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Abstract: Despite rising interest in income inequality, scholars remain divided over the mechanisms underlying inclusive income growth and how these mechanisms vary across countries. This study introduces the concept of national growth profiles, the additive contribution of changes in taxes, transfers, composition, and other factors including market institutions to changes across a country's income distribution. We present a decomposition framework to measure national growth profiles for eight high-income countries from the 1980–2010s. Our findings adjudicate competing sociological and economic perspectives on rising inequality. First, we find that policy-driven changes in taxes and transfers are the dominant drivers of inclusive growth at the tails of the income distributions. Second, rising educational attainment contributes most to income growth across the distribution, but consistently contributes to less-inclusive growth. When changes in education are considered, changes in assortative mating and single parenthood have little consequence for changes in inequality. Third, changes to other factors including market institutions increased inequality in countries such as the U.S., but less so in France and Germany. Had the U.S. matched the changes to Dutch tax policy, Danish transfer policy, or other factors of most other countries, it could have achieved more inclusive income growth than observed.

INTRODUCTION

Inclusive income growth is a measure of two components of changes in the income distribution: rising *levels* of income and *equality* in the change of income across the distribution. A country with large income gains, but with those gains concentrated in the top of the distribution, experiences growth but not inclusivity. A country experiencing equal declines in income levels across the distribution achieves inclusivity, but not growth. High and rising levels of income inequality have prompted calls for more inclusive income growth in public discourse and academic research (Atkinson 2015, Brandolini and Smeeding 2011, Corak 2013). Nonetheless, competing accounts exist regarding the mechanisms most amenable to achieving inclusive growth.

Some scholars have proposed that rising educational attainment, combined with increases in the demand for non-routine cognitive skills, have contributed to high growth but with less inclusivity (Acemoglu and Autor 2011, Autor and Dorn 2013, Goldin and Katz 2008). Sociologists and economists have also debated the relative contribution of changes in family demography, tax and transfer systems, and labor market institutions in shaping inclusive growth (Boushey 2019, Brady, Finnigan and Hübgen 2017, Esping-Andersen 2007, McCall and Percheski 2010, McLanahan and Percheski 2008, Nolan 2018, Red Bird and Grusky 2015, Weeden and Grusky 2013). This study incorporates each of these perspectives to measure the relative contribution of changes in taxes, transfers, composition, or other factors including market institutions to changes in the income distribution among high-income countries.

To do so, we introduce the concept of *national growth profiles*. A country's growth profile captures the additive contribution of changes in taxes, transfers, demographic and employment composition, and a residual term that we refer to as "other factors including market institutions" (hereafter "taxes, transfers, composition, and other factors") in shaping the levels

and inclusivity of growth across the income distribution.[1] For example, one country's growth profile might reveal that it primarily relies on policy changes to taxes and transfers to achieve inclusive growth, while another country's growth profile might point to compositional change, such as rising educational attainment, as its pathway to inclusive growth, with little effect of changes in taxes, transfers, or other factors.

To measure national growth profiles, we extend the decomposition framework introduced in DiNardo, Fortin, and Lemieux (1996) to isolate the contribution of each component of a country's growth profile to income growth at each percentile of the income distribution. Put differently, our decomposition framework informs us of the contribution of changes in taxes, transfers, composition, and other factors on growth rates at the 5^{th}, 50^{th}, and 99^{th} percentiles of the income distribution, and each percentile in between. In doing so, we are able to move beyond the use of a single summary indicator, such as a Gini coefficient, to provide a comprehensive view of the sources of change across the income distribution.

Using household income data from the Luxembourg Income Study (LIS) Database, provided by LIS, the Cross-National Data Center in Luxembourg, we apply our decomposition framework to analyze national growth profiles in eight countries from the 1980s to 2010s. These countries include the United States, Australia, Canada, Germany, France, the Netherlands, Denmark, and Finland. These eight countries share large-scale institutional features: they are all classified as high-income and capitalist. At the same time, they are diverse with respect to household demography, labor market structures, social policy features, and fiscal policies. Each of these eight countries experienced varying rates of income growth and the inclusivity of that income growth from the 1980s to 2010s.

The countries' respective growth profiles advance sociological knowledge of changing

[1] As defined later, we refer to "other factors" as a residual that combines all of the political, social, economic institutions of society that shape the earnings associated with certain employment and demographic characteristics. Taxes and transfers are considered on their own and are not included in this conceptualization of institutions.

income distributions in several ways. First, consistent with the *tax and transfer* perspective of changes in inequality, we find that policy-driven changes in income transfers were the strongest individual contributors to income growth at the 10th percentile in each country. Policy-driven changes in taxation, meanwhile, reduced incomes near the top of the distribution in the Netherlands and Denmark to help these countries achieve more inclusive growth, but instead increased top incomes and contributed to less inclusive growth in the U.S., Australia, and Finland. Outside of the tails of the distribution, however, changes in taxes and transfers have had a small influence on changes in the levels or inclusivity of income growth.

Second, rising educational attainment had the largest effects on changes in incomes across most of each country's distribution. In fact, when changes in education are considered, we find that changes in assortative mating and single parenthood have little consequence for changes in country's income distributions. This finding challenges the large focus in the sociological literature on shifts in family structure as a primary driver of rising inequality.

Finally, our results suggest that our conceptualization of other factors including market institutions, which includes changes in market earnings unexplained by compositional changes, has generally promoted non-inclusive income growth, but with large variation by country. In the U.S., the non-inclusive effect of other factors, particularly at the top of the income distribution, is consistent with the skill-biased technological change (SBTC) perspective of rising returns to educational attainment. However, in countries that have generally maintained stronger labor market institutions, such as France and Germany, other factors including market institutions did not contribute to similar increases in inequality. These findings challenge the external validity of the SBTC perspective on rising inequality: cross-national experiences suggest that changes in the returns to education and other demographic characteristics need not exacerbate inequality.

Conceptually, a focus on national growth profiles allows comparative researchers to

progress from a focus on historical, between-country variation in inequality to cross-national variation in the mechanisms driving *changes* in income distributions. Methodologically, our framework moves beyond the analysis of individual outcomes employed in Kitigawa-Oaxaca-Blinder and Fairlie decompositions to instead evaluate sources of income growth for the entire income distribution. Though we apply our framework in the context of evaluating national growth profiles, its potential use spans broadly across sociology, social policy, and economics literatures.

BACKGROUND

Two sets of shortcomings in prior research on cross-national variation in income inequality impede our current understanding of the pathways toward inclusive income growth. We discuss these limitations first, then introduce our primary research questions and a conceptual framework for addressing the research questions.

Investigating Changes in Inequality

First, the dominant practice in cross-national studies of income inequality is to investigate variation in *levels* of inequality. Foundational studies in the comparative institutions literature, for example, have identified the distinct stratifying and commodifying features of national welfare regimes that shape patterns of inequality (Esping-Andersen 1990). In more recent iterations of this cross-national research, scholars have narrowed in on how specific welfare state and labor market institutions – such as social spending, universality of transfers, family policies, unionization, and more – shape cross-national variation in poverty and income inequality (Brady and Bostic 2015, Brady, Finnigan and Hübgen 2017, Gornick and Jäntti 2012, Huber and Stephens 2001, Kenworthy 2011, Marx, Salanauskaite and Verbist 2013). Despite this rich and useful literature, comparative sociological research has had less to say on the

sources of cross-national variation in *changes* in the income distribution.[2] The distinction between levels and trends is not trivial. Consider, for example, that some of the largest relative increases in income inequality in recent decades can be found in the comparatively egalitarian countries of Denmark and Finland.[3]

Dominant perspectives on the rise of inequality in high-income countries have primarily emerged from the economics literature. Theories of skill-biased technological change (and its successor, *routine*-biased technological change) have posited that rising demand for specific skills (or tasks), combined with rising returns to educational attainment (and declining returns to routine tasks), have contributed to increases in inequality (Acemoglu and Autor 2011, Autor, Levy and Murnane 2003, Goldin and Katz 2008, Goos, Manning and Salomons 2014). The dominance of the technological change narrative, and economic perspectives on the rise of inequality in general, prompted Myles (2003) to ask "Where have all the sociologists gone?" and has evoked claims that sociologists have been "strangely and remarkably silent" (Morris and Western 1999:624) and have "contributed little to the recent boom in inequality research" (Esping-Andersen 2007:639). In fairness, sociologists have critiqued the technological change perspective of rising inequality, demonstrating that such analyses tend to ignore important institutional context and cross-national heterogeneity (Kristal 2013, Parolin 2020). Likewise, sociological research has offered competing accounts of rising inequality that focus individually on family formation practices (Esping-Andersen 2007, McLanahan and Percheski 2008); tax and transfer systems (Brady, Blome and Kleider 2016, Wimer et al. 2020); and rent-seeking institutions, social class, norms and labor market regulations (DiPrete, Eirich and Pittinsky 2010, Red Bird and Grusky 2015, Weeden and Grusky 2013, Western and Rosenfeld 2011),

[2] Exceptions include studies that tend to focus on changes within individual countries, such as those demonstrating how declining unionization in the U.S. contributes to greater inequality. In contrast, the present study is concerned with cross-national variation in the sources of changing income distributions.
[3] This is true in terms of *relative* or *percent* changes in inequality, though less so when changes in inequality are viewed in *absolute* terms, as we discuss later.

though often focusing on trends in a single country. Aside from consensus that economic inequality is rising, however, there nonetheless remains, as McCall and Percheski (2010:332) write, "less agreement on exact details of these trends."

Sociological Perspectives on Changes in Inequality

This leads to the second limitation in the literature: disagreement over the mechanisms underlying inclusive growth. In broad terms, the competing perspectives can be segmented into three groups: changes in taxes and transfers, changes in composition, and changes in other factors including market institutions. We review the evidence to summarize each of these three perspectives.

The **tax and transfer** perspective on inclusive income growth emphasizes the importance of the welfare state in shaping a more egalitarian income distribution.[4] More generous income transfers, whether through enhancements in benefit levels or coverage, are likely to have favorable effects on income growth toward the bottom of the income distribution (Atkinson 2015, Brady, Blome and Kleider 2016, Brady 2019, Förster and Vleminckx 2004, Gornick and Jäntti 2016). In the U.S. case, for example, Wimer et al. (2020) find that increases in the generosity of income support programs are largely responsible for the income growth of the bottom decile of the U.S. income distribution from 1967 to 2015. Similarly, higher tax rates on higher-income households are effective at reducing top incomes and achieving more equitable growth (Atkinson, Piketty and Saez 2011). Taxes and transfers directly affect the association between demographic characteristics, such as single motherhood, and disposable household income; thus, some scholars have proposed that taxes and transfers are more consequential than compositional change in explaining variations in income distributions across place and time (Brady, Finnigan and Hübgen 2017, Rainwater and Smeeding 2003).

[4] The effect of taxes and transfers on the income distribution are often observed jointly. For example, scholars have long displayed "pre-tax, pre-transfer" poverty rates before showing their "post-tax, post-transfer" variations. We explicitly separate these two components to understand the independent effects of policy-driven changes in transfers on inclusive income growth, as well as policy-driven changes in income taxation.

Critics, however, counter that generous changes to transfer benefits may contribute to moral hazard effects, in which stronger social protections entice families to alter their behavior in a way that increases their benefit levels (Agersnap, Jensen and Kleven 2019, Antel 1992). For example, scholars have advanced claims that generous cash assistance benefits in the U.S. in the 1980s led to depressed employment rates among single mothers (Haskins 2016, Murray 1994). If this argument were generally true, we should see that policy changes to transfers that produce more inclusive growth lead to compositional changes that offset some of that growth. Put differently, a proper assessment of the role of taxes and transfers should evaluate whether behavioral responses mitigate some of their inequality-reducing effect, as this study does.

The countries in our study have seen notable variation in changes in tax and transfer programs from the late 1990s through the 2010s. In countries such as the U.S., Australia and Finland, top marginal tax rates have declined during the years of inclusion in this study (OECD 2020). In countries such as Denmark and Canada, in contrast, top marginal tax rates have declined. Countries have generally seen increases in spending on transfers, though in part due to compositional changes and with transfers targeted at different points across the distribution (Wimer et al. 2020).

Changes in **demographic and employment composition** have also received much attention in sociological research on inequality and stratification (Esping-Andersen 2007, Iceland 2019, McLanahan and Percheski 2008, Moller, Alderson and Nielsen 2009, Rainwater and Smeeding 2003, Torche 2011). Changes in family structure and size, age, educational attainment, and employment are each likely to affect the levels and inclusivity of income growth in a country.[5] One segment of this field has focused on the rise in single parenthood (as has

[5] Immigration and citizenship status may also be relevant demographic characteristics of interest. However, data on immigration and citizenship are not consistently available across the countries and years in our study. In a sensitivity check, we test the extent to which the inclusion of immigration and citizenship alters our understanding of the effects of compositional change on inclusive income growth in the U.S., one of the countries where data on immigration and citizenship is available. The results are not meaningfully different, but we cannot determine whether the same would be true for other countries.

been observed in most countries in this analysis; see trends in each of our demographic and employment indicators in Appendix I). Households headed by single mothers, in particular, face higher rates of poverty and tend to have fewer resources relative to households headed by two parents; as such, a rise in single motherhood is generally posited to contribute to lower levels and inclusivity of income growth (Fox et al. 2015, Garfinkel and McLanahan 1986, Iceland 2019, Wilcox and Wang 2017).

Other scholars have investigated the role of assortative mating (e.g., when adults tend to partner with persons of similar education levels) in driving inequality (Breen and Salazar 2011, Esping-Andersen 2007, OECD 2011, Schwartz 2010, Torche 2010). Theory suggests that rising similarity of partners' education levels in many countries (though not all; see Appendix I), combined with rising women's employment, may contribute to greater family income among high-educated partners and thus to rising inequality. Empirical assessments of this claim, however, are mixed. Cancian and Reed (1999) find that increases in assortative mating explained little of rising inequality in the U.S., a finding matched by Breen and Salazar (2011). The latter study and Western, Bloome and Percheski (2008) instead suggest that within-group inequalities – dispersions of income within family types with otherwise similar characteristics – are more consequential to rising inequality than differences in income across family types. With respect to women's labor supply, Esping-Andersen (2007) finds that rising maternal employment was associated with *reduced* levels of inequality in the Nordics despite an increase in assortative mating. In contrast, Schwartz (2010) finds that assortative mating contributes notably to rising family earnings inequality.[6]

One difficulty in assessing the relative role of assortative mating in shaping inclusive income growth is that the phenomenon is closely related to rising educational attainment for

[6] Note, however, that this study exclusively examines earnings (rather than disposable income) and does not disentangle the role of rising educational attainment in general versus rising similarity in partners' education levels in shaping trends in inequality.

the population at-large (Western, Bloome and Percheski 2008). The attainment of higher education, independent of family sorting arrangements, has been recognized as "the great equalizer" given its association with economic success in adulthood, even among individuals from disadvantaged backgrounds (Cappelli 2015, Pfeffer 2008, Torche 2011). Shifting from a micro to macro perspective, however, the implications of rising educational attainment for trends in inequality are less clear. As noted, the skill-biased technological change (SBTC) perspective on inequality posits that rising educational attainment, combined with rising returns to higher education, has been a dominant driver of inequality in recent decades (Goldin and Katz 2008). Given that all countries included in this study saw increases from the 1980s to 2010s in the share of the population with a university degree (see Appendix I), the SBTC perspective suggests that rising educational attainment may contribute to less-inclusive income growth.

Critics of the composition-centric perspective on rising inequality, however, tend to argue that the relative contributions of changes in education, family structure, and employment to inclusive growth are likely to be conditional on prevailing tax and transfer systems (Brady, Blome and Kleider 2016, Gornick and Jäntti 2012, Parolin 2019). Consider that moving from unemployment to employment will increase a household's earnings, but may reduce the level of income transfers that the household receives and may increase the level of taxes that the household pays. In this case, the disposable income (post-tax and post-transfer) income gains will be more muted than the factor income (primarily earnings from employment) gains that result from an increase in employment. If so, it may be that the *tax and transfer* explanations are more consequential that the *composition* perspective in explaining inclusive growth.

Another critique is that changes in returns to higher education (and other demographic and labor market characteristics) are conditional on prevailing labor market institutions. For example, sociologists have found that the effects of automation, digitization, and globalization

in shaping the earnings distribution are largely conditional on the strength of organized labor (Fernandez 2001, Kristal 2013, Parolin 2020). Similarly, changes in the returns to higher education are largely a product of public investment into education and the employment standards of lower-wage workers (Horowitz 2018, Weisstanner and Armingeon 2018).

This leads to the third perspective: **changes in other factors, including market institutions**. Empirically, this component is best understood as a residual that captures all changes in the household earnings distribution that are not explained by observed compositional changes. Specifically, the residual includes changes in the returns to *observed* characteristics (e.g. rising returns to higher education), but also changes in *unobserved* features, such as immigration status, that are in theory measurable but not consistently available in our datasets; *unobservable* features, such as motivation, which are not generally available in datasets due to the difficulty of achieving precise measurement; and changes in the returns to all unobserved or unobservable characteristics. The returns components of our residual term conceptually parallels the *penalties* component of the penalties/prevalence framework of Brady, Finnigan, and Hübgen (2017) and other studies focusing on the *returns* to a measurable set of characteristics (or the *betas* in a Kitigawa-Oaxaca-Blinder model).

The economics literature often attributes these "unexplained" changes to forces such as skill-biased technological change or rising returns to higher education (Goldin and Katz 2008). Sociologists, in contrast, have largely pointed to changes in rent-generating institutions, labor market regulations, and a broad range of social and cultural features, such as norms around pay standards and institutionalized perceptions of equity (DiPrete, Eirich and Pittinsky 2010, Kenworthy and Pontusson 2005, Moller, Alderson and Nielsen 2009, Western and Rosenfeld 2011). For example, labor market institutions, such as union membership, employment protection legislation, and minimum wage laws, affect the distribution of earnings independent of taxes, transfers, or composition (Brady, Baker and Finnigan 2013, Western and Rosenfeld

2011, Wilmers 2017). In many countries, including the U.S., worker power has steadily declined in recent decades. In countries such as France, however, levels of collective bargaining coverage have been relatively stable (OECD 2018). Meanwhile, institutions generating top-end rents – through mechanisms such as occupational closure, returns to higher education, and managerial pay-setting – have strengthened in countries such as the U.S., though perhaps less so in other high-income countries (Red Bird and Grusky 2015, Weeden and Grusky 2013).

Disentangling all of a country's political, social, and economic institutions that affect this residual term is not feasible. Moreover, our residual term can also include the effect of compositional features that we are unable to include our regression models. Thus, in our empirical operationalization, we refer to the concept as "other factors including market institutions," or "other factors" for short, recognizing that while sociological research has made clear that changes in market institutions are likely to have large effects on changes in inequality, our framework cannot distinguish the many competing forces within the residual term.

National Growth Profiles

As described, sociological research has offered contrasting views on the mechanisms underlying trends in inclusive income growth. Adopting a cross-national perspective on within-country trends in inclusive growth, this study aims to disentangle the relative contribution of the three dominant perspectives – taxes and transfers, composition, and other factors including market institutions – in driving the relative inclusivity of income growth. To do so, we introduce the concept of *national growth profiles*. We conceptualize a growth profile as a unified framework that measures each of the distinct components driving changes in a country's income distribution. In other words, a growth profile isolates and measures the mechanisms that contribute to growth at each point along the income distribution. We propose that growth profiles can be measured as the sum of four primary components: changes in taxes, transfers, composition, and other factors including market institutions ("taxes, transfers, composition, and

other factors"). A cross-national investigation of growth profiles can be used to investigate **the extent to which changes in taxes, transfers, composition, and other factors contribute to inclusive income growth.**

To provide an appropriate answer to this question, our framework for measuring national growth profiles must be able to isolate the precise contribution of changes in each of these components to changes in income growth across the distribution. This is necessary to assess whether one set of factors appears more important than others in driving inclusive income growth. One challenge in meeting this objective, however, is that taxes, transfers, composition, and other factors evolve in tandem. For example, if a country increases income transfers toward jobless individuals, it may discourage some jobless individuals from pursuing employment (the moral hazard effect). If so, this resulting compositional change would dampen the contribution of the increase in transfers on income growth.

To properly distinguish these components, our framework for measuring national growth profiles separates the influence of changes in taxes and transfers on inclusive growth into two components: *policy-driven* changes in the contribution of taxes or transfers and *compositional changes* that activate the level of taxes paid or transfers received independent of actual policy change. The policy-driven contribution of transfers captures the result of the actual policy change (the policy rules or intentions), such as an increase in the minimum unemployment benefit rate in a given country. The change in transfers activated by *composition* includes changes in composition that affect the likelihood that households receive those transfer benefits (or the benefit levels that a household receives). For example, even if there is no intended policy change to unemployment benefits, but there are now more jobless adults than before, this compositional change will activate greater receipt of transfer benefits, contributing to a larger effect of transfers in boosting income growth at the bottom of the distribution. Our framework is able to separate this increase in taxes or transfers as activated by compositional

change from the contribution of taxes or transfers driven by intentional policy change.

