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Earnings dynamics of immigrants and natives in Sweden 1985–2016[a]

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Abstract

This paper analyzes earnings inequality and earnings dynamics in Sweden over 1985–2016. The deep recession in the early 1990s marks a historic turning point with a massive increase in earnings inequality and earnings volatility, and the impact of the recession and the recovery from it lasted for decades. In the aftermath of the recession, we find steady growth in real earnings across the entire distribution for men and women and decreasing inequality over more than 20 years. Despite the positive trend, large gender differences in earnings dynamics persist. While earnings growth for men is more closely tied to the business cycle, women face much higher volatility overall. Earnings volatility is also substantially higher among foreign-born workers, reflecting weaker labor market attachment and high risk of large negative shocks for low-income immigrants. We document an important role of social benefits usage for the overall trends and for differences across sub-populations. Higher benefits enrollment, especially for women and immigrants, is associated with higher earnings volatility. As the generosity and usage of benefit programs declined over time, we find stronger earnings growth among low-income workers, consistent with higher self-sufficiency.

Keywords: Earnings inequality, earnings volatility, immigration, social insurance
JEL-codes: D31, E24, J15, J31, J61

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1 Introduction

What is the overall level of income inequality and how much income risk do individual workers face over the business cycle and over their careers? Do earnings volatility and career trajectories differ across population groups and contribute to persistent disadvantages? To what extent does existing social insurance mitigate these differences in labor market dynamics? Answers to these questions are crucial for policy makers to help design taxation and welfare programs, especially as they face increasing income inequality, persistent gender gaps, or new challenges from increasing immigration.

To shed new light on these questions, this paper analyzes earnings dynamics in Sweden over three decades, 1985–2016. We document aggregate trends and highlight persistent differences in earnings dynamics by gender and origin. Studying earnings dynamics in Sweden is particularly interesting because its institutional framework is designed to mitigate risk. Collective bargaining directly affects earnings levels and growth, and generous social insurance aims to mitigate individual earnings shocks. Yet, the Swedish welfare state and labor market institutions have changed substantially over the last decades, which may have had important implications for labor market attachment and earnings dynamics. Understanding the interaction between policy changes and labor market dynamics is crucial for policymakers in finding a balance between economic incentives and social insurance.

In the first part of our analysis, we document three main patterns that characterize earnings inequality and earnings dynamics in Sweden over the last three decades: First, Sweden experienced a deep recession in the early 1990s, which changed the trajectory of earnings dynamics in important ways. During this recession, Sweden saw a massive increase in earnings inequality and earnings volatility driven by large real earnings losses among low-income workers. The recession emphasizes the role of higher-order moments to understand earnings risk because skewness of earnings growth declined dramatically, especially for men, and excess kurtosis jumped up. Taken together, this implies that men faced a stronger increase in earnings risk because of more frequent large and negative earnings shocks.

Second, we document a long recovery period characterized by a gradual decline in earnings inequality and volatility towards pre-recession levels and, importantly, by steady and fast growth in real terms across the entire earnings distribution for men and women over more than 20 years since the mid-1990s. These trends make Sweden stand out among OECD countries that typically experienced increasing or flat inequality and only moderate gains or even losses for large parts of the earnings distribution. It also stands in contrast to the increase in disposable income inequality in Sweden that has been documented in previous studies (OECD, 2011, Aaberge et al., 2018), and this motivates our analysis of the interaction

between labor market dynamics and social insurance in the second part of the paper.

Third, even though Sweden has one of the highest female participation rates in the OECD, we document large and persistent gender differences in earnings dynamics. Women face somewhat higher earnings inequality and drastically higher earnings volatility than men. While higher long-term mobility among women suggests that some earnings losses are temporary, we find particularly high earnings volatility among young and middle-aged women, exacerbated by large negative skewness of earnings growth. In contrast, men have more stable and linear careers but face larger business-cycle fluctuations in earnings growth, as evidenced by their exposure to the 1990s recession.

In the second part of the analysis, we further unpack these main results. Our goal is to characterize trends in income risk for different populations, focusing on the role of the strong (but changing) welfare state in Sweden. To this end, we first analyze earnings dynamics for immigrants whose population share has been quickly and massively increasing recently and who are a key at-risk population in the policy debate (Calmfors and Gassen, 2019). Perhaps surprisingly, we document that this group also experienced large real gains in earnings over time, only slightly lower than natives. While we also find broadly similar time trends in earnings inequality and volatility among foreign-born and native workers, we highlight important differences: Earnings volatility is much higher among immigrants, and the difference by origin is particularly pronounced among men. Moreover, immigrants across all age groups with low or moderate income levels face substantially higher downward risk in earnings than their native peers, even though low-income immigrants, especially women, have shown stronger earnings improvements than natives recently.

In the next step, we show that differences in earnings dynamics by gender and origin are closely linked to labor market attachment and annual hours worked. To make this point, we first document that trends in earnings inequality cannot be explained by trends in wage inequality; in fact, wage inequality has been increasing for large parts of the sample while earnings inequality has simultaneously declined. We further emphasize opposite life-cycle dynamics in wages and annual hours worked: While wage inequality increases substantially with age, earnings inequality declines because of a steep reduction in hours dispersion. This pattern is consistent with larger differences in labor market attachment, job mobility, and benefits usage among young workers.

Finally, we build on these insights to relate earnings dynamics to income risk. Crucially, a large reduction in annual hours worked often goes along with participation in public benefit programs. We show that benefits enrollment matters especially in the bottom tail of the earnings distribution, where workers receive 30–50% of their income in work-related benefits due to, e.g., unemployment, sickness and disability, parental leave or studies. Entering

or exiting work-related benefit programs is associated with large changes in earnings that can account for a substantial share of the tails in earnings growth, especially for women. Hence, higher benefits enrollment among women and foreign-born men contributes to higher earnings volatility among these groups. In order to assess overall income volatility, we then analyze total work-related income, which is the sum of earnings and work-related benefits, as well as after-tax disposable income, which also adds means-tested benefits and capital income. Here, our key finding is that patterns for overall income have moved opposite to earnings over time. Not only did inequality in disposable and work-related income increase as documented in previous work (Aaberge et al., 2018), but volatility in these income measures also increased substantially. This trend was opposite to gradually declining earnings volatility in recent decades. While work-related benefits, other cash transfers, and progressive taxation all contribute to lower volatility in disposable income than in earnings, their impact has substantially declined over time.

Analyzing the causal link between benefit systems and labor market dynamics is beyond the scope of the paper. Yet, the simultaneous decrease in usage of benefit programs and in labor market inequality are consistent with increased self-sufficiency of low-income workers as generosity of benefits gradually decreased and the economy recovered from the deep recession in the 1990s. We find this pattern in particular among immigrant men whose benefits enrollment declined faster and earnings grew more quickly among low-income workers. At the same time, the results on decreasing social insurance raise important equity concerns for groups with high benefits take-up: women and immigrants. These findings emphasize the importance of a comprehensive analysis of social insurance and labor market outcomes to understand dynamics and risk in the lower part of the income distribution.

The paper relates closely to the literature on earnings dynamics, see Meghir and Pistaferri (2011). Our findings lend support to the role of higher-order moments of earnings growth to characterize labor market uncertainty, both over the business cycle (Guvenen et al., 2014) and over the life cycle of individual workers (Guvenen et al., 2015). Our focus on the entire income distribution complements work by Badel et al. (2018) who study the properties of life-cycle earnings dynamics for the top 1 percent of the earnings distribution in Sweden and other OECD countries. We emphasize differences in life-cycle dynamics driven by hours and wages and provide evidence on substantial heterogeneity by gender and region of origin, complementing the analysis by education in Friedrich et al. (2019). Differences in earnings dynamics for women are largely driven by more frequent changes in annual hours, especially related to benefits usage. Our decomposition of earnings dynamics into dynamics of wages and hours relates to Altonji et al. (2013) who estimate a joint model of employment, mobility, wages, and hours over the life-cycle.

We find a close link between earnings dynamics and benefits usage, especially for women and immigrants, which indicates that earnings fluctuations may not reflect income risk but rather individual choices, and understanding the incentives from the welfare system is crucial to separate these channels. In a related paper comparing data from different OECD countries including Sweden, Busch et al. (2021) show that within-household income smoothing is not effective at mitigating skewness fluctuations over the business cycle, but tax-and-transfer policies reduce the cyclicality of income risk. This relates to other studies on social insurance against labor market risk, see Low et al. (2010). We complement these findings by documenting the declining insurance of income risk provided by transfers and taxation in Sweden over time while earnings inequality and volatility have simultaneously declined.

More broadly, this paper is also related to previous work studying trends in earnings and income inequality in Sweden. Edin and Holmlund (1995) document increasing wage inequality between the mid-1980s and the early 1990s related to a period of weakening of the centralized bargaining process. Skans et al. (2009) find a continuous rise in between-plant wage inequality over 1985–2000, while Gustavsson (2007) and Domeij (2008) argue that changing returns to skills and changing labor-force composition contributed to rising inequality, respectively. Domeij and Flodén (2010) show an increase in earnings inequality in the early 1990s related to job loss in the recession, which was mitigated by the generous welfare system. Similarly, Björklund and Freeman (2010) find that the accompanying increase in disposable income was largely driven by faster income growth in the upper tail. Robling and Pareliussen (2017) document rising inequality in disposable income over the last three decades and estimate an important role for population aging and changes in household structure with increasing shares of singles and single parents. In addition, Roine and Waldenström (2005) find an important role for capital gains in increasing top income inequality between 1980 and 2000. Our findings of declining earnings inequality since the mid-1990s is also related to Hammar and Waldenström (2020) who document a decrease in global earnings inequality over the last two decades.

Finally, our focus on earnings dynamics among immigrants by region of origin complements other studies on labor market performance of immigrants to Nordic countries and the link to the welfare system (Bratsberg et al. (2017); Calmfors and Gassen (2019); Bratsberg et al. (2010) and Bratsberg et al. (2014)). For Sweden, focusing on the 1990s, Hammarstedt and Shukur (2006) show large earnings disadvantages of new immigrants, especially non-European immigrants. Gustafsson and Zheng (2006) show that less-privileged immigrants have substantially lower earnings than natives and are more vulnerable to the state of the economy. Åslund and Rooth (2007) find that initial labor market conditions of refugees at arrival have a persistent impact on their labor market outcomes, and Åslund et al. (2017)

documents a relatively slow entry process of immigrants and long-term outcomes below those of the average worker. This may also contribute to higher level (Hammarstedt, 2000) and more persistent dependence on social insurance (Hansen and Lofstrom (2009); Laun et al. (2020)). We complement these findings by highlighting the higher level of earnings volatility and downward earnings risk that immigrants face in the Swedish labor market, as evidenced by large contemporaneous and substantial long-run scarring effects of the 1990s recession, especially among immigrants from Africa, Asia and the Middle East. These shocks were accompanied by higher benefits receipt, but we find that benefits usage is gradually converging to native levels as labor market attachment has strengthened since the mid-2000s.

The remainder of this paper is organized as follows. In section 2 we describe the data and institutional details. We present findings on earnings dynamics by gender for cross-country comparison in section 3. Section 4 analyzes differences by origin, and the role of social insurance, in particular work-related benefits, in shaping the broader patterns of earnings dynamics. Section 5 concludes.

2 Data and Institutional Details

2.1 Data

We use data from the administrative register LOUISE, provided by Statistics Sweden. Our main measure of earnings is annual individual labor earnings including positive self-employment income, which is uncensored.[1] We harmonize the sample following guidelines by the Global Income Dynamics Project to facilitate cross-country comparison and focus on the core labor force, aged 25–55, over 1985–2016. We define employment as having total annual earnings of at least 1.5 times the monthly earnings at the retail minimum wage (Skedinger, 2015), and include all employed workers each year.[2] Earnings are deflated using the CPI with base year 2018 and the analysis is conducted in local currency.[3] To measure earnings inequality, we mainly use percentile ratios of log earnings in the cross-section of workers. Specifically, we analyze trends in the gap between log earnings at the 90th, 50th, and 10th percentile of log earnings. To measure earnings volatility, we analyze the distributions of 1-year and 5-year residualized earnings growth exploiting the long panel data, see details in Appendix A.

[1] Changing tax incentives have led to some income shifting from earnings to capital income in closely held corporations (Björklund, 2020), which is excluded from our main analysis but considered in robustness.

[2] The time trends are not sensitive to the definition of the minimum earnings threshold, but the level of volatility and inequality is higher when including individuals with very low earnings.

[3] When translating earnings measures into USD, we use the average annual exchange rate provided by the Federal Reserve Bank of St Louis: https://fred.stlouisfed.org/series/EXSDUS.

To contrast our findings for labor earnings with broader income concepts, we also use information on other types of income from the LOUISE database during 1995–2016. First, we use information on total work-related income, which is the sum of earnings and taxable work-related benefits. We define the share of work-related benefits in relation to total work-related income and separate between four different benefit types: unemployment benefits; sickness and disability benefits; parental leave benefits; and study grants and other benefits.[4] Second, we use information on individual disposable income, which also includes other income sources such as capital income and means-tested benefits, and is expressed net of taxes.

We use information from 1990 onwards from the Wage Structure Statistics provided by Statistics Sweden to define wages and hours worked. The register contains the full public sector and a sample of private firms and covers in total about 50 percent of the workers in our sample. The information is collected once per year and refers to a recent work period, typically during fall. The wage measure captures the full-time equivalent monthly wage rate.

Immigrants are defined based on birth country from administrative records. We divide immigrants into five regions of origin: Nordic countries; Eastern Europe; Asia; Africa and the Middle East; and Other, including Western Europe, Northern America, Latin America and the few immigrants from Oceania. We sometimes divide immigrants into two broader groups: *Africa, Asia and the Middle East*, including the third and fourth regions of origin in the list, and *Europe and the Americas*, including the other regions of origin.

We define recession years using the OECD recession indicators for Sweden provided by the Federal Reserve Bank of St Louis.[5] Recession years are marked by grey bars in all figures.

2.2 Descriptive Statistics

When analyzing earnings dynamics, it is necessary to focus on those individuals who are employed each year. Figure 1a shows the share of employed individuals aged 25–55 by gender. Employment is high among both men and women. Although higher for men, the female employment rate at close to 80 percent sets Sweden apart from most countries. Figure 1a also shows that employment rates permanently dropped in the early 1990s, when Sweden went through a deep recession, but have been relatively stable afterwards. Figure 1b shows that immigrants in particular were severely affected by the recession, with employment rates in the longer run stabilizing at levels 10–15 percentage points lower than pre-recession levels.[6]

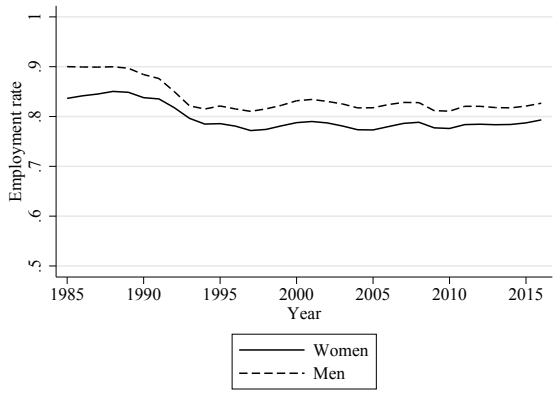
[4]Parental leave benefits include both long-term parental benefits when a child is born and temporary parental benefits when caring for a sick child. Study grants include publicly provided loans and transfers for adult studies.

[5]https://fred.stlouisfed.org/series/SWEREC

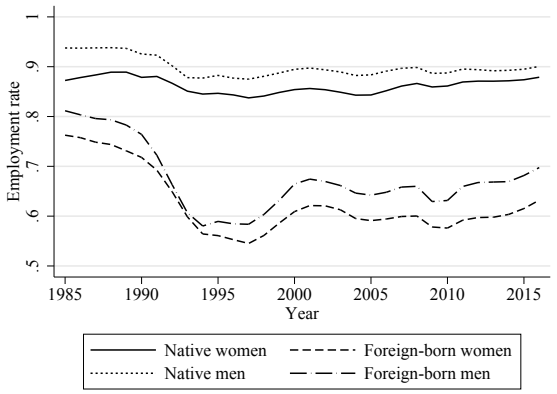
[6]Figures A.1a and A.1b also show that the recession hit young workers the hardest, especially women. Although part of this captures increased unemployment among the young, it also reflects delayed labor

Figure 1: Employment Rate and Share Foreign-Born in Ages 25–55

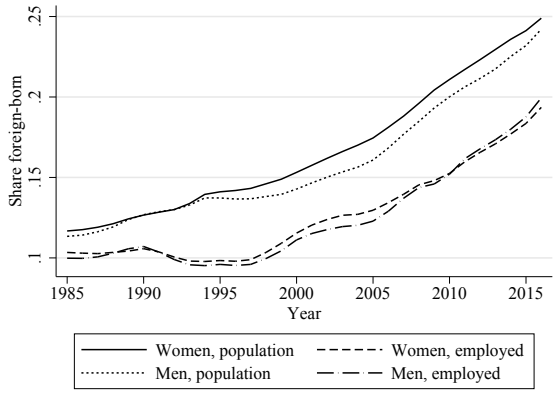
(a) Employment Rate by Gender



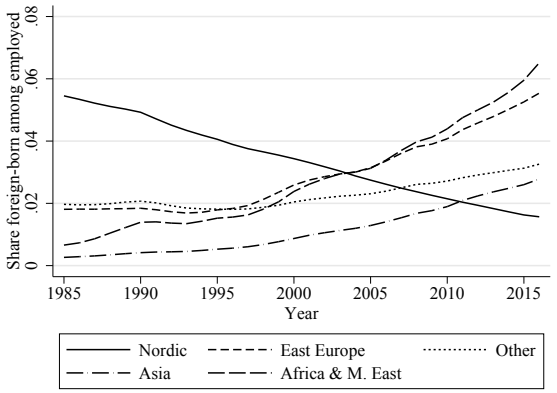
(b) Employment Rate by Gender and Origin



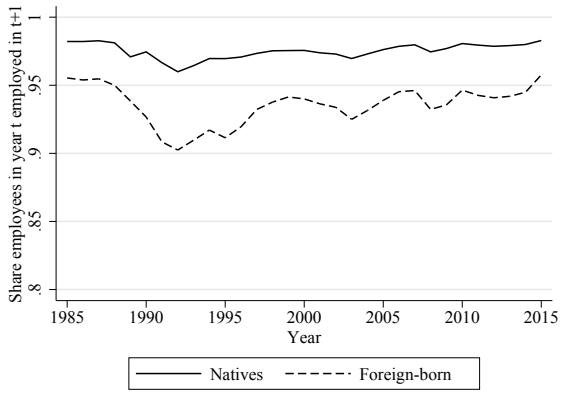
(c) Foreign-Born by Gender



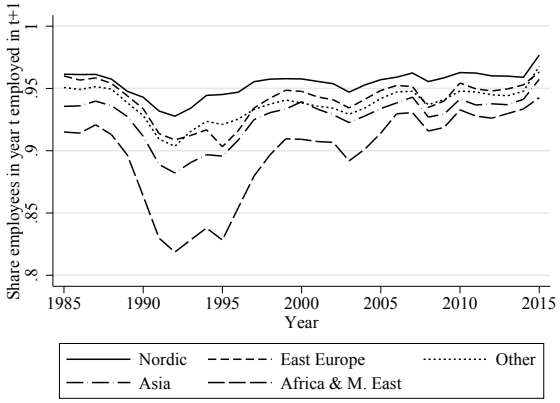
(d) Foreign-Born by Region



(e) Consecutively Employed by Origin



(f) Consecutively Employed by Region



Notes: *Figures 1a and 1b plot the share employed in the population aged 25–55 by gender and origin. Employment is defined as having annual earnings above 1.5 times the monthly earnings at the retail minimum wage. Figure 1c shows the share foreign-born by gender in the full population and among employed in ages 25–55. Figure 1d shows the share foreign-born among employed in ages 25–55 from different regions of origin. Figures 1e and 1f show the share of employed workers in year t who are employed in year t+1 for natives and foreign-born and by region of origin.*

Figure 1c shows a large and continuous increase in the immigrant share in the full population during the entire observation period, but the immigrant share among employed workers, included in our analysis, took off only from around 2000 and doubled in 15 years.[7] This increase in the immigrant share, combined with lower participation rates than for natives, also helps explain the lower overall employment rates in the last two decades in Figure 1a. Figure 1d shows the composition among employed by region of origin. Whereas the share of immigrants from the Nordic countries, primarily Finland, has continuously declined, the largest increase can be seen in the share of immigrants from Africa and the Middle East. Also the share from Eastern Europe, including former Yugoslavia as well as the Baltic states, has increased, as has the share from Asia, primarily capturing immigration from Afghanistan.[8] Finally, Figure 1e shows the share of employed workers who work in consecutive years.[9] This share is stable at around 95% for natives, but substantially lower for immigrants, especially during and after the 1990s recession. Differences by region of origin in Figure 1f show that workers from Africa and the Middle East faced particularly instable employment during that time.

Table 1 provides more descriptive statistics for the employed sample in 1985, 1995, 2005 and 2015. The age and gender composition is similar over time, while the share of foreign-born workers has almost doubled in 20 years, from 9.7% in 1995 to 18.6% in 2015. Table 1 also shows that average full-time equivalent monthly wages (for the workers covered by the Wage Structure Statistics), as well as real annual earnings across the entire earnings distribution, have increased substantially over time. Most of annual earnings come from employment and only a small amount from self-employment. Total pre-tax work-related income and after-tax disposable income also show a real increase on average over the period. Yet, benefits as a share of total work-related income have declined over time.[10] Finally, the variance of income, for disposable income in particular, has increased substantially, motivating the analysis of income inequality and dynamics.

market entry where a larger share chooses longer formal education after the recession – in particular women.

[7] Distinguishing trends by fine education groups in Figure A.3 suggests increasing polarization of the immigrant population in a growing share with college education, and a large share with less than high school education.

[8] Figures A.2a and A.2b show region of origin by gender. Dividing immigrants by region, Figures A.1c and A.1d show that employment rates are lowest among immigrants from Africa and the Middle East, but that the employment drop in the 1990s recession was largest among immigrants from Eastern Europe. Many immigrants arrived from former Yugoslavia during the recession years, suffering hard from the economic conditions at arrival with difficulties entering the labor market.

[9] This figure also conditions on being registered in Sweden in the next consecutive year. But total attrition plays a small role, with less than 0.5% of previously employed immigrants no longer registered in Sweden.

[10] Studying different types of benefits shows a decline in the real value of average unemployment benefits, increases in parental leave and studies and other benefits, and a varying size of sickness and disability benefits over the period, see Figure A.5.

Table 1: Descriptive Statistics

	1985	1995	2005	2015
	(1)	(2)	(3)	(4)
Age	38.7	39.7	39.7	39.8
	(8.17)	(8.60)	(8.37)	(8.65)
Male	0.527	0.521	0.522	0.520
Foreign-born	0.102	0.097	0.126	0.186
Annual earnings	23,001	31,469	40,289	43,389
	(13,041)	(19,552)	(27,860)	(30,068)
Employment earnings	22,019	30,620	39,004	42,339
	(13,462)	(20,090)	(28,356)	(30,320)
Self-employment earnings	982	848	1,285	1,050
	(4,629)	(4,851)	(7,455)	(7,769)
P10 Annual earnings	8,543	10,265	13,251	15,542
P25 Annual earnings	14,820	20,446	26,369	29,129
P50 Annual earnings	22,492	30,264	37,987	40,735
P75 Annual earnings	28,466	39,100	48,963	52,507
P90 Annual earnings	36,091	50,234	64,356	68,761
Total work-related income	–	33,516	42,261	44,921
		(18,565)	(26,803)	(29,234)
Share work-related benefits	–	0.123	0.116	0.088
		(0.231)	(0.218)	(0.183)
Disposable income	–	25,782	32,753	39,683
		(10,607)	(40,786)	(90,753)
Monthly full-time equiv. wage rate	2,315	2,983	3,866	4,115
	(765)	(972)	(1,675)	(1,749)
Observations	2,950,475	3,036,303	2,953,457	3,205,645

Notes: *All income measures are reported in real 2018 USD.*

2.3 Institutional Setting

This paper analyzes earnings dynamics among Swedish workers over more than 30 years, from 1985 to 2016. Although a full account of the course of events during this long period is outside the scope of this paper, it is important to bare in mind some of the most important changes in the Swedish labor market, particularly in the 1990s.

During the 1980s, the unemployment rate in Sweden was very low at around 2 percent and labor force participation was very high. In 1991, the Swedish economy was hit by a deep recession and the unemployment rate increased sharply to above 10 percent in 1993.[11] According to Skans et al. (2009), the main causes were a series of macroeconomic shocks, policy failures and an international recession. The crisis hit all sectors of the Swedish economy and led to large cuts in public sector employment. The crisis also offset a fiscal consolidation of the Swedish economy. The unemployment rate declined eventually but has been permanently higher compared to pre-crisis levels, contributing to the lasting drop in employment in Figure 1a. In contrast, other recessions had modest macroeconomic implications. The

[11] See Gottfries (2018) for an overview of the labor market in Sweden since the 1990s

recession during the early 2000s mainly affected the IT sector, and the global financial crisis in 2008 primarily affected manufacturing, leading to a comparatively less dramatic increase in unemployment.

The fiscal consolidation following the 1990s crisis also affected the benefit systems. Sweden has an encompassing welfare system with comparatively generous public transfers. Table 1 showed that work-related benefits as a share of work-related income has declined over time. An important reason is that many amounts and ceilings in the benefit systems are price indexed or even expressed in nominal terms, which implies an erosion of the value of benefits relative to earnings.[12] Specifically, the overall generosity of the unemployment insurance has fallen since the 1990s, both in terms of the replacement rate and the ceiling, which remained nominally fixed from 2002 until 2015. Sickness and disability benefits were subject to large variation in screening stringency over time, driving variation in take-up (see, e.g., Johansson et al. (2014) and Hägglund and Johansson (2016)). Parental leave benefits have become more generous over time in terms of both benefit amounts and duration, and take-up of parental leave benefits has increased continuously. The increase in study benefits in the late 1990s reflects the largest expansion of adult education in Sweden, as a response to the lasting effects of the 1990s crisis.

The Swedish tax system has also undergone important changes during this period (see Rietz et al. (2015) for a full overview). Although our main outcome measure is gross annual earnings, taxation will affect work incentives as well as the development of post-tax disposable income, analyzed in section 4. In 1991, Sweden implemented the "tax reform of the century", which lowered marginal income tax rates and substantially reduced progressivity in the tax system. In addition, the reform introduced separate taxation of capital and labor income, as well as special rules (known as "3:12 rules") for shifting labor income to capital income in closely held corporations.[13] These transfer rules have become more generous through reforms from 2006 onwards, and hence income shifting may hide some changes in the earnings distribution, especially at the top of the distribution (Björklund, 2020). Another change in labor taxation is the introduction and expansions of an earned income tax credit (EITC) during 2007–2010 and in 2014, with the purpose of increasing the incentives for work by introducing a tax wedge between labor and transfer income (see, e.g., Laun (2017)).

Wage bargaining is also central for the development of labor earnings. Union density is

[12]For example, the ceilings in the sickness, disability and parental leave systems are price indexed, whereas the ceiling in the unemployment insurance is expressed in nominal terms.

[13]Specifically, the reform introduced a flat tax rate on capital income of 30 percent. The role of capital income in the development of income inequality has been analyzed (see, e.g., Björklund et al. (2019) and Roine and Waldenström (2012)), and is not a focus of this paper. When including capital income in our earnings measure, we find, in line with previous studies, that this primarily matters for inequality at the top of the income distribution, see Appendix D.6.

high in Sweden and unions play an important role in wage setting and bargaining, with collective agreements typically extending also to non-union workers. There is no legally binding minimum wage, but collective agreements usually stipulate minimum wage levels. During the 1980s and 1990s, wage negotiations took place at the industry level, with the exception of economy-wide wage restraints during the period 1991–1993 (see Skans et al. (2009)). Some negotiations returned to the national level in 1997, when the so-called Industrial Agreement (IA) was signed between the unions and the employer organizations in the industrial sector to achieve consensus on wage developments consistent with low inflation and high employment, see Holmlund (2003). The IA became a model for similar agreements in other parts of the economy, and has been combined with a stronger local influence (Skans et al., 2009).

3 Earnings Inequality and Dynamics

We begin with a thorough analysis of the dynamics of labor market earnings in Sweden. The focus on annual earnings for the employed work force helps understand how careers are shaped and emphasizes the central role that the labor market plays for individual workers' exposure to risk and uncertainty.[14]

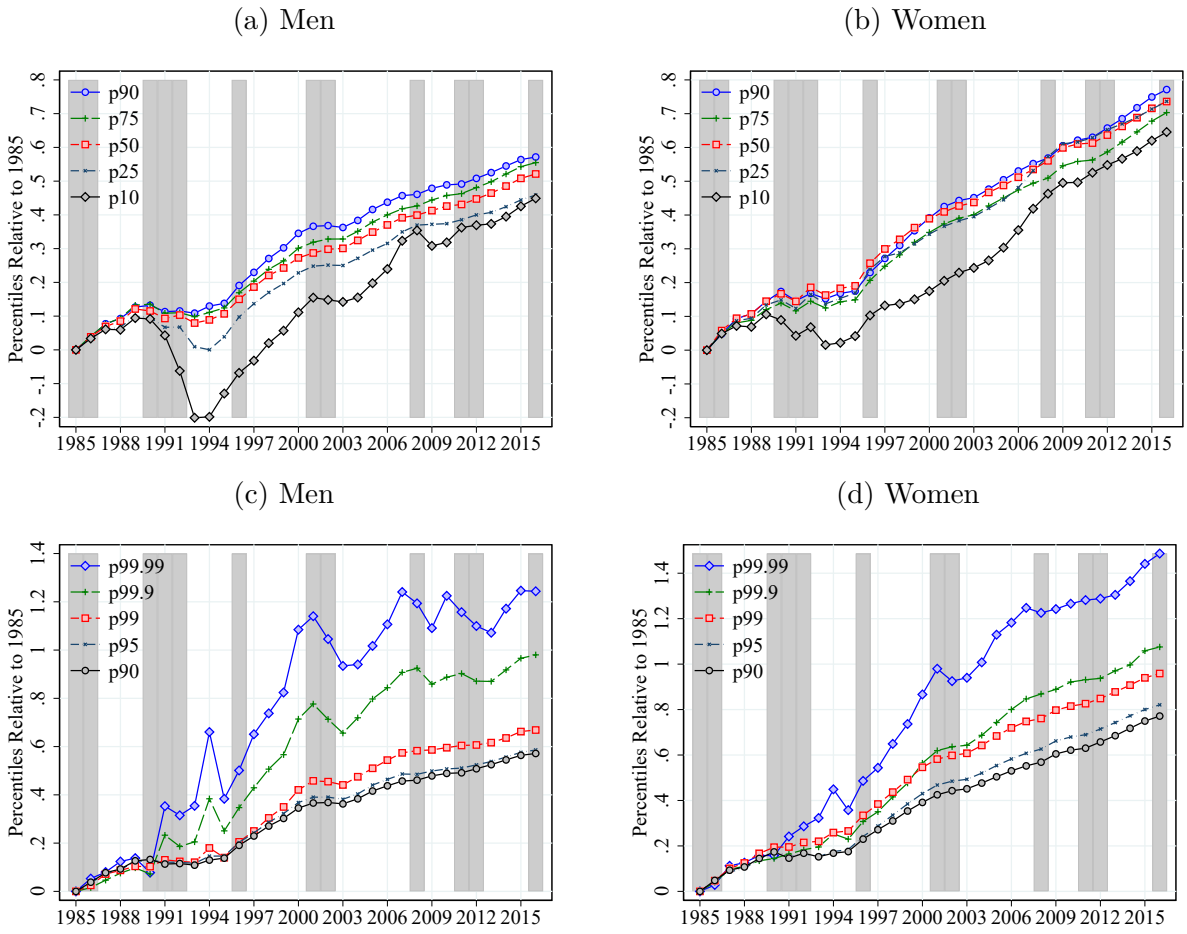
3.1 Earnings Inequality

Understanding earnings dynamics in Sweden over the last three decades starts from acknowledging the massive role of the deep recession in the early 1990s. As Figures 2a and 2b show, this recession had large and long-lasting implications for low-income workers. Men at the 10th percentile of earnings lost 20 log points (or 18%) relative to their income in 1985 during the 1990s recession, and despite experiencing faster earnings growth over the last two decades, the bottom of the male earnings distribution only fully recovered these differential losses until the financial crisis.[15] Losses were smaller for women during the 1990s recession but the lower tail of the earnings distribution experienced a second dip in the late 1990s and an even slower recovery. These differences in the magnitude and timing of the recession by gender may in part be due to differences in exposure across industries, with male-dominated manufacturing being especially affected during the recession and the female-dominated public sector shrinking substantially to contain public spending after the recession (from 55% of

[14] Appendix C provides various extensions to the results presented in this section for cross-country comparison.

[15] Perhaps surprisingly, highly educated workers with at least some college education at the bottom of the distribution experienced the largest real losses and a much slower recovery after the 1990s recession than low-educated workers with less than college education (Figure A.25). See Appendix D.1 for more results by education groups.

Figure 2: Changes in Percentiles of the Log Real Earnings Distribution

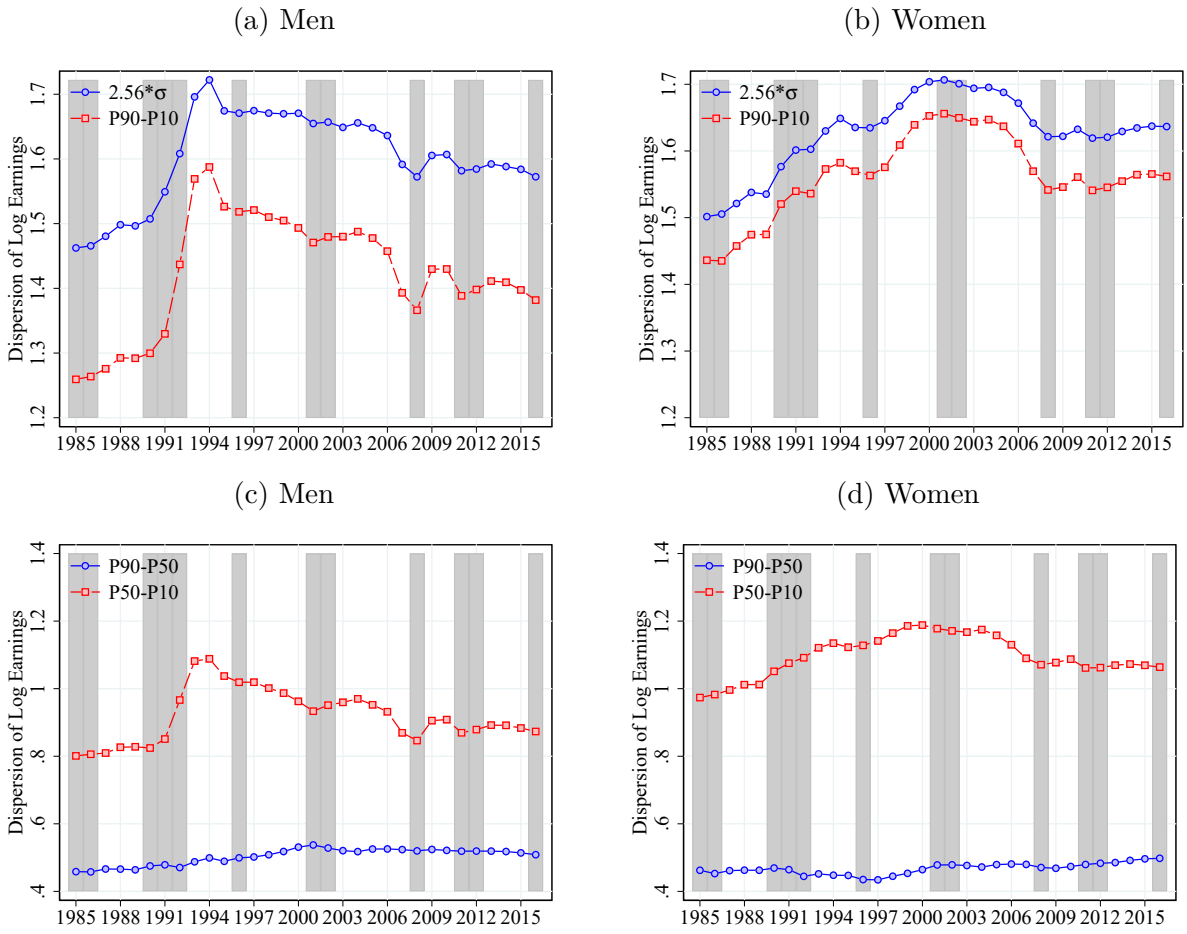


Notes: *Using raw log earnings and the CS sample, Figure 2 plots against time the following variables: (a) Men: P10, P25, P50, P75, P90 (b) Women: P10, P25, P50, P75, P90, (c) Men: P90, P95, P99, P99.9, P99.99, (d) Women: P90, P95, P99, P99.9, P99.99. All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

female employment in 1993 to 49% in 2000, see Figure A.4).

