Family and Government Insurance: Wage, Earnings, and Income Risks in the Netherlands and the U.S.

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Abstract

We document new facts on the dynamics of male wages and earnings, household earnings, and before- and after-tax income in the Netherlands and the United States. We find that, in both countries, earnings display rich dynamics, including substantial asymmetries and nonlinearities by age and previous earnings levels. Most of these dynamics, particularly in the Netherlands, are related to fluctuations in hours worked rather than in wages. Individual-level male wage and earnings risk is relatively high at the beginning and end of one's working life, and for those in the lower and upper parts of the income distribution. In the Netherlands, government transfers are a major source of insurance. They have notable effects on the standard deviation, skewness and kurtosis of income changes. In the U.S. the role of family insurance is much larger than in the Netherlands. Family and government insurance reduce, but do not eliminate non-linearities in household disposable income by age and previous earnings in both countries.

Keywords: Wage risk, self-insurance, social insurance, progressive taxation, redistribution, life cycle

JEL classification: D31, E24, J31, H31

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1 Introduction

Wage risk affects key economic decisions, including consumption, saving, and labor supply, and is an important determinant of household's welfare. Households can self-insure against these shocks. That is, single people can adjust their own labor supply and savings, while couples can adjust the labor supply of both partners, in addition to savings. Furthermore, governments can supplement or partly replace the need for self-insurance through progressive taxes and transfers.

This paper studies the size and distribution of wage shocks and the role of insurance mechanisms against these shocks in the Netherlands and the Unites States. We start by documenting the distribution of wage shocks at the individual level by analyzing distributional measures of wage changes, including the standard deviation, skewness, kurtosis, and persistence, by age and previous earnings. To understand the role of individual-level labor supply and fluctuations in hours, we compare the distribution of individual wage shocks with that of individual-level earnings. To analyze the role of family insurance through the labor supply of both partners, we compare the distributions of individual-level and household-level earnings. To examine the role of government insurance, we compare the distribution of household income, pre- and post-taxes, and transfers, by age group and previous earnings.

Our high-quality administrative data on income, taxes, and government transfers on individuals and households for the Netherlands (IPO) enables us to get precise estimates of the dynamics of wage shocks and the role of private and public insurance mechanism to mitigate these shocks. We compare the results with estimates for the U.S. Panel Study of Income Dynamics (PSID), and find that the distribution of wage and earnings shocks display rich dynamics and, particularly, depend on age and previous earnings in both countries, as was previously documented for earnings in the U.S. (Guvenen, Karahan, Ozkan and Song, 2016, and Arellano, Blundell and Bonhomme, 2017).

Our contribution to the literature is threefold. First, whereas most previous studies investigated shocks in individual earnings, we distinguish between shocks in wages and changes in hours worked. As both may have different dynamics, this provides us with a better understanding of the nature of income risk. Using high-quality administrative data on hours worked (derived from payroll administration), we find that most of the fluctuations in earnings are related to changes in hours rather than changes in wages.

This differs from what we find in Dutch household survey data (DNB Household Survey) or the PSID, and suggests that accurate measurement of earnings and hours worked is crucial to properly account for wage dynamics.

Second, we investigate the degree of insurance provided by spousal labor supply (by comparing individual earnings and total earnings at the household level) and insurance provided by the tax and transfer system (by comparing pre- and after-taxes household income). We find that the family is a relevant source of insurance in the Netherlands, but most of this insurance comes from income pooling rather than labor supply reactions of secondary earners or added worker effects. Taxes and, particularly, the transfer system play a much larger role in the reduction of income risk.

Third, we compare two countries: the Netherlands and the U.S. This is an interesting comparison because these two countries differ substantially in the size of their welfare state and the progressiveness of their tax system.[1] We find that family insurance is more relevant in the U.S. than in the Netherlands, whilst in the latter the government is responsible for the bulk of the reduction in income risk. This also holds if we compare survey data across both countries. Finally, our analysis provides data that rich models of risks and insurance should match to be consistent with the key features of the micro-data that we document.

Our paper contributes to a growing literature on higher-order moments of income shocks. Guvenen et al. (2016) investigate higher order earnings risk using US Social Security administrative data. They find substantial nonlinearities and non-normalities, but they can only study gross individual earnings process, so they cannot separate hours and wages or study additional insurance mechanisms. Hoffman and Malacrino (2019) use Italian administrative data to decompose earnings growth in changes in employment time and changes in weekly earnings. Like us, they find that changes in employment time are an important driver of earnings growth. Halvorsen, Holter, Ozkan and Storesletten (2019), using Norwegian data, and Busch, Domeij, Guvenen and Madera (2018), using data for Germany, attribute changes in earnings particularly to changes in wages. These

[1] Although eligibility requirements have become more restrictive over the past two decades, the Dutch welfare system is one of the most comprehensive in Europe; see Kalwij, Kapteyn and de Vos (2018) for a detailed and up-to-date description of social security reforms in the Netherlands. The OECD Social Expenditure Database 2016 shows that public social expenditure on family support, disability, unemployment and active labor market policies as a percentage of GDP is twice as high in the Netherlands compared to the U.S.

international differences suggest that the institutional frameworks are important to determine whether wages or hours are the most important margins of adjustment. Similarly to our results, Busch et al. (2018) and Halvorsen et al. (2019) find that the benefit system is particularly important to insure workers against earnings fluctuations. Pruitt and Turner (2018), use administrative data from the U.S. and find that the probability of the spouse entering employment rises when the male experiences earnings losses.

There is mounting interest in the higher-order moments of income shocks. They are key input for models on asset prices (Mankiw, 1986; Constantinides and Ghosh, 2014; Schmidt, 2016), monetary policy (Kaplan, Moll and Violante, 2016), and optimal social insurance and taxation (Golosov, Troshkin and Tsyvinski, 2016). Taking into account higher-order moments also influence estimates on the welfare costs of earnings fluctuations (De Nardi, Fella and Paz-Pardo (2019) find that they are smaller when taking into account higher-order moments).

The remainder of the paper proceeds as follows. Section 2 describes our data and approach, after which sections 3 and 4 present the results. Section 5 concludes.

2 Data and approach

This section describes the data, our sample selection criteria, our wage and income measures, and the statistics that we set out to analyze.

Data sources We use two datasets for our main analysis: administrative tax records from the Dutch Income Panel Study (IPO) which contain detailed information of various income sources and administrative data on hours worked from the Dutch payroll administrations (DPA). For the purpose of comparing our findings for the Netherlands to the US we use data from the Panel Study of Income Dynamics (PSID) in the US.[2]

The IPO data set contains detailed information on, amongst others, personal income, household income, demographics, and labor market status for a representative 1% population sample (about 95,000 individuals) and their household members. The sample is randomly selected by Statistics Netherlands based on their national security number and is followed over time since 1989. Because of a major tax reform, some of the income

[2] Appendix F documents that are findings on the basis of the IPO administrative data are robust to using survey data for the Netherlands.

definitions in IPO changed in 2001. Our sample therefore starts in 2001.

The IPO data set has several important advantages over survey data. First, the data is often collected from or checked with a third party. For instance, income measures are derived from tax records complemented with information provided by banks and other financial institutions. In addition, Statistics Netherlands performs several checks on the data to guarantee their quality. This drastically reduces or even eliminates measurement error and errors due to non-reporting. Second, individuals are followed for as long as they are residing in the Netherlands (as of December 31 of the sample year). We thus have little to no endogenous panel attrition. Panel attrition only occurs as a result of migration or death. New panel members enter the panel for the first time in the year of their birth, and immigrants to the Netherlands in the year of their arrival. Third, and very importantly, the IPO data set contains a detailed decomposition of labor and asset income, taxes and social insurance premia paid, and government transfers received for all household members. It also contains a detailed transfers breakdown, including unemployment insurance, disability insurance and social assistance. The fact that, unlike other administrative data sets such as the US Social Security Administration, the IPO data set tracks households rather individuals and contains information on all direct taxes and transfers allow us to investigate the role of both the family and the government insurance in reducing income fluctuations..

The DPA payroll data provide yearly information on the number of days that a worker has been employed and the number of hours worked, up to full-time, reported as a fraction of full-time weekly hours according to the sectoral collective labor agreement, the so-called "part-time" factor. The information is reported directly by employers to the tax authorities. The "part-time" factor is not only based on contractual hours, but also on paid overtime hours.[3] Paid leave of absence, such as sick leave or parental leave, is counted in the data as hours effectively worked as long as wages are not reduced, and thus we cannot separate it out.[4]

Turning to the U.S. data, the PSID began in 1968 with a representative sample of

[3]For those workers whose contracts do not specify the explicit number of hours (such as zero-hours, min-max, or piece-rate pay contracts), the actual amount of hours paid is reported.

[4]The "part-time" factor does not include overtime hours for full-time workers or overtime hours that are paid at a higher rate than usual hours. Fortunately, starting from 2006 we have detailed monthly information on hours that does include a very good measure of overtime. In Appendix A we show that considering that restricting the analysis to 2006 onwards and only considering this alternative, richer measure does not affect our main conclusions.

18,000 individuals living in 5,000 families. We use it for the period 1968 to 1992. We exclude the years 1993-1997, because of a major redesign of the survey and those after 1997 because the PSID became bi-yearly after that date. To confirm that the results are not driven by the different time periods for the U.S and the Netherlands (see Heathcote, Perri and Violante, 2010 for a discussion of changes in the distribution of wages and earnings in the U.S. across this period of time), in Appendix B we also study our statistics of interest for the period after 1997 for two-years income changes in both countries. This robustness check shows that the cross-country differences that we document come from different cross-country features and not from comparing different sample periods.