DATA & METHODS

Our methodological approach proceeds in three steps. We first detail our data source and sample selection. We then detail the six primary indicators of income growth that we use in our decomposition framework of national growth profiles. Third, we describe how we apply those six indicators to decompose income growth in a country into changes in taxes, transfers, composition, and other factors including market institutions.

Data & Sample

We use household income data from the LIS Database. LIS provides harmonized income data across a broad set of countries spanning several decades. We limit our country selection to (1) countries with consistent data from the late 1980s (or early 1990s) to 2010s, (2) datasets that allow us to isolate pre-tax/transfer income, (3) countries with consistent demographic and labor market indicators over time, and (4) countries with sufficient sample size and diversity to allow for adequate balance when reweighting across samples over time. Eight countries within the LIS data meet these qualifications: the U.S., Canada, Australia, France, Germany, the Netherlands, Finland, and Denmark (see Appendix I for descriptive statistics and the precise years applied for each country).[7] In the Supplemental Appendix, we present evidence that to notably expand our country coverage, we would need to analyze trends in inequality only from around 2004 onward, a substantially shorter timeframe relative to our primary analysis. Given that much of the rise in inequality in high-income countries occurred prior to 2004, and that the shorter timeframe limits the extent of variation in taxes, transfers, and composition that we can measure, we prioritize the longer timeframe despite the smaller

[7] Several countries were eliminated from consideration due to failure to meet criterion 1. Countries with "gross datasets" (AT, BE, HU, IE, IT, LU, MX, PL, RU, SK, SL, ES) did not meet criterion 2. The UK changed the labeling of its education variable between the 1990s and 2010s samples and did not meet criterion 3. Norway met the first three criteria, but did not achieve a successful balance in our reweighting attempts (criterion 4), due to a change from survey to register data and a large change in the sample size between the first and final year (14,721 vs. 507,822, respectively), leading to its exclusion.

number of available countries. The eight countries in our study include large variation in welfare state and labor market institutions. As such, we can expect to see variation in the inclusivity of income growth across the countries, as well in the role of taxes, transfers, composition, and other factors in shaping patterns of income growth.

Our primary analyses focus on non-retirement households. Specifically, we exclude households that have a non-employed individual over the age of 60 due to their vastly different income compositions. In the Supplemental Appendix, we demonstrate that, in each country examined in our study, around half of the retirement-age population has no factor income (income from labor or capital), far different from households without retirement-age adults. As a sensitivity check, we also present results when removing all households with individuals above the age of 64, regardless of employment status; the results, as displayed in the Supplemental Appendix, are not meaningfully different from our primary analysis.

Indicators of Income Growth

Our decomposition framework relies on six primary indicators of income growth for each country. We describe these indicators in broad terms first, then narrow in on their precise measurement and explain how we use the indicators to decompose income growth into taxes, transfers, composition, and market institutions. These six indicators include the *observed* change in (1) factor income, (2) gross income, and (3) disposable income for a given country from the 1980s to 2010s, as well as the *counterfactual* change in (4) factor, (5) gross, and (6) disposable income if the demographic and labor market composition of the country were held constant over time.

Table 1 details the distinctions among the three major income concepts. *Factor* income includes a household's income from labor and capital. For most households, this is primarily earnings from employment. In these datasets, among non-retirement households, income from capital comprises only 3 percent of factor income, on average, meaning that 97 percent is

income from labor. Importantly, taxes and transfers are not accounted for in measuring factor income. *Gross* income is the sum of a household's factor income plus income transfers. This includes social insurance, social assistance, and private transfers.[8] *Disposable* income then accounts for income taxes and social contributions paid.

Table 1: Primary measures of household income

Income Concept	**Components**
Factor income (*f*)	Income from labor and capital
Gross income (*g*)	Factor income plus transfers
Disposable income (*d*)	Gross income minus income taxes and social contributions paid

Note: Income from labor comprises 97% of factor income on average (compared to 3% capital income).

For all household income definitions across all countries and years, we convert values to 2017 USD using the purchasing power parity (PPP) indices made available by LIS. Due to the potential for measurement error at the bottom of the income distribution, we exclude the 1st through 4th disposable income percentiles in our analyses. We bottom-code all incomes at 100 PPPs to avoid divisions by zero or near-infinite changes when calculating relative income growth. We explicitly measure *household* income, rather than *family* income, as this is the recommendation of the Canberra guidelines on income measurement, as well as all that LIS allows (The Canberra Group 2001).

In our primary analysis, we focus on *relative* income growth, measuring percent changes in income at each percentile over time. This is consistent with most applications of the Gini coefficient, P90/P10 ratios, and other relative assessments of trends in inequality. In Appendix V, we also present results when measuring *absolute* income growth. As these results show, the

[8] More precisely, transfers in the LIS Database include monetary social insurance, social assistance, and private transfers, as well as non-monetary social assistance transfers and non-monetary private transfers. For more details, see the LIS documentation (www.lisdatacenter.org).

distinction does not meaningfully affect our decomposition of the *sources* of income growth, but does, of course, affect the *levels* of observed income growth. Consider, for example, that a 5 percent relative income growth may be small in absolute terms if the baseline income value is small, and may be comparatively large in absolute terms if the baseline value is larger.

We use growth incidence curves to measure and display income growth across the factor, gross, and disposable income distributions. Specifically, we measure the percent change in income growth for each percentile from the 5th to 99th percentiles along the income distribution, and we standardize this change by the number of intervening years ("standardized relative income growth").[9] Importantly, the growth incidence curves applied here are "anonymized" in that they do not follow the same households over time (Kharas and Seidel 2018). Instead, they follow income growth at a given percentile of the income distribution, regardless of which specific households are situated at that percentile. This approach is consistent with prior applications of growth incidence curves (Alderson, Beckfield and Nielsen 2005, Ferreira, Firpo and Galvao 2019, Milanovic 2016, Ravallion and Chen 2003).

Formally, the cumulative percent change of a percentile, or $g(p)$, from 1984 to 2016 is measured as:

$$g(p)_i = \left(\frac{y_{2016}(p)}{y_{1984}(p)} - 1\right)_i \qquad (1)$$

Here, *y* is the income of the households at percentile *p* of the income distribution in the given year. When measuring absolute changes in income (see Appendix V), we simply subtract the earliest year's income value for the given percentile by the most-recent year's value. Given that our study countries have different timespans, we standardize each country's relative income growth by dividing the cumulative growth by the span of years in the sample (2016-1984 = 32

[9] We cannot produce a true measure of average annual income growth given that data for each consecutive year are not available in the LIS Database. We compare the difference between our measure of standardized relative income growth and average annual income growth in the Supplemental Appendix.

in this example, but the exact number of years varies by country). The subscript *i* refers to the income concept of interest. In our case, that is primarily disposable income (*d*), though we also evaluate observed changes in factor (*f*) and gross (*g*) income for each percentile. Recall that observed changes in factor, gross, and disposable income are the first three indicators applied in our decomposition framework.[10]

The final three indicators in our framework are the counterfactual growth in factor, gross, and disposable income if the composition of the given country were to be held constant from the first to final year. Put differently, what would income growth at each percentile in a given country have looked like if there were no change in education, employment, family characteristics, and so on? Assuming rising educational attainment contributed positively to income growth along the distribution, for example, we should see that this "composition-constant" income growth is less than the observed income growth.

To measure composition-constant income growth across the distribution, we apply a semi-parametric decomposition technique introduced in DiNardo, Fortin, and Lemieux (1996); hereafter "DFL decomposition." The DFL decomposition, in short, reweights the composition of the population in the final year for each country to match the composition of the population in the first year (for each country) based on a given set of observed characteristics, *x*. In this case, those observed are a combination of demographic and employment characteristics. The DFL reweighting function is defined as:

$$\psi(\mathrm{x}) = \frac{\Pr(t_x{=}1984|x)}{\Pr(t_x{=}2016|x)} \cdot \frac{\Pr(t_x{=}2016)}{\Pr(t_x{=}1984)} \qquad (2)$$

in which t_x is the probability of being in year *t* conditional on a vector of household characteristics *x*. In this study, vector *x* includes the following household-level variables based

[10] Throughout this paper, we use the term "indicators" to refer to the six indicators used to produce our decomposition framework (observed and composition-consistent changes in factor, gross, and disposable income). We use the term "components" when referring to the four components underlying changes in a country's income distribution (changes in taxes, transfers, composition, and other factors).

on the characteristics of the household members: our demographic characteristics, including the share of household members in given age bins (under 18, 18-25, 26-35, 36-45, 46-55, 55+), the gender of household head, mean educational attainment among adults in the household, family structure (single mother, single father, female head with no children, male head with no children, or two-parent households with children), mean marital/partnership status of adults in household, number of people in the household, number of children in the household, an indicator of whether the household head and spouse/partner have the same level of education (set to zero for non-partnered heads), and a separate indicator of whether they have the same employment status; and our labor market characteristics, including mean employment status of adults in the household. We also include a rich set of interactions to acknowledge, for example, that having all adults employed affects income differently if there is one adult in the home versus, say, three adults. In Appendix I, we provide descriptive statistics for each variable.

We multiply the given weights in the LIS data by the reweighting function, $\psi(x)$. We then evaluate whether the reweighting exercise was successful in balancing the means of the characteristics in the most-recent sample with the observed means in the original sample; as demonstrated in Appendix II, we broadly achieve balance among the characteristics of interest in the eight countries in this analysis. We then produce a counterfactual income distribution in year *t* using the new weights. The result details how the income distribution in year *t* (say, 2016) would differ from its observed value if the composition of the population matched that of the base year (1984). Plugging the counterfactual income distribution into Equation (1) in place of 2016, we now have counterfactual income *growth* for the respective country if its composition were held constant. Repeating this process for factor, gross, and disposable income provides us the final three indicators to embed into our decomposition of income growth.

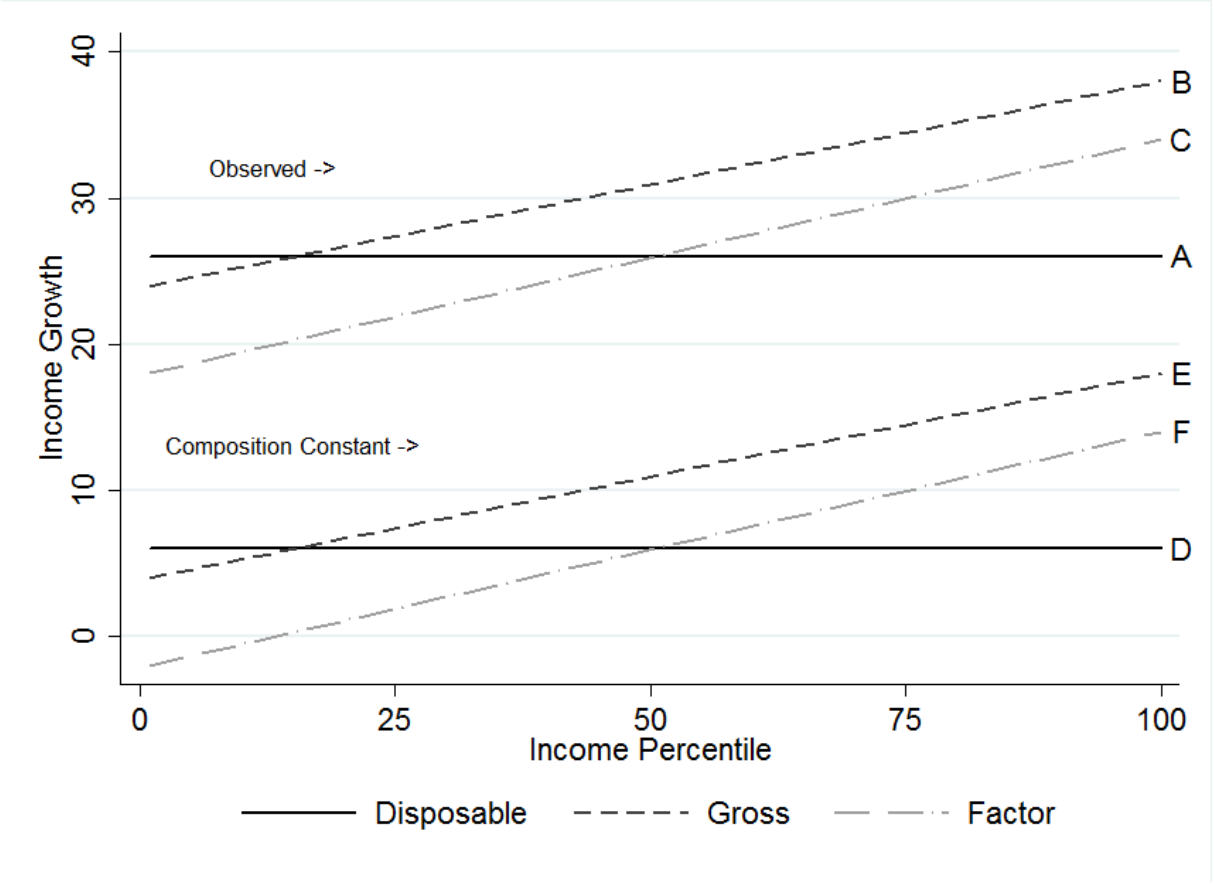
Decomposition Framework

With our six indicators of income growth identified (observed vs. composition-constant

changes in gross, factor, and disposable income), we can now turn toward our framework for decomposing income growth into changes in taxes, transfers, composition, and other factors. To achieve clarity in describing our framework, we first visualize the relationship among our six indicators, then formally define the decomposition framework.

Figure 1 presents a stylized example of the six indicators in our decomposition framework for a given country. The X-axis identifies each income percentile, while the Y-axis projects income growth for the percentile for each of the six indicators. The precise levels and slopes of the lines in this stylized example are mostly arbitrary and should not be over-interpreted here. What matters is understanding the differences among the six indicators, as detailed below.

Figure 1: Stylized example of indicators of decomposition framework



Each indicator is provided a label (A through F), which will we refer to below in presenting our formal decomposition framework. The labels are as follows:

A= Disposable income growth, observed
B = Gross income growth, observed
C = Factor income growth, observed
D = Disposable income growth if composition were held constant from first year
E = Gross income growth if composition were held constant from first year
F = Factor income growth if composition were held constant from first year

Note that, in this stylized example, inclusive growth is achieved, as disposable income growth (line A) is flat and positive across the income distribution. Our decomposition framework ultimately uses each of the other five indicators (lines B through F) to explain those observed levels of disposable household income growth at each percentile.

We now plug these into our decomposition framework. As defined in Equation (3), each of our four components are measured individually and expressed as an additive function to explain the disposable income growth of a given percentile.

$$g(p)_d = \quad g'(p_{tax})^{Policy} \quad + g'(p_{transfer})^{Policy} \quad + g'(p_{comp}) \quad + g'(p_{other}) \qquad (3)$$
$$A = \quad D - E \quad + E - F \quad + A - D \quad + F$$

The first part of the equation provides the formal definition, whereas the labels beneath correspond to those presented in Figure 1. The subscript *tax*, *transfer*, *comp*, and *other* refer respectively to the contribution of changes in taxes, transfers, composition, and other factors. As discussed, other factors include market institutions and all changes in the market income distribution not explained by shifts in composition (including changes in unexplained factors). Together, these components sum to overall disposable income growth of a given percentile, or $g(p)_d$. A central innovation in our framework comes in our further segmentation of composition into three subcomponents as follows:

$$g'(p_{comp}) = \quad + g'(p_{comp})_f \quad + g'(p_{transfer})^{Comp} \quad + g'(p_{tax})^{Comp} \qquad (4)$$
$$A - D = \quad C - F \quad + (B - C) - (E - F) \quad + (A - B) - (D - E)$$

The contribution of compositional change to income growth is the combined effect of (1) compositional change that affects changes in factor income, or $g'(p_{comp})_f$; (2) the change

in composition that activates changes in transfers, or $g'(p_{transfer})^{Comp}$; and (3) the change in composition that activates changes in taxes, or $g'(p_{tax})^{Comp}$. This segmentation of composition into these three components is important for two reasons. First, it allows us to provide a uniquely detailed portrait of the three primary mechanisms through which compositional change affects disposable household income growth. For example, if the average household sees an increase in education and employment, this is likely to have favorable effects on household earnings (positive effect of composition on factor income growth, or $g'(p_{comp})_f$); but may reduce the receipt of income transfers due to the gain in earnings (negative compositional effect, or $g'(p_{transfer})^{Comp}$, as transfer income falls as a result of the change); and may increase the tax burden even if tax rates do not change, as the household now earns more than before and thus might pay more in taxes, which reduces disposable income (negative compositional effect, or $g'(p_{tax})^{Comp}$).

Second, identifying the change in composition that activates changes in taxes, $g'(p_{tax})^{Comp}$, allows us to separate out the effect of policy-driven changes in taxation, or $g'(p_{tax})^{Policy}$, on changes in the income distribution.[11] The same is true for transfers. Recall that the policy-driven changes in taxes and transfers are two of the four components in our decomposition framework in Equation (3).

The policy-driven contribution of *taxes* to income growth at a given percentile – the first component of our decomposition framework – is defined as the difference between the change in composition-constant disposable income and composition-constant gross income:

$$g'(p_{tax})^{Policy} = \left(\frac{y_{2016|x=1984}(p)}{y_{1984}(p)} - 1\right)_d - \left(\frac{y_{2016|x=1984}(p)}{y_{1984}(p)} - 1\right)_g \quad (5)$$

$$\text{D} - \text{E} = \text{D} - \text{E}$$

[11] The policy effect can also be understood as the policy rules, or policy intentions, which affect changes in incomes independent of behavioral or demographic factors.

In Equation (5), the subscript *d* represents our *disposable* income definition of household resources, which includes all taxes and transfers, while the subscript *g* represents *gross* income (measured prior to taxes). The policy-driven contribution of taxes is measured as the difference in income growth from 1984 to 2016 between *disposable* and *gross* income at a given percentile if the composition of the population had not changed since 1984. In other words, if the composition of a country's population does not change, but disposable income grows at a greater rate than gross income for a given percentile, then the difference is attributable to a policy-driven reduction in taxes at that percentile. In Figure 1, this is line D minus E. The contribution of policy-driven changes in *transfers* – the second component of our decomposition framework – is measured similarly, but with one change: rather than taking the difference between the disposable (d) and gross income (g) distributions, we take the difference between the gross (g) and factor income (f) distributions in Equation (5).

To measure the change in taxes and transfers activated by compositional change – part of the compositional change component in our decomposition framework – we take the difference in the observed growth of *gross* versus *factor* income (for transfers), minus the respective policy component. For the change in transfers as activated by change in composition, this is defined formally as:

$$g'(p_{transfer})^{Comp} = \underset{\text{(B-C) – (E-F) =}}{\left(g(p)_g - g(p)_f\right)} \underset{\text{(B-C)}}{} \underset{\text{– (E-F)}}{- g'(p_{transfer})^{Policy}} \quad (6)$$

Measuring the change in taxes as activated by changes in composition is measured similarly, but again taking the disposable (*d*) minus the gross income (*g*) distribution instead. To measure the contribution of compositional change to factor income growth, part of our compositional change component, we calculate:

$$g'(p_{comp})_f = \left(\frac{y_{2016}(p)}{y_{1984}(p)} - 1\right)_f - \left(\frac{y_{2016|x=1984}(p)}{y_{1984}(p)} - 1\right)_f \quad (7)$$

C - F = C − F

In Equation (7), the contribution of compositional change to the factor income growth of a given percentile is the observed income growth minus the counterfactual factor income growth if all characteristics are held at their initial levels. In Figure 1, this is line C minus F.

The final component of our decomposition framework, the contribution of other factors including market institutions, or $g'(p_{other})$, is measured simply as $\left(\frac{y_{2016|x=1984}(p)}{y_{1984}(p)} - 1\right)_f$ in the second half of Equation (7). In Figure 1, this is line F. In other words, the "other factors" component is defined as the factor income growth of the percentile if the composition of the population had not changed. Together, changes in these four components – taxes, transfers, composition, and other factors – add up to the overall change in disposable income at a given percentile of the distribution.

Advantages and Limitations

We briefly discuss the advantages and limitations of our decomposition approach. Relative to Kitigawa-Oaxaca-Blinder and Fairlie decompositions, our framework allows for an analysis of distributional outcomes rather than simply a decomposition of the mean of a given characteristic. Moreover, our framework offers greater flexibility in decomposing changes in income at a given percentile into an additive set of subcomponents. Relative to standard measures of income inequality, such as the Gini coefficient, our framework for measuring inclusive income growth is more comprehensive and flexible. It is more comprehensive in that we account for both *growth* and *dispersion*, whereas most measures of inequality only capture dispersion. Our framework is more flexible in that we measure income growth (and the sources of it) across the entirety of the distribution, whereas the other indices tend to produce a single summary indicator to describe dispersion (and thus might be more sensitive changes at a given part of the distribution).

