis of the role of realized capital gains for Swedish top income shares.

3.3.3 Top Income Shares

Top income shares reflect a specific aspect of income inequality, namely the share of all incomes going to a certain share of the highest-earning individuals or households. Throughout, we will compute these shares using the population and incomes in our database, which means that the total income reference will be the one contained in the income tax registries, and no further adjustments will be made for exempt incomes such as in-kind incomes or tax-evaded incomes. We will compute new top income shares in the pre-tax income distribution which replicate and extend the series produced by Roine and Waldenström (2008, 2010). We will also present new long-run series of the post-tax and transfer top income shares.

Figure 3.11 displays the income share of the highest-earning top decile displayed for the three pre- and post-tax income concepts reported above: factor income, market income and disposable income. The series exhibit a remarkable similarity in time series trends as the corresponding Gini coefficients in Figure 3.6. All series show flat or falling shares in the 1970s and 1980s, then increasing shares in the 1990s and 2000s, followed by a relatively flat trend in the 2010s. However, the levels are relatively spread out, with almost 10 percentage points differences, where the factor-income top decile goes from 25 percent in the 1980s to almost 35 percent in the 2010s, and the disposable-income top decile share goes from 17 percent to 25 percent over the same years.

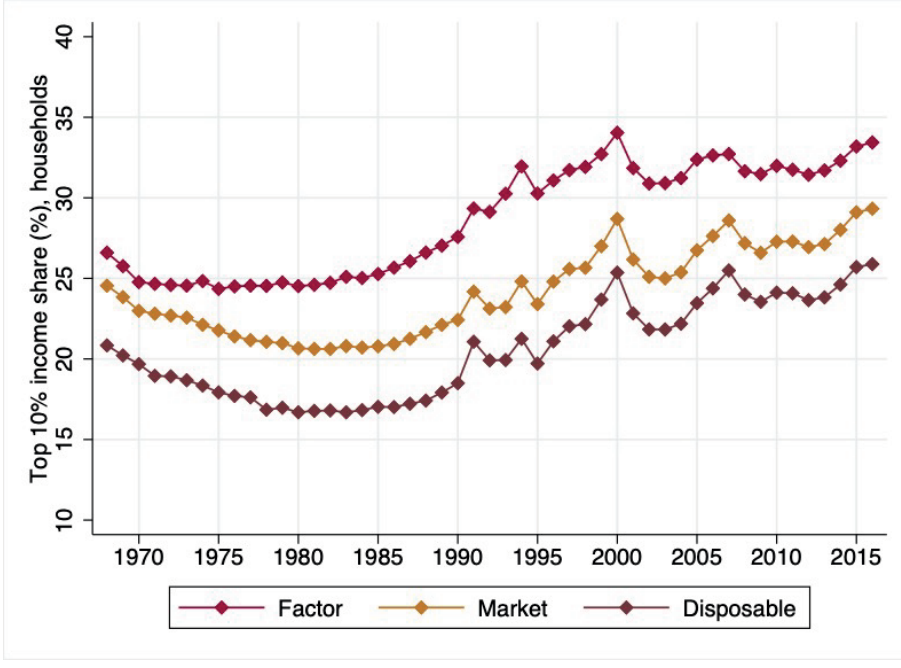

Figure 3.11. Top 10 Percent Income Shares: Pre- and Post-Tax Incomes.

Note: Factor income is pre-tax labor (including social security contributions and payroll taxes), business and capital incomes. Market income is pre-tax labor (excluding social security contributions and payroll taxes, but including pensions and taxable benefits), business and capital incomes. Disposable income is post-tax market income plus non-taxable benefits.

When decomposing the top disposable-income decile in Figure 3.12, we see that labor earnings comprise the major part of incomes in this group. In fact, would one subtract the incomes of the top percentile group, then the share of labor incomes would have been even larger. Capital incomes become increasingly important over time, especially from the late 1990s onward. Taxes have reduced the top share by approximately one-third during the entire study period.[47]

[47] In future versions of this paper, we plan to compute average tax rates for all income groups.

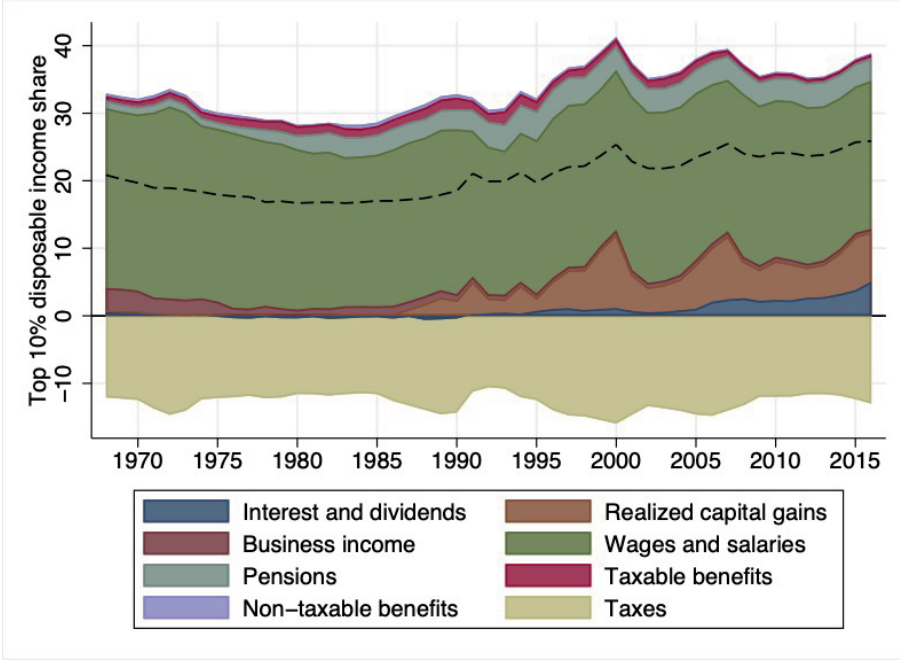

Figure 3.12. Decomposing the Top 10 Percentiles Income Share.

Turning to the top 1 percent share of pre-tax market income and post-tax-and-transfer disposable income in Figure 3.13, the pattern looks broadly similar to the top decile in terms of time-series trends. The income share falls during the 1970s and is almost flat in the 1980s, then jump up sharply in 1991 and thereafter continues to increase. The disposable-income top percentile share was down at three percent in the 1980s and has hovered between six and eight percent during the 2010.

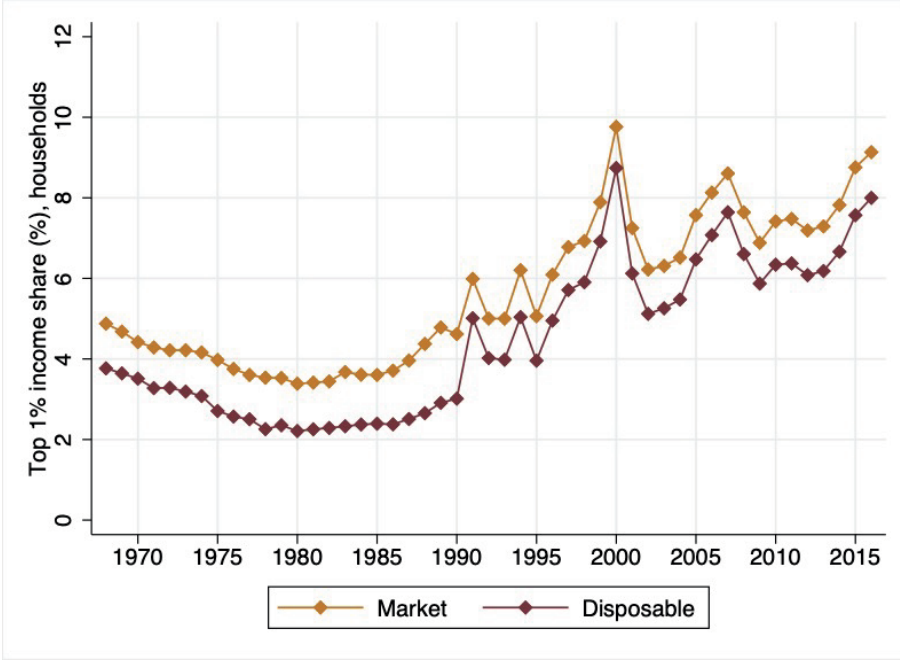

Figure 3.13. Top 1 Percent Income Shares: Pre- and Post-Tax Incomes.

Note: Market income is pre-tax labor (excluding social security contributions and payroll taxes, but including pensions and taxable benefits), business and capital incomes. Disposable income is post-tax market income plus non-taxable benefit.

The composition of the top 1 percentile incomes is shown in Figure 3.14. The most striking difference with the top 10 percent incomes is the substantially larger relative importance of capital income in the top percentile over the recent years. From having comprised less than one-twentieth in the 1970s and 1980s, realized capital gains rose to represent approximately half of all top percentile income from the mid-1990s onward. Interest and dividend income have become increasingly important in the 2010s and represent one-third in 2016, which means that total capital income makes up two thirds of the top 1 percentile income today. The surge in dividend income during the late 2000s and 2010s is related to substantial tax cuts of dividend income in closely held corporations.[48]

[48] For a discussion of the role of the tax changes referring to closely held corporations in 2006, and the possible effects on income shifting from labor to capital income among the owners of these firms, see Alstadsæter and Jacob (2016)).

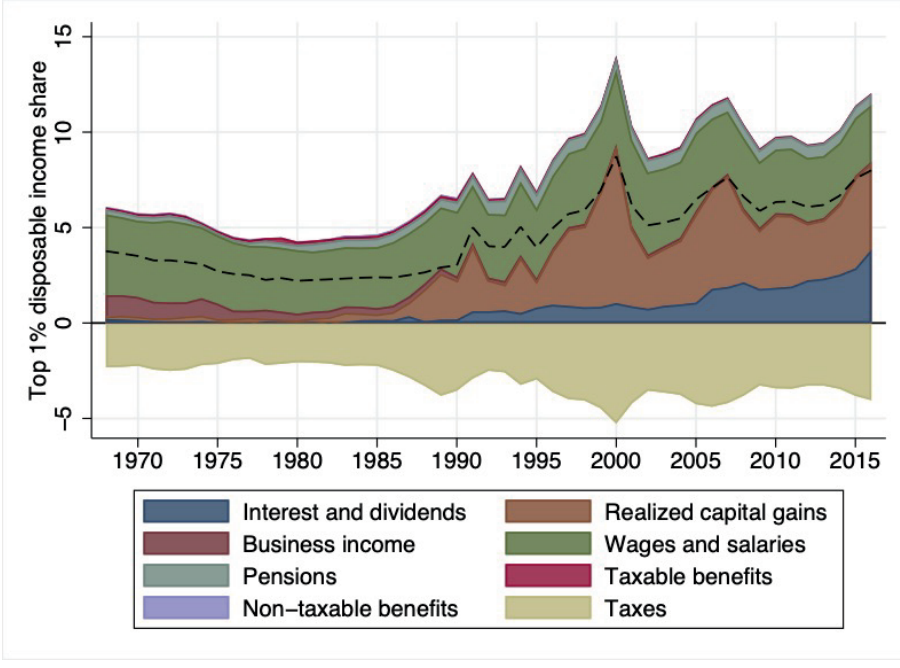

Figure 3.14. Decomposing the Top 1 Percentile Income Share.