After this deep recession in the early 1990s, Figures 2a and 2b also show that Sweden experienced steady growth across the earnings distribution for men and women over more than 20 years. Median real earnings have increased by more than two-thirds (50 log points) for men and doubled (75 log points) for women between 1985 and 2016. Even workers at the 10th percentile of the distribution experienced real gains of 91% (65 log points) for women and 57% (45 log points) for men compared to 1985 levels. Figures 2c and 2d further show that gains at the top of the distribution, between the 90th and 95th percentile, were only slightly larger than for the median worker. Only the top 1 percent of the distribution for both men and women received larger real gains relative to 1985. The results we find here may even understate total gains at the top of the distribution because tax incentives led to some income shifting from earnings to capital income among small business owners as discussed in

Figure 3: Income Inequality



Notes: *Using raw log earnings and the CS sample, Figure 3 plots against time the following variables: (a) Men: P90–10 and 2.56*SD of log income (b) Women: P90–10 and 2.56*SD of log income (c) Men: P90–50 and P50–10, (d) Women: P90–50 and P50–10. Shaded areas are recessions. 2.56*SD corresponds to P90–10 differential for a Gaussian distribution.*

Björklund (2020). Nevertheless, the large and ubiquitous gains across the distribution make Sweden stand out among other OECD countries during that time.[16]

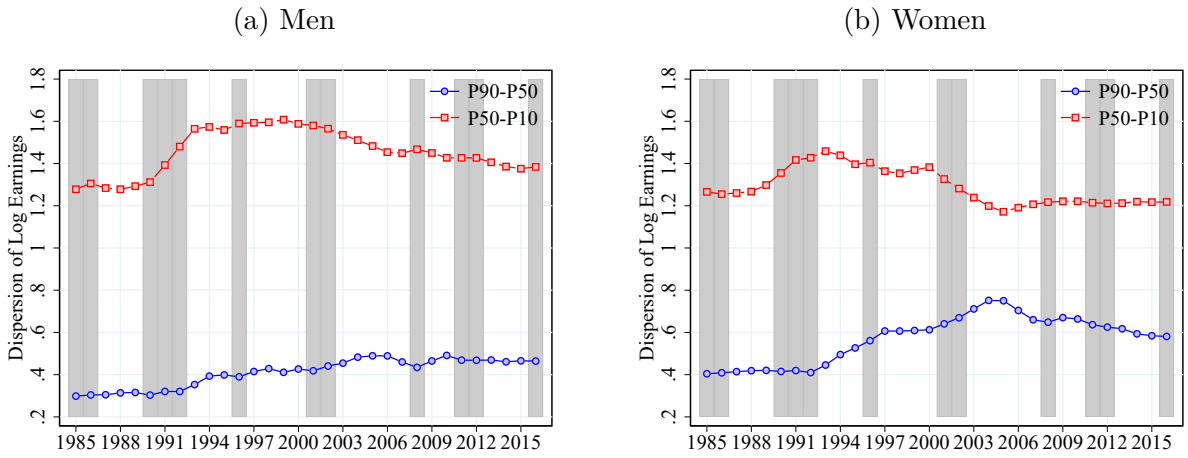
The large shock of the 1990s recession and the subsequent recovery with uniform trends in earnings are also reflected in the time series of earnings inequality, measured as the variance of log earnings or the difference between the 90th and 10th percentile of the log earnings distribution (P90–10 gap). Figure 3 shows the dramatic increase in log earnings dispersion for men and less for women during the recession 1991–1993. After this deep recession, earnings inequality gradually declined. For men, measures of earnings inequality have been decreasing gradually since the peak in 1994 to slightly above pre-recession levels today. For women, the increase in inequality continued throughout the 1990s and only declined after 2001, matching the delayed impact in the bottom of the distribution in Figure 2b.

[16]Notably, we find that real gains were similar for high and low-educated workers, see Appendix D.1.

As expected based on Figure 2, splitting the P90–10 gap into the difference between the 90th percentile and the median (P90–50 gap) and the difference between the median and the 10th percentile (P50–10 gap) in the lower panel of Figure 3 confirms that both the increase in earnings inequality during the 1990s and the subsequent decline for both men and women is driven by changes in the bottom part of the distribution. These changes are closely related to the impact of and recovery from the 1990s recession, while inequality in the upper half of the distribution slightly increased over time.

This is an important finding because these labor market trends over the last two decades are opposite to the increase in disposable income inequality that has been documented (Aaberge et al., 2018). Hence, the convergence in the lower half of the earnings distribution may have mitigated overall inequality. To connect these income concepts, we will analyze another important component of disposable income in section 4 that also interacts with the labor market development for low-income workers: the role of social benefits. In particular, take-up rates for work-related benefits increased quickly during the 1990s recession and then declined gradually over time. We further document that decreasing benefits usage accompanies the decline in inequality over the last two decades for men and women as low-income workers strengthen their labor market attachment and rely less on social insurance.

Figure 4: Income Inequality: Initial Conditions

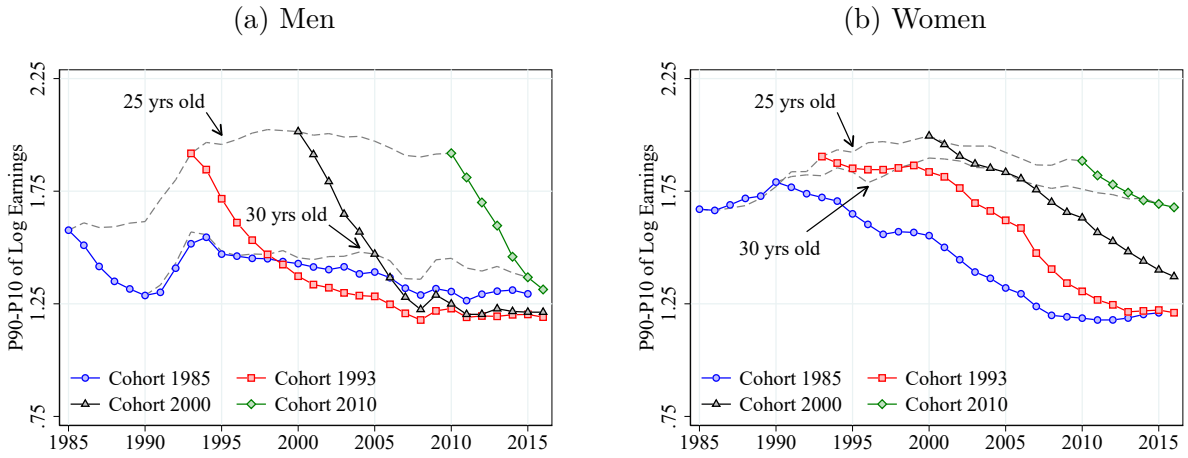


Notes: *Using raw log earnings and the CS sample, Figure 4 plots against time the following variables: (a) Men: P90–50 and P50–10 at age 25, (b) Women: P90–50 and P50–10 at age 25. Shaded areas are recessions. Shaded areas are recessions.*

Despite the gradual aggregate decline in inequality after the 1990s recession, we find that the consequences for entering cohorts were more permanent. Figure 4 shows a substantial increase in the P50–10 earnings gap at age 25 in the early 1990s, but this increase persists for male workers and only gradually declines after 2000. For young women, we find an increase in the P90–50 earnings gap concurrent with convergence in the bottom tail after

the recession, suggesting that the median 25-year old woman was not strongly attached to the labor market after the recession. This is consistent with young workers seeking higher formal education during and after the recession, in response to the economic environment and in particular incentivized through generous study grants.

Figure 5: Life-Cycle Inequality over Cohorts



Notes: *Using raw log earnings and the CS sample, Figure 5 plots against time the following variables: (a) Men: P90–10 over the life cycle for all cohorts available, (b) Women: P90–10 over the life cycle for all cohorts available.*

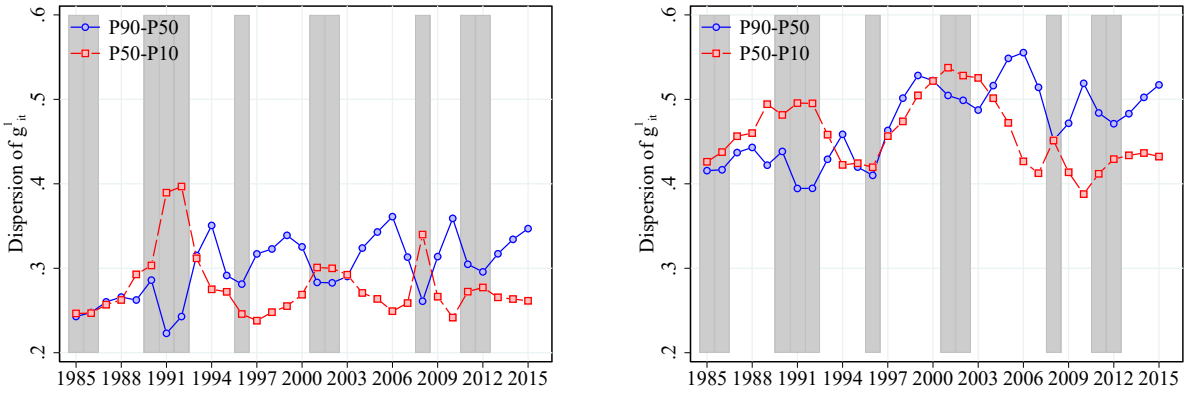
Increasing educational attainment over the 1990s implies that a larger share of workers at age 25 attended formal education while working part-time or part-of-the-year. These differences in hours worked can help explain the large dispersion in annual earnings among young workers in Figure 5. Among men, this dispersion declines quickly until age 30, while for women the decline is much smaller. As we discuss in more detail in section 4.2, these trends are indeed driven by declining inequality in annual hours worked; in contrast, wage inequality substantially increases over the life cycle. We further show that gender differences are closely related to differences in benefits usage, consistent with women receiving the majority of parental leave benefits, for example.

3.2 Earnings Volatility

After documenting the persistent changes for cross-sectional and life-cycle earnings inequality after the deep recession of the 1990s, we now turn to the panel dimension to measure earnings dynamics of individual workers and trends in earnings volatility over time. To this end, we focus on the log difference in residual earnings between consecutive years, $g_t^1 = \epsilon_{t+1} - \epsilon_t$. The residualization removes gender-age-specific differences in earnings, see Appendix A for details.

Figure 6: Dispersion in 1-Year Log Earnings Changes

(a) Men (b) Women



Notes: *Using residual one-year earnings changes and the LX sample, Figure 6 plots against time the P90–50 and P50–10 gaps for (a) Men, (b) Women. Shaded areas are recessions.*

Figure 6 first shows trends in the P90–50 gap and P50–10 gap of 1-year earnings growth. Starting from low levels in the 1980s, we document a striking divergence during the 1990s recession. While the P50–10 gap is counter-cyclical as it increases substantially during the recession, the P90–50 gap is strongly pro-cyclical. This implies that earnings losses become larger and earnings gains smaller during the recession. Yet, these cyclical patterns are much less pronounced during subsequent recessions after 2000. This again highlights the massive shock to the labor market in the 1990s. Compared to other crises, Sweden experienced a much larger increase in unemployment during the 1990s recession, suggesting that changes in annual hours worked are a key driver of cyclicality in earnings growth.

In addition to high volatility during the recession, the recovery period between the mid-1990s and the mid-2000s shows a striking cycle in labor market dynamics, in particular for women. Until 2000, we find a sharp increase in both the P90–50 and the P50–10 gap in earnings growth for women, but only a moderate increase for men. As we analyze in more detail in section 4.2, usage of generous leave and education benefits increased substantially during that time, while at the same time wage bargaining was decentralized, including in the public sector. Subsequent compression of earnings growth until the financial crisis is consistent with the renewed strengthening of centralized bargaining around 2000. More importantly, benefits usage declined in the 2000s as the real value of benefit programs declined, eligibility rules were tightened, and tax reform increased incentives to work.

Gender differences in earnings volatility More broadly, Figure 6 reveals systematic differences in the level and cyclicality of earnings changes by gender. There is a persistent

gender gap in earnings volatility, with higher earnings growth dispersion for women than for men. Women may more frequently have part-of-the-year employment because of leave spells or they may switch more frequently between part-time and full-time employment. In contrast, comparing business cycle patterns by gender shows somewhat larger fluctuations for men, which suggests that they may go through more frequent unemployment spells for parts of the year during a recession. We will return to these differences in the next section where we compare these patterns for wages and including work-related benefits.

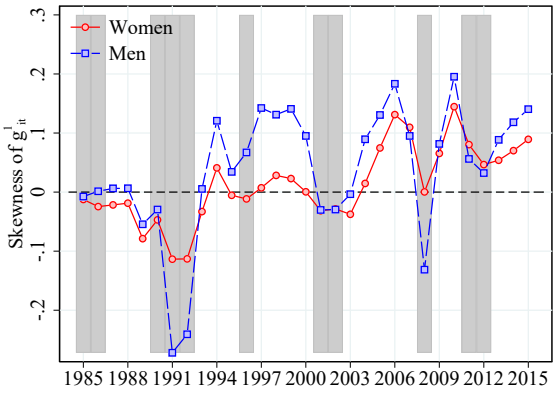
To further investigate these gender differences, Figure 7 analyzes higher-order moments of the earnings growth distribution. To measure its asymmetry, we first consider the Kelley skewness of earnings changes, defined as $\frac{(P90-P50)-(P50-P10)}{P90-P10}$. Positive (negative) Kelley skewness indicates that the P90–50 gap accounts for a larger (smaller) share of earnings growth dispersion than the P50–10 gap, while ignoring tail events in the top and bottom 10 percent of the distribution. As such, the results in Figure 7a map directly to the ratio of the P90–50 and P50–10 gap in earnings growth in Figure 6 and emphasize that skewness is highly pro-cyclical, turning more negative during recessions. The magnitude of these changes in skewness over the business cycle is much larger for men than for women. Men face a larger deterioration in earnings growth during recessions than women, but they also benefit from more positive shocks during boom periods. Yet, in recent years these differences have declined. In addition, Figure 7a suggests an increase in skewness over time. This pattern reflects larger positive than negative shocks at the individual level, painting a cautiously positive picture of earnings volatility consistent with the overall increase in real earnings in Figure 2.

To measure the tail extremity of the distribution, we use the Crow-Siddiqui kurtosis measure, defined as $\frac{P97.5-P2.5}{P75-P25}$. Intuitively, the higher the value of kurtosis, the larger are tail events compared to typical earnings changes. Specifically, the tails are compared to the inter-quartile range, while excluding the role of large outliers in the tails of the earnings growth distribution.

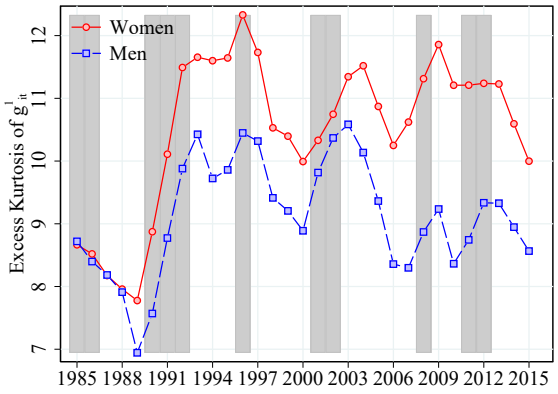
Figure 7b shows that the Crow-Siddiqui kurtosis was relatively low and similar for men and women in the late 1980s but then increased steeply during the 1990s recession, more so among women. This increase in tail events of earnings growth interacts with negative skewness during the recession to increase idiosyncratic risk. After the 1990s recession, we find a gradual decline in the Crow kurtosis for men, whereas the kurtosis for women has maintained a higher level until today, showing a slower downward trend than for men. This gender difference in kurtosis is driven by a longer upper and lower tail of earnings changes for women because the denominator of the Crow measure, the inter-quartile range of earnings growth, is similar for men and women. This suggests that women continued to frequently

Figure 7: Skewness and Kurtosis of 1-Year Log Earnings Changes

(a) Kelley Skewness



(b) Crow-Siddiqui Kurtosis



Notes: *Using residual one-year earnings changes and the LX sample, Figure 7 plots against time the following variables: (a) Men and Women: Kelley skewness, defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$*, (b) Men and Women: Excess Crow-Siddiqui kurtosis calculated as* $\frac{P97.5-P2.5}{P75-P25} - 2.91$ *where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for a Normal distribution. Shaded areas are recessions.*

face very large earnings changes over the 1990s, which could in part be explained by longer leave spells and more benefits usage. A faster decline in benefits receipt through UI and leave policies, as well as more stable jobs for men could also help explain their gradually decreasing kurtosis over recent decades.

Finally, gender differences in earnings volatility may differ over the life-cycle and depending on income level. To shed more light on these potential differences, Figure 8 analyzes dispersion, skewness, and kurtosis of one-year earnings growth by gender, age group, and income percentile, using average earnings over the last three years to rank individuals across the distribution (see Appendix A for details). Taken together, the results show that young and middle-aged women in particular face substantially higher earnings volatility than other groups.

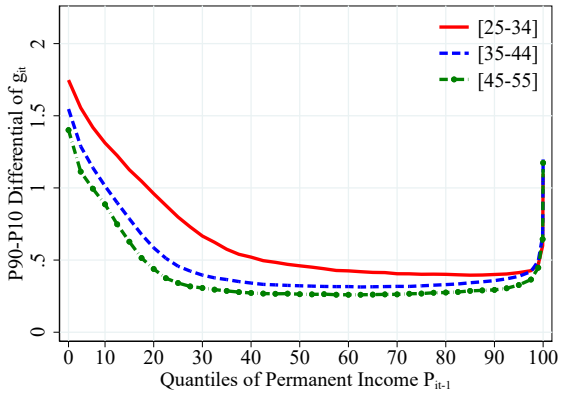
The first row of Figure 8 shows that earnings growth dispersion is by far the highest for young women aged 25–34 across the entire income distribution and only gradually declines with income. This is in contrast to the typical U-shape pattern across permanent income that we document for all other groups, with a large decrease in volatility in the bottom tercile of the income distribution and a smaller increase for the top decile. This asymmetry in earnings changes is consistent with more mobility in the bottom than in the top half of the income distribution, and is less pronounced for older workers.[17]

A comparison of Figures 8c and 8d also shows striking gender differences for skewness by age group and income, which add nuance to the gender comparison of skewness in Figure

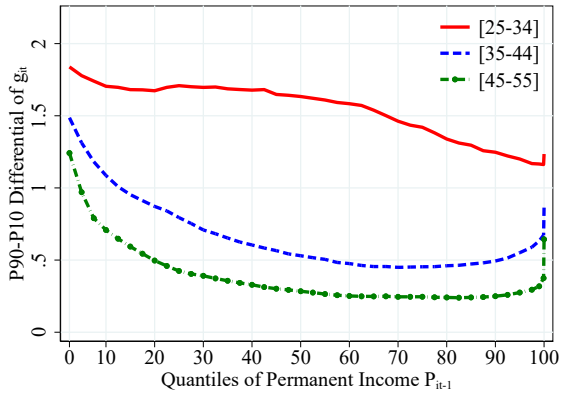
[17] These patterns are slightly stronger for five-year earnings growth, see Figure A.20.

Figure 8: Dispersion, Skewness, and Kurtosis of 1-Year Log Earnings Changes

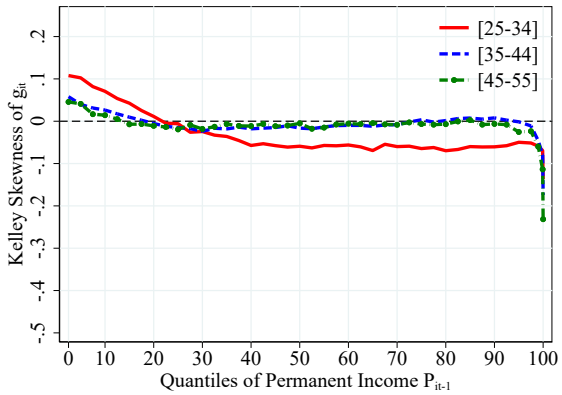
(a) Men



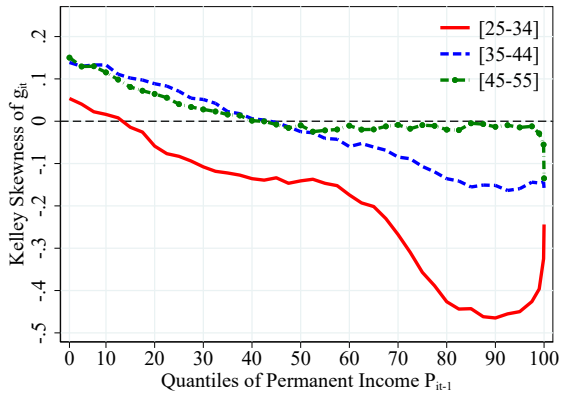
(b) Women



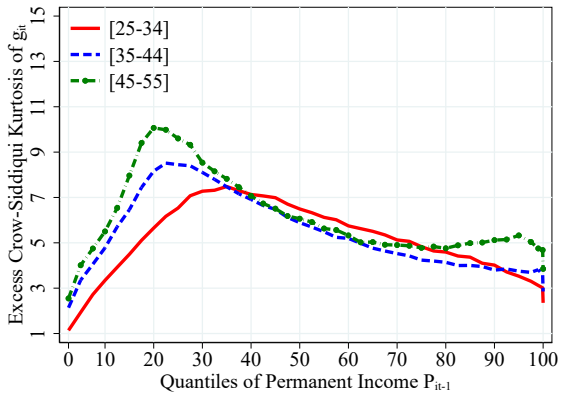
(c) Men



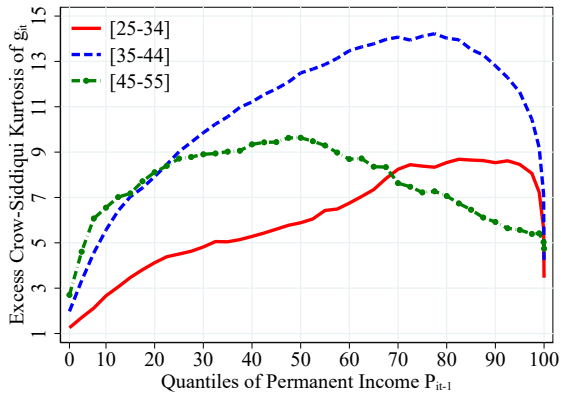
(d) Women



(e) Men



(f) Women



Notes: *Using residual one-year earnings changes and the LX-H sample, Figure 8 plots against permanent income quantile groups the following variables for the 3 age groups: (a) Men: P90–10, (b) Women: P90–10, (c) Men: Kelley Skewness, (d) Women: Kelley Skewness, (e) Men: Excess Crow-Siddiqui kurtosis, (f) Women: Excess Crow-Siddiqui kurtosis. Kelley Skewness defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$*. Excess Crow-Siddiqui kurtosis calculated as* $\frac{P97.5-P2.5}{P75-P25} - 2.91$ *where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for Normal distribution.*

7a. Kelley skewness for men is largely flat around zero, except for young men who face positive skewness in the lower tail that suggests larger positive shocks for upward mobility. In contrast, young women experience lower skewness than older age groups for all income ranks, and in particular in the top tercile of the distribution. Combined with the large dispersion in earnings growth for this group in Figure 8b, the negative Kelley skewness implies massive negative earnings shifts, which are consistent with the role of childbearing and moves from full-time to part-time work. In addition, the skewness of earnings changes for women aged 35–44 is also strongly decreasing in permanent income. Positive skewness among women with low permanent income suggests some improvements for women who increase their labor market attachment, but negative skewness in the upper tail of the distribution is again consistent with a substantial share of parental leave taking which comes at a lower replacement rate, and hence larger earnings penalty, for high-income women.

Finally, we find an inverse U-shape for the Crow-Siddiqui kurtosis across the income distribution, see Figures 8e and 8f. For men of all age groups, the kurtosis increases steeply in the bottom quartile of the income distribution, and displays a long gradual decline in kurtosis for higher incomes, suggesting more stable high incomes.[18] For women, the kurtosis patterns differ substantially in level and turning point of the U-shaped curve by age. Strikingly, the kurtosis for young women increases up to the 95th percentile of permanent income, suggesting larger tail events for high-earners. Middle-aged women experience the highest kurtosis of all gender-age groups, with peak kurtosis at the 75th percentile of permanent income. This group is likely more heterogeneous with some women advancing in their careers and others having weaker labor market attachment during child rearing ages.

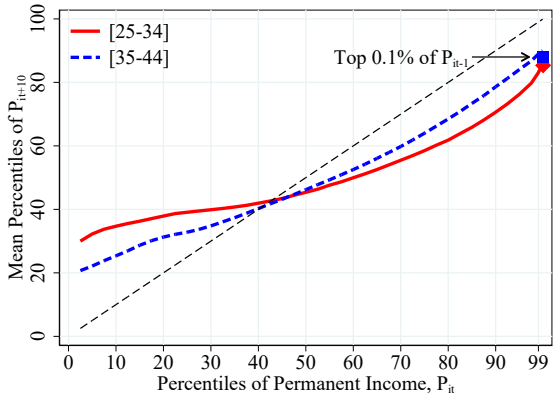
Consistent with the results in Guvenen et al. (2015), the combined patterns for skewness and kurtosis by age and income suggest that older individuals with higher earnings have more room to fall and less room to move up. But the results also point to an important role of generous work-related benefits that may contribute to important differences in earnings dynamics between young women and men, as women may take longer leave of absence and switch to part-time work.

Gender differences in long-term mobility In order to assess how gender differences in short-term earnings volatility relate to longer-term career outcomes, we conclude this section by analyzing 10-year mobility in permanent income by gender and age group. Specifically, Figure 9 plots the average permanent income rank in $t+10$ across the current distribution of permanent income at time t. To avoid compositional changes, we focus on one particular

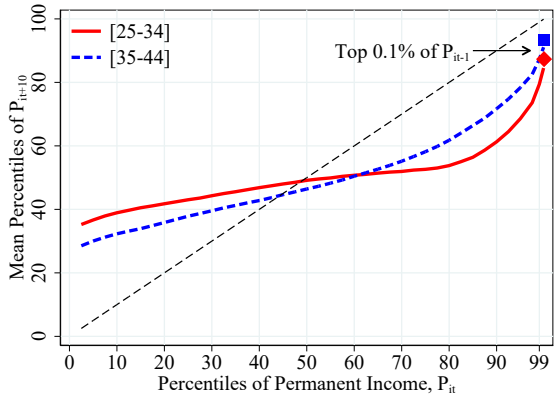
[18] For the middle of the distribution, we typically find a decrease in the Crow measure with higher income, but a simultaneous increase in the coefficient of kurtosis, suggesting more large shocks but fewer extreme shocks in this income range, see Figure A.21.

Figure 9: Evolution of 10-Year Mobility Over the Life Cycle

(a) Men



(b) Women



Notes: *Figure 9 shows average rank-rank mobility over 10 years by computing average percentiles of permanent income, P_{t+10} ten years later for workers in each permanent income percentile in the base year. The figure separately plots mobility for workers in age groups 25–34 and 35–44 in the base year and averages over the results for each available base year 1985–2005.*

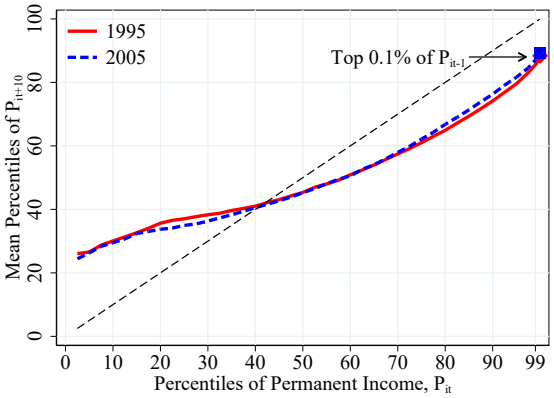
year, and define age cohorts in that year whom we track over ten years.

The results in Figure 9 show systematically higher mobility for women, which suggests that some earnings losses for women are temporary, but it also indicates massive divergence of career paths among women. For any initial income in the bottom 80 percent of the distribution, young women aged 25–34 on average reach a rank between the 40th and 50th percentile ten years later. Similarly, there is also substantial downwards mobility for individuals at the top of the distribution. For the age group 35–44, the mobility pattern is weaker, especially at the top, but still substantial. Men of the same age group are less mobile, suggesting a more linear career progression than for women. One interpretation of these differences is that men sort into career paths by education relatively early in the life cycle and are more likely to preserve their position in the distribution. In contrast, women are more likely to combine household and labor market investments and thus, educational sorting by income is weaker at young ages. In particular, high mobility above the median for women suggests that some highly talented women occupy lower income percentiles early in their careers.

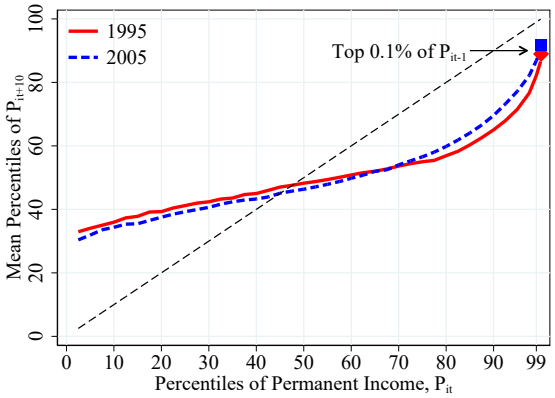
Figure 10 suggests that these mobility patterns have changed little for men but decreased slightly for women between 1995 and 2005. As we show in section 4.2, an important part of large changes in earnings occur when individuals enter or exit benefit programs, but benefits usage has substantially declined over time. If women with high career potential become less likely to receive work-related benefits, this suggests that they will also appear less often in low earnings percentiles at young ages. This stronger initial sorting by income may contribute to the slight reduction in mobility for women over time, but instead of decreased social mobility,

Figure 10: Evolution of 10-Year Mobility Over Time

(a) Men



(b) Women



Notes: *Figure 10 shows average rank-rank mobility over 10 years by computing average percentiles of permanent income, P_{t+10} ten years later for workers in each permanent income percentile in the base year, using two alternative base years 1995 and 2005 and averaging over all age groups.*

this mechanism may reflect stronger attachment of women to the labor market and better career outcomes for talented women.

In sum, we find an encouraging development of earnings volatility over time, with workers facing relatively fewer and smaller negative earnings shocks.[19] As we discuss in detail below, changing enrollment in benefit programs over time may help explain broader trends in earnings volatility in response to the deep 1990s recession and during the subsequent recovery. Yet, we also document substantial and persistent differences in the level and cyclicality of earnings volatility between men and women. While higher long-term mobility among women suggests that some large earnings shocks are temporary, we find particularly high earnings volatility among young and middle-aged women, exacerbated by large negative skewness of earnings growth. This is not true for men who experience more stable and linear careers but face larger business cycle fluctuations in earnings growth.

4 Mechanisms

The most striking patterns that emerge from section 3 are (i) the massive increase in earnings inequality and volatility during the 1990s recession, (ii) the recovery from the recession with a gradual decline in inequality and volatility accompanied by large real gains across the

[19]The decline in negative earnings changes holds across all gender-education groups, see Figure A.26. In addition, the positive trend in skewness is more pronounced for high-educated workers, especially women. These changes also reflect improvements in longer term career opportunities, as evidenced by persistently higher positive 5-year earnings shocks, see Figure A.27.

entire earnings distribution, and (iii) substantial and persistent gender differences in earnings volatility. This section aims to shed more light on the underlying drivers of these trends and differences, in order to assess their consequences for individual exposure to risk.

First, the aggregate trends in real earnings gains and decreasing inequality and volatility may hide large differences for sub-populations. Importantly, Sweden experienced a large increase in the population share of immigrants over time, with a recent increase in low-skill immigration that may pose additional challenges for policymakers. The varying labor market success of immigrants has been discussed frequently in recent years (Bratsberg et al. (2017), Calmfors and Gassen (2019)) and aggregate patterns may hide differential fortunes for this minority group. In section 4.1, we investigate how earnings dynamics of foreign-born workers differ from or contribute to overall patterns.

Second, since the Swedish labor market features a strong social safety net to mitigate earnings shocks and to support child bearing and continuing education, earnings only provide a partial and potentially misleading view of labor market risk. In section 4.2, we investigate the role of these social benefits by analyzing variation in annual hours worked, and directly measuring take-up and magnitude of work-related benefits among labor market participants. This analysis will help understand to what extent higher earnings volatility for women is related to gender differences in program take-up and labor market attachment. In addition, large changes in eligibility and generosity of public benefit programs occurred over the period we study, and we discuss how these changes may contribute to the aggregate trends in earnings dynamics that we document. In particular, we show that our findings of gradually declining earnings inequality and volatility are opposite to trends in disposable income (OECD, 2011, Aaberge et al., 2018). This speaks to a changing balance between employment and social insurance, which has important implications for individual income risk.

4.1 Immigration

Earnings Inequality We begin by shedding light on whether immigrants face particular challenges in the labor market. To this end, we analyze differences in earnings trends and dynamics between foreign-born and native workers. A first striking difference was already highlighted in Figure 1b: a much larger part of the immigrant than the native population are outsiders of the labor market, in particular after the recession in the early 1990s. In addition to a lower employment rate, the evidence also points to longer leave spells among participants, see Figure 1e. With these compositional differences in mind, we analyze to what extent working immigrants keep up with or deviate from the labor market trends for

natives.