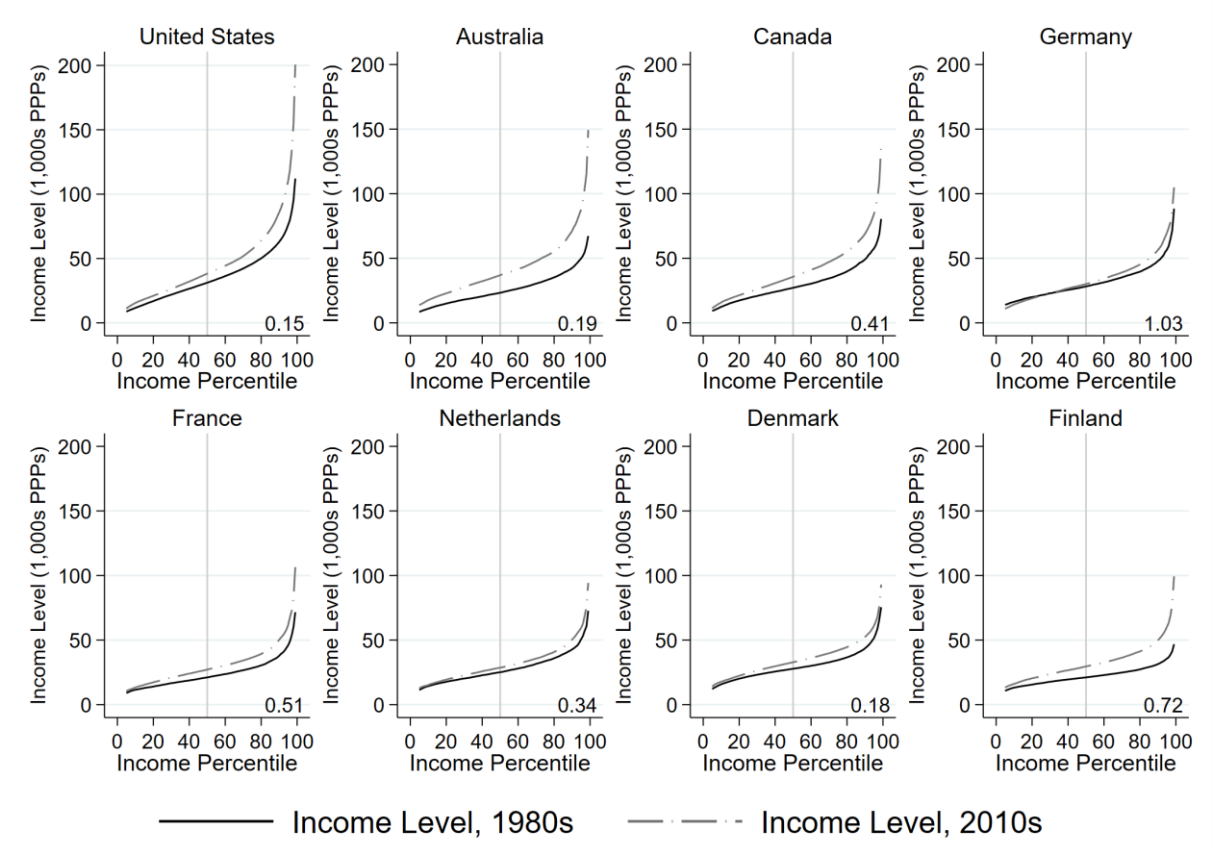
Our framework builds on the reweighting techniques introduced in the DFL decomposition, but differs in its application: rather than reweighting to produce a single counterfactual distribution, we leverage variation in observed and reweighted distributions for gross, net, and disposable income to achieve our additive decomposition.

That said, our framework has limitations that should be considered when interpreting our results. First, our framework necessarily includes all *composition* effects (education, family structure, etc.) into a single component to overcome interactions among the subcomponents if we were to separate them out. Later, we do show the individual contributions of education compared to family structure, for example, but we note that the sums of each of the subcomponents do not necessarily add up to the overall contribution of compositional change due to their interactions. Second, though our framework allows us to descriptively compare the drivers of inequality across country, we cannot test for statistically significant differences in the drivers of income growth across countries in the same manner as traditional regression-based approaches. Third, we reiterate that our *other factors including market institutions* component is a residual term that contains all effects of changing income distributions that are not captured in our observed characteristics. We cannot formally disentangle which phenomena among the broad set of "other factors" are more consequential in driving inclusive income growth. Finally, we note that our framework cannot claim to provide *causal* evidence on the forces driving trends in inequality.

FINDINGS

Though this study primarily focuses on *changes* in income across the distribution, we begin our results with a look at variation in *levels* of disposable incomes in the first and final year of analysis for the countries in this study. Doing so provides a look at income levels for each point of the income distribution before understanding the sources of change for each from the 1980s to 2010s.

Figure 2: Levels of disposable income (thousands of PPPs) by percentile in 1980s and 2010s and changes in 90th percentile relative to 10th percentile (P90/P10 ratio)



Note: Number in bottom-right of each figure represents the difference in P90/P10 ratio for each country from the first to the final year (the final year's P90/P10 ratio minus the first year's ratio). Levels represent level of disposable household income in real PPPs at each percentile.

Income growth can be visualized as the vertical distance between the two curves. Australia, for example, experienced greater income growth across much of its distribution compared to, say, the Netherlands. Note that the dashed lines (2010s distribution) are nearly always above the solid lines (1980s distribution), indicating that all eight countries experienced income growth during this time period, with the slight exception of the bottom of the German income distribution. Given the nearly universal pattern of income *growth*, we primarily focus on the *inclusivity* of income growth in this study.

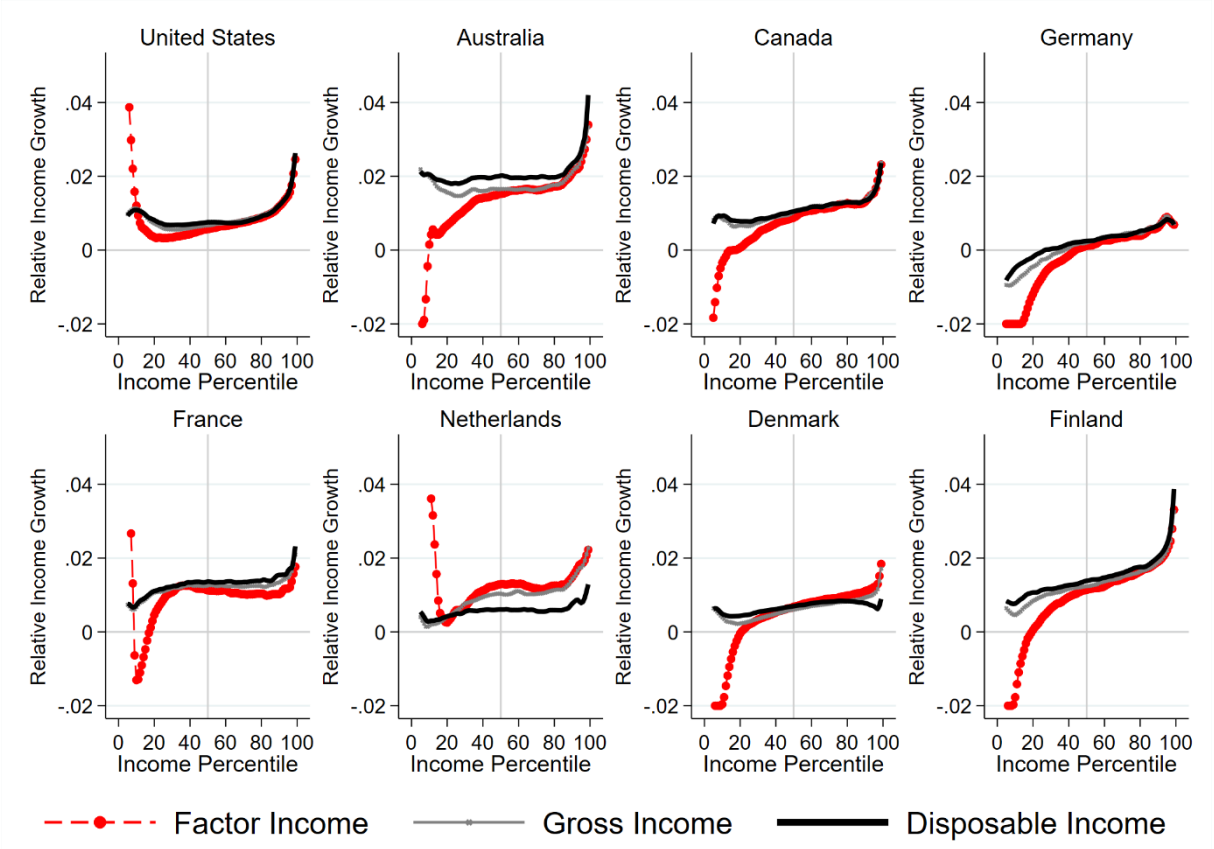
Inclusivity is visualized as the slope of each curve. A completely-horizontal curve, for example, would represent a perfectly equal income distribution. The number in the bottom-right of each figure summarizes the difference in the P90/P10 ratio (one summary indicator of

relative changes in inclusiveness) between the two years for the respective country. The results show that the eight countries examined experienced varying levels of growth and inclusivity from the 1980s to 2010s. Australia, for example, experienced slightly greater levels of growth relative to the U.S. and Canada, though the U.S. saw smaller increases in the P90/P10 ratio relative to Australia and Canada. Top incomes (around the 99th percentile) appear to have increased sharply in each of these three countries.

Germany, France, and the Netherlands, in contrast, have experienced more modest growth between the two time periods. Germany, in particular, has experienced growth with large increases in the P90/P10 ratio.[12] France experienced low levels of growth with a larger change in its P90/P10 ratio compared to the U.S. or Canada. Finally, Denmark and Finland display flatter (more egalitarian) income distributions in both years, with particularly large increases in levels of income growth for Finland. However, Finland also saw notable increases in inequality. The P90/P10 ratio grew at a faster rate in Finland (0.72) and Denmark (0.18) than in the U.S. (0.15). However, Appendix V shows that absolute changes in inequality (P90 minus P10) still grew faster in the U.S. relative to Finland and Denmark.

[12] Much of this is likely due to the unification of West and East Germany in 1990, one year after this time series begins.

Figure 3: Relative income growth by income concept (1980s-2010s)



Note: Observed changes in factor, gross, and disposable income represent, respectively, lines C, B, and A from Fig. 1. Income growth measured as cumulative relative income growth divided by the total number of years observed for the given country.

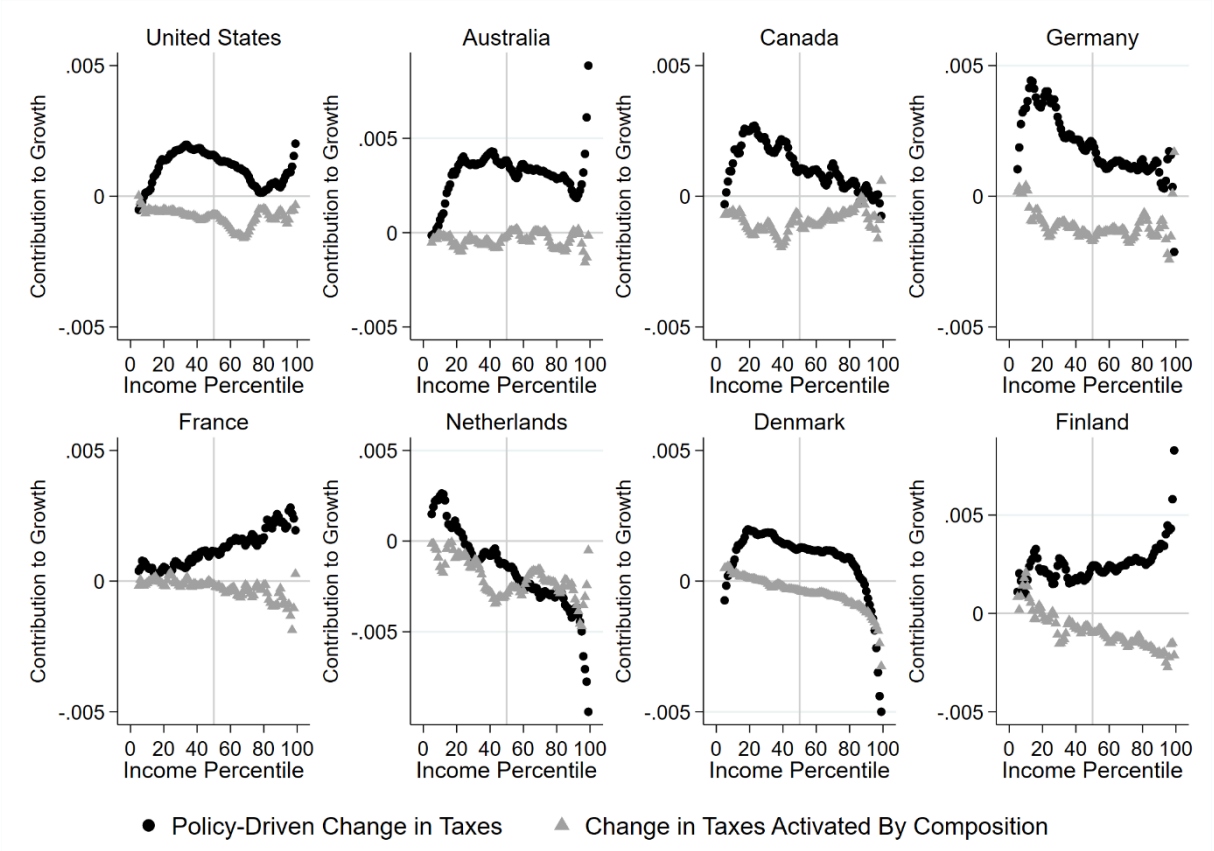
Figure 3 displays growth incidence curves for factor, gross, and disposable income for each country at each percentile. Recall that "inclusive" income growth is observed when the growth incidence curve is flat across the distribution (equal gains across the income distribution) and above zero (incomes increased). The levels and inclusiveness of income growth vary by country and depend on the income definition applied. In all countries, for example, factor income growth (red circles in Figure 3) differs notably from disposable income growth. In the U.S. and the Netherlands, factor income increased below the 20th percentile. In all other countries, however, factor income growth is negative across much of the bottom 20th percentile of the income distribution.

The gross income distribution (gray lines) tends to be hidden under the disposable income distribution (black lines) in Figure 3, but we summarize the key takeaways here. Adding

transfers to the factor income distribution generally increases levels of income growth near the bottom of the distribution. In Australia, for example, note the contrast between the 2 percent decrease in factor income (before transfers) and the 2 percent increase in gross income (after transfers) around 10th percentile. Similar patterns are observed in Canada, Germany, France, Denmark, and Finland. The two exceptions are the U.S. and the Netherlands, where gross income growth is less than factor income growth around the bottom decile.

Finally, the disposable income curve (black line) reveals changes in the income distribution when taxes are also included. In Denmark and the Netherlands, accounting for changes in taxes reduces income growth above the 80th percentile to create more equitable growth across the distribution. In countries like the U.S., in contrast, changes in taxes do not blunt the increases at the top of the distribution. In the U.S., the greatest gains are concentrated in the highest decile, consistent with other evidence on rising top incomes (Atkinson, Piketty and Saez 2011). We now turn toward more-detailed evidence on how changes in taxes, transfers, composition, and other factors shaped the observed gains in disposable household income.

Figure 4: Contribution of taxes to disposable income growth



Note: Contribution of policy-driven changes in taxes is line D minus E in Figure 1. Change in taxes activated due to compositional change is line A minus B minus the policy component. See Equations 5-6 for more detail. Income growth measured as cumulative relative income growth divided by the total number of years observed for the given country.

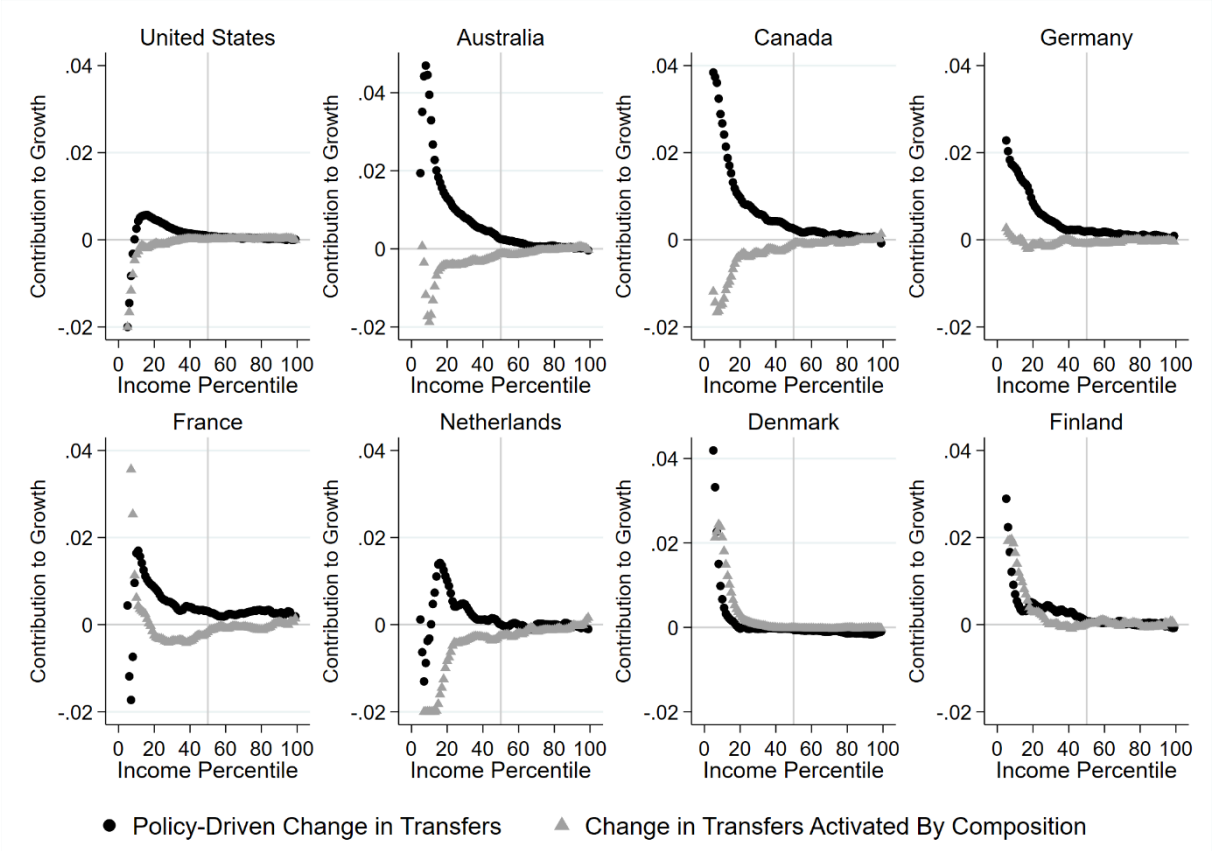
Figure 4 presents the policy-driven contribution of taxes to disposable income growth for each country (the first of the four components in our decomposition framework), as well as the change in taxes activated due to compositional change (part of the compositional change component of our framework). Recall again the difference between these two components. If a country increases its tax rates on high earners, this should lead to a policy-driven effect that is negative or, in other words, contributes to less growth in disposable household incomes toward the top of the distribution. If a country's composition changes such that more are taxed at higher rates, the change in taxes as activated by compositional change should also be negative, as these households are now paying more in taxes, which reduce disposable income.

Our results suggest that, in the U.S., the policy-driven change in taxes has contributed

positively to income growth, particularly for the 20th through 70th percentiles and the upper-most decile. These patterns align with expectations given observed changes in tax rates from 1986 onward. In 1986, the top marginal tax rate was 50 percent, applied to households with income over $116,870 in 1986 USD (approximately $275,000 in 2016 USD). In 2016, however, the top marginal tax rate was 39.6 percent and applied to households making at least $415,000 per year in 2016 USD (Saez and Zucman 2019, Tax Foundation 2018). Our decomposition framework captures this, demonstrating a policy-induced increase to top incomes as a result of the changes. The change in taxes as activated by composition, in contrast, contributes to relatively small declines in disposable income above the median. This pattern is similar in Australia, which saw large gains at the top of its income distribution. Our results suggest that this increase is largely due to policy-driven changes to taxation in Australia. In Canada, in contrast, policy-driven changes to taxation promoted more inclusive growth.

Germany and the Netherlands provide separate examples of how to increase the progressivity of the tax structure. The results suggest that policy changes in Germany have reduced the tax burden for the bottom half of its income distribution, while changes in the Netherlands appear to have increased the tax burden for the top half of its income distribution. Similarly, Denmark increased the tax burden on its top earners, ensuring that policy-driven changes to taxes contributed to more inclusive income growth. Finland, in contrast, reduced the tax burden on top earners, as evident in the positive policy curve near the top decile in Figure 4. These findings align with observed policy changes in the Finnish top marginal tax rates, which have declined over time, and changes in Danish top marginal tax rates, which have risen from 1987 onward (OECD 2020).

Figure 5: Contribution of transfers to disposable income growth



Note: Contribution of policy-driven changes in transfers is line E minus F in Figure 1. Change in transfers activated due to compositional change is line B minus C minus the policy component. See Equations 5-6 for more detail. Income growth measured as cumulative relative income growth divided by the total number of years observed for the given country.

