INCOME DYNAMICS IN SWEDEN 1985-2016

Benjamin Friedrich
Lisa Laun
Costas Meghir

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. Earnings dynamics differ substantially by gender, education, and origin. Men face lower volatility than women, but their earnings growth is more closely tied to the business cycle. Earnings volatility is also higher among high-educated and foreign-born workers. 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.

Benjamin Friedrich
Kellogg School of Management
Strategy Department
2211 Campus Drive
Evanston, IL 60208
benjamin.friedrich@kellogg.northwestern.edu

Lisa Laun
Institute for Evaluation of Labour Market
and Education Policy (IFAU)
Box 513
SE-751 20 Uppsala
Sweden
Lisa.Laun@ifau.uu.se

Costas Meghir
Department of Economics
Yale University
37 Hillhouse Avenue
New Haven, CT 06511
and IZA
and also NBER
c.meghir@yale.edu

An online appendix is available at http://www.nber.org/data-appendix/w28527

1 Introduction

Income inequality in Sweden is low compared to other OECD countries, but has been increasing quickly over time (OECD, 2011, Aaberge et al., 2018). These patterns for disposable income are jointly driven by changes in labor market dynamics, taxation, and social welfare programs. Understanding the role of labor market earnings is crucial because earnings dynamics determine how careers are shaped and thus play a central role for individual workers' exposure to risk and uncertainty over the business cycle and over their careers. In addition, earnings volatility and career trajectories may differ across population groups and may contribute to persistent disadvantages for women and less-educated workers. Understanding these differences is important for better targeting of redistribution and active labor market policies. These questions are particularly topical given the recent increase in low-skill immigration that may pose additional challenges for policymakers.

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.

This paper documents patterns of earnings inequality and volatility for Sweden over 1985–2016 for the core labor force, aged 25–55. To facilitate cross-country comparison, we harmonize the sample according to GIDD[1] guidelines. In the first part, we document aggregate trends, business-cycle fluctuations, and level differences in earnings dynamics by gender. In addition, we exploit the long panel data to analyze inequality and volatility of earnings at labor market entry and throughout the life cycle, comparing cohorts over three decades. To measure earnings inequality, we mainly use percentile ratios of log earnings. To measure earnings volatility, we analyze the distributions of 1-year and 5-year residualized earnings growth. In the second part, we first distinguish outcomes by education and analyze earnings dynamics for the large and growing immigrant population. Compositional changes of these groups in the overall workforce may also help explain aggregate trends. To provide a more comprehensive perspective on income dynamics for vulnerable sub-populations and the full labor force, we then investigate the role of labor market attachment and social insurance in mitigating earnings inequality and volatility. In this context, we further analyze the link

---

[1]Global Income Dynamics Database Project.

between benefits usage and earnings volatility, and we shed light on the role of declining benefits take-up for broader trends in earnings dynamics.

Sweden experienced a deep recession in the early 1990s, which changed the trajectory of earnings dynamics in important ways. Compared to a very stable period with low inequality in the 1980s, Sweden saw a massive increase in earnings inequality through high unemployment and weaker labor market attachment. Dispersion in earnings quickly widened for both incoming cohorts and older low-income workers. While the recession hit low-income male workers immediately, losses were smaller but the recovery began later for women. The recession and the recovery had long-lasting implications for earnings dynamics in Sweden. Following the recession, Sweden stands out as a country with steady and fast growth across the entire earnings distribution for men and women over more than 20 years. These real gains were accompanied by decreasing earnings inequality over time, driven by catch-up growth among low-income workers most affected by the recession.

In addition, earnings volatility changed substantially in the 1990s, and again our analysis reveals important differences by gender. While the size of large negative earnings changes for men and women spiked during the 1990s recession and quickly declined afterwards, we find a second, massive increase in positive and negative earnings shocks for women in the late 1990s, followed by a steep decline in volatility in the 2000s. In general, men face lower earnings volatility than women, but their earnings growth is more closely tied to the business cycle, as evidenced by a larger decline in skewness of earnings growth during recessions. Consistent with an overall positive shift in earnings, skewness of earnings growth shows an upward trend over time, while maintaining a procyclical pattern.

Taken together, the first part of the analysis reveals encouraging trends on real earnings gains, with a massive increase in earnings over time across the entire income distribution, as well as reduced inequality and volatility in earnings over time following the 1990s recession. The differences by gender and trends over time point to differences in labor market attachment and an important role of social benefits, which motivates the second part of our analysis. The development of earnings inequality and volatility among subpopulations is important for the understanding of how the labor market has functioned over time and to shed light on differences in self-sufficiency. At the same time, focusing on earnings and excluding social insurance will overstate the amount of inequality and labor market risk individuals face. Thus, analyzing the separate roles of the underlying labor market dynamics and the generous Swedish social welfare system helps furthering the understanding of the drivers of inequality and volatility in consumption possibilities and welfare.

Starting with differences in earnings inequality, we find, perhaps surprisingly, that real earnings gains over 1985–2016 have been similar across education groups. Yet, earnings

2

inequality is larger among immigrants than among natives across all gender-education groups. For low educated workers, this difference is mainly driven by a longer left tail of low earnings among immigrants, while a small share of high educated immigrants also achieve very high earnings. We also document additional polarization among low-income immigrants. While high-skilled immigrants in the bottom part of the earnings distribution experienced larger gains than highly educated native workers, low-income immigrants with low education fared worse than their native peers.

We then turn to earnings dynamics and find systematically higher earnings volatility for highly educated workers. Yet, earnings growth is more left skewed for low educated workers, suggesting a longer tail of negative shocks and/or fewer large positive shocks. While the skewness of earnings growth is procyclical for all gender-education groups, low-educated men experience the largest negative shocks during recessions. These differences by education groups suggest that the secular increase in educational attainment may have somewhat counteracted the aggregate decline in inequality and volatility of earnings we document. In addition, we document that immigrants face much higher earnings volatility. This pattern is driven in part by educational polarization among immigrants: We find both a high share of low-skill workers with unstable employment relationships and a high share of high-skill immigrants with substantial earnings growth.

Labor market attachment and annual hours worked play a key role in interpreting differences in earnings dynamics by gender, education, and origin. To make this point, we first show that trends in earnings inequality cannot be explained by trends in wage inequality; in particular, wage inequality among women has been increasing since 1990 whereas earnings inequality for this group peaked around 2000 and has decreased steeply since then. 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.

A reduction in annual hours worked often goes along with participation in a welfare program. Since work-related benefits are replacements of labor earnings, entry to and exit from social welfare programs may contribute significantly to earnings volatility. We measure level and trends in benefits usage across sub-populations in order to illustrate the link between social insurance and earnings dynamics. Benefits enrollment matters especially at the 10th percentile of the earnings distribution, where workers receive 30–50% of their income in social benefits. Entering or exiting benefit programs is associated with large changes in earnings that can account for a substantial share of large earnings changes, especially for women. Higher benefits enrollment among women and foreign-born men contributes to

higher earnings volatility among these groups. Yet, a faster decline in benefits enrollment among foreign-born workers over time may also help explain faster earnings growth among low-income immigrants.

Finally, we assess the extent of social insurance by analyzing total work-related income, defined as the sum of earnings and work-related benefits, as well as after-tax disposable income. We find that disposable income inequality is 30% lower than earnings inequality, largely because of the insurance mechanism of work-related benefits. Yet, this insurance channel as well as broader redistribution mechanisms have been decreasing over time: While earnings inequality has decreased at least since 2000, previous work has documented a substantial increase in disposable income inequality in Sweden over time, concurrent with social welfare reform reducing redistribution (Aaberge et al., 2018). We confirm these established facts and complement existing studies with evidence on increasing volatility in individual disposable income. This trend was opposite to the declining trend in earnings volatility in the second half of the 2000s. 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. At the same time, the results on decreasing social insurance raise important equity concerns for groups with high benefits take-up: women, immigrants, and low-educated workers. These findings emphasize the importance of a comprehensive analysis of welfare systems and labor market outcomes to understand dynamics 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 education building on 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. 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.

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 (2017) who document a decrease in global earnings inequality over the last two decades.

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 education and 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, for the period 1985–2016. Our main measure of earnings is annual individual labor earnings

including positive self-employment income, which is uncensored. We define employment as having total annual earnings of at least 1.5 times the monthly earnings at the retail minimum wage, and include all employed workers aged 25–55 during 1985–2016.[2] We deflate all earnings using the CPI with base year 2018 and conduct the main analysis in local currency.[3] We also use demographic information on age, gender, education level and marital status from LOUISE. 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 *No college* consists of individuals with elementary or high school education and *College* consists of individuals with at least some college education.[4] Immigrants are defined by region of birth in administrative registers provided by Statistics Sweden, distinguishing Swedish-born and foreign-born individuals.

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 due to, e.g., studies, military service, unemployment, parental leave, sickness and disability leave. We define the share work-related benefits in relation to total work-related income. We also use information on different benefit types, such as unemployment, parental leave, sickness and disability benefits, as well as study grants. 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 refer to a recent work period, typically during fall. The wage measure captures the full-time equivalent monthly wage rate.

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]Information on minimum wages for the retail sector has been generously provided by Per Skedinger at the Research Institute of Industrial Economics, see Skedinger (2015). The results are not sensitive to the definition of the minimum earnings threshold. The broad trends are similar although 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.

[4]Since we define education level by the maximum level achieved during the observation period, we have few individuals with missing information on education. These are assigned to the lowest education group.

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

2.2 Descriptive Statistics

The black lines in Figure 1 show the share of employed individuals aged 25–55, included in our sample, by gender and education level. First, we note that employment is high among both men and women. The high female employment rate, at above 70 percent for low-educated and above 80 percent for high-educated, sets Sweden apart from most countries. Second, we note that employment rates are higher among men and high educated workers. Third, we note that the employment rates were clearly affected by the recession in the early 1990s. Since the mid-1990s, however, employment rates have been relatively stable. The grey lines in Figure 1 show the share of individuals with positive earnings, instead of earnings above 1.5 times the monthly minimum retail wage, by gender and education level. Although the levels differ with respect to the definition of employment, the pattern is very similar. Appendix Figure A.1 shows that the drop in employment around the 1990s recession is visible across all age groups but most pronounced among the young.
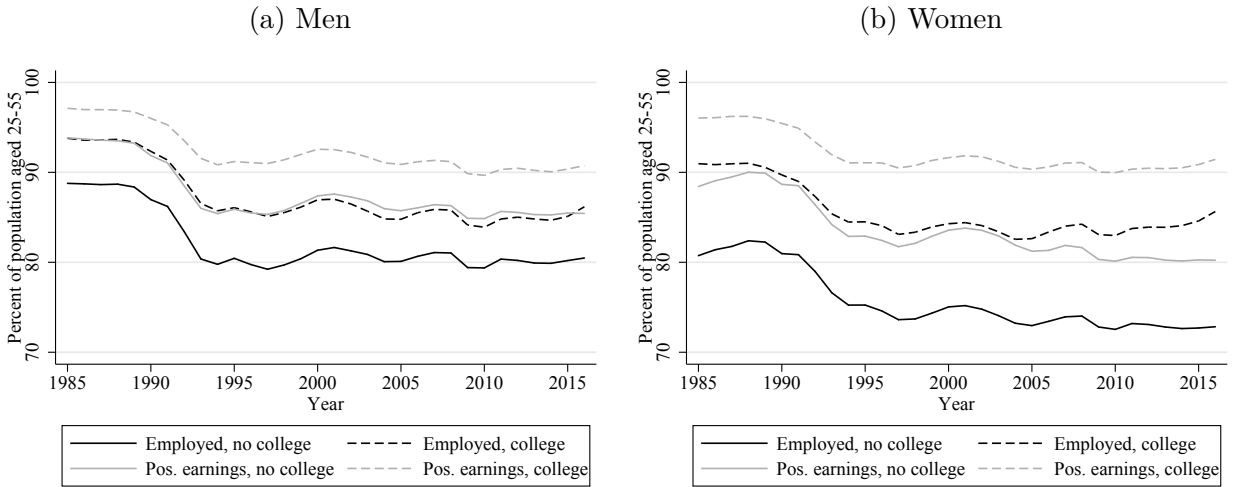
Figure 1: Employment

(a) Men

(b) Women

Table 1 provides descriptive statistics for the employed sample in 1985, 1995, 2005 and 2015. The age and gender composition is similar over time, but the work force has been changing in other dimensions. The share of college-educated workers has increased rapidly, from 28% in 1985 to 47% in 2015, and the share of foreign-born workers has almost doubled, from 9.7% in 1995 to 18.6% in 2015.

Average annual earnings, measured in real 2018 USD, have increased over time across the entire earnings distribution. 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. Also the variance,

for disposable income in particular, has increased. Benefits as a share of total work-related income has declined over time. 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. The full-time equivalent monthly wage rate, for the workers covered by the Wage Structure Statistics, has also increased substantially over time. Appendix Figure A.2 shows a continuous increase in the wage rate since 1995. It also shows that the share of part-time workers gradually declined among women and remained stable for men.

Table 1: Descriptive statistics

	1985 (1)	1995 (2)	2005 (3)	2015 (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
College education	0.281	0.347	0.422	0.470
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

Note: All income measures in the table are reported in real 2018 USD.