Sample selection For each data set, we select a sample of male earners age 25 to 60 to abstract from education and retirement decisions. We exclude self-employed workers[5] and individuals with a very low attachment to the labor market. We include individuals with labor earnings of at least 2720 dollar a year (2200 euro) in 2014 prices. We equivalize all measures of earnings that pertain to the entire household using the equivalence scale provided by Statistics Netherlands.[6]

Variable definitions We study individual wages and gross labor earnings, household gross earnings, household pre-tax (primary) income, household after-tax (disposable) income.

We define individual gross earnings as the total amount received by a worker in a given year according to their contract, which includes employee's contributions to social security.[7]

We compute household gross earnings by aggregating individual earnings of all household members. By adding income from savings we obtain household pre-tax income. Finally, household after-tax income equals household pre-tax income minus income taxes (plus allowances, including healthcare, rent, child and childcare, study costs, and alimony) plus transfers. Transfers are the sum of unemployment benefits, disability benefits, social assistance and pension benefits.

[5]That is, those for whom income out of self-employment is their main income source following Guvenen et al. (2016).

[6]This assumes that two adults need 37% more income than a single adult to achieve the same welfare level, and two adults with two children need 88% more income than a single adult.

[7]In the Netherlands, these include a contribution for health insurance and a premium for unemployment, disability, and pension benefits.

We compute individual gross wages w_{it} as

$$w_{it} = \frac{y_{it}}{h_{it}} \tag{1}$$

where y_{it} denotes individual gross yearly earnings and h_{it} (a measure of) hours worked within the year. We obtain our measure of hours worked by linking administrative payroll data from the DPA to our main IPO sample, thus properly accounting for time spent unemployed, part-time work, and overtime. More precisely, our yearly hours measure is the sum, over all employment spells in the year, of the product of the number of weeks worked and the average number of hours per week in each spell. In the DPA dataset actual hours per week are reported normalized by the typical number of hours in a full-time work week in the relevant sector. The resulting wage is therefore an average weekly wage over the total time spent in employment in the course of the year.

Approach As standard in the literature, we purge age and time effects from log wages by running the following regression and identifying its estimated residuals as wage shocks

$$\log w_{it} = \beta_1 \text{age}_{it} + \beta_2 \text{age}_{it}^2 + \alpha_t + u_{it}. \tag{2}$$

The subscript i refers to an individual, t is year, α_t represents year fixed effects, and the error term u_{it} captures the stochastic component of wages.

Rather than estimating a parametric earnings process on the data, we follow Guvenen et al. (2016) and report key moments of the distribution of earnings changes. The main reason for doing so is that, as documented by Guvenen et al. (2016) using administrative data for the US, these moments are inconsistent with the typical, covariance-stationary, parametric linear process typically used in the literature. In what follows, we report the first four moments of earnings changes.

We compute both the conventional measure of skewness (Pearson's or centered third moment) and Kelley's coefficient of skewness. The latter is less sensitive to outliers and is given by

$$S_{\text{K}} = \frac{P_{90} + P_{10} - 2P_{50}}{P_{90} - P_{10}}, \tag{3}$$

where a zero implies a symmetric distribution, positive values represent right skewness, and negative values represents left skewness.

Concerning kurtosis, we report in the main text only the robust Crow-Siddiqui measure[8] which is given by

$$S_{\text{CS}} = \frac{P_{97.5} - P_{2.5}}{P_{75} - P_{25}}. \tag{4}$$

The term S_{CS} is large if $P_{97.5} - P_{2.5}$ is large relative to the probability mass that is concentrated between P_{75} and P_{25}, corresponding to heavy tails.

Finally, we analyze persistence by age, by regressing $\hat{u}_{it+1}$ on $\hat{u}_{it}$ for different ages.

To investigate the role of different insurance mechanisms, after studying wages, we repeat the analysis for individual-level earnings, household earnings and household after-tax (disposable) income. The comparison of wages and earnings is informative about self-insurance through labor supply. The comparison of individual-level and household-level earnings is informative about family insurance through the labor supply of the spouse. The comparison between household pre- and post-tax income helps to shed light on the role of insurance by the government through transfers and progressive taxation.

3 Results: Netherlands

In this section, we discuss male earnings changes and the contribution of hours and wages to their dynamics. We then contrast the properties of male earnings, household earnings, and after-tax household income and discuss their implications for family and government insurance.

3.1 Male earnings, wages, and hours

Figure 1 reports a set of statistics for male earnings (left panels), wage (middle panels), and hours (right panels) changes by previous earnings for various age groups.

Starting from the top row, which reports the standard deviation of earnings changes, there are three features worth noticing. First, the variability of earnings changes is more than twice as large (0.5) for workers at the lowest percentiles of previous earnings than for workers around the median (0.2). Second, this variability tends to increase for workers with previous earnings above the 90th percentile. Third, workers in the oldest (55-59)

[8] Appendix C reports the conventional fourth standardized moment.

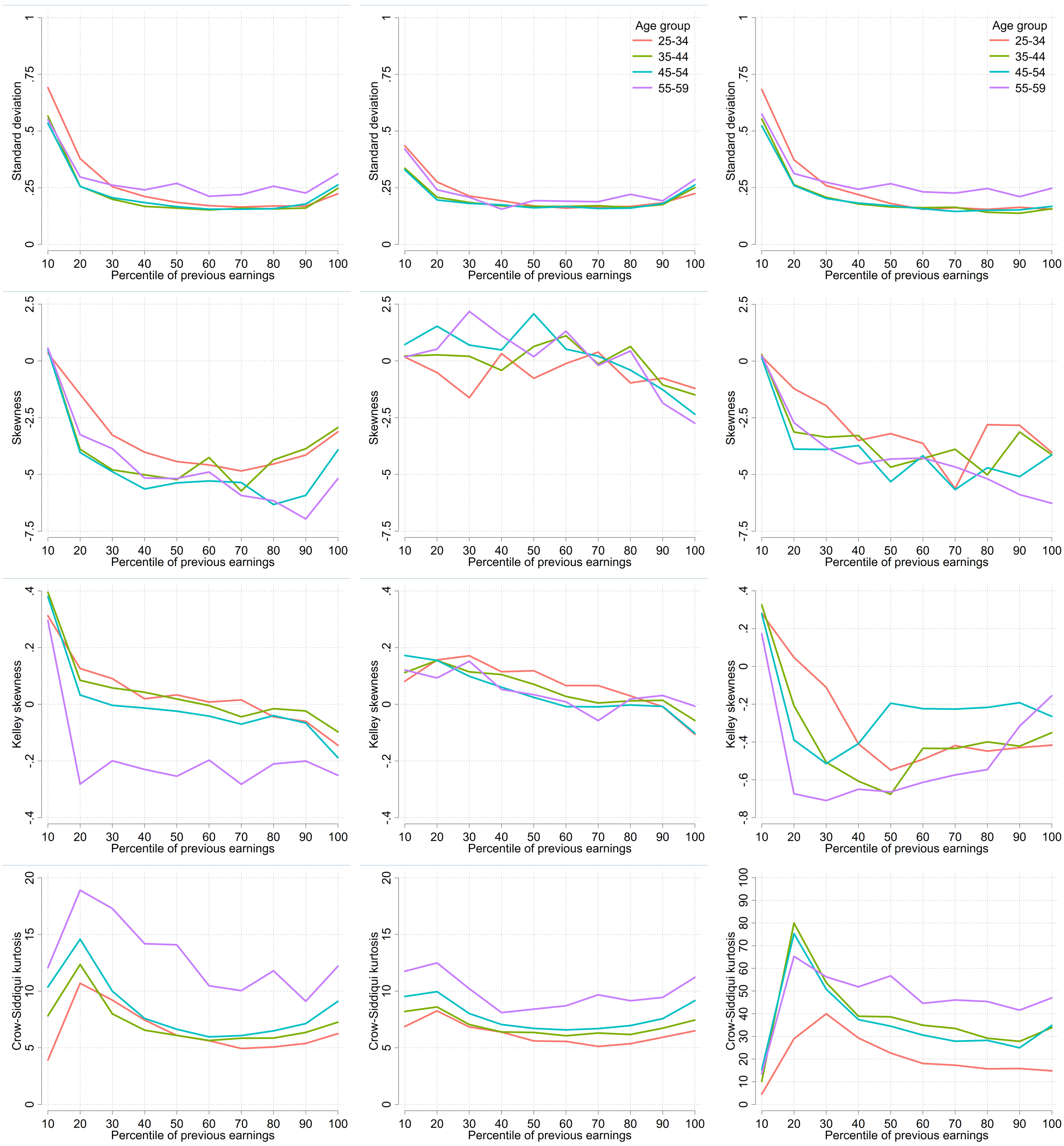

Figure 1: Netherlands: male earnings (left), male wages (middle), and male hours (right). Standard deviation (top row), Kelley's skewness (second row), skewness (third row), and Crow-Siddiqui kurtosis (bottom row).

group experience the largest earnings change volatility, with the notable exception of age 25-34 workers in the lowest three deciles of the distribution of previous earnings.

Moving across columns and comparing the variance of earnings changes to that of its components—wages and earnings—reveals that the differential patterns by age are mostly driven by differential patterns in hours. The variance of wage changes displays less heterogeneity by age groups and also less variability by previous earnings percentile than the variance of earnings. This suggests that there is important action at the hours margin and that most fluctuations in earnings, particularly for lower earners, are due to temporary unemployment, reductions in working time, or labor supply decisions.