Figure 5 presents both the policy-driven contribution of transfers to disposable income growth (the second of the four components in our decomposition framework), as well as the change in transfers as activated by compositional change (part of the compositional change component of our framework). Looking at the U.S., we see that policy-driven changes in transfers contributed to more favorable income growth in the second decile of the distribution. This is consistent with evidence from Wimer et al. (2020), who find that increases in SNAP benefits (i.e., vouchers for the purchase of food), in particular, have contributed to favorable income gains for lower-income households despite the decline of cash assistance from AFDC/TANF. The change in transfers activated by compositional change was negative for the U.S., indicating that, over time, fewer households had compositional characteristics associated

with the receipt of more transfer benefits. This aligns with evidence demonstrating that rising employment rates among single parents and increases in educational attainment have led to fewer households eligible for social assistance or insurance (Parolin 2021).

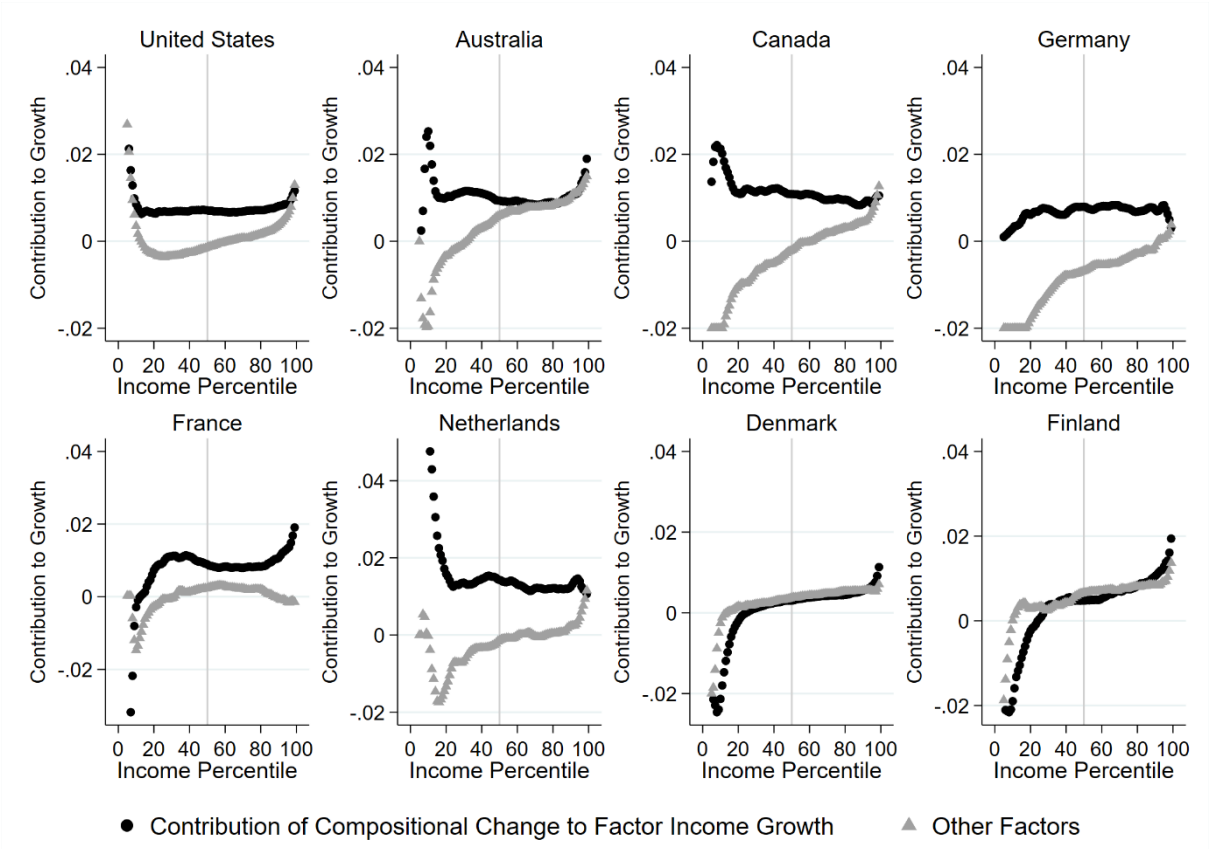
Canada and Australia, in contrast, see policy-driven increases in income transfers (see the positive value for the policy component) combined with compositional changes that have reduced the contribution of changes in income transfers to income growth, suggesting again that fewer households in these countries are now in a position to receive the transfers. This divergence between the policy-driven changes in transfers and changes in transfers activated by compositional change contrasts with the moral hazard hypothesis.

In Germany and France, policy changes have increased the generosity of transfers from the 1980s onward (positive policy components), though the composition components of the contribution of income transfers have remained relatively flat.[13] In the Netherlands, policy changes have contributed to a declining role of income transfers at the very bottom of the distribution, but have boosted incomes closer to the 10th percentile. Compositional changes, meanwhile, activated a decline in transfers.

In Denmark and Finland, policy-driven changes in transfers have contributed to more favorable income growth at the bottom of the distribution, though the changes in transfers activated by composition activated an *increase* in transfers (more households in a position to receive transfer benefits, consistent with the decline in factor income growth that we observed in Figure 3). This suggests that the Danish and Finnish welfare states became more generous for lower-income households, while more households also were in a position to receive the benefits.

[13] This aligns with observed policy changes. In France, for example, the *revenu de solidarité active* (RSA) introduced in 2009 increased transfer payments to workers earning low wages, likely contributing to the policy-driven increase in transfers above the 10th percentile.

Figure 6: Contribution of change in composition and other factors including market institutions to factor income growth



Note: The contribution of compositional change to factor income growth is line C minus F in Figure 1. "Other Factors" refers to the contribution of other factors including market institutions, or the counterfactual factor income growth if there were no change in composition, represented in line F in Figure 1. Income growth measured as cumulative relative income growth divided by the total number of years observed for the given country.

Figure 6 documents the final two components of our growth profiles: the contribution of compositional change to factor income growth (pre-tax/transfer, primarily household earnings; part of the compositional change component), as well as the effect of other factors including market institutions, or $g'(p_{other})$, which is equivalent to the counterfactual factor income growth if there were no change in the composition of the given country from the 1980s to 2010s.

In the U.S, compositional change contributed to increases in factor income across much of the income distribution at a rate of around 1 percentage point per year. This aligns with expectations given what we observed before in Figure 5: changes in composition reduced the share of households in the U.S. who were in a position to receive transfer benefits. In the U.S.,

Australia, and Canada, other factors including market institutions contributed to non-inclusive income growth. Put differently, even if there were no change in composition from the 1980s to the 2010s, households in the upper half of the distribution would still experience greater income gains due to other factors that attribute larger relative earnings premiums for higher education, full-time employment, or other demographic/employment characteristics.

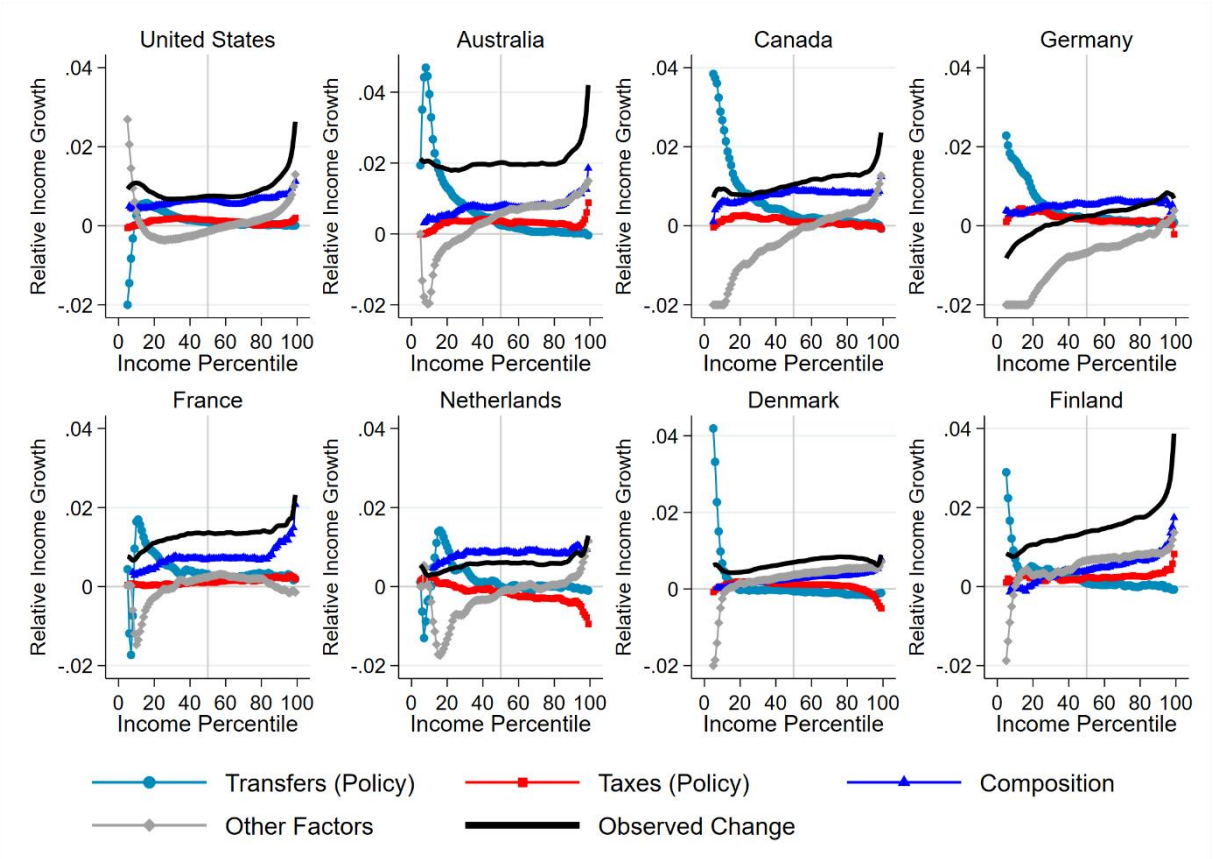
The Netherlands stands out as seeing large factor income gains from compositional change across the bottom half of its distribution. In contrast, the effects of compositional change on changes in the factor income distribution were relatively small in France and Germany toward the bottom of the distribution. France is unique among our study countries in seeing relatively small contributions of others factors to income growth across most its distribution, perhaps due to the country's relatively stable labor market institutions, including rates of collective bargaining coverage (OECD 2018).

In Finland and Denmark, the contribution of compositional change to factor income growth is negative across the bottom two deciles of the distribution (again consistent with what we observed in Figure 5). Finland and Denmark both experienced non-inclusive changes in factor income attributable to other factors. While historically strong social, political, and labor market institutions have helped to shape more egalitarian income distributions in these countries, the weakening of such institutions may have contributed to regressive changes in the income distribution.

In Appendix III, we further disaggregate the compositional effects into changes in education, employment, and family structure. Due to interactions among these three sets of indicators (changes in family structure and education are likely to coincide with changes in employment), the contributions of education, employment, and family structure in Appendix III do not necessarily add up to the contribution of compositional change as a whole. Nonetheless, Appendix III shows clearly that changes in educational attainment tend to be more

consequential to changes in income growth relative to changes in employment and household structure. Moreover, changes in educational attainment contribute to income growth across most of each country's distribution, but also contribute to non-inclusive income growth in each country. Put differently, changes in education – independent of changes in the returns to education, which is captured in our *other factors* component – have contributed to higher but less inclusive income growth. When accounting for changes in education, changes in employment and household structure (which includes patterns of assortative mating) have more muted effects across each country's income distribution.

Figure 7: Comparing national growth profiles by country (levels and sources of change in disposable income at each percentile)



Note: Larger figures for each country are provided in the Supplemental Appendix. "Composition" includes all three components detailed in Equation (4). Observed change represents the observed disposable household income growth at the given percentile. Income growth measured as cumulative relative income growth divided by the total number of years observed for the given country.

Figure 7 now compiles each component of a country's growth profile into a single figure

to provide a complete look at the drivers of disposable income growth across the distribution. Larger figures for each country are also provided in the Supplemental Appendix. The solid black line represents the observed change in disposable household income, while the dotted lines represent the four components of a country's growth profile. Here, "composition" now combines the compositional change that affects changes in factor income, the change in composition that activates changes in transfers, and the change in composition that activates changes in taxes, as described in Equation (4). Table 2, below, summarizes the key takeaways from the figure.

Specifically, Table 2 narrows in on the contributions of each component at the 10^{th}, 50^{th}, 90^{th} and 99^{th} percentiles. The selection of these specific percentiles is simply to provide a glimpse of changes at different points along the distribution. These percentiles are often used in assessments of lower-half inequality (P50/P10), upper-half inequality (P90/P50), and the very top of the distribution (99^{th} percentile). Results for all percentiles are visualized in Figure 7 (and in larger figures in the Supplemental Appendix).

Table 2: Summary of national growth profiles (disposable income) at 10th, 50th, 90th, and 99th percentiles

Country	Percentile	Strd. Relative Income Growth	Due to Change in Composition	Due to Policy-Driven Changes in Taxes	Due to Policy-Driven Changes in Transfers	Due to Change in Other Factors
US	10	1.1%	0.5%	0.0%	0.6%	0.0%
US	50	0.8%	0.6%	0.2%	0.1%	-0.1%
US	90	1.2%	0.7%	0.0%	0.0%	0.4%
US	99	2.6%	1.1%	0.2%	0.0%	1.3%
AU	10	2.0%	0.4%	0.1%	2.6%	-1.1%
AU	50	2.0%	0.8%	0.4%	0.2%	0.6%
AU	90	2.3%	1.1%	0.2%	0.1%	1.0%
AU	99	4.2%	1.8%	0.9%	0.0%	1.5%
CA	10	0.9%	0.4%	0.2%	1.5%	-1.2%
CA	50	1.1%	0.7%	0.1%	0.2%	0.0%
CA	90	1.3%	0.7%	0.0%	0.0%	0.5%
CA	99	2.4%	1.2%	0.0%	0.0%	1.3%
DE	10	-0.4%	0.3%	0.4%	1.5%	-2.2%
DE	50	0.2%	0.5%	0.2%	0.2%	-0.6%
DE	90	0.7%	0.6%	0.1%	0.1%	-0.2%
DE	99	0.7%	0.4%	-0.1%	0.0%	0.4%
FR	10	0.9%	0.4%	0.0%	1.6%	-1.2%
FR	50	1.4%	0.7%	0.1%	0.3%	0.2%
FR	90	1.6%	1.1%	0.2%	0.3%	0.0%
FR	99	2.3%	2.0%	0.2%	0.2%	-0.1%
NL	10	0.3%	0.0%	0.2%	2.4%	-2.6%
NL	50	0.6%	0.9%	-0.1%	0.1%	-0.3%
NL	90	0.8%	0.9%	-0.5%	0.1%	0.3%
NL	99	1.3%	1.2%	-0.8%	0.0%	0.9%
DK	10	0.5%	0.0%	0.1%	0.2%	0.1%
DK	50	0.7%	0.3%	0.1%	-0.1%	0.4%
DK	90	0.8%	0.4%	-0.1%	-0.2%	0.6%
DK	99	0.9%	0.7%	-0.6%	-0.1%	0.8%
FI	10	0.8%	0.0%	0.2%	0.4%	0.2%
FI	50	1.4%	0.4%	0.2%	0.1%	0.6%
FI	90	2.0%	0.8%	0.3%	0.0%	0.9%
FI	99	3.9%	1.7%	0.8%	-0.1%	1.4%

Note: Table summarizes findings from Figure 7. "Composition" includes all three components detailed in Equation (4). US=United States. AU=Australia. CA=Canada. DE=Germany. FR=France. NL=Netherlands. DK=Denmark. FI=Finland. Standardized ("Strd.") relative income growth refers to cumulative income growth divided by the number of years over which the growth occurred.

The findings confirm that each of the eight countries features a unique growth profile, though with some overarching similarities. In each country, for example, policy-driven changes in income transfers contributed more than the other components to income growth at the 10th percentile. Meanwhile, in the U.S., Canada, and Australia, income growth has been greatest at the 99th percentile. In each of these countries, the growth of the 99th percentile is more than double the growth of the median. However, the mechanisms underlying these patterns differ across the three countries. In Australia, policy-driven changes to taxes drive nearly a fourth of the gains at the very top, whereas in Canada, changes in compositional and other factors' effects contributed to all of the gains at the very top. In the U.S., non-inclusive changes in other factors including market institutions contributed to slower growth at the median compared to Australia or Canada. This variation in mechanisms underscores the usefulness of national growth profiles in explaining observed changes in each country's income distribution.

In Germany, France, and the Netherlands, relative growth rates at the 99th percentile were smaller than those observed in the U.S., Canada, or Australia. For the Dutch, this is largely due to progressive changes in income taxation, while for the French and Germans, this had more to do with limiting regressive changes in other factors. Changes to composition (and educational attainment, in particular; see Appendix III), contributed more to income growth at the median relative to the other three components in these three countries.

Finland stands out as seeing the least inclusive changes in its income distribution when measuring relative growth (though this is not the case when measuring absolute changes in inequality, as shown in Appendix V). A combination of compositional change, non-inclusive changes to taxation, and non-inclusive changes to other factors contributed to large growth (standardized relative income growth of 3.9 percent) at the 99th percentile of the Finnish distribution. Meanwhile, the 10th percentile of the Finnish distribution grew at a slower rate than in the U.S., Canada, or Australia. Denmark, in contrast, experienced more inclusive growth

than Finland, but with vastly different levels of growth. In Denmark, the 99th percentile grew at a standardized rate of 0.9 percent, while its median grew at a standardized rate of 0.7 percent. Policy-driven changes in taxation at the top of the distribution clearly achieved this parity in Danish income growth. Perhaps more impressively, Denmark maintained inclusive growth despite increasingly non-inclusive changes in other factors. As in each country observed here, increases in transfers were the primary drivers of Danish income growth at the 10th percentile.

DISCUSSION

Having introduced our decomposition framework and visualized the diverse national growth profiles, we now summarize the evidence on our primary research question: **to what extent do changes in taxes, transfers, composition, and other factors including market institutions contribute to inclusive income growth?**

The economics and sociology literatures have demonstrated that cross-national variation in taxes and transfers are central to explaining variation in poverty and inequality across both place and time. From the perspective of within-country changes in inequality, however, can variation in changes in tax and transfer systems better explain patterns of inclusive income growth relative to changes in composition or other factors including market institutions? Our evidence suggests that this is indeed the case – but only at the tails of the distribution. Across all eight countries examined, policy-driven changes to income transfers were the most important component of income growth in the bottom decile of the distribution. Thus, in the absence of these policy changes, each of the countries would have likely seen a rising P90/P10 ratio, one metric of income inequality. Our evidence does not provide broad support for concerns of moral hazard effects. In six of the eight countries examined, income transfers became more generous while changes to composition simultaneously ensured that fewer households were in a position to receive the transfers. Only in Finland and Denmark did rising generosity of income transfers coincide with more households being in a position to receive

transfers. This finding for Denmark is consistent with evidence from Agersnap, Jensen and Kleven (2019); for Finland, it is consistent with our descriptive statistics in Appendix I. Nonetheless, claims of an inherent trade-off between equality and efficiency in the domain of income transfers lack face validity in most of the countries examined here.

Tax policy, conversely, has been particularly important in determining the trajectory of top incomes. Consider the difference in inclusive income growth between Denmark and Finland: changes to Finnish tax policy contributed to four times the rate of relative growth at the 99th percentile compared to the 10th percentile. In contrast, Denmark imposed tax policy changes that contributed to *decline* in incomes at the 99th percentile while reducing the tax burden for the 10th percentile. These different approaches to changes in tax policy from the 1980s to 2010s help to explain why Finland saw a much steeper increase in income inequality relative to Denmark. Similarly, changes to tax policy in the Netherlands reduced income growth at the 99th percentile by nearly a percentage point per year, on average, while in Australia, declining top tax rates contributed to increases in income growth at the 99th percentile. This helps to explain why the 99th percentile in Australia increased at a rate three times faster than in the Netherlands. Given this evidence, our first primary takeaway is that taxes and transfers remain an essential component of inclusive income growth, particularly for offsetting non-inclusive changes in other factors including market institutions, but have been effective only at the tails of the income distributions among the countries observed.

In contrast, compositional changes carry consequences across most of each country's distribution. Of the three broad compositional groupings – education, family structure, and employment – that sociologists have studied extensively in the context of inequality, changes in educational attainment contributed the most to increases in *levels* of income growth, but with decreases in the *inclusivity* of income growth (see Appendix III). Put differently, rising educational attainment increased incomes, consistent with sociological perspectives that find

higher education to be a dominant driver of economic mobility, but also increased income inequality (independent of any changes to the returns to educational attainment, which we capture in the *other factors* component).