Table 1 showed that Sweden has experienced a large increase in its immigrant population over the observation period. Figure 2 shows the development over time. The left panel shows a large and continuous increase in the immigrant share in the full population during the observation period. The share foreign-born among employed workers, included in our sample, took off only from around 2000 and doubled in 15 years. The level difference between the full population and the employed sample indicates that employment is lower in the foreign-born population than among natives. The right panel shows that the increase in the

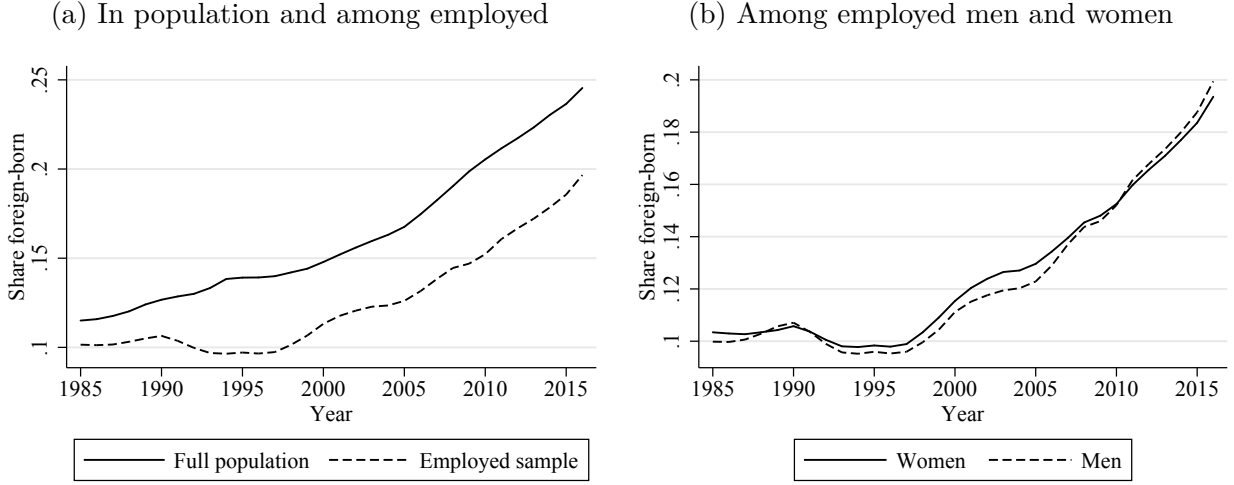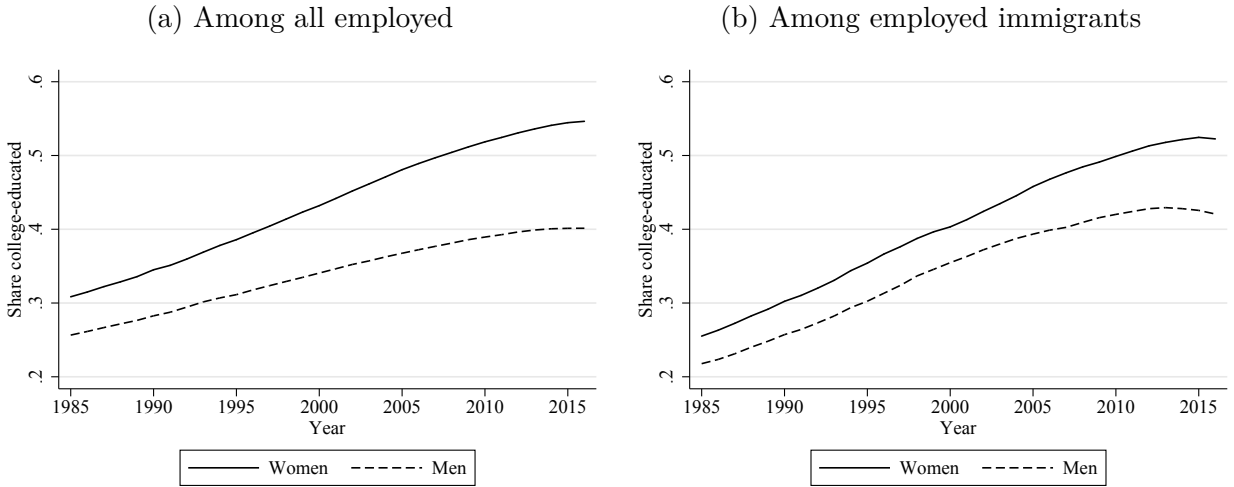Figure 2: Share Foreign-Born Among Individuals Aged 25–55

(a) In population and among employed

(b) Among employed men and women

Figure 3: Share College-Educated Among Individuals Aged 25–55

(a) Among all employed

(b) Among employed immigrants

share of foreign-born among employed workers is very similar among men and women.

Table 1 also showed a rapid increase in educational attainment over time. The left panel of Figure 3 shows that the share of employed individuals aged 25–55 with at least some college education has been continuously increasing over time. For women the share increased from 30% in 1985 to 55% in 2015, while the male share increased from 25% to 40%. The right panel shows a similar pattern in the employed immigrant population, with an even larger increase in the share college-educated workers. Distinguishing finer education groups in Figure A.3 suggests increasing polarization of the immigrant population in a growing share with 3-year college or PhD education, and a large share with less than 9 years elementary school.

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.

During the 1980s, the unemployment rate in Sweden was very low at around 2 percent and labor force participation was high. In 1991, the Swedish economy was hit by a deep recession and the unemployment rate increased sharply to above 10 percent in 1993.[6] 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 unemployment rate declined eventually, but has been permanently higher compared to pre-crisis levels. As could be seen in Figure 1, the 1990s crisis led to a large and lasting drop in employment. In contrast, other recessions had modest macroeconomic implications. The 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.

Union density is high in Sweden and unions play an important role in wage setting and bargaining. Collective agreements typically extend 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 the discussion in Skans et al. (2009). Some negotiations returned to the national level in 1997, when the so-called Industrial Agreement (IA) was signed between the blue-collar and white-collar 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 parts of the service sector and in the public sector, which were concluded in 2000 (Elvander, 2002). This coordination in wage bargaining across industries has been combined with a stronger local influence (Skans et al., 2009). In the public sector, for example, rigid wage scales have been abandoned in favor of tailoring wage adjustments to local needs.

The Swedish tax system has also undergone important changes during the period under study (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, which is part of our country-specific analysis in section 4 of the

---

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

paper. In 1991, Sweden implemented the "tax reform of the century", which lowered marginal income tax rates and substantially reduced progressivity in the tax system.[7] Another change in labor taxation are 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. The EITC aimed to increase work incentives by introducing a tax wedge between labor and transfer income (see, e.g., Laun (2017)).

Also the generosity of the welfare system affects incentives to work. Sweden has an encompassing welfare system with comparatively generous public transfers. The fiscal consolidation following the 1990s crisis also affected the benefit systems. As could be seen in Table 1, 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 benefits systems are price indexed or even expressed in nominal terms, which implies an erosion of the value of benefits relative to earnings even without any reforms.[8] Figure A.5 shows substantial variation in the average real value and take-up of different benefits types over time. The overall generosity of the unemployment insurance has fallen since the 1990s, both in terms of the replacement rate and the ceiling. Around 2000, the unemployment insurance became somewhat more generous again, but still less so than before the 1990s crisis. The ceiling in the unemployment insurance remained constant in nominal terms from 2002 until 2015, which implies an erosion of the UI system. The large variations in sickness and disability benefits are primarily due to changes in stringency over time (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 benefits 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.

3 Main Results: Earnings Inequality and Dynamics

In this section, we provide evidence on earnings dynamics in Sweden by gender for a standardized comparison across countries. While ignoring the direct role of social insurance, the focus on annual earnings rather than total income or wealth helps understand how careers are

---

[7]A second key component of this reform was the introduction of separate taxation of capital and labor income, with a flat tax rate on capital income of 30 percent and special rules for translating labor income to capital income for certain firms. 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.

[8]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.

Figure 4: Changes in Percentiles of the Log Real Earnings Distribution

(a) Men
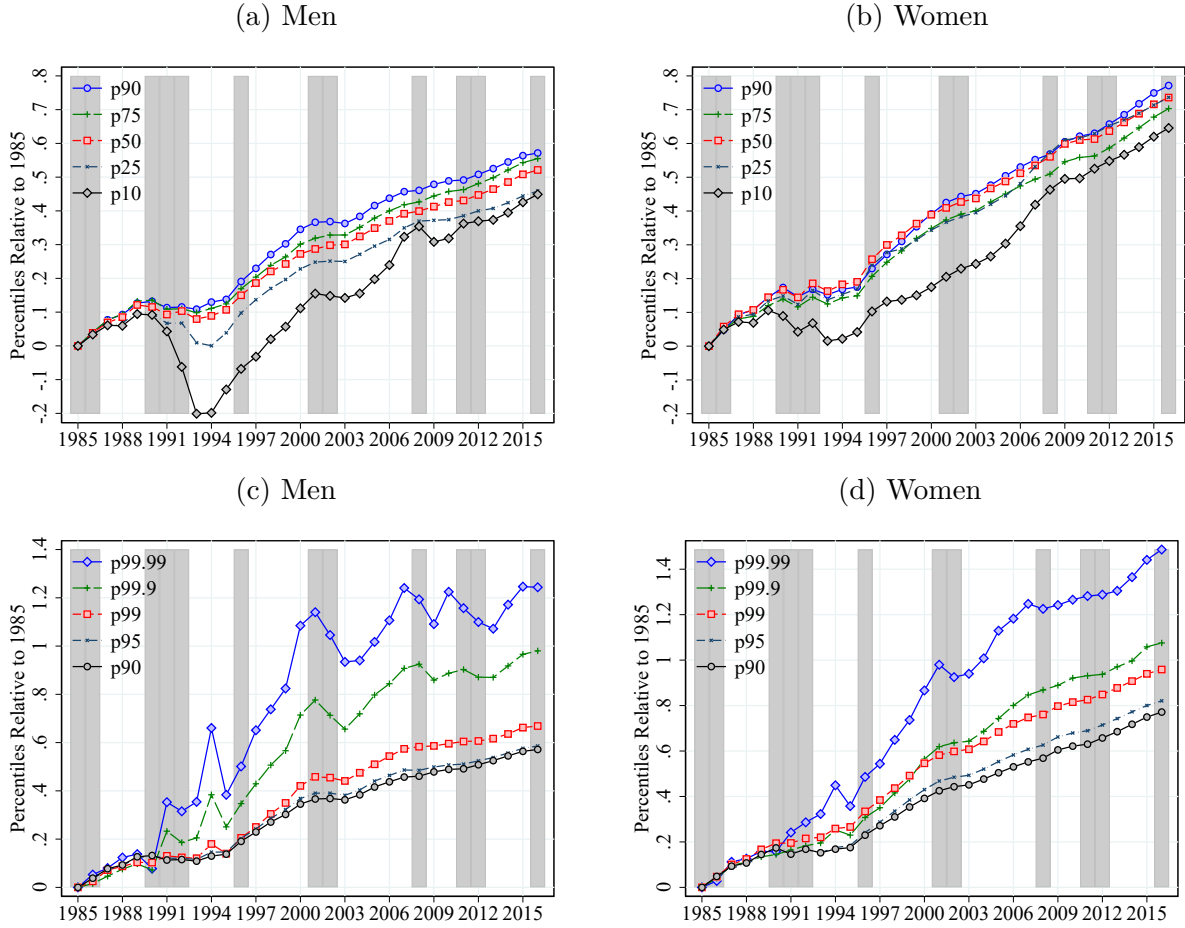
(b) Women

(c) Men

(d) Women

Notes: *Using raw log earnings and the CS+Tmax sample, Figure 4 plot 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.*

shaped and emphasizes the central role that the labor market plays for individual workers' exposure to risk and uncertainty.

3.1 Earnings Inequality

Figures 4a and 4b tell two key stories for Sweden over the last decades: First, Sweden stands out as a country that experienced steady growth across the earnings distribution for men and women over more than 20 years since after the recession in the early 1990s. Median log real earnings have increased by two-thirds for men and doubled for women between 1985 and 2016, see Figures 4a and 4b respectively. Even workers at the 10th percentile of the distribution experienced real gains of 65% for women and 45% for men. Figures 4c and 4d further show that gains at the top of the distribution, between the 90th and 99th

percentile, were only slightly larger than for the median worker. Only the top 1 percent of the distribution for both men and women stands out with much larger real gains relative to 1985.

Second, the recession in the early 1990s had large and long-lasting implications for low-income workers. Men at the 10th percentile of earnings lost 20% relative to their income in 1985 during the 1990s recession, and despite experiencing the fastest growth rate over the last decades, the bottom of the male earnings distribution only fully made up for these differential losses until the financial crisis. Losses were much 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 female employment in 1993 to 49% in 2000, see Figure A.4).

Earnings inequality, measured as the variance of earnings or the earnings gap between the 90th and 10th percentile of the earnings distribution (90–10 gap), was low at the end of the 1980s and increased dramatically for men and less for women during the recession 1991–1993, see Figure 5. After this deep recession, earnings inequality gradually declined. For men, measures of earnings inequality decreased immediately after the peak in 1994 and continued to decrease gradually until today. For women, the increase in inequality continued throughout the 1990s and only declined after 2000, matching the delayed impact in the bottom of the distribution in Figure 4b.

As expected based on Figure 4, splitting the 90–10 gap into the difference between the 90th percentile and the median (90–50 gap) and the difference between the median and the 10th percentile (50–10 gap) in the lower panel of Figure 5 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.

Since social benefits provide an important source of additional income for workers in the bottom tail of the earnings distribution, we will analyze their role in mitigating earnings inequality in more detail in section 4. 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.
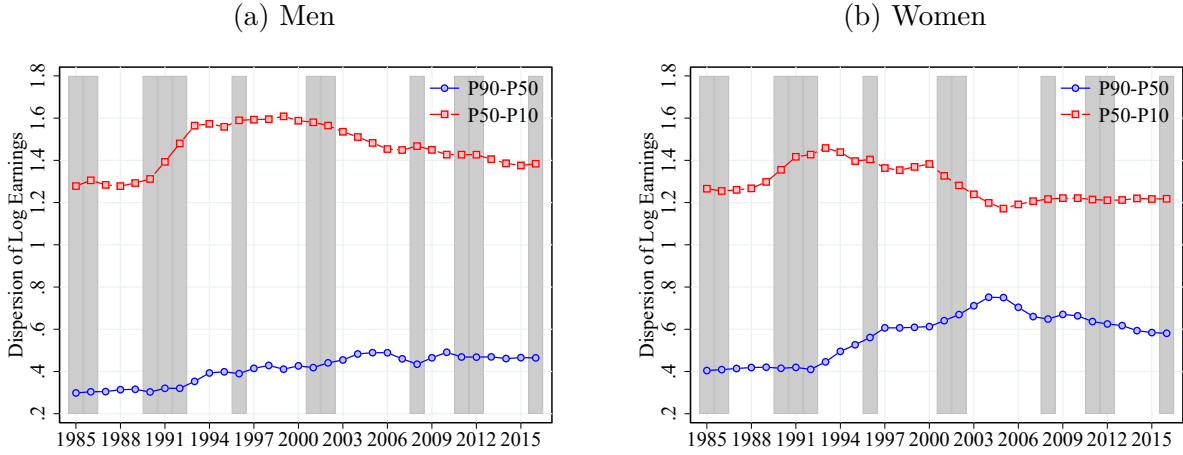
Figure 5: Income Inequality