Some of these patterns by age are likely related to key Dutch institutional features, which include widespread flexible contracts and generous sick leave. Flexible contracts are common among young workers and might generate more variability in their earnings and hours. The generous sick leave policy partially insures older workers in case of long-lasting negative health events and reduces the cost of their earnings and hours fluctuations. For instance, the employer is required to continue paying at least 70% of their employee's earnings during their first two years of sickness. Thereafter, one may become eligible for (partial) disability benefits.

The second row of panels in Figure 1 studies the asymmetry of the distribution of earnings, wages and hours changes by reporting Pearson's skewness, that is the third centered moment. Earnings display substantial negative skewness.[9] Comparing the skewness of earnings changes to that of wages and hours reveals that it is hours, rather than wage, that drive the negative skewness of earnings. The skewness of wage changes is mostly non-negative with the exception of workers within the top decile of previous earnings.

Since high-order centered moments are highly sensitive to outliers, the third row of panels report Kelley's skewness, a measure which is robust to outliers. As far as earnings are concerned, Kelley's skewness is zero or positive for most age groups and for most of the distribution of previous earnings. The noticeable exception is for workers in the 55-59

[9] In fact skewness is substantially more negative than found in related studies such as Guvenen et al. (2016) for the USE or Halvorsen et al. (2019) for Norway. This feature of the data is mostly driven by different variable definitions. We plot the skewness of earnings over the distribution of earnings in the previous year, while these studies plot it over a measure of recent earnings that represents an average over the previous 5 years. Thus, our sample selection is less stringent (we only require the earnings in t and $t-1$ to be above the minimum earnings level, and the ordering of percentiles is different. In Appendix D we show that, using a comparable measure of recent earnings, skewness is much closer to the values found in those studies.

age bracket for which it is significantly negative. Turning to wages and hours, reveals that the negative skewness is driven by the behavior of hours and not wages. For the other age groups the negative skewness of hours tends to be offset by the positive skewness of wages. Thus, the data shows that the driver of most large negative changes in earnings is a reduction in hours (which can include unemployment, partial disability, and so on).

Finally, the last row of panels reports a robust measure of kurtosis (Crow-Siddiqui).[10] The kurtosis of earnings changes is highest towards the bottom of the distribution of previous earnings (up to the 25th percentile).The large kurtosis that we observe suggests that earnings shocks are very infrequent but that, when they happen, they tend to be of a large magnitude. This is particularly true for older workers, for whom employment protection is strongest in the Netherlands. Kurtosis is even higher for hours than for earnings suggesting that hour fluctuations are infrequent, but when they do happen they are relatively large (note the different scale in the graph). This provides some support for models of life-cycle labor supply where male labor supply is inelastic and subject to unemployment shocks, or only subject to adjustments of a discrete nature.

Taken together, the moments in Figure 1 provide strong evidence in favor of age-variation, non-linearity, and non-normality of earnings changes.

To further clarify the role of hours and wage changes and their co-movement in explaining the rich nonlinear patterns in male earnings, Figures 2 and 4 decompose the three centered moments of earnings considered above into the contribution of the respective moments of wages and hours and their comovement.

In the left panel of Figure 2 we observe that, for most households, the variance of wages and hours worked is relatively low. It is larger for the lowest earners, for whom most of the fluctuations are related to hours rather than wages, and for the highest earners, for whom the opposite is true. The covariance between the two changes is effectively zero.

The three graphs in Figure 3 further explore the extent to which changes in male earnings are related to changes in hours and wages. The first graph on the left focuses on people who, during the previous period, were in the first earnings decile. The second and third graphs in this figure, isolate people who were at median earnings and the ninth earnings decile, respectively. Within each graph, for each group, the horizontal axis measures changes in earnings and the vertical axis measures changes in hours or wages,

[10]For completeness, Appendix C reports the centered Pearson's measure of kurtosis.

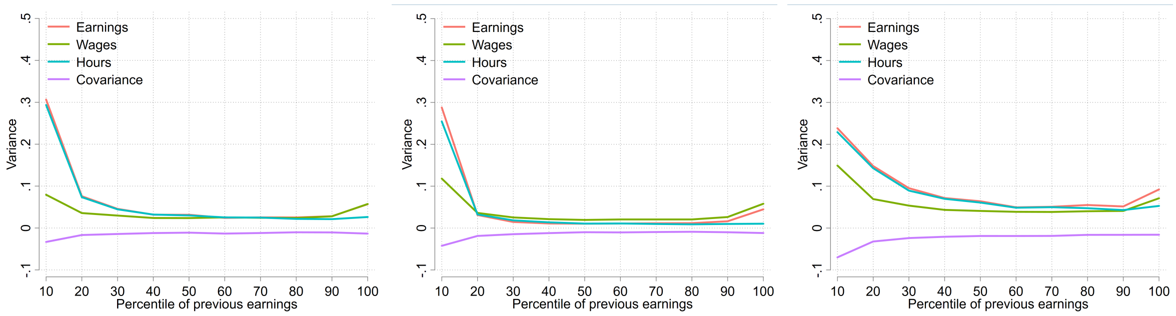

Figure 2: Variance of changes in male earnings, wages and hours. Left: all workers; middle: workers with a positive hours change; right: workers with a negative hours change.

both expressed in terms of log points. In addition, each dot on a line represents a decile in the changes in *current* male earnings relative to the previous one.

For instance, the leftmost data point in the left panel of Figure 3 shows that earners in the lowest decile of previous earnings who experience the worst earnings change suffer on average an 80% decrease in their earnings (read off 45 degree line). Of these, above 70 percentage points are accounted for by a reduction in hours, and slightly less than 10 percentage points are due to a reduction in wages. Naturally, those with the lowest previous earnings are also those who experience the largest earnings increase in relative terms (140%, the rightmost data point in the left panel of Figure 3). For those, again, most of the change is due to an increase in hours, with only a small role for wages. Most people, however, face very small changes to their earnings, hours, and wages, and that's why most dots are located very close to zero.

These patterns are different for people with previous earnings around the median (central panel). For them, negative shocks are due to both changes in wages and hours, and positive shocks are almost entirely due to increasing wages. Similarly, at the top of the distribution of previous earnings (right panel), negative shocks in earnings are mainly due to drops in wages and, to a somewhat lesser extent, in hours.

Turning to skewness, the left panel of Figure 4 reveals that the negative skewness in earnings changes is mostly driven by changes in hours rather than in wages, while the contribution of the (negative) co-skewness is limited. Thus, the observed large earnings skewness likely reflects temporary periods out of employment or reductions in the numbers of hours worked per week. This is consistent with the evidence presented in Hoffman and Malacrino (2019) for Italy, but at odds with the findings in Busch et al. (2018)

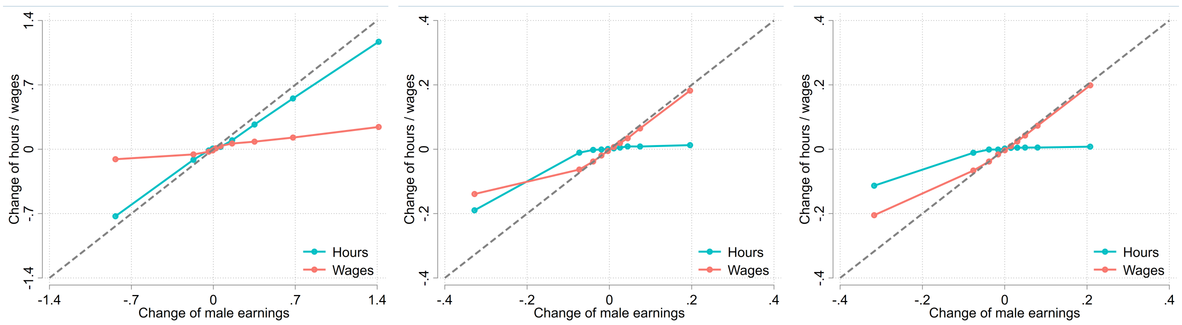

Figure 3: Male earnings changes versus hours and wage changes. Each dot represents a decile of changes in male earnings. First decile of previous earnings (left), median decile of previous earnings (middle), 9th decile of previous earnings (right).

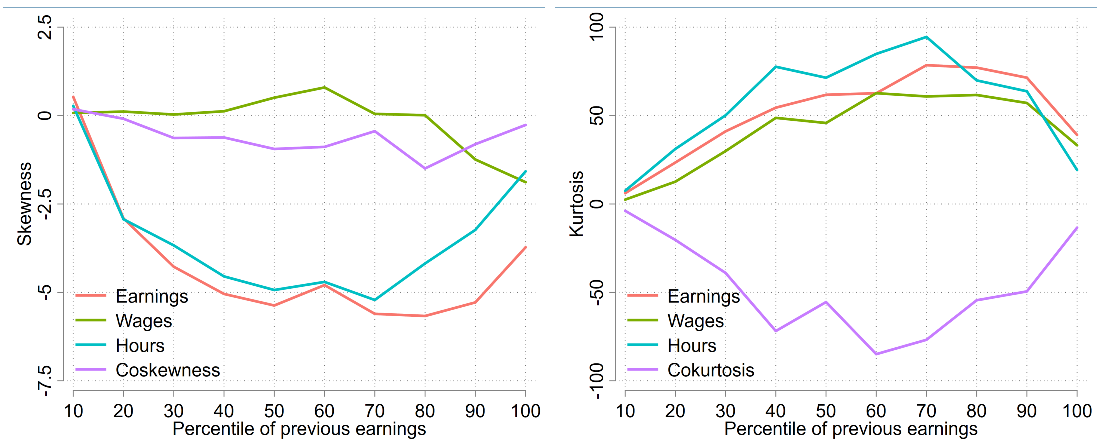

Figure 4: Skewness and kurtosis of changes in male earnings, wages and hours

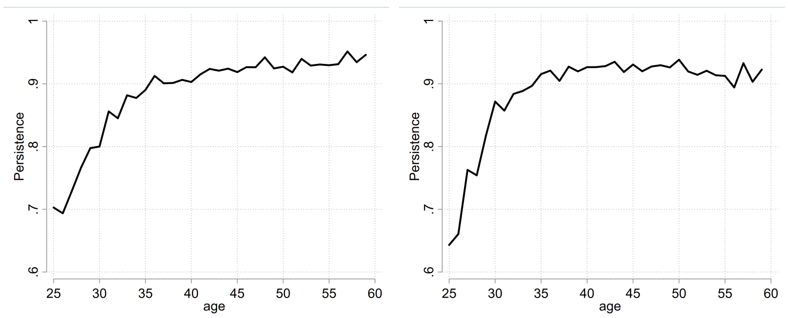

Figure 5: Netherlands: persistence of male earnings (left) and male wages (right) as function of age.