Though family structure has been a strong focus of sociological literature on income inequality, our findings suggest that changes in single parenthood and assortative mating have had a relatively small impact on changes in inequality across the countries and time points examined here. This is consistent with the work of Western, Bloome and Percheski (2008). The small impacts of family structure on changes in the income distribution are perhaps due to the endogeneity of family structure with other demographic and labor market changes. For example, theories of the association of assortative mating and rising inequality are generally built on assumptions that (1) educational attainment is rising and (2) maternal employment is increasing (Esping-Andersen 2007). Thus, when separately accounting for education, the conditional effect of assortative mating is relatively small. Indeed, we confirm this in Appendix IV: when we exclude changes in educational attainment from our models, the conditional effect of assortative mating on changes in the income distribution are stronger and inequality-increasing. When we include changes in educational attainment, however, the conditional effect of assortative mating is weaker and no longer inequality-increasing. Our results suggest that selective sorting of well-educated spouses across households is of secondary relevance, in the context of inclusive income growth, compared to broad increases in educational attainment. Similarly, shifts in single parenthood, independent of changes in education and employment, appear to explain little of the rising inequality across the countries observed in this study. These findings challenge the strong emphasis on family structure and single parenthood in the sociology literature; instead, rising educational attainment and changes in taxes/transfers appear to be more consequential for shifts in income distributions.

Finally, shifts in other factors including market institutions tend to have inequality-

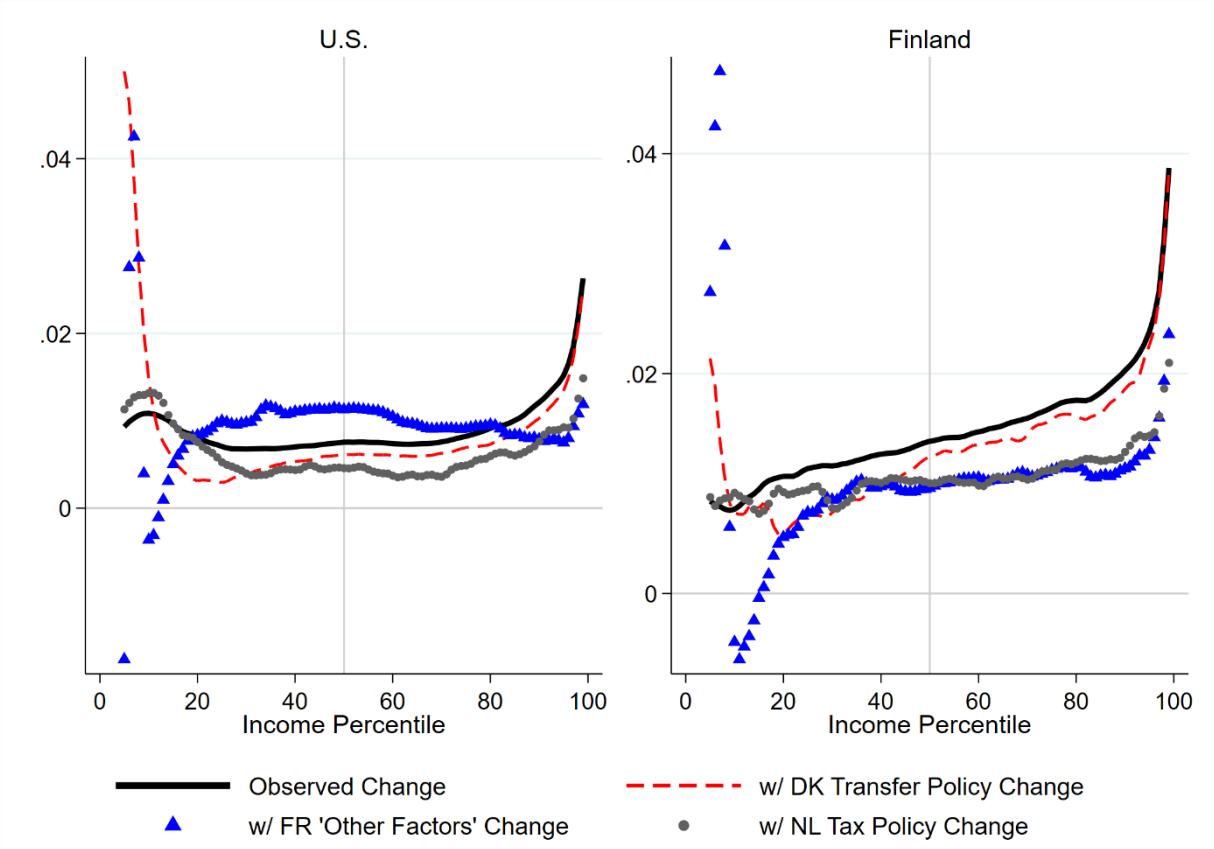
increasing effects across most the countries observed in this study, but with notable variation. Put differently, changes in the labor market returns to education, employment, and family structure have generally contributed to less inclusive income growth. The rising and inequality-increasing returns to education, in particular, is consistent with the SBTC perspective on rising income inequality. Indeed, the combination of rising educational attainment and rising returns to compositional characteristics explain almost all of the growth of 99th percentile in the U.S.

Strikingly, though, several European countries see just as large contributions of compositional change to rising incomes, but without the increasingly-unequal returns to composition. In France, for example, other factors including market institutions contributed to a decline in incomes at the 99th percentile and no change at the 90th percentile. France is one of few countries where union coverage has remained stable and collective bargaining coverage has actually increased in recent decades (OECD 2018); however, our framework cannot discern with certainty if this trend affects France's residual component. Germany, another country with high levels of collective bargaining coverage, likewise experienced very small inequality-increasing effects of changes in other factors. At the 99th percentile, for example, the contribution of the other factors component to income growth in Germany was around a quarter of the effect size observed in the U.S., Canada, and Australia.

Put simply, our results suggest that inequality-increasing returns are not inevitable consequences of market forces; rising educational attainment and compositional change more generally need not lead to more inequality. To illustrate this point and its implications for inclusive income growth in comparative context, we conclude by visualizing a counterfactual income distribution in the U.S. and Finland (the countries in this study that featured the smallest and large increases, respectively, in the P90/P10 ratio from the 1980s to 2010s) if they had adopted the pathways toward inclusive income growth observed in other countries. Specifically, we show a counterfactual income distribution for the U.S. if, as one example, the U.S. had

adopted changes to the tax system that the Dutch had implemented (rather than the observed changes to the U.S. tax system) or the effect of "other factors" comparable to the French (rather the non-inclusive changes observed in the U.S.). This counterfactual is purely an accounting exercise, but is illustrative nonetheless in documenting alternative pathways toward more inclusive income growth.

Figure 8: Counterfactual income distributions in the U.S. and Finland if the countries were to adopt changes in components observed in other countries



Note: Y-axis = Income growth measured as cumulative relative income growth divided by the total number of years observed for the given country.

Figure 8 shows that observed income growth in the U.S. (left panel, solid black line) saw large income gains at the 90th percentile, moderate gains around the median, and small increases around the 10th percentile. The 90th percentile grew at a standardized rate of 0.1 percentage points (p.p.) faster relative to the 10th percentile. Had the U.S. adopted the transfer policy changes observed in Denmark (see red dashed line), however, it might have achieved

more inclusive income growth: the 10th percentile would have increased at a standardized rate of 0.3 p.p. faster than the 90th percentile. Had the U.S. seen the change in other factors of France rather than its own (blue triangles), top incomes would have declined, with the 90th percentile growing at a standardized rate of 0.8 p.p. instead of 1.2 p.p.; notably, though, many bottom incomes would have fallen, as well. Finally, if the U.S. had mimicked changes in tax policy of the Netherlands, the 10th percentile of the U.S. distribution would have grown at about 0.6 p.p. faster relative to the 90th percentile, promoting more inclusive income growth. These counterfactuals demonstrate that changes in composition (and rising educational attainment especially) need not lead to the overall rise in inequality seen in the U.S.

The findings are similar for Finland (right panel), the country seeing the largest gains in the P90/P10 ratio in this study. Had Finland kept its compositional change as is, but adopted the transfer policy changes of nearby Denmark or the tax policy changes of the Dutch, the country would have likely experienced far more inclusive income growth. Top incomes in Finland would have also declined if the country had seen the change in other factors including market institutions of France. Put simply, the cross-national experiences demonstrate that changes to taxes, transfers, and other factors including market institutions – independent of rising educational attainment or shifts to family structure – remain essential in achieving more inclusive income growth.

CONCLUSION

Given rising income inequality across high-income countries, scholars and policymakers have increasingly embraced the concept of inclusive income growth. However, few studies to date have comprehensively measured patterns of and pathways toward inclusive income growth. Moreover, scholars have disagreed over the precise mechanisms underlying inclusive growth and how these mechanisms vary across countries. To address these tensions, this study introduced the concept of national growth profiles. Growth profiles measure the

additive contribution of changes in taxes, transfers, composition, and other factors including market institutions in shaping income growth at each point along an income distribution. The evidence produced four central findings that advance our knowledge of cross-national variation in inequality and inclusive growth.

First, from a descriptive perspective, the most egalitarian countries have generally seen the largest increases in inequality among the non-retirement population from the 1980s to 2010s. Finland, for example, experienced a greater increase in the P90/P10 ratio during this time period than did the U.S., Canada, or Australia. To be sure, Finland still features much lower *levels* of inequality compared to these countries, and features smaller *absolute* increases in inequality (see Appendix V). Nonetheless, changes throughout the past three decades justify greater investigation of *trends* in inequality as a complement to investigations of longstanding variation in levels of inequality.

Second, our framework allowed us to adjudicate competing narratives in the sociology and economics literatures regarding the dominant drivers of inclusive income growth. Specifically, our national growth profiles revealed the relative contribution of changes in taxes and transfers; changes in family structure, employment, and education; and changes in other factors including market institutions in shaping trends in inequality. Our findings suggest that taxes and transfers continue to be an essential component of inclusive income growth. Policy-driven changes in income transfers were the strongest individual contributors to income growth at the 10^{th} percentile in each country. Policy-driven changes in taxation that reduced incomes near the top of the distribution, meanwhile, were essential in the Netherlands and Denmark for achieving more inclusive growth, while tax policy changes in the U.S., Australia, and Finland instead increased top incomes and contributed to less inclusive growth. Our results corroborate perspectives that tax and transfer systems have been more consequential than compositional change in influencing inequality – but, according to our findings, primarily at the tails of the

distribution.

Third, rising educational attainment had the largest effects on changes in incomes across most of each country's distribution. In fact, when changes in education are accounted for, changes in assortative mating, single parenthood, and other family structure effects have little consequence for changes in country's income distributions. This finding challenges the large focus in sociological literature on shifts in family structure as a primary driver of inequality.

Finally, our results suggest that changes in other factors including market institutions have generally promoted non-inclusive income growth, but with large variation by country. In the U.S., the non-inclusive effect of other factors, particularly at the top of the income distribution, is consistent with the SBTC perspective of rising returns to educational attainment. In countries that have generally maintained high levels of union membership and collective bargaining coverage, such as France, changes in other factors did not contribute to similar increases in inequality. We show, for example, that if the U.S. or Finland had experienced the same effect of changes in other factors as France, they both would have seen much lower income growth at the very top of their respective distributions. Similarly, our results suggest that countries such as the U.S. and Finland could have adopted the tax policy changes of the Dutch, the transfer policy changes of the Danish, or followed a number of other pathways to achieve more inclusive income growth than observed.

Conceptually, our introduction of national growth profiles shifts focus from historical variation in inequality across political-institutional context to the mechanisms underlying ongoing changes in income inequality across high-income countries. Empirically, our decomposition framework advances the ability of scholars to differentiate the sources of variation across any two income distributions. In addition to its capacity to decompose the sources of income growth at each percentile along an income distribution, our decomposition framework is able to measure observed policy changes *without* having to directly incorporate

external data on policy indicators. For example, our framework was able to accurately pick up the changing top tax rates in countries like Denmark, Finland, and the U.S. (Figure 4), the rise of SNAP benefits in the U.S. (Figure 5), among other examples. Uniquely, our framework is able to separate the contribution of compositional change into three subcomponents that operate through changes in earnings, receipt of transfers, and payment of taxes.

In closing, we acknowledge several limitations of our study and we offer opportunities for future research. First, due to the broad focus on the sources of changes in inequality across eight countries, this study was unable to offer an in-depth look at the precise policy decisions or institutional changes that drive the mechanisms that we observe in each country. Future studies could build on this to examine, for example, whether within-country changes in unionization (and other contextual factors) are responsible for the increasingly regressive residual effects across these countries. Second, though we focus on variation in *changes* in inequality, it must be kept in mind that the countries experiencing the greatest relative increases in inequality are often not the most unequal countries. Finland and Denmark, for example, have far less income inequality today than the U.S. despite larger increases in inequality over the past several decades. Third, we reiterate that our *other factors including market institutions* component is a residual term that contains all effects of changing income distributions that are not captured in our observed characteristics. We cannot formally distinguish which phenomena among the broad set of "other factors" are more consequential for inclusive income growth.

Moving forward, scholars across sociology, social policy, and economics disciplines can apply national growth profiles and our decomposition framework to a wide array of investigations into inequality or income growth. As this study demonstrates, national growth profiles provide conceptual and empirical advantages in understanding the varying sources of rising income inequality across high-income countries.

Appendix I: Demographic and employment characteristics by country and year

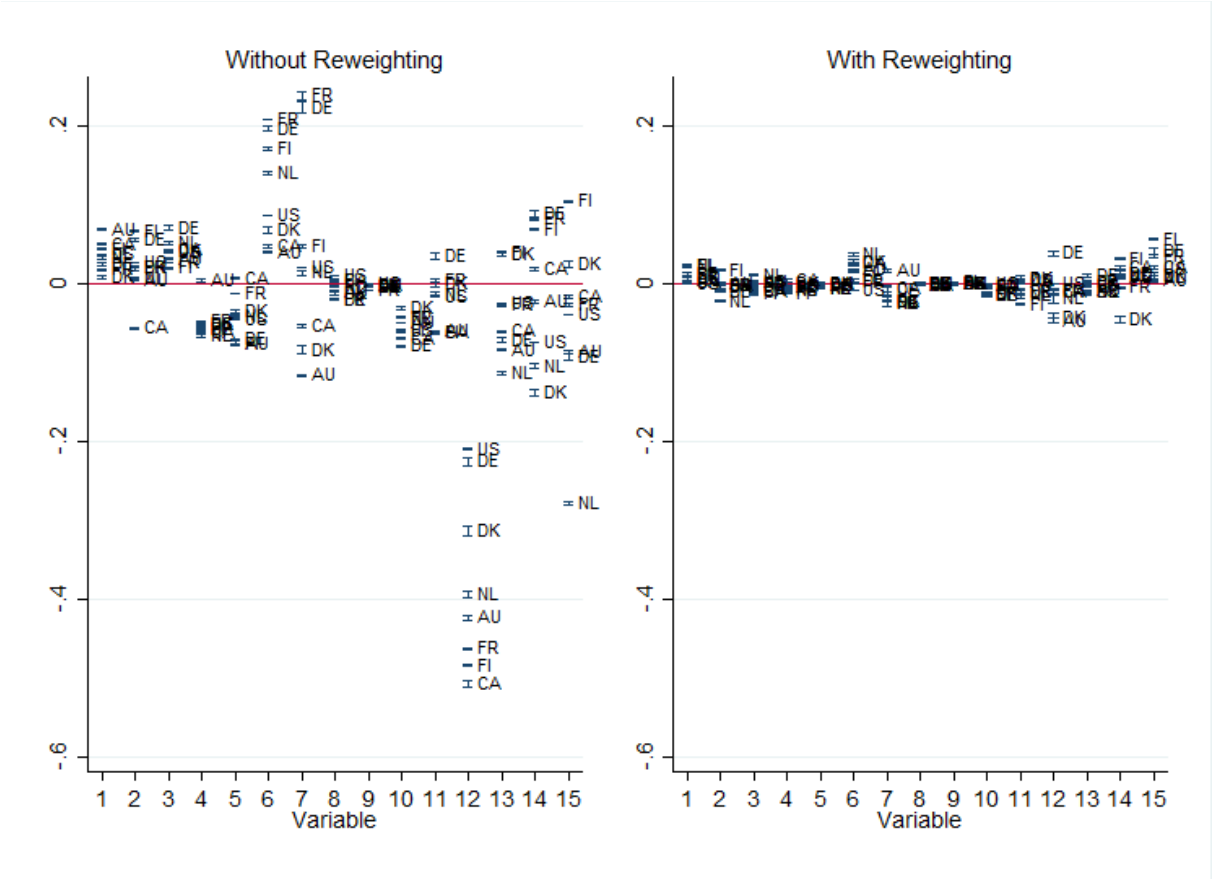
Variable	AU85	AU14	CA87	CA17	US86	US16
# Children in HH	1.58	1.26	1.33	1.20	1.49	1.36
# Adults in HH	2.17	2.29	2.27	2.31	2.20	2.21
Age 18-25	20.9%	20.6%	14.8%	20.9%	14.7%	12.4%
Age 26-35	20.2%	17.6%	21.5%	17.8%	21.1%	17.7%
Age 46 to 55	9.6%	10.0%	11.4%	17.7%	10.9%	17.0%
Age 56 - 65	0.0%	4.7%	3.1%	0.0%	3.3%	5.8%
Married/Partnered	78.0%	74.1%	77.9%	73.2%	72.2%	63.2%
Single Mother HH	3.8%	5.0%	3.3%	2.9%	6.9%	6.2%
Single Father HH	0.5%	0.7%	0.6%	0.8%	0.9%	1.0%
Female Head, With Kids	9.2%	12.2%	12.0%	13.8%	10.5%	15.9%
Male Head, With Kids	58.2%	44.9%	52.2%	39.3%	51.6%	41.0%
Female Head, No Kids	8.2%	12.3%	10.6%	16.5%	8.8%	13.9%
Male Head, No Kids	20.0%	24.9%	21.2%	26.7%	21.3%	22.1%
Low Education	30.1%	17.7%	19.3%	7.7%	17.0%	11.9%
Medium Education	18.2%	27.8%	33.0%	20.4%	33.5%	32.0%
High Education	16.8%	29.7%	20.9%	46.8%	21.5%	30.7%
% of Adults in HH Employed	47.6%	54.9%	51.7%	56.4%	49.8%	52.4%
Spouses Have Same Edu.	43.5%	46.0%	53.9%	52.8%	50.2%	58.0%
Spouses Have Same Emp.	44.5%	52.3%	48.0%	48.9%	75.3%	58.6%
Female Head & Employed	18.7%	27.5%	24.6%	31.1%	24.9%	33.7%
Male Head & Employed	67.1%	60.8%	62.2%	56.4%	65.3%	56.2%
Variable	**DE89**	**DE16**	**FR89**	**FR10**	**NL90**	**NL13**
# Children in HH	1.06	1.00	1.44	1.25	1.31	1.21
# Adults in HH	2.22	2.03	2.28	2.04	2.10	2.09
Age 18-25	16.0%	10.8%	14.3%	12.2%	13.3%	12.5%
Age 26-35	21.0%	14.4%	18.7%	16.0%	20.8%	16.0%
Age 46 to 55	16.7%	23.9%	12.2%	17.1%	12.5%	19.3%
Age 56 - 65	4.4%	8.0%	4.3%	5.4%	3.6%	5.5%
Married/Partnered	70.0%	50.1%	73.9%	52.6%	74.0%	60.2%
Single Mother HH	3.1%	5.5%	3.5%	5.5%	3.7%	3.9%
Single Father HH	0.5%	1.0%	0.4%	1.3%	0.4%	0.7%
Female Head, With Kids	4.0%	10.0%	13.0%	15.8%	4.2%	10.1%
Male Head, With Kids	50.5%	40.3%	52.3%	42.7%	54.9%	45.3%
Female Head, No Kids	10.3%	16.5%	9.4%	13.7%	9.4%	13.1%
Male Head, No Kids	31.7%	26.7%	21.4%	21.1%	27.3%	26.9%
Low Education	18.0%	8.1%	37.1%	20.0%	28.1%	15.8%
Medium Education	40.7%	35.9%	25.8%	31.4%	26.7%	31.6%
High Education	13.0%	19.0%	8.2%	21.8%	11.1%	25.0%
% of Adults in HH Employed	50.1%	56.3%	47.4%	50.0%	42.3%	52.5%
Spouses Have Same Edu.	47.2%	38.2%	55.4%	46.9%	38.3%	48.8%
Spouses Have Same Emp.	37.2%	45.9%	47.7%	50.3%	25.4%	52.6%
Female Head & Employed	19.4%	31.5%	24.4%	30.3%	14.1%	23.2%
Male Head & Employed	67.8%	54.9%	62.8%	52.8%	66.6%	57.2%

Variable	DK87	DK13	FI87	FI16
# Children in HH	1.12	1.16	1.32	1.27
# Adults in HH	1.94	2.02	1.97	1.93
Age 18-25	15.4%	13.6%	19.1%	12.5%
Age 26-35	19.5%	15.3%	20.0%	18.3%
Age 46 to 55	13.3%	19.0%	11.4%	18.0%
Age 56 - 65	3.6%	5.4%	0.0%	5.8%
Married/Partnered	60.8%	53.0%	71.1%	52.7%
Single Mother HH	4.3%	5.7%	4.4%	4.1%
Single Father HH	0.6%	1.1%	0.7%	0.9%
Female Head, With Kids	12.6%	15.3%	14.0%	14.1%
Male Head, With Kids	44.9%	38.2%	50.2%	38.9%
Female Head, No Kids	11.9%	14.5%	11.7%	16.9%
Male Head, No Kids	25.7%	25.3%	18.9%	25.1%
Low Education	26.6%	21.3%	31.2%	39.1%
Medium Education	28.7%	30.8%	35.6%	34.7%
High Education	11.2%	21.4%	8.0%	26.1%
% of Adults in HH Employed	59.4%	54.4%	54.8%	50.2%
Spouses Have Same Edu.	41.4%	54.8%	52.1%	45.1%
Spouses Have Same Emp.	59.3%	55.9%	59.7%	48.5%
Female Head & Employed	26.4%	29.4%	30.6%	29.0%
Male Head & Employed	59.7%	52.2%	57.4%	48.4%
# Children in HH	1.12	1.16	1.32	1.27

Note: “Spouses” includes marital spouse or partner. Household head is defined by observing the lead earner in each household. In case of tie, we select the oldest working-age adult. Low education refers to household head with “less than upper secondary education completed” (less than high school in the U.S. context). High education refers to tertiary education completed (attainment of a university degree). Non-married parents who live with a partner are not included as single parents. US=United States. AU=Australia. CA=Canada. DE=Germany. FR=France. NL=Netherlands. DK=Denmark. FI=Finland.