Finally, our population-wide data allow us to stretch the measurement of top income shares into the extreme top of the income distribution, the top 0.001 percentile—that is, the top 100,000th of the income distribution. This exclusive group comprises the 80–100 highest-earning individuals in the economy (although not necessarily being the same ones from one year to another), as measured by equivalized household incomes. Figure 3.15 shows an extraordinary increase in the share of incomes going to this small top group. From a share around 0.1 percent in the 1970s and 1980s, the share increased rapidly after 1995 to reach a peak level in the year 2000 of 0.8 percent, which is 800 times the average income and almost 1,000 times the median income. The share has been between 0.3 and 0.6 in the 2010s.

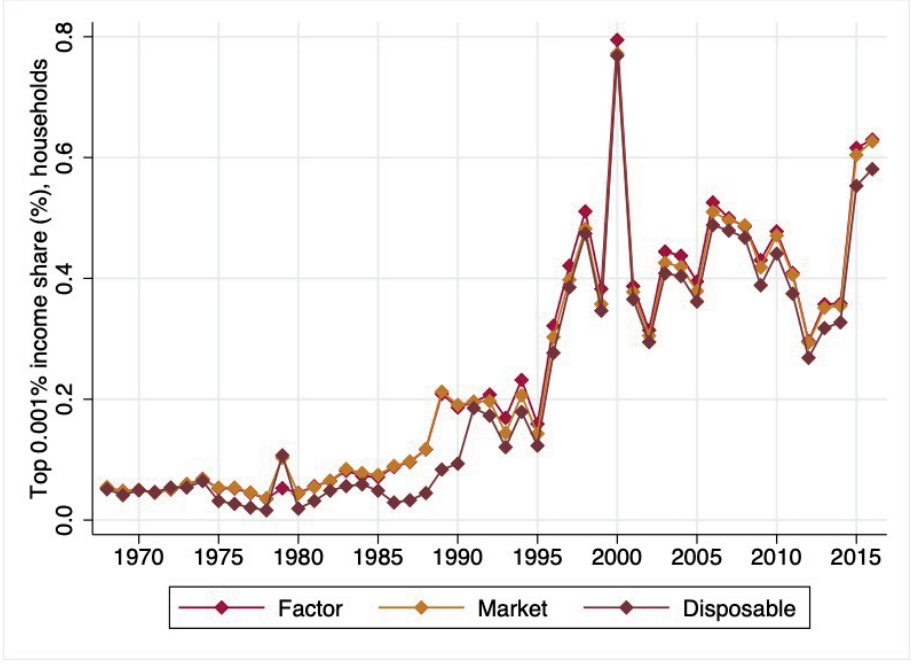

Figure 3.15. Top 0.001 Percent Income Share: Pre- and Post-Tax Incomes.

Note: Factor income is pre-tax labor (including social security contributions and payroll taxes), business and capital incomes. Market income is pre-tax labor (excluding social security contributions and payroll taxes, but including pensions and taxable benefits), business and capital incomes. Disposable income is post-tax market income plus non-taxable benefits.

Looking at the income composition of the top 0.001 percentile group in Figure 3.16, the role of capital income among top income earners is taken to the extreme. Virtually all income in this small group is capital income. Realized capital gains comprise most of this for most years, which indicates that the transitory income component in this group is relatively large. However, dividend income has become notably larger in this top group since the mid-2000s.

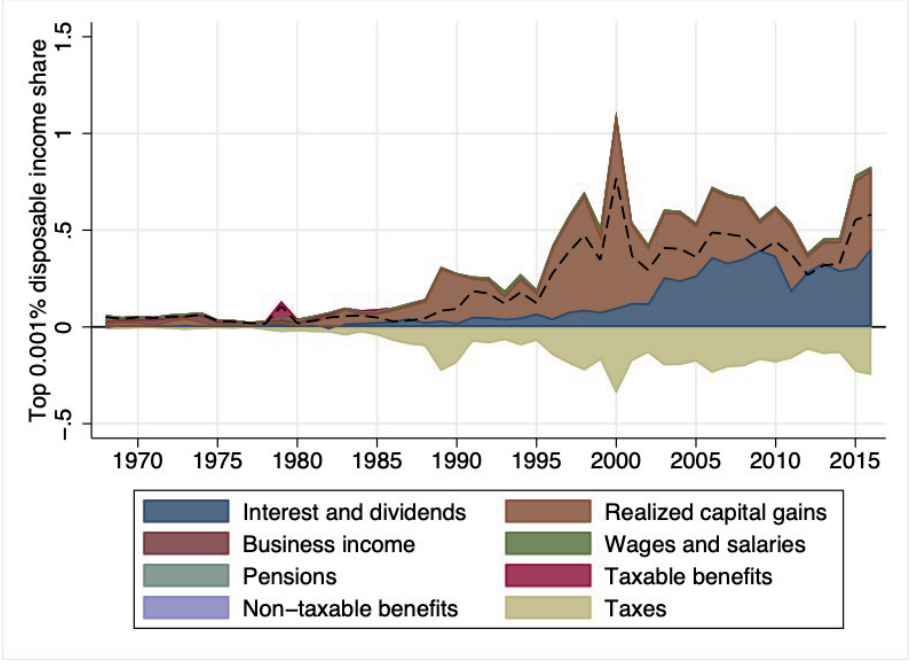

Figure 3.16. Decomposing the Top 0.001 Percentile Income Share.

3.4 Comparison with Previous Series

One important aspect of the analysis of our new income database is how the inequality estimates it produces stand up against the official series of Statistics Sweden (SCB). Over time, different series have been used, mainly depending on the quality of household information. Up until the 2010s, the household survey HINK (*Inkomstfördelningsundersökningen*), later renamed HEK (*Hushållens ekonomi*), was used. This survey used income data from the same registries as we use, but the households were generated from telephone interviews and as a sample, whereas our households are fully register-generated and have full-population coverage.[49] From 2011, Statistics Sweden has used the new apartment register (*Lägenhetsregistret*) to create a full-population income database (*Inkomster och skatter*, IoS). Figure 3.17 compares the disposable-income Gini coefficient for equivalized households in our database with the different series from Statistics Sweden.

[49] For a longer discussion, see Björklund (1998) and Björklund and Jäntti (2019).

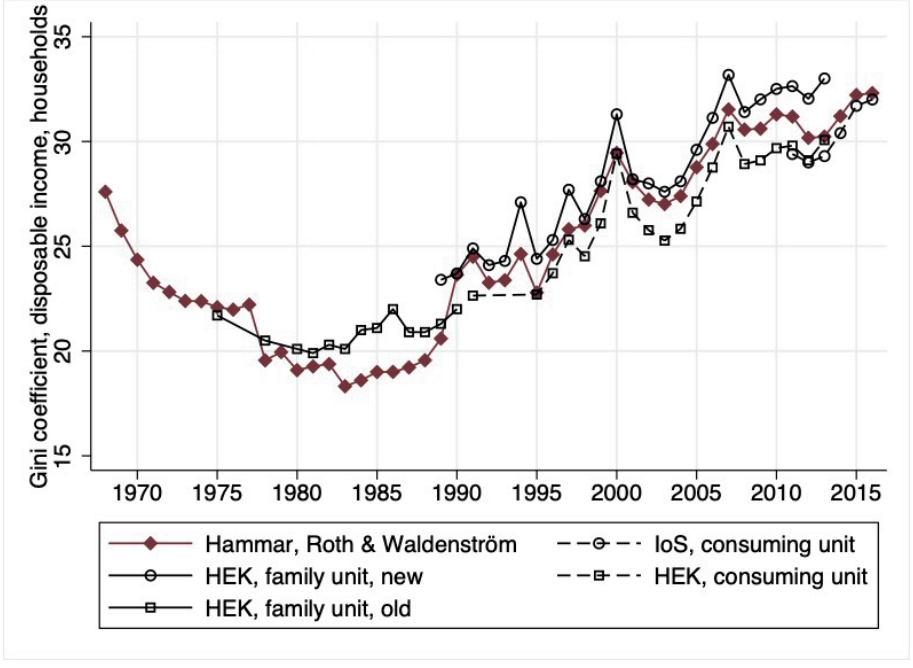

Figure 3.17. Gini Coefficient Comparison with Statistics Sweden.

Note: Gini coefficients showing disposable income inequality for equivalized households. "Hammar, Roth and Waldenström" refers to this study; IoS to *Inkomster och skatter*; and HEK to *Hushållens ekonomi*. The new HEK series includes adjustments for the 1991 tax reform income base broadening. Note that some variation in household definitions and equivalence scales across the different series remain.

The top income share series presented by Roine and Waldenström (2008) covered a long time period stretching back to the beginning of the twentieth century. For this rea- son, the series was based on pre-tax incomes excluding most transfers and allowances in the redistributive system. Furthermore, the nature of the historical data was such that household adjustments were not possible to any greater extent, and the postwar statis- tics underlying their data was individual-based, which implied that their top income shares was also based on individuals. The top income shares of Roine and Waldenström were also not based on microdata, but tabulated distributions with income thresholds that did seldom match the exact percentile shares of interest. For this reason, top in- come shares were generally interpolated using Pareto interpolation.

In Figure 3.18, we compare the series of Roine and Waldenström (2008) with our new series. We select our top share of pre-tax market incomes among adult individuals and the incomes including realized capital gains. The comparison shows a great deal of congruence, with both levels and trends closely matching each other across the two sources. There is a tendency of an overestimation of post-1990 top income shares by Roine and Waldenström, but the difference is small.