for Germany. The limited contribution of co-skewness is also at odds with the findings of (Halvorsen et al., 2019) for Norway where co-skewness plays a substantial role in explaining negative skewness of earnings growth. These international differences suggest that the institutional framework that governs the labor market is crucial to determine the sources of earnings fluctuations and whether adjustments occur at the margin of hours or wages. Finally, kurtosis, in the right-hand-side panel of Figure 4 is also driven more by hours than by wages. Most individuals do not change working hours between one year and the next and this leads many relatively small changes in earnings.

Finally, Figure 5 reports the persistence, measured by the first-order autoregressive coefficient, of earnings and wage changes. Similarly to what has been documented for other countries, in the Netherlands the persistence of earnings is lowest for the young and increases until about age 40 when it stabilizes. The same is true for wages, though their persistence is even lower until age 30—labor supply is more persistent than wages—but then rises faster between 30 and 40.

In sum, male workers experience significant earnings variability, especially at lower levels of earnings and during their youngest and oldest working periods. This variability displays rich dynamics and the lion's share of these dynamics comes from the behavior of hours rather than that of wages.

3.2 Household insurance

To investigate the effect of insurance within the household, we compare the nature of changes in male and household earnings (left vs. central panels of Figure 6). The top panel of the figure shows that persistence is very similar for male and household earnings.

Turning to the second panel we can see that, among older workers, the standard deviation is a little bit lower for households than for male earnings and that (third panel), except for younger households, Kelley's skewness is less negative for changes in household earnings compared to male earnings. Interestingly, for younger workers we find higher standard deviations and more negative Kelley skewness for household earnings compared to male earnings, which could be explained by female spouses reducing working hours after the birth of children.

The bottom two panels of figure 6 show that the labor supply of the secondary earner plays an important role in reducing the impact on household earnings of very big shocks to male earnings: the centered skewness and kurtosis of household earnings are substantially lower than those of male earnings. This means that on the household level there are more frequent but small changes in earnings, compared to less frequent but larger changes in male earnings and wages. Thus the Dutch family plays a role in reducing the risks that households face. These features of the data might be either due to a pooling of earnings within the household or due to an increase in the labor supply of women when their husbands experience a negative earnings shock (added worker effect).

Figure 7 examines the role of these two channels in generating within-household insurance. It reports the average change of women's hours between years t and $t+2$ as a response to changes in male earnings between t and $t+1$ for couples. If there was an added worker effect, the number of hours worked by the woman in the household would respond to earnings shocks suffered by the man; by looking at two-year windows we can capture changes in female labor supply which are not exactly contemporaneous to the man's earnings shock. We do not find any association between changes in male earnings and changes in women's hours worked, indicating that it is mostly income pooling which explains the reduced earnings risk that households face. This is in line with findings for Norway (Halvorsen et al. (2019)), and may be due to correlated labour market opportunities of spouses. The only noticeable, but small, labor supply reaction in the Netherlands is for women who reduce hours worked as a response to large positive changes in male earnings, if the husband is in the top decile of the distribution of previous earnings (right panel).

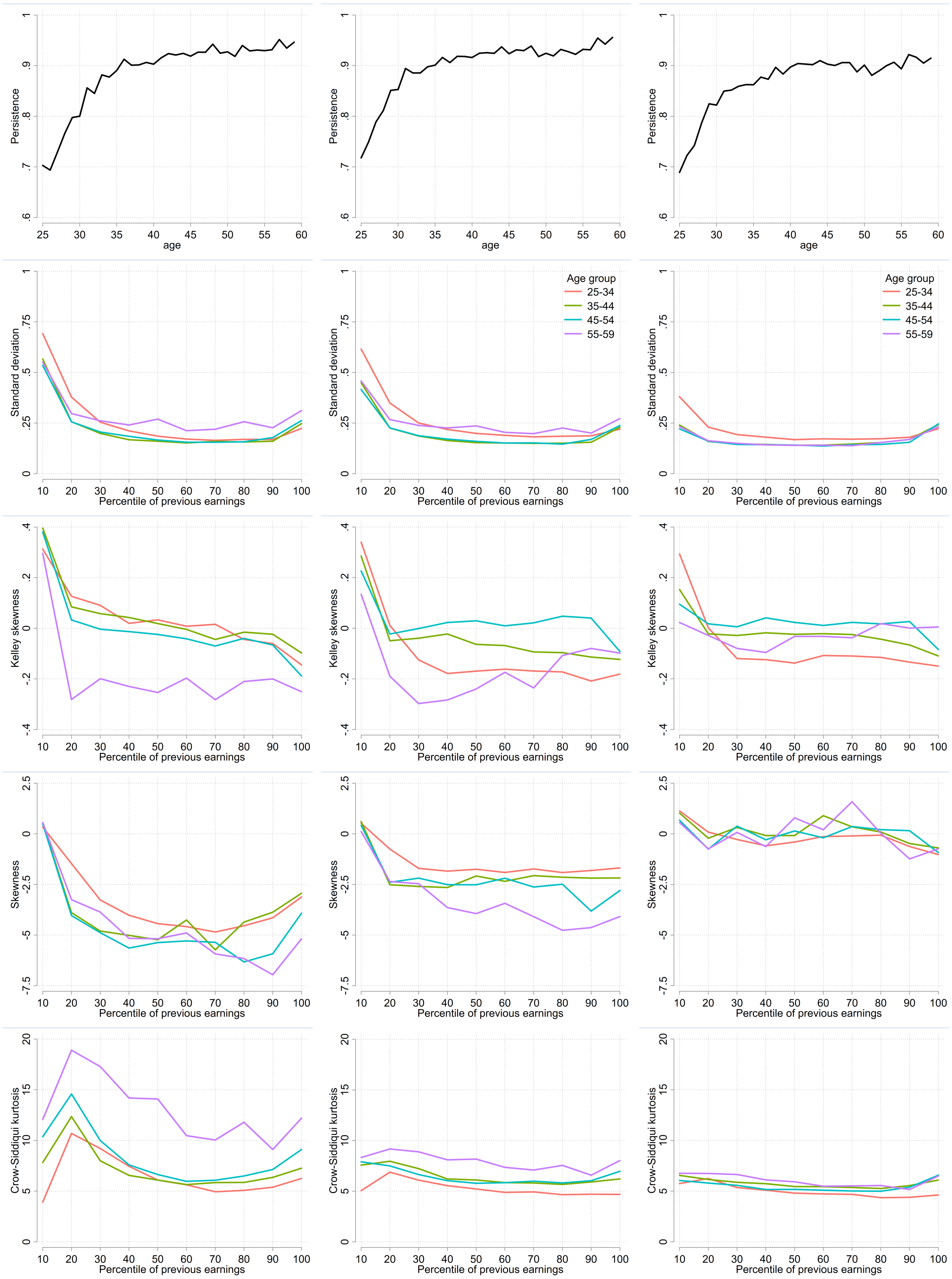

Figure 6: Netherlands: male earnings (left), household earnings (center), post-tax income (right). Persistence (top row), standard deviation (second row), Kelley's skewness (third row), skewness (fourth row), and Crow-Siddiqui kurtosis (bottom row).

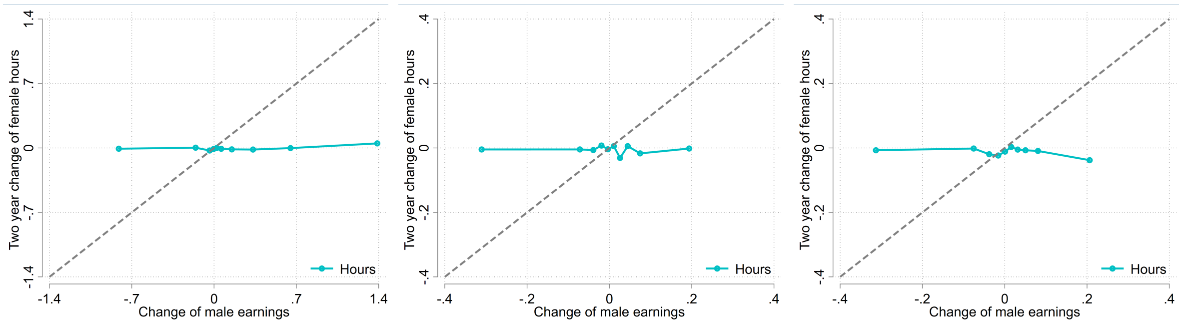

Figure 7: Male earnings changes and female labor supply. Each dot represents a decile of changes in male earnings. Lowest decile of previous male earnings (left), median decile of previous male earnings (center), 9th decile of previous male earnings (right)

3.3 Insurance from taxes and transfers

We investigate the role of government insurance by comparing the central panels (which represent household earnings) and right-hand-side panels (which represent disposable income after taxes and benefits) in Figure 6.[11]

The comparison of these two columns in Figure 6 shows that taxes and transfers make a huge difference for the measures of risk that we focus on, especially at the lower end of the income distribution and for households in the oldest age group. In terms of disposable income, the standard deviations are lower and both measures of skewness become less negative. For instance, the standard deviation of household income changes at the lowest percentiles of previous earnings declines from about 0.62 before taxes and transfers to a little over 0.37 after taxes and transfers. The reduction in the standard deviations and both measures of skewness is especially apparent for workers in the oldest age group. For them, skewness becomes almost zero. The Crow-Siddiqui kurtosis further drops from about 8 on the household level before taxes and transfers (it peaked at about 17 for wages and male earnings) to well below 7 after taxes and transfers.