Figure 11 first contrasts earnings trends by income percentiles for foreign-born and native workers by gender. The main finding is that immigrants have also experienced large gains in real earnings over time, but still substantially below the gains for natives over the three decades that we study. Specifically, median real earnings for foreign-born men increased by 52% (42 log points) compared to 84% (61 log points) for natives, and the difference for women is larger at 73% median earnings growth for immigrants and 112% for natives. In addition, the comparison by origin also shows that the 1990s recession hit immigrants especially hard. For both men and women, the shock at the bottom of the distribution was much more widespread than for natives. Not only did earnings at the 10th percentile (P10) suffer a deeper decline, foreign-born workers at P25 also experienced similarly large losses and this is in contrast to much smaller impact for native workers.[20]

Of course, there may also be large differences in labor market trends within the subpopulation of foreign-born workers. To shed more light on this, we split foreign-born workers into two groups by region of origin: workers from Europe and the Americas and workers from Africa, Asia, and the Middle East. We show trends in male earnings for these two groups in Figures 11e and 11f, respectively.[21] The evidence suggests that trends for European and American immigrants look more similar to natives, whereas immigrants from Africa, Asia, and the Middle East are hit the hardest by the 1990s recession as evidenced by a large decline in median earnings. Yet, despite these large losses in the 90s and large additional inflow of immigrants from these regions over the last two decades, this group has experienced massive real earnings gains over time.

Despite this larger impact of the 1990s recession for a broader part of the earnings distribution, Figure 12 documents similar trends in earnings inequality for natives and immigrants over time. One exception is the stronger relative and absolute decline in inequality in the bottom half of the distribution for foreign-born men, narrowing the gap to natives and reaching below 1985-levels by the end of the sample period. Distinguishing immigrants by region of origin reveals that inequality remains higher for workers from Africa, Asia, and the Middle East, and the decline is more pronounced for immigrants from Europe and the Americas. Overall, this convergence may be related to stronger labor market attachment and steeper decline in benefits usage as we discuss below.[22]

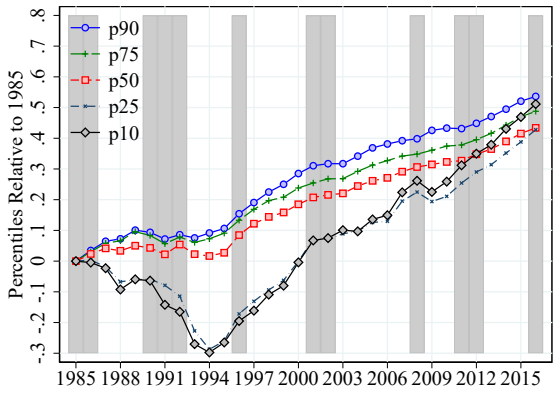
[20] Additional analysis by origin and education in Figures A.29 and A.30 shows that these larger and more persistent losses for immigrants are driven by low-educated workers, while high-educated immigrants with lower incomes match (for women) or outperform (for men) their native peers.

[21] Results for women are qualitatively similar, see Figure A.28.

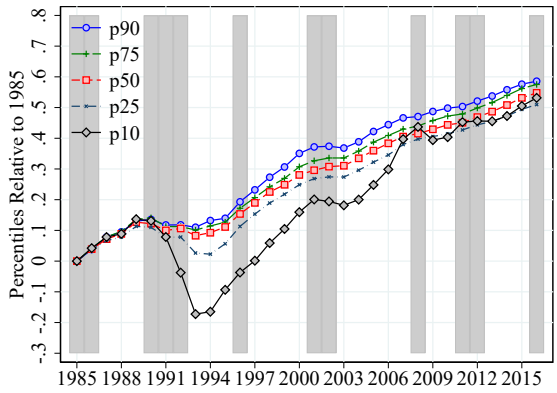
[22] Another exception is the trend in lower-tail inequality for women by origin after the 1990s recession: Inequality among foreign-born women peaks right after the recession in 1994 and gradually declines afterwards. For native women, the increase in inequality continues throughout the 1990s and only declines after

Figure 11: Income Percentiles by Gender and Origin

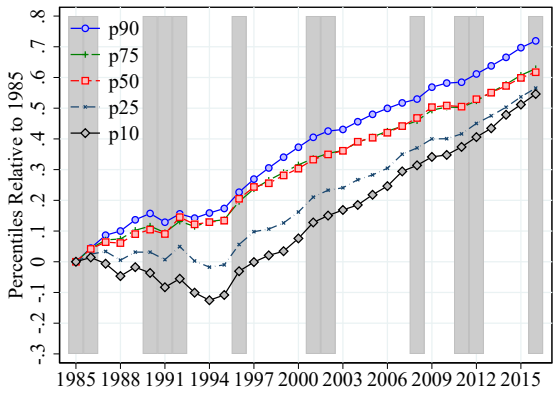
(a) Foreign-Born Men



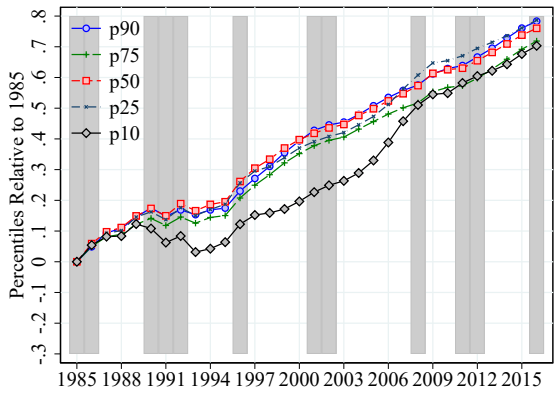
(b) Native Men



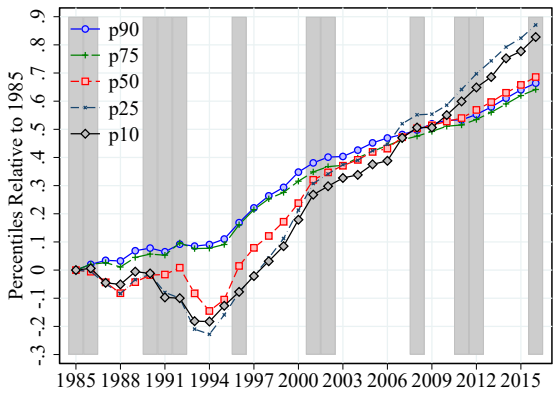
(c) Foreign-Born Women



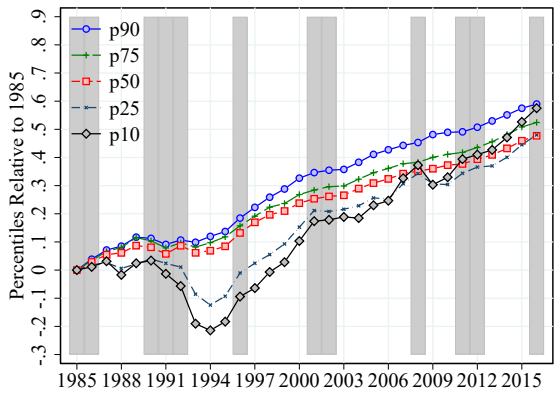
(d) Native Women



(e) Men: Africa, Asia, and Middle East

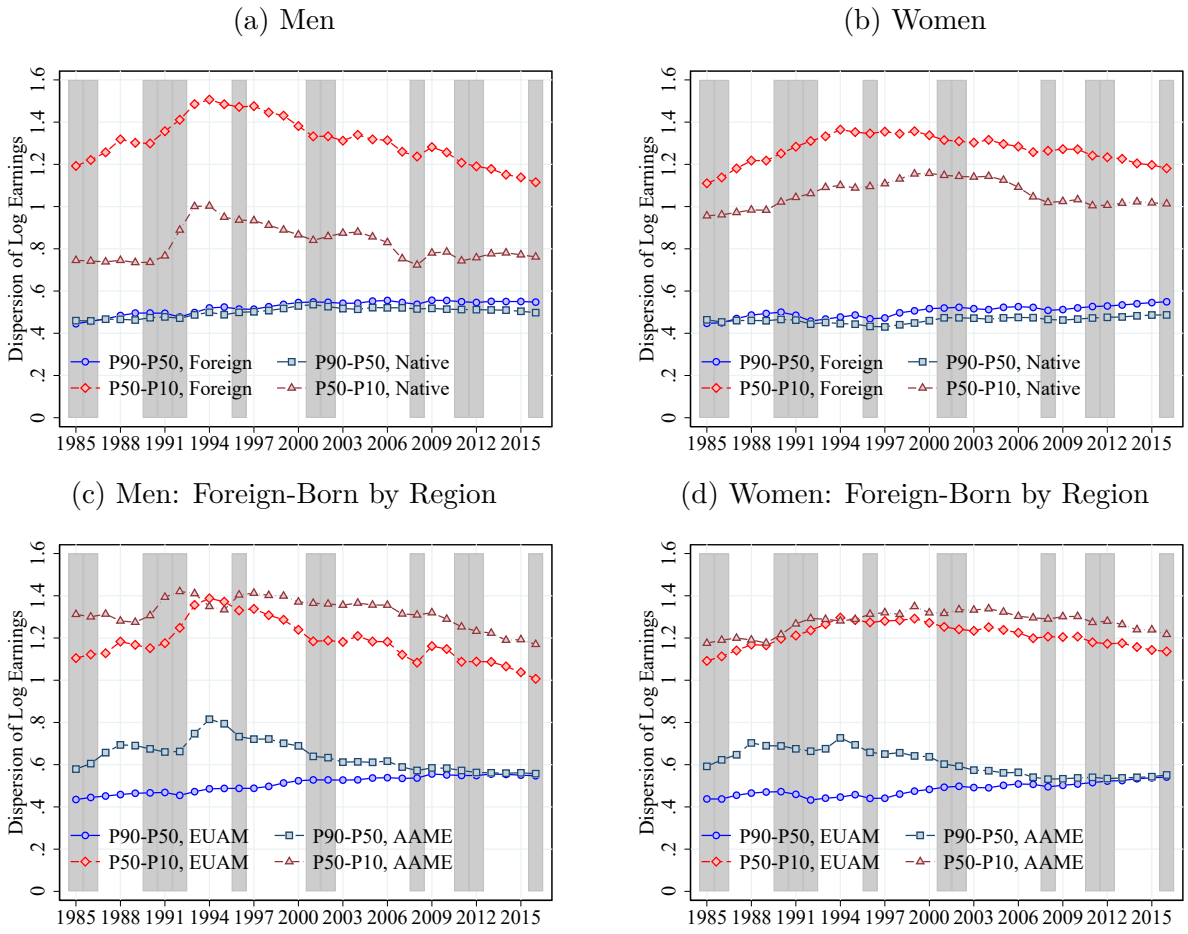


(f) Men: Europe and the Americas



Notes: *Using raw log earnings and the CS sample split by gender and origin, Figure 11 plots P10, P25, P50, P75, P90 of log earnings against time. All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure 12: Income Inequality by Origin



Notes: *Using the CS sample, Figure 12 plots the P90–50 and P50–10 differentials in log earnings against time, separately for foreign-born and native workers and by gender, and splitting the immigrant sample by region of origin distinguishing European and American immigrants (EUAM) from workers from Africa, Asia, and the Middle East (AAME). Shaded areas are recessions.*

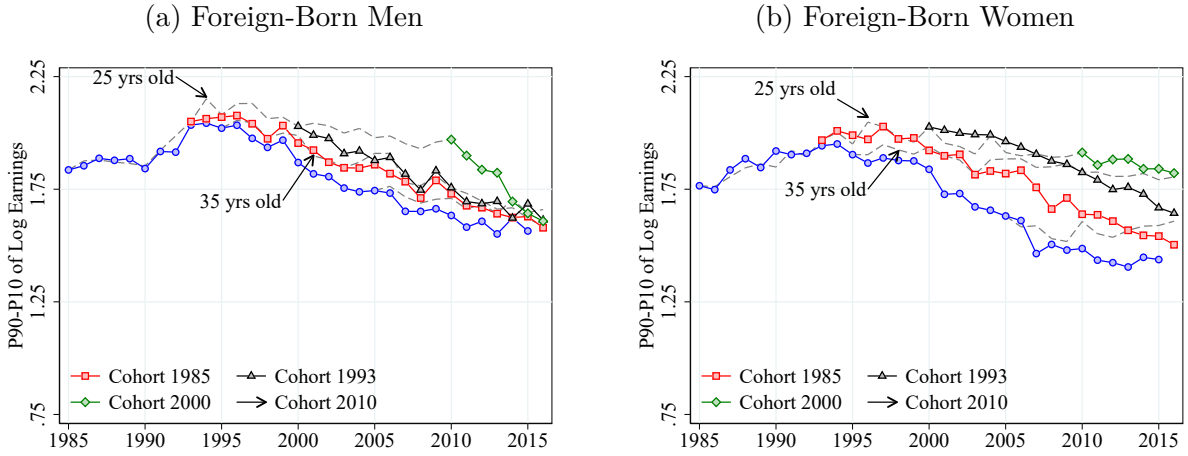
Most importantly, Figure 12 shows that earnings inequality is substantially larger among foreign-born workers than among native workers in general, especially for men. These persistent level differences are entirely driven by wider earnings dispersion in the bottom half of the distribution among immigrants, and this difference by origin is particularly pronounced for men. In contrast, inequality in the upper half of the distribution is similar across groups; if anything dispersion is larger among immigrant workers. Taken together, these patterns are consistent with polarization of foreign-born workers: A larger share of the immigrant population has relatively weak labor market attachment, working fewer hours or having more frequent unemployment spells, but there is also a higher share of workers with tertiary

2000. This difference is again consistent with differences in persistence of benefits usage during the recovery from the 1990s recession.

education (see Appendix Figure A.3), whose career trajectories contribute to higher earnings inequality.

In addition, we find that higher earnings dispersion for immigrants holds across the entire life-cycle. Comparing the life-cycle patterns for foreign-born workers in Figure 13 to the aggregate patterns in Figure 5 shows dramatic differences, especially for men: While native workers experience substantial convergence in earnings between age 25 and 30, immigrants barely do by their mid-30s and later. This is consistent with natives quickly moving into stable employment, whereas a large share of immigrants still faces precarious employment at later stages of the life-cycle.

Figure 13: Life-Cycle Inequality over Cohorts among Foreign-Born Workers



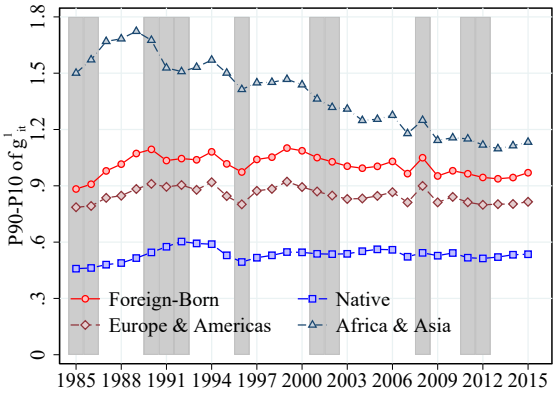
Notes: *Using raw log earnings and the CS sample, Figure 13 plots against time the following variables: (a) Men: P90–10 over the life cycle for all cohorts available, (b) Women: P90–10 over the life cycle for all cohorts available.*

In sum, the real earnings trends show that immigrants are not left behind in general. However, we document polarization among immigrants with higher overall inequality and a longer and deeper impact of the 1990s recession for a large share of low-income immigrants, in particular from Africa, Asia and the Middle East. We also find evidence of stronger reduction in inequality among immigrants, mainly for male workers from Europe and the Americas, which may be related to differential changes in their dependence on the public benefit system over time compared to the native population. We explore these differences in more detail in section 4.2.

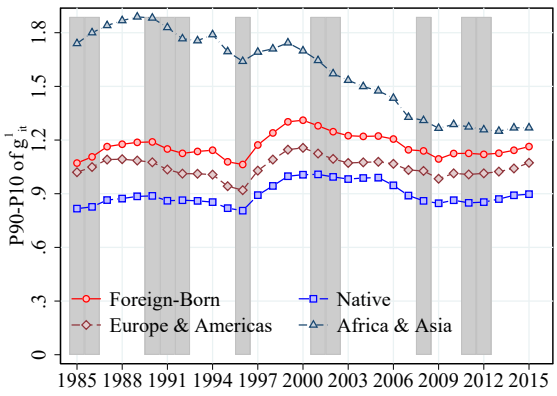
Earnings Volatility In addition to higher earnings inequality, differences in earnings volatility could be another important policy focus, reflecting different levels of risk and career opportunities. Figure 14 first compares the P90–10 gap of 1-year earnings changes by gender and origin. The trends in earnings volatility are similar across groups, suggest-

Figure 14: Dispersion in 1-Year Earnings Changes by Origin

(a) Men



(b) Women



Notes: *Using the LX sample, Figure 14 plots the P90–10 differential in 1-year residualized earnings change against time, separately for foreign-born and native workers and by gender. Shaded areas are recessions.*

ing that broader changes in the labor market are responsible for these patterns by affecting different jobs and workers similarly. But again, these overall patterns hide different dynamics by region of origin. While earnings volatility remains stable among immigrants from Europe and the Americas, volatility declines substantially for immigrants from Africa and Asia, including the Middle East, even though this group may include many workers newly arrived after 2000. This suggests that immigrants move into more stable employment over time, consistent with a growing share of workers from Africa and Asia who are employed in consecutive years, see Figure 1f.

Yet, despite these trends, we also find that immigrants continue to face much higher earnings volatility in addition to higher earnings inequality. The differences between immigrants and natives are again more pronounced for men, even though foreign-born women face the highest volatility among all groups. These level differences by origin suggest that a higher share among immigrant workers face less stable employment relationships and substantial variation in wages and/or annual hours worked.[23]

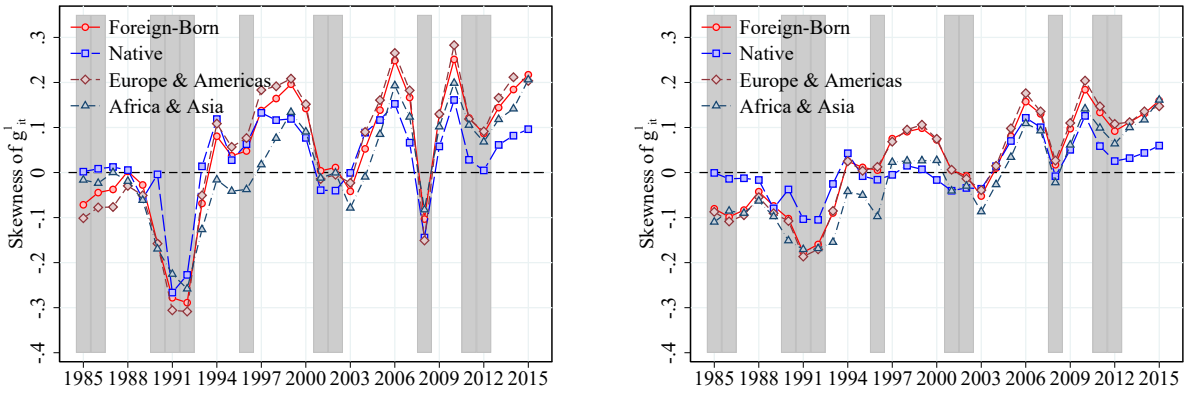
Despite higher levels of volatility overall, we do not find evidence of higher cyclicality of earnings changes among immigrants. Instead, the top row of Figure 15 shows less negative or more positive Kelley skewness for immigrants compared to natives since the mid-1990s and suggests a differential increase in Kelley skewness for immigrants over time. While immigrants faced more frequent and larger negative earnings changes than natives during the 1980s and the 1990s recession, foreign-born workers have benefited from more positively

[23]We further account for differences in annual participation rates (Figure 1e) by analyzing the arc-percent change in earnings in a robustness analysis and find that the differences by origin become only slightly larger when including entry and exit of workers, see Figure A.31.

Figure 15: Kelley Skewness of Earnings Changes by Origin

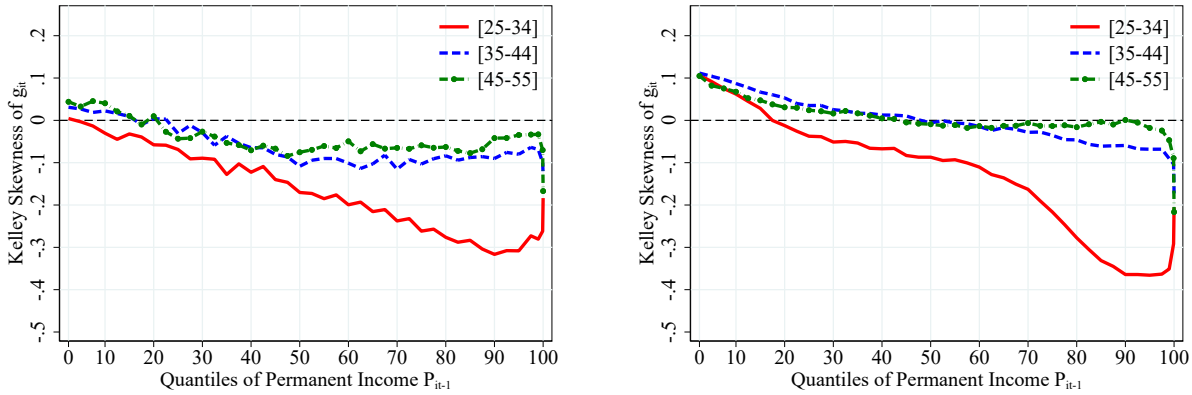
(a) Kelley Skewness, Men

(b) Kelley Skewness, Women



(c) Kelley Skewness, All Foreign-Born

(d) Kelley Skewness, All Natives



Notes: *Figure 15 uses residual one-year earnings changes to plot Kelley skewness for foreign-born and native workers. Using the LX sample, Figures 15a and 15b plot Kelley skewness against time, separately by origin and gender. Shaded areas are recessions. Using the LX-H sample pooled across gender, Figures 15c and 15d plot Kelley Skewness against permanent income quantile groups for 3 age groups.*

skewed earnings growth than natives over the last two decades. This differential trend suggests improvements in career opportunities for immigrants, in particular for women. Notably, this result is mainly driven by immigrants from Europe and the Americas in the late 1990s and 2000s, but also holds for immigrants from Africa, Asia, and the Middle East in recent years.[24]

Yet, there is a substantial caveat to this result. Studying heterogeneity by age groups and permanent income percentiles reveals that Kelley skewness for young, relatively poor immigrants is negative, in contrast to positive skewness among their native peers (Figure 15c). This suggests that the native population is more likely to move up substantially

[24]These patterns also hold conditional on education, see Figure A.32. Only low-educated male immigrants tend to face more pro-cyclical skewness than native peers.

along the income distribution. In addition, even for older age groups and individuals with median income, foreign-born workers face systematically more negative skewness of earnings changes. This difference holds across regions of origin,[25] and not only for short-term but also for longer-term earnings changes.[26] These patterns suggest that immigrants across all age groups with low or moderate income levels face substantially higher downward risk in earnings than their native peers.

In sum, our analysis paints a complex picture about the diverse challenges of the increasing share of immigrants in the Swedish workforce. We confirm higher inequality and volatility of earnings among immigrants overall, but find large differences by region of origin and income level. Low-income immigrants, especially from Africa, Asia, and the Middle East, face less stable employment and substantially larger downward risk. At the same time, faster earnings improvements for low-income immigrants compared to natives have contributed to the reduction in inequality and volatility we observe in the full population over the last two decades.

4.2 Labor Market Attachment and Social Insurance

Wages and Hours By definition, earnings vary through changes in wages and annual hours worked, which can occur both through hours changes within jobs and because of part-of-the-year employment. As a first step towards understanding the large gender differences in earnings dynamics, this section separates the role of wages from the hours and participation margins. To this end, we use a 50% subsample of our main dataset for whom wage information is available from the Swedish Wage Structure Statistics (see the data section 2.1). Since the composition of this sub-sample may deviate somewhat from the main analysis, we compare earnings and wage dynamics within this sub-sample. We focus on the period from 1990 onwards for both earnings and wages, since that is the period fully covered by the wage data.

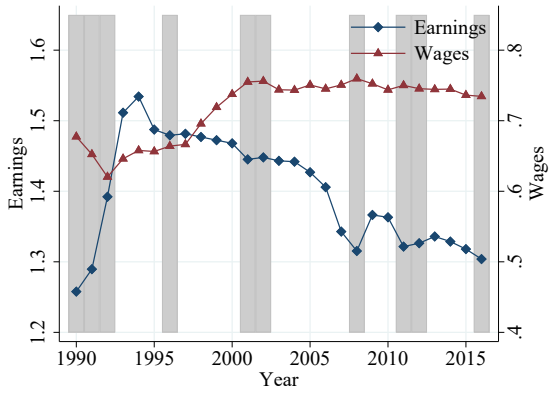
Figure 16 shows the development of the P90–10 gap in earnings and wages for men and women, respectively. We see that the P90–10 gap in log wages is about one-third the size of the P90–10 gap in log earnings among women and about 50% for men. Interestingly, Figure A.36 shows that the upper tail of the wage and earnings distribution are more similar, consistent with smaller hours variation and fewer unemployment spells for high-income individuals.

[25] Figure A.34 shows similar results for immigrants from Europe and the Americas compared to immigrants from Africa, Asia and the Middle East.

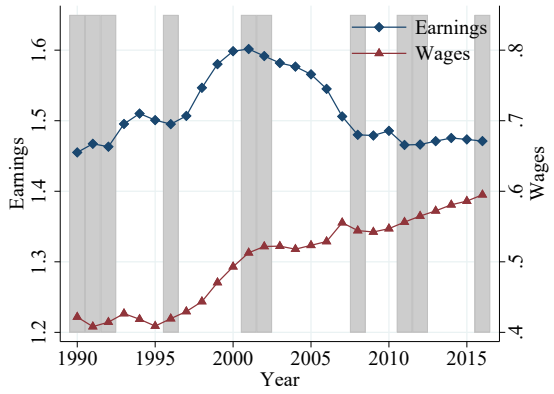
[26] Specifically, we repeat the analysis from Figure 15c for 5-year earnings growth in Figure A.35 and continue to find much more negative Kelley skewness for all age groups in the bottom two-thirds of the income distribution. Immigrants from Africa, Asia, and the Middle East face the largest long-term downward risk.

Figure 16: Level and Trend in Inequality: Wages and Earnings

(a) P90–10 Gap, Men



(b) P90–10 Gap, Women



Notes: *Using the wage survey sample, Figure 16 plots the P90–10 gap in log earnings and log monthly wages against time, separately for men and women. Shaded areas are recessions.*

In contrast, dispersion in the bottom half of the earnings distribution is much larger than dispersion in wages. This is consistent with earnings variation being predominantly driven by annual hours.

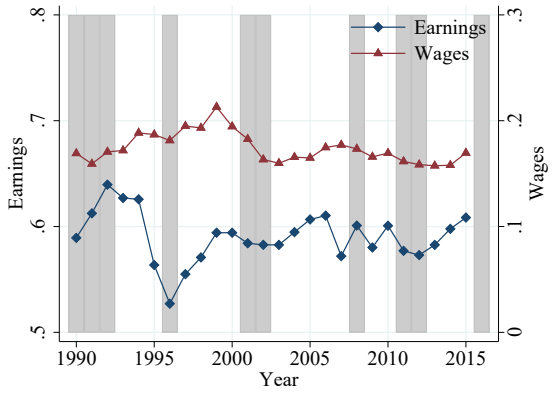
Turning to inequality trends reveals a key insight about wages and hours: While increasing wage inequality exceeds the increase in earnings inequality for men in the early 1990s, the subsequent period between 1993 and 2000 even shows opposite patterns in earnings and wages: Earnings inequality gradually declined after the spike in 1993, whereas wage inequality increased substantially, consistent with persistent changes such as deregulation, more flexible wage bargaining, and rising skill premia (Gustavsson, 2007). Wage inequality is flat after 2000, in line with the introduction of new industrial agreements and increasing supply of skilled labor. In contrast, earnings inequality continued to decline with a particular drop after 2006. For women, the increase in wage inequality in the 1990s goes along with increasing earnings inequality, but wage inequality continues to increase across the entire period, whereas earnings dispersion declines substantially after 2000, with a steep drop in particular after 2006.[27] Possible explanations of the differential wage trend for women include the role of the massive education program in the late 1990s with high female enrollment, as well as sectoral wage trends combined with differences in occupational shares by gender.[28] Figure A.6 shows that the share of part-time workers is stable for men and declines gradually for women over 1995–2015. This suggests that an increase in stable full-time jobs and a

[27]The increase in wage inequality for women after 2000 is mainly driven by the upper tail, in contrast to declining wage inequality for men, see Figure A.36.

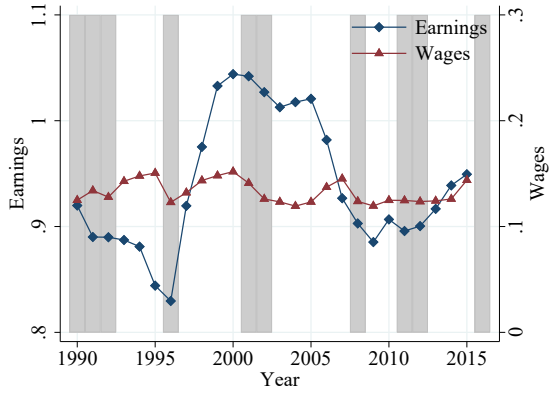
[28]In particular, Figure A.4 shows a high share of women employed in the public sector, which was stable at 55% over 1985-1995, and then gradually declined by 15 percentage points over 1995-2015.

Figure 17: Level and Trend in Volatility: Wages and Earnings

(a) P90–10 Gap, Men



(b) P90–10 Gap, Women



Notes: *Using the wage survey sample, Figure 17 plots the P90–10 gap in 1-year changes of residualized earnings and residualized monthly wages against time, separately for men and women. Shaded areas are recessions.*

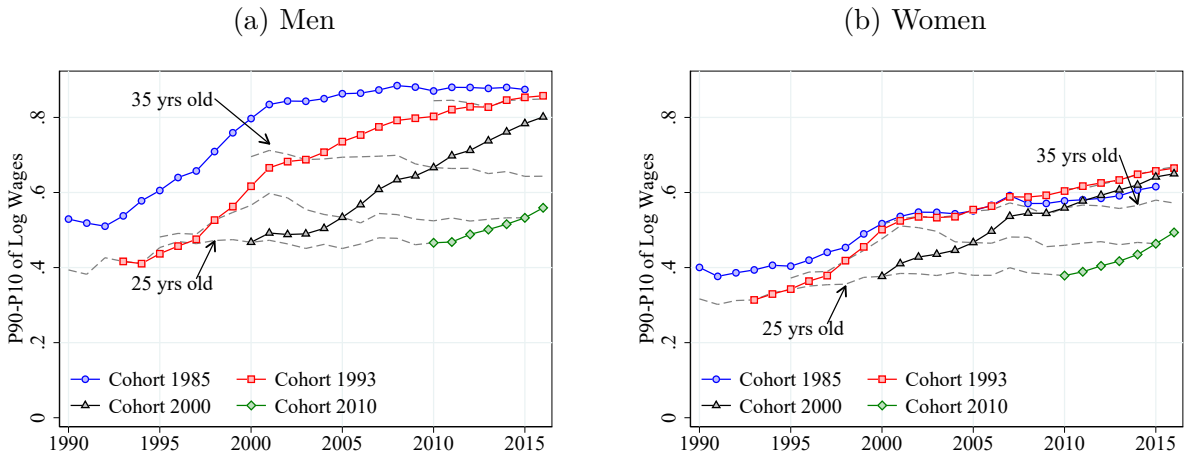
reduction in temporary leave spells have contributed to lower earnings inequality.

In addition, we also find a massive role of hours for earnings volatility in Figure 17: The P90–10 gap in log wage growth is less than 25% of the P90–10 gap in log earnings changes. Figure A.37 shows that this result holds for both the upper and lower tail of the distribution, suggesting that most large positive and negative shocks to earnings entail substantial changes in hours. In addition, the large decline in earnings growth dispersion in the mid-2000s, especially for women, is not mirrored in wages at all.

Taken together, these differences in inequality and volatility between wages and earnings emphasize the crucial role of trends in annual hours worked, especially for women. Since wage inequality has increased, dispersion in annual hours worked must have decreased even more over time to counteract this trend and to explain the diverging trend in earnings. Given the timing of these large reductions in earnings inequality and earnings volatility, we hypothesize an important role for changing usage of public benefits among the working population, which lead to substantial changes in annual hours worked.

Finally, and consistent with the changing role of social benefits and labor market attachment by age, we find evidence of decreasing variation in annual hours worked over the life cycle. While the results in Figure 5 indicate decreasing earnings inequality by age, Figure 18 shows that wage inequality is increasing over the life cycle. This pattern is driven by highly educated workers while wage dispersion is flat over the life cycle for low-educated workers, see Friedrich et al. (2019). These differences between earnings and wage inequality suggest that inequality in annual hours decreases over the life cycle. This pattern is consistent with initially larger differences in labor market attachment (especially due to a high share of stu-

Figure 18: Wage Inequality over the Life-Cycle by Gender



Notes: *Using raw log wages and the CS sample, Figure 18 plots against time the following variables: (a) Men: P90–10 over the life cycle for all cohorts available, (b) Women: P90–10 over the life cycle for all cohorts available.*

dents among the high-educated young), parental leave absences, and higher job mobility for young workers. We turn to these benefits in detail in the next section.

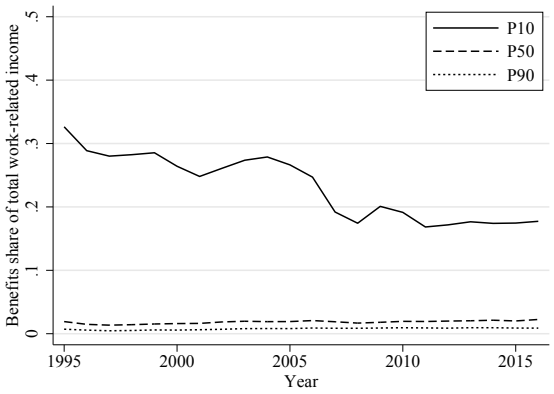
Work-Related Benefits So far, the analysis of earnings inequality has excluded benefits receipt and hence will overstate the amount of labor market risk by ignoring social insurance. Work-related benefits are replacements of labor earnings and program take-up often goes along with a reduction in annual hours worked. As a result, entry to or exit from public benefit programs may contribute significantly to the earnings volatility documented in the previous sections. In this section, we directly measure usage of work-related benefits among labor market participants. As discussed in section 2.1, these are taxable income replacements due to, e.g., unemployment, sickness and disability, parental leave or studies.

The top panels of Figure 19 show the share of benefits receipt in total work-related income, i.e., the sum of work-related benefits and earnings. By definition, this measure is bounded between zero and one. We plot the share of benefits at three key percentiles of the earnings distribution to illustrate the role of social insurance across the earnings distribution. The results show that benefits are a small fraction of total work-related income at the median and 90th percentile of earnings.[29] At the 10th percentile, however, benefits account for a large share of total work-related income. This is not surprising given the strong social safety net in Sweden. Importantly, benefits play a bigger role for women, with about 15–20 percentage points higher share of benefits in total work-related income at the 10th percentile of earnings

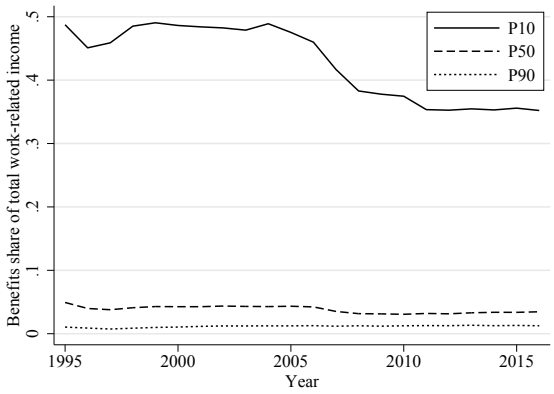
[29]Nevertheless, many workers across the entire earnings distribution are enrolled in some benefit program during the year, as we show in Figure A.38.