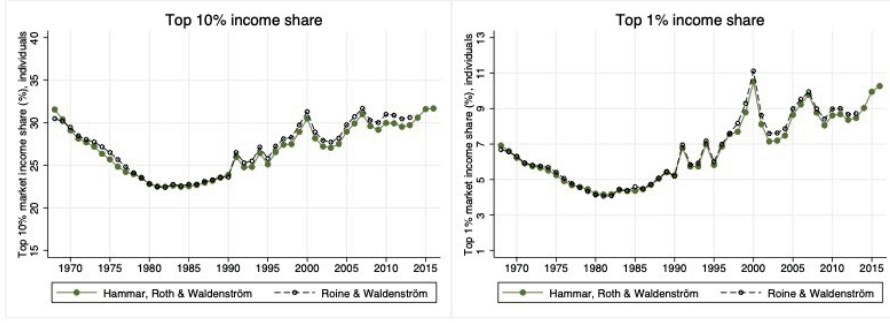

Figure 3.18. Top Income Share Comparison.

Note: "Hammar, Roth and Waldenström" denotes data from this paper; and "Roine and Waldenström" denotes data from Roine and Waldenström (2008) and later updates.

3.5 Conclusions

The main contribution of this paper is the presentation of a new population-wide database on incomes, taxes and transfers in Sweden that spans the recent five decades, 1968– 2016. This database extends the existing Swedish income inequality statistics in several dimensions. We add over four decades of full-population inequality estimates, the late 1960s through the early 2010s, to the current survey-population estimates. We pre- date the initial year of inequality estimates from 1975 to 1968. We present annual data from 1968 instead of 1980 as in the current survey-based statistics. In addition to this, our database will contain more consistent income variables than the current inequality datasets offer.

As the analysis is preliminary because of the need for some additional adjustments in the data, the results of the series presented here should be interpreted with caution. Having said this, we conclude that our new series do not change the overall trends and inequality patterns found in the official series of Statistics Sweden. We find that the trends in disposable-income inequality exhibited lower levels in the 1970s and 1980s than they do today, but also that the level of inequality has been almost trendless during the 2010s. Our data allow us to look into the very top of the distribution, and there we find that income shares relative the rest of the population have trended upwards, but also that virtually all of the incomes among these groups is made of capital returns. Further analyses are needed to gain a deeper understanding of these patterns and the forces that underlie them. We intend to pursue such analysis in future work.

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Appendix 3.A

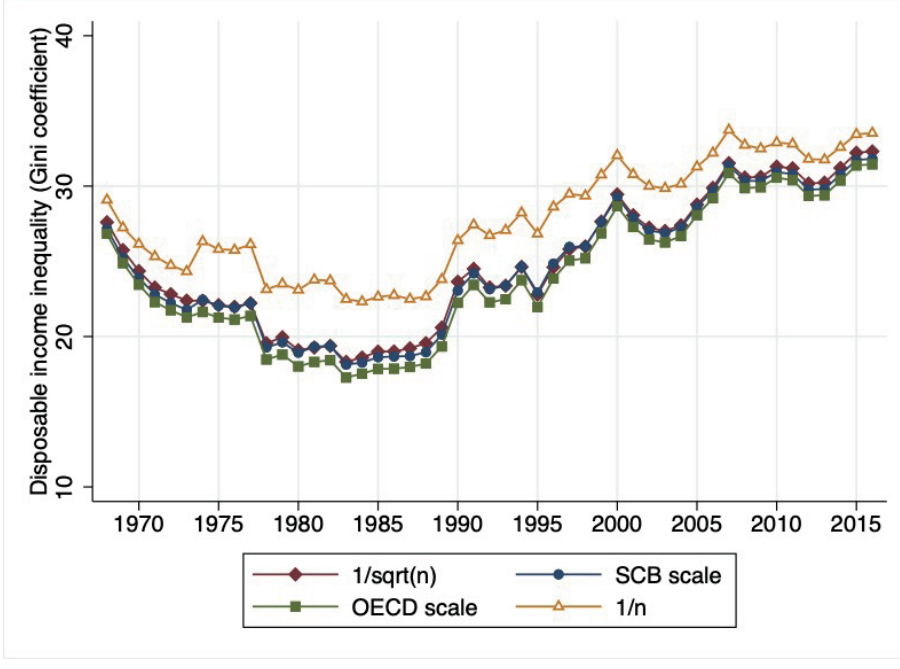

Figure 3.A1. Comparing Different Household Equivalence Scales.

4. The Impact of Social Beliefs on Microfinance Performance

with Katarzyna Burzynska

Published 2015 in *Journal of International Development*, vol. 27(7), pp. 1074–1097.

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4.1 Introduction

Since the late 1980s, *microfinance institutions* (MFIs) have developed as a key way to solve the financial exclusion problem of poor people in developing countries, and the so-called "microfinance revolution" quickly gained popularity around the world.[50] Both theory and empirical studies suggest that financial exclusion can hamper economic development and lead to persistent income inequality (Banerjee and Newman, 1993; Ray, 1998). The major advantage of MFIs is thus to ensure easier access to credit services through the offering of small loans without monetary or physical collateral demands. Nevertheless, there is a substantial variation between countries in terms of the success and performance of MFIs (Armendáriz and Morduch, 2010; Cull *et al*., 2007).

Various cross-country studies have attempted to explain the uneven microfinance performances by differences in economic and organisational indicators, such as MFIs' legal status, regulation and corporate governance (Cull *et al*., 2011; Hartarska and Nadolnyak, 2007; Mersland and Strøm, 2009; Roberts, 2013). More recently, microfinance studies also started to take the impact of formal institutional arrangements into account. These studies suggest that MFIs may perform better in countries where the traditional financial system is underdeveloped (Vanroose and D'Espallier, 2013) and where formal institutions are weak (Ahlin *et al*., 2011).

We take the analysis one step further and shift attention to informal arrangements. Because MFIs imitate informal lending practices and rely strongly on personalised interactions and communal norms, their operations should be deeply embedded in a country's social and cultural context (Epstein and Yuthas, 2011). Through the use of group lending and social collateral, microfinance is therefore likely to rely more on informal institutions such as trust rather than on the formal institutional environment. Building on this informal institutional perspective, we examine the role of social beliefs on MFIs' operational and financial performance across countries. To our knowledge, this study provides the first large cross-country analysis of the impact of social beliefs on microfinance performance.

For the purpose of this study, we construct a dataset of 311 MFIs located in 37 countries based on the information provided by the *Microfinance Information Exchange* (MIX, 2012), which we complement with survey data on trust from the *World Values Survey* (WVS, 2012) and the *Global Barometer Surveys* (GBS, 2009) as well as the individualism versus collectivism index developed by Hofstede, Hofstede and Minkov (2010). To distinguish the impact of social beliefs from that of other factors, we select a large set of control variables based on previous studies and theoretical considerations.

[50] From 2000 to 2011, the total number of MFIs increased from 218 to 1529, and the number of active borrowers increased from 9 million to 98 million according to the MIX Market database (MIX, 2012).

We find evidence in support of our hypothesis that social beliefs affect MFIs' financial performance. Our results show that MFIs in countries with higher levels of trust have significantly lower default risks and charge lower interest rates. Moreover, a higher degree of collectivist cultural values is associated with significantly lower costs per borrower and costs per dollar loaned. Ancillary tests indicate that while the effect of collectivism is most significant for smaller MFIs, the positive correlation between trust and MFI financial performance holds for MFIs of all sizes.

The remainder of this paper proceeds as follows. In Chapter 4.2, we explain the relationship between MFI performance and social beliefs and develop our hypotheses. In Chapter 4.3, we describe the dataset and discuss the choice of variables. In Chapter 4.4, we present the methodology. In Chapter 4.5, we report the results on the relationship between MFI performance and social beliefs. Finally, Chapter 4.6 concludes the paper.

4.2 Microfinance and Social Beliefs

The idea that informal institutions, such as culture, customs, beliefs, norms and religion, affect organisational performance is strongly supported by a wide range of theoretical and empirical studies (Ménard and Shirley, 2005; Williamson, 1998). In our paper, we focus particularly on trust and collectivist cultural norms. Microfinance lending schemes rely on collective action, cooperation and coordination for mutual benefit, all of which depend strongly on reciprocity and trust (Beilmann and Realo, 2012). We therefore conjecture that the level of trust as well as the degree of collectivist cultural norms, as features of communities and nations, should have a pivotal role in the development and performance of microfinance.

4.2.1 Trust

Trust plays an important role in any type of financial exchange, and while formal contracts and legal regulations can serve as its substitute, they come at the expense of transaction costs (Howorth and Moro, 2012). Because trust is present at multiple levels of interactions within microfinance relationships, both between borrowers and between borrowers and loan officers, its amount can critically affect the outcomes (Epstein and Yuthas, 2011). MFIs can use trust to minimise the need for formal contracts and regulations and to serve as an alternative control mechanism. This allows an MFI to save money and resources on transaction and monitoring costs, to provide lower interest rates and, eventually, to fulfil its mission to offer financial services to the poorest and most disadvantaged clients.

Moreover, microfinance repayment relies on joint liability, social connections, informal networks and other features of informal group lending

schemes, implying that MFIs operate in a credit market that relies on credible promises instead of formal collateral. Trust and social collateral, which encompasses borrowers' reputation and the social networks to which they belong, can solve problems of imperfect information and credible commitment (Karlan *et al*., 2009; Keefer and Knack, 2005). Peer pressure, joint liability and the threat of social sanctions can decrease the risks of opportunistic behaviour by contracting parties, while social connections between borrowers promote savings in screening and mutual monitoring (Bastelaer and Leathers, 2006). Consequently, the higher the level of trust, the better the MFI performance should be.

Epstein and Yuthas (2011) develop a theoretical model that incorporates trust as an important determinant of MFI performance. The positive impact of higher levels of trust on MFI performance is explained by three main mechanisms. First, trust motivates borrowing group members to cooperate and to share information and resources, which increases loan repayment (Bastelaer and Leathers, 2006; Karlan, 2007). Second, trust improves the sustainability of borrowing groups over time, thus decreasing the risk of default (McEvily *et al*., 2003). Third, trust is necessary in order to form the relationship between loan officers and clients and for loan officers to obtain important information from clients, which in turn allows loan officers to charge lower interest rates (Uchida *et al*., 2012).

Previous experimental and country-specific micro-level studies also suggest that social ties can reduce moral hazard behaviour within groups (e.g. Hermes *et al*., 2005, in Eritrea) and that clients with stronger social connections, a similar culture and higher trust tend to have higher repayment rates (Al-Azzam *et al*., 2012, in Jordan; Bastelaer and Leathers, 2006, in Zambia; Cassar *et al*., 2007, in South Africa and Armenia; Karlan, 2007, in Peru). If such relationships exist on the micro level, there is reason to believe that they should also be decisive in explaining variation in cross-country comparisons of organisational performance.

