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Francesca Subioli

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Francesca Subioli
Department of Economics and Law - Sapienza University of Rome
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Abstract

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Keyword: Earnings inequality, Great Gatsby curve, intragenerational mobility, earnings dynamics, unequal mobility, Italy

JEL Cassification: D31, D63

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Abstract

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[1]Department of Economics and Law, Sapienza University of Rome. Contact: francesca.subioli@uniroma1.it
[2]Department of Economics and Law, Sapienza University of Rome. Contact: michele.raitano@uniroma1.it

1 Introduction

In recent years, the economic literature and the policy debate have been increasingly concerned with the rise in income inequality experienced since the last decades of the 20th century in most high-income countries (see, among others, OECD (2008) and OECD (2011)). Despite inequality is shaped by complex processes acting through various mechanisms and is influenced by several possible determinants (Atkinson, 2016), shared wisdom argues that these trends have been mainly due to processes acting in the markets and, specifically, the bulk of the increase in inequality seems attributable to the rise in earnings dispersion (Salverda et al., 2014). However, also due to the scarcity of accurate and long longitudinal data, most analyses on trends in earnings inequality provide pictures of what happened at various points in time (typically years), focusing on 'snapshots' of the income distribution. The usual focus is on cross-sectional inequality – across people at a point in time –, neglecting what happens to individuals from one period to the next (Burkhauser and Couch, 2009).

Whatever the magnitude of period inequality, observing individual income dynamics is crucial to assess the characteristics of the process shaping inequality and its consequences on individual and social well-being for mainly two reasons. The first one is related to social welfare: as pointed out by Jenkins (2011) and OECD (2018), a society with a certain level of income inequality where individuals change their positions in the income ladder faces different challenges than one with the same (or a lower) level of inequality where individuals are stuck in their income positions during their whole life. The second reason for tracking individual careers concerns people themselves: in general, individuals are concerned not only with the average income they receive over a certain period, but also with its *pattern* over time. Since people prefer a stable income stream to a fluctuating one, having a stable stream may be considered welfare-enhancing per se (Shorrocks, 1978). If this is the case, the policy concern should deal with the dynamics of income as well as its level.

While the empirical association between income inequality and intergenerational persistence has been widely studied starting from the work of Corak (2013), there has been less attention to the *intragenerational* persistence, possibly also due to data requirements. We are aware of some works investigating through longitudinal data whether a high level of inequality is mitigated by a similarly high level of income mobility through cross-country comparisons.[1] Taking as reference the United States as a high-inequality country, comparisons between the levels of mobility in the US and in Europe reveal that the differences in income mobility are not so pronounced, not even with respect to the Nordic European countries (Gangl, 2005). A very recent work (Guvenen et al., 2022) covering a wide range of countries all over the world, finds a positive and weak correlation (0.35) between country-level inequality and persistence in income positions after five years.[2]

[1] See Burkhauser and Couch (2009) for a review of these works. More recent works are Alves and Martins (2012) comparing the US and Nordic countries, Aaberge and Mogstad (2014) for European countries, and OECD (2018) for OECD countries.

[2] Guvenen et al. (2022) is part of the output of a worldwide project focused precisely on looking beyond snap-

Besides the aggregate correlation between inequality and mobility, a further major issue in the evaluation of the income movements underlying inequality is related to the assessment of who are the *winners* and *losers* of income mobility:

> «[...] 'unequal mobility' can occur when unpredictable income changes combine with low levels of long-term (upward) income mobility and when this concerns mostly the most vulnerable population groups.» (OECD (2018), p. 65).

Indeed, it may be the case that only part of the population benefits from a desirable notion of mobility – upward and smooth income growth –, while another part suffers its more negative aspects which take the form of income instability.

With this framework in mind, we use Italy as our case study – a country characterised by a steep rise in labour income inequality in the last decades – and characterise long-run patterns of inequality and mobility across several cohorts of workers with a twofold aim. First, to understand whether the well-proved increase in earnings inequality has been compensated by higher mobility between workers, or has been due to widening persistent differences. Second, we go into details of income changes and distinguish 'good' mobility – i.e., upward and predictable changes – from mere volatility – i.e. frequent and unpredictable fluctuations – to assess *who* is concerned and whether there is a vulnerability problem related to income dynamics that policymakers should be concerned about.

In measuring the dynamics underlying income inequality changes between two points in time, the empirical literature has encountered some substantial challenges. First, no univocal methods and measures have emerged, given the complex and multifaceted nature of the concept of income mobility itself. As reviewed in Fields and Ok (1999), Jenkins (2011) and (Jäntti and Jenkins, 2015), the conceptualization of income mobility depends on the reference period – mobility from when to when? –, the reference group – mobility relative to whom? –, and the reference concept of income – mobility with respect to what? –. Such complexity naturally led to a proliferation of conceptualizations, measurement tools and indices, each of which is useful for isolating a specific facet of income mobility. We believe that the best approach to this complexity is to take into account as many different aspects of income mobility as possible, rather than choosing only one. This can return a comprehensive picture of the dynamics of inequality, not tied to the type of measure chosen. In this respect, our approach is in the same spirit as Jenkins (2011). We may also be surprised to find different pictures depending on the specific aspect we look at.

