ONLINE APPENDIX

FOR

EARNINGS DYNAMICS OF IMMIGRANTS AND NATIVES IN SWEDEN 1985–2016

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A Sample and Income Measurement

A.1 Sample Definitions

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

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

For the main analysis in section ??, the LX-H sample is restricted to the last two decades of the sample for cross-country comparison. Together with the other restrictions, this implies that the LX-H sample for our main analysis covers the period 1997–2011. For the analysis in section ??, we extend the coverage to the full sample because the 1990s recession and recovery period is crucial to understand persistent differences between native and foreign-born workers.

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

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

A.2 Definitions for Income Measures

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

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

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

Note that these measures of earnings changes will only be computed for individuals who have earnings above the minimum income threshold in time $t$ and above one-third of the threshold income in $t+1$. Similarly, we define 5-year forward residualized log earnings changes,

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

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

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

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

Finally, we define permanent earnings as

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

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

B.1 Additional Facts on Sample Composition

Figure A.1: Employment Rates Across Groups

(a) Men by Age

(b) Women by Age

Notes: Figure A.1 plots the share employed in the population aged 25–55 by gender, age and region of origin. Employment is defined as having annual earnings above 1.5 times the monthly earnings at the retail minimum wage.
Figure A.2: Share Foreign-Born Among Employed in Ages 25–55, by Gender and Region of Origin

(a) Men

(b) Women

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

Figure A.3: Natives and Immigrants by Education Level

(a) Natives

(b) Foreign-Born

Notes: Figure A.3 plots the share of natives and foreign-born with different levels of education among employed in ages 25–55. Education is defined by the maximum education level achieved during 1985–2016.
Figure A.4: Public Sector Employment

Notes: Figure A.4 plots the share of employed men and women in ages 25–55 working in the public sector, based on the employment with largest annual earnings in the Register-Based Labor Market Statistics (RAMS).
Figure A.5: Benefits Usage among Employed in Ages 25–55

(a) Benefit Amounts, Men

(b) Benefit Amounts, Women

(c) Benefits Take-up, Men

(d) Benefits Take-up, Women

Notes: Figure A.5 plots the average benefit amounts and share taking up benefits among employed in ages 25–55 by benefit types. The discontinuous break for studies+other benefits in Figures A.5c and A.5d indicates a time series break in the included variables. However, the pattern is not reflected in Figures A.5a and A.5b, which suggests that the break concerns benefit types with low average amounts.
Figure A.6: Share Part-Time Work

(a) Men

(b) Women

Notes: Figure A.6 shows the share part-time workers among employed in ages 25–55 included in the Wage Structure Statistics. The register is based on five separate data collections for the municipality, county council and state sector in the public sector and for blue-collar and white-collar workers in the private sector. We pool information from the municipality, county council and state sector into a public sector, but keep blue-collar and white-collar workers separately. For the public sector, we use information on contracted hours and define part-time work as less than 87.5 percent of full-time. For most workers this implies less than 35 contracted hours per week. For the private sector, we use a variable directly capturing the incidence of part-time work.
B.2 Main Results for the Full Population

Figure A.7: Distribution of Earnings in the Population

(a) Percentiles

(b) Top Percentiles

(c) Dispersion

(d) Right- and Left-Tail Dispersion

Notes: This figure reports results for the pooled sample of men and women. Using raw log earnings and the CS sample, Figure A.7 plots against time the following variables: (a) P10, P25, P50, P75, P90, (b) P90, P95, P99, P99.9, P99.99, (c) P90–10 and 2.56*SD of log income, (d) P90–50 and P50–10. In (a) and (b) percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.
Figure A.8: Income Inequality: Initial Conditions and Life-Cycle Dynamics

(a) Earnings dispersion at age 25

(b) Life-cycle earnings inequality

Notes: Using raw log earnings and the CS sample pooled for men and women, Figure A.8a plots P90–50 and P50–10 at age 25 against time, while Figure A.8b plots against time the P90–10 gap over the life cycle for all cohorts available. Shaded areas are recessions.

Figure A.9: Dispersion in 1-Year Log Earnings Changes in the Population

(a) Earnings Growth Dispersion

(b) Kelley Skewness

(c) Excess Crow-Siddiqui Kurtosis

Notes: Using residual one-year earnings changes and the LX sample pooled for men and women, Figure A.9a plots the P90–50 and P50–10 gaps against time. Figure A.9b plots the Kelley skewness, defined as \((P_{90} - P_{50}) - (P_{50} - P_{10}) / P_{90} - P_{10}\), while Figure A.9c plots Excess Crow-Siddiqui kurtosis calculated as \(\frac{P_{97.5} - P_{2.5}}{P_{75} - P_{25}} - 2.91\) where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for a Normal distribution. Shaded areas are recessions.
Figure A.10: Dispersion, Skewness, and Kurtosis of 1-Year Log Earnings Changes in the Population

(a) P90–10 Gap of 1-Year Earnings Change

(b) Kelley Skewness

(c) Excess Crow-Siddiqui kurtosis

Notes: Using residual one-year earnings changes and the LX-H sample pooled across men and women, Figure A.10 plots against permanent income quantile groups the following variables for the 3 age groups: (a) P90–10, (b) Kelley Skewness, (c) Excess Crow-Siddiqui kurtosis. Kelley Skewness defined as \((\frac{P_{90} - P_{50}}{P_{90} - P_{10}})\). Excess Crow-Siddiqui kurtosis calculated as \((\frac{P_{97.5} - P_{2.5}}{2.91})\) where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for Normal distribution.
Figure A.11: Evolution of 10-Year Mobility