Figure 8 summarizes the roles of household and government insurance by showing the pass-through of changes in male earnings to before- and after-tax income. It shows that taxes and transfers offset positive and negative changes in male earnings, especially for households at the bottom of the distribution of previous earnings. For example, households in the 20th percentile of previous earnings with a negative earnings shock of 60% experience on average a 40% drop in pre-tax household income, but only a 10%

[11]Household disposable income also contains net income from savings. In Appendix E we show that this capital income makes little difference for household income dynamics.

Figure 8: Household before- vs after-tax income. Each dot represents a decile of changes in male earnings.

drop in disposable household income. Households in the 50th and 80th percentile of previous male earnings experience smaller changes in male earnings (the dots are closer to zero). Households in the 80th percentile of previous male earnings receive, as expected, less insurance from progressive taxation and transfers in case of a negative shock in male earnings (the difference between the slopes of the blue and the red lines is smaller). On the other hand, positive shocks in male earnings are also more cushioned by the government for households in the 20th percentile of previous male earnings, compared to households in the 50th and 80th percentile of previous male earnings.

Given that government insurance is especially prevalent in the Netherlands and especially so at older ages, Figure 9 further breaks down the role of various government programs for our 55-59 age group by sequentially adding specific transfer programs or taxes. The graphs show that disability insurance greatly reduces the standard deviation of household earnings changes below the 20th percentile of previous earnings, while unemployment insurance generates a significant reduction even at higher levels of previous earnings. It also shows that, for this age group, (early) retirement transfers play a much larger role in reducing variation in household income than progressive taxes. The bottom graph of Figure 9 shows that negative skewness is completely offset by taxes and transfers in the bottom 45 percentiles of the distribution of previous earnings, whereas it is partly offset between the 45th and the 80th percentile of previous earnings.

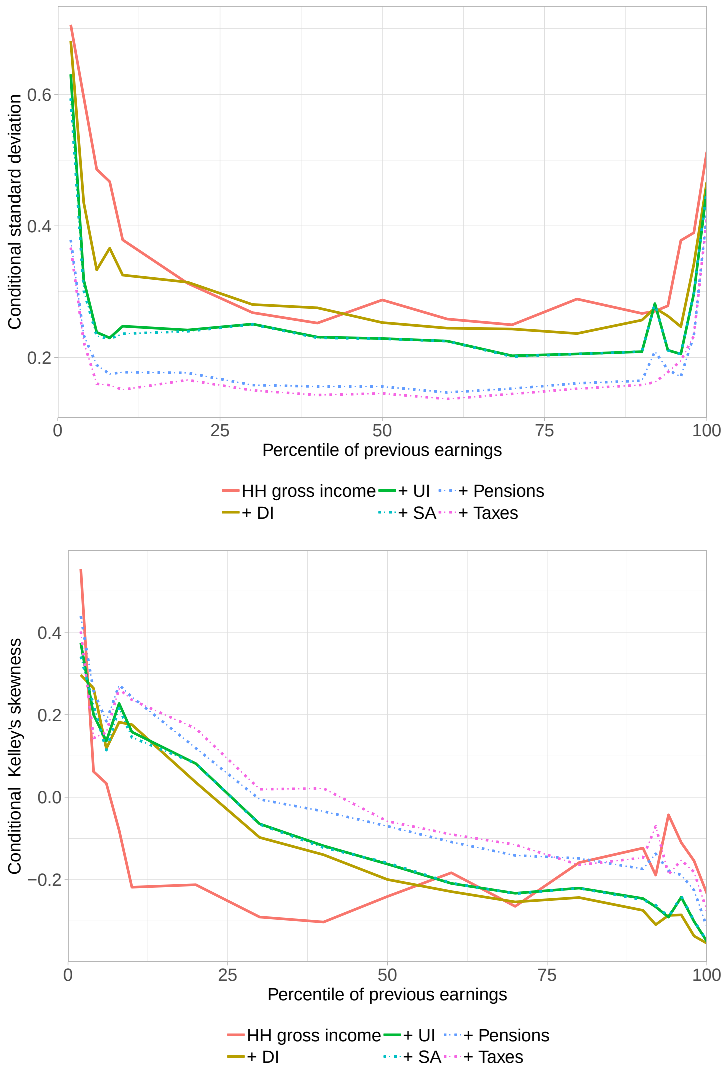

Figure 9: NL, age 55-59, Relative contribution of transfers and taxes to the standard deviation of household income. Red line, household gross income, gold line: including disability insurance, green line: also including unemployment insurance, dotted green line: also including social assistance, dotted blue line also including pensions, dotted red line: also net of taxes.

Our analysis makes it clear that the government and private pensions provide a lot of insurance in the Netherlands. Progressive taxation reduces earnings variability and the benefit system (unemployment insurance, disability insurance, and welfare) and private pensions reduce income variability. In particular for older workers and for the bottom of the distribution of previous earnings, transfers effectively eliminate large negative shocks, such that negative skewness disappears and the kurtosis is reduced. The breakdown of transfer programs or taxes suggest that progressive taxation plays less of a role in reducing earnings variability.

4 Results: Netherlands versus U.S.

Figure 10 compares our summary statistics for the Netherlands (left hand side) and the U.S. (right hand side) for all age groups together.

For the Netherlands, these graphs confirm and clarify our results conditional on age-groups. First, in the Netherlands the rich dynamics of earnings are mostly driven by hours rather than wages. Second, the insurance provided by the secondary earner reduces the negative skewness and the kurtosis present in male earnings changes over a wide range of percentiles of previous earnings. Third, taxes and transfers have large effects on all of the summary statistics that we consider and reduce both risk and inequality in wages and earnings. The patterns that we observe are consistent with the primary earner taking on more earnings risk in terms of additional negative skewness and larger kurtosis while being able to count both on spousal insurance through labor supply, and insurance through the government via taxes and transfers to help insure against the risks related to these choices.

Turning to the U.S., the standard deviations of all income measures are higher than in the Netherlands. Comparing wages and earnings, we can see that the standard deviation of male earnings is higher than that of male wages at higher and lower levels of previous earnings, indicating a volatility in hours that amplifies the dispersion in wage changes in the U.S. A similar pattern holds for skewness (larger negative skewness for earnings than wages) and, to a lower extent, for kurtosis. Thus, the data indicates that, in both countries much of these rich earnings dynamics are driven by hours rather than by wages. However, whilst in the Netherlands the skewness of male wages is almost zero, except for the highest earners, it remains negative for most huseholds in the U.S., which suggests that negative wage adjustments are more frequent in the U.S. The relatively unfrequent wage adjustments in the Netherlands also show up in the higher kurtosis of wage changes (bottom left panel).[12]

We also find a larger role for spousal labor supply in the U.S., in reducing the standard deviation and skewness of male earnings for all levels of previous earnings. The labor supply of the secondary earners tends to compress both the volatility and the tails of the household earnings distribution in the U.S (in line with Pruitt and Turner (2018), who are using administrative data from the U.S.). These patterns are present in both countries. Only, in the Netherlands, Kelley's skewness becomes more negative after taking into account spousal labor supply.

Government insurance reduces the variability and skewness of earnings changes in both countries. However, this role is larger in the Netherlands, where the government effectively brings the skewness of disposable income to almost zero for almost all of the earnings distribution.

To confirm that results are driven by cross-country differences and not by period of observation, we also examine income dynamics for the PSID in the post 1997 period, which covers the same time frame as the IPO data. In Appendix B we show that the results are very similar, indicating that the results are mainly driven by cross-country differences.

Finally, we evaluate whether our cross-country comparison is affected by the fact that we use administrative data for the Netherlands and survey data for the U.S. To do so, we examine income dynamics using Dutch survey data (DHS) and compare them with those from our administrative data. Most of the patterns across the income distribution are similar (see Appendix F). Notably, in this survey data, the differences between gross-income and net-income are smaller, and the role of wages in earnings dynamics is larger than in our administrative data. Given that wages are constructed by dividing earnings and hours, and that the data does not allow us to account for the number of employment time, this likely related to measurement error in changes in hours worked in survey data.[13]

[12]The centered kurtosis can be found in Appendix C.

[13]Net-income is also more volatile than gross-income, which is likely driven by the imputation of taxes. When we compute net-income without taxes the volatility becomes substantially lower.