Appendix II: Balance checks before and after reweighting samples

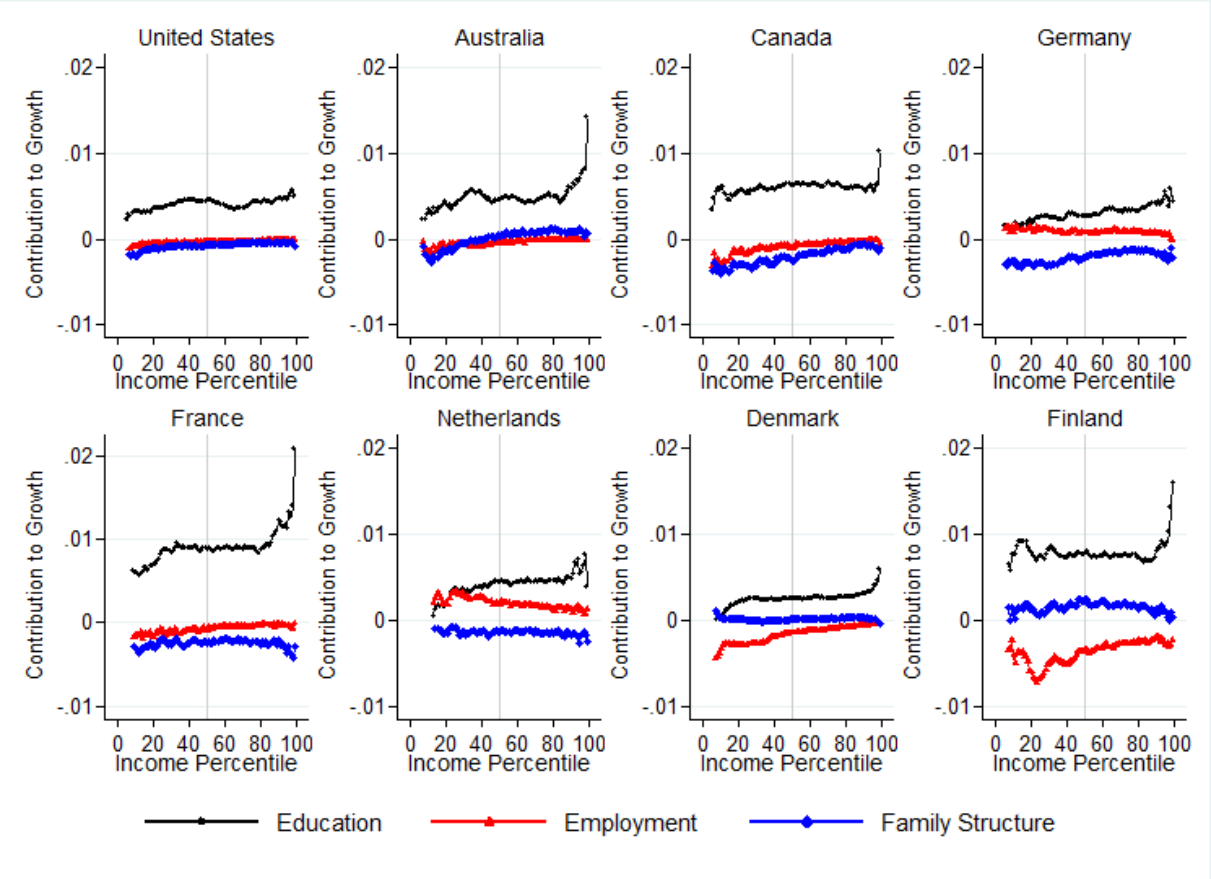
Figure: 1980s mean of characteristics minus 2010s mean of characteristic without reweighting of 2010 sample (left panel) and with reweighting of 2010 sample (right panel) by country



Note: Y-Axis represents difference between 1980s mean of characteristic and 2010s mean of characteristic. X-Axis variable list:

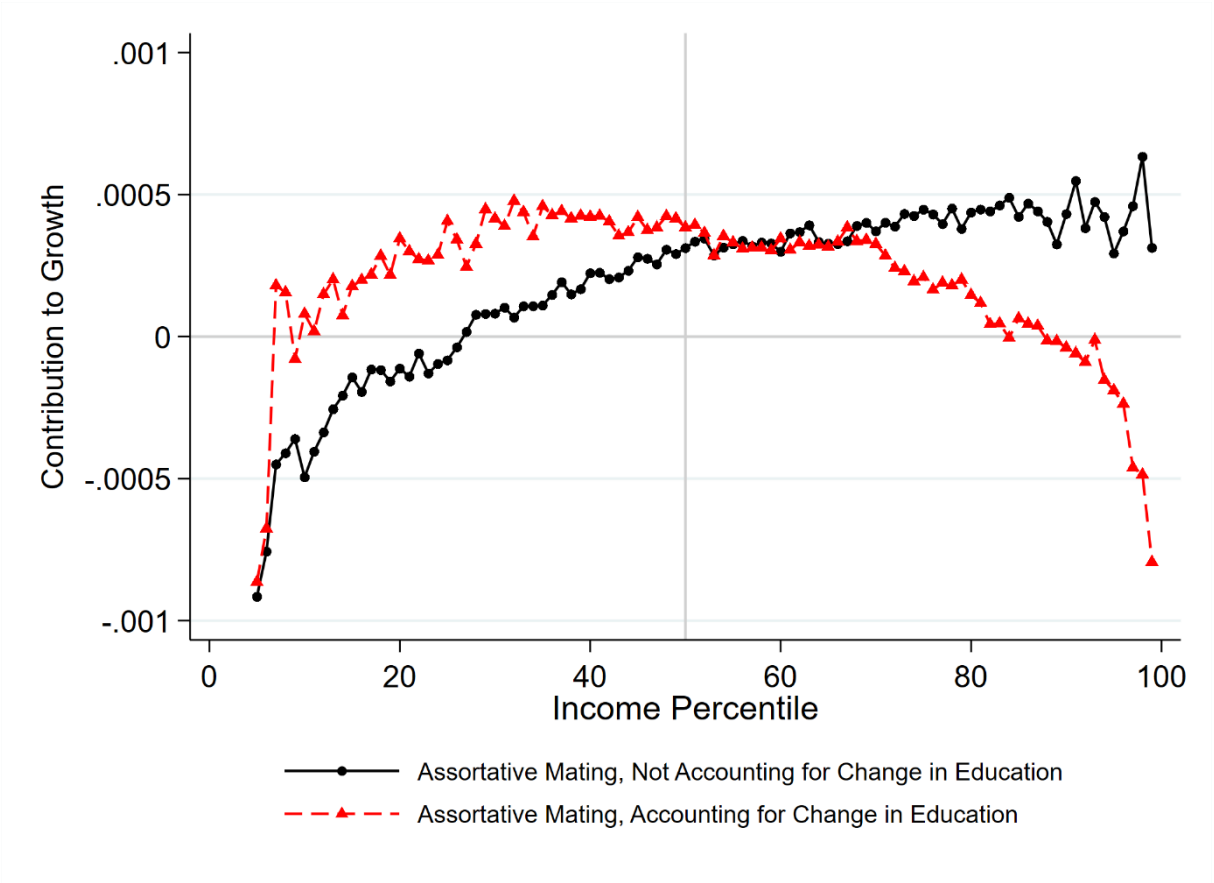
1. Share of HH members age 0-17
2. Share of HH members age 18-25
3. Share of HH members age 26-35
4. Share of HH members age 46-55
5. Share of HH members age 56-65
6. Share of adults in HH married/partnered
7. Number of adults in HH
8. Single mother HH
9. Single father HH
10. Female head, no children HH
11. Male head, no children HH
12. Mean education level of adults in HH
13. Employment rate of adults in HH
14. Spouses/partners in HH have same education status (binary)
15. Spouses/partners in HH have same employment status (binary)

Appendix III: Individual contribution of changes in education, employment, and family structure to changes in factor income growth across the distribution



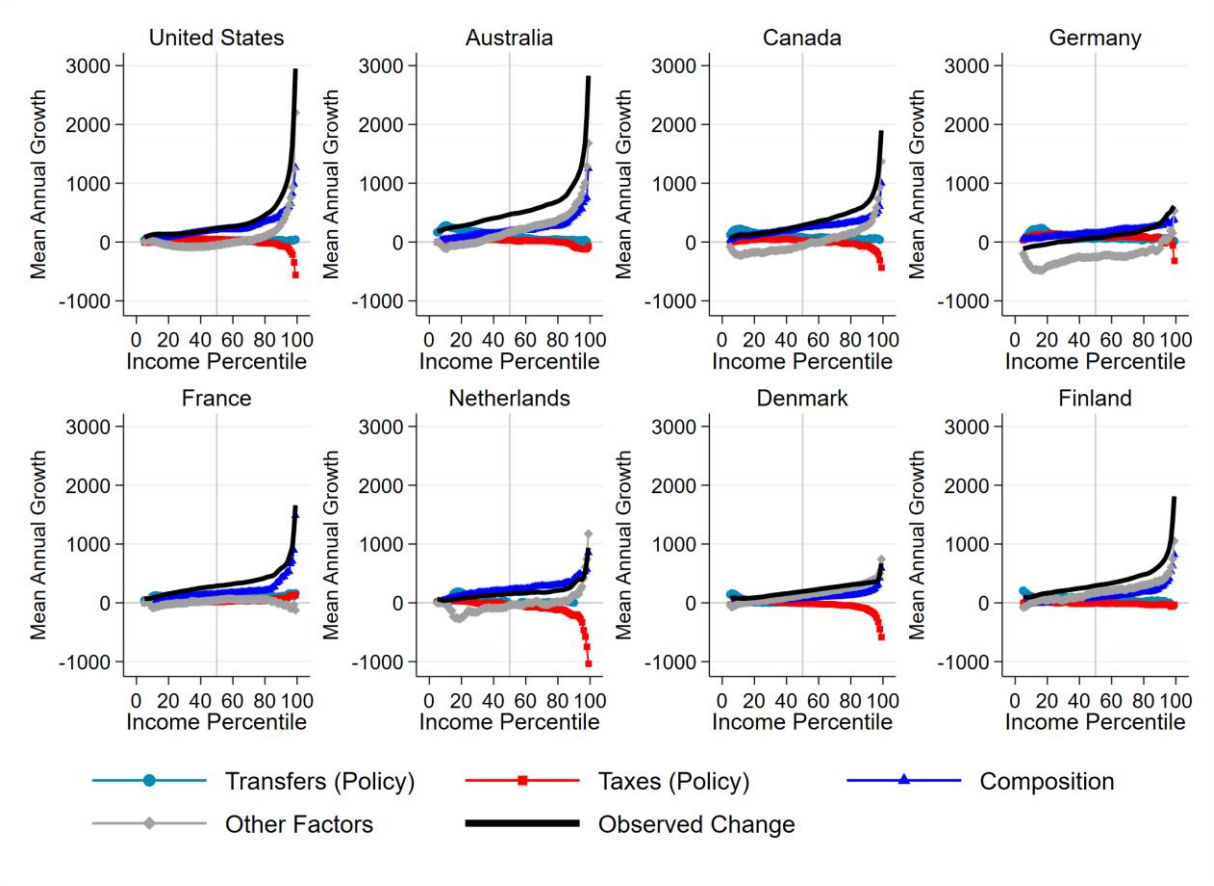
Note: Contribution to changes in disposable income growth presented. Due interactions among the three indicators, the combined values will not necessarily add up to overall contribution of compositional change to disposable income growth. Family structure includes indicators of assortative mating, household type (e.g. single-parent household), marital/partnership status, and number of children in household.

Appendix IV: Mean conditional contribution of assortative mating to disposable income growth before and after accounting for rise in educational attainment (1980s to 2010s)



Note: Conditional contribution of assortative mating is measured by subtracting (i) the effect of compositional change on income growth when assortative mating is excluded from the model by (ii) the effect of compositional change on income growth when assortative mating is included. To identify the conditional effect of assortative mating without accounting for changes in education, we repeat this step but exclude educational attainment from both models (i) and (ii).

Appendix V: National growth profiles (disposable income) when measured using absolute changes in income



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Supplemental Appendix for:

"Pathways toward Inclusive Income Growth:
A Comparative Decomposition of National Growth Profiles"

This supplemental appendix includes:

Figure S1: National growth profile, United States

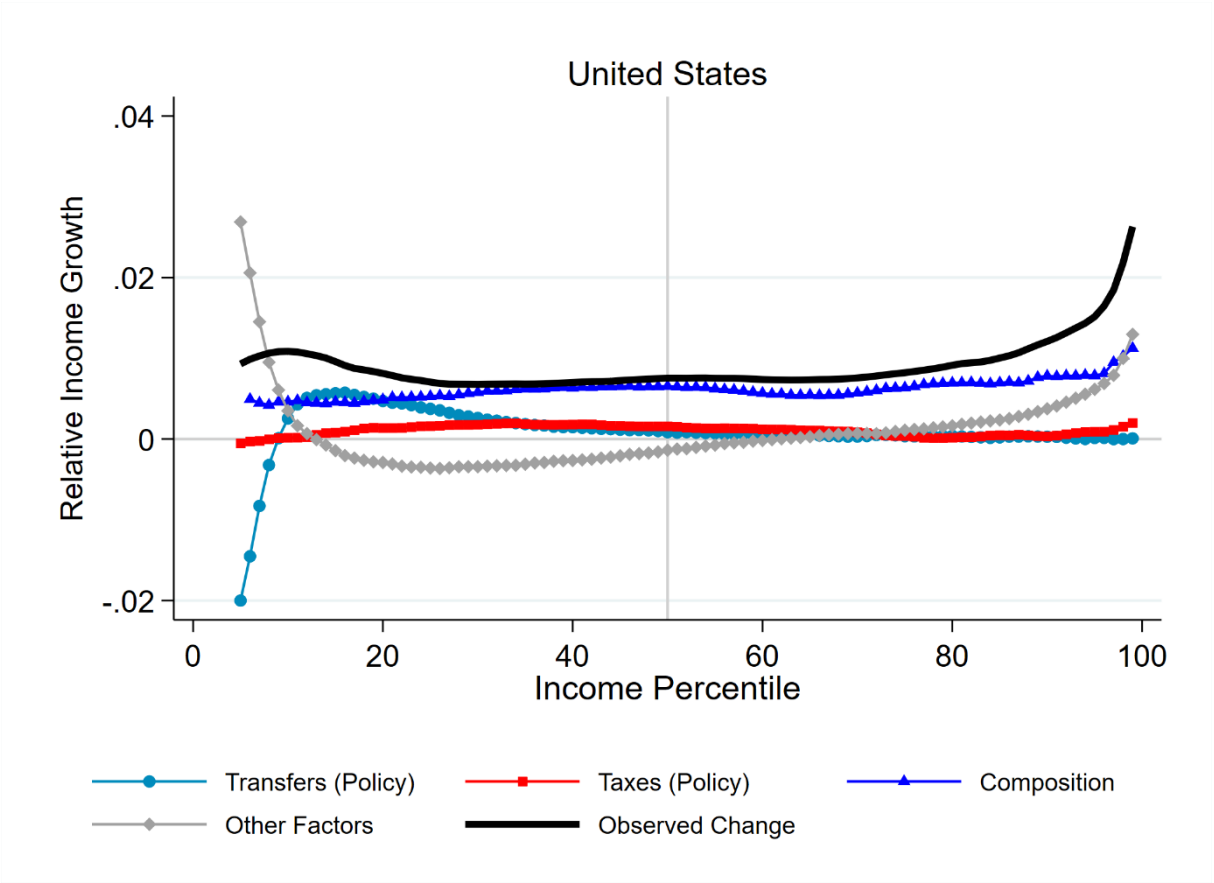


Figure S2: National growth profile, Australia

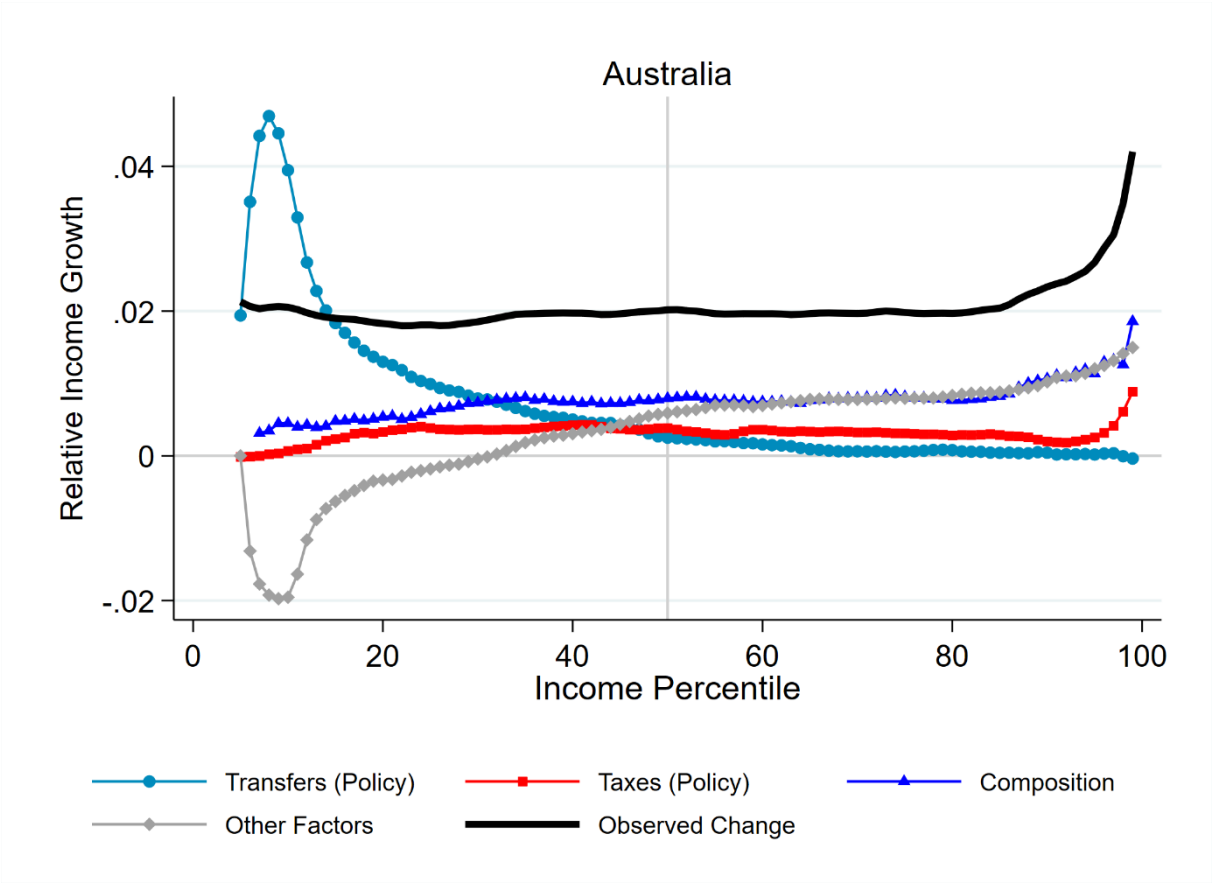


Figure S3: National growth profile, Canada

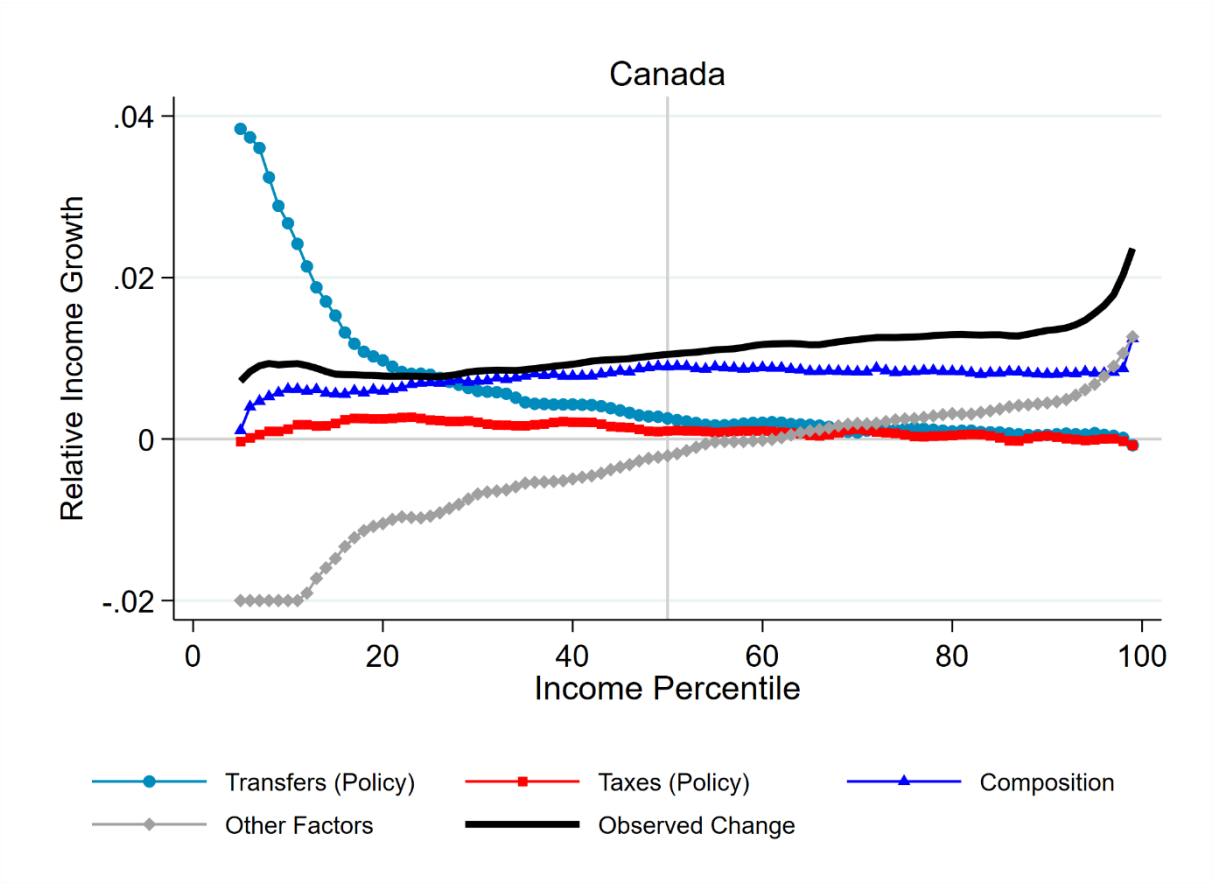


Figure S4: National growth profile, Germany

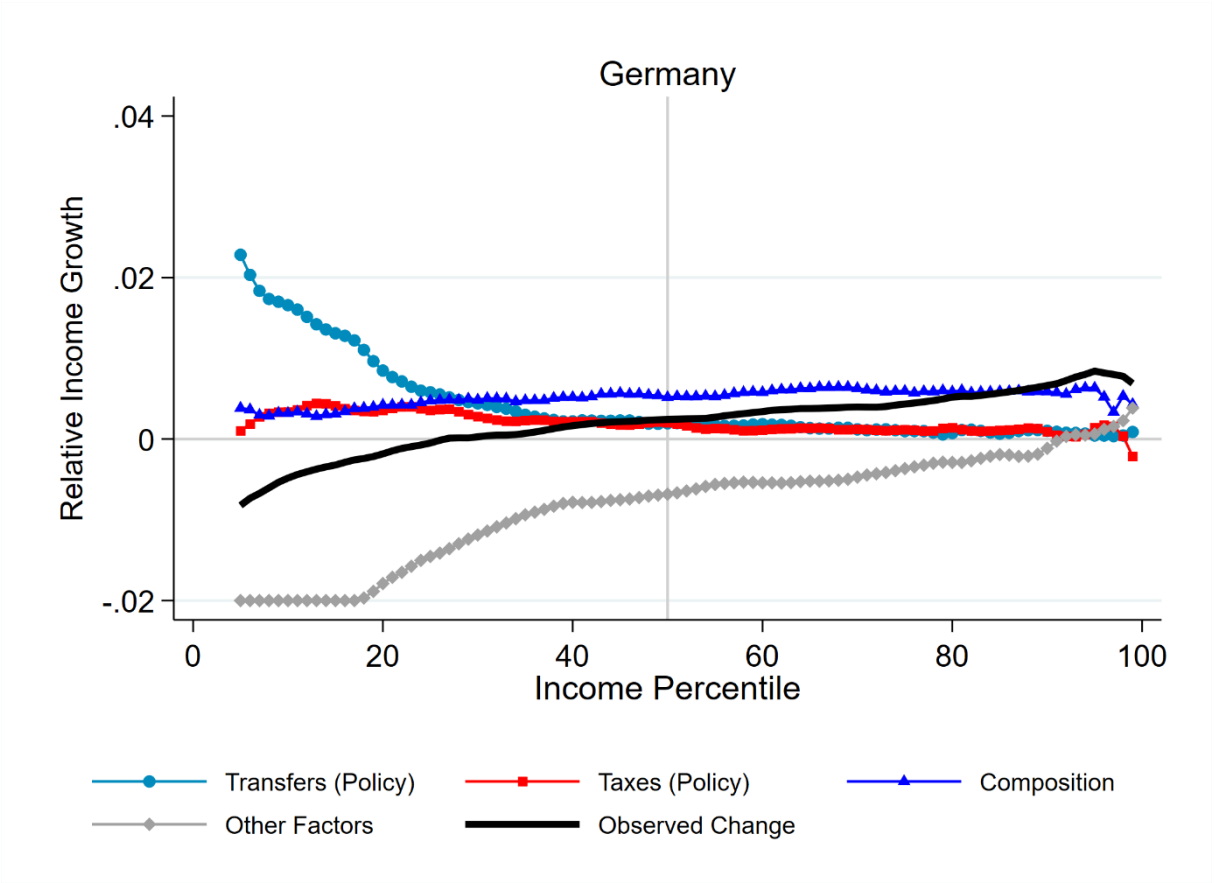


Figure S5: National growth profile, France

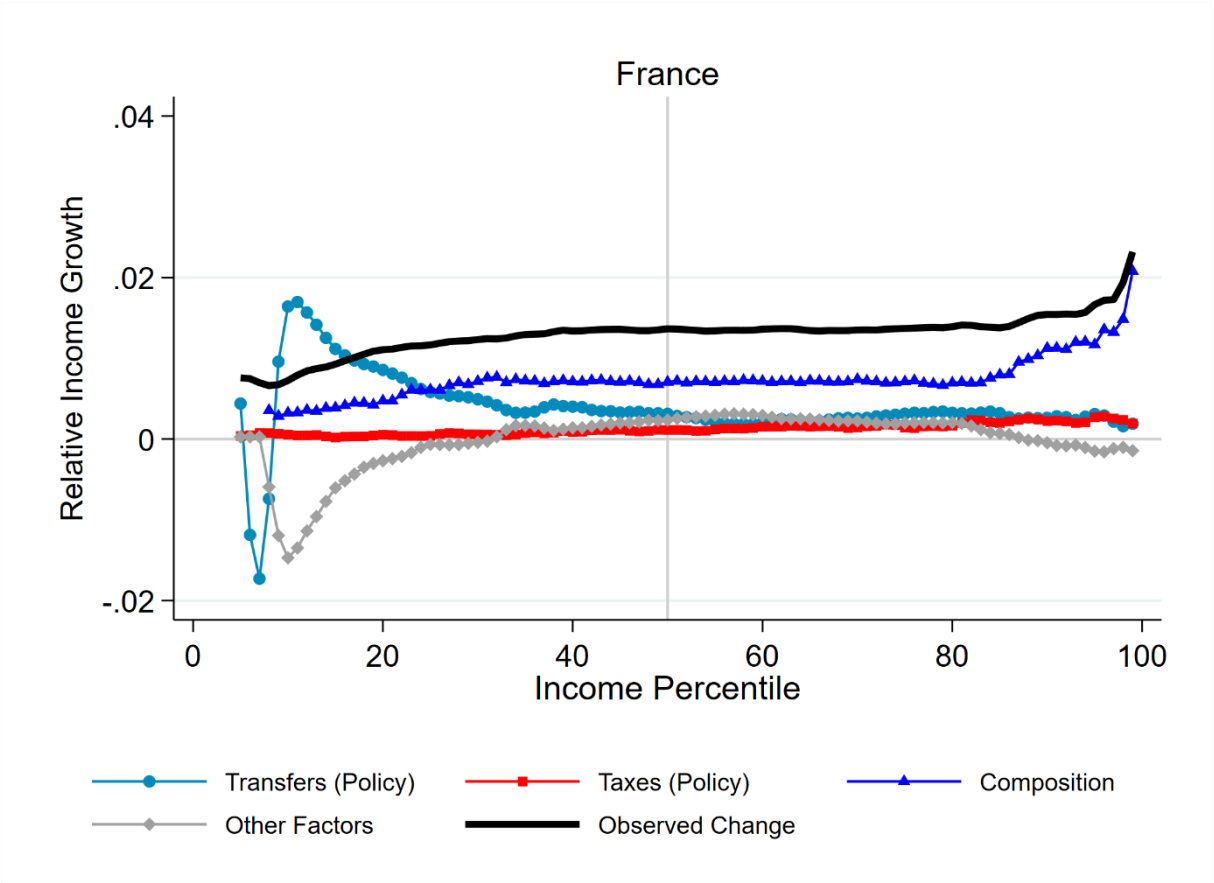


Figure S6: National growth profile, Netherlands

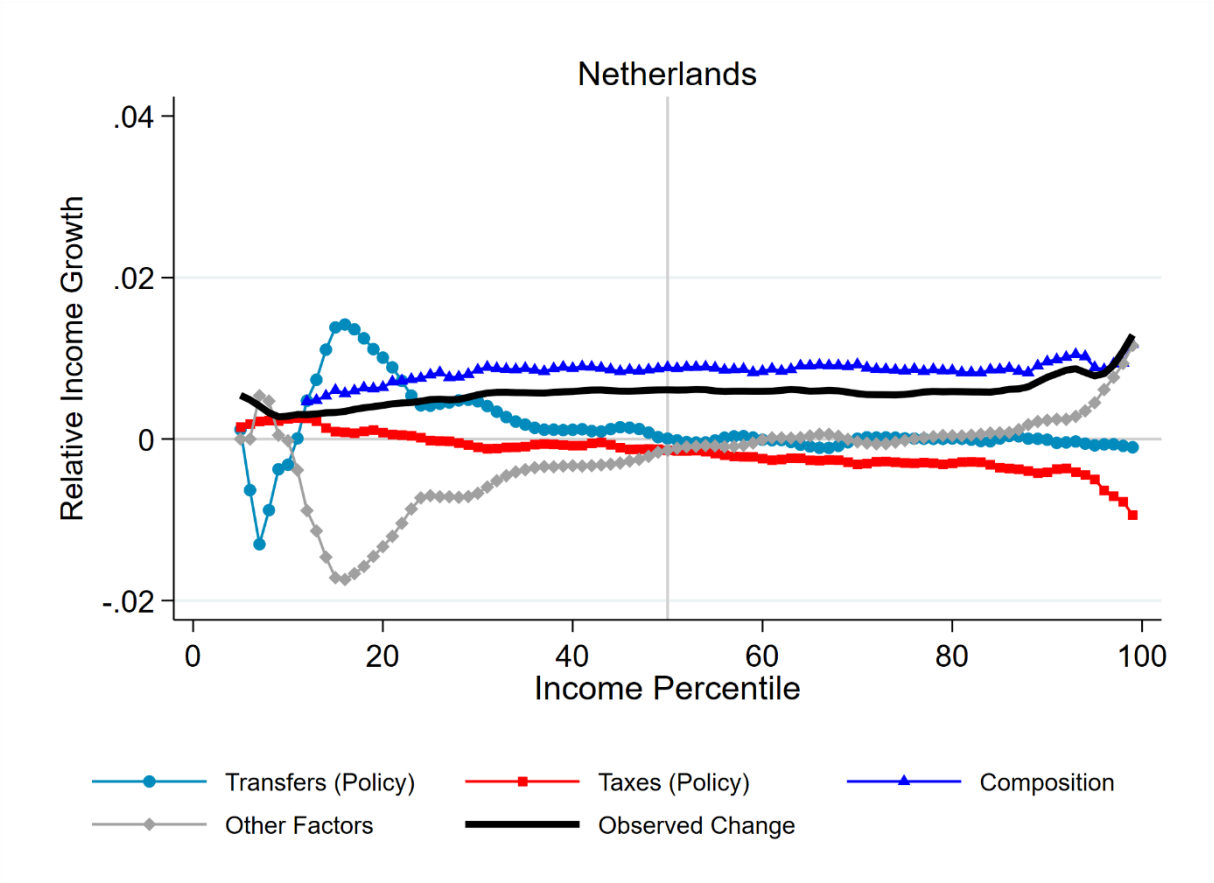


Figure S7: National growth profile, Denmark

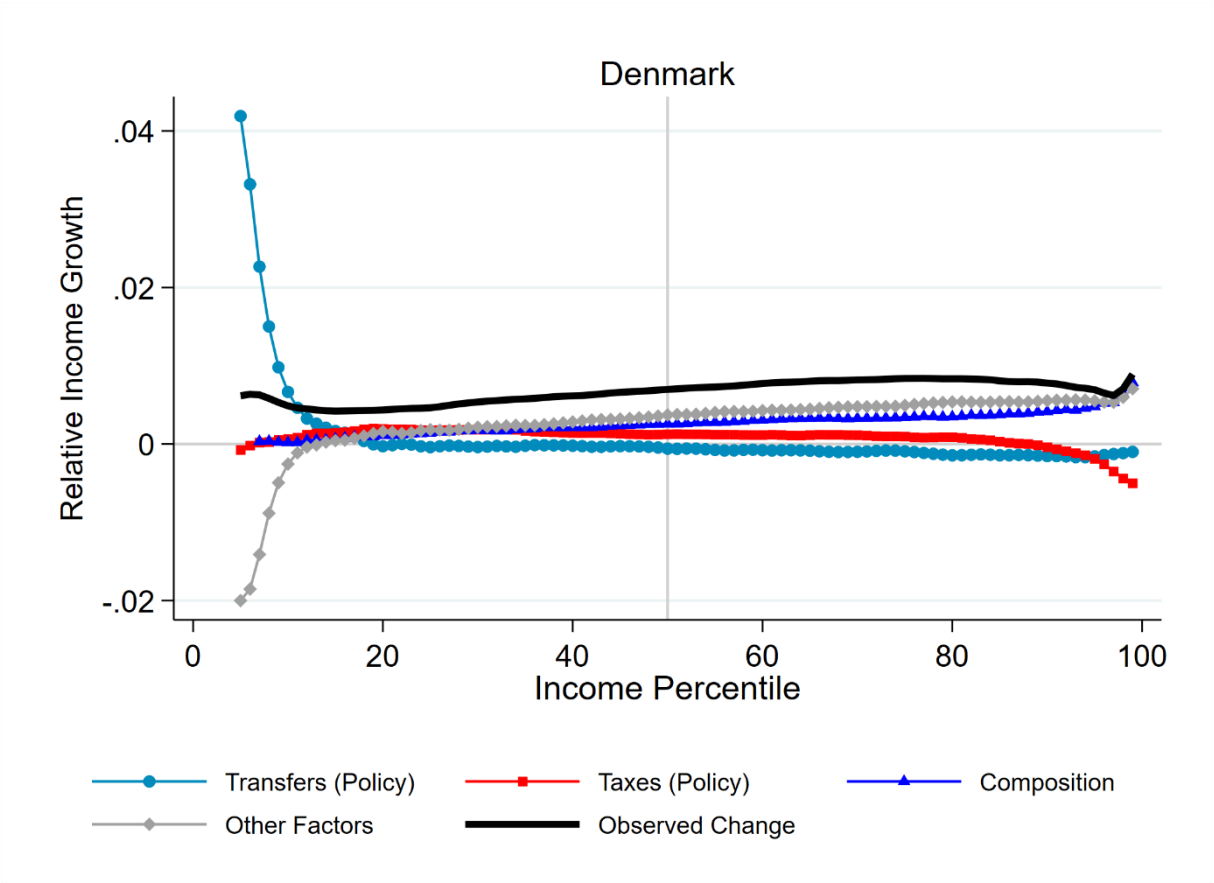


Figure S8: National growth profile, Finland

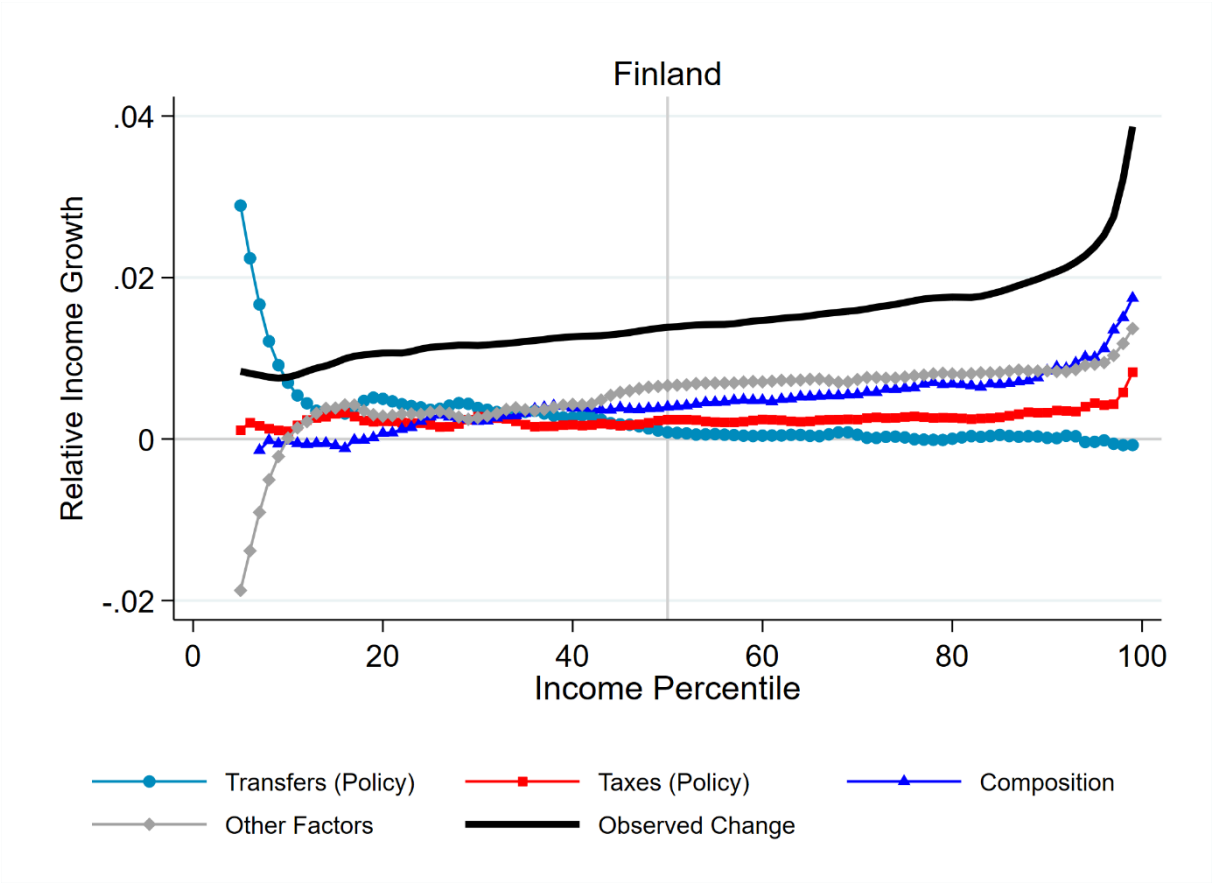
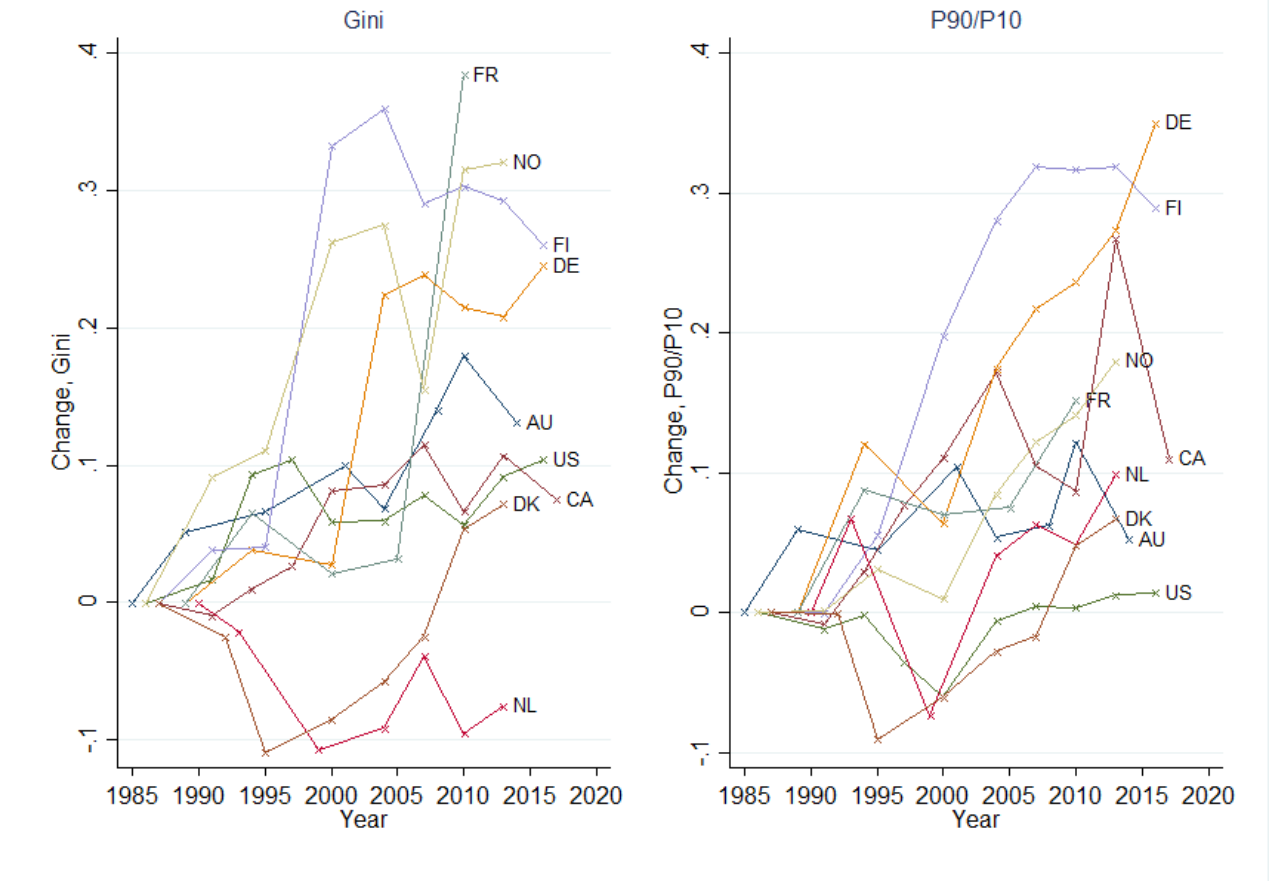


Figure S9: Trends in income inequality (Gini coefficient and P90/P10 ratio) by country



Note: Equivalized household disposable income. Data from Luxembourg Income Study. Households with retirement-age adults (age 60+) excluded. P90/P10 refers to the level of income at the 90th percentile of the country's income distribution relative to the 10th percentile.