Figure 19: Benefits Usage across Percentiles of the Earnings Distribution

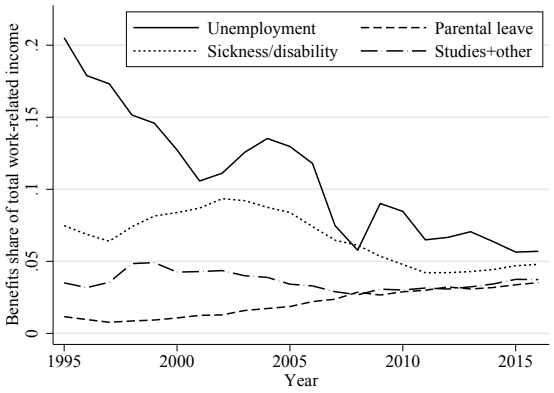
(a) Men



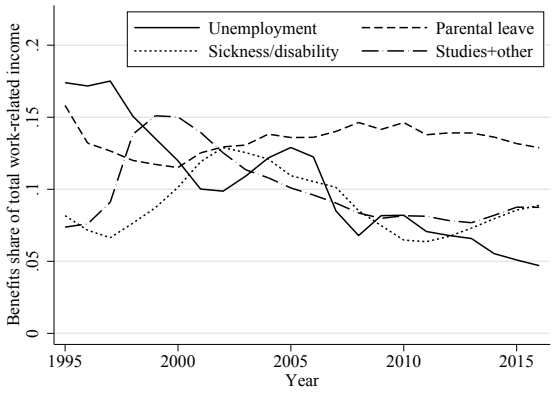
(b) Women



(c) Men, P10 Earnings



(d) Women, P10 Earnings



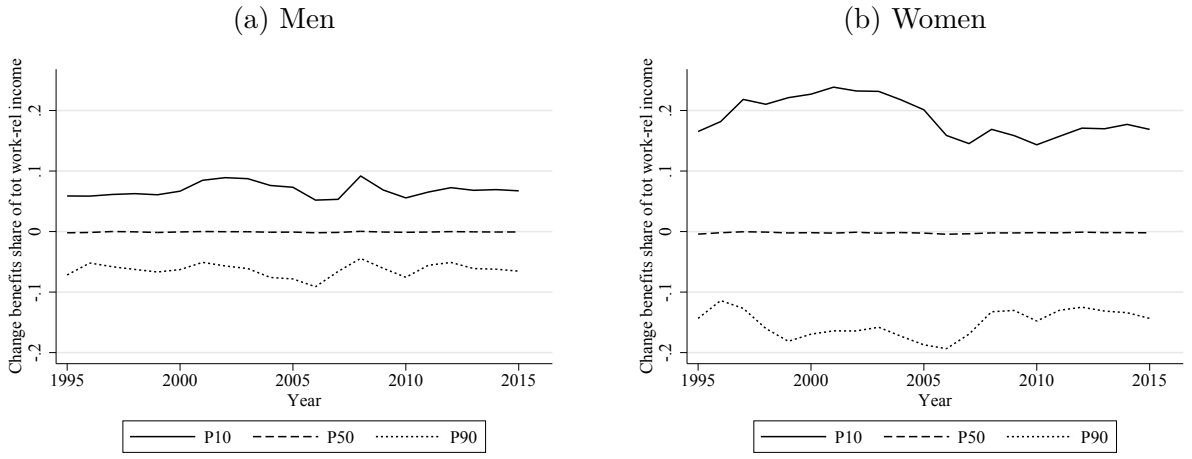
Notes: *Using the CS sample, Figures 19a and 19b plot the value share of benefits in total work-related income at the P10, P50, and P90 of the log earnings distribution against time, separately for men and women. Figures 19c and 19d plot the value share of different types of benefits in total work-related income at the P10 of the log earnings distribution against time, separately for men and women. The categories combine sickness insurance and disability benefits and group study grants together with all other (minor) benefit types.*

than for men. For both men and women, benefit shares are highest and stable over the period 1995–2005, then decline quickly by 10 percentage points before the financial crisis in the late 2000s and stabilize at this lower level in the most recent years.

As Figures 19c and 19d show, the overall decline in the importance of benefits masks compositional changes in the types of benefits that workers utilize. The importance of parental leave is stable for women and gradually increasing for men throughout the sample period.[30] Unemployment benefits matter most during and after recessions, but then decline quickly as the economy improves; this pattern is particularly pronounced in the late 1990s. More broadly, we observe an overall decline in the importance of unemployment benefits over

[30]Take-up of parental leave benefits increases particularly quickly among high-income women, presumably reflecting more frequent but shorter leave spells across multiple years, see Figure A.39.

Figure 20: Change in Share Work-Related Benefits across Percentiles of the Earnings Growth Distribution



Notes: *Using the LX sample, Figures 20a and 20b plot the change in the value share of benefits in total work-related income at the P10, P50, and P90 of the distribution of 1-year residualized earnings change against time, separately for men and women.*

the sample period. For the recovery after the 1990s recession, we find that other benefits, which include study grants, disability and sickness leave, for example, substantially increased in the late 1990s, especially among women. Then we find a similar gradual decline for both men and women after their importance peaked in the early 2000s.[31]

Part of the decline in benefits take-up is likely related to a gradually declining real value of benefits and stricter eligibility rules over time, see section 2.3. Many benefits are not directly tied to wage growth and contain nominal ceilings for maximum benefit amounts that were not fully inflation-adjusted over time. In addition, tighter rules on participation in training and acceptance of job offers made unemployment insurance less generous, for example. Taken together, these changes made benefits relatively less attractive over time, while at the same time in-work tax rates declined compared to out-of-work tax rates after the earned-income tax credit was introduced in 2007.

Next, we analyze the role of benefits in earnings changes. Benefit amounts typically replace previous earnings at a proportional rate up to a maximum benefit amount. Hence, large changes in earnings may overstate the size of negative income shocks when ignoring the compensating role of social insurance.

To map the results to the main patterns in earnings volatility, we now focus on the 90th, 50th and 10th percentile of the earnings growth distribution. Specifically, Figure 20 plots the average change in the share of benefits in total work-related income in subsequent years for these earnings growth percentiles. Our results show that changes in benefits play a very

[31] Overall, the decline in UI benefits as well as in sickness and disability benefits seems largely driven by lower caseload, see Figure A.39.

important role for large positive and negative earnings changes. For the 10th percentile of the earnings growth distribution, we calculate that earnings on average decrease by 20% for men and 35% for women. Figure 20 shows that these earnings changes go along with an increase in the share of benefits in total earnings by 5–10 (15–20) percentage points for men (women). A simple back-of-the-envelope calculation based on these results suggests that a replacement rate of at most 92% for women and 68% for men can fully account for the earnings changes in the tails of the earnings growth distribution.[32] This calculation compares to a replacement rate of 80% of previous earnings up to a ceiling in practice, and thus highlights the key role of benefit take-up in understanding tail events in earnings dynamics.

Finally, we also analyze benefits usage separately by origin. Comparing foreign-born and native workers at P25 of earnings in Figure 21a shows substantially higher benefits usage among immigrants, and this difference is particularly striking for men. At P10 in Figure 21b, benefits still account for a larger share of total work-related income for foreign-born men than for natives throughout the sample, but the opposite holds for women. This suggests that a small share of native women have very high dependence on social insurance. In addition, Figure 21 shows that foreign-born workers experience a steeper decline in the role of benefits than natives over time. For men (women) the share of benefits at the 10th earnings percentile drops from 40% (50%) in 1995 to 20% (30%) in 2016. The larger decline in benefits usage among foreign-born men is largely driven by a larger reduction in unemployment benefits and sickness and disability benefits than among native men over this period, see Figure A.40.[33] This trend may help explain the faster improvements in the lower tail of the earnings distribution and decreasing inequality among foreign-born workers over time that we document in section 4.1. As immigrants rely less on social insurance, they become more self-sufficient by increasing their labor market attachment.[34]

In sum, we find a major role of benefits usage in driving earnings trends. Lower benefits usage goes along with faster earnings growth at the bottom of the earnings distribution. In

[32] Specifically, we calculate the replacement rate R that solves

$$\Delta S = \frac{B_1}{B_1 + E_1} - \frac{B_0}{B_0 + E_0} = \frac{R \cdot \Delta E}{R \cdot \Delta E + (1 - \Delta E)} - S_0$$

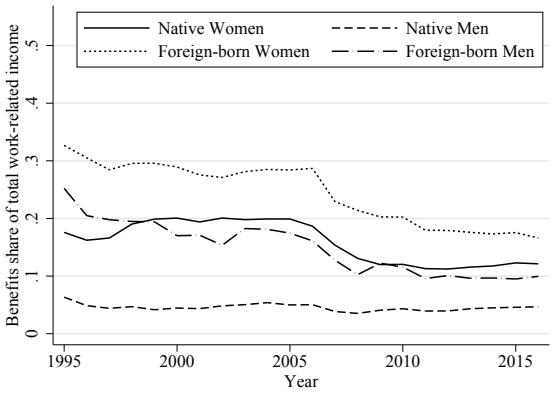
where ΔE is the percent change in earnings, ΔS is the percentage change in the benefits share in total work-related income, and S_0 is the initial benefits share. This formula assumes that the worker is no longer eligible for previous benefits B_0 at time 1, and hence provides an upper bound on the replacement rate to rationalize the change in the benefit share. Then we can express $B_1 = R \cdot \Delta E \cdot E_0$ and $E_1 = (1 - \Delta E) \cdot E_0$. In our calculation, we use the average initial share of benefits in total work-related income at the 10th percentile of the earnings change distribution. These shares are 7% for men and 15.6% for women, respectively.

[33] A smaller part of the differences by origin for men is driven by native men increasing their usage of parental leave more than foreign-born men.

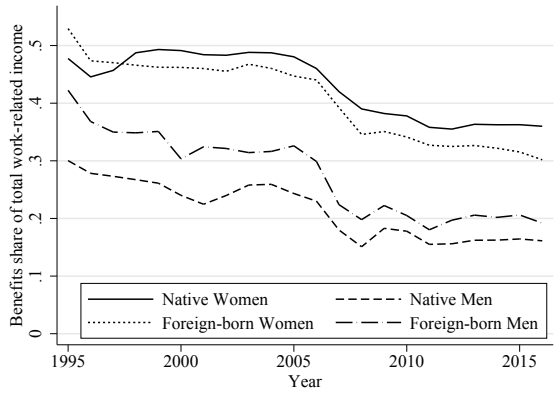
[34] Figure A.41 shows that these trends are similar for immigrants from different regions of origin, consistent with broader patterns of assimilation.

Figure 21: Benefits Usage by Origin at the Bottom of the Earnings Distribution

(a) 25th Percentile



(b) 10th Percentile



Notes: *Using the CS sample, Figures 21a and 21b plot the value share of benefits in total work-related income at the P25 and P10 of the log earnings distribution against time, distinguishing subpopulations by gender and origin.*

addition, entry to and exit from benefit programs are often associated with large changes in earnings. Hence, it is important to be cautious about directly interpreting earnings changes as income shocks.

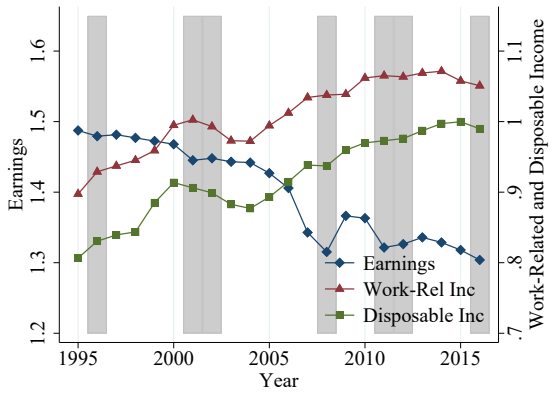
Social Insurance After establishing a large and changing role of work-related benefits, we now aim to analyze more broadly the changing role of social insurance for labor market dynamics in Sweden. We do this by contrasting the earnings results with disposable income and analyze income risk more broadly, taking social insurance into account. This is especially important for interpreting the previous results for groups with weaker labor market attachment, women and immigrants.

We first compare our main results for earnings in section 3 to two other income concepts: total work-related income, defined as the sum of earnings and pre-tax work-related benefits; and individual disposable income, which in addition to labor earnings and work-related benefits also includes capital income and means-tested benefits such as housing allowances and social assistance, and is expressed net of taxes. Hence, comparing these two measures allow us to separate public programs that are directly related to work absences from other cash transfers and tax incentives. Disposable income is also particularly relevant because it is most closely related to consumption and individual utility. We compare these three income concepts from 1995 onwards, when all measures are available in our data. To further increase comparability, we limit the analysis to the sample included in section 3, i.e., individuals with labor earnings above 1.5 times the monthly minimum retail sector wage in a given year.

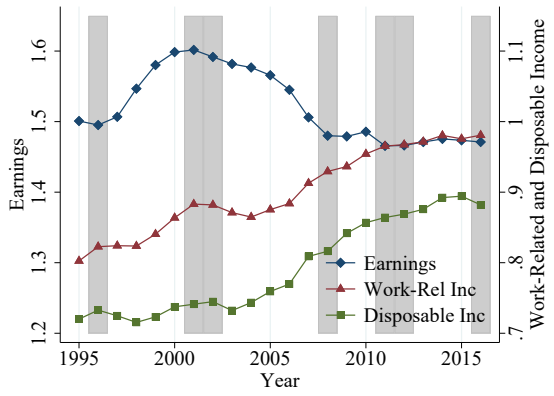
Figure 22 presents the evolution of inequality across income concepts. Figures 22a and

Figure 22: Income Inequality: P90–10 for Log Earnings and Disposable Income

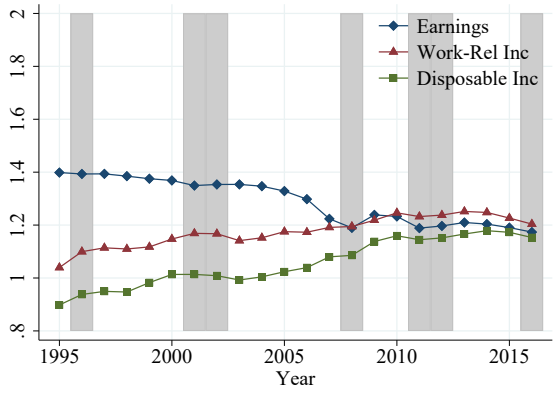
(a) Men



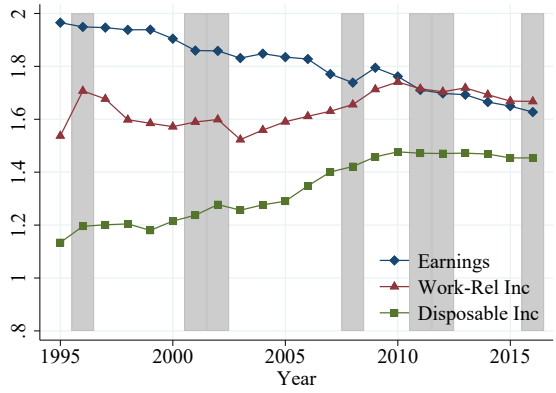
(b) Women



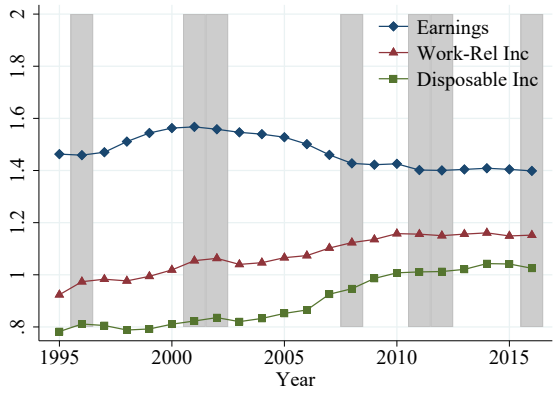
(c) Native Men



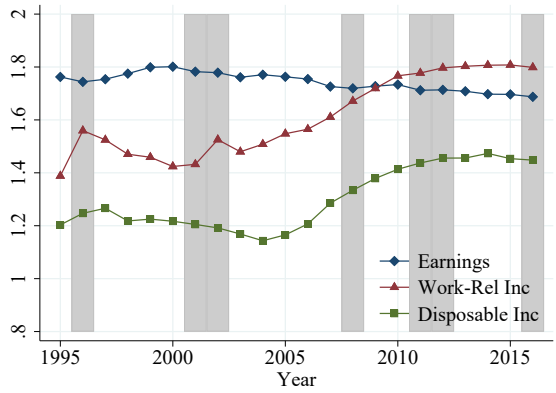
(d) Foreign-Born Men



(e) Native Women



(f) Foreign-Born Women



Notes: *Using the CSB sample over 1995–2016, Figure 22 plots the P90–10 differential in log income against time, separately for men and women, and distinguishing native and foreign-born workers. Each figure distinguishes three income concepts; log earnings, log total work-related income, and log disposable income, see section 2.1. Shaded areas are recessions.*

22b plot the P90–10 gap for individual earnings in blue against the left axis, whereas total work-related income (red) and disposable income (green) are plotted against the right axis. Focusing first on the levels of income inequality, we find that dispersion in log disposable income is about half as large as dispersion in log earnings for both men and women in 1995. Work-related benefits account for the large majority of that difference, as evidenced by a substantial decline in inequality when considering total work-related income instead of earnings.

Most importantly, Figure 22 shows a massive increase in disposable income inequality, which is well documented in the literature (Aaberge et al., 2018) but is in sharp contrast to the gradual decline in earnings inequality we find in section 3.[35] Most of the increase in inequality is already visible in total work-related income, consistent with a reduction in the availability and generosity of work-related public benefits. Only a small part of the increase seems driven by taxation, capital income, and non-taxable cash transfers such as social assistance and housing benefits.[36] One way to reconcile these trends is that changes in work-related benefits and the introduction of the earned-income tax credit may have incentivized more individuals to increase their labor market attachment. This points to the close interaction between the transfer system and labor market outcomes in explaining the rising income inequality in Sweden.

Comparing workers by origin and gender in the remaining panels of Figure 22 further illustrates the convergence in income dispersion across different measures, which is more pronounced for immigrant workers. Despite higher initial levels of income inequality, immigrants have experienced a substantial increase in disposable income inequality since the mid-2000s. Because the increase in the P90–10 gap in log income is at least as large as for natives but immigrants started from a higher initial level, the level gap has widened even more among immigrants. Together with the steep increase in the immigrant share in the population, this suggests that the aggregate trends are not only driven by a decline in social insurance, but also by compositional change towards foreign-born workers. Nevertheless, the evidence also points to a substantial decline in redistribution through work-related benefits. In fact, with the exception of native women, work-related benefits no longer reduce earnings dispersion. Instead, dispersion for work-related income is higher than earnings inequality in recent years, consistent with an increasing role of leave programs and their disproportion-

[35] The increase affects the entire disposable income distribution, with the largest increase in dispersion for the bottom half of the distribution from the mid-2000s onwards, see Figure A.44.

[36] The role of taxation and capital income becomes clear when analyzing the upper half of the distribution in Figure A.42. The patterns for the P90–50 gap are similar for work-related income and earnings, but the trends for disposable income deviate substantially from the mid-2000s onwards.

ate benefits for higher-income workers.[37] Finally, comparing trends for foreign-born men and women, we find that earnings inequality declines more for men, whereas dispersion in work-related income increases more for women. This is consistent with foreign-born women facing a particularly large increase in income risk because their labor market attachment has increased less than for foreign-born men, and their continuing dependence on public benefits makes them more exposed to declining social insurance.

Figure 23 further adds to this debate about income risk by showing that, in addition to an increase in inequality for total work-related income and disposable income, individuals also experienced an increase in volatility of these income concepts. Volatility increases both in the upper and lower tail of the income growth distribution (Figure A.43), suggesting both a reduced role for taxation of large positive income changes and lower social insurance in case of large negative income changes. On aggregate, this increase in volatility is more pronounced in disposable income than in total work-related income, consistent with an important role for capital income and taxation.

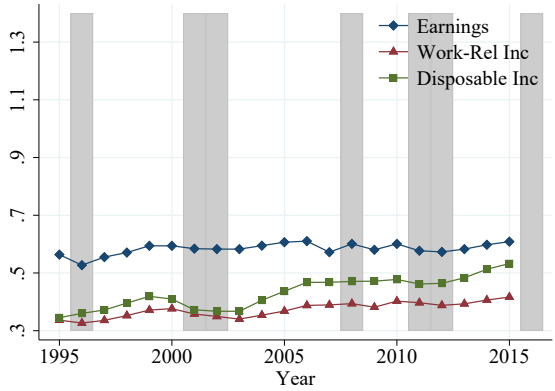
When comparing trends by origin, we find that the increase in volatility of work-related and disposable income is very similar for immigrant workers. This trend is opposite to the decline in earnings volatility for immigrants, and we interpret this result as suggestive evidence of increasing labor income risk. Female immigrants face the largest increase in work-related income volatility and hence seem most exposed to the increase in income risk. In contrast, earnings and work-related income volatility are stable for native workers, who only experience an increase in disposable income volatility. Additional analysis further emphasizes the higher level of income risk for immigrants across the entire income distribution, see Figure A.45. In addition, especially young and male immigrants face higher asymmetric risk of negative shocks, as evidenced by a large negative skewness of income changes (Figure A.47). These disadvantages are substantially more pronounced for 5-year income changes, suggesting worse opportunities for upward mobility and higher risk of downward mobility, see Figures A.46 and A.48.

Combining the results on benefits take-up, insurance through work-related benefits, and the changes in social insurance over time, our findings suggest that reduced income redistribution is accompanied by stronger labor market attachment and thus higher self-sufficiency of workers. Yet, this change comes at increased income risk for individuals who now face higher income volatility and receive lower insurance, in particular to mitigate negative shocks during recessions. This trend will affect those groups more who rely most on benefits both in normal times and during crises: women and immigrants.

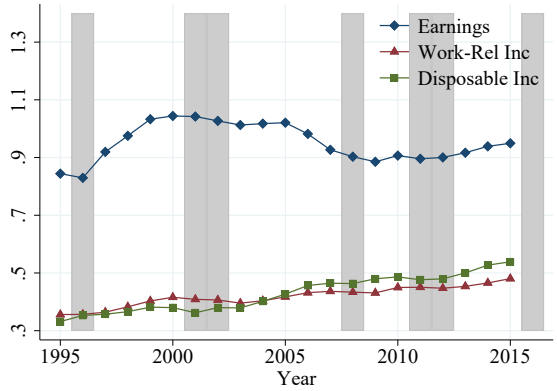
[37] Figure A.5 showed the increasing role of parental leave benefits in work-related benefits.

Figure 23: Income Volatility: P90–10 of Log Changes in Earnings and Disposable Income

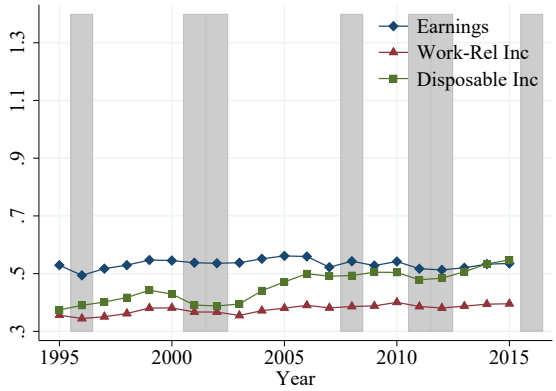
(a) Men



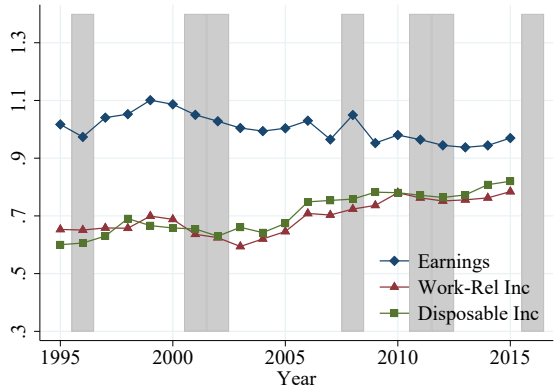
(b) Women



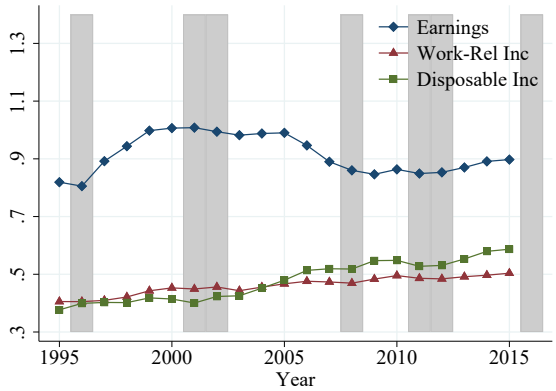
(c) Native Men



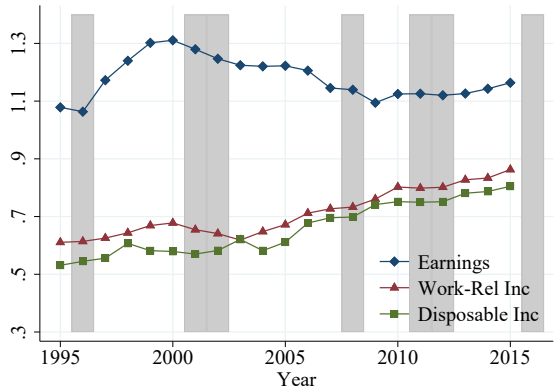
(d) Foreign-Born Men



(e) Native Women



(f) Foreign-Born Women



Notes: *Using the LXB sample over 1995–2016, Figure 23 plots the P90–10 differential in 1-year residualized income changes against time, separately for men and women, and distinguishing native and foreign-born workers. Each figure distinguishes three income concepts; log earnings, log total work-related income, and log disposable income, see section 2.1. Shaded areas are recessions.*

5 Conclusion

This paper analyzes earnings inequality and earnings dynamics in Sweden over 1985–2016. The recession in the early 1990s marks a historic turning point with a massive increase in earnings inequality and earnings volatility, and the impact of the recession and the recovery from it lasted for decades. In the aftermath of the recession, we document steady and equal growth in real earnings across the entire distribution for men and women over more than 20 years. In addition, we find a gradual decrease in earnings inequality that may have helped to mitigate the well-documented increase in disposable income inequality.

The facts that we provide point to important differences in earnings inequality and earnings dynamics by gender, age and origin. Men face lower volatility than women, but their earnings growth is more closely tied to the business cycle. Earnings volatility is especially high for young and middle-aged women who face frequent large and negative earnings changes. While immigrants have also benefited from sustained growth in real earnings, we also document higher inequality and volatility of earnings among immigrants. These average differences hide distinct challenges for low-income immigrants, in particular from Africa, Asia, and the Middle East, who experienced the longest and deepest impact of the 1990s recession and who continue to face less stable employment and substantially larger downward risk in earnings. For both women and immigrants, weaker labor market attachment and larger fluctuations in annual hours worked are the key driver of high earnings volatility. These differences highlight a shortcoming of the literature which mainly focuses on earnings, and point to an important direction for future work on sources of labor market risk, jointly accounting for the role of dynamics in hours and wages to explain earnings dynamics and career paths in these sub-populations.

Finally, our results emphasize the close relationship between the generosity of the public benefits system and labor market attachment. The close link between earnings dynamics and social benefits usage is particularly visible during the recovery from the recession. One the one hand, when labor market attachment strengthens, the need for social insurance declines. On the other, when benefit systems are tightened due to fiscal consolidations in the aftermath of the recession, labor market attachment increases. During the entire period, we document an important role of social benefits usage for overall earnings trends and for differences across sub-populations. Higher benefits enrollment among low-income workers, especially among women and immigrants, is associated with higher earnings volatility. When benefits usage decreased over time, low-income workers experienced more stable earnings growth. Yet, the improvement in the labor market may come at the cost of increased income risk because earnings shocks are now less insured through social benefits. Since benefits take-up

is particularly high among women and immigrants, our results may raise important equity concerns for these sub-populations. To assess this potential equity-efficiency tradeoff, future work could further analyze the causal effect of incentives from the social welfare system on individual and household choices, comparing effects on labor market performance and exposure to income risk.

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Online Appendix

A Definition of Sample and Income Concepts

A.1 Sample Definitions

We denote the full time period available for the analysis by T^{max}. We define two types of samples for the main analysis, which are used to estimate cross-sectional (CS) and longitudinal (LX) statistics, respectively.

The CS sample includes all workers aged 25–55 who have real annual earnings in the current year above the minimum earnings threshold. The LX sample includes all workers who are in the CS sample and have 1-year and 5-year (forward) residual earnings changes, as defined below. We further define the LX-H sample which selects the subset of LX with a permanent earnings measure over the past three years, as defined below.

In addition, we define analogous samples CSB, LXB, LXB-H which cover the same worker population but over the shorter time period 1995–2016 for which disposable income measures and benefits receipt are available.

Finally, we define the wage survey sample as all workers aged 25–55 who have real annual earnings in the current year above the minimum earnings threshold and who are covered by the Wage Structure Statistics. This sample allows us to compare wage and earnings dynamics for about 50 percent of the full sample.

A.2 Definitions for Income Measures

We denote residualized log earnings by ϵ_{it}. This measure is computed in order to avoid trends being affected by people being at different stages of their life cycles, business cycle, etc. To obtain this measure, we regress log real earnings, log y_{it}, against a full set of age dummies, separately by gender and year. Residualize log earnings ϵ_{it} are the residuals from these regressions.

Based on residualized log earnings, we define earnings growth as 1-year forward residualized log earnings changes,

$$g_{it} = \Delta\epsilon_{it} = \epsilon_{i,t+1} - \epsilon_{it}.$$

Note that these measures of earnings changes will only be computed for individuals who have earnings above the minimum income threshold in time t and above one-third of the threshold

income in t+1. Similarly, we define 5-year forward residualized log earnings changes,

$$g_{it}^{5} = \Delta^{5}\epsilon_{it} = \epsilon_{i,t+5} - \epsilon_{it}.$$

In addition, we calculate the 1 year forward arc-percent change in earnings as

$$\Delta^{1} dhs_{it} = \frac{\tilde{y}_{i,t+1}^{ga} - \tilde{y}_{it}^{ga}}{0.5 \cdot (\tilde{y}_{i,t+1}^{ga} + \tilde{y}_{it}^{ga})}$$

where $\tilde{y}_{it}^{ga} = y_{i,t+1}/\bar{y}_{i,t+1}^{ga}$ is real annual earnings relative to the gender-age specific average earnings level.

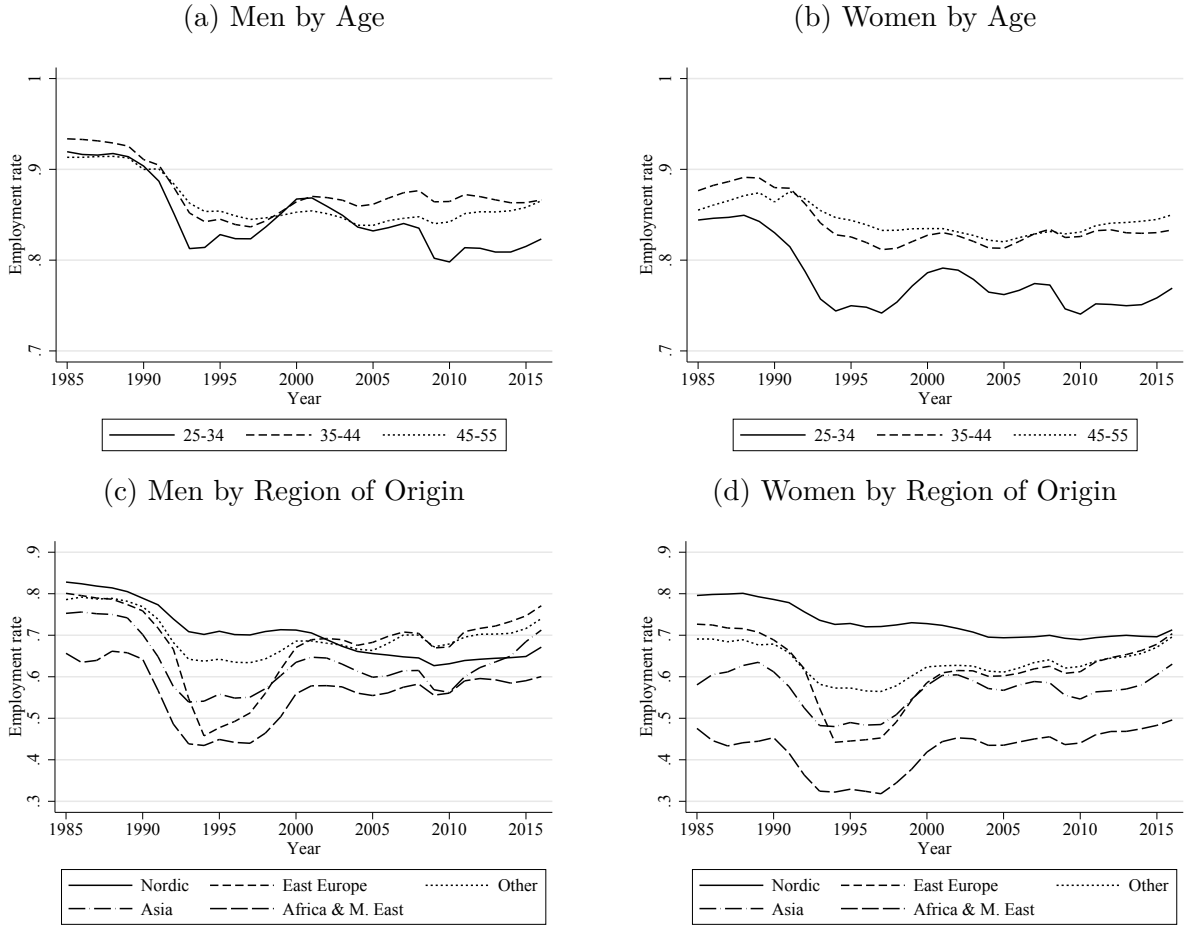
Finally, we define permanent earnings as

$$P_{it-1} = \frac{\sum_{s=t-3}^{t-1} y_{is}}{3}.$$

This measure takes average earnings over the previous three years. This measure includes zeros or earnings below the minimum income threshold for individuals who have at least 2 years of earnings above the threshold. To again avoid contamination from life cycle effects, etc., we regress this measure against a full set of age dummies, separately by gender and by year. We call the residuals of this regressions ϵ_{it}^{P} and these residuals are used to rank people in percentiles of the corresponding distribution.