(a) Over the Life Cycle

(b) Over Time

Notes: Figure A.11a shows average rank-rank mobility pooled for men and women 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. Figure A.11b shows average rank-rank mobility over 10 years by computing average percentiles of permanent income, $P_{t+10}$ ten years later for the pooled sample of men and women in each permanent income percentile in the base year, using two alternative base years 1995 and 2005 and averaging over all age groups.
B.3 Additional Evidence on Earnings Dynamics and Inequality

Figure A.12: Dispersion, Skewness, and Kurtosis of 5-Year Log Earnings Changes

Notes: Using residual five-year earnings changes and the LX-H sample, Figure ?? plots against permanent income quantile groups the following variables for the 3 age groups: (a) Men: $P_{90}–10$, (b) Women: $P_{90}–10$, (c) Men: Kelley Skewness, (d) Women: Kelley Skewness, (e) Men: Excess Crow-Siddiqui kurtosis, (f) Women: Excess Crow-Siddiqui kurtosis. Kelley Skewness defined as \[ \frac{(P_{90} - P_{10}) - (P_{50} - P_{10})}{P_{90} - P_{10}} \]. Excess Crow-Siddiqui kurtosis calculated as \[ \frac{P_{97.5} - P_{2.5}}{2.91} \] where the first term is the Crow-Siddiqui measure of Kurtosis and 2.91 corresponds to the value of this measure for Normal distribution. Each figure averages the respective outcome across years over the period 1997–2011.
Figure A.13: Standardized Moments of 1-Year Log Earnings Changes

Notes: Using residual one-year earnings changes and the LX-H sample, Figure ?? plots against permanent income quantile groups the following variables for the 3 age groups: (a) Men: Standard deviation, (b) Women: Standard deviation, (c) Men: Coef of Skewness, (d) Women: Coef of Skewness, (e) Men: Excess Kurtosis, (f) Women: Excess Kurtosis. Excess kurtosis equals the coefficient of kurtosis minus 3, the coefficient of kurtosis for the Normal distribution. Each figure averages the respective outcome across years over the period 1997–2011.
B.4 Additional Evidence on Mechanisms

Figure A.14: Income Percentiles by Region of Origin among Foreign-Born Female Workers

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

(b) Men: Europe and the Americas

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

(d) Women: Europe and the Americas

Notes: Using raw log earnings and the CS sample, Figure A.14 plots against time P10, P25, P50, P75, P90, separately for male and female immigrants. We further split foreign-born workers by region of origin, distinguishing two groups, (a)+(c) Africa, Asia and Middle East, and (b)+(d) Europe and the Americas. All percentiles are normalized to 0 in the first available year, 1985. Shaded areas are recessions.
Figure A.15: Dispersion of 1-Year Arc-Percent Changes in Earnings by Gender and Origin

Notes: Using the LX sample, Figure A.15 plots the P90–10 differential in 1-year arc-percent change in earnings against time, separately for foreign-born and native workers and by gender. Arc-percent change is defined in section A. Shaded areas are recessions.
Figure A.16: Kelley Skewness of 1-Year Earnings Growth by Gender, Origin, and Education

(a) Foreign-Born Men

(b) Native Men

(c) Foreign-Born Women

(d) Native Women

Notes: Using the LX sample, Figure A.16 uses residual one-year earnings changes to plot Kelley skewness for foreign-born and native workers, separately by gender. Each plot further distinguishes the gender-origin subsample by education group. Shaded areas are recessions.
Figure A.17: Kelley Skewness of 1-Year Earnings Growth by Region of Origin, Age, and Income

(a) Europe and the Americas

![Graph showing Kelley Skewness of g1it by quantiles of permanent income.]

(b) Africa, Asia, and Middle East

![Graph showing Kelley Skewness of g1it by quantiles of permanent income.]

Notes: Using residual one-year earnings changes and the LX-H sample for the full immigrant population, Figure A.17 plots Kelley Skewness against permanent income quantile groups for the 3 age groups, separately by foreign region of origin. Kelley Skewness is defined as \((P_{90} - P_{50}) / (P_{90} - P_{10})\). Each figure averages Kelley skewness in each bin across years over the period 1988–2011.
Figure A.18: Kelley Skewness of 5-Year Earnings Growth by Gender, Origin, Age, and Income

(a) All Foreign-Born

(b) All Natives

(c) Europe and the Americas

(d) Africa, Asia, and Middle East

Notes: Using residual five-year earnings changes and the LX-H sample, Figure 7 plots Kelley Skewness against permanent income quantile groups for the 3 age groups, separately for the following subpopulations: (a) All foreign-born, (b) All natives, (c) foreign-born from Europe and the Americas, (d) foreign-born from Africa, Asia, and Middle East. Kelley Skewness is defined as \((\frac{P_{90} - P_{50}}{P_{90} - P_{10}} - \frac{P_{50} - P_{10}}{P_{90} - P_{10}})\). Each figure averages Kelley skewness in each bin across years over the period 1988–2011.
Figure A.19: Level and Trend in Inequality: Wages and Earnings

(a) P90–50 Gap, Men

(b) P50–10 Gap, Men

(c) P90–50 Gap, Women

(d) P50–10 Gap, Women

Notes: Using the wage survey sample, Figure A.19 plots the P90–50 gap and P50–10 gap in log earnings and log monthly wages against time, separately for men and women. Shaded areas are recessions.
Figure A.20: Income Volatility: Earnings, Benefits, and Disposable Income

(a) P90–50 Income Growth, Men

(b) P90–50 Income Growth, Women

(c) P50–10 Income Growth, Men

(d) P50–10 Income Growth, Women

Notes: Using the LXB sample over 1995–2016, Figure A.20 plots the P90–50 and P50–10 differentials in 1-year residualized income changes against time, separately for men and women. Each figure distinguishes three income concepts; log earnings, log total work-related income, and log disposable income, see section ???. Shaded areas are recessions.