Figure S10: Factor income distribution by country and year for households with non-working retirement-age adults

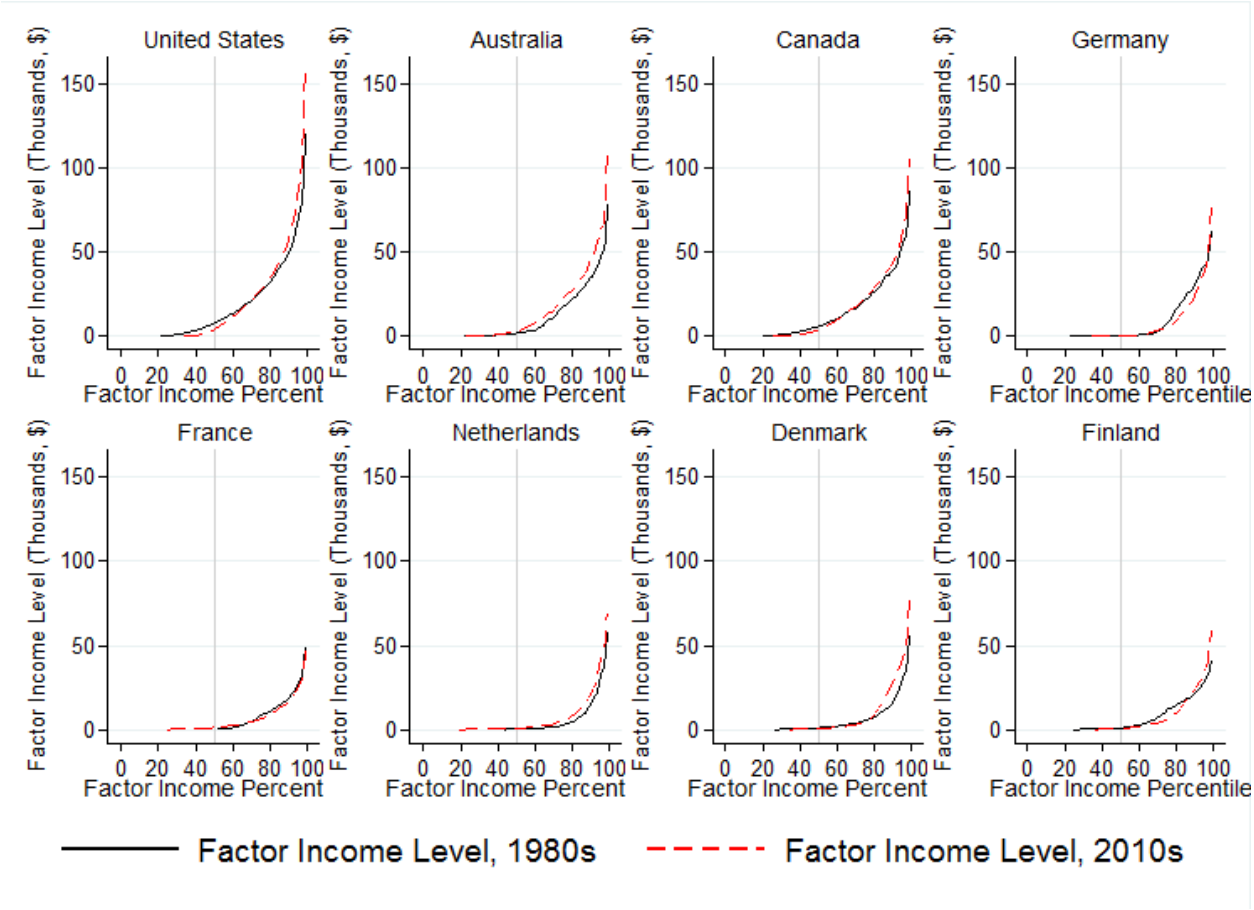


Figure S11: National growth profiles when excluding all households with individuals age 65 or older

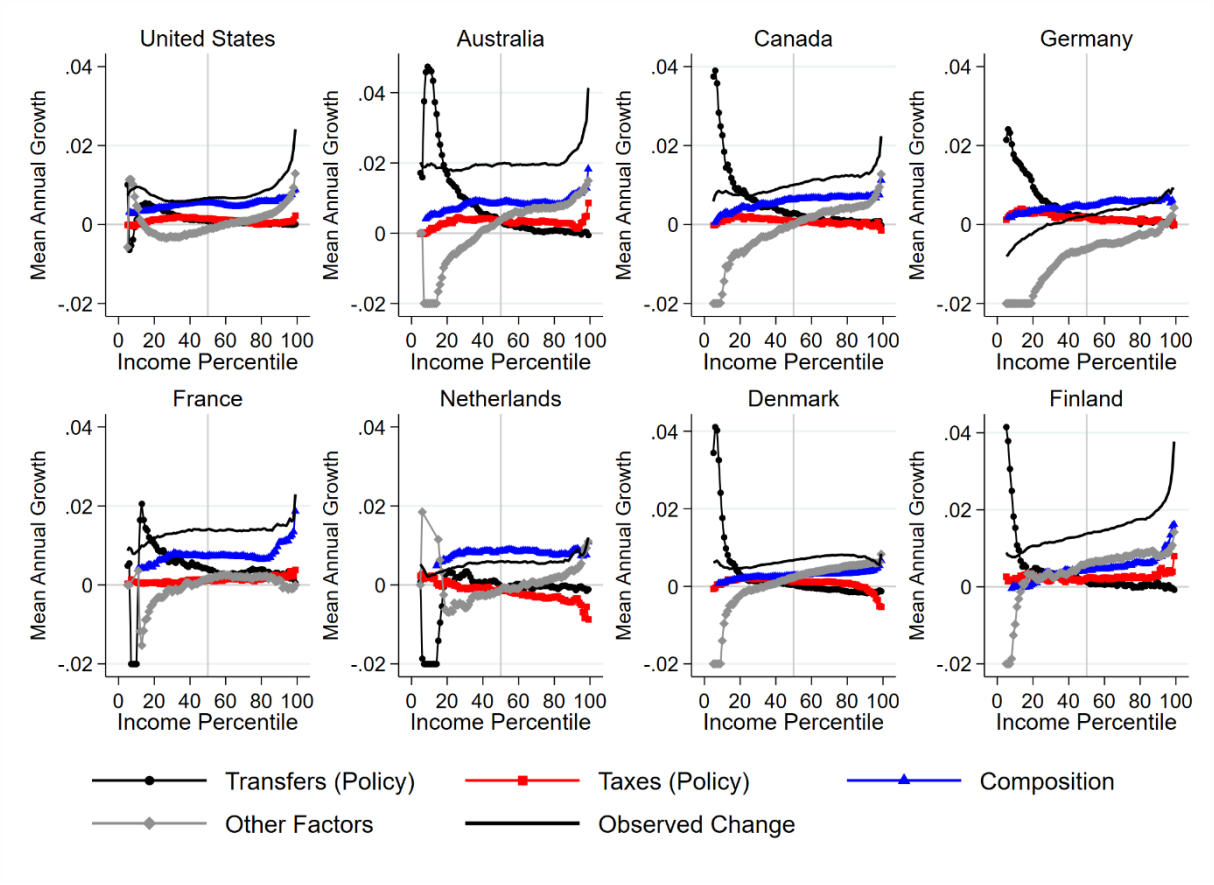
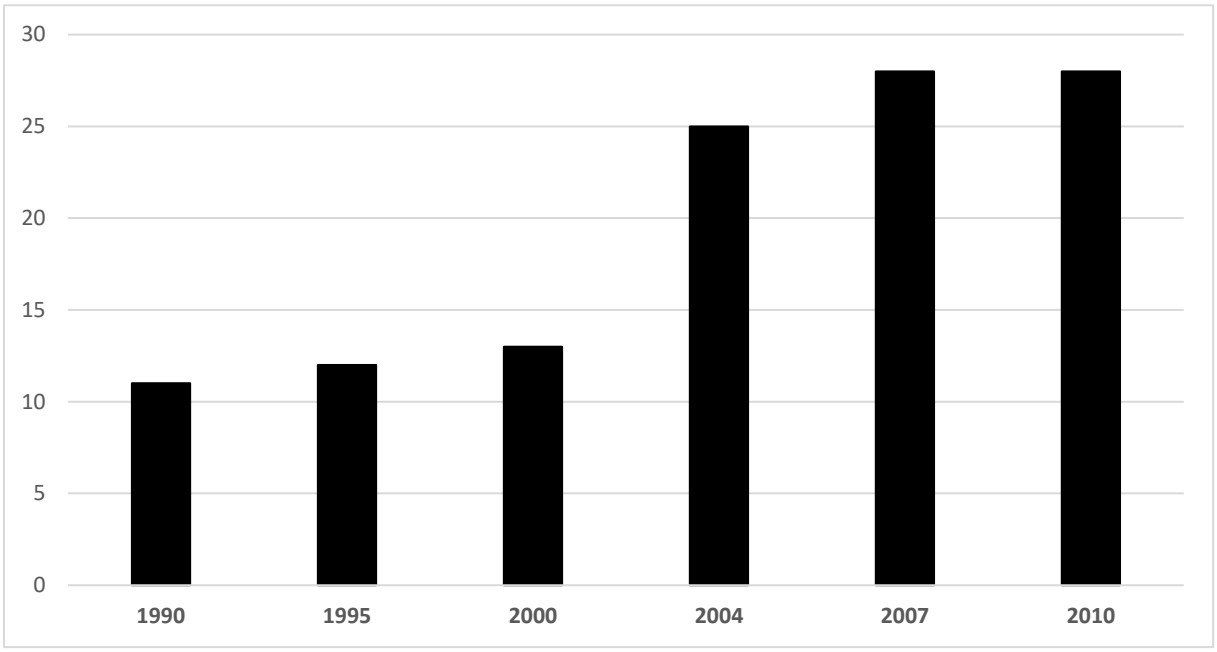


Figure S12: Number of countries in LIS dataset that meet initial criteria for inclusion (Y-axis) by the first year in which they can possibly be included (X-axis) with consistent data through approximately 2015



Note: Years on X-axis are approximate years, so that 1990 also includes datasets available between 1988 and 1992. The count on the Y-axis represents the maximum number of countries with consistent data available from the given year through around 2015.

Figure S13: Comparing average annual absolute growth rates when calculated as a mean over all years of analysis (dashed line) or cumulative growth divided by number of intervening years (solid line)

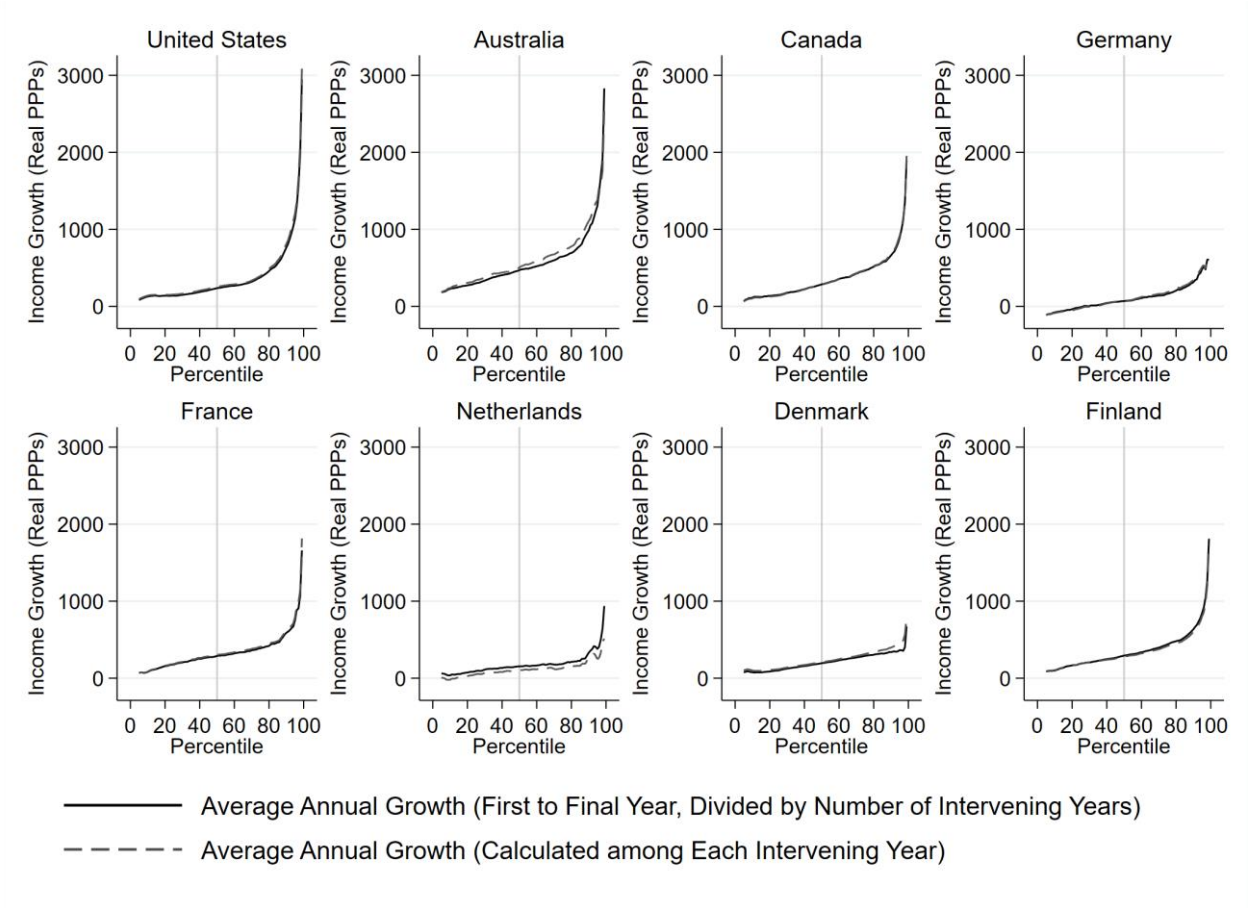
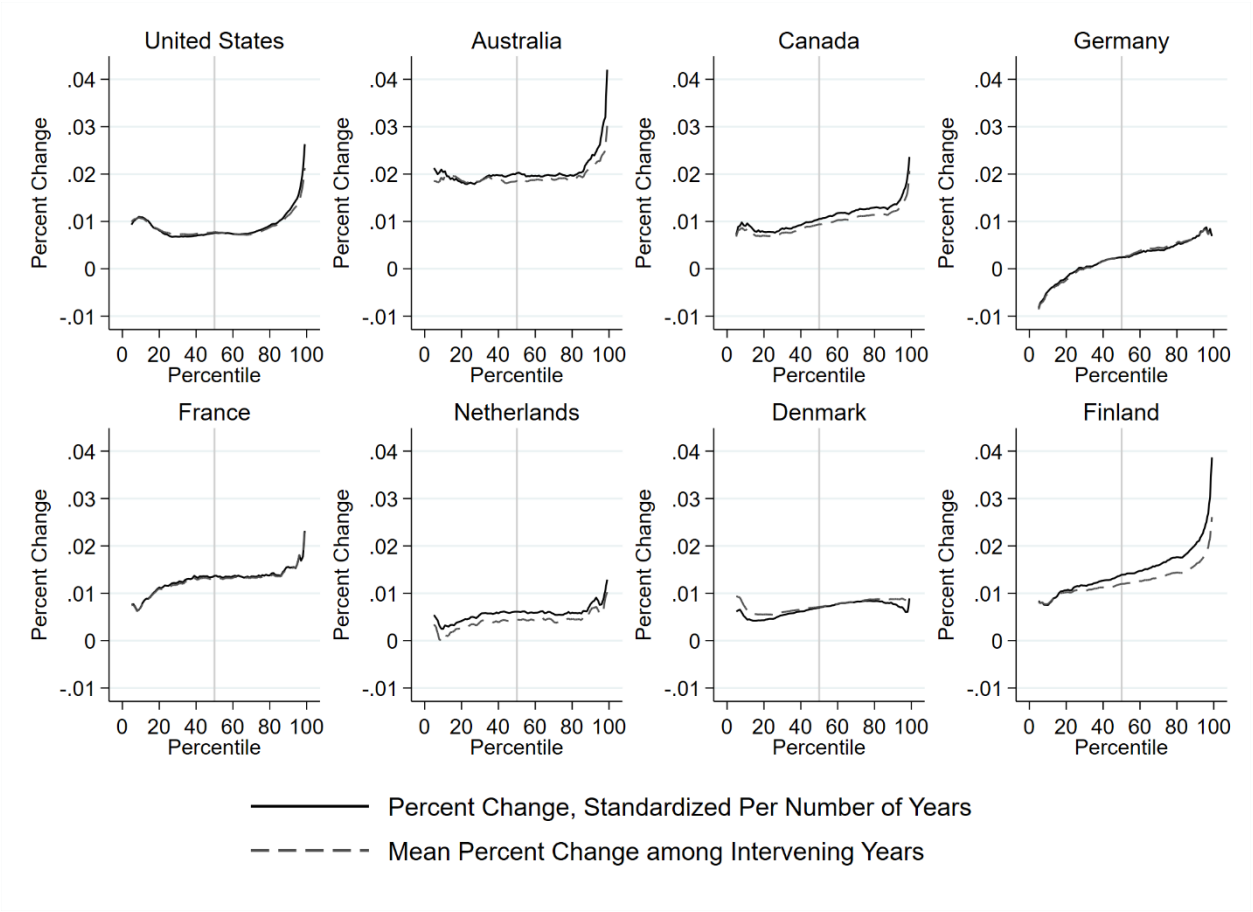


Figure S14**:** Comparing average annual percent change in income (among years available) to standardized relative income growth (cumulative change divided by total number of years)



To illustrate the difference between standardized relative income growth and average annual growth ("mean percent change among intervening years"), consider the following simplified example:

Table: Stylized example of income growth and differences when measuring standardized relative income growth vs. average annual income growth

	Year 2000	Year 2001	Year 2002	% Change from 2000 to 2001	% Change from 2001 to 2002	Mean of two prior values	Change from 2000 to 2002	Prior value divided by two
Example A	100	110	120	10%	9.1%	9.5%	20%	10%
Example B	100	120	120	20%	0.0%	10.0%	20%	10%

In both Example A and B, the average annual income growth (measured in relative terms) from Year 2000 to 2002 is **10**%, or ((120/100-1)/2). However, Example A features growth rates of 10% (Year 2000 to 2001) and 9.1% (Year 2001 to 2002), for a mean annual growth rate of **9.5%**. Example B features growth rates of 20% (Year 2000 to 2001) and 0% (Year 2001 to 2002), for a mean annual growth rate of **10%**. The point being: cumulative income growth standardized by the number of intervening years (which we use in our primary analysis) is not necessarily identical to the average annual growth rate.

Figure S15: Growth profiles measured using average annual income growth (among all available intervening years)