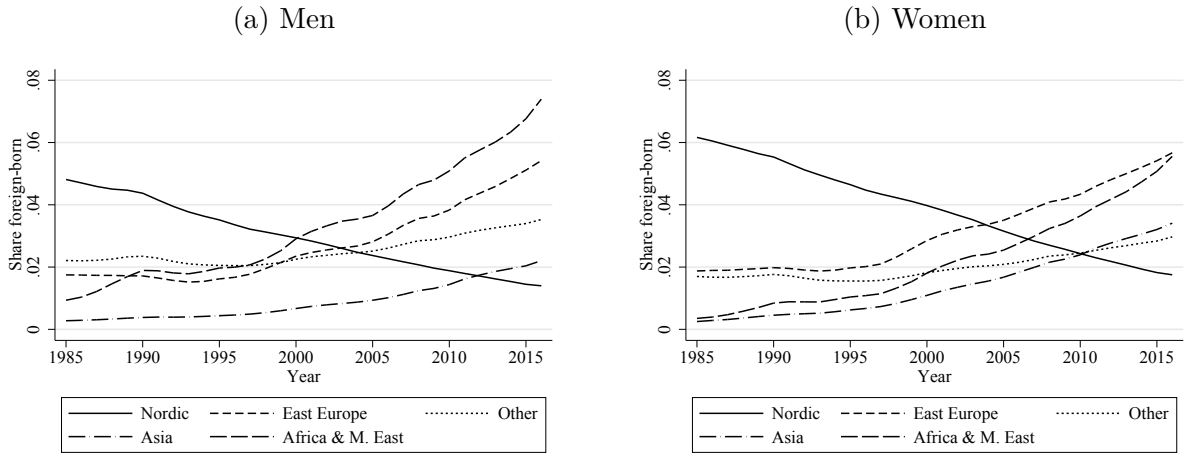
B More Stylized Facts on Sample Composition and Income

Figure A.1: Employment Rates Across Groups



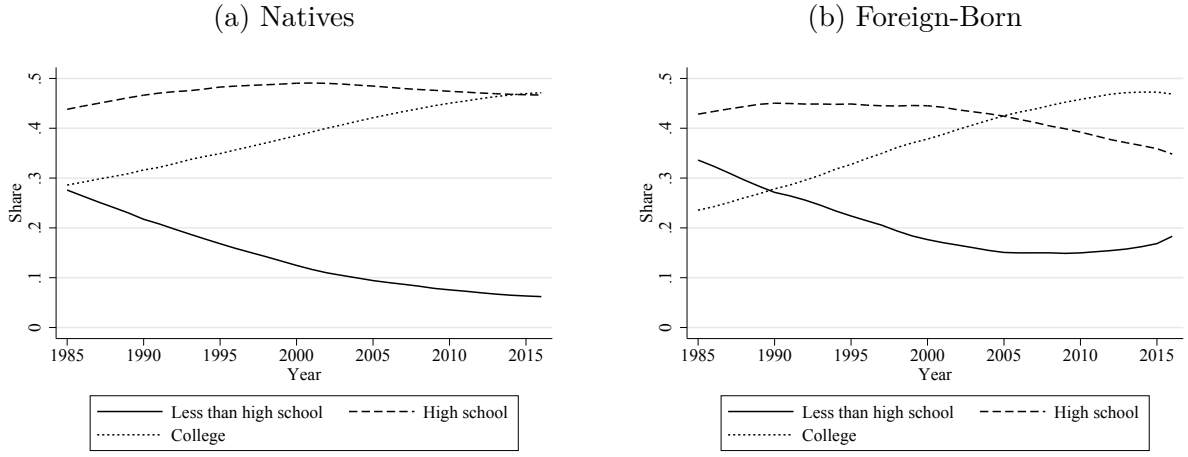
Notes: *Figure A.1 plots the share employed in the population aged 25–55 by gender, age and region of origin. Employment is defined as having annual earnings above 1.5 times the monthly earnings at the retail minimum wage.*

Figure A.2: Share Foreign-Born Among Employed in Ages 25–55, by Gender and Region of Origin



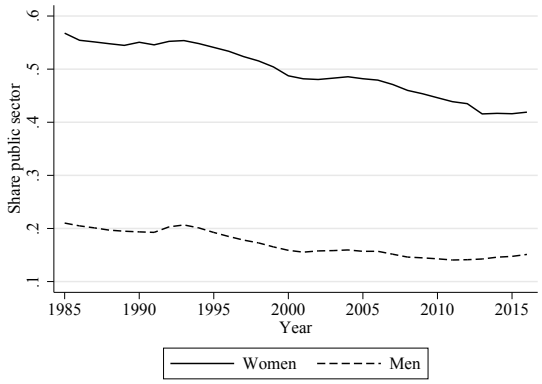
Notes: *Figure A.2 plots the share foreign-born among employed in ages 25–55 from different regions of origin by gender.*

Figure A.3: Natives and Immigrants by Education Level



Notes: *Figure A.3 plots the share of natives and foreign-born with different levels of education among employed in ages 25–55. Education is defined by the maximum education level achieved during 1985–2016.*

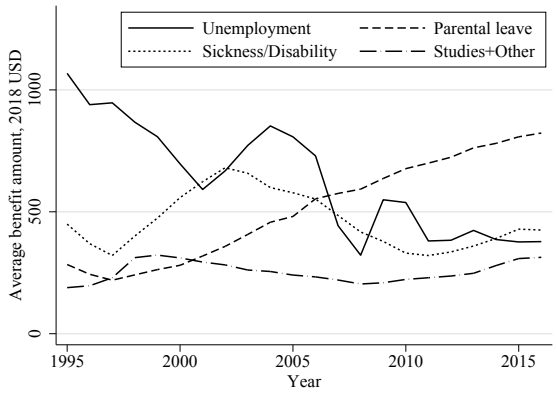
Figure A.4: Public Sector Employment



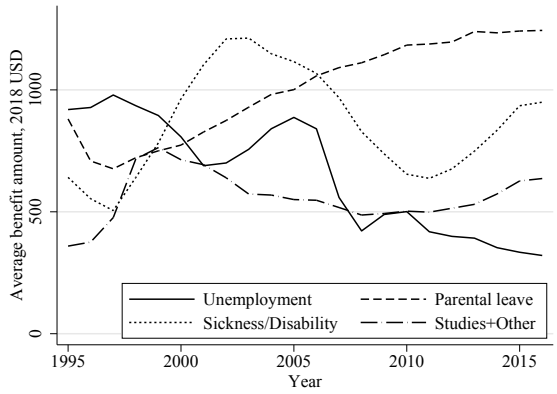
Notes: *Figure A.4 plots the share of employed men and women in ages 25–55 working in the public sector, based on the employment with largest annual earnings in the Register-Based Labor Market Statistics (RAMS).*

Figure A.5: Benefits Usage among Employed in Ages 25–55

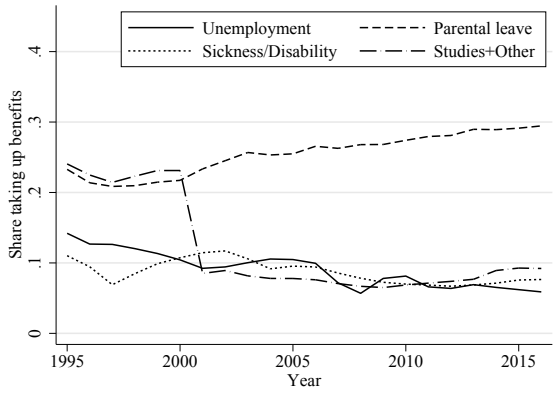
(a) Benefit Amounts, Men



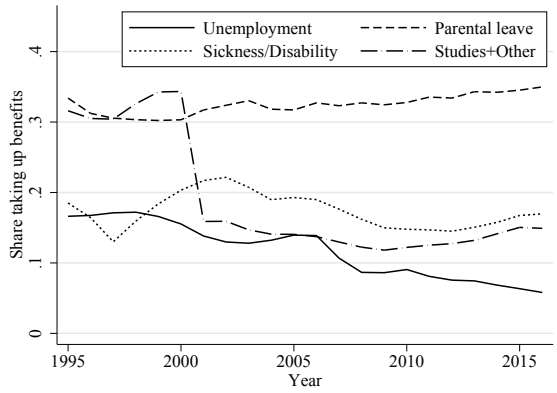
(b) Benefit Amounts, Women



(c) Benefits Take-up, Men

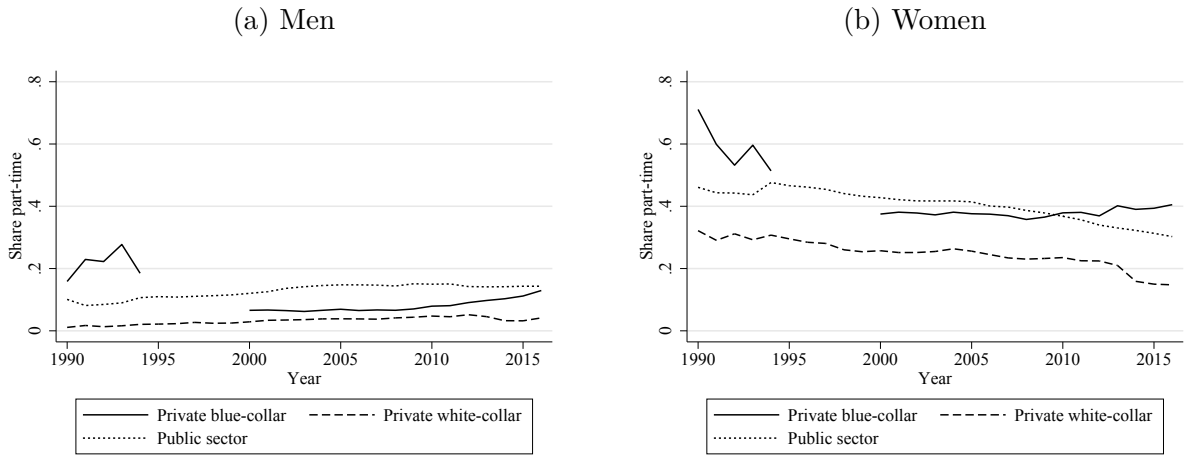


(d) Benefits Take-up, Women



Notes: *Figure A.5 plots the average benefit amounts and share taking up benefits among employed in ages 25–55 by benefit types. The discontinuous break for studies+other benefits in Figures A.5c and A.5d indicates a time series break in the included variables. However, the pattern is not reflected in Figures A.5a and A.5b, which suggests that the break concerns benefit types with low average amounts.*

Figure A.6: Share Part-Time Work

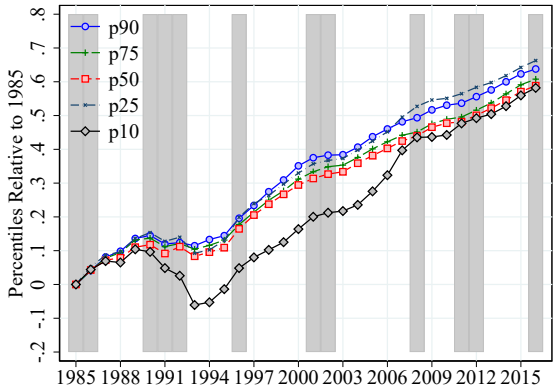


Notes: *Figure A.6 shows the share part-time workers among employed in ages 25–55 included in the Wage Structure Statistics. The register is based on five separate data collections for the municipality, county council and state sector in the public sector and for blue-collar and white-collar workers in the private sector. We pool information from the municipality, county council and state sector into a public sector, but keep blue-collar and white-collar workers separately. For the public sector, we use information on contracted hours and define part-time work as less than 87.5 percent of full-time. For most workers this implies less than 35 contracted hours per week. For the private sector, we use a variable directly capturing the incidence of part-time work.*

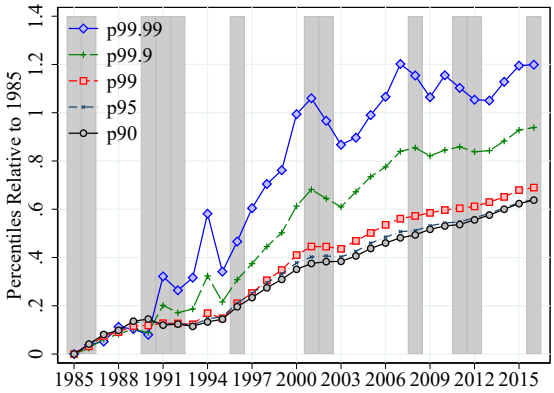
C Additional Results for Section 3

Figure A.7: Distribution of Earnings in the Population

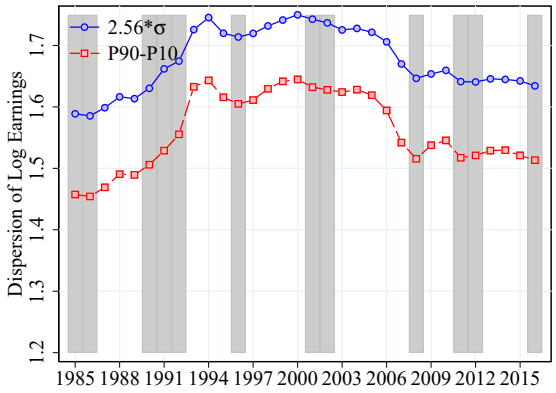
(a) Percentiles



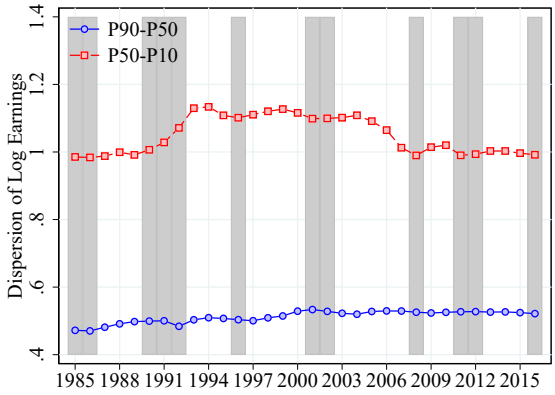
(b) Top Percentiles



(c) Dispersion



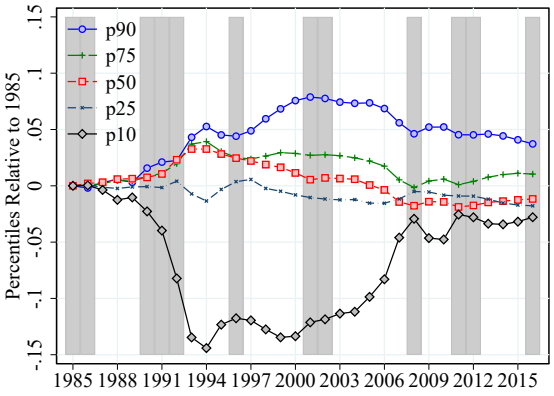
(d) Right- and Left-Tail Dispersion



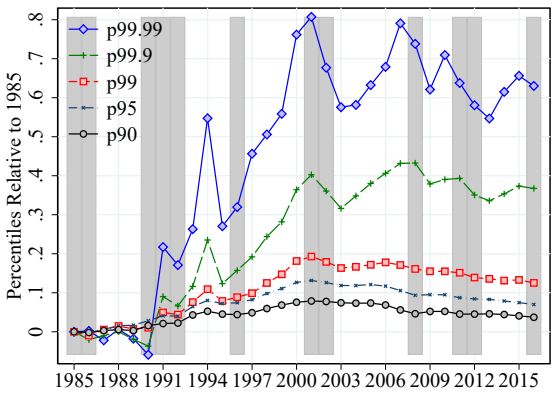
Notes: *This figure reports results for the pooled sample of men and women. Using raw log earnings and the CS sample, Figure A.7 plots against time the following variables: (a) P10, P25, P50, P75, P90, (b) P90, P95, P99, P99.9, P99.99, (c) P90–10 and 2.56*SD of log income, (d) P90–50 and P50–10. In (a) and (b) percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure A.8: Distribution of Residual Earnings in the Population after Controlling for Age

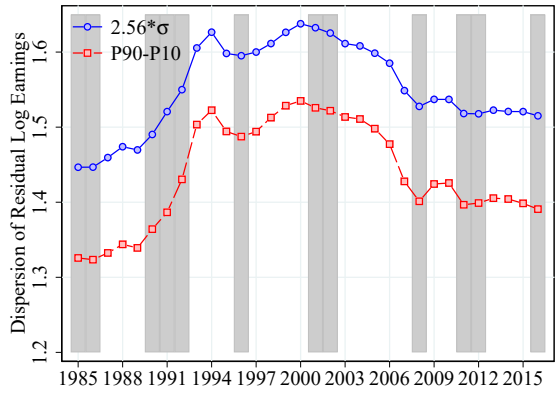
(a) Percentiles



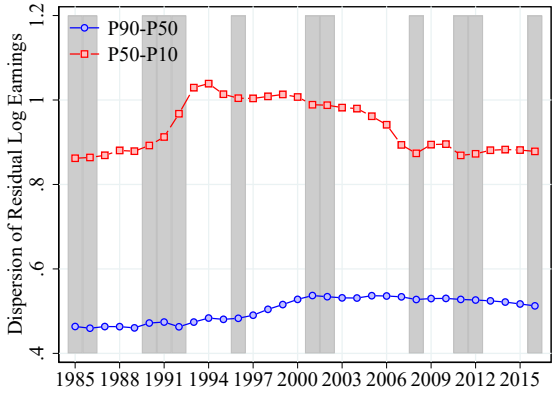
(b) Top Percentiles



(c) Dispersion



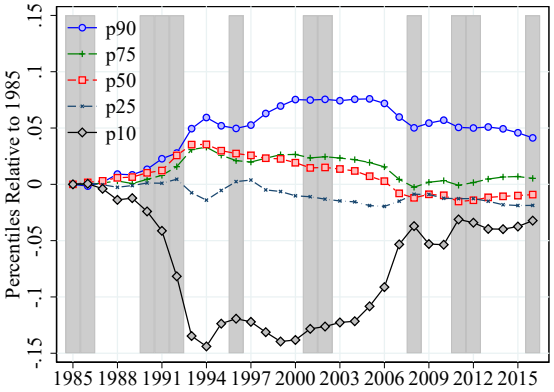
(d) Right- and Left-Tail Dispersion



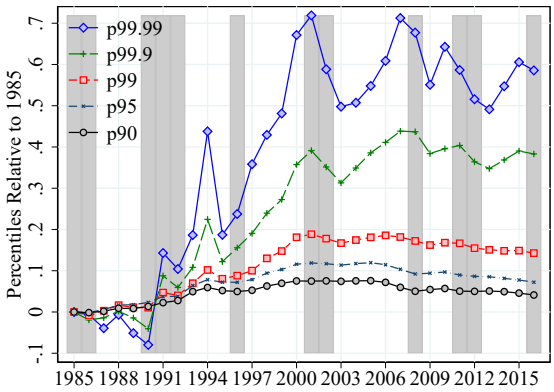
Notes: *This figure reports results for the pooled sample of men and women. We residualize log earnings using gender×age×year fixed effects. Using these residual earnings and the CS sample, Figure A.8 pools men and women and plots against time the following variables: (a) P10, P25, P50, P75, P90, (b) P90, P95, P99, P99.9, P99.99, (c) P90–10 and 2.56*SD of log income, (d) P90–50 and P50–10. In (a) and (b) percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure A.9: Distribution of Residual Earnings in the Population after Controlling for Age and Education

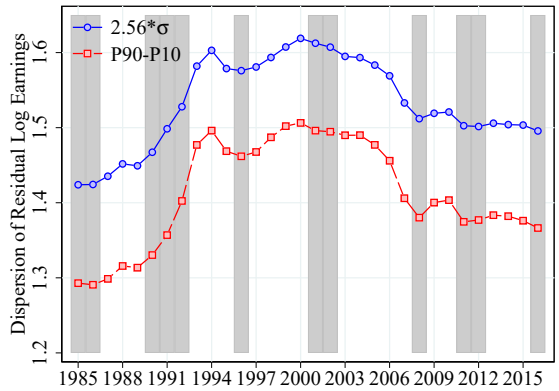
(a) Percentiles



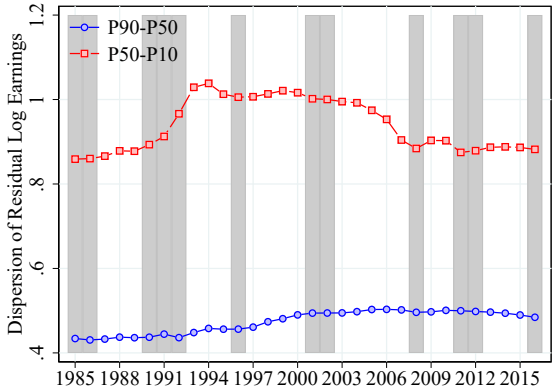
(b) Top Percentiles



(c) Dispersion



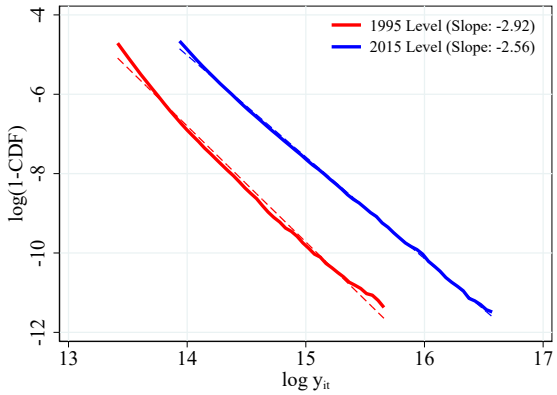
(d) Right- and Left-Tail Dispersion



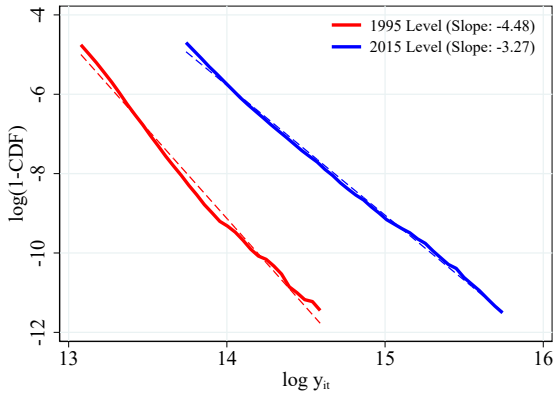
Notes: *This figure reports results for the pooled sample of men and women. We residualize log earnings using gender×age×education×year fixed effects, where education is measured by two groups (high school or less and at least some college). Using these residual earnings and the CS sample, Figure A.9 pools men and women and plots against time the following variables: (a) P10, P25, P50, P75, P90, (b) P90, P95, P99, P99.9, P99.99, (c) P90–10 and 2.56*SD of log income, (d) P90–50 and P50–10. In (a) and (b) percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure A.10: Top Income Inequality: Pareto Tail at Top 1%

(a) Men



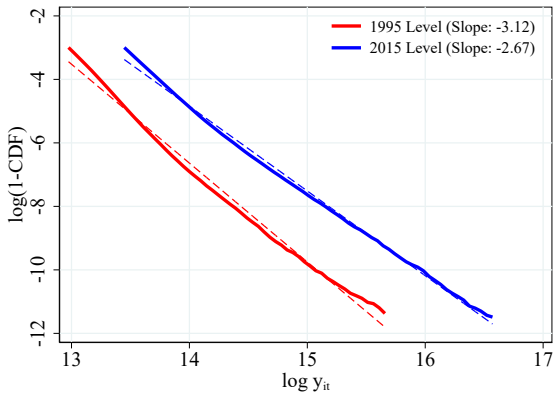
(b) Women



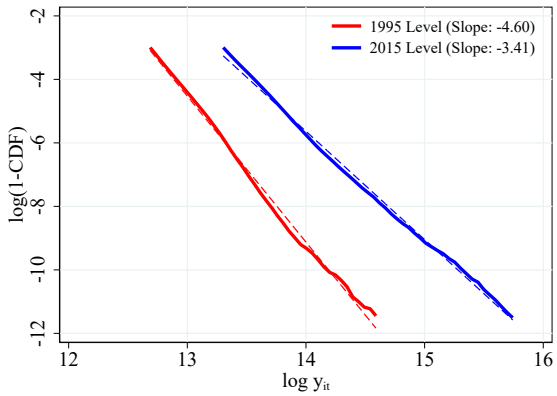
Notes: *Using the top 1% of the CS sample, Figure A.10 plots the log empirical density (log(1-CDF)) of log earnings in a log-log plot. We provide the linear fitted line and report the slope measuring the Pareto tail index in 1995 and 2015, separately for men and women.*

Figure A.11: Top Income Inequality: Pareto Tail at Top 5%

(a) Men



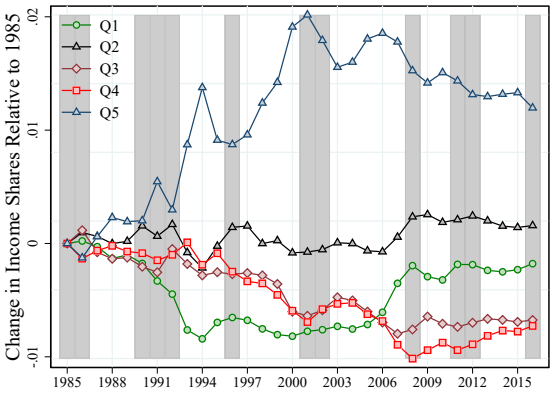
(b) Women



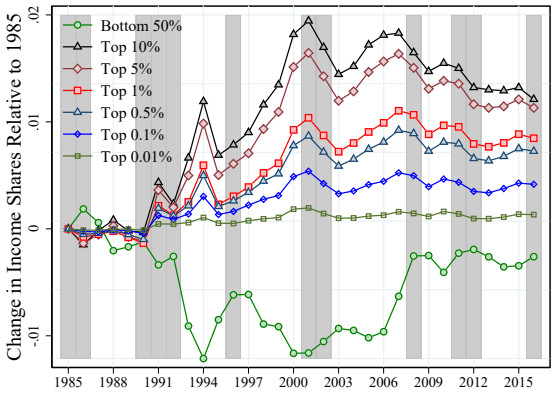
Notes: *Using the top 5% of the CS sample, Figure A.10 plots the log empirical density (log(1-CDF)) of log earnings in a log-log plot. We provide the linear fitted line and report the slope measuring the Pareto tail index in 1995 and 2015, separately for men and women.*

Figure A.12: Changes in Income Shares Relative to 1985

(a) Income Shares of Quintiles

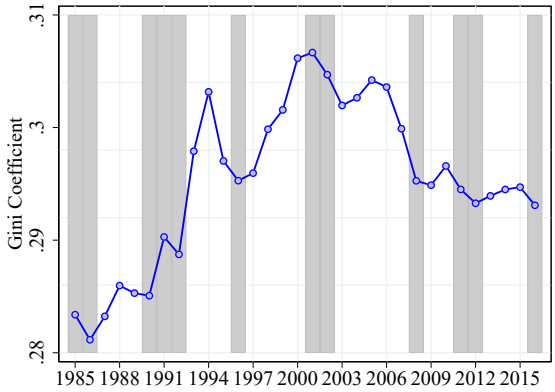


(b) Selected Income Shares



Notes: *Using earnings and the CS sample for the full population, Figure A.12 plots against time the following variables: (a) share of total earnings accruing to each quintile of the earnings distribution, (b) share of total earnings accruing to the bottom 50%, top 10%, 5%, 1%, 0.5%, 0.1%, 0.01%. All income shares are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

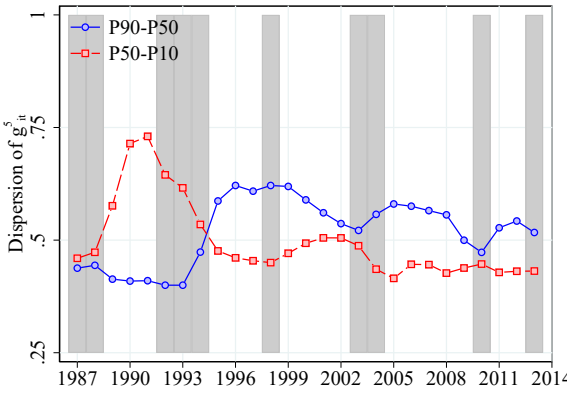
Figure A.13: Gini Coefficient



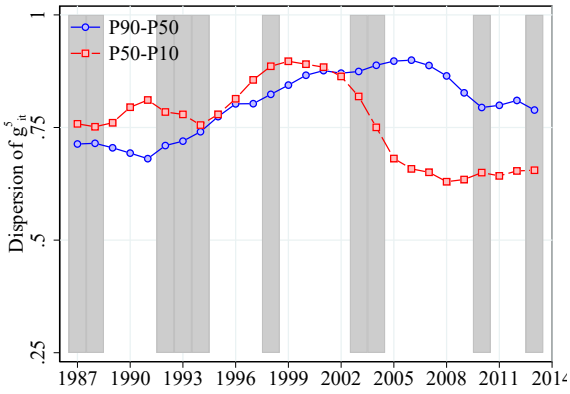
Notes: *Using earnings and the CS sample for the full population, Figure A.13 plots against time the Gini coefficient. Shaded areas are recessions.*

Figure A.14: Dispersion of Five-Year Earnings Change

(a) Men



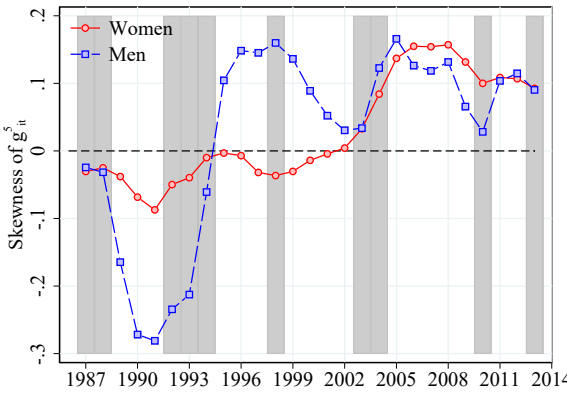
(b) Women



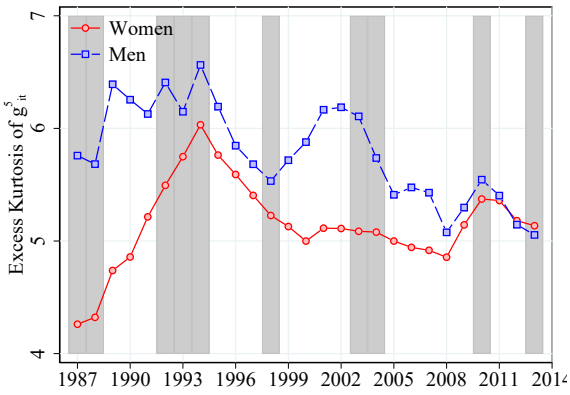
Notes: *Using residual five-year earnings changes and the LX sample, Figure A.14 plots against time the P90–50 and P50–10 gaps for (a) Men, (b) Women. Shaded areas are recessions.*

Figure A.15: Skewness and Kurtosis of Five-Year Earnings Change

(a) Kelley Skewness



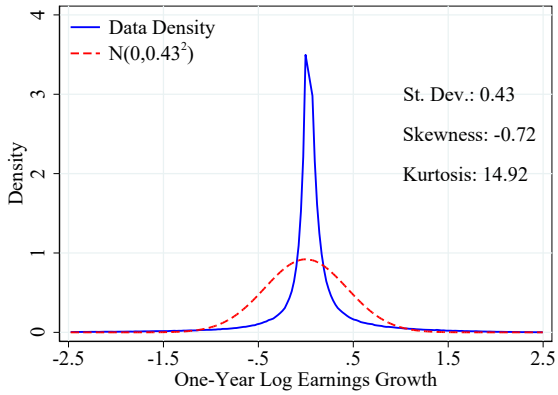
(b) Excess Crow-Siddiqui Kurtosis



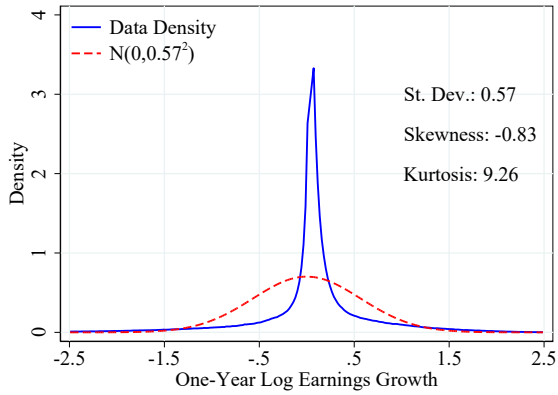
Notes: *Using residual five-year earnings changes and the LX sample, Figure A.15 plots against time the following variables: (a) Men and Women: Kelley skewness, defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$*, (b) Men and Women: Excess Crow-Siddiqui kurtosis calculated as* $\frac{P97.5-P2.5}{P75-P25} - 2.91$ *where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for a Normal distribution. Shaded areas are recessions.*

Figure A.16: Empirical Densities of One-Year Earnings Growth

(a) Men



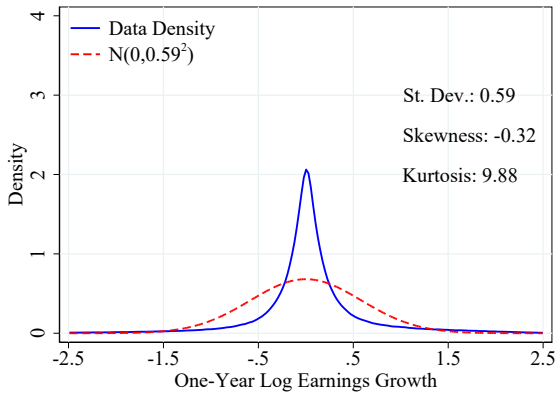
(b) Women



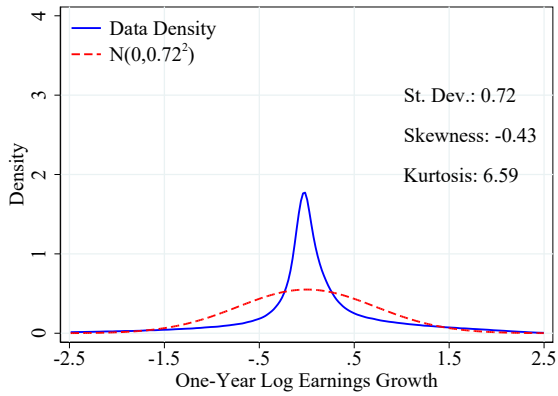
Notes: *Using the LX sample in 2005, Figure A.16 plots the density of residual one-year earnings changes and the best fit using a normal distribution, separately for (a) Men and (b) Women.*

Figure A.17: Empirical Densities of Five-Year Earnings Growth

(a) Men



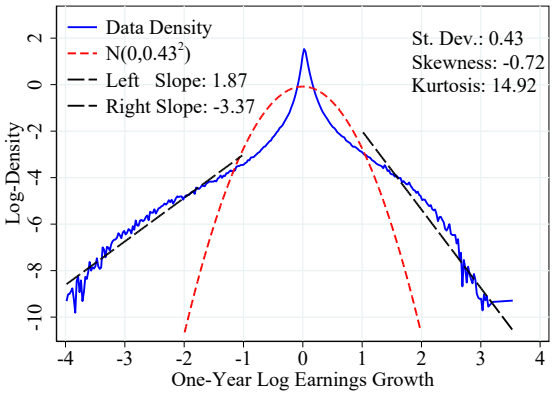
(b) Women



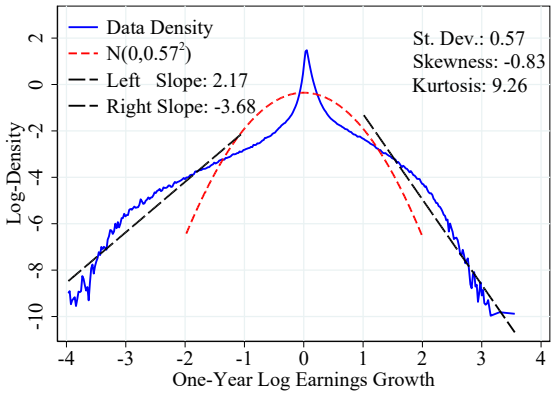
Notes: *Using the LX sample in 2005, Figure A.17 plots the density of residual five-year earnings changes and the best fit using a normal distribution, separately for (a) Men and (b) Women.*