Given the discussed benefits of higher trust, we propose the following hypothesis:

Hypothesis 1. The higher a country's level of trust:
(a) the higher its MFI repayment rates,
(b) the lower its MFI costs and
(c) the lower its MFI interest rates.

4.2.2 Collectivist Cultural Norms

Another important dimension of social beliefs is that of cultural variation, particularly the aspect of collectivist versus individualist cultural norms (Markus and Kitayama, 1991). In more collectivist societies, individuals are more willing to subordinate their personal goals to collective ones and regard

themselves as strongly connected with other members of the group. In contrast, individuals in more individualistic societies see each other as autonomous beings pursuing their personal goals (Oyserman *et al*., 2002).

The sociocultural environment in which MFIs operate, which includes obligations, expectations, norms and self-imposed rules of conduct, can influence financial management and the choice of guarantors, thus affecting MFI lending practices. In a highly collectivist country, where obligations to the well-being of the extended family and kinship network are valued higher than the individual's private benefit, group welfare is part of the individual member's self-identity and reputation. As such, individuals in more collectivist countries not only work hard to repay their own debts but also encourage other group members to do the same (Gould, 2010).

Moreover, compared with individualist societies, collectivist societies rely more on informal institutions, which can allow MFIs to take better advantage of the existing informal environment. Collectivist cultural norms enhance the group's ability to use the threat of non-financial social and moral sanctions against the individual group member, which in turn should reduce moral hazard and lead to lower default rates in repayment (Greif, 1994). With improved peer monitoring and the increased effectiveness of peer pressure as an enforcement mechanism, MFIs in collectivist societies should be able to achieve higher repayment rates, reduce operating costs and charge lower interest rates. This is also supported by a comparative study of microfinance in Bangladesh and the USA, in which Gould (2010) attributes the relative success of Bangladeshi MFIs to their reliance on collectivist cultural norms, which are stronger in Bangladesh compared with the USA.

Our second hypothesis is therefore the following:

Hypothesis 2. The higher a country's degree of collectivist cultural norms:
(a) the higher its MFI repayment rates,
(b) the lower its MFI costs and
(c) the lower its MFI interest rates.

4.3 Data

4.3.1 Microfinance Institution Data

Our MFI performance data come from the MIX Market database (2012). The MIX Market reports data from approximately 2000 MFIs from more than 100 countries. We focus on the period 2003–2011 and match these data with the available information on social beliefs. Because of concerns about the reliability of self-reported data such as that provided by the MIX Market, we decide to base our study on MFI reports that are audited by a third party and to

only include observations that correspond to a calendar-year fiscal year (as in Ahlin *et al*., 2011). Moreover, we require each institution to be exclusively focused on microfinance, that is, the percentage of its operations composed of microfinance to be 80% or higher. Finally, in our analysis, we only include observations of the dependent variables that are available for at least four consecutive years. In all, this leaves us with 331 MFIs from 37 countries with available information on both social beliefs and MFI performance.

Because our results are conditioned on MFIs that have reported their performance to the MIX Market, we cannot make inference about MFIs that are not included in this sample. Nonetheless, the MIX Market is considered the largest online database of MFIs, and it is widely used in the microfinance literature (Cull *et al*., 2011; Roberts, 2013; Vanroose and D'Espallier, 2013). The summary statistics presented in Table 4.1 indicate that the MFIs included in our sample are very comparable with those included in the study by, for example, Ahlin, Lin and Maio (2011) in terms of MFI characteristics. Because large MFIs might, however, be overrepresented in the MIX Market database (Mersland and Strøm, 2009), we also investigate subsamples based on MFI size.

Table 4.1. *Summary Statistics of MFI Variables Used in the Study.*

Variable	*N*	Mean	SD	P25	Median	P75
Average interest rate	1,514	0.40	0.24	0.27	0.35	0.47
Cost per dollar loaned	1,513	0.28	0.25	0.13	0.21	0.34
PAR30	1,464	0.07	0.09	0.02	0.05	0.08
Cost per borrower	1,513	414.68	852.49	129.66	247.01	451.93
Average loan size	1,524	2,623.67	8,205.80	450.15	1,012.56	2,818.66
Age	1,524	15.27	8.54	9.00	14.00	20.00
Borrowers $_{t-1}$ (1,000s)	1,524	142.61	738.99	3.18	11.57	38.62
Assets per loan $_{t-1}$	1,521	1.55	4.02	1.14	1.25	1.44
Bank	1,524	0.09	0.29	0.00	0.00	0.00
Credit union/cooperative	1,524	0.11	0.31	0.00	0.00	0.00
NBFI	1,524	0.31	0.46	0.00	0.00	1.00
NGO	1,524	0.44	0.50	0.00	0.00	1.00
Rural bank	1,524	0.04	0.19	0.00	0.00	0.00

Note: The sample consists of data from 331 MFIs in 37 countries. We require each MFI in our sample to have at least 80% of its operations composed of microfinance.

Our sample coverage is not geographically balanced, which relates to the fact that MFIs are mostly active in developing countries with relatively low levels of financial and economic development.[51] Nevertheless, there is a fair degree of variation between those countries, not only in terms of social beliefs but

[51] The regional distribution of our sample coverage includes 13 countries from Latin America and the Caribbean, 9 countries from Africa, 4 countries from East Asia and the Pacific, 4 countries from Eastern Europe and Central Asia, 4 countries from Middle East and North Africa, and 3 counties from South Asia (see Table 4.A1 in the Appendix).

also in terms of economic and financial development. These countries range from Ethiopia, with a *gross domestic product* (GDP) per capita of 341 US dollars in 2010, to Chile, with a GDP per capita of 12,671 US dollars. Zambia has the lowest level of financial development, with domestic credit to the private sector at 12% of GDP in 2010, while China ranks at the top, with domestic credit to the private sector at 130% of GDP.

Because social beliefs are hypothesised to facilitate MFI transactions by raising repayment rates and reducing costs to both lenders and borrowers, our main dependent variables are the commonly used drivers of MFI financial performance, namely the average interest rate, cost per borrower, cost per dollar loaned and portfolio at risk. Following Ahlin, Lin and Maio (2011), we calculate the average interest rate as the ratio of financial revenue to the average gross loan portfolio, and we calculate the cost per borrower as the ratio of operating expenses to the average number of active borrowers.[52] As an indicator of default problems, we use the standard international measure of portfolio quality, that is, *portfolio at risk* (PAR30), which is the fraction of the loan portfolio overdue for more than 30 days.

Following Ahlin, Lin and Maio (2011), we control for the following MFI-specific characteristics: age, institutional type, and size decomposed into the number of active borrowers, the average loan size and the ratio of assets to loans.[53] Table 4.1 presents the summary statistics of the MFI variables used in the analysis. In total, we consider 331 MFIs, of which 44% are operating under *non-governmental organisation* (NGO) status, 31% are registered as *non-bank financial institutions* (NBFIs), 11% as cooperatives or credit unions, 9% as commercial banks and 4% as rural banks. To evaluate the representativeness of this sample, we compare it with the broader sample used by Ahlin, Lin and Maio (2011). With median MFI having an average loan size of 1,013 dollars and charging an average interest rate of 35%, we find our sample very similar.

4.3.2 Social Beliefs

Our two key measures of social beliefs are trust and the value of collectivism relative to individualism in a society. The most common measure of trust applied in cross-country studies is based on the standard survey question "*Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?*" and uses the percentage of people who answer, "*most people can be trusted*" as an indicator of the

[52] We recalculate the cost per borrower in constant 2005 international dollars per borrower in constant 2005 international dollars.

[53] All MFI size controls (i.e. the average loan size, assets to loans ratio and number of active borrowers) are converted to natural logarithms.

country's general level of trust.[54] The three latest waves of the WVS (2012) covers the period 1995–2008 and provides information on 44 countries matching our MFI data, while the GBS (2009) provide data on 24 additional countries over the period 1995–2010.[55] The data are matched with available information on collectivism, which leaves us with 37 countries. Within this sample, the countries with the highest levels of trust are China (with an average trust score of 56%), Pakistan (40%), Vietnam (39%) and Jordan (32%), while Brazil (7%), the Philippines (10%), Kenya (10%) and Tanzania (11%) are the countries with the lowest trust scores (see Table 4.A1 in the Appendix).

We base our indicator of the collectivism versus individualism cultural dimension on the survey-based *individualism index* (IDV) developed by Hofstede, Hofstede and Minkov (2010). This individualism index is the most commonly used measure of collectivism and has been validated in a number of studies (e.g. Chui *et al*., 2010; Weber *et al*., 1996). The original index takes values from 0 to 100, where a high value indicates a high degree of individualism and a low value indicates a high degree of collectivism. For the convenience of easier interpretation of the results, we subtract the IDV's original values from 100 such that a high value indicates a high degree of collectivism and a low value indicates a high degree of individualism. Within our sample, the countries characterised by the highest collectivism values are Guatemala (with a collectivist score of 94 points), Ecuador (92 points), Panama (89 points) and Colombia (87 points), while Argentina (54 points), Lebanon (60 points), Russia (61 points) and Brazil (62 points) are the most individualist ones (see Table 4.A1 in the Appendix).

The summary statistics of the social beliefs variables are presented in Table 4.2, together with the description of the other country-specific variables used in the analysis.

[54] We calculate the average trust scores when scores from more than one survey are available. As an alternative measure, we also use the latest available score for each country. This alternative measure is correlated with the average measure at 87% and gives very similar results.

[55] The GBS (2009) database includes the Latinobarómetro (2012), the Afrobarometer (2009), the AsiaBarometer (2012), the East Asian Barometer (2009) and the Arab Barometer (2007). The surveys ask the same question as the WVS (2012) to approximately the same number of individuals in each country.