(a) Men
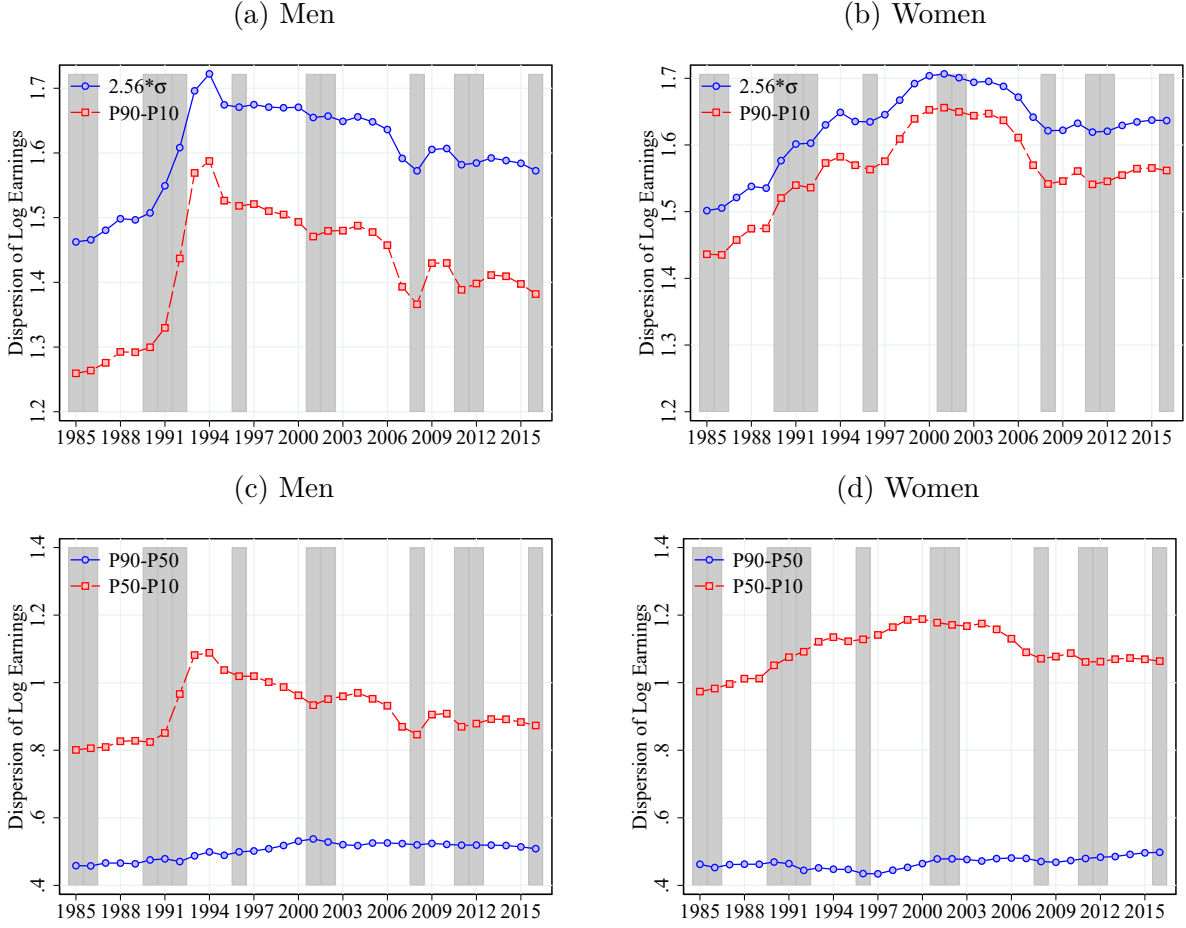
(b) Women

(c) Men

(d) Women

Notes: *Using raw log earnings and the CS+TMax sample, Figure 5 plot 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.*

Figure 6 illustrates that the trends in inequality over time are also reflected by initial earnings dispersion at labor market entry. Specifically, the earnings gap between the 10th and 50th percentile of earnings at age 25 for both men and women increased substantially during 1990–93 and gradually declined afterwards. In contrast, initial inequality in the upper half of the distribution increased throughout the 1990s. At its peak for women in 2005, the 90–50 earnings gap at age 25 was twice as large as in the early 1990s, while the increase for men was somewhat smaller. Yet, the patterns for the 50–10 gap dominate for the aggregate trends because the 90–50 gap in earnings only accounts for 20–30% of the overall 90–10 gap at age 25.

In interpreting earnings patterns at age 25, it is important to keep in mind that educational attainment increased substantially over the 1990s, in particular incentivized through generous study grants. Hence, part of the increased earnings dispersion at young ages may

14

Figure 6: Income Inequality: Initial Conditions

(a) Men

(b) Women

reflect an increase in the share of young workers attending formal education while working part-time or part-of-the-year. Consistent with this, we find a steep life-cycle increase in earnings between age 25 and 35 for men across the entire distribution (see Appendix Figure A.13). Since these gains are highest for the bottom of the earnings distribution at young ages, Figure 7 shows that the 90–10 earnings gap decreases with age within cohort. As we discuss in more detail in section 4.2.1 below, this trend is driven by declining inequality in annual hours worked; in contrast, wage inequality substantially increases over the life cycle.

Figure 7: Life-Cycle Inequality over Cohorts
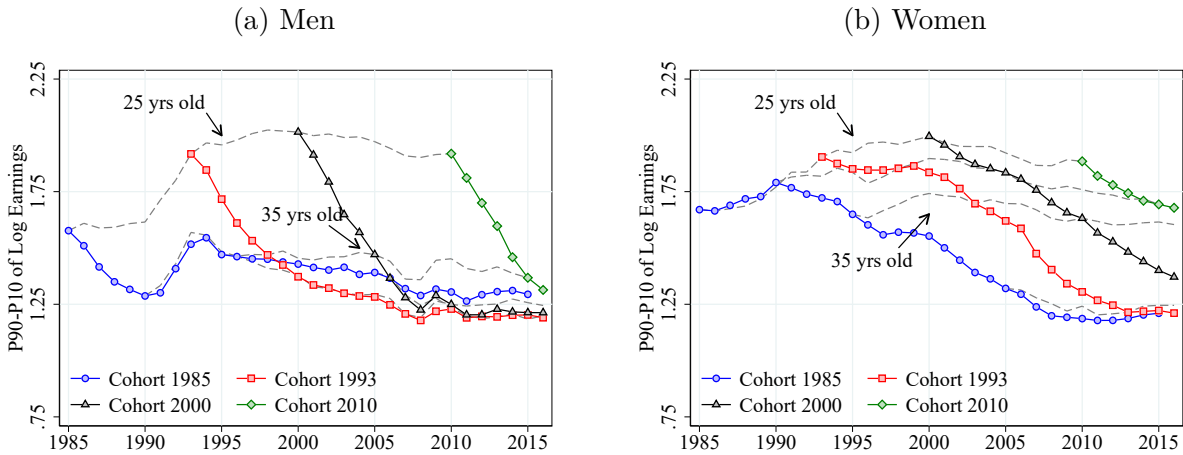
(a) Men

(b) Women

3.2 Earnings Volatility

After documenting cross-sectional patterns in inequality over time and by age within cohorts, 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 wages between consecutive years, $g_t = \epsilon_{t+1} - \epsilon_t$. The residualization removes any gender-age-specific differences in earnings, see Appendix A for details.

3.2.1 Dispersion of Wage Growth

We start by analyzing the 90–50 gap and 50–10 gap in 1-year earnings growth in Figure 8. First, we find that changes in earnings follow clear business cycle patterns. While the 50–10 gap is counter-cyclical as it increases substantially during recessions, the 90–50 gap is strongly pro-cyclical. This implies that earnings losses become larger and earnings gains smaller during recessions. This cyclicality of earnings growth is most pronounced around the 1990s recession and is less visible during subsequent recessions after 2000. 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.

Second, we find 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. We will return to these differences in the next section where we compare these patterns for wages and including work-related benefits.

Third, focusing on broader trends using the 90–10 gap of earnings growth in Figures 8c and 8d, the period between the mid-1990s and the mid-2000s is important in Sweden, in particular for women. Until 2000, we find a sharp increase in both the 90–50 and the 50–10 gap 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, in particular 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, and as we show in section 4, 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.

16

Figure 8: Dispersion in 1-Year Log Earnings Changes

(a) Men

(b) Women

(c) Men
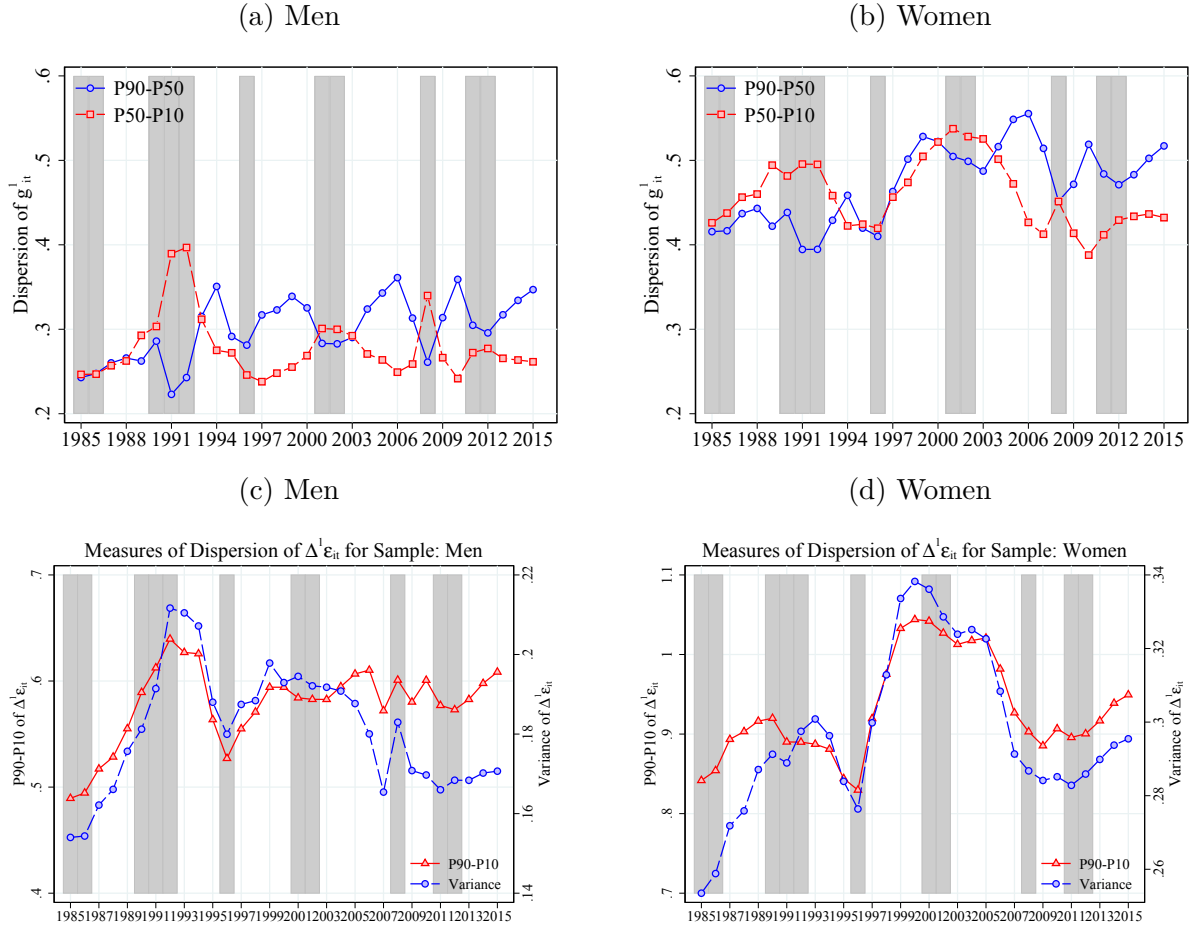
(d) Women

Notes: *Using residual one-year earnings changes and the LX sample, Figure 5 plot against time the following variables: (a) Men: P90-10 differential, (b) Women: P90-10 differential. Shaded areas are recessions.*

Finally, one-year earnings growth may reflect both transitory and permanent shocks. Using five-year wage growth to highlight permanent changes, we again find substantially higher volatility for women whose 90–50 gap in earnings growth increased until the financial crisis in the late 2000s, while the 50–10 gap dropped sharply in the mid-2000s, see Appendix Figure A.14. At the same time, we document striking differences in trends for men compared to the short-term results: While the one-year 90–50 gap increased slowly throughout the period, we find a gradual decline in the five-year 90–50 gap for men after the 1990s recession. This contrast is for example consistent with a higher share of variable pay components that increase short-term volatility but matter less for earnings growth over a longer time horizon. It is also consistent with short-term benefits usage, for example for parental leave or sickness leave that dominate short-term earnings fluctuations but account for a small share of longer-term earnings changes.

3.2.2 Higher-Order Moments

Next, we turn to higher-order moments of the earnings growth distribution. To measure its asymmetry, we consider the coefficient of skewness, i.e., the third standardized moment $E\left[\left(\frac{X-\mu}{\sigma}\right)^3\right]$, and the Kelley skewness of earnings changes, defined as $\frac{(P90-P50)-(P50-P10)}{P90-P10}$. Across both measures, zero skewness indicates a symmetric distribution of positive and negative shocks. The difference is that the Kelley measure only uses the distance of the 10th and 90th percentile from the median. Hence, positive (negative) Kelley skewness indicates that the 90–50 gap accounts for a larger (smaller) share of earnings growth dispersion than the 50–10 gap, while completely ignoring the role of tail events in the top and bottom 10 percent of the distribution. In contrast, the coefficient of skewness includes these cases and yields a somewhat less transparent measure of asymmetry of earnings growth, where negative skewness can be driven by both more frequent and larger negative shocks, but extreme events receive the largest weight.

The first column of Figure 9 plots skewness of one-year residual earnings growth by gender over time. The Kelley skewness is close to zero or positive in most years, with the exception of the 1990s recession and the financial crisis 2008. This result maps directly to the ratio of the 90–50 and 50–10 gap in earnings growth in Figure 8. The data further suggest an increase in skewness over time. This pattern reflects larger positive than negative shocks at the individual level, consistent with the overall increase in real earnings in Figure 4. The coefficient of skewness is negative, highlighting the role of large negative outliers, but this measure also displays a positive trend over time. Taken together, these patterns paint a cautiously positive picture of earnings volatility in Sweden over time as workers face relatively fewer and smaller negative shocks.

In line with the cyclical patterns of earnings growth discussed in the previous section, skewness is highly pro-cyclical, turning more negative during recessions. The magnitude of these changes in skewness over the business cycle is larger for men than for women. Hence, men face a larger deterioration in earnings growth during recessions than women. This difference is especially pronounced for the coefficient of skewness. Even though women face higher volatility overall (see Figure 8), the earnings growth distribution for men is more left-skewed during recessions and less left-skewed during growth periods. These results suggest that earnings volatility for men is more closely tied to the business cycle than for women.