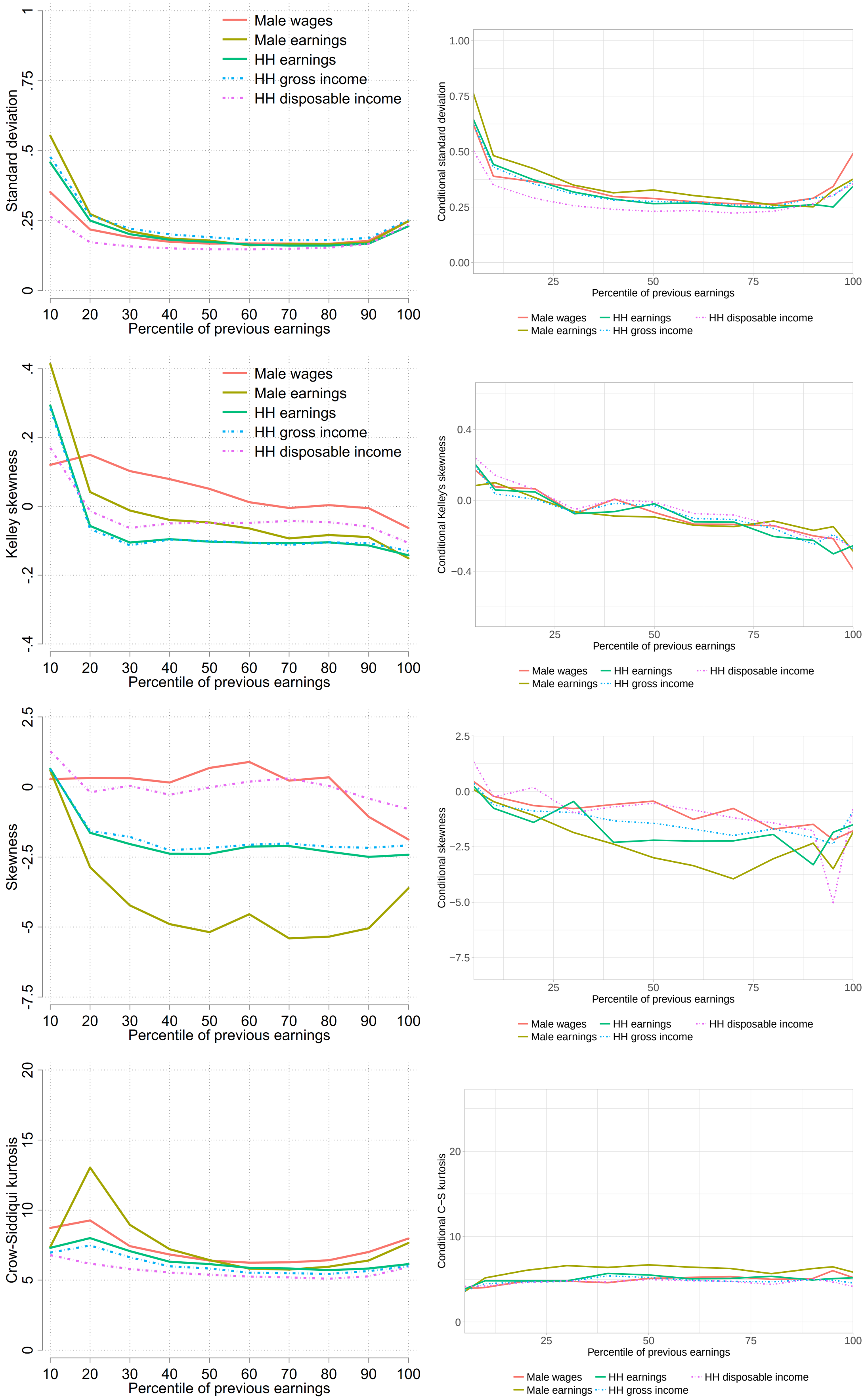

Figure 10: NL (Left), U.S. (right)

5 Conclusions

We study the nature of income dynamics over the life cycle in the Netherlands and the U.S. For the Netherlands, we use high-quality administrative data to analyze shocks in wages and hours worked. Furthermore, we investigate the degree of insurance provided by spousal labor supply and by the tax and transfers system in both countries.

Our results show clear evidence of non-linearity and age dependence of wages and earnings in both countries, with higher earnings risk for the lowest and highest earners. Except for outliers, large wage shocks are mostly positive in the lower half of the earnings distribution and negative in its top decile. Changes in employment time are an important driver of changes in earnings, especially at the lower part of the earnings distribution. An the top, upward mobility is driven by positive wage shocks (as these households are already working full-time).

In line with previous work for other countries, our results show that large downward shocks in earnings are more likely than large upward shocks. Especially for older workers and above the lowest income group, people reach wage scale ceilings and exhaust opportunities to move up, while negative earnings risk due to sickness, long term unemployment and retirement increase. For most workers, however, earnings stay about the same from one year to the other. The wages and earnings of older workers appear to be rigid, apart from some outliers driven by large changes in employment time.

In the Netherlands women's earnings do not reduce the standard deviation of income risk at the household level. Indeed, for the age group 25-34 the variance even increases after the 30th percentile, probably due to the birth of children. However, income pooling within the household substantially reduces skewness, thus suggesting that the presence of a secondary earner in the household can smooth out large negative shocks. We do not find evidence for an added worker effect in the Netherlands.

Comparing family and government insurance we find that the government plays a much larger role in reducing wage risk in the Netherlands compared to the U.S. A breakdown in government programs for older workers in the Netherlands shows that DI and UI programs reduce income risk, especially for the lowest quarter of the male earnings distribution. Pensions and taxes (to a lower extent) reduce earnings risk across the whole distribution. On the other hand, in the U.S. the role that the family plays is much more important. The results suggest that taxes and transfers may crowd out insurance that could be generated within the family.

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A Dutch male wages, computed using actual hours worked.

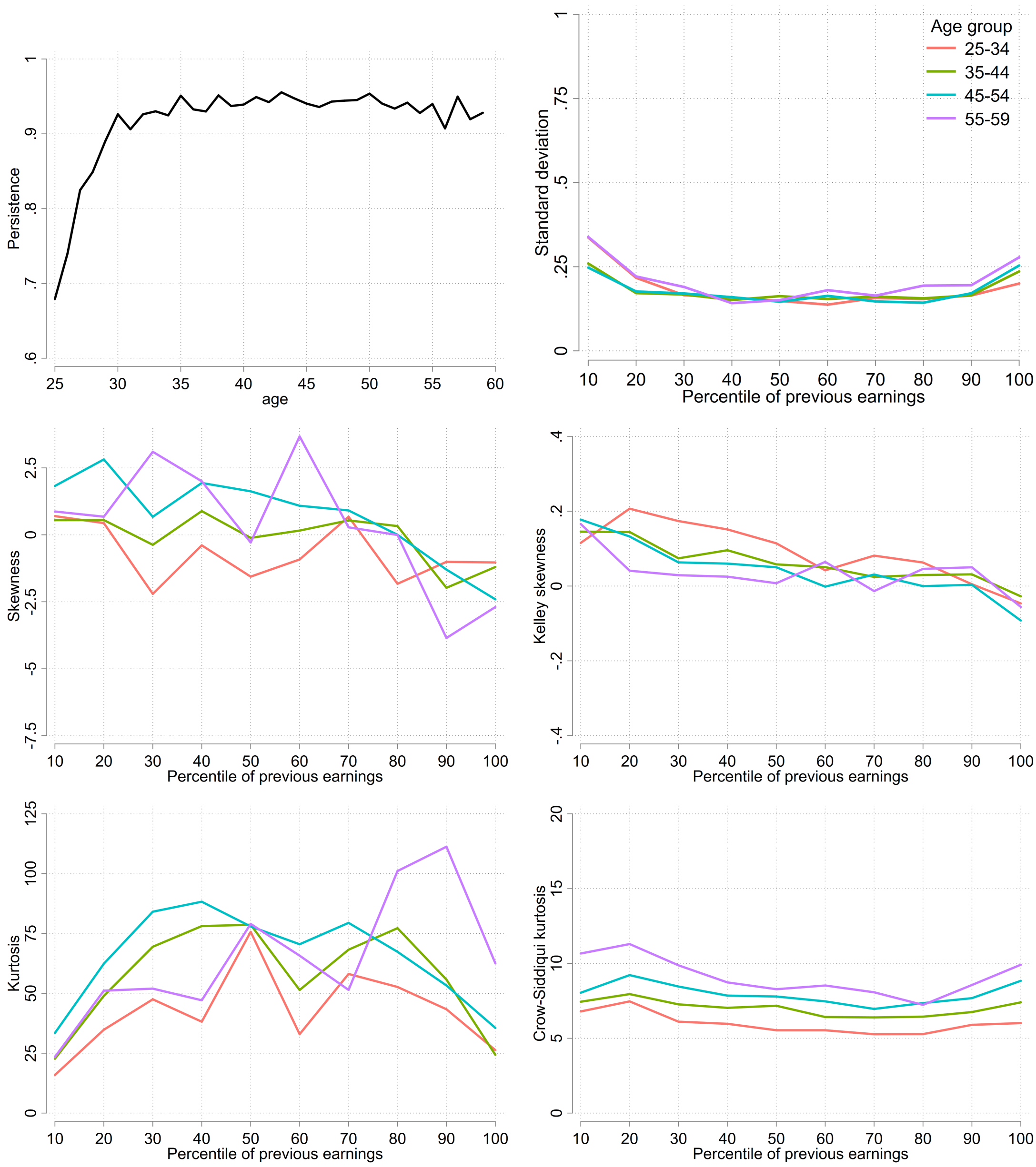

Figure 11: Dutch male wages, computed using actual hours worked. Wage persistence (top left) and following moments of wage changes: standard deviation (top right), skewness (middle left), Kelley's skewness (middle right), kurtosis (bottom left), and Crow-Siddiqui kurtosis (middle right), by age group and previous earnings percentile.

B Two-year changes in the Netherlands and the U.S.