Table 4.2. *Social Beliefs and Descriptions of Country-Specific Variables.*

Variable	*N*	Mean	SD	P25	Median	P75	Min	Max
Trust level	1,524	0.21	0.08	0.15	0.21	0.25	0.07	0.56
Collectivism	1,524	80.00	9.00	70.00	81.00	86.00	54.00	94.00
Rule of law	1,524	–0 .57	0.44	–0.86	–0.61	–0.39	–1.43	1.31
Control of corruption	1,524	–0.46	0.41	–0.79	–0.49	–0.24	–1.49	1.50
Regulatory quality	1,524	–0.14	0.52	–0.43	–0.13	0.26	–1.32	1.54
Government effectiveness	1,524	–0.30	0.36	–0.58	–0.29	–0.02	–0.97	1.27
Political stability	1,524	–0.69	0.68	–0.99	–0.74	–0.15	–2.73	0.86
Ethnic fractionalisation	1,524	0.48	0.21	0.24	0.54	0.66	0.05	0.86
Language fractionalisation	1,459	0.32	0.29	0.06	0.24	0.46	0.02	0.90
GDP growth	1,524	0.03	0.03	0.01	0.04	0.06	–0.08	0.14
Laborforce	1,524	0.68	0.08	0.65	0.69	0.73	0.42	0.91
Manufacturing	1,524	0.17	0.05	0.14	0.17	0.20	0.03	0.33
Private credit	1,524	0.36	0.21	0.24	0.29	0.43	0.08	1.30
GDP per capita $_{t-1}$	1,524	6.06	3.36	3.36	6.10	7.97	0.53	14.77
Unfree dummy	1,524	0.60	0.49	0.00	1.00	1.00	0.00	1.00
Colony dummy	1,524	0.84	0.37	1.00	1.00	1.00	0.00	1.00
Low income	1,524	0.07	0.25	0.00	0.00	0.00	0.00	1.00
Lower-middle income	1,524	0.38	0.49	0.00	0.00	1.00	0.00	1.00
Upper-middle income	1,524	0.55	0.50	0.00	1.00	1.00	0.00	1.00
Agriculture	1,524	0.12	0.08	0.07	0.08	0.14	0.03	0.48
Services	1,524	0.56	0.08	0.54	0.57	0.60	0.24	0.81
FDI	1,524	0.04	0.04	0.02	0.03	0.05	–0.00	0.31
Inflation	1,508	0.06	0.05	0.03	0.05	0.08	–0.01	0.51
Population below poverty line	1,517	0.28	0.21	0.15	0.17	0.43	0.01	0.90
Settler mortality	1,278	4.47	0.53	4.26	4.26	4.36	3.26	7.60
English legal origin	1,524	0.13	0.34	0.00	0.00	0.00	0.00	1.00
French legal origin	1,524	0.77	0.42	1.00	1.00	1.00	0.00	1.00
Socialist legal origin	1,524	0.09	0.29	0.00	0.00	0.00	0.00	1.00
Catholic	1,524	64.21	41.31	6.80	91.60	95.80	0.00	96.60
Muslim	1,524	14.39	29.19	0.00	0.10	7.20	0.00	99.40
Protestant	1,524	3.83	5.80	0.90	2.40	3.80	0.00	31.90
Other religions	1,524	17.57	27.91	1.70	3.70	17.80	0.40	97.60

Note: The sample consists of data from 37 countries. We require each country in our sample to have a score on trust and collectivism.

4.3.3 Country-Specific Variables

In addition to social beliefs and MFI characteristics, we explore a large number of other variables used in the literature to explain cross-country variation in MFI performance.

Existing empirical research on MFIs suggests that their financial performance is related to the macroeconomic and institutional environment in which they operate (Ahlin *et al*. 2011). We use per capita economic growth and GDP per capita to account for a country's economic situation (as in Ahlin *et al*., 2011; Hartarska and Nadolnyak, 2007; Mersland *et al*., 2013). Because MFI

performance is affected by access to the traditional financial system (Vanroose and D'Espallier, 2013), we also include the ratio of private sector domestic credit to GDP (*Private credit*) as a determinant of financial sector development. Following Ahlin, Lin and Maio (2011), we further control for the prevalence of labour opportunities in the economy using the ratio of the total labour force to the population aged 15 years and above (*Laborforce*) and the manufacturing value added to GDP ratio (*Manufacturing*). All of the economic control country-level data come from the World Bank's *World Development Indicators* (WDI, 2013).

To control for the formal institutional setting, we consider a number of indicators, including the rule of law, control of corruption, regulatory quality and political stability indicators, from the World Bank's *Worldwide Governance Indicators* (WGI, 2013).

Another concern is that the level of a society's cultural heterogeneity can potentially drive the indicators of social beliefs and therefore affect our outcome variables (Glaeser *et al*., 2000). To account for this, we complement our set of base controls with a measure of ethnic fractionalisation. The ethnic fractionalisation index comes from Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2003), in which a higher value indicates a higher degree of fractionalisation within the country.

A larger set of country controls encompasses various aspects of institutional conditions that could be potentially correlated with social beliefs and MFI financial outcomes. First, based on the study by Acemoglu, Johnson and Robinson (2001), we construct a dummy indicating whether a country is a former colony or not, of which 84% of the countries included in our sample are. We also consider the natural logarithm of settler mortality as a proxy for the degree of extractive institutions and the protection against risk of expropriation index as an alternative proxy for the quality of current institutions. Second, a country's score on the Heritage Foundation's (2013) *Index of Economic Freedom* serves as a proxy for the development of market institutions. Based on 2010 country evaluations of this index, we construct a dummy indicating whether a country is considered to have a "*mostly unfree*" economy, of which 60% of the countries in our sample do.[56] Third, we group countries according to their 2010 income levels into low-income, lower-middle income or upper-middle income countries based on the World Bank's (2013) classification.[57] Upper-middle income countries dominate our sample, followed by lower-middle income countries. Fourth, La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999) and Beck, Demirgüç-Kunt and Levine (2003*b*) suggest that national legal traditions are correlated with certain characteristics of financial systems, such as the access to equity finance and the government ownership

[56] The group of "*mostly unfree*" economies remains largely unchanged during our investigation period 2003–2011.
[57] Group members remain largely unchanged during our investigation period 2003–2011.

of banks, and thus influence their development. To control for this aspect, we include dummies for English common law, French civil law and socialist law. Fifth, from the study by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999), we also obtain another aspect of culture, that is, the percentage of the population in each country belonging to different religious affiliations separated between Catholic, Protestant, Muslim and others. Finally, we investigate whether our measures of social beliefs could capture the general effect of poverty. As a proxy for poverty, we use the average levels of the poverty headcount ratio at 2 dollars per day, based on the WDI (World Bank, 2013).[58] The percentage of the population below the poverty line varies in our sample from less than 1% in Russia to approximately 80% in Tanzania.

4.4 Estimation Methodology

Empirical analyses of MFI performance usually specify performance as a function of MFI-specific variables as well as macroeconomic and institutional factors (Ahlin *et al*., 2011; Hartarska and Nadolnyak, 2007; Mersland *et al*., 2013), which we complement with social beliefs. Formally, the estimated equation takes the following form:

$$y_{ijt} = \alpha + \beta_S S_{jt} + \beta_M M_{jt} + \beta_X X_{it} + u_{ijt}$$

where y_{ijt} is the performance variable for MFI i in country j at time t; S_{jt} captures the impact of social beliefs; M_{jt} are macroeconomic and formal institutional country-specific variables; X_{it} is a vector of MFI-specific variables; and u_{ijt} is an error term.

Our main performance indicators are interest rates, operating costs and default rates, while trust and collectivism are the focal explanatory variables. In our baseline specification, we then follow Ahlin, Lin and Maio (2011). Macroeconomic controls consist of GDP per capita growth, labour force participation, manufacturing share, private credit and lagged levels of GDP per capita in linear and quadratic forms. We add rule of law as a proxy for formal institutional development. Finally, we include age, institutional-type dummies, and a lagged number of borrowers, average loan size and assets per loan as MFI control variables.

Our initial analysis of the data reveals the presence of severe outliers and indicates that the residuals are not normally distributed. We therefore follow Ahlin, Lin and Maio (2011) and estimate the model using a quantile regression, which has several useful properties. First, its objective function is a weighted sum of absolute deviations, which gives a vector of coefficients that

[58] An alternative measure is the poverty headcount ratio at 1.25 dollars a day, which gives similar results.

are robust to outlier observations (Koenker and Bassett, 1978).[59] Second, when the standard assumption of normality of the error term does not hold, quantile regression estimators are more efficient than least square estimators (Buchinsky, 1998). Finally, in contrast to *ordinary least squares* (OLS), which estimate the mean effect of explanatory variables, quantile regression allows for estimations of the entire conditional distribution of the dependent variable. By calculating coefficient estimates at various quantiles of the conditional distribution, we are therefore able to study the effects of social beliefs on MFIs with varying levels of financial performance.

We compute standard errors robust to heteroskedasticity and misspecification following Angrist, Chernozhukov and Fernández-Val (2006). Furthermore, because within-MFI standard errors can be correlated because of MFI-specific shocks, we verify the need to cluster standard errors at the MFI level by testing for intra-cluster correlation using the Parente and Santos Silva (2013) test. In the case of detected intra-cluster correlation, we compute robust standard errors as proposed by Parente and Santos Silva (2013), which serve as an alternative to bootstrap, offering faster computation times.

Given scarce comparable data and surveys covering trust and collectivism measures for a large country sample, we cannot use time-variant indicators that would allow us to apply country fixed effects. To minimise the risk of unobserved heterogeneity across countries, we thus control for a wide range of country characteristics, including income, poverty, labour force, manufacturing, financial sector development, formal institutional setting, ethnic fractionalisation and religion. Nonetheless, there is still a potential risk of unobserved heterogeneity left, which we need to keep in mind in considering our findings. For robustness, we also estimate OLS regressions where we, one at a time, eliminate the top and bottom 5% of the sample based on the dependent variables, which gives similar results.[60]

To check for multicollinearity, we compute *variance inflation factors* (VIF) for each regression. The VIF scores range from 1.14 to 29.42, with an average of 6. All the variables of interest have low VIFs of about 2.5, and the only variables with high VIFs are the controls for income due to the inclusion of powers. As the values are below the problematic 10 proposed in the literature (O'Brien, 2007), the results suggest that multicollinearity should not be a concern. Moreover, there is no strong correlation between the major country and MFI variables (see Table 4.A2 in the Appendix).

[59] For robustness, we drop 5 or 10 extreme outliers based on Cook's distance measure and run median regressions in each case. The main results hold.
[60] Results available upon request.

4.5 Empirical Results

4.5.1 Baseline Results of the Impact of Social Beliefs on Microfinance Institution Performance

We first determine the appropriate model specification by testing for intra-cluster correlation using the Parente and Santos Silva (2013) test. The results of this test indicate that there is intra-cluster correlation. We therefore apply standard errors that are robust under heteroskedasticity and intra-cluster correlation. Table 4.3 presents the estimation results obtained from the quantile regression with robust standard errors clustered on MFI.