To measure the tail extremity of the distribution, we use the coefficient of kurtosis, i.e., the fourth standardized moment $E\left[\left(\frac{X-\mu}{\sigma}\right)^4\right]$, and the Crow-Siddiqui kurtosis measure, defined as $\frac{P97.5-P2.5}{P75-P25}$. Intuitively, the higher the value of kurtosis, the larger are extreme tail events compared to typical earnings changes. For the Crow measure, the tails are compared to

Figure 9: Skewness and Kurtosis of 1-Year Log Earnings Changes

(a) Kelley Skewness (b) Crow-Siddiqui Kurtosis

(c) Coefficient of Skewness (d) Coefficient of Kurtosis
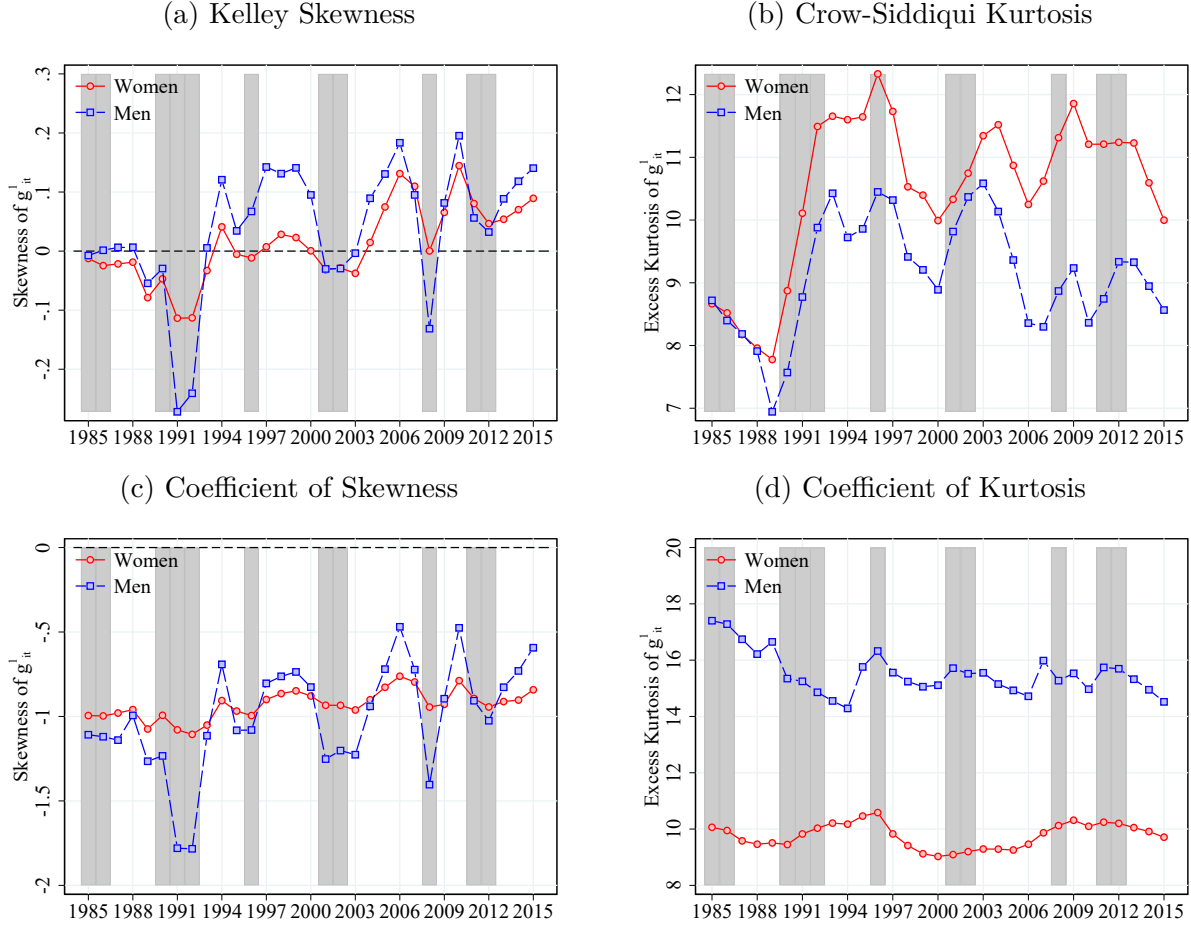
Notes: *Using residual one-year earnings changes and the LX sample, Figure 6 plot against time the following variables: (a) Men and Women: Kelley skewness, defined as $\frac{(P90-P50)-(P50-P10)}{P90-P10}$, (b) Men and Women: Excess Crow-Siddiqui kurtosis calculated as $\frac{P97.5-P2.5}{P75-P25} - 2.91$ where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for Normal distribution. Shaded areas are recessions.*

the inter-quartile range, while excluding the role of large outliers in the tails of the earnings growth distribution. The coefficient of kurtosis includes these values and puts particularly high weight on large outliers.

The right column of Figure 9 plots the two kurtosis measures for one-year residual earnings growth by gender over time. We first note that the Crow-Siddiqui kurtosis shows slightly higher levels among women. This result is entirely 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. Women more frequently face very large shocks, while men in stable jobs may often experience only small changes in earnings. This is reflected by a more compressed earnings growth range for men between the 2.5th and 97.5th percentile.

19

The comparison across kurtosis measures yields two striking insights. First, the level order by gender is reversed for the coefficient of kurtosis. Since the results for the Crow measure exclude the top and bottom 2.5 percent of earnings changes, this suggests that men experience the largest outliers in earnings growth. Second, and more importantly, the comparison reveals massive earnings fluctuations among women: The Crow-Siddiqui measure is about the same size and frequently larger than the coefficient of kurtosis. This suggests that even when ignoring the most extreme positive and negative earnings changes, many women frequently face very large changes in annual earnings.

In addition to level differences, we find a substantial decline in the Crow kurtosis for men over time, after a large spike during the 90s recession, see Figure 9b. The pattern in the Crow measure is identical for men and women until the early 1990s, but then the kurtosis for women increases more dramatically and maintains this higher level until today, showing a slower downward trend than for men. This suggests that large earnings changes become more common for women than for men over the 1990s, which could in part be explained by longer unemployment spells and more benefits usage. A faster decline in benefits receipts through UI and leave policies for men could also help explain their gradually decreasing kurtosis over recent decades.
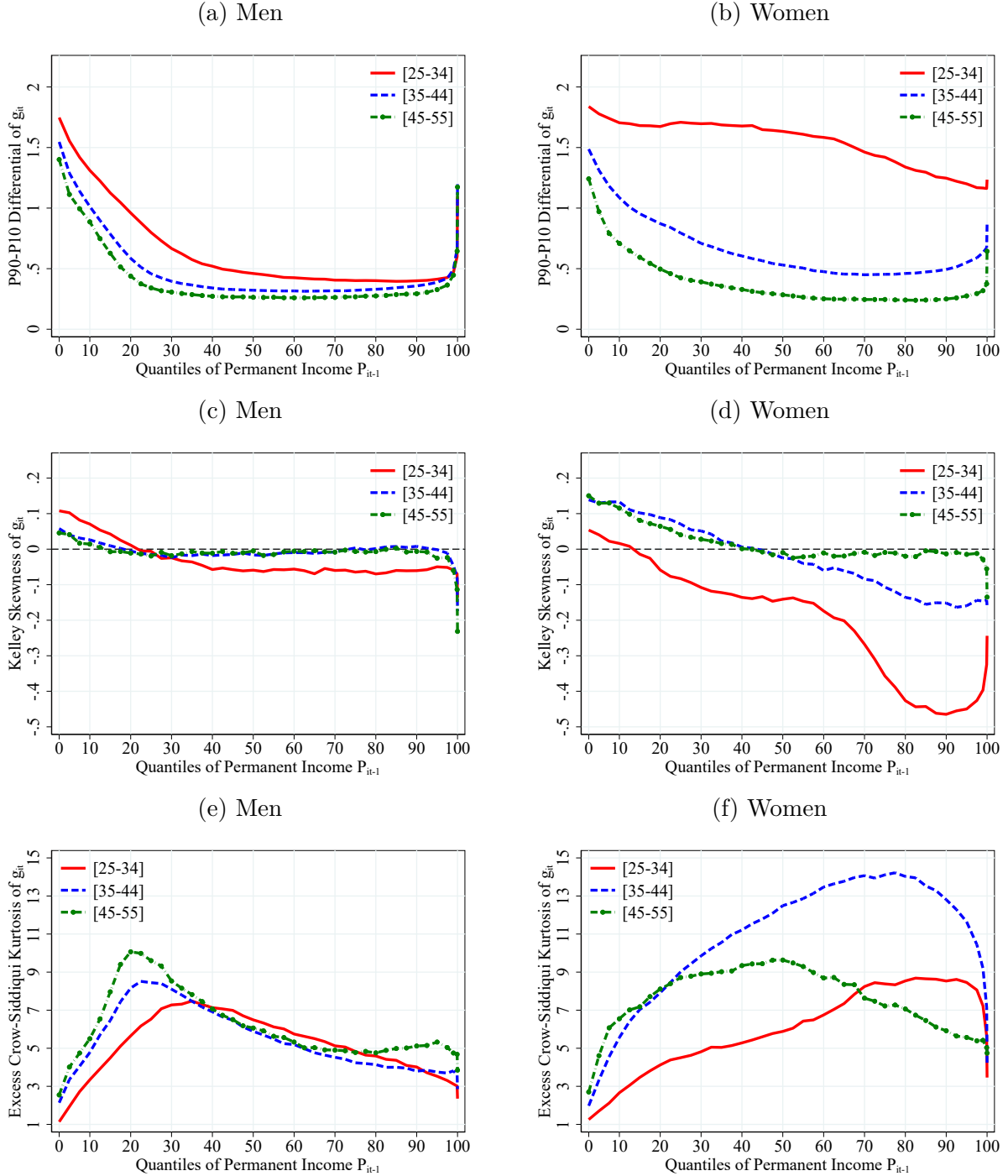
Finally, the kurtosis results suggest counter-cyclical business cycle patterns, indicating more tail events during recessions. This pattern interacts with negative skewness during recessions to increase idiosyncratic risk. Analyzing five-year earnings growth averages out some of these fluctuations and yields more stable business cycle patterns and trends, see Appendix Figure A.15. Specifically, we find a persistent downward trend in the Crow measure for men and women over time. Yet, at the same time, the coefficient of kurtosis remains relatively stable with counter-cyclical fluctuations.

In sum, we find an encouraging development of earnings volatility over time, with workers facing relatively fewer and smaller negative earnings shocks. We also document substantial differences in the level and cyclicality of earnings volatility between men and women, with higher volatility for women but a closer connection to the business cycle for men. As we discuss in detail in section 4.2, changing enrollment in benefit programs over time may help explain broader trends in earnings volatility.

3.2.3 Heterogeneity by Age and Income

To shed light on differences in earnings dynamics over the life-cycle and depending on income level, we now analyze earnings volatility by age and permanent income percentile, using average earnings over the last three years to rank individuals across the distribution (see Appendix A for details).

Figure 10: Dispersion, Skewness, and Kurtosis of 1-Year Log Earnings Changes

(a) Men

(b) Women

(c) Men

(d) Women

(e) Men

(f) Women

The first row of Figure 10 shows higher dispersion of one-year earnings growth for younger workers conditional on income. In addition, we document a U-shape pattern of volatility in permanent income conditional on age, with a large and gradual decrease in the bottom tercile of the permanent 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.[9] One exception to the U-shaped pattern are young women whose earnings dispersion decreases gradually and linearly in income. Importantly, young women face substantially higher dispersion than young men across the entire income distribution.

Figures 10c and 10d analyze skewness of earnings changes by gender, income, and age group. Here, the gender differences are again striking. Kelley skewness for men is largely flat around zero, and only young men face considerable 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 10b, 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. These patterns are 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 10e and 10f. 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. The increase is largest for older workers, consistent with fewer changes in earnings, but there are no differences by age for men above the 30th percentile of permanent income.[10] For women, the kurtosis patterns differ substantially in level and turning point of the U-shaped curve by age. 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

---

[9]We also note that these patterns are slightly more pronounced for five-year earnings growth, see Figure A.16.

[10]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.

Figure 11: Evolution of 10-Year Mobility Over the Life Cycle

(a) Men (b) Women
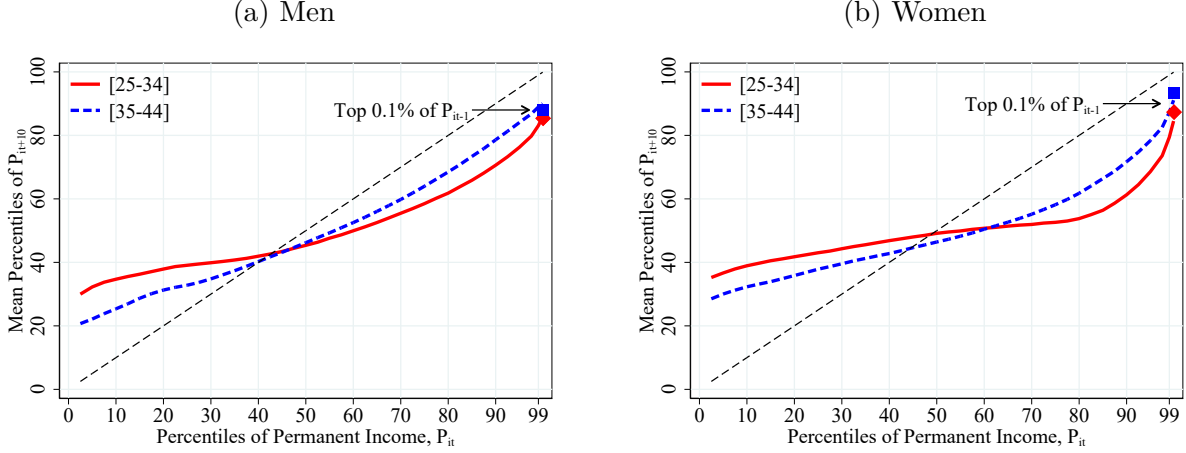
Notes: *Figure 11 shows average rank-rank mobility over 10 years by computing average percentiles of permanent income, P_{t+10} ten years later for workers in each permanent income percentile in the base year. The figure separately plots mobility for workers in age groups 25–34 and 35–44 in the base year and averages over the results for each available base year 1985–2005.*

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 take longer leave of absence and switch to part-time work. We get back to this in Section 4.2.

3.3 Mobility

We also find evidence of different labor market dynamics for men and women when analyzing 10-year mobility in permanent income by age group. Specifically, Figure 11 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 year, and define age cohorts in that year whom we track over ten years.

The results show systematically higher mobility for 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 age group 35–44, the mobility pattern is weaker, especially at the top, but still substantial. For men of the same age group, we find somewhat lower mobility, suggesting a more linear career progression than for women. One interpretation of these differences is that men sort into career paths

Figure 12: Evolution of 10-Year Mobility Over Time

(a) Men   (b) Women
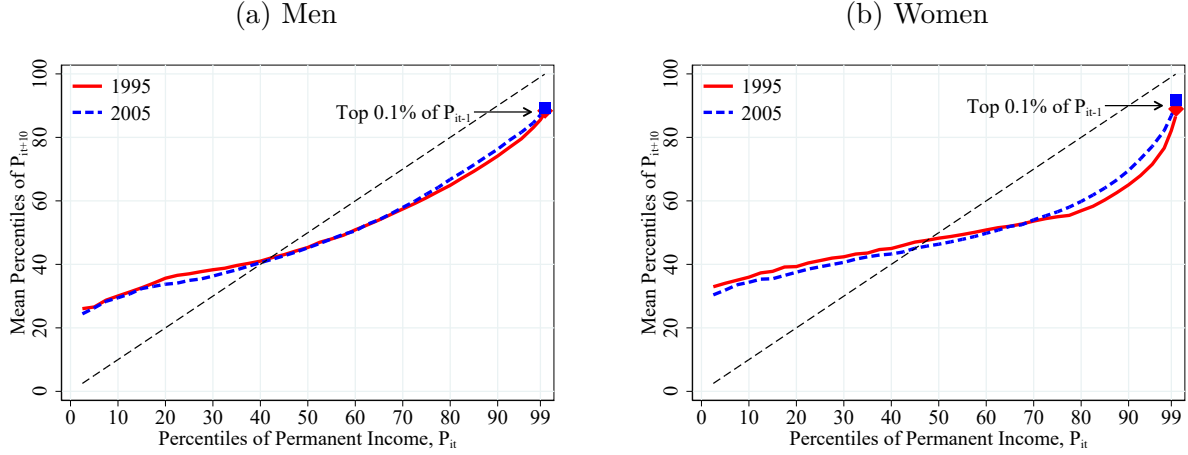
Notes: Figure 12 shows average rank-rank mobility over 10 years by computing average percentiles of permanent income, P_{t+10} ten years later for workers in each permanent income percentile in the base year, using two alternative base years 1995 and 2005 and averaging over all age groups.