Figure A.18: Empirical Log-Densities of One-Year Earnings Growth

(a) Men



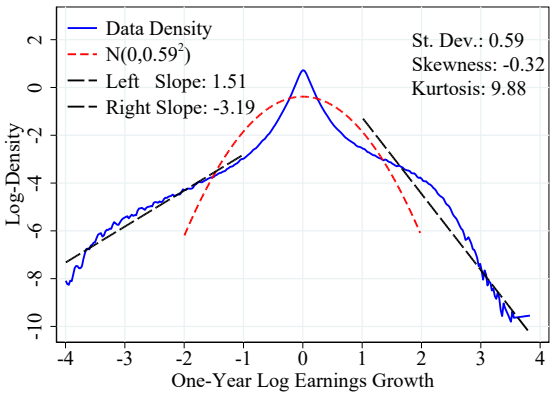
(b) Women



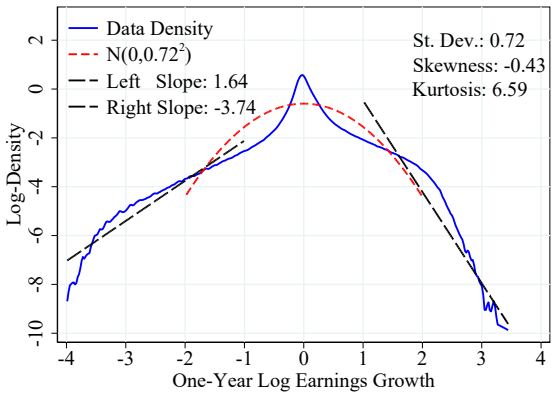
Notes: *Using the LX sample in 2005, Figure A.18 plots the log-density of residual one-year earnings changes and the best fit using a normal distribution, separately for (a) Men and (b) Women.*

Figure A.19: Empirical Log-Densities of Five-Year Earnings Growth

(a) Men



(b) Women

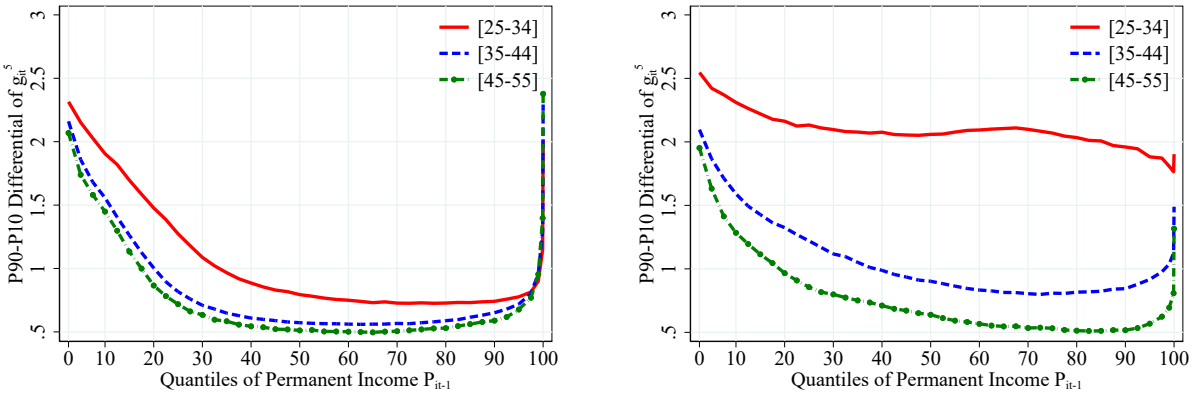


Notes: *Using the LX sample in 2005, Figure A.19 plots the log-density of residual five-year earnings changes and the best fit using a normal distribution, separately for (a) Men and (b) Women.*

Figure A.20: Dispersion, Skewness, and Kurtosis of 5-Year Log Earnings Changes

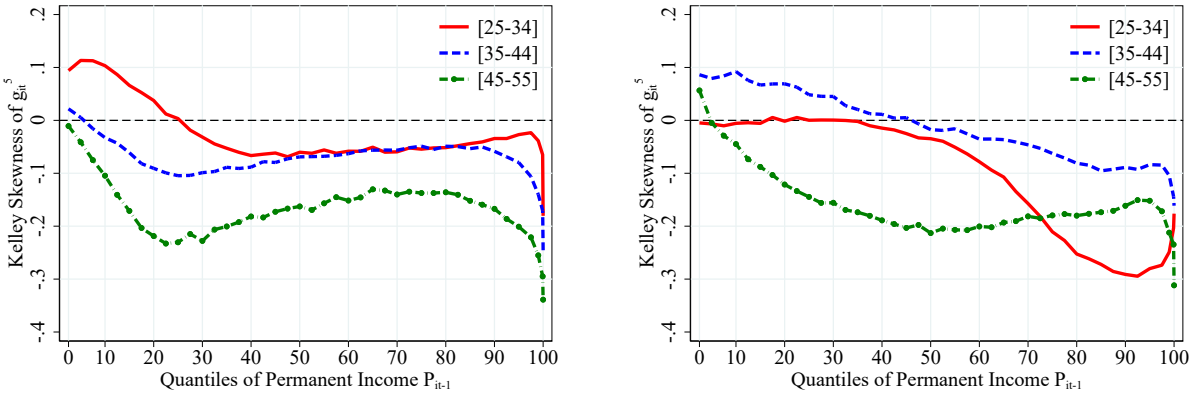
(a) Men

(b) Women



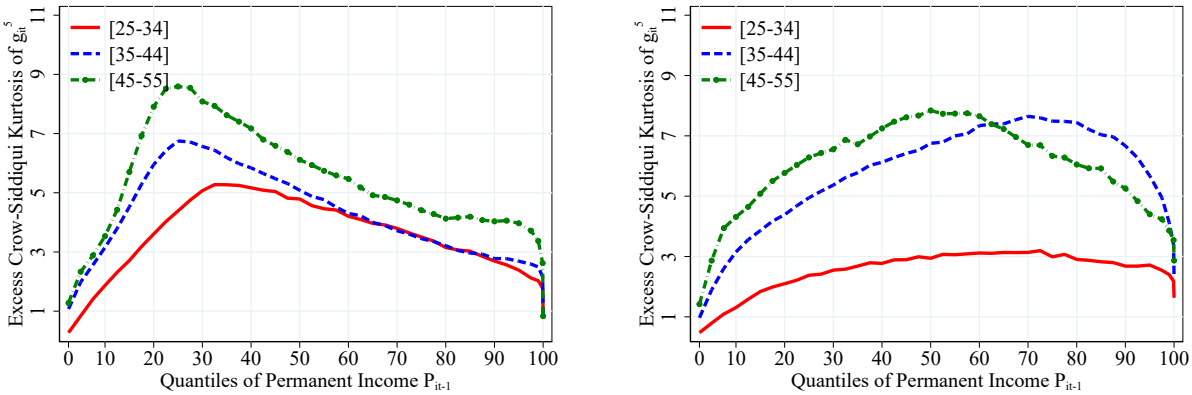
(c) Men

(d) Women



(e) Men

(f) Women

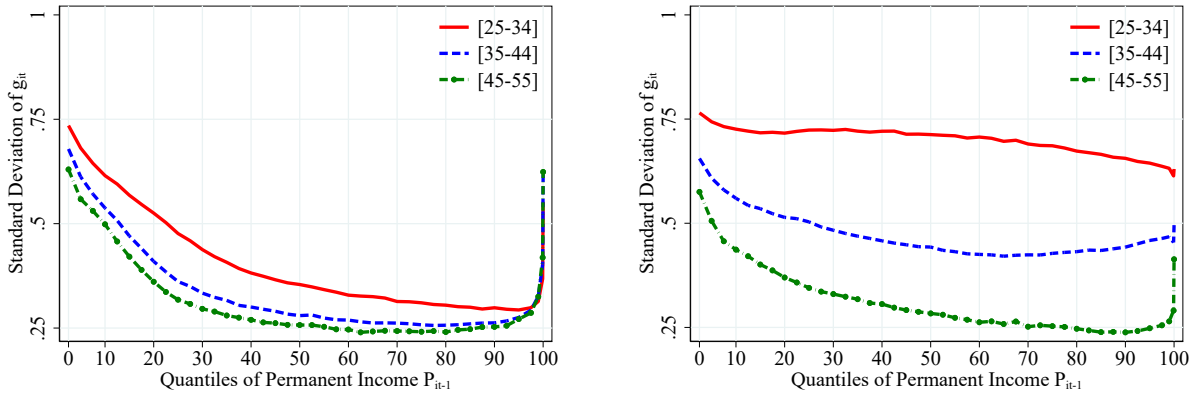


Notes: *Using residual five-year earnings changes and the LX-H sample, Figure 8 plots against permanent income quantile groups the following variables for the 3 age groups: (a) Men: P90–10, (b) Women: P90–10, (c) Men: Kelley Skewness, (d) Women: Kelley Skewness, (e) Men: Excess Crow-Siddiqui kurtosis, (f) Women: Excess Crow-Siddiqui kurtosis. Kelley Skewness defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$. *Excess Crow-Siddiqui kurtosis calculated as* $\frac{P97.5-P2.5}{P75-P25} - 2.91$ *where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for Normal distribution.*

Figure A.21: Standardized Moments of 1-Year Log Earnings Changes

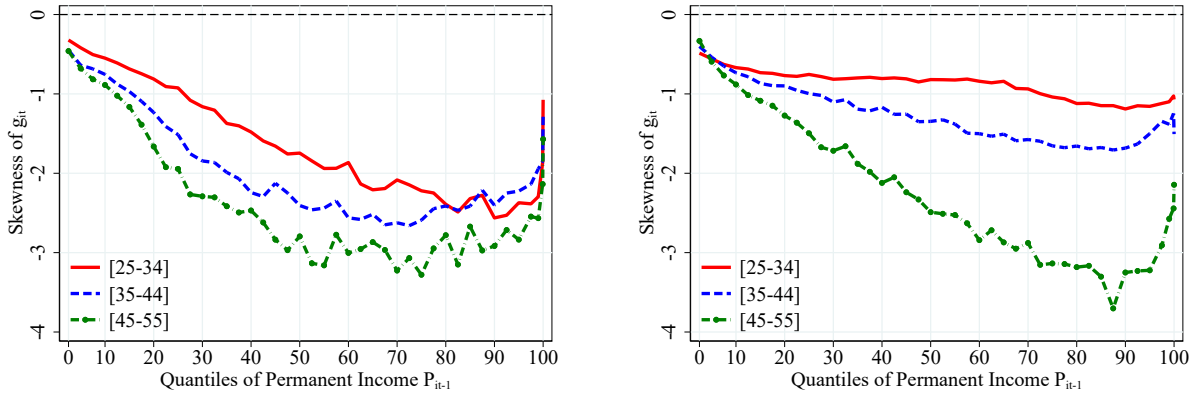
(a) Men

(b) Women



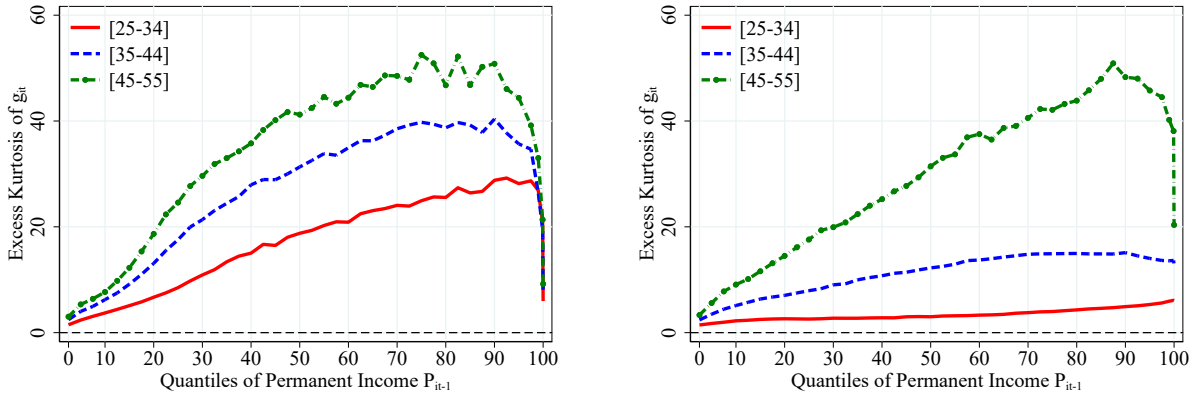
(c) Men

(d) Women



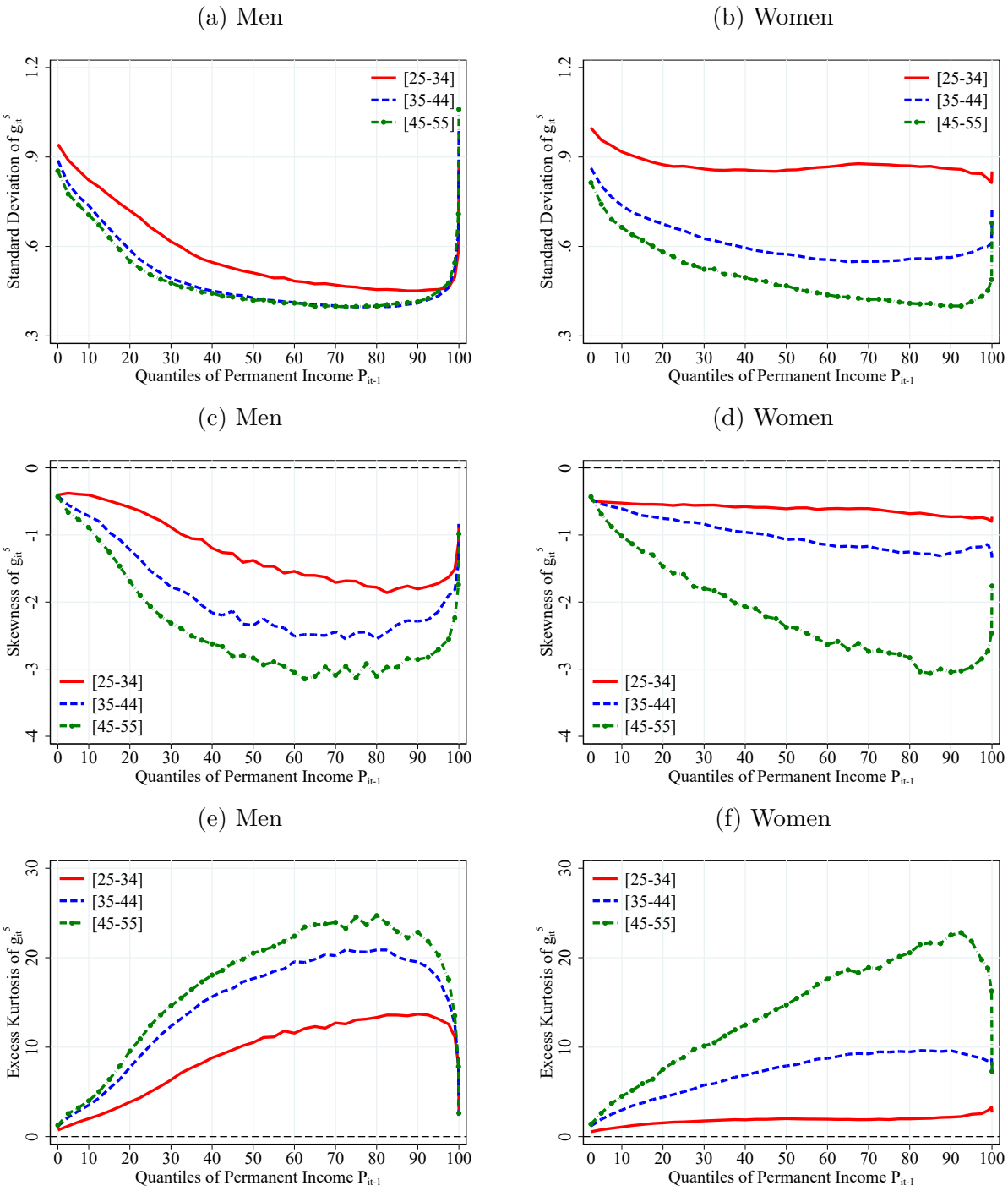
(e) Men

(f) Women



Notes: *Using residual one-year earnings changes and the LX-H sample, Figure 8 plots against permanent income quantile groups the following variables for the 3 age groups: (a) Men: Standard deviation, (b) Women: Standard deviation, (c) Men: Coef of Skewness, (d) Women: Coef of Skewness, (e) Men: Excess Kurtosis, (f) Women: Excess Kurtosis. Excess kurtosis equals the coefficient of kurtosis minus 3, the coefficient of kurtosis for the Normal distribution.*

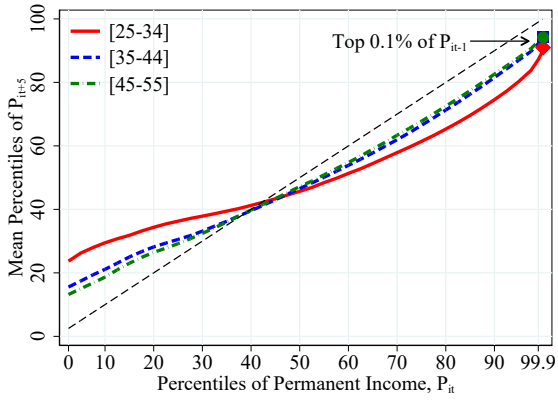
Figure A.22: Standardized Moments of 5-Year Log Earnings Changes



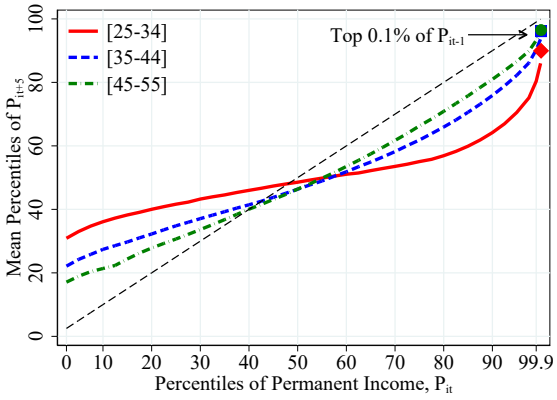
Notes: *Using residual five-year earnings changes and the LX-H sample, Figure 8 plots against permanent income quantile groups the following variables for the 3 age groups: (a) Men: Standard deviation, (b) Women: Standard deviation, (c) Men: Coef of Skewness, (d) Women: Coef of Skewness, (e) Men: Excess Kurtosis, (f) Women: Excess Kurtosis. Excess kurtosis equals the coefficient of kurtosis minus 3, the coefficient of kurtosis for the Normal distribution.*

Figure A.23: Evolution of 5-Year Mobility Over the Life Cycle

(a) Men



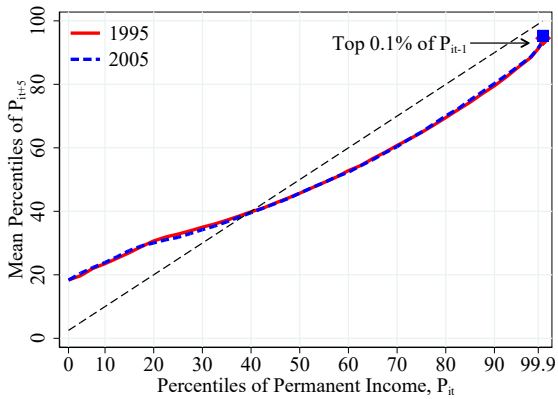
(b) Women



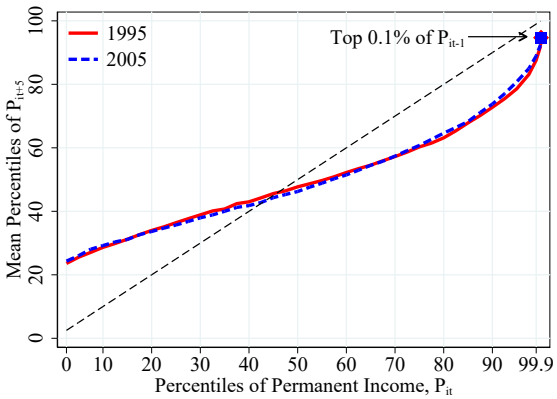
Notes: *Figure A.23 shows average rank-rank mobility over 5 years by computing average percentiles of permanent income, P_{t+5} five years later for workers in each permanent income percentile in the base year. The figure separately plots mobility for workers in age groups 25–34 and 35–44 in the base year and averages over the results for each available base year 1985–2005.*

Figure A.24: Evolution of 5-Year Mobility Over Time

(a) Men



(b) Women



Notes: *Figure A.24 shows average rank-rank mobility over 5 years by computing average percentiles of permanent income, P_{t+5} five years later for workers in each permanent income percentile in the base year, using two alternative base years 1995 and 2005 and averaging over all age groups.*

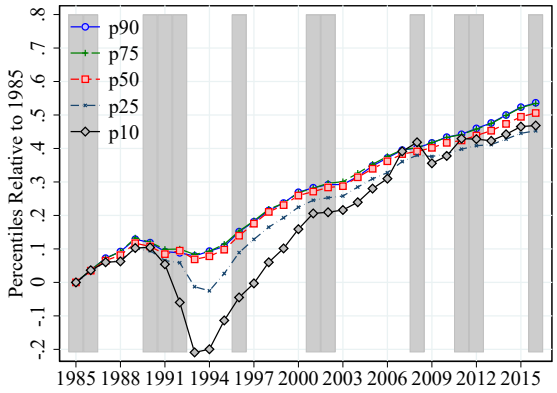
D Additional Results for Section 4

D.1 Education

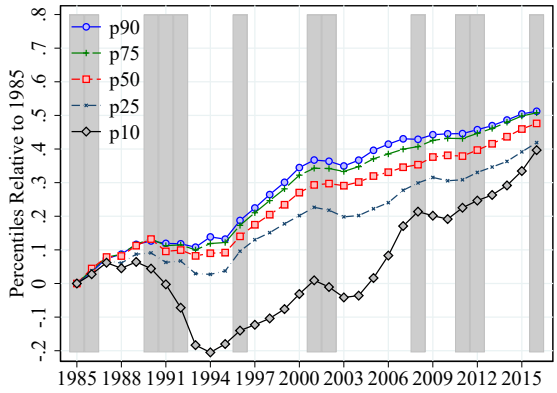
Education level for each individual is determined by the maximum level achieved during the observation period. We divide individuals into two broad education groups, where *Low-Educated* consists of individuals with elementary or high school education and *High-Educated* consists of individuals with at least some college education.

Figure A.25: Income Percentiles by Gender and Education

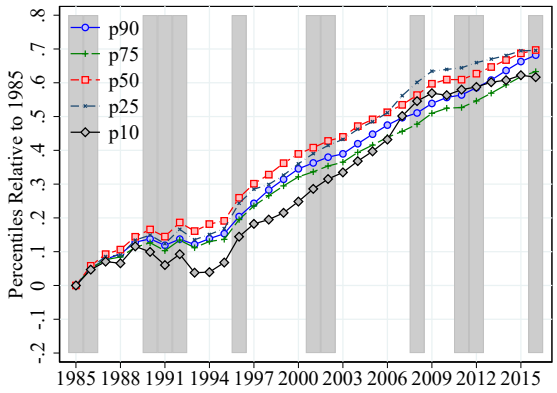
(a) Low-Educated Men



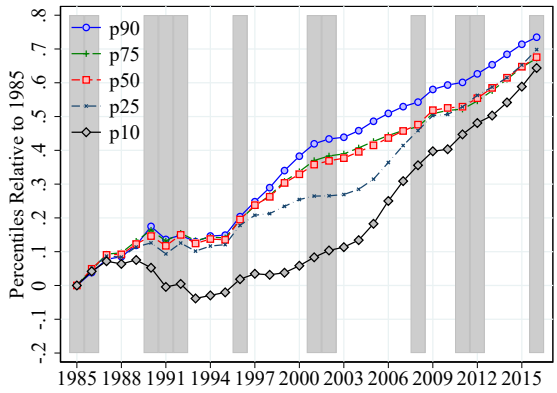
(b) High-Educated Men



(c) Low-Educated Women



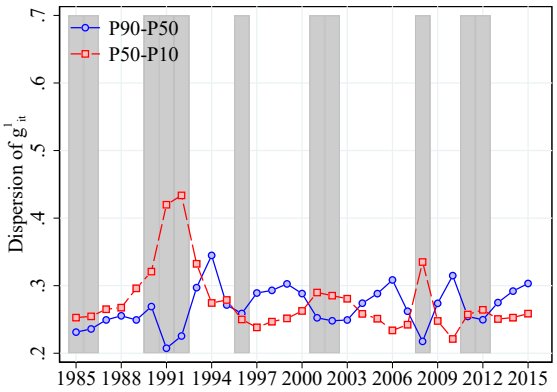
(d) High-Educated Women



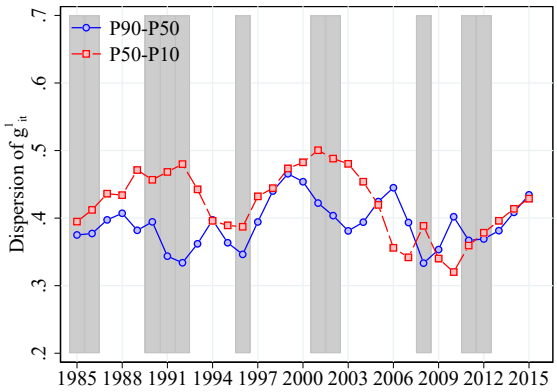
Notes: *Using raw log earnings and the CS sample, Figure A.25 plots against time P10, P25, P50, P75, P90, separately by gender and education group. All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure A.26: Dispersion and Skewness of 1-Year Log Earnings Changes by Gender and Education

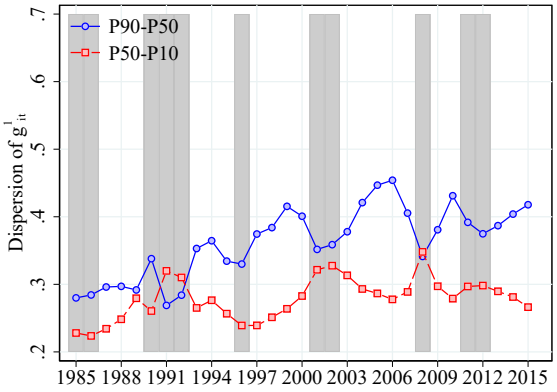
(a) Dispersion, Low-Educated Men



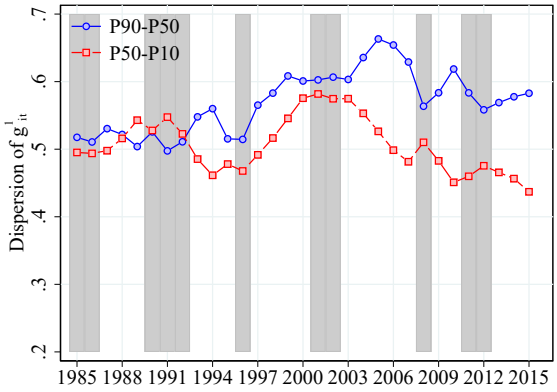
(b) Dispersion, Low-Educated Women



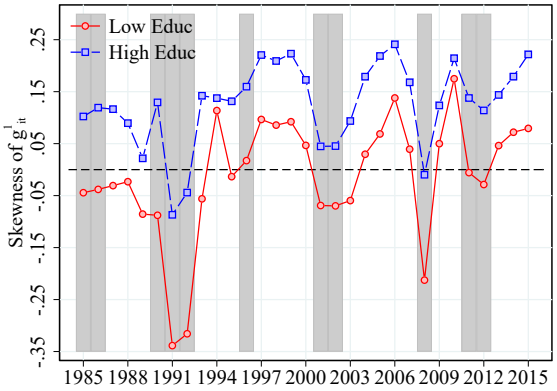
(c) Dispersion, High-Educated Men



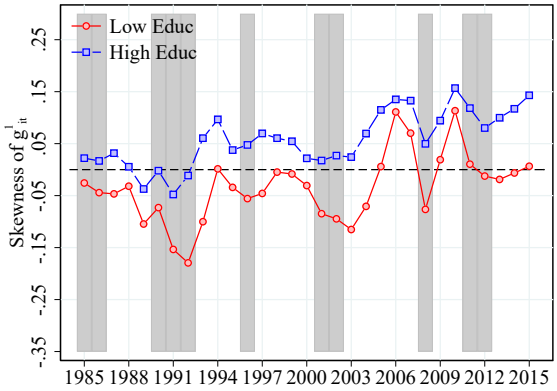
(d) Dispersion, High-Educated Women



(e) Kelley Skewness, Men



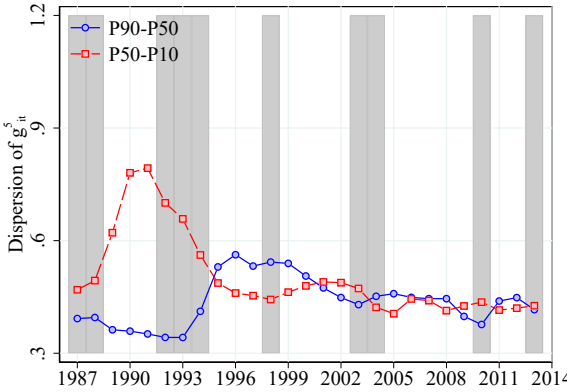
(f) Kelley Skewness, Women



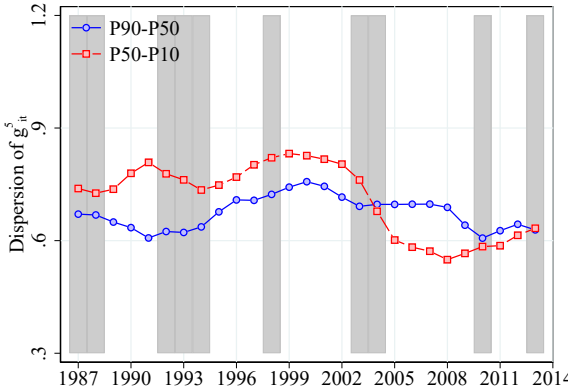
Notes: *Using residual one-year earnings changes and the LX sample, Figures A.26a–A.26d plot the P90-50 and P50-10 differential against time by gender-education group. Figures A.26e and A.26f show Kelley skewness by education for men and women, respectively. Shaded areas are recessions.*

Figure A.27: Dispersion and Skewness of 5-Year Log Earnings Changes by Gender and Education

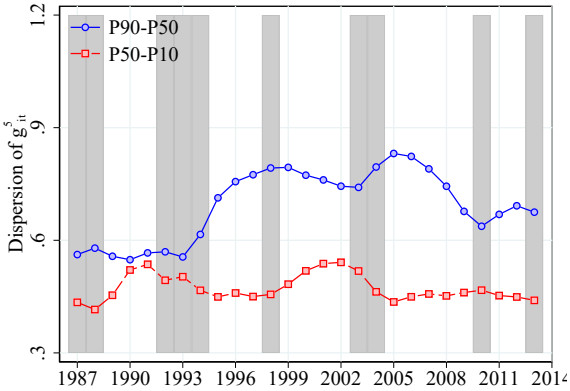
(a) Dispersion, Low-Educated Men



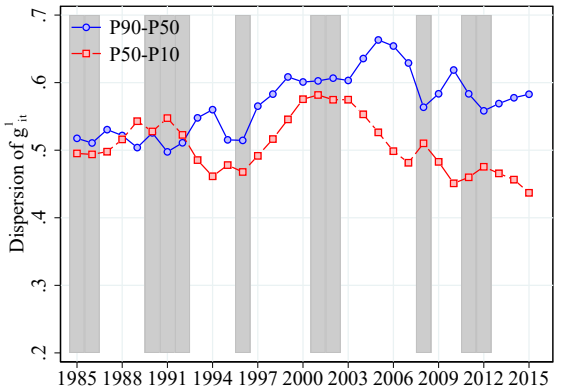
(b) Dispersion, Low-Educated Women



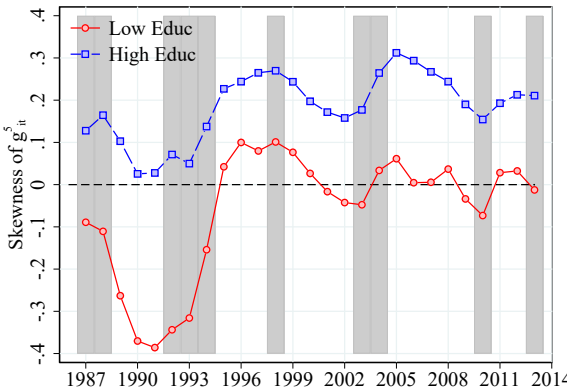
(c) Dispersion, High-Educated Men



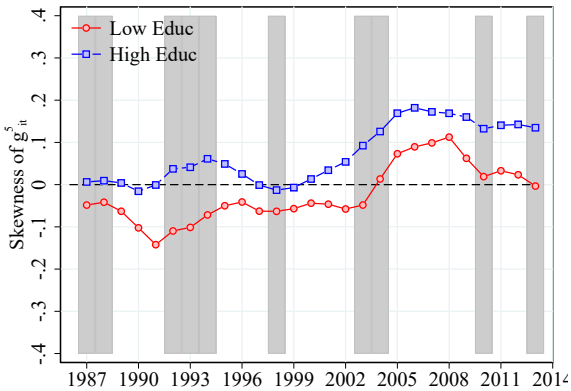
(d) Dispersion, High-Educated Women



(e) Kelley Skewness, Men



(f) Kelley Skewness, Women

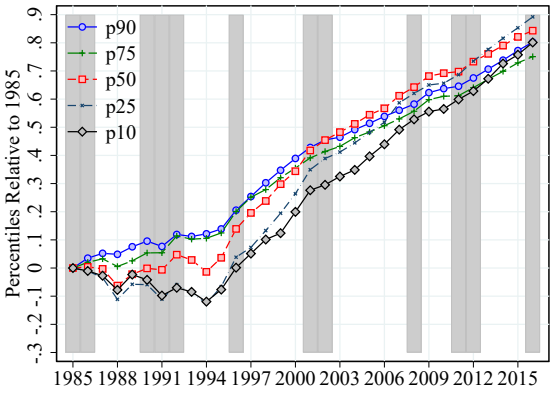


Notes: *Using residual five-year earnings changes and the LX sample, Figures A.27a–A.27d plot the P90-50 and P50-10 differential against time by gender-education group. Figures A.27e and A.27f show Kelley skewness by education for men and women, respectively. Shaded areas are recessions.*

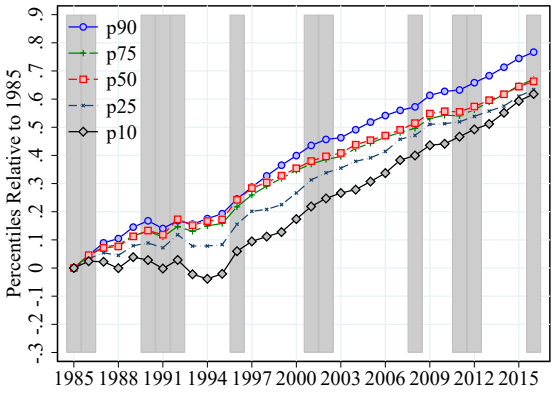
D.2 Immigration

Figure A.28: Income Percentiles by Region of Origin among Foreign-Born Female Workers