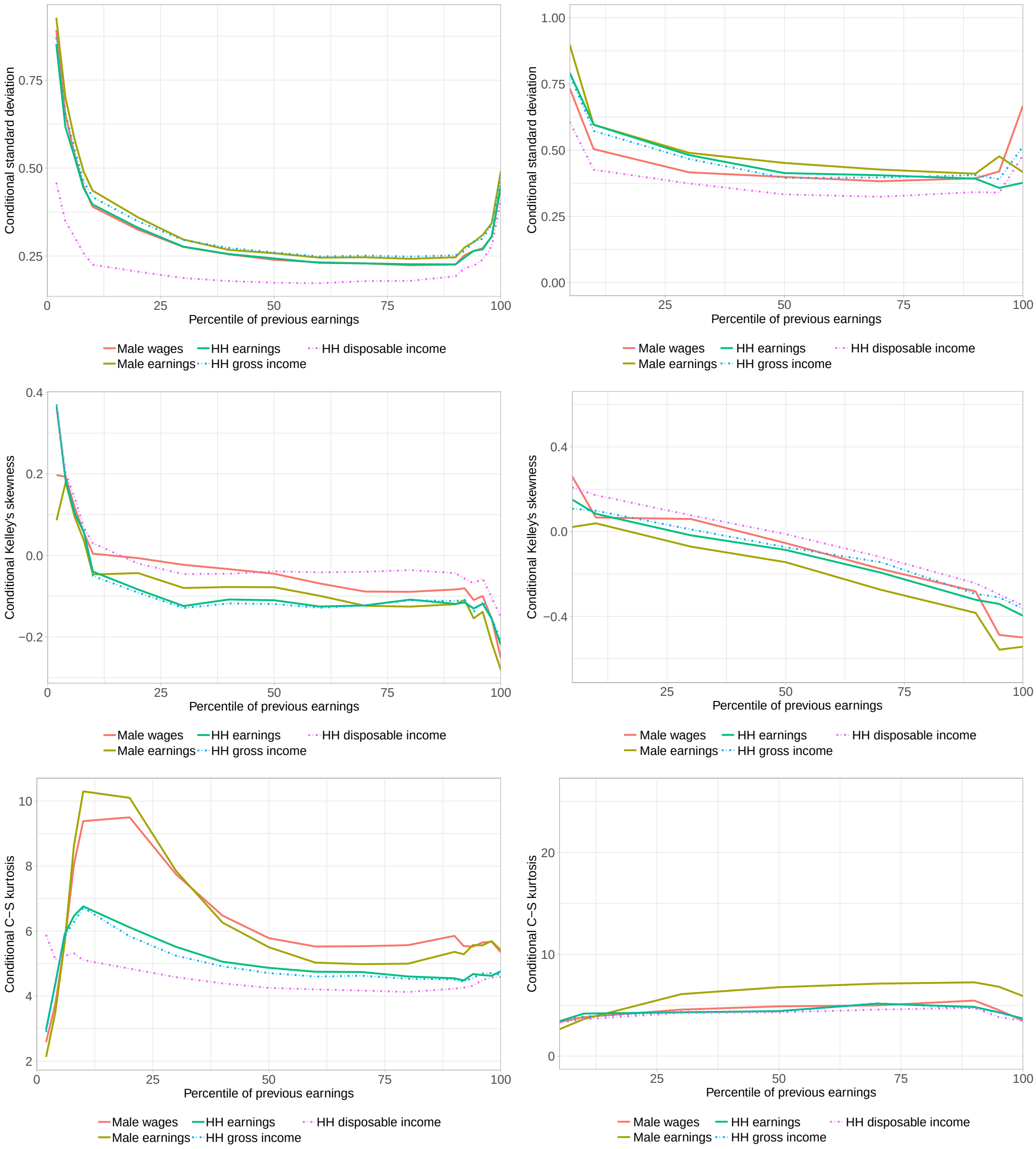

Figure 12: Netherlands, IPO after 2000 period (left), U.S., new PSID after 1997 period (right)

C Non-robust measures of kurtosis

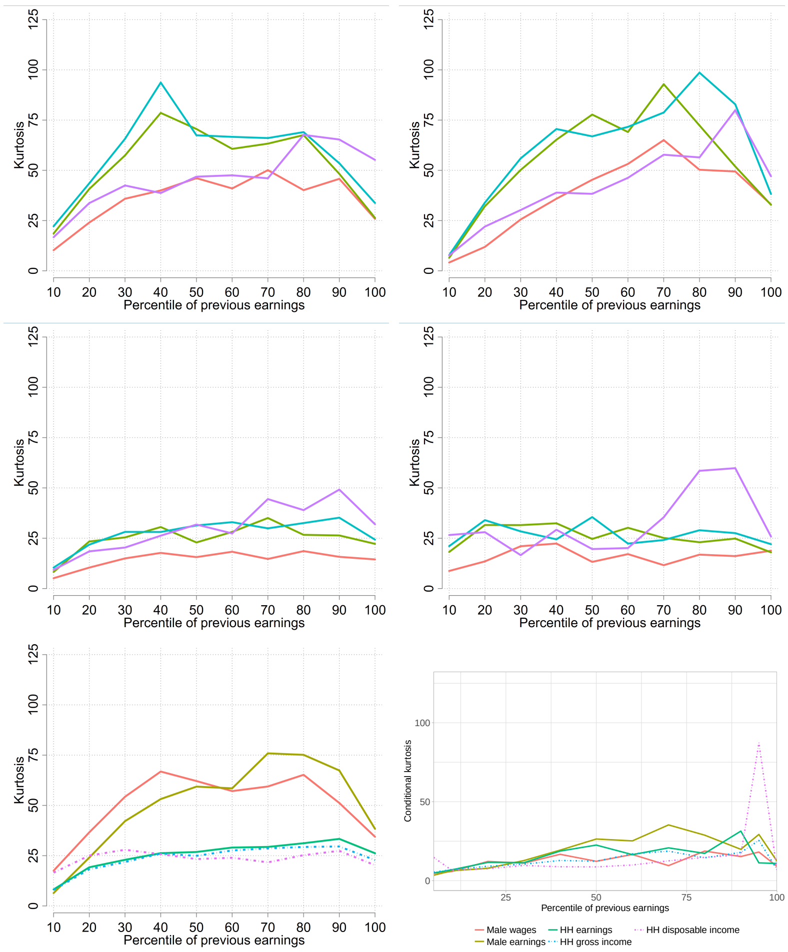

Figure 13: Non-robust measures of Kurtosis: Dutch male wages (top left), Dutch male earnings (top right), Dutch pre-tax household income (middle left), Dutch after-tax household income (middle right), NL combined income measures (bottom left), US combined income measures (bottom right).

D Male earnings by recent earnings

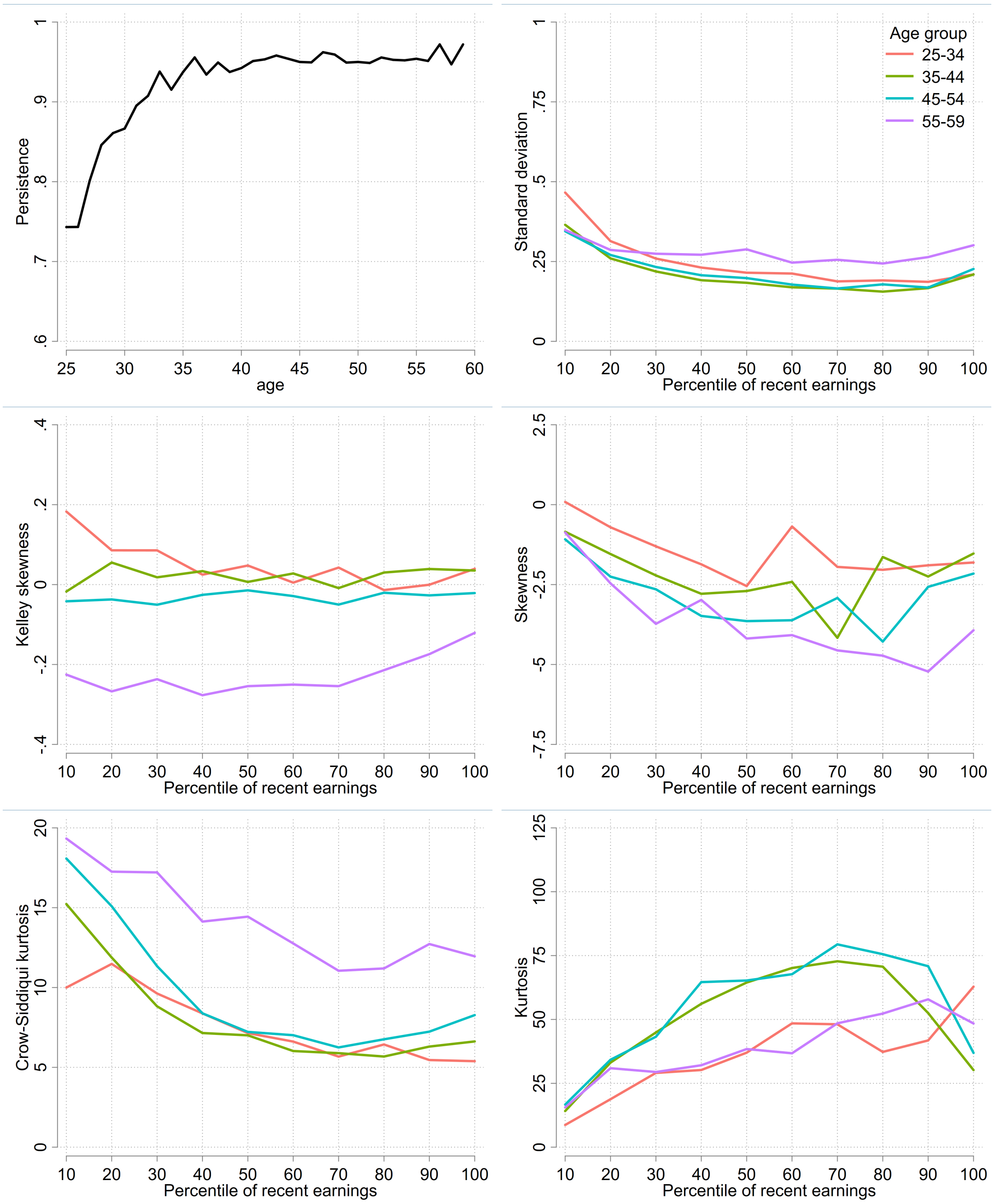

Figure 14: The Dutch data: Male earnings by recent earnings.