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, since mobility is more pronounced above the median for women, highly talented women seem likely to occupy lower income percentile early in their careers.

Figure 12 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 high-educated women 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 sorting by education and income may contribute to the slight reduction in mobility for women over time, but instead of decreased social mobility, this mechanism may reflect stronger attachment of women to the labor market and better career outcomes for talented women.

4   Country-Specific Part

The most striking patterns that emerge from section 3 are (i) the massive increase in earnings over time across the entire income distribution, (ii) initially increasing and then decreasing earnings inequality and volatility over time with a turning point around 1995 for men and 2000 for women, and (iii) substantial differences in level and cyclicality of earnings volatility by gender. This section aims to shed more light on the underlying drivers of these trends

and differences.

First, one important driver of real gains in earnings may be an increase in average educational achievement, combined with increasing skill premia. This suggests that despite the dominant aggregate trend, these gains may have been distributed far from evenly across education groups. In addition, 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 (Åslund 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 low-skilled and foreign-born workers differ from or contribute to overall trends.

Yet, since the Swedish labor market features a large extent of social insurance through unemployment insurance, sickness and parental leave benefits, as well as disability insurance, earnings only provide a partial and potentially misleading view of labor market risk. To provide a more comprehensive perspective on income dynamics, section 4.2 further analyzes the role of the Swedish welfare system in mitigating earnings inequality and volatility. Specifically, we compare benefits usage across subpopulations and investigate how changes in the welfare system over time can help explain the trends in inequality and volatility in section 3.

4.1 Composition of the Labor Force

### 4.1.1 Earnings Inequality by Origin and Education

This section analyzes differences in earnings dynamics and trends by educational attainment and origin. Figure 13 first documents, perhaps surprisingly, that real earnings gains over 1985–2016 have been similar across education groups.[11] As Appendix Figure A.25 shows, only high-educated workers at the very top of the distribution experienced much larger gains than low-educated workers, and the difference is especially pronounced for men.

Figure 13 also reveals a surprisingly deep and long-lasting impact of the recession in the early 1990s on highly educated workers, especially men. While high-educated workers at the 10th percentile only caught up with the large growth in the rest of the distribution recently, low-educated workers at the 10th percentile recovered much more quickly and had reached the same total growth as higher income percentiles by the mid-2000s. Put differently, low-

---

[11]As described in Section 2.1, education level is determined by the maximum education level achieved during the observation period. This helps defining employment level for the immigrant population, who often lacks education information during the first years in Sweden. It also helps analyzing earnings dynamics for education groups that are consistent over time.

Figure 13: Income Percentiles by Gender, Education and Origin

(a) Low-Educated Men
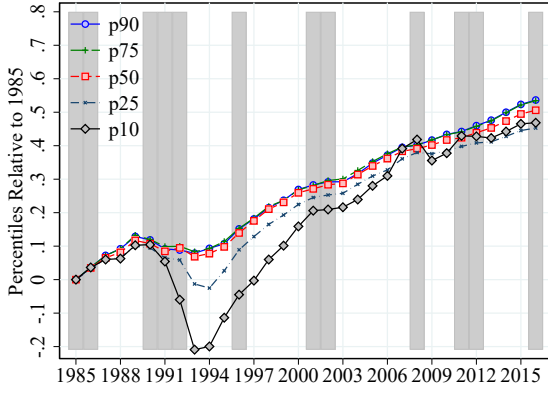
(b) High-Educated Men
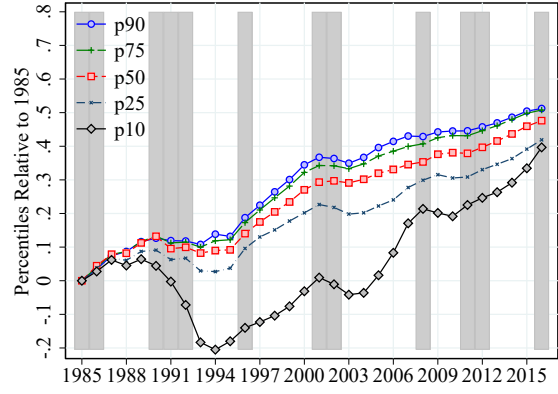
(c) Low-Educated Women
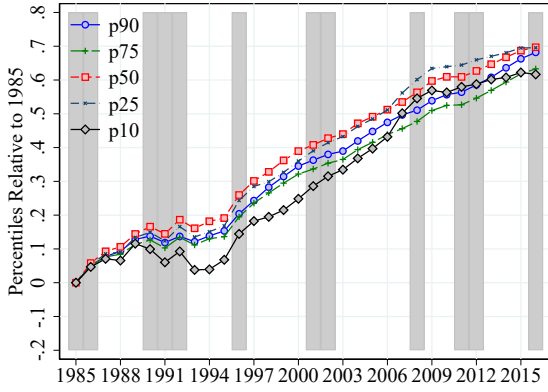
(d) High-Educated Women
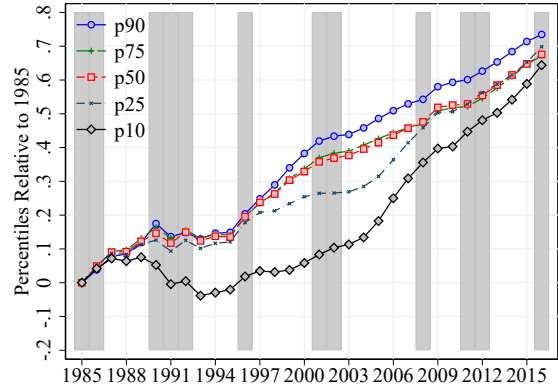
(e) Foreign-Born, Low-Educated Men
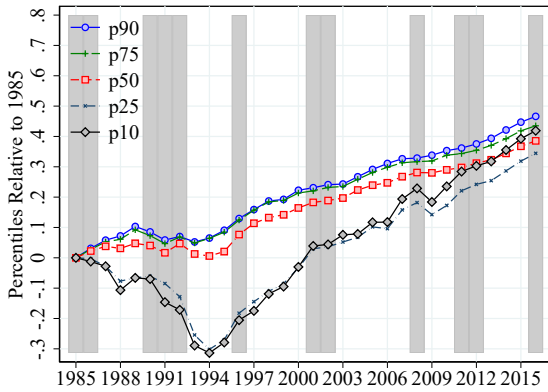
(f) Foreign-Born, High-Educated Men
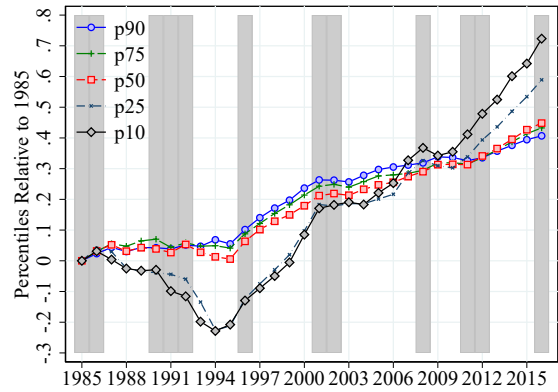
Notes: Using raw log earnings and the CS+Tmax sample split by education and gender, Figure 13 plots P10, P25, P50, P75, P90 of log earnings for men against time, separately by gender, education and origin. All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions. High education is defined as at least some college education.

income low-educated workers experienced exceptionally high earnings growth between the mid-1990s and the mid-2000s, whereas the bottom tail of high-educated workers received the large gains over the last two decades.

We complement Figure 13 with levels of earnings dispersion by education groups in Appendix Figures A.26 and A.27. One important point to note is that income inequality is substantially larger for high-educated workers. For men, this difference is particularly pronounced with a 20% larger 50–10 gap and a 50% larger 90–50 gap. In addition, these supplementary figures further stress differences in inequality trends by education. For all gender-education groups, the 90–50 gap remains remarkably stable over three decades. Yet, dynamics in the bottom half of the distribution differ, because of differences in timing of catch-up growth after the 1990s recession for men, and because of broader trends for women. For low-educated women, the 50–10 gap remains quite stable over time. For all other groups, we find a substantial decrease in the 50–10 gap starting in the mid-2000s; for high-educated women this decline continues back to the level of the mid-1985s by 2016.

Even conditional on education, immigrants may face different challenges and shocks in the labor market. Trends by income percentiles for foreign-born men in the bottom panels of Figure 13 show that high-educated immigrants in the bottom quartile of the income distribution have experienced substantially faster growth than native workers. Since the 1990s recession, they experienced twice the annual growth rate in real earnings than the median worker. At the same time, the upper half of the income distribution received similar gains across high-educated workers from different origins. These patterns for high-educated workers are in sharp contrast to the differences for low-educated men by origin. Here, foreign-born workers gained substantially less in real terms over time, both through a slower recovery after the 1990s crisis in the bottom tail and through lower growth for median and upper tail earnings. These differences by origin across education groups are consistent with polarization among the foreign-born workforce: While high-skilled immigrants have been very successful in the labor market, low-skilled immigrants fared substantially worse than the native population. These differences by origin are qualitatively similar but much less pronounced for women, see Appendix Figure A.32. This suggests more similar jobs and labor market participation between native and foreign-born women, but at the same time substantial differences for men. These could be differences in both career paths and labor market attachment.

Figure 14 shows that earnings inequality is substantially larger among foreign-born workers than among native workers. Comparing workers by origin within education-gender group, we find that the level differences in inequality by origin are larger for men. Taking an average over time, foreign-born men with low (high) education have about 50% (33%) higher stan-

Figure 14: Income Inequality by Origin and Education

(a) Foreign-Born Men

(b) Native Men

(c) Foreign-Born Women
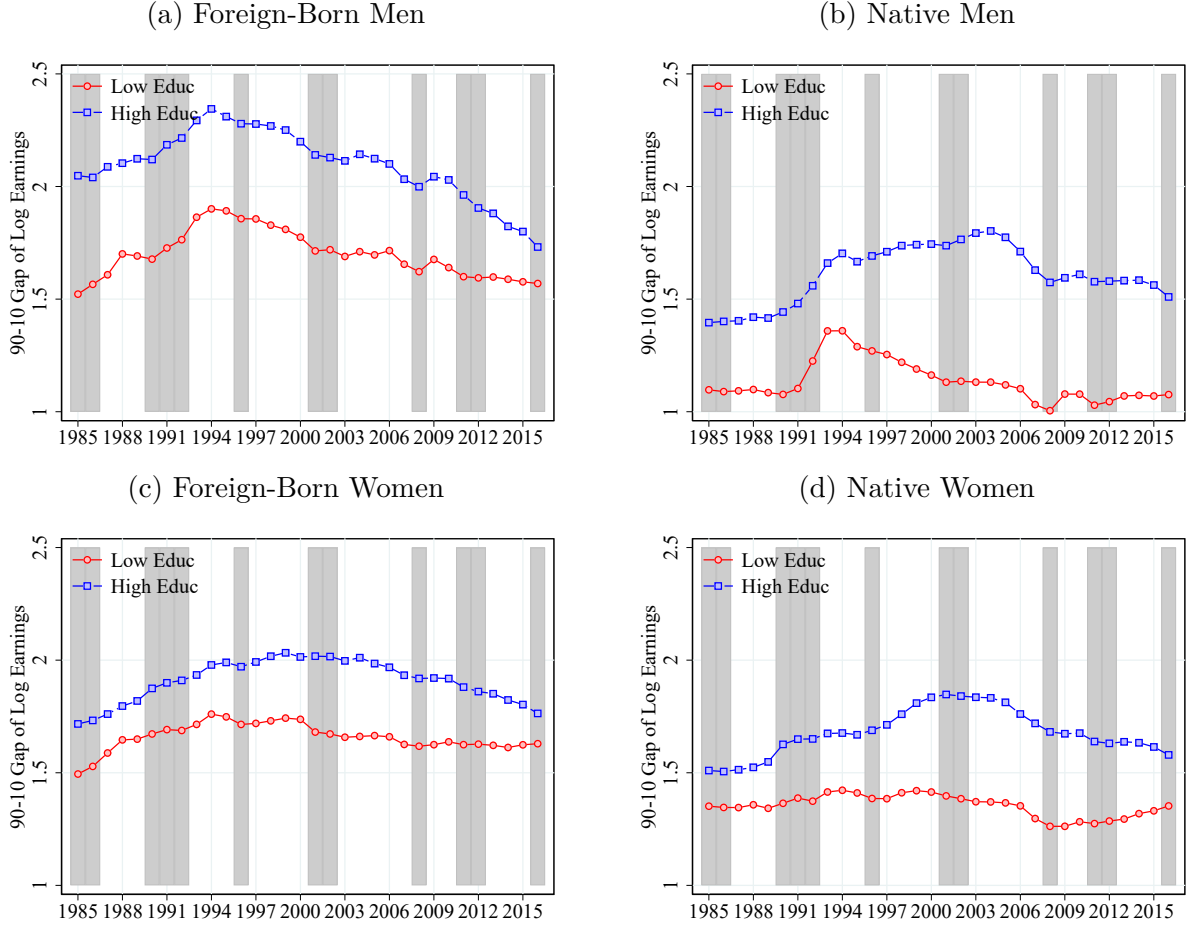
(d) Native Women

Notes: Using the CS+TMax sample, Figure 14 plots the P90-10 differential in log earnings against time, separately for foreign-born and native workers and by gender. Shaded areas are recessions.

dard deviation of earnings than their native peers, while for low and high educated women the differences are roughly 15% and 10%, respectively. For highly educated workers, these large differences are driven by larger dispersion in both the upper and lower tail of earnings. For-low educated workers, higher inequality among foreign-born workers is mainly driven by a wider 50–10 earnings gap, see Appendix Figure A.31. The relatively low earnings level at the 10th percentile is consistent with a share of the immigrant population with relatively weak labor market attachment, working fewer hours or having more frequent unemployment spells, for which we find more evidence when analyzing earnings dynamics below. In addition, the high earnings inequality among high-educated immigrants is also consistent with a higher share of workers with tertiary education, whose career trajectories contribute to higher earnings inequality. Figure 14 further shows a clear trend towards lower inequality for foreign-born men over time, especially for the highly educated. This convergence in earn-

ings between the top and bottom of the distribution is much stronger than for the native population.

In sum, these results point to ubiquitous earnings growth and a recent decline in inequality especially in the lower tail of the earnings distribution. We do not find evidence that low-educated workers or immigrants are left behind in general. However, we document polarization among immigrants with a longer and deeper impact of the 1990s recession for low-educated immigrants. We also find stable instead of decreasing inequality among low-educated women. One potential explanation that we explore in more detail in section 4.2 is that these groups have continued to rely heavily on the social welfare system, whereas other groups have more quickly reduced their dependence on work-related benefits and instead have strengthened their labor market attachment.