(a) Women: Africa, Asia, and Middle East



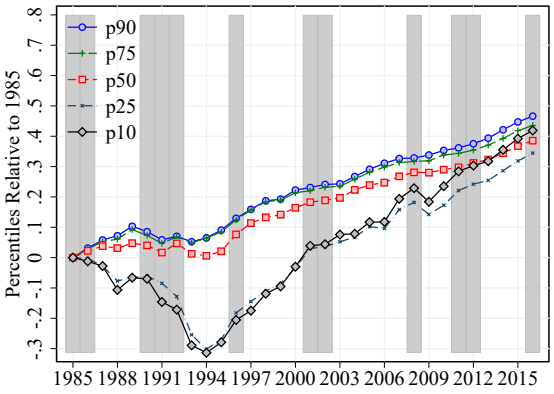
(b) Women: Europe and the Americas



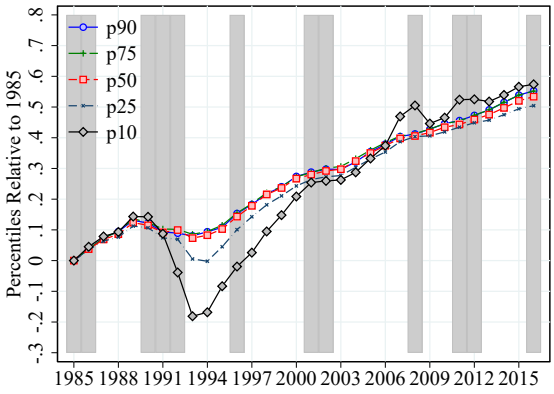
Notes: *Using raw log earnings and the CS sample, Figure A.28 plots against time P10, P25, P50, P75, P90, for female immigrants. We split foreign-born women by region of origin, distinguishing two groups, (a) Africa, Asia and Middle East, and (b) Europe and the Americas. All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure A.29: Income Percentiles for Men by Education and Origin

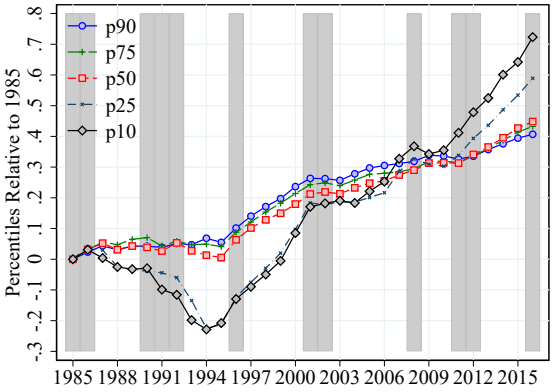
(a) Foreign-Born Men, Low Education



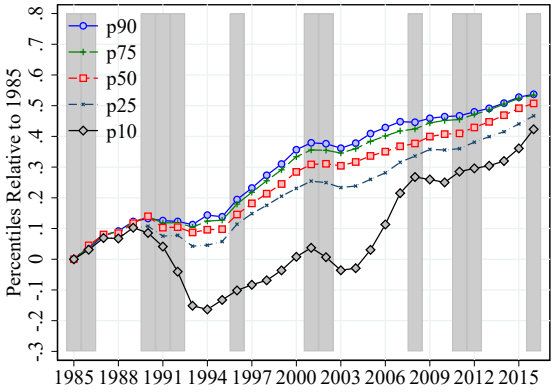
(b) Native Men, Low Education



(c) Foreign-Born Men, High Education



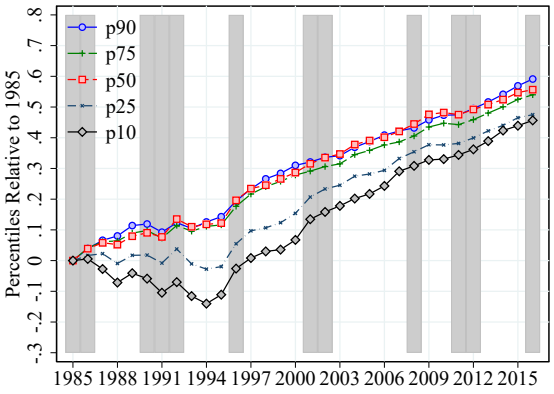
(d) Native Men, High Education



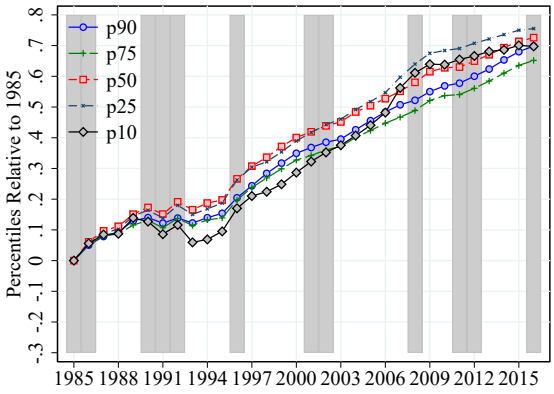
Notes: *Using the CS sample, Figure A.29 plots P10, P25, P50, P75, P90 of log earnings for men against time, separately by education and origin. The figures distinguish foreign-born and native men, and workers with and without college education (low vs high education). All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure A.30: Percentiles of Log Earnings for Women by Education and Origin

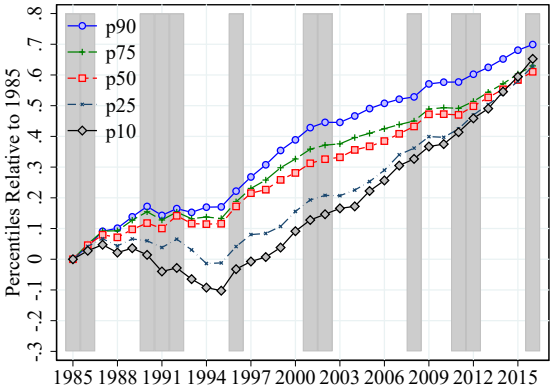
(a) Foreign-Born Women, Low Education



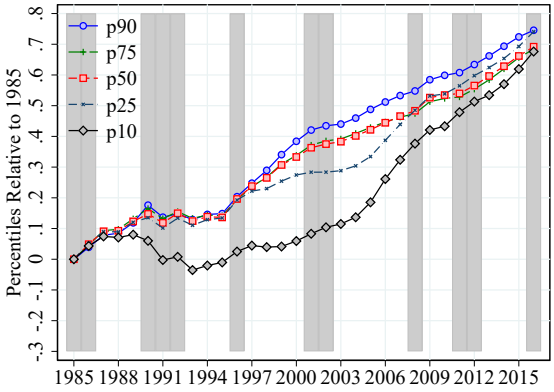
(b) Native Women, Low Education



(c) Foreign-Born Women, High Education



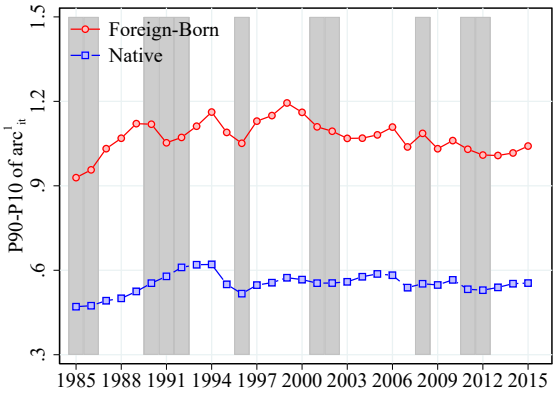
(d) Native Women, High Education



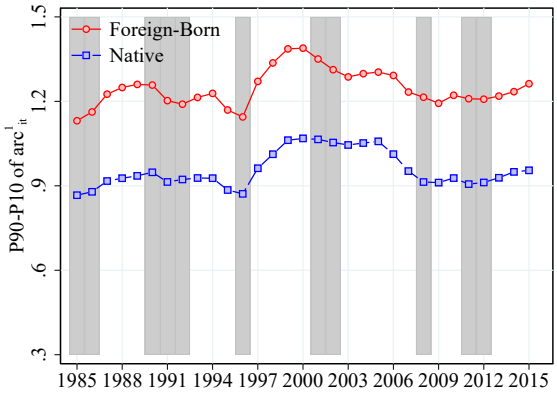
Notes: *Using the CS sample, Figure A.30 plots P10, P25, P50, P75, P90 of log earnings for women against time, separately by education and origin. The figures distinguish foreign-born and native women, and workers with and without college education (low vs high education). All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.*

Figure A.31: Dispersion of 1-Year Arc-Percent Changes in Earnings by Gender and Origin

(a) Men



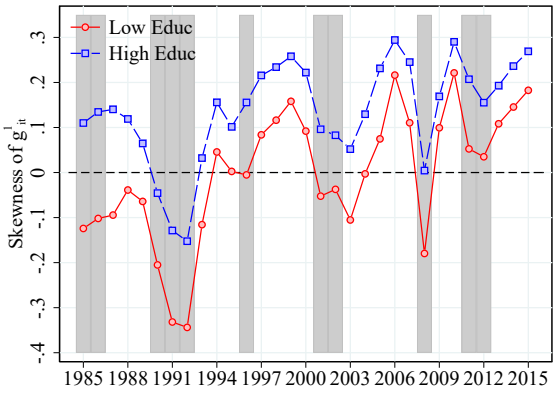
(b) Women



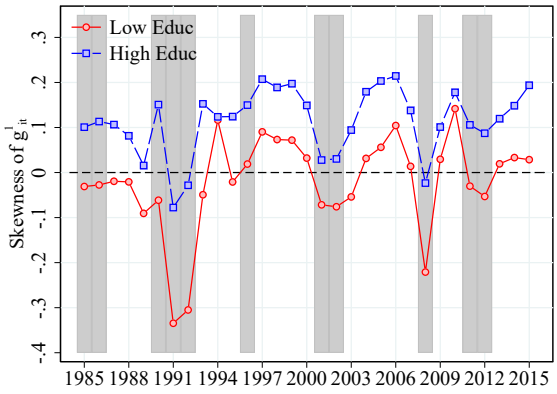
Notes: *Using the LX sample, Figure A.31 plots the P90–10 differential in 1-year arc-percent change in earnings against time, separately for foreign-born and native workers and by gender. Arc-percent change is defined in section A. Shaded areas are recessions.*

Figure A.32: Kelley Skewness of 1-Year Earnings Growth by Gender, Origin, and Education

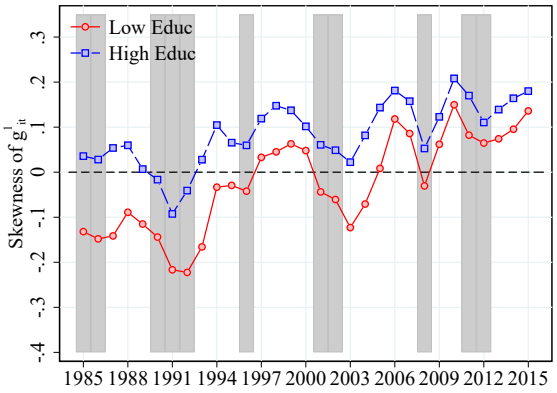
(a) Foreign-Born Men



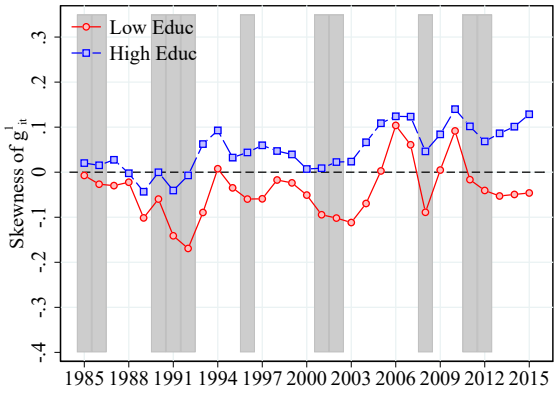
(b) Native Men



(c) Foreign-Born Women

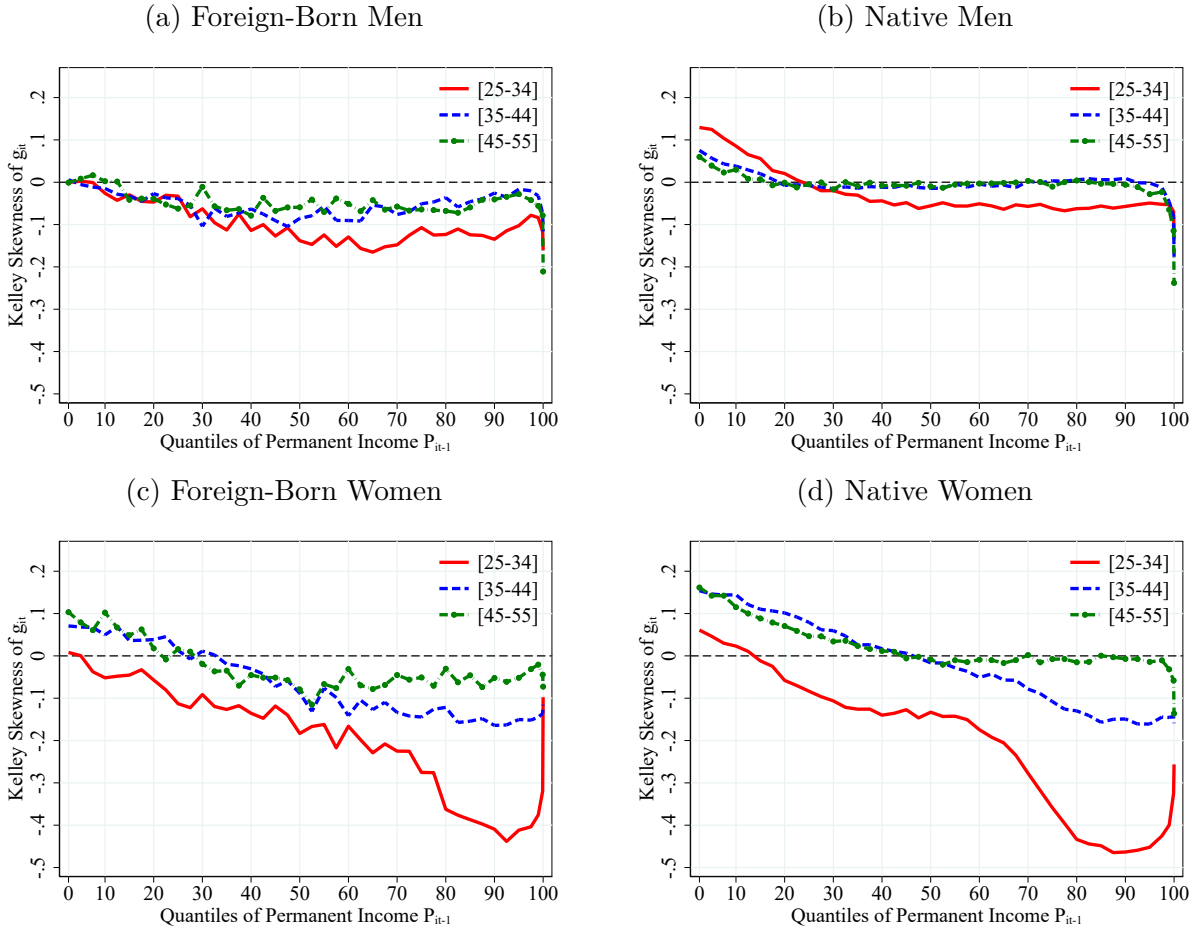


(d) Native Women



Notes: *Figure A.32 uses residual one-year earnings changes to plot Kelley skewness for foreign-born and native workers, separately by gender. Each plot further distinguishes the gender-origin subsample by education group. Shaded areas are recessions.*

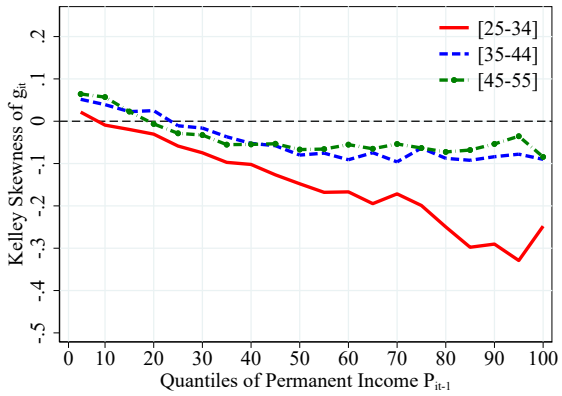
Figure A.33: Kelley Skewness of 1-Year Earnings Growth by Gender, Origin, Age, and Income



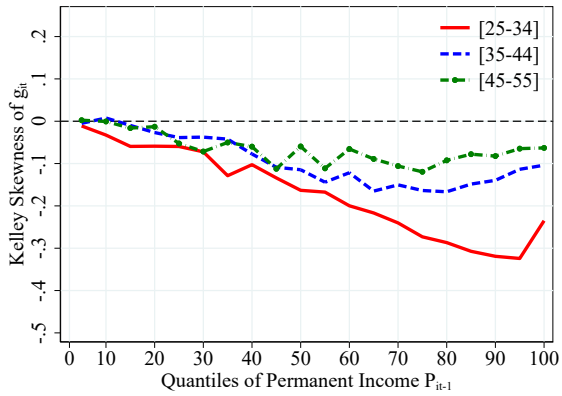
Notes: *Using residual one-year earnings changes and the LX-H sample, Figure A.33 plots Kelley Skewness against permanent income quantile groups for the 3 age groups, separately by gender and origin (foreign-born and natives). Kelley Skewness is defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$.

Figure A.34: Kelley Skewness of 1-Year Earnings Growth by Region of Origin, Age, and Income

(a) Europe and the Americas



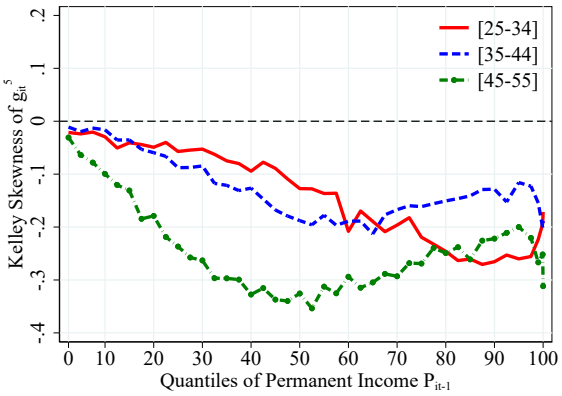
(b) Africa, Asia, and Middle East



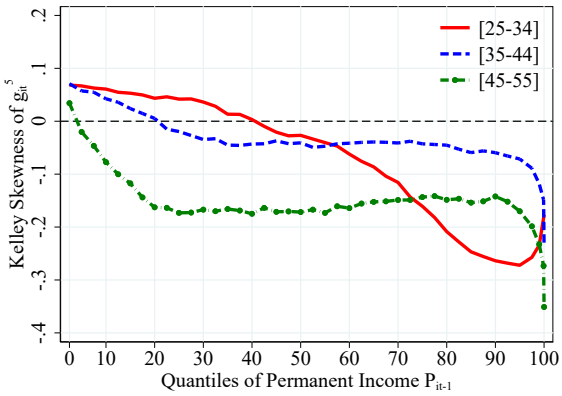
Notes: *Using residual one-year earnings changes and the LX-H sample for the full immigrant population, Figure A.34 plots Kelley Skewness against permanent income quantile groups for the 3 age groups, separately by foreign region of origin. Kelley Skewness is defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$.

Figure A.35: Kelley Skewness of 5-Year Earnings Growth by Gender, Origin, Age, and Income

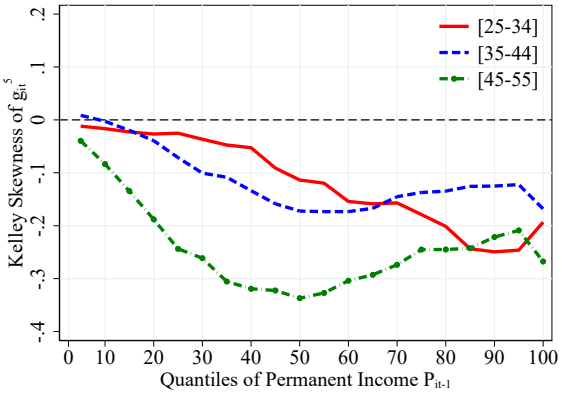
(a) All Foreign-Born



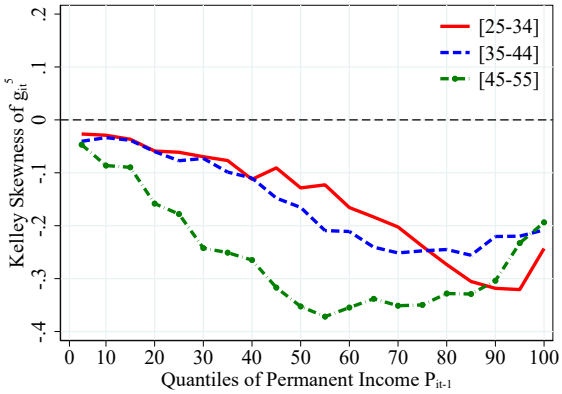
(b) All Natives



(c) Europe and the Americas



(d) Africa, Asia, and Middle East

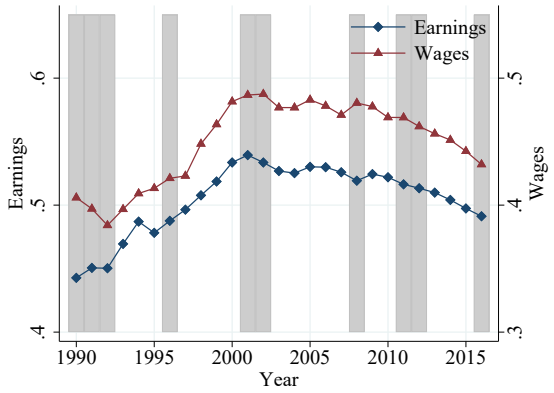


Notes: *Using residual five-year earnings changes and the LX-H sample, Figure A.33 plots Kelley Skewness against permanent income quantile groups for the 3 age groups, separately for the following subpopulations: (a) All foreign-born, (b) All natives, (c) foreign-born from Europe and the Americas, (d) foreign-born from Africa, Asia, and Middle East. Kelley Skewness is defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$.

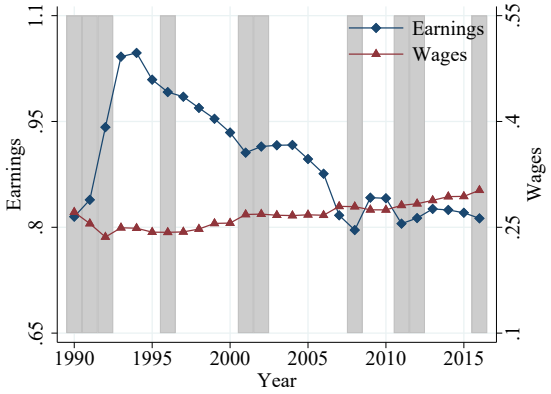
D.3 The Role of Hours and Wages

Figure A.36: Level and Trend in Inequality: Wages and Earnings

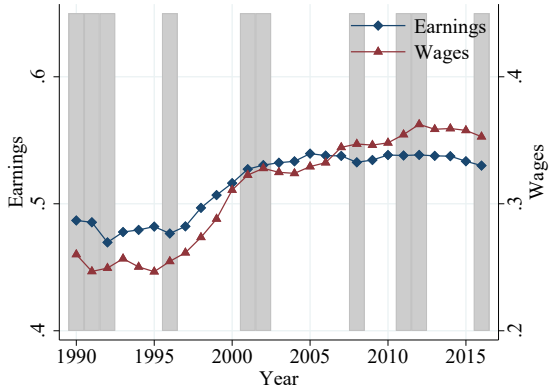
(a) P90–50 Gap, Men



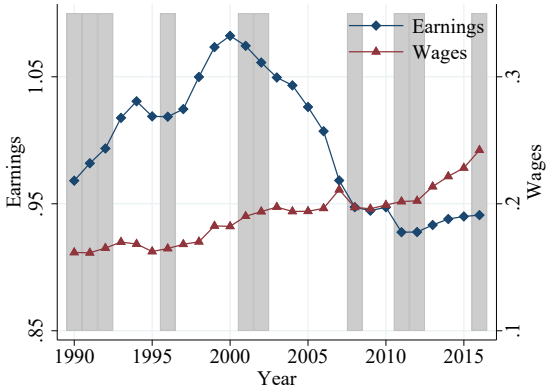
(b) P50–10 Gap, Men



(c) P90–50 Gap, Women



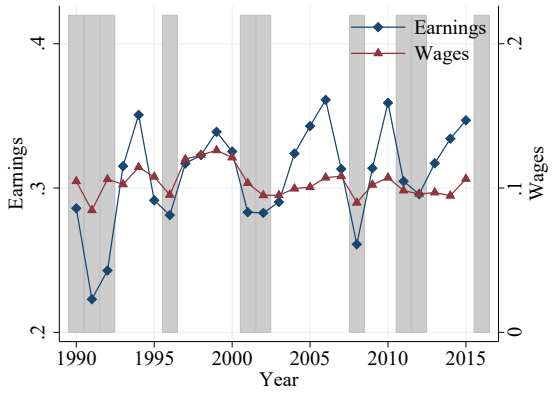
(d) P50–10 Gap, Women



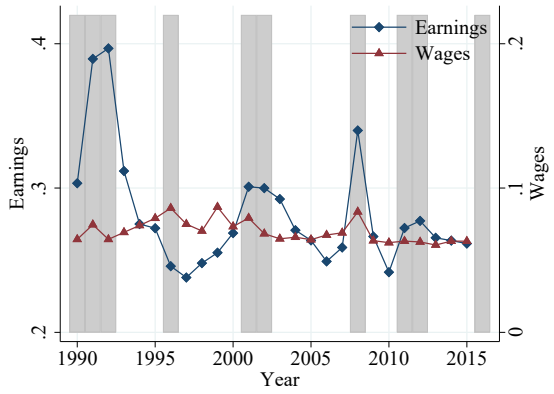
Notes: *Using the wage survey sample, Figure A.36 plots the P90–50 gap and P50–10 gap in log earnings and log monthly wages against time, separately for men and women. Shaded areas are recessions.*

Figure A.37: Level and Trend in Volatility: Wages and Earnings

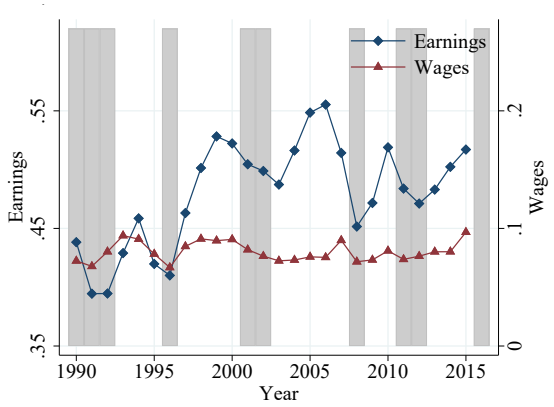
(a) P90–50 Gap, Men



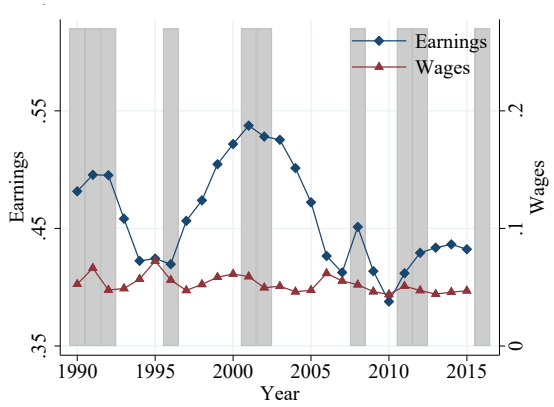
(b) P50–10 Gap, Men



(c) P90–50 Gap, Women



(d) P50–10 Gap, Women



Notes: *Using the wage survey sample, Figure A.37 plots the P90–50 gap and P50–10 gap in 1-year changes of residualized earnings and residualized monthly wages against time, separately for men and women. Shaded areas are recessions.*

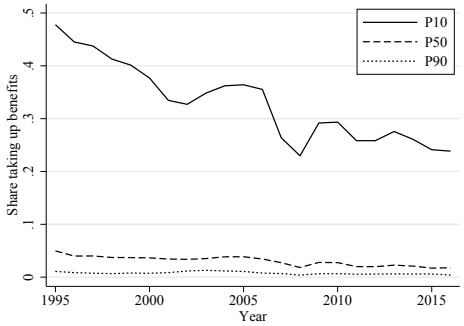
D.4 Work-Related Benefits

Figure A.38: Benefits Take-Up across Percentiles of the Earnings Distribution

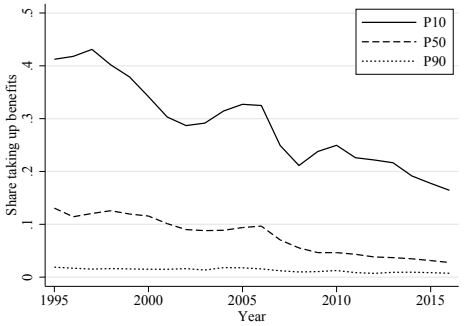
Notes: *Figure A.38 shows the share of employed in ages 25–55 taking up work-related benefits, as defined in section 2.1, at different percentiles of the earnings distribution, by gender.*

Figure A.39: Benefits Take-Up by Benefit Type across Percentiles of the Earnings Distribution

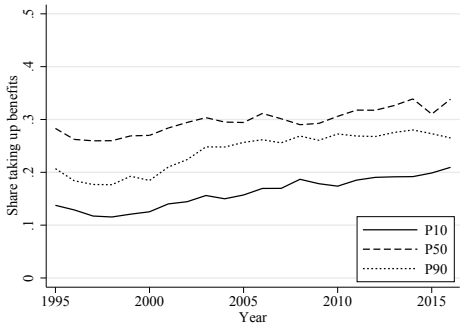
(a) Men, Unemployment



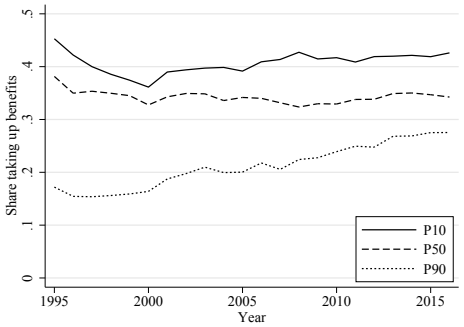
(b) Women, Unemployment



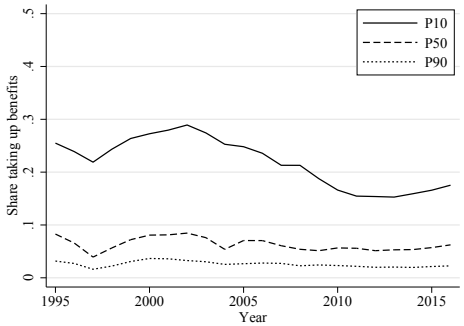
(c) Men, Parental Leave



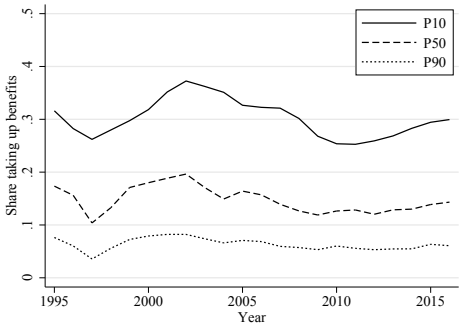
(d) Women, Parental Leave



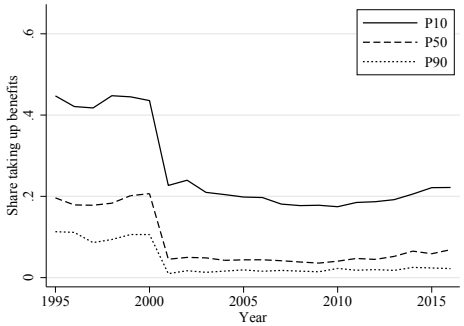
(e) Men, Sickness/Disability



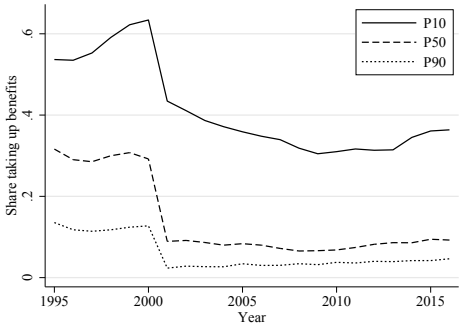
(f) Women, Sickness/Disability



(g) Men, Studies + Other



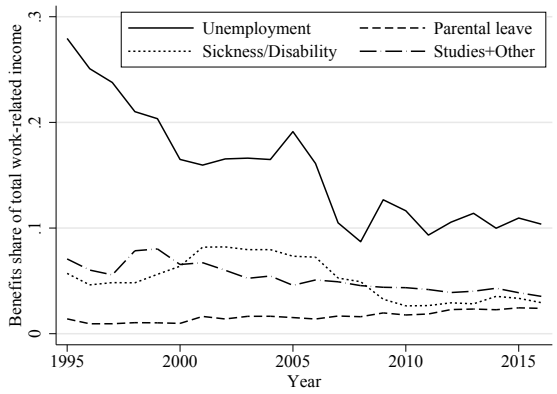
(h) Women, Studies + Other



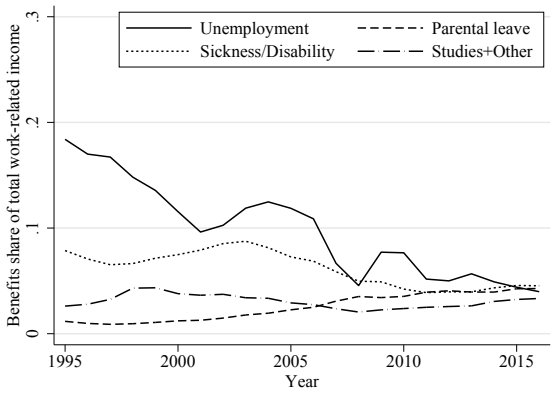
Notes: *Figure A.39 shows the share of employed in ages 25–55 taking up different types of work-related benefits at different percentiles of the earnings distribution, by gender.*

Figure A.40: Benefits Usage by Origin at the 10th Percentile of the Earnings Distribution

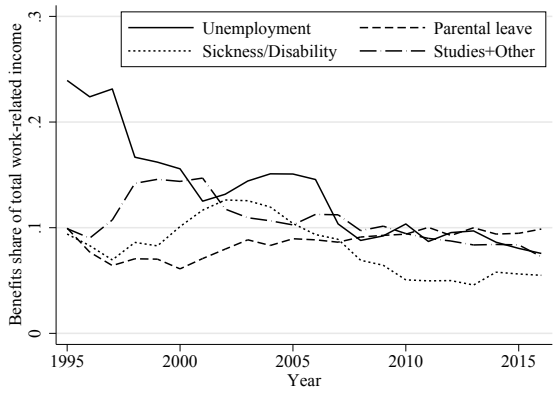
(a) Foreign-Born Men



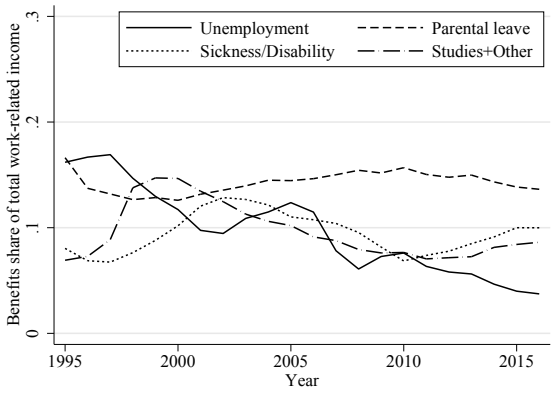
(b) Native Men



(c) Foreign-Born Women

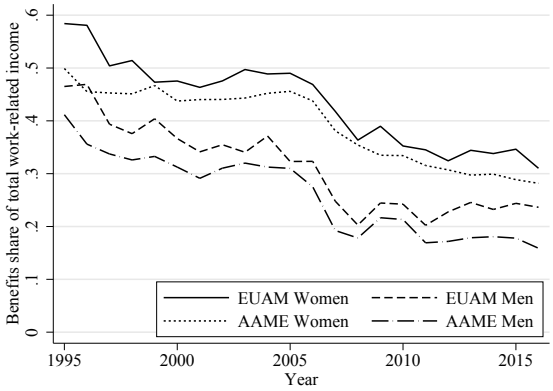


(d) Native Women



Notes: *Figure A.40 shows the share of different types of work-related benefits in total work-related income among employed in ages 25–55 at the 10th percentile of the earnings distribution by gender and origin.*