As shown in Table 4.3, we find a significant negative correlation between trust and default risk. That is, the fraction of actual loans at risk in MFI portfolios is significantly lower in countries where there is higher trust. A value of 0.146 suggests that the PAR30 of MFIs in countries with higher levels of trust is typically 0.146 percentage points lower. This is consistent with *Hypothesis 1a*, implying that trust improves microloan default rates by strengthening the borrowers' repayment discipline. Contrary to our expectations in *Hypothesis 1b*, we do not find significant effects of trust on MFI operating costs. Consistent with *Hypothesis 1c*, however, there is a significant negative correlation between a country's level of trust and MFIs' average interest rates, indicating that microcredit is less expensive for borrowers in higher-trust societies. An additional percentage point of trust is associated with a 0.341 percentage point lower average interest rate. This result is consistent with the findings of Howorth and Moro (2012), which show that trust decreases the cost of bank credit for small businesses. By reducing transaction and agency costs, higher trust can also influence the lending decisions of MFI loan officers, encouraging them to offer lower interest rates to their clients.

Table 4.3. *Trust, Collectivism and MFI Performance (Quantile Regression with Robust Standard Errors Clustered on MFI).*

Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.314***	63.021	–0.418	–0.146***
	(0.096)	(126.129)	(0.126)	(0.041)
Collectivism	–0.001	–3.695***	–0.003**	0.001**
	(0.001)	(1.250)	(0.001)	(0.000)
Rule of law	–0.024	–6.946	–0.029	0.001
	(0.026)	(29.570)	(0.025)	(0.008)
Ethnic fractionalisation	0.043	–140.535	–0.002	0.004
	(0.031)	(40.296)	(0.030)	(0.018)
GDP growth	–0.141	–302.115***	–0.294**	–0.138***
	(0.115)	(147.425)	(0.121)	(0.042)
Private credit	–0.177***	–175.543***	–0.135***	–0.005
	(0.037)	(44.544)	(0.042)	(0.013)
Laborforce	–0.252***	240.482***	–0.136*	–0.017
	(0.086)	(85.891)	(0.080)	(0.025)
Manufacturing	0.507**	–170.878	0.110	0.204***
	(0.210)	(265.543)	(0.232)	(0.070)
GDP per capita $_{t-1}$	–0.001	–15.981	–0.002	–0.010***
	0.009	(12.083)	(0.010)	(0.003)
GDP per capita $^{2}_{t-1}$	0.001**	1.525*	0.001	0.001***
	(0.001)	(0.922)	(0.001)	(0.000)
Age	–0.000	0.003	0.000	–0.000
	(0.000)	(0.039)	(0.000)	(0.000)
Age ^{2}	0.002	–3.877	–0.005	0.003**
	(0.004)	(4.625)	(0.003)	(0.001)
ln Borrowers $_{t-1}$	–0.014***	–27.473***	–0.021***	–0.002
	(0.003)	(4.788)	(0.003)	(0.001)
ln Average loan $_{t-1}$	–0.080***	150.226***	–0.075***	0.007***
	(0.007)	(14.727)	(0.006)	(0.002)
ln Assets / Loans $_{t-1}$	0.052***	65.198***	0.081***	0.011**
	(0.014)	(18.422)	(0.014)	(0.005)
Observations	1,519	1,513	1,518	1,464
R-squared	0.409	0.209	0.472	0.131
MFIs	331	331	331	329
PSS test	26.28	20.36	26.28	18.95
p value	0	0	0	0

Note: Standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Included in all regressions are MFI institutional-type dummies.

Contrary to *Hypothesis 2a*, collectivism seems to be related to higher default rates. The estimated effect, however, is small, with MFIs in more collectivist countries having 0.001 percentage points higher PAR30.[61] Consistent with

[61] The correlation becomes insignificant altogether if we exclude from our analysis those MFIs that provide information that they do not provide group loans (giving us a subsample of 99 MFIs that certainly offer group loans). A potential interpretation of this may be that a higher

Hypothesis 2b, MFIs in more collectivist societies tend to have lower costs both in terms of cost per borrower and cost per dollar loaned. An additional point in the collectivism measure is associated with a reduction in the costs per borrower of 3.69 dollars and a reduction in the costs per dollar loaned of 0.3 basis points. These results are consistent with the view that MFIs in collectivist societies can benefit from the increased effectiveness of peer monitoring and peer pressure compared with those in more individualist countries. However, we find no support for *Hypothesis 2c*, as we do not find any significant relationship between collectivism and MFIs' average interest rates. This suggests that MFIs do not pass on the cost savings of having more collectivist cultural values in terms of lower interest rates to their customers.

To rule out the possibility that our measures of trust or collectivism could capture the effect of a country's cultural homogeneity, we control for ethnic fractionalisation in all of the regressions. Our results suggest that a society's heterogeneity has a significant negative effect on MFIs' cost per borrower only. A potential explanation for this is that with increased fractionalisation, societies have larger informal sectors (Lassen, 2007), which in turn could increase competition among MFIs and thereby lead to lower costs. As for other controls, the main indicators of the macroeconomic environment have the expected sign, where both economic growth and financial development are significantly correlated with better MFI performance, as also found by Ahlin, Lin and Maio (2011).

Even though we control for the economic environment, rule of law and ethnic heterogeneity in our model specifications, there is still a possibility that our measure of generalised trust is not exogenous. To address this potential omitted variable bias, we also consider a larger set of control variables, including services, agriculture and manufacturing shares of GDP, inflation and population below the poverty line. We add each of these variables, one at a time, to our baseline specification. Moreover, we check for possible time effects by estimating our base model with added time dummies. For each specification, the negative correlation between generalised trust and MFIs' average interest rates and default costs remains statistically significant and of the similar order of magnitude. Similarly, the negative correlation between collectivism and operating costs remains statistically unaffected. To allow for a potential interaction between trust and collectivism, we also include interaction terms in the empirical estimates, which are found to be insignificant.[62]

degree of individualism could be associated with better repayment rates of loans taken by individuals but not by groups.

[62] Results available upon request.

4.5.2 Impact of Social Beliefs on Performance of Larger versus Smaller Microfinance Institutions

Social beliefs are hypothesised to work best in small, close-knit communities, and their influence should wither as the group size increases. As such, we are interested in whether social beliefs can enhance the financial performance of smaller MFIs better than that of larger MFIs. To investigate whether social beliefs have different impacts across different MFI sizes, we divide our sample into two groups according to the number of active borrowers. An MFI is classified as large (small) if its number of borrowers is above (below) the sample median.[63]

Table 4.4. *Effect of Trust on Average Interest Rates and Portfolio at Risk among Smaller versus Larger MFIs.*

	Small MFIs		Large MFIs	
Variables	Average interest rate	PAR30	Average interest rate	PAR30
Trust level	–0.431***	–0.136**	–0.457***	–0.144**
	(0.139)	(0.058)	(0.150)	(0.061)
Collectivism	–0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.001)
Rule of law	–0.067**	0.006	0.016	0.003
	(0.033)	(0.010)	(0.041)	(0.010)
Ethnic fractionalisation	0.077	0.020	0.014	–0.002
	(0.055)	(0.053)	(0.043)	(0.014)
GDP growth	0.076	–0.190*	–0.247	–0.172***
	(0.149)	(0.106)	(0.198)	(0.052)
Private credit	–0.112**	–0.001	–0.169**	–0.006
	(0.055)	(0.020)	(0.069)	(0.021)
Laborforce	–0.323**	–0.093	–0.239	–0.001
	(0.126)	(0.085)	(0.147)	(0.031)
Manufacturing	0.412	0.247**	0.722***	0.146**
	(0.273)	(0.117)	(0.275)	(0.066)
Observations	735	713	759	728
R-squared	0.509	0.079	0.624	0.162
MFIs	243	242	192	189
PSS test	13.70	10.15	17.43	11.72
p value	0	0	0	0

Note: Standard errors in parentheses. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

Table 4.4 presents the effect of trust on the average interest rates and portfolio at risk. Contrary to our expectations, we do not find differences in the significance of the trust effect between smaller and larger MFIs, and the magnitude

[63] As an alternative specification, we divide our sample into two groups according to asset size, which gives similar results.

of coefficients is similar. Trust therefore plays a significant role in reducing interest rates and the probability of loan defaults for MFIs of all sizes.[64] This result is in line with those of La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997), who argue that trust is especially important in supporting cooperation in larger organisations, and with those of Howorth and Moro (2012), who find significant effects of trust on the performance of small banks, which are more similar to larger MFIs. Therefore, the size of an MFI is not the main determinant of the effectiveness of trust.

In contrast, collectivism clearly lowers the costs of smaller MFIs while having no significant effect among larger MFIs (Table 4.5). These results can be explained by cooperative norms being most effective for smaller groups or communities with long-standing relationships, where the sanctioning against violators of such norms is most severe, while trust can still play a significant role in more complex, multiple-network societies (Hechter and Opp, 2001).

Table 4.5. *Effect of Collectivism on Average Interest Rates and Portfolio at Risk among Smaller versus Larger MFIs.*

	Small MFIs		Large MFIs	
Variables	Cost per borrower	Cost per dollar loaned	Cost per borrower	Cost per dollar loaned
Trust level	136.857	–0.051	–30.350	–0.297*
	(257.780)	(0.171)	(180.554)	(0.159)
Collectivism	–4.836***	–0.003**	–1.384	–0.001
	(1.820)	(0.001)	(1.795)	(0.002)
Rule of law	–42.500	–0.042	10.731	–0.021
	(36.402)	(0.033)	(19.664)	(0.058)
Ethnic fractionalisation	–187.140**	–0.013	–89.838*	0.020
	(86.918)	(0.048)	(53.316)	(0.053)
GDP growth	–363.153	–0.109	–307.357	–0.368**
	(317.352)	(0.172)	(200.401)	(0.148)
Private credit	–141.049	–0.167**	–137.478	–0.094*
	(93.272)	(0.067)	(100.702)	(0.053)
Laborforce	159.419	–0.263**	270.838**	–0.140*
	(206.570)	(0.134)	(125.396)	(0.078)
Manufacturing	–515.076	–0.110	104.591	0.522**
	(345.873)	(0.284)	(229.774)	(0.207)
Observations	733	737	756	758
R-squared	0.346	0.546	0.528	0.566
MFIs	243	243	190	191
PSS test	10.72	13.64	13.45	15.51
p value	0	0	0	0

Note: Standard errors in parentheses. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

[64] When we group MFIs based on assets, the only difference in the results is that the effect of trust on interest rates in larger MFIs is insignificant.