4.1.2 Earnings Volatility by Origin and Education

While most earnings trends in the previous section do not suggest pressing equity concerns about low-educated workers and immigrants in the cross-section, differential patterns in earnings volatility could be another important policy focus, reflecting different levels of risk and career opportunities.

Different panels in Figure 15 show the 90–10 gap of 1-year earnings changes by gender and origin, further decomposing each group by low and high education level. Overall, broader trends in earnings volatility are similar across origin-gender-education groups, suggesting that broader changes in the labor market are responsible for these patterns by affecting different jobs and workers similarly. Yet, in addition to higher earnings inequality, we also find that immigrants face much higher earnings volatility: Compared to natives, the 90–10 gap in earnings growth of immigrants is twice as large for men and 20–50% higher for women.

One interpretation of these level differences by education and origin is that earnings dynamics for low-income workers are tied to labor market attachment. We account for differences in participation by analyzing the arc-percent change in earnings in robustness analysis and find that the differences by origin become larger when including entry and exit of workers. This suggests that a main driver of differences in earnings volatility is indeed a higher share of immigrant workers with less stable employment relationships. For these workers, but also for high-educated women who may participate in different benefit programs such as parental leave, symmetric entry and exit between benefits and work in subsequent years may contribute to higher observed earnings volatility. We shed further light on this in the next sections.

Focusing next on the asymmetry of earnings changes in Figure 16, the Kelley measure first reveals three main differences by education: First, high-educated workers experience sys-

Figure 15: Dispersion in Earnings Changes by Origin and Education

(a) Foreign-Born Men

(b) Native Men

(c) Foreign-Born Women
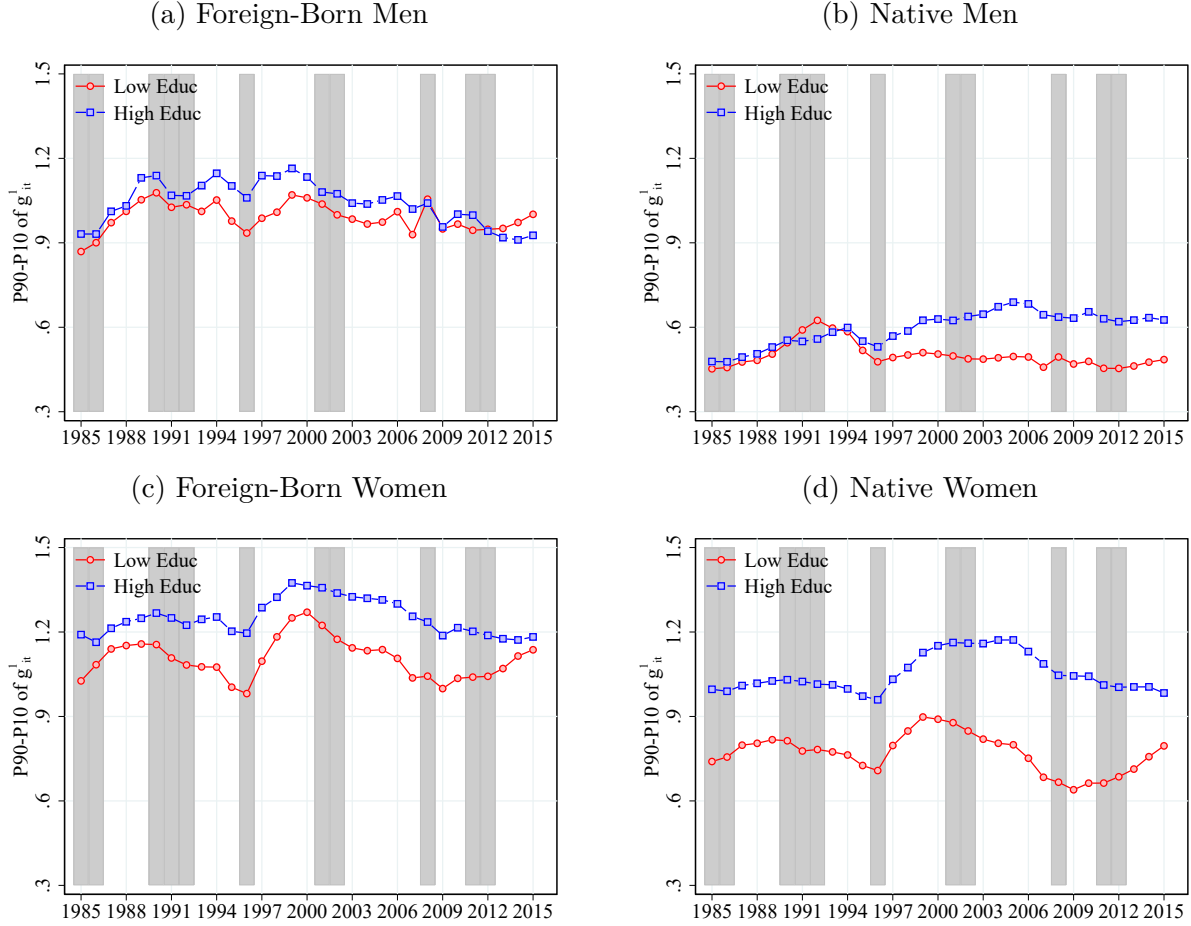
(d) Native Women

Notes: *Using the LX sample, Figure 15 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.*

tematically more right-skewed earnings growth than low-educated workers, indicating larger positive earnings changes. Second, low-educated workers tend to face higher cyclicality of skewness, with larger decline in earnings growth during recessions for both men and women. Third, conditional on education, skewness for women is lower than for men, consistent with relatively worse career advancement. But this pattern does not hold during deep recessions where men experience a larger decrease in skewness.[12]

Taken together, these results suggest that earnings growth for low-educated men is most closely tied to the business cycle, whereas high-educated workers, especially men, climb a steeper career ladder. Importantly, these results also hold for 5-year changes in earnings (Appendix Figure A.30), suggesting deep underlying differences in permanent career op-

---

[12]All of these patterns also hold when using arc-percent changes in earnings to include entry and exit from the labor force, see Appendix Figure A.29.

Figure 16: Kelley Skewness of Earnings Changes by Origin and Education

(a) Foreign-Born Men
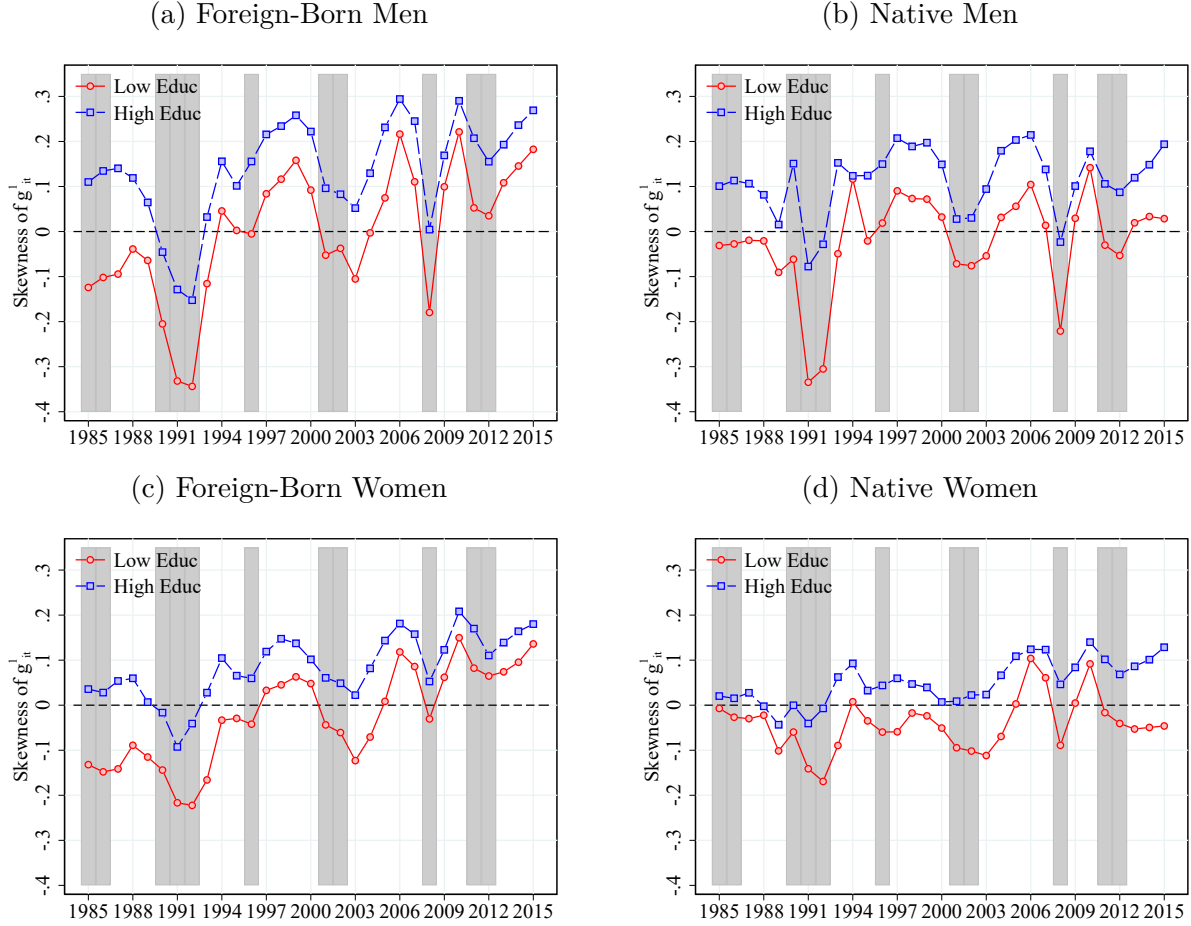
(b) Native Men

(c) Foreign-Born Women

(d) Native Women

Notes: Using the LX sample, Figure 16 plots Kelley skewness of 1-year residualized earnings change against time, separately for foreign-born and native workers and by gender. Each figure shows separate lines for workers with high and low education, defined as workers with or without college education. Shaded areas are recessions.

portunities during boom periods and disruptions during recessions across gender-education groups. As a result of these differences, increasing educational attainment may have counteracted the broader trend toward lower earnings volatility but can help explain an aggregate reduction in business cycle risk.

In addition, Figure 16 shows higher cyclicality among all immigrant groups compared to their native peers. These differences are driven by a substantially larger reduction in the 90–50 gap in earnings growth for all immigrant sub-populations during recessions (Table A.1), suggesting fewer large positive shocks. Moreover, low educated male immigrants face the largest increase in the 50–10 gap. In sum, these differences suggest that immigrants face worse career opportunities than natives during recessions.

More generally, studying heterogeneity by age groups and permanent income percentiles further reveals that Kelley skewness for young, relatively poor immigrants is negative, in

contrast to positive skewness among their native peers (Figure A.33). This suggests that the native population is more likely to move up substantially along the income distribution. In addition, even for older age groups and individuals with higher income, foreign-born workers face systematically more negative skewness of earnings changes, and this difference holds for both short-term and long-term earnings changes (see Figures A.33 and A.34). These patterns suggest that immigrants face worse career opportunities than natives across all age groups and income levels.

At the same time, we note an increase in Kelley skewness for immigrant subgroups and high-educated women over time in Figure 16, while skewness for native men and low-educated women is stable. This pattern is related to the substantial decline in the 90–10 gap in earnings changes after the mid-2000s for foreign-born workers in Figure 15. Specifically, the positive trend in skewness is driven by a faster reduction in the 50–10 gap of earnings growth compared to the 90–50 gap for high-skilled women and immigrants, shown in Figures A.28f and A.31, respectively. This is in contrast to much lower but stable levels of earnings volatility overall, especially among the high educated, see Figure A.28. These different trends by gender, education, and origin could indicate improvements in career opportunities for immigrants and high-educated workers, in particular for women. But it could also suggest weakening labor market attachment such that left tail events among continuing workers become less common. Foreign-born, in particular low-educated workers, may be more likely to be out of work for more than one year after a negative shock, while natives may be able to find new employment more quickly.[13]

In sum, immigrants account for a large and increasing share of the Swedish workforce (Figure 2) and the share of high-educated immigrants is higher and increasing faster than for natives, especially among men (Figure 3). As a result, higher inequality and volatility in earnings for immigrants drives up the levels in the full population. At the same time, faster improvements for (high-educated) immigrants compared to natives help explain the reduction in inequality and volatility we observe in the full population over the last two decades.

4.2 Hours, Work-Related Benefits, and Social Insurance

Although the previous sections point to higher earnings volatility for women, high-educated workers, and immigrants, part of these fluctuations in earnings may overstate the amount of

---

[13]Different selection among foreign-born and native workers who work in subsequent years may also helps explain the perhaps surprising result that earnings growth is less right-skewed for native workers. While foreign-born workers face larger positive and negative earnings fluctuations in absolute terms, the 90–50 gap accounts for more of the dispersion in earnings changes, whereas the distribution is more symmetric for native workers.

income risk that individuals face. Sweden offers a strong social safety net in case of sickness or unemployment, and strong support for child bearing and continuing education in the form of parental and educational leave programs. Hence, social insurance mitigates adverse shocks and earnings fluctuations may in part reflect individual fertility or human capital investment choices.

Since the Swedish welfare system went through large changes over the period we study, these reforms may also contribute to aggregate trends in earnings dynamics that we document. In particular, changes in eligibility and generosity of welfare programs may affect program take-up and in turn labor market attachment of workers.

In this section, we investigate the role of these social benefits by analyzing variation in annual hours worked, directly measuring take-up and magnitude of work-related benefits among labor market participants, and estimating the role of social insurance in mitigating labor market shocks.