Figure A.41: Benefits Usage by Region of Origin at the 10th Percentile of the Earnings Distribution

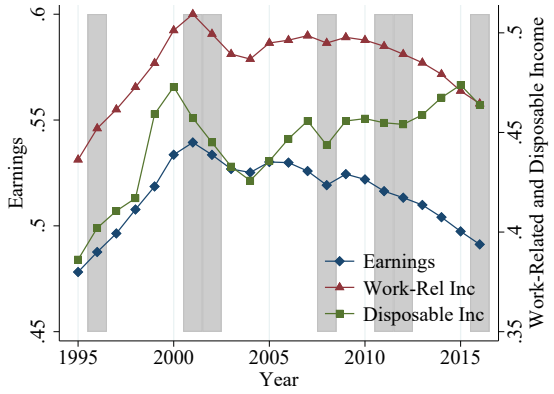


Notes: *Figure A.41 shows the share work-related benefits in total work-related income among employed in ages 25–55 at the 10th percentile of the earnings distribution by gender and region of origin.*

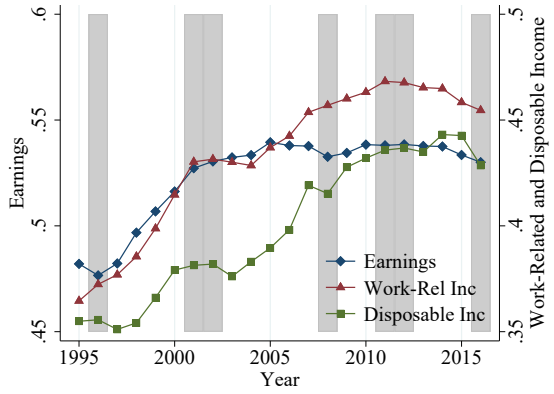
D.5 Social Insurance

Figure A.42: Income Inequality: Earnings, Benefits, and Disposable Income

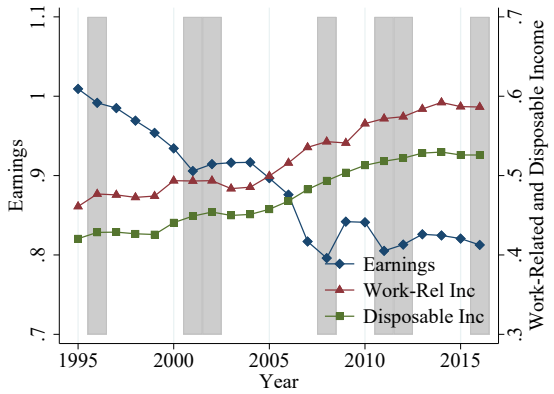
(a) P90–50 Log(Income), Men



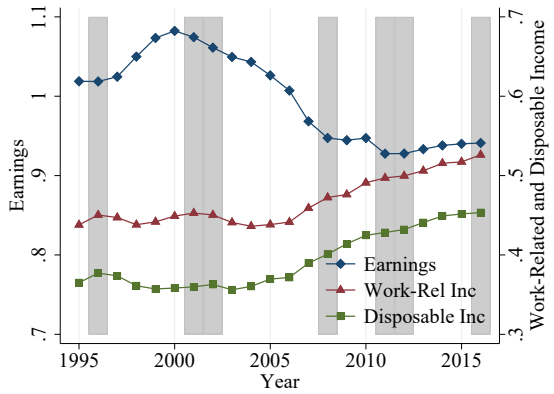
(b) P90–50 Log(Income), Women



(c) P50–10 Log(Income), Men



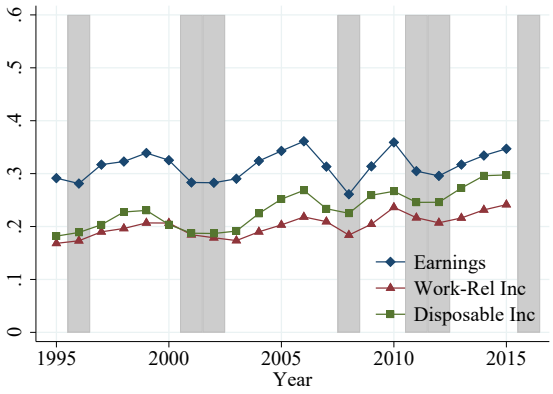
(d) P50–10 Log(Income), Women



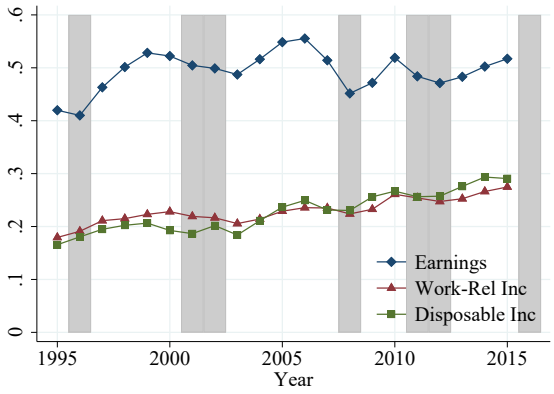
Notes: *Using the CSB sample over 1995–2016, Figure A.42 plots the P90–50 and P50–10 differentials in log income against time, separately for men and women. Each figure distinguishes three income concepts; log earnings, log total work-related income, and log disposable income, see section 2.1. Shaded areas are recessions.*

Figure A.43: Income Volatility: Earnings, Benefits, and Disposable Income

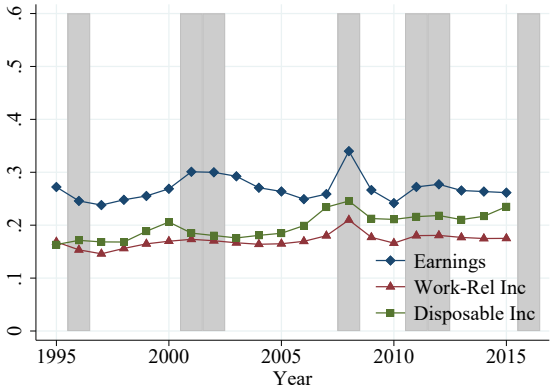
(a) P90–50 Income Growth, Men



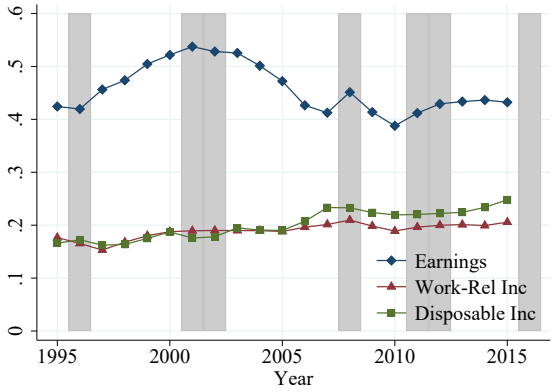
(b) P90–50 Income Growth, Women



(c) P50–10 Income Growth, Men



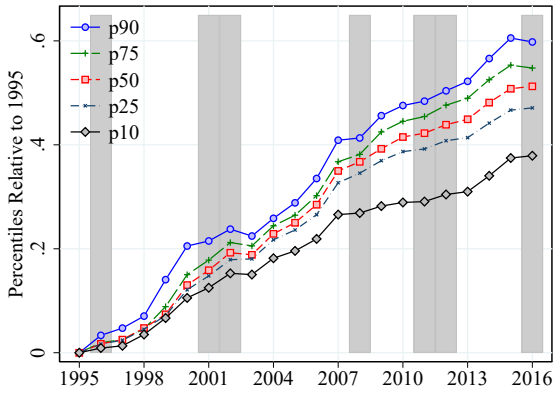
(d) P50–10 Income Growth, Women



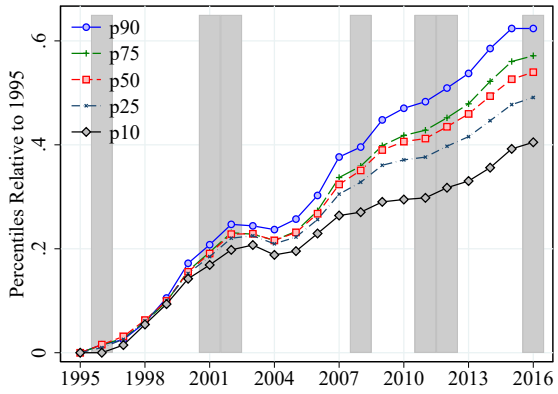
Notes: *Using the LXB sample over 1995–2016, Figure A.43 plots the P90–50 and P50–10 differentials in 1-year residualized income changes against time, separately for men and women. Each figure distinguishes three income concepts; log earnings, log total work-related income, and log disposable income, see section 2.1. Shaded areas are recessions.*

Figure A.44: Trends in Disposable Income Inequality

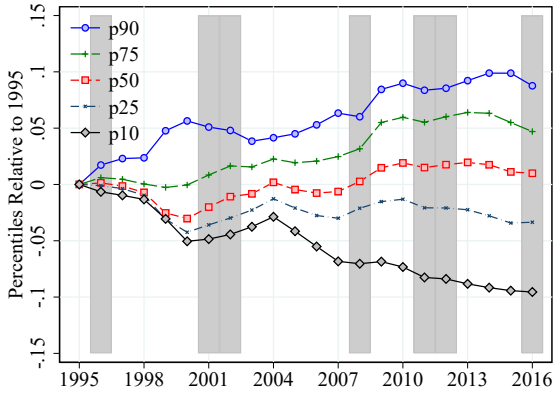
(a) Men, Log Income



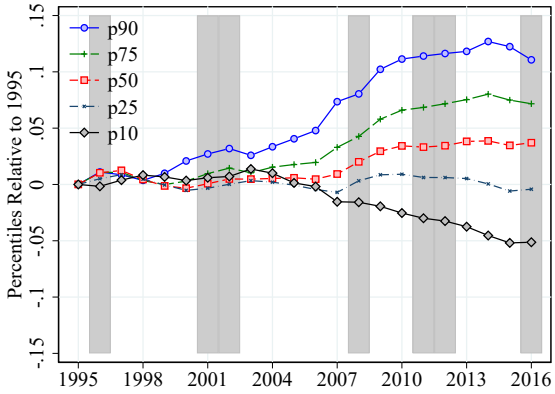
(b) Women, Log Income



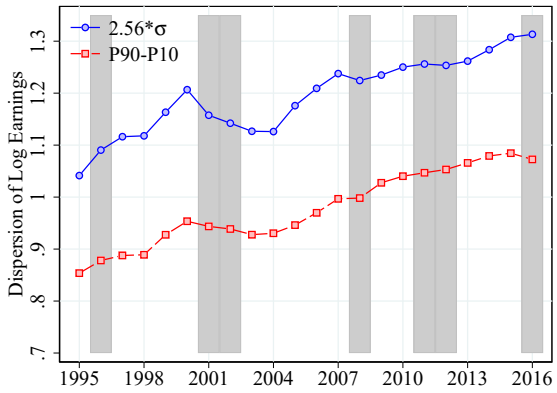
(c) Men, Residual Income



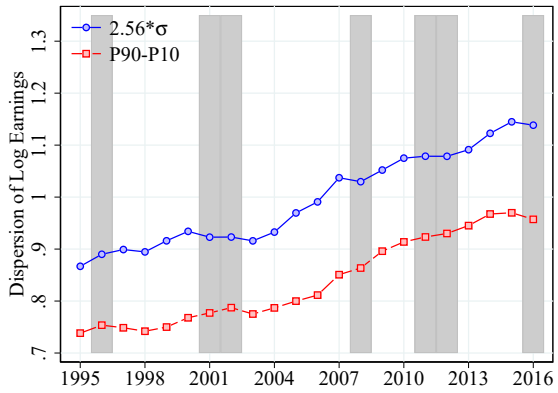
(d) Women, Residual Income



(e) Men, Log Income Inequality



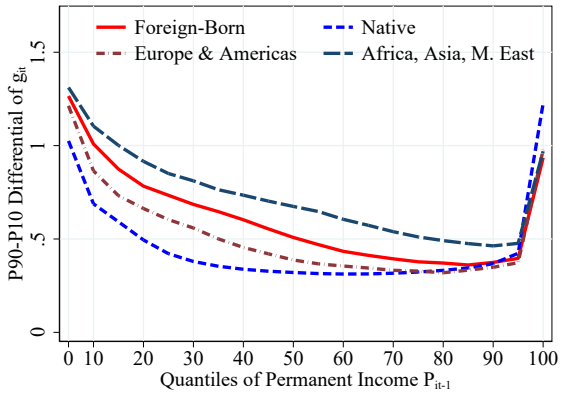
(f) Women, Log Income Inequality



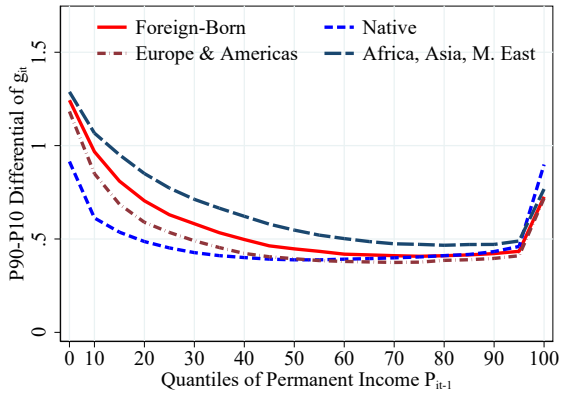
Notes: *Using the CSB sample, Figures (a)-(d) plot P10, P25, P50, P75, P90 by gender, using log disposable income in panels (a) and (b) and residualized disposable income in (c) and (d). All percentiles are normalized to 0 in the first available year, 1995. Figures (e) and (f) show 2.56*Standard deviation and the P90–10 gap in log disposable income by gender over time. Shaded areas are recessions.*

Figure A.45: 1-Year Disposable Income Volatility by Income and Origin

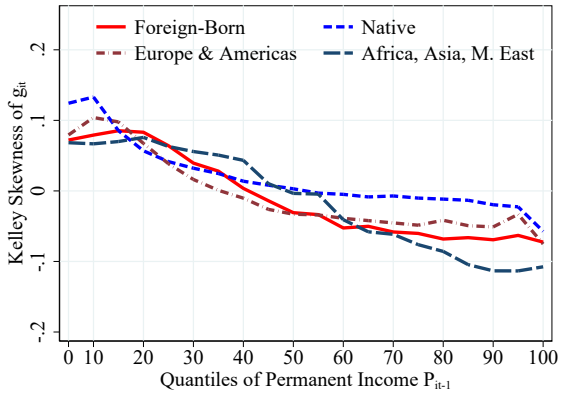
(a) P90–10 Income Growth, Men



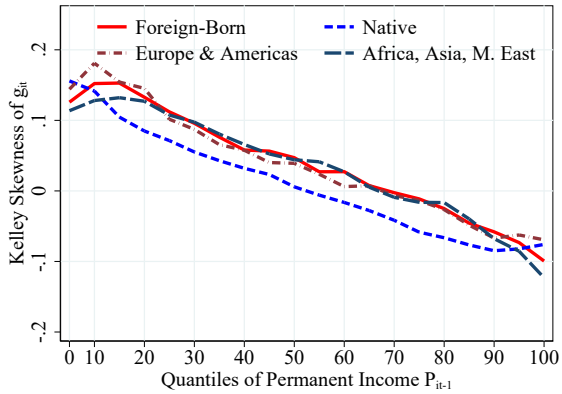
(b) P90–10 Income Growth, Women



(c) Kelley Skewness, Men



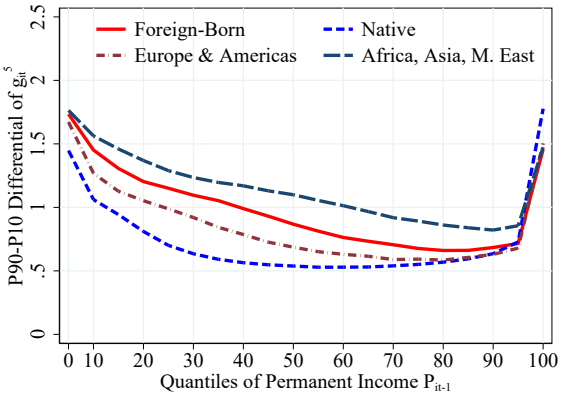
(d) Kelley Skewness, Women



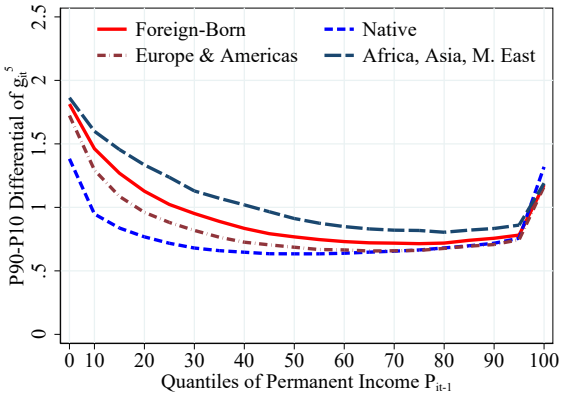
Notes: *Using residual one-year changes in disposable income and the LXB-H sample, Figure A.45 plots against permanent income quantile groups the following variables: (a) Men: P90–10, (b) Women: P90–10, (c) Men: Kelley Skewness, (d) Women: Kelley Skewness. Each figure distinguishes foreign-born and native workers, and further splits the immigrant sample by two regions of origin (Europe & Americas, and Africa, Asia, Middle East). Kelley Skewness is defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$.

Figure A.46: 5-Year Disposable Income Volatility by Income and Origin

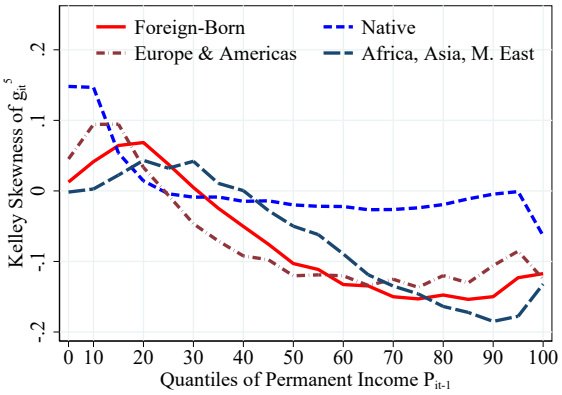
(a) P90–10 Income Growth, Men



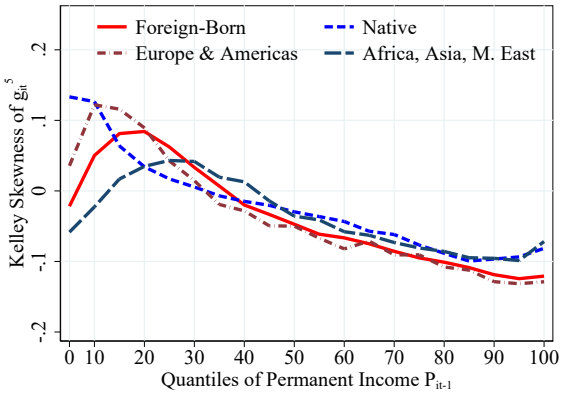
(b) P90–10 Income Growth, Women



(c) Kelley Skewness, Men



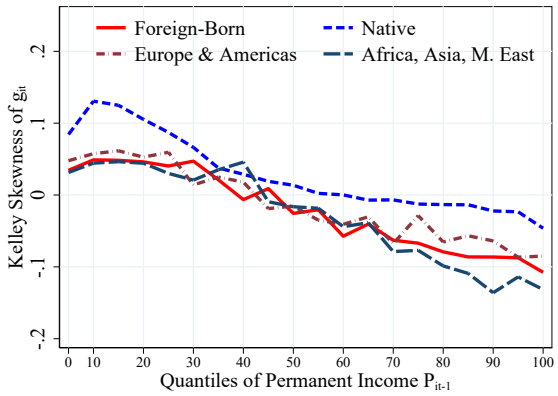
(d) Kelley Skewness, Women



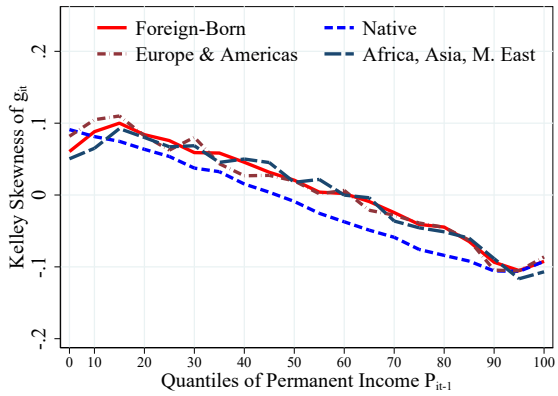
Notes: *Using residual five-year changes in disposable income and the LXB-H sample, Figure A.46 plots against permanent income quantile groups the following variables: (a) Men: P90–10, (b) Women: P90–10, (c) Men: Kelley Skewness, (d) Women: Kelley Skewness. Each figure distinguishes foreign-born and native workers, and further splits the immigrant sample by two regions of origin (Europe & Americas, and Africa, Asia, Middle East). Kelley Skewness is defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$.

Figure A.47: Kelley Skewness of 1-Year Disposable Income Changes by Age, Income, and Origin

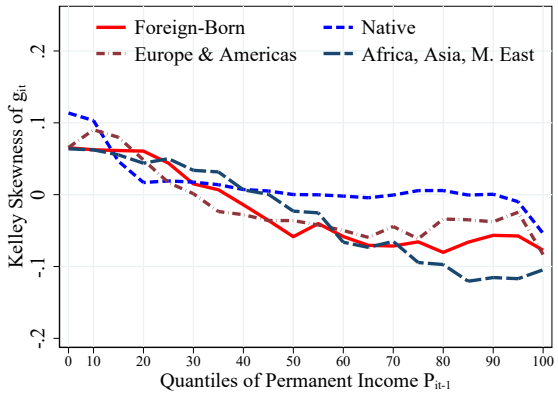
(a) Men, Age 25–34



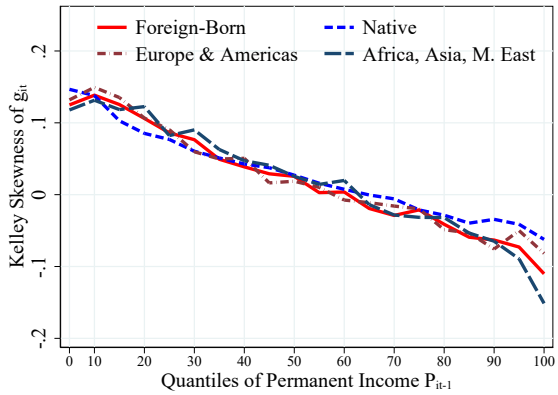
(b) Women, Age 25–34



(c) Men, Age 35–44



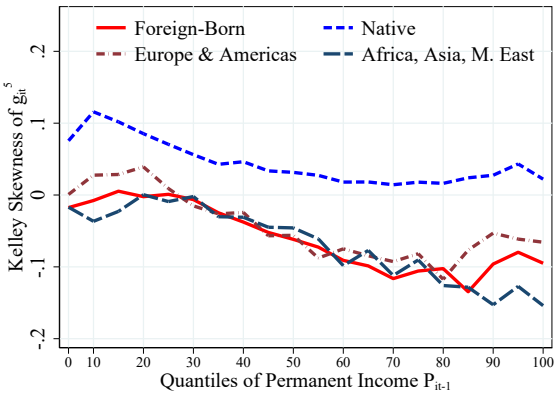
(d) Women, Age 35–44



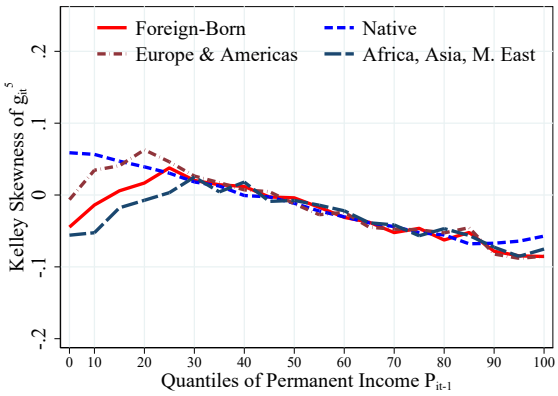
Notes: *Using residual one-year changes in disposable income and the LXB-H sample, Figure A.47 plots Kelley Skewness against permanent income quantile groups for: (a) Men, Age 25-34, (b) Women, Age 25-34, (c) Men, Age 35-44, (d) Women, Age 35-44. Each figure distinguishes foreign-born and native workers, and further splits the immigrant sample by two regions of origin (Europe & Americas, and Africa, Asia, Middle East). Kelley Skewness is defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$.

Figure A.48: Kelley Skewness of 5-Year Disposable Income Changes by Age, Income, and Origin

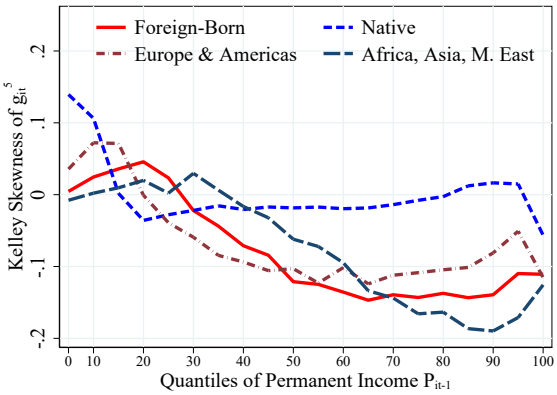
(a) Men, Age 25–34



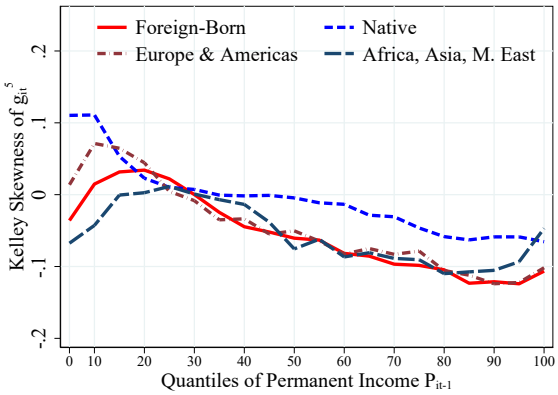
(b) Women, Age 25–34



(c) Men, Age 35–44



(d) Women, Age 35–44



Notes: *Using residual five-year changes in disposable income and the LXB-H sample, Figure A.48 plots Kelley Skewness against permanent income quantile groups for: (a) Men, Age 25-34, (b) Women, Age 25-34, (c) Men, Age 35-44, (d) Women, Age 35-44. Each figure distinguishes foreign-born and native workers, and further splits the immigrant sample by two regions of origin (Europe & Americas, and Africa, Asia, Middle East). Kelley Skewness is defined as* $\frac{(P90-P50)-(P50-P10)}{P90-P10}$.

D.6 Capital Income

This section considers the role of capital income in overall income inequality. Most Swedish taxpayers report negative capital income based on mortgage payments, for example, reducing their gross income. Figure A.49a shows that including capital income implies slightly lower income for the bottom 90 percent of the distribution, compared to focusing only on labor income. In contrast, average income among the top 10 percent of the distribution in Figure A.49b increases substantially more, especially during boom periods, when including capital gains.

Figure A.49: Labor and Capital Income Across the Earnings Distribution

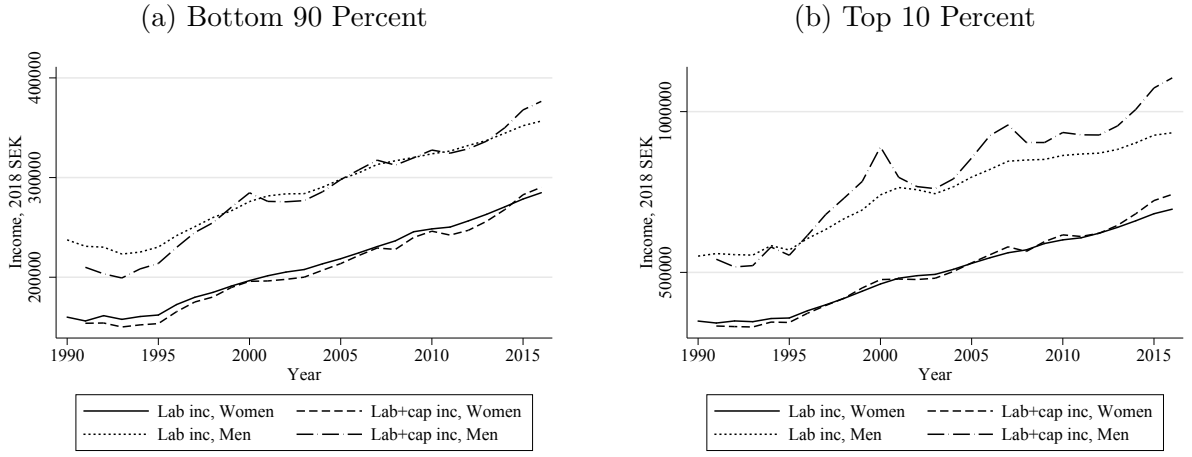
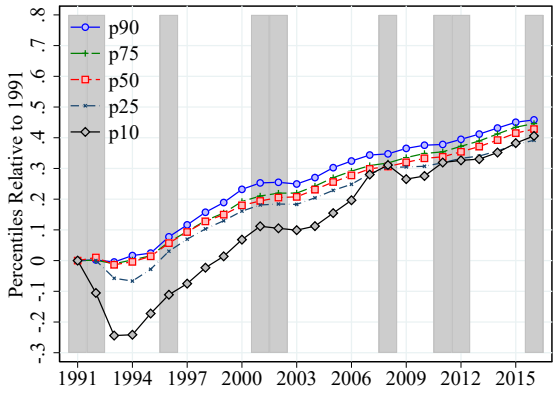


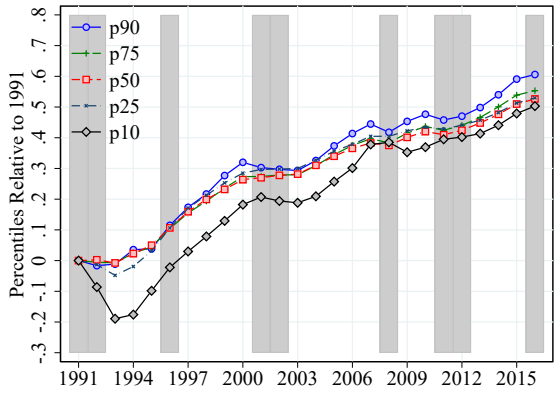
Figure A.50 plots the time series of income percentiles from 1991–2016 for earnings and earnings plus capital income. Here, we find that real gains were larger when including capital gains. These differences are largest at the 90th percentile of the distribution, but they also exist throughout the income distribution, with about 10 percent larger real gains over 1991–2016 at the median income when including capital income.

Figure A.50: Income Inequality: The Role of Capital Income

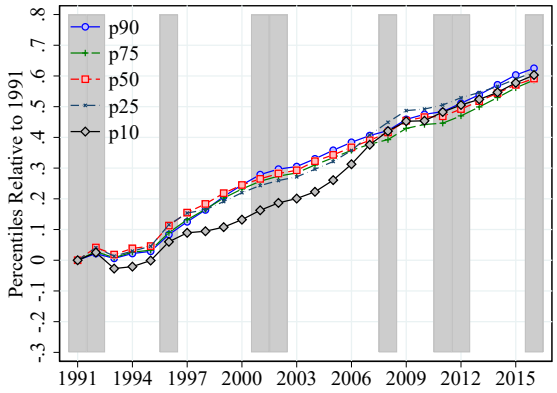
(a) Earnings, Men



(b) Earnings + Capital Income, Men



(c) Earnings, Women



(d) Earnings + Capital Income, Women

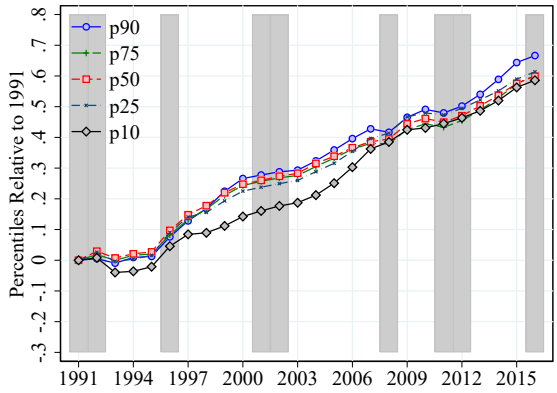
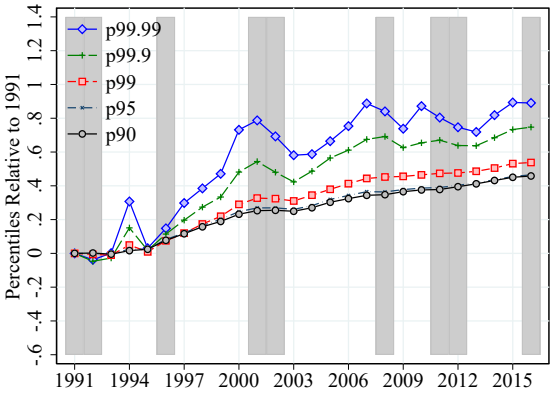


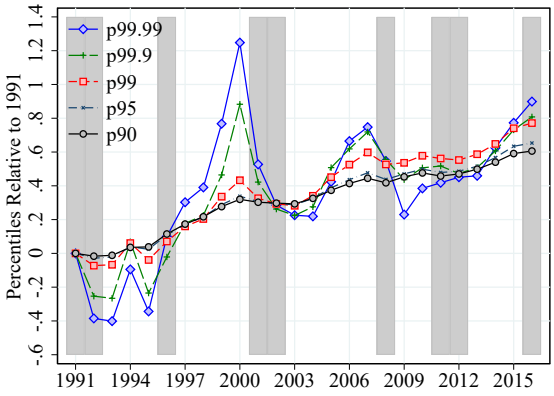
Figure A.51 plots the time series of top income percentiles from 1991–2016 for earnings and earnings plus capital income. We document that capital income yields much more volatile patterns over time, whereas top earnings increase steadily and substantially over time.

Figure A.51: Top Income Inequality: The Role of Capital Income

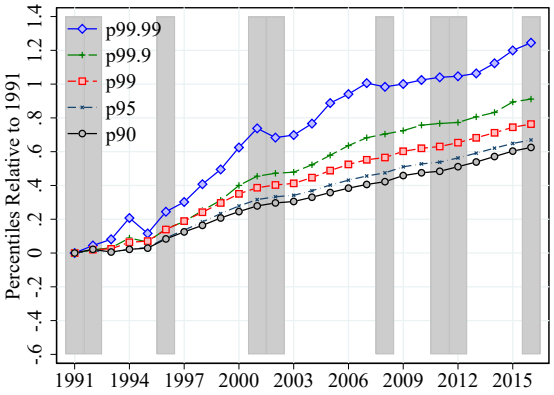
(a) Earnings, Men



(b) Earnings + Capital Income, Men



(c) Earnings, Women



(d) Earnings + Capital Income, Women