E The role of asset income

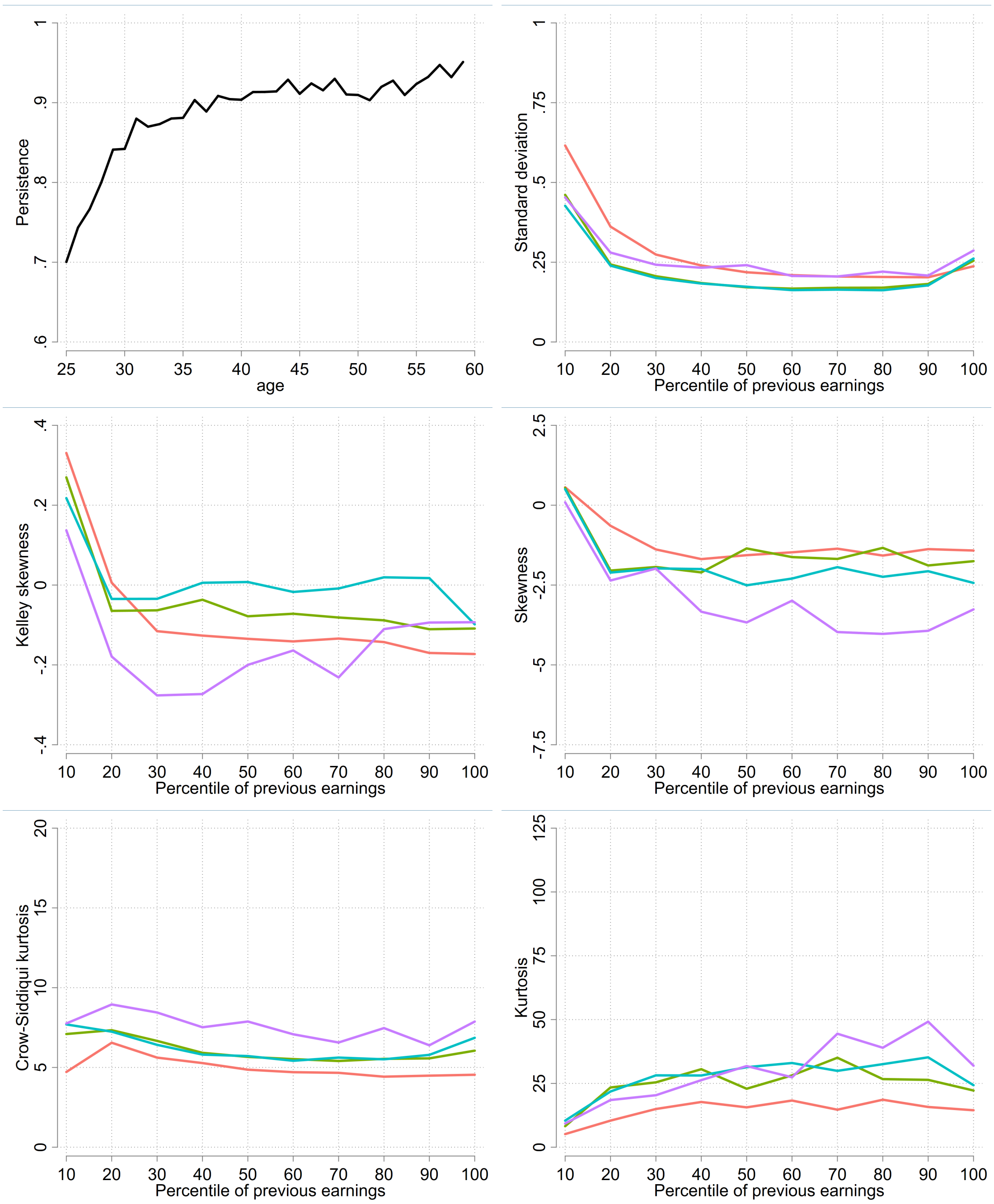

Figure 15: The Dutch data: Household pre-tax income, including household earnings and capital income

F DNB household survey

This section reports the same labor income moments in Section 4 but computed using household survey, rather than the administrative IPO, data for the Netherlands. The survey data come from the Dutch Household Survey (DHS) which is a representative Internet-based panel of over 2000 households administered by CentERdata at Tilburg University and sponsored by the Dutch Central Bank. It contains detailed information on components of personal and household income.

We use the DHS to confirm that the patterns that we document for the Netherlands in our administrative data set also hold in survey data for the Netherlands over the same, 2001 to 2014, period. Comparing Figure 16 below to the left-hand panels in Figure 10 in Section 4 reveals that patterns are very similar across the two datasets. Given that our data for the U.S. comes from a household survey, this reassures us that the differences that we document across countries are not due to the nature of the data set but rather to institutional differences across countries.

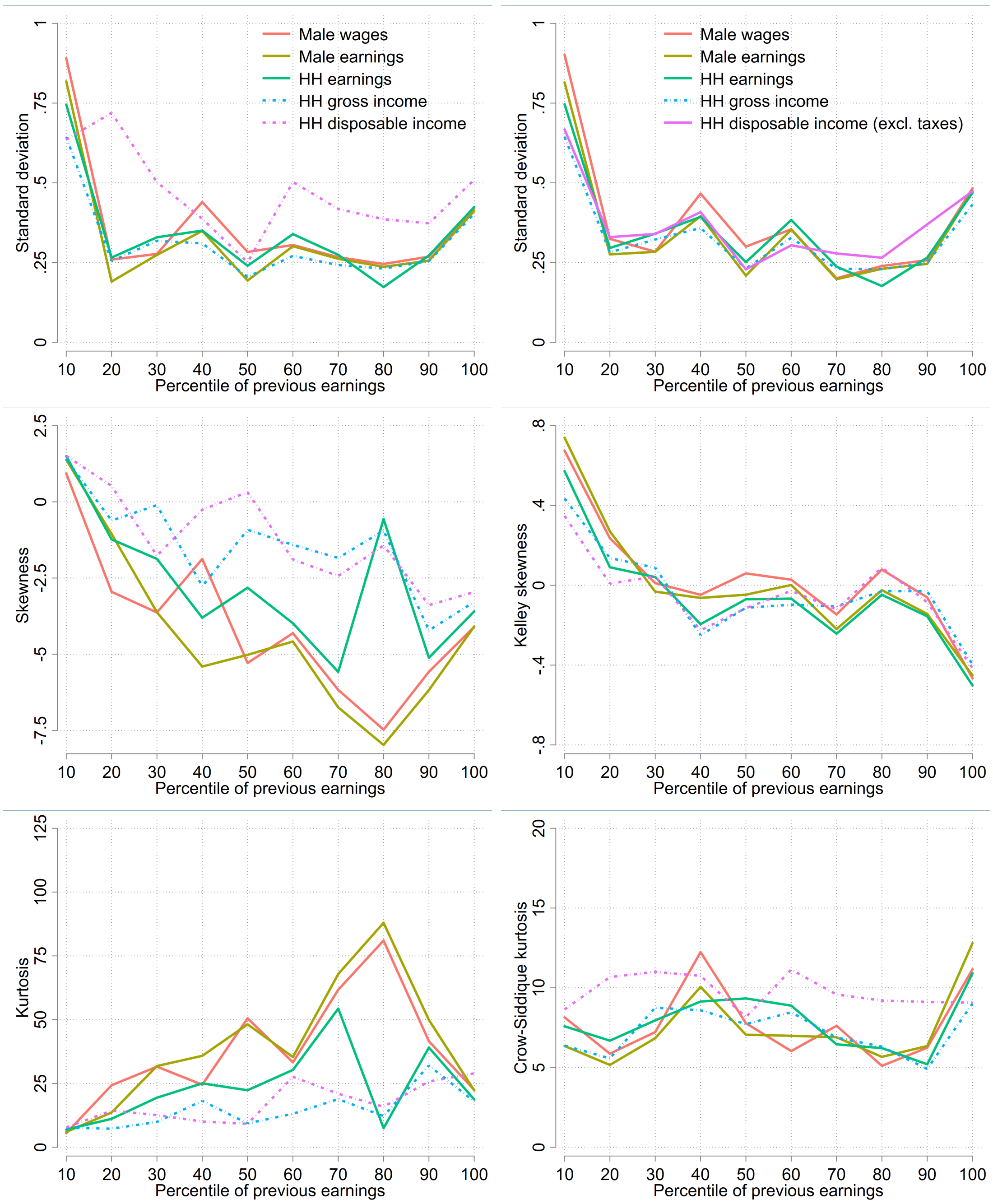

Figure 16: The Dutch data: DNB Household Survey (DHS).