4.2.1 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. To separate the role of wages from the hours and participation margins, 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 17 shows the development of the 90–10 gap in earnings and wages for men and women, respectively. We see that the 90–10 gap in wages is about one-third the size of the 90–10 gap in earnings among women and about 50% for men. Interestingly, the upper tail of the wage and earnings distribution are more similar for men, especially for the highly educated. This is consistent with smaller hours variation and fewer unemployment spells for this group. 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 persistent changes such as deregulation, more

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

(a) 90-10 Gap, Men
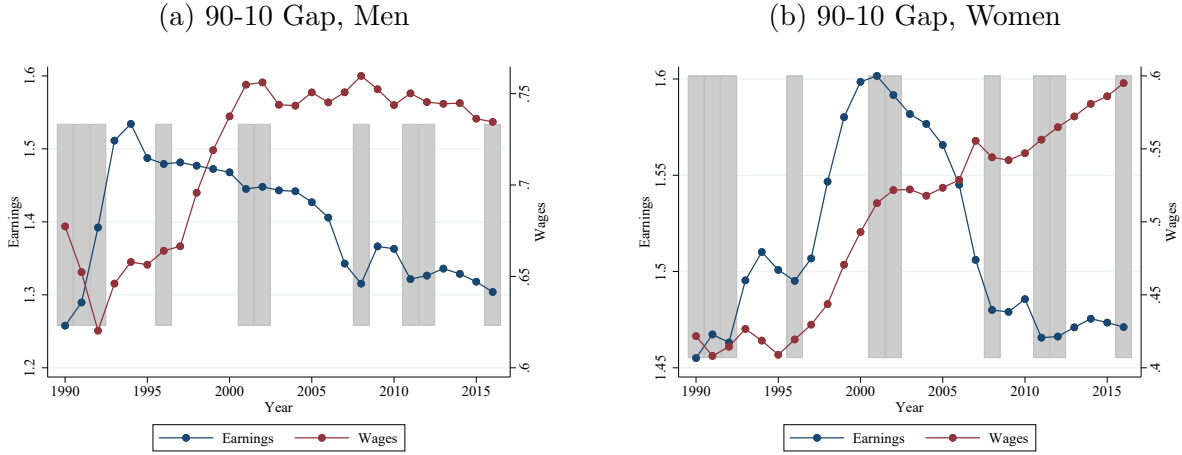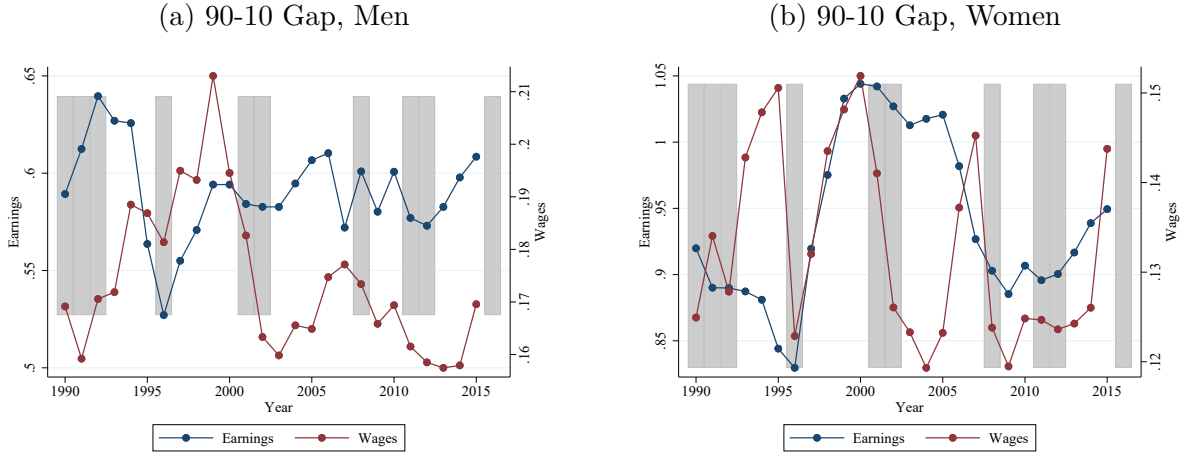
(b) 90-10 Gap, Women

Notes: *Using the wage survey sample, Figure 17 plots the 90-10 gap in log earnings and log monthly wages against time, separately for men and women. Shaded areas are recessions.*

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. In comparison, Figure A.2 shows that the share of part-time workers is stable for men and declines gradually for women over 1995–2015. This suggests that higher weekly hours contribute relatively little to the trends in annual earnings; instead, an increase in stable jobs and a reduction in temporary unemployment spells seem crucial in reducing earnings inequality.

In addition, we also find a massive role of hours for earnings volatility in Figure 18: The 90–10 gap in wage growth is less than 25% of the 90–10 gap in 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. Since wage inequality has increased across all gender-education groups, 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

Figure 18: Level and Trend in Volatility: Wages and Earnings

(a) 90-10 Gap, Men

(b) 90-10 Gap, Women

Notes: *Using the wage survey sample, Figure 18 plots the 90-10 gap in 1-year changes of residualized earnings and residualized monthly wages against time, separately for men and women. Shaded areas are recessions.*

volatility, we hypothesize an important role for changing usage of welfare benefits among the working population, which lead to substantial changes in annual hours worked.

Finally, and consistent with the changing role of social benefits by age, we find evidence of decreasing variation in annual hours worked over the life cycle. While the results in Figure 7 indicate decreasing earnings inequality by age, Figure 19 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 students among the high-educated young), parental leave absences, and higher job mobility for young workers. We turn to these work-related welfare benefits in detail in the next section.

4.2.2 Work-Related Benefits

So far, the analysis of earnings inequality has excluded benefits receipt and hence will over-state 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 social welfare 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 benefits include taxable work-related benefits, such as unemployment insurance, sickness insurance, disability insurance, military service,

Figure 19: Wage Inequality over the Life-Cycle by Gender
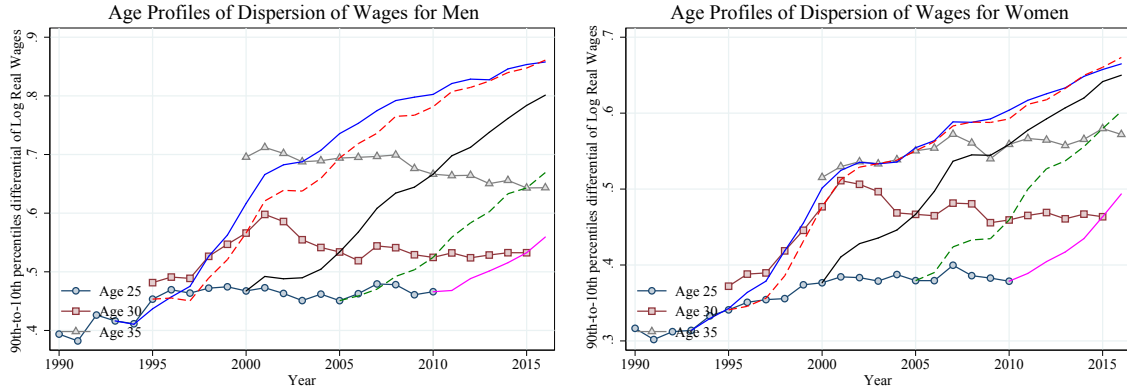
study grants and parental leave benefits.

The top panel of Figure 20 shows 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.[14] At the 10th percentile, however, benefits account for a large share of total labor 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 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 20c and 20d 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.[15] Unemployment benefits matter most during and after recessions, but then decline quickly as the economy improves; in particular in the late 1990s after the recession around 1992, and again after the recession in the early 2000s. More broadly, we observe a decline in the importance of unemployment benefits over the sample period. In addition, other

---

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

[15]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: Benefits usage across percentiles of the earnings distribution

(a) Men

(b) Women

(c) Men, P10 Earnings
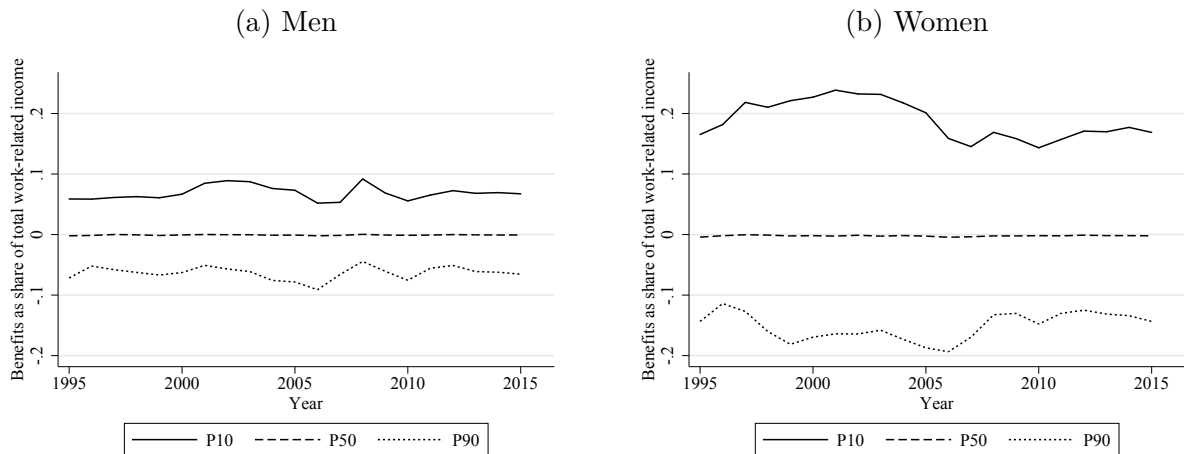
(d) Women, P10 Earnings
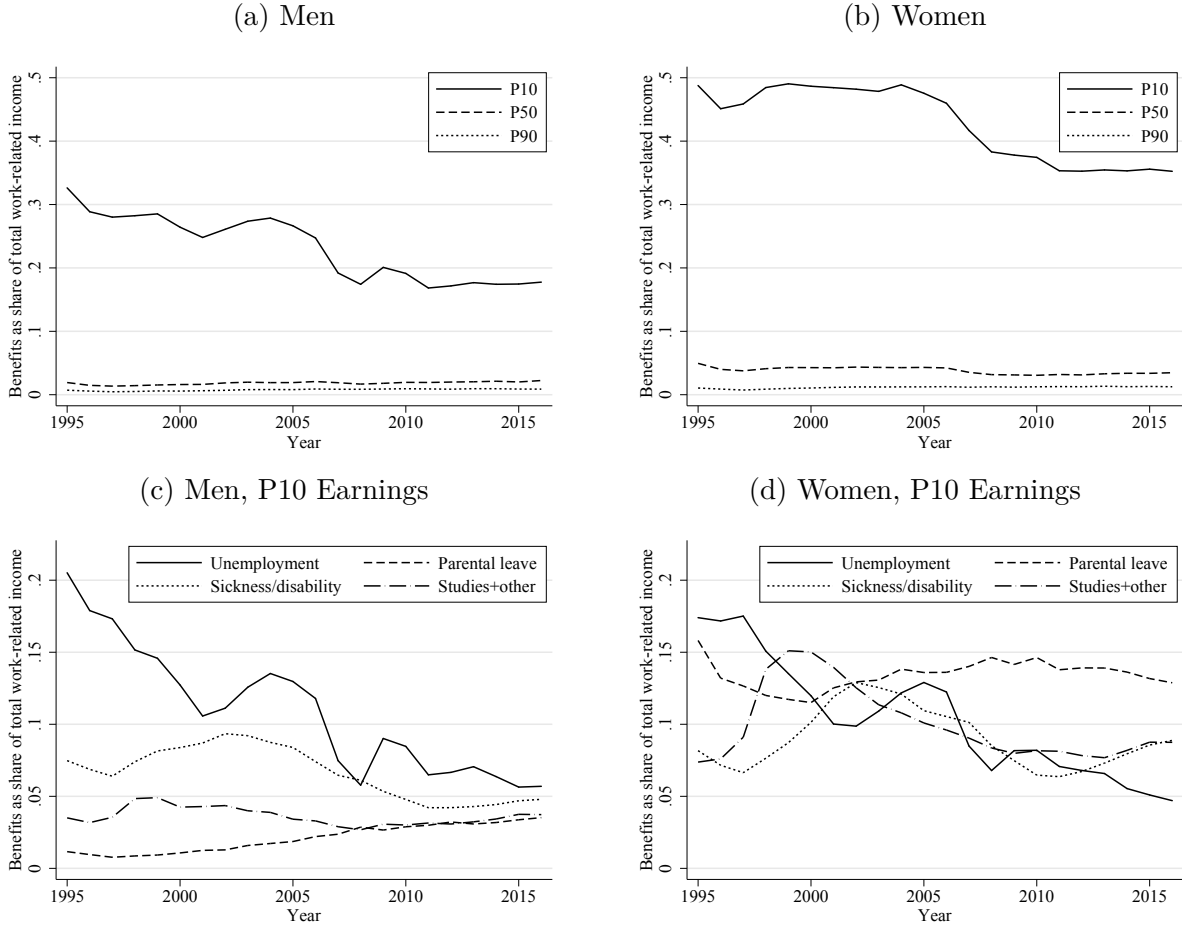
Notes: Using the CS+Tmax sample, Figures 20a and 20b plot the value share of benefits in total work-related income at the P10, P50, and P90 of the log earnings distribution against time, separately for men and women. Figures 20c and 20d plot the value share of different types of benefits in total work-related 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.

benefits, which include study grants, disability and sickness leave, for example, display a similar gradual decline for both men and women after their importance peaked in the early 2000s. Interestingly, the previous increase in these benefits in the late 1990s was especially pronounced among women. Overall, the decline in UI benefits as well as in sickness and disability benefits seems largely driven by lower caseload, see Figure A.39.

Part of the decline in benefits take-up rates 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,

Figure 21: Change in the share of work-related benefits across percentiles of the earnings growth distribution

(a) Men

(b) Women

Notes: Using the LX sample, Figures 21a and 21b 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.

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 21 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 important role for large positive and negative earnings changes. The average 50–10 gap in earnings growth for men in Figure 8 is 0.25, while the average 50–10 gap is 0.45 for women. For these cases, we find an increase in the share of benefits in total earnings by 5–10 (15–20) percentage points for men (women) in Figure 21. If the average replacement rate of benefits is 50%, then these benefits can account for the vast majority of earnings changes in the tails of the earnings growth distribution.

Finally, we also analyze benefits usage separately by education and country of origin. In general, differences in benefits usage across education groups are small, as shown in Figure A.40. Perhaps surprisingly, at the 10th percentile of earnings we find a somewhat larger role for benefits among high-educated women than for the low-educated. This difference is consistent with a larger 50–10 gap in earnings for high-educated women compared to

low-educated women.

Comparing foreign-born and native workers in Figure A.40, we find interesting differences between men and women. While benefits account for a larger share of total work-related income for foreign-born men than for natives throughout the sample, the opposite holds for women. In addition, 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 benefit 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.42.[16] 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 4.1.1. As immigrants rely less on social insurance, they become more self-sufficient by increasing their labor market attachment.