4.5.3 Impact of Social Beliefs on the Performance of Non-Governmental Organisations versus Banking Institutions

In our baseline results, we control for the effect of legal status by including institutional type dummies (Table 4.3). To determine whether our results hold for more specific groups of MFIs, we distinguish between NGOs, which are typically not regulated by a banking supervisory agency, and more formal, supervised banking institutions (banks and NBFIs).

Table 4.6 reports the results of these split-sample regressions. Our findings indicate that the two organisational types of MFIs benefit from social norms in somewhat different ways. While both NGOs and banking institutions have better repayment rates thanks to higher trust, only banking institutions benefit from trust in terms of lowered interest rates. For NGOs, collectivism is associated with lower interest rates instead. As such, we find that more institutionalised organisations such as banks benefit more from trust, while NGOs rely more on collectivism, which seems reasonable given the more informal nature of NGOs compared with banking institutions.

Table 4.6. *Split-Sample Regression for Different Organisational Types (NGOs and Banking Institutions).*

	Banking institutions				NGOs			
Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.396**	313.658	0.005	–0.282***	–0.207	14.449	–0.007	–0.130**
	(0.198)	(272.839)	(0.191)	(0.057)	(0.182)	(99.486)	(0.256)	(0.051)
Collectivism	0.002	–6.252*	0.000	–0.001*	–0.005***	–2.518	–0.006***	0.001
	(0.002)	(3.237)	(0.002)	(0.001)	(0.002)	(1.539)	(0.002)	(0.001)
Observations	611	608	610	593	669	668	669	641
R-squared	0.333	0.245	0.517	0.091	0.450	0.180	0.444	0.119
MFIs	128	128	128	128	141	141	141	140
PSS test	17.45	11.70	13.03	10.68	16.95	14.78	17.44	11.92
p value	0	0	0	0	0	0	0	0

Note: Standard errors in parentheses. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Included in all regressions are all baseline controls (Table 4.3).

4.5.4 Impact of Social Beliefs with Alternative Formal Institutional Variables

When we control for trust and collectivist cultural norms, a "good" formal institutional environment as proxied by the rule of law does not seem to play a significant role in the financial performance of MFIs. This result is consistent with those of Ahlin, Lin and Maio (2011), who find the rule of law indicator to be insignificant for MFI performance. However, they also find some other institutional determinants to be detrimental to MFI performance. Because the rule of law is not the only possible proxy for the quality of formal institutions, we assess the robustness of our results to different aspects of formal institutions by replacing the rule of law with other governance indicators, including the control of corruption, regulatory quality, government effectiveness and political stability indicators from the WGI (World Bank, 2013).[65] Table 4.7 presents the results with government effectiveness used as the alternative institutional determinant.[66]

In contrast to Ahlin, Lin and Maio (2011), we do not find any negative effects of formal institutional quality on MFI performance. In fact, these correlations only hold when social beliefs are not controlled. Once we include them in our analysis, the negative effects of the formal institutional setting on MFI performance disappear. Moreover, the beneficial effects of social beliefs on MFI performance remain significant under all alternative specifications.

[65] We exclude from our analysis the last of the six indicators provided by the WGI (World Bank, 2013), that is, voice and accountability, because of its high correlation with the trust measure.

[66] Results with control of corruption, regulatory quality and political stability are available upon request.

Table 4.7. *Government Effectiveness, Social Beliefs and MFI Performance.*

Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.302***	58.232	–0.100	–0.167***
	(0.111)	(117.239)	(0.112)	(0.043)
Collectivism	–0.001	–3.507***	–0.002**	0.001**
	(0.001)	(1.116)	(0.001)	(0.000)
Government effectiveness	–0.005	4.846	0.029	–0.009
	(0.030)	(32.690)	(0.030)	(0.010)
Ethnic fractionalisation	0.041	–145.335***	–0.017	0.008
	(0.032)	(40.450)	(0.032)	(0.018)
GDP growth	–0.192*	–288.156**	–0.425***	–0.132***
	(0.110)	(142.316)	(0.107)	(0.046)
Private credit	–0.195***	–180.370***	–0.179***	0.005
	(0.041)	(41.344)	(0.041)	(0.014)
Laborforce	–0.207***	256.984***	–0.058	–0.023
	(0.077)	(77.438)	(0.060)	(0.025)
Manufacturing	0.434	–167.438	–0.049	0.238***
	(0.284)	(253.218)	(0.290)	(0.080)
Observations	1,519	1,513	1,518	1,464
R-squared	0.407	0.209	0.468	0.134
MFIs	331	331	331	329
PSS test	26.84	20.01	25.64	18.89
p value	0	0	0	0

Note: Standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

4.5.5 Impact of Social Beliefs Including Historical Heritage

Recent studies stress the importance of colonial experience on current institutions (Beck *et al*., 2003*a*; Acemoglu *et al*., 2001; La Porta *et al*., 1999). In particular, colonisation policies adopted by colonising European countries depended on the conditions in the colonies and left long-lasting effects on the quality of institutions in now-independent states. The argument is that the colonisers created better institutions in environments in which they could settle safely. To explore the importance of this historical aspect, we control for extractive institutions using the logarithm of settler mortality as a proxy.

Table 4.8. *Colonialism, Social Beliefs and MFI Performance.*

Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.182	9.000	–0.043	–0.177***
	(0.149)	(182.135)	(0.144)	(0.057)
Collectivism	–0.002	–3.025***	–0.002	0.001**
	(0.002)	(1.122)	(0.001)	(0.000)
Settler mortality	0.060**	49.894	0.072***	–0.003
	(0.029)	(30.402)	(0.017)	(0.007)
Rule of law	–0.072**	–39.642*	–0.075***	0.001
	(0.031)	(21.164)	(0.027)	(0.009)
Ethnic fractionalisation	0.013	–155.210***	–0.015	–0.006
	(0.037)	(49.884)	(0.038)	(0.024)
GDP growth	0.047	–286.617**	–0.070	–0.133***
	(0.131)	(144.300)	(0.117)	(0.051)
Private credit	–0.172***	–170.957***	–0.134***	–0.004
	(0.049)	(58.012)	(0.050)	(0.016)
Laborforce	–0.340***	191.551	–0.273***	–0.042
	(0.089)	(116.551)	(0.083)	(0.041)
Manufacturing	0.365*	–39.596	0.289	0.174
	(0.200)	(376.595)	(0.194)	(0.108)
Observations	1,274	1,270	1,273	1,229
R-squared	0.411	0.212	0.492	0.181
MFIs	281	281	281	280
PSS test	25.25	15.77	23.24	18.73
p value	0	0	0	0

Note: Standard errors in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

As shown in Table 4.8, the effects of social beliefs on the costs per borrower and PAR30 hold both with and without settler mortality controls. Moreover, extractive institutions tend to have statistically significant negative effects on MFI performance by increasing interest rates and the costs per dollar loaned. Although the effect of trust on the average interest rate becomes insignificant, informal institutions might still be especially important for MFIs operating within extractive institutions working as a viable substitute for a more favourable environment. Indeed, if we include the interaction term between trust and settler mortality, we find that the more extractive the institutions are, the more trust lowers MFI costs, which is significant at the 5% level.[67] In an alternative specification, we control for political heritage by including dummies for legal origin and find the effects of social beliefs significant and of similar magnitude as in the baseline results (Table 4.9).

[67] Results available upon request.

Table 4.9. *Legal Origin, Social Beliefs and MFI Performance.*

Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.221**	–91.454	–0.052	–0.124**
	(0.094)	(154.230)	(0.141)	(0.052)
Collectivism	–0.002*	–3.032**	–0.003**	0.001*
	(0.001)	(1.216)	(0.001)	(0.000)
Rule of law	–0.042	6.354*	–0.033	–0.003
	(0.028)	(25.839)	(0.024)	(0.009)
Ethnic fractionalisation	0.061**	–143.804***	0.005	–0.008
	(0.029)	(35.207)	(0.030)	(0.019)
GDP growth	–0.003	–397.674***	–0.287**	–0.126***
	(0.101)	(154.023)	(0.124)	(0.041)
Private credit	–0.150***	–251.966***	–0.132***	0.008
	(0.040)	(70.869)	(0.045)	(0.013)
Laborforce	–0.213**	68.938	–0.067	0.013
	(0.094)	(121.117)	(0.091)	(0.030)
Manufacturing	0.358	–28.493	0.007	0.215***
	(0.222)	(326.933)	(0.231)	(0.068)
English legal origin	–0.086**	55.653	–0.051*	0.018
	(0.038)	(46.758)	(0.026)	(0.013)
Socialist legal origin	–0.065**	155.230*	–0.042	–0.017
	(0.026)	(79.172)	(0.036)	(0.011)
Observations	1,519	1,513	1,518	1,464
R-squared	0.416	0.204	0.478	0.136
MFIs	331	331	331	329
PSS test	25.02	19.62	26.53	19.09
p value	0	0	0	0

Note: Standard errors in parentheses. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

4.5.6 Impact of Social Beliefs Including Economic Freedom and Country Income Groups

We further investigate if our results hold when we take the development of market institutions and the current economic situation into account. To control for the degree of economic freedom, we include a dummy indicating repressed, or "*mostly unfree*", economies, which we base on the *Index of Economic Freedom 2010* (Heritage Foundation, 2013). The results are presented in Table 4.10.

Table 4.10. *Economic Freedom, Social Beliefs and MFI Performance.*

Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.295***	96.070	–0.065	–0.140***
	(0.099)	(118.136)	(0.120)	(0.044)
Collectivism	–0.001	–3.596***	–0.003**	0.001**
	(0.001)	(1.108)	(0.001)	(0.000)
Rule of law	–0.023	–2.683	–0.031	0.001
	(0.024)	(26.134)	(0.021)	(0.008)
Unfree	–0.057*	–34.777	–0.086**	–0.005
	(0.033)	(24.395)	(0.034)	(0.007)
Ethnic fractionalisation	0.020	–157.562***	–0.032	0.004
	(0.037)	(41.218)	(0.030)	(0.018)
GDP growth	–0.115	–258.485*	–0.221**	–0.136***
	(0.105)	(141.090)	(0.106)	(0.043)
Private credit	–0.190***	–186.648***	–0.158***	–0.005
	(0.037)	(43.282)	(0.039)	(0.014)
Laborforce	–0.228**	264.547***	–0.094	–0.016
	(0.104)	(86.363)	(0.071)	(0.027)
Manufacturing	0.447**	–229.647	–0.032	0.197***
	(0.225)	(269.781)	(0.213)	(0.074)
Observations	1,519	1,513	1,518	1,464
MFIs	331	331	331	329
PSS test	26.11	19.94	26.88	18.94
p value	0	0	0	0

Note: Standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

There is some indication that MFIs operating in the environments where there is less market freedom have lower interest rates and lower costs per dollar loaned. To control for country effects, we include dummies indicating those groups based on economic development, that is, low-income countries, lower-middle income countries and upper-middle income countries. These results are presented in Table 4.11.

Table 4.11. *Income Group, Social Beliefs and MFI Performance.*

Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.383***	71.651	–0.184	–0.132***
	(0.099)	(120.021)	(0.121)	(0.048)
Collectivism	–0.001	–3.732***	–0.003**	0.001**
	(0.001)	(1.244)	(0.001)	(0.000)
Rule of law	–0.047*	–6.498	–0.042*	0.003
	(0.024)	(29.536)	(0.022)	(0.009)
Low income	–0.141**	–43.276	–0.121**	0.035
	(0.057)	(50.249)	(0.048)	(0.024)
Lower-middle income	–0.006	–17.406	–0.003	0.009
	(0.022)	(34.523)	(0.024)	(0.013)
Ethnic fractionalisation	0.043	–160.246***	0.009	0.010
	(0.035)	(47.542)	(0.027)	(0.021)
GDP growth	–0.066	–353.314**	–0.231**	–0.131***
	(0.103)	(162.896)	(0.115)	(0.044)
Private credit	–0.172***	–182.716***	–0.135***	–0.007
	(0.032)	(44.632)	(0.040)	(0.013)
Laborforce	–0.267***	249.609***	–0.160**	–0.013
	(0.088)	(83.464)	(0.077)	(0.028)
Manufacturing	0.387*	–224.702	–0.040	0.212***
	(0.209)	(282.487)	(0.205)	(0.079)
Observations	1,519	1,513	1,518	1,464
MFIs	331	331	331	329
PSS test	25.21	20.09	25.61	18.40
p value	0	0	0	0

Note: Standard errors in parentheses. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

Microfinance institutions in low-income countries charge lower interest rates and bear lower costs per dollar loaned compared with middle-income countries. Nevertheless, in both specifications, the effects of social beliefs on MFI performance remain significant. The better performance of MFIs in the poorest countries with less-developed market economies can be an indication that clients there are most dependent on MFI services, which improves the repayment discipline. Moreover, such economic environments can be more conducive for economic actors to rely on informal institutions.

4.5.7 Impact of Social Beliefs Including Religion

Finally, religion could conducively be another possible determinant of MFI performance. Because Islamic principles generally prohibit interest, MFIs operating in such settings may report interest rates inaccurately. Furthermore, Mersland, D'Espallier and Supphellen (2013) find that Christian MFIs have significantly lower costs of funds and interest rates than secular ones.

However, because of a high correlation between the religion indicators and trust, we cannot directly include them in the regressions. Instead, we exclude the four countries with the highest shares of Muslim populations (Jordan, Morocco, Pakistan and Senegal). Table 4.12 presents the results.

Table 4.12. *Social Beliefs and MFI Performance (Sample Excluding Countries with the Percentage of Muslim Population above 90%).*

Variables	Average interest rate	Cost per borrower	Cost per dollar loaned	PAR30
Trust level	–0.356***	8.087	–0.168	–0.134***
	(0.119)	(128.210)	(0.198)	(0.045)
Collectivism	–0.001	–3.498***	–0.002*	0.001**
	(0.001)	(1.327)	(0.001)	(0.000)
Rule of law	–0.040	–6.398	–0.042	0.000
	(0.034)	(33.846)	(0.032)	(0.008)
Ethnic fractionalisation	0.054	–200.535***	0.029	0.026
	(0.046)	(55.494)	(0.077)	(0.026)
GDP growth	–0.123	–262.403*	–0.273*	–0.140***
	(0.129)	(147.256)	(0.139)	(0.042)
Private credit	–0.159***	–202.197***	–0.142	0.008
	(0.054)	(53.129)	(0.094)	(0.013)
Laborforce	–0.332**	369.203***	–0.095	–0.080*
	(0.148)	(99.231)	(0.228)	(0.044)
Manufacturing	0.587***	–253.159	0.073	0.237***
	(0.217)	(277.363)	(0.371)	(0.078)
Observations	1,415	1,411	1,414	1,364
R-squared	0.403	0.208	0.471	0.141
MFIs	308	308	308	307
PSS test	26.34	19.27	26.36	17.92
p value	0	0	0	0

Note: Standard errors in parentheses. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$. Included in all regressions are GDP per capita controls, MFI size and age controls and MFI institutional-type dummies.

Social beliefs continue to exert significant favourable influence on MFI performance, with only the effect of collectivism on the cost per dollar loaned being weakened, yet not eliminated. Similarly, the exclusion of the four countries with the highest shares of Christian populations does not qualitatively affect the results.[68]

[68] Results available upon request.

4.6 Conclusion

Despite microfinance's strong similarity to informal, relationship-based lending and its deep embeddedness in social and cultural contexts, there has been little empirical analysis of the effects of social beliefs on MFI performance. To address this gap in the literature, we employ a dataset of 331 MFIs from 37 countries and combine it with cross-country survey data on trust and collectivism.

We find that social beliefs help explain the observed differences in the financial performance of MFIs over the investigated period, 2003–2011, even when the economic environment, quality of formal institutions, historical factors and ethnic fractionalisation are taken into account. Our results show that there is a negative and statistically significant relationship between the level of trust in a country and MFIs' average interest rates and default costs. We also find a significant, negative relationship between collectivist cultural norms and MFIs' operating costs.

The evidence in this paper indicates that social beliefs have a significant effect on MFIs' performance, allowing them to save on monitoring and default costs and to offer lower interest rates to their clients. This is consistent with the idea that MFIs are able to take advantage of a society's higher level of trust and stronger collectivist cultural norms, which improve cooperation and increase the within-group sense of responsibility and to use them as viable substitutes for traditional, formal institutions.

Our findings provide further insights for MFI development across countries. First, MFI financial performance not only relies on the macroeconomic and formal institutional environment, as the current empirical literature suggests, but is also closely related to social beliefs, particularly trust and norms of cooperation. Therefore, the informal institutional setting in which an MFI is situated should be taken into account when evaluating MFI performance. Second, social beliefs are more important to MFI performance than the formal institutional setting, and more formal institutions are not necessarily detrimental to MFI performance if the informal setting is taken into account. This result can explain the negative effect of good regulations and government on MFI performance found by Ahlin, Lin and Maio (2011). Third, our results confirm that social collateral, supported by trust and collectivist cultural norms, can work as a substitute for physical collateral in MFIs. Finally, our results suggest that it is advisable for MFIs operating in countries with weak social beliefs to develop appropriate strategies that help substitute for weak social norms of trust and cooperation.

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Appendix 4.A

Table 4.A1. *List of Countries Included in the Study (2003–2011).*

Country	Trust level, average (%)	Collectivism index (100 – IDV)	Number of MFIs included in study
Albania	24	80	5
Argentina	21	54	8
Bangladesh	24	80	8
Brazil	7	62	15
Bulgaria	25	70	7
Burkina Faso	15	85	2
Chile	15	77	3
China	56	80	2
Colombia	17	87	21
Costa Rica	16	85	10
Dominican Republic	27	70	4
Ecuador	21	92	42
Egypt	28	75	8
El Salvador	23	81	13
Ethiopia	24	80	1
Ghana	12	85	10
Guatemala	25	94	16
Honduras	20	80	16
Indonesia	30	86	14
Jordan	32	70	7
Kenya	10	75	11
Lebanon	16	60	2
Malawi	26	70	2
Mexico	22	70	26
Morocco	20	75	2
Nigeria	16	70	2
Pakistan	40	86	13
Panama	21	89	3
Peru	15	84	34
Philippines	10	68	38
Romania	15	70	3
Russia	25	61	4
Senegal	27	75	4

Country	Trust level, average (%)	Collectivism index (100 – IDV)	Number of MFIs included in study
Sri Lanka	18	65	6
Tanzania	11	75	4
Vietnam	39	80	13
Zambia	14	65	2

Table 4.A2. *Correlation Table for Main Variables.*

	Average interest rate	Cost per dollar loaned	PAR30	Cost per borrower	Average loan	Age	Borrowers $_{t-1}$	Assets / loans $_{t-1}$
Cost per dollar loaned	0.70**							
PAR30	0.02	0.02						
Cost per borrower	–0.04	–0.02	0.01					
Average loan	–0.15***	–0.15***	–0.01	0.86***				
Age	–0.16***	–0.23***	0.07***	–0.01	0.04			
Borrowers $_{t-1}$	–0.08***	–0.10***	–0.02	–0.07***	–0.04*	0.18***		
Assets / loans $_{t-1}$	0.09***	0.11***	–0.02	–0.02	–0.02	–0.02	–0.01	
Trust level	–0.17***	–0.09***	–0.07***	–0.03	–0.02	–0.13***	0.10***	–0.01
IDV	0.31***	0.33***	0.02	0.02	–0.03	–0.16***	0.01	0.02
Rule of law	0.00	0.01	–0.01	0.10***	0.12***	–0.10***	–0.05**	0.02**
Ethnic fractionalisation	0.04	0.01	0.06**	–0.02	–0.03	–0.10***	–0.22***	0.02
GDP growth	–0.10***	–0.10***	–0.12***	–0.03	–0.03	0.00	0.07***	–0.01
Laborforce	–0.09***	–0.06***	–0.02	–0.01	0.00	0.07***	0.11***	0.02
Manufacturing	0.08***	0.05*	0.11***	–0.05**	–0.03	0.00	0.03	0.00
Private credit	–0.28***	–0.25***	–0.08***	0.05*	0.07***	0.02	0.09***	–0.04
GDP per capita $_{t-1}$	0.12***	0.06**	–0.06***	0.24***	0.19***	–0.04*	–0.16***	–0.06***

	Trust level	IDV	Rule of law	Ethnic fract.	GDP growth	Laborforce	Mannfacturing	Private credit
IDV	–0.21							
Rule of law	–0.07***	0.39***						
Ethnic fractionalisation	–0.14***	–0.34***	–0.27***					
GDP growth	0.07***	0.03	0.11***	0.00				
Laborforce	–0.16***	–0.24***	–0.26***	0.23***	0.20***			
Manufacturing	0.29***	0.31***	0.15***	–0.51***	0.08***	–0.18***		
Private credit	0.44***	0.13***	0.39***	–0.45***	0.09***	–0.13***	0.22***	
GDP per capita $_{t-1}$	–0.13***	0.20***	0.20***	–0.03	–0.15***	–0.03	–0.04*	0.01

Note: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

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