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 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.
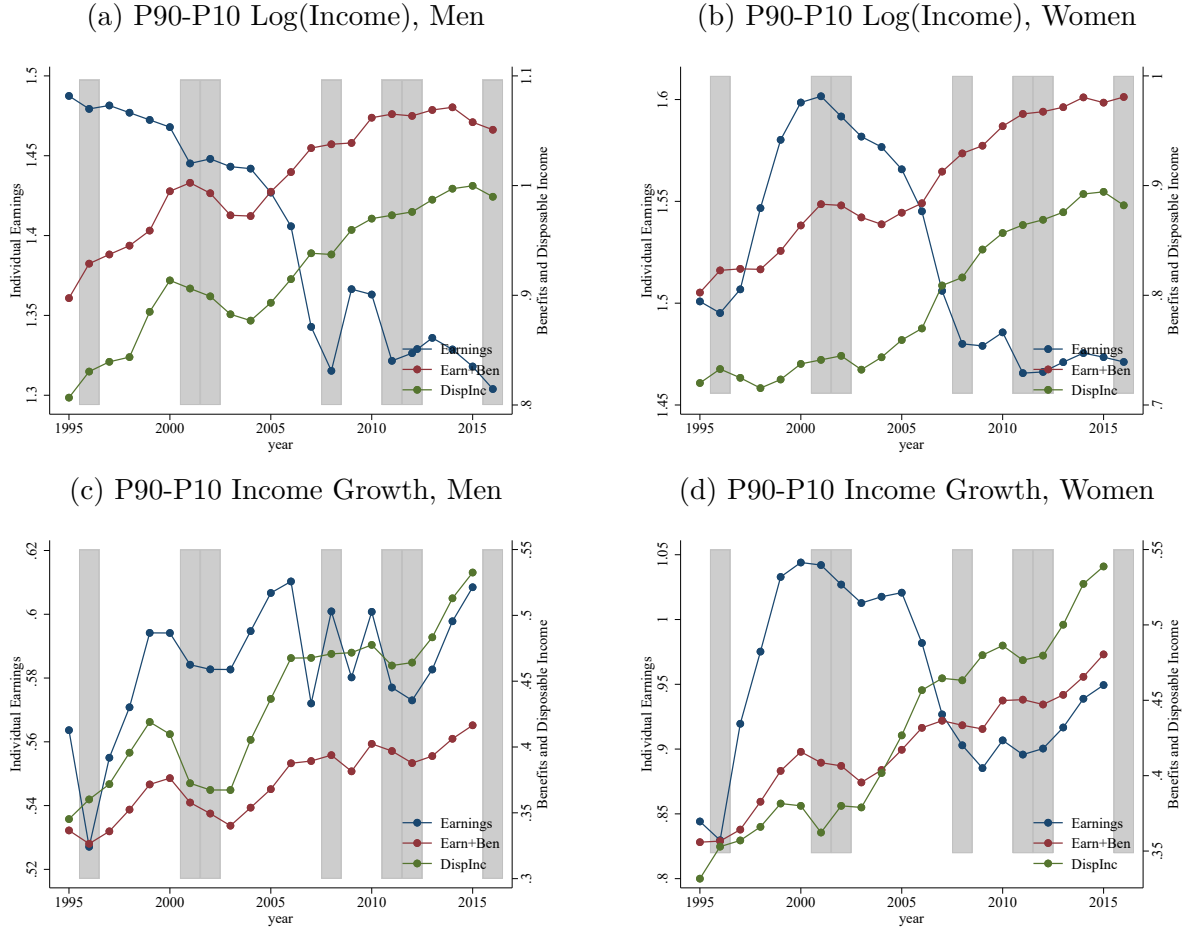
4.2.3 Social Insurance

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. The main goals of this section are to quantify (i) how much social insurance mitigates earnings inequality and volatility, (ii) how the extent of social insurance has changed over time, and (iii) to what extent social insurance reduces differences in income inequality and volatility across sub-populations by gender, education, and country of origin.

To this end, 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 welfare policies 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

---

[16]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.

Figure 22: Income Inequality and Income Volatility: Earnings and Social Insurance

(a) P90-P10 Log(Income), Men

(b) P90-P10 Log(Income), Women

(c) P90-P10 Income Growth, Men

(d) P90-P10 Income Growth, Women

Notes: Using the CSB sample over 1995–2016, Figures 22a and 22b plot the P90-10 differential 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. Distinguishing the same income measures, Figures 22c and 22d use the LXB sample to plot the P90-10 differential in 1-year residualized income changes against time, separately for men and women. Shaded areas are recessions.

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 minimum retail sector wage in a given year.

Figure 22 presents the evolution of inequality and volatility across income concepts. Note that individual earnings are plotted in blue against the left axis, whereas total work-related income (red) and disposable income (green) are plotted against the right axis in all panels. Focusing first on the levels of income inequality in Figures 22a and 22b, we find about one-third lower inequality when considering individual disposable income. Work-related benefits account for the large majority of that insurance, as inequality in total work-related income is already 25% lower than earnings inequality. 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. 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.45. Most of the increase in inequality is already visible in total work-related income, consistent with a reduction in the generosity of social welfare benefits. Only a small part of the increase seems driven by taxation and non-taxable cash transfers such as social assistance and housing benefits. Changes in work-related benefits and the introduction of the earned-income tax credit may have incentivized more individuals to seek employment and thus changed selection among workers.[17] In sum, we find that rising income inequality in Sweden has been generated to a large extent by changes in the transfer system.

The bottom panel of Figure 22 further adds to this debate by showing that, in addition to an increase in inequality for total work-related income and disposable income, individuals also experienced an increase in income volatility at the same time. This increase is much more pronounced in disposable income than in total work-related income. In addition, Figure A.44 shows that the increase in volatility is driven by increasing inequality in both the upper and lower tail of the income growth distribution. This suggests both a reduced role for taxation of large positive income changes and lower social insurance in case of large negative income changes.

To shed more light on the role of social insurance in reducing income volatility, Table 2 further analyzes the level, trend, and cyclical patterns of the Kelley skewness for 1-year changes in earnings (columns 1–4) and in total work-related income (columns 5–8) over 1995–2016. Here, we run regressions of the Kelley measure by gender-education group, y_t on a linear time trend t and an indicator for being in a recession, r_t,

$$y_t = \alpha + \beta \cdot r_t + \gamma \cdot t + \epsilon_t.$$

We normalize t to zero in 2005 such that the coefficient α represents the average level of the outcome of interest in that year, while γ estimates the annual average change in skewness over 1995–2016, and β reflects the cyclical component, i.e., the level difference in skewness between recessions and growth periods.

First, while skewness of earnings growth is much larger for high-educated workers on average, comparing results by income measure between columns 1–4 and columns 5–8 of Table 2 shows that including work-related benefits raises skewness for low-educated women much more than for high-educated women. As a result, both groups experience a similar

---

[17]However, Figure A.1 revealed no systematic changes in employment rates over the last two decades.

Table 2: Level, Trend, and Cyclicality of Kelley Skewness of Income Growth

Kelley	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Annual Earnings				Total Work-Related Income		
Skewness	Female		Male		Female		Male	
	LowEd	HighEd	LowEd	HighEd	LowEd	HighEd	LowEd	HighEd
Recession	-0.051**	-0.033**	-0.123***	-0.101***	-0.023	-0.019	-0.060*	-0.068***
	(0.020)	(0.013)	(0.036)	(0.029)	(0.021)	(0.013)	(0.029)	(0.021)
Level 2005	-0.001	0.089***	0.063***	0.183***	0.072***	0.112***	0.051***	0.161***
	(0.015)	(0.008)	(0.015)	(0.012)	(0.014)	(0.008)	(0.012)	(0.010)
Trend	0.004**	0.005***	0.001	-0.000	0.000	0.004***	0.003	0.002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
Obs	21	21	21	21	21	21	21	21
R-squared	0.305	0.599	0.461	0.480	0.053	0.438	0.287	0.448

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

positive skewness of changes in total work-related income. The same patterns do not hold for men, where work-related benefits slightly reduce the level of skewness similarly for both education groups. This is consistent with a much lower overall share of benefits income in total work-related income for men. We further note that trends in skewness are similar for earnings and total work-related income, except for low-educated women. The latter group receives larger positive earnings shocks over time, yet these changes disappear for total work-related income. This suggests that larger earnings changes seem to merely replace pre-existing income fluctuations from benefits usage. This is true to a much lesser extent for high-educated women whose larger positive earnings changes map to larger positive changes in total work-related income.

Second, and as expected, work-related benefits also play an important role in mitigating adverse shocks during recessions. Social insurance during crises is especially important for men, as evidenced by a larger difference between the coefficients in columns 4 and 8 of Table 2 than between the coefficients in columns 2 and 6, for example. This is consistent with a larger role for (pro-cyclical) unemployment benefits in overall benefits usage of men, see Figure 20. Social insurance reduces the decline in skewness during recessions by 30% for high-educated and by 50% for low-educated male workers. In contrast, women across education groups face a substantially smaller decline in skewness of earnings growth during recessions than men, but work-related benefits mitigate this entire effect, resulting in acyclical total work-related income for women. For both men and women, comparing the estimates for earnings and total work-related income implies a stronger insurance role of benefits during recessions for the low-educated.

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, low-educated workers, and immigrants.

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, income, education, and country of origin. Men face lower volatility than women, but their earnings growth is more closely tied to the business cycle. Earnings volatility is also systematically higher for highly educated workers but more left skewed for low educated workers. Earnings volatility is higher among the quickly increasing share of foreign-born workers. Their weaker labor market attachment counteracts overall trends of decreasing earnings volatility. These rich patterns can motivate future work on sources of labor market risk for different sub-populations, in particular accounting for the role of dynamics in hours and wages.

Finally, our results emphasize the close relationship between the generosity of the welfare 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 welfare 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, we document a clear equity-efficiency tradeoff of these changes. 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, immigrants, and low-educated workers, our results raise important equity concerns for these subpopulations.

References

Aaberge, Rolf, Christophe André, Anne Boschini, Lars Calmfors, Kristin Gunnarsson, Mikkel Hermansen, Audun Langørgen, Petter Lindgren, Causa Orsetta, Jon Pareliussen, P-O Robling, Jesper Roine, and Jakob Egholt Søgaard (2018). *Increasing Income Inequality in the Nordics*. Nordic Council of Ministers.

Altonji, Joseph G., Anthony Smith, and Ivan Vidangos (2013). "Modeling Earnings Dynamics". *Econometrica* 81, pp. 1395–1454.

Åslund, Olof, Anders Forslund, and Linus Liljeberg (2017). *Flykting- och anhöriginvandrades etablering på den svenska arbetsmarknaden*. IFAU Report 2017:14. IFAU.

Badel, Alejandro, Moira K. Daly, Mark Huggett, and Martin Nybom (2018). "Top Earners: Cross-country Facts". *Federal Reserve Bank of St. Louis. Review* 100.3, pp. 237–257.

Björklund, Anders and Richard B. Freeman (2010). "Searching for Optimal Inequality/Incentives". In: Freeman, Richard B., Birgitta Swedenborg, and Robert Topel. *Reforming the Welfare State: Recovery and Beyond in Sweden*. University of Chicago Press, pp. 25–56.

Björklund, Anders, Markus Jäntti, Per Olof Robling, Jesper Roine, and Daniel Waldenström (2019). *Kapitalinkomster och inkomstfoördelning - Bilaga 3 till Långtidsutredningen 2019*. SOU 2019:62. Statens Offentliga Utredningar.

Busch, Christopher, David Domeij, Fatih Guvenen, and Rocio Madera (2021). "Skewed Idiosyncratic Income Risk over the Business Cycle: Sources and Insurance". *American Economic Journal: Macroeconomics* Forthcoming.

Calmfors, Lars and Nora Sánchez Gassen (2019). *Integrating Immigrants into the Nordic Labour Markets*. Nordic Council of Ministers, p. 205.

Domeij, David (2008). "Rising Earnings Inequality in Sweden: The Role of Composition and Prices". *The Scandinavian Journal of Economics* 110.3, pp. 609–634.

Domeij, David and Martin Flodén (2010). "Inequality trends in Sweden 1978–2004". *Review of Economic Dynamics* 13.1, pp. 179–208.

Edin, Per-Anders and Bertil Holmlund (1995). "The Swedish Wage Structure: The Rise and Fall of Solidarity Wage Policy?" In: *Differences and Changes in Wage Structures*. NBER Chapters. National Bureau of Economic Research, Inc, pp. 307–344.

Elvander, Nils (2002). "The New Swedish Regime for Collective Bargaining and Conflict Resolution: A Comparative Perspective". *European Journal of Industrial Relations* 8, pp. 197–216.

Friedrich, Benjamin, Lisa Laun, Costas Meghir, and Luigi Pistaferri (2019). *Earnings Dynamics and Firm-Level Shocks*. Working Paper 25786. National Bureau of Economic Research.

Gottfries, Nils (2018). "The Labor Market in Sweden since the 1990s". *IZA World of Labor* 411, pp. 1–12.

Gustavsson, Magnus (2007). "The 1990s rise in Swedish earnings inequality – persistent or transitory?" *Applied Economics* 39.1, pp. 25–30.

Guvenen, Fatih, Fatih Karahan, Serdar Ozkan, and Jae Song (2015). *What Do Data on Millions of U.S. Workers Reveal about Life-Cycle Earnings Risk?* Working Paper 20913. National Bureau of Economic Research.

Guvenen, Fatih, Serdar Ozkan, and Jae Song (2014). "The Nature of Countercyclical Income Risk". *Journal of Political Economy* 122.3, pp. 621–660.

Hägglund, Pathric and Per Johansson (2016). *Sjukskrivningarnas anatomi – en ESO-rapport om drivkrafterna i sjukförsäkringssystemet*. Tech. rep. 2016:2. Expert Group in Public Economics (ESO).

Hammar, Olle and Daniel Waldenström (2017). *Global earnings inequality, 1970–2015*. Working Paper Series 2017:7. Uppsala University, Department of Economics.

Holmlund, Bertil (2003). *The Rise and Fall of Swedish Unemployment*. CESifo Working Paper Series 918. CESifo.

Johansson, Per, Lisa Laun, and Tobias Laun (2014). "Screening Stringency in the Disability Insurance Program". *The B.E. Journal of Economic Analysis and Policy* 14.3, pp. 873–91.

Laun, Lisa (2017). "The Effect of Age-Targeted Tax Credits on Labor Force Participation of Older Workers". *Journal of Public Economics* 152, pp. 102–118.

Low, Hamish, Costas Meghir, and Luigi Pistaferri (2010). "Wage Risk and Employment Risk over the Life Cycle". *American Economic Review* 100.4, pp. 1432–67.

Meghir, Costas and Luigi Pistaferri (2011). "Chapter 9 - Earnings, Consumption and Life Cycle Choices". In: ed. by David Card and Orley Ashenfelter. Vol. 4. Handbook of Labor Economics. Elsevier, pp. 773–854.

OECD (2011). *Divided We Stand: Why Inequality Keeps Rising*. OECD Publishing.

Rietz, Gunnar, Dan Johansson, and Mikael Stenkula (2015). "Swedish capital income taxation (1862-2013)". In: *Swedish Taxation: Developments since 1862*. Palgrave Macmillan US, pp. 123–178.

Robling, Olof and Jon Pareliussen (2017). *Structural Inequality: The Case of Sweden.* Working Papers 1382. OECD Economics Department.

Roine, Jesper and Daniel Waldenström (2005). *Top Incomes in Sweden over the Twentieth Century.* SSE/EFI Working Paper Series in Economics and Finance 602. Stockholm School of Economics.

— (2012). "On the Role of Capital Gains in Swedish Income Inequality". *Review of Income and Wealth* 58, pp. 569–587.

Skans, Oskar Nordström, Per-Anders Edin, and Bertil Holmlund (2009). "Wage Dispersion Between and Within Plants: Sweden 1985-2000". In: Lazear, Edward P. and Kathryn L. Shaw. *The Structure of Wages: An International Comparison.* University of Chicago Press, pp. 217–260.

Skedinger, Per (2015). "Employment effects of union-bargained minimum wages: Evidence from Sweden's retail sector". *International Journal of Manpower* 36, pp. 694–710.