Most of the mobility indices, as well as the inequality ones, require setting a *reference group* to compare income values and positions. With longitudinal data, two strategies are possible to compare different generations: a *time approach*, comparing people's income at any age in a given calendar year, and a *cohort approach*, fixing age and comparing people belonging to the same cohort of birth regardless the calendar year. Inequality and mobility

shot inequality to uncover mobility patterns underlying it. The main output is an open-source database – the Global Repository of Income Dynamics GRID – for 13 countries (available at https://www.grid-database.org/) containing aggregate indices of income dynamics from administrative sources. For Italy, the data used is the social security-based sample INPS-LoSai covering the years 1985-2016 for private employees.

measures are heavily influenced by the life-cycle features of earnings: even when considering only individual income from labour, leaving aside the impact of demographic events like a marriage or the birth of a child, a typical income trajectory should rise up to a certain age due to the accumulation of experience and then decrease with retirement. Therefore, measures of inequality based on a calendar year approach can be affected by changes in the demographic structure: inequality may increase from one year to the next either because there is more dispersion in earnings at a given age, or because the age composition of the population has changed.

For the purpose of this work, we believe that a cohort approach is more suited: we compare people within their own generation, assuming that their reference group are those having a similar age in the same years – their *peers*. This means that within their group people share the macroeconomic conditions that are specific to their generation at a given life-cycle phase. Our goal with this setting is to compare the inequality and mobility prospects of different generations of workers: as employment and earnings prospects may change across cohorts, comparing the within-generation inequality and mobility values is informative with respect to *intergenerational fairness* concerns (Raitano et al., 2021). In fact, we already know from previous studies for Italy that the progressive 'dualization' of the labour market that started in the mid-80s – imposing worse contractual arrangements to new entrants while maintaining secure conditions for incumbent workers – has led to a serious gap in the economic well-being of different generations of workers, especially in terms of career prospects.[3]

A second crucial challenge for mobility measurement is related to data. By its very nature, mobility depends on time; therefore, the choice of the concept of mobility adopted is also driven by the time coverage of the available data, and their capacity to follow individuals over time. A typical problem from this point of view is panel attrition, often characterizing survey data, but also the simple fact of observing individuals at a distance of time. To address this issue, we rely on a matched survey-administrative dataset for the Italian private sector covering a long time span (1975-2018) and following the entire careers of workers born in very different economic contexts. Some peculiar characteristics of this dataset, detailed in Section 3, make it particularly suited for the purpose of this work with respect to other survey and administrative sources available for Italy.

We contribute to the literature on income inequality and income mobility by providing the first cross-cohort intragenerational Great Gatsby curves for a single country, and providing a strategy to study the individual-level vulnerability due to income dynamics. In Section 2, we detail how we measure intragenerational inequality and mobility at the individual and aggregate level, distinguishing notions of 'good' and 'bad' mobility. Then, we provide information about the data in Section 3. Section 4 presents and discusses the re-

[3]For empirical evidence on the consequences of labour market flexibilization for new entrants in Italy see, among others, Rosolia and Torrini (2007), Barbieri and Scherer (2009), Naticchioni et al. (2016), Rosolia and Torrini (2016), Raitano and Fana (2019), Hoffmann et al. (2022). For a detailed discussion of the reforms that shaped this 'dual' labour market, see Boeri and Garibaldi (2007).

sults of the analysis: first, we describe the evolution across subsequent cohorts of several indices of intragenerational inequality and mobility, also focusing on non-linearities along the income distribution (Section 4.1 and 4.2). Then, we discuss in Section 4.3 our estimates of the correlation between inequality and mobility levels, and present the underlying intragenerational Great Gatsby curves. In Section 4.4, we show and discuss our findings on the phenomenon of unequal mobility. Finally, Section 5 provides a heterogeneity analysis for the main results by gender, level of education and macro area of work, and Section 6 concludes.

2 Methodology

2.1 General setting

To get empirical estimates of the inequality-mobility trade off in the intragenerational context, our strategy consists of measuring for separate cohorts of Italian workers the aggregate inequality and mobility levels, and then simply estimating their correlation. A positive correlation would be a sign of complementarity between inequality and mobility and, therefore, of a possible compensation between the two. A negative correlation, on the contrary, would signal a trade-off: greater inequality would also come with the burden of less income mobility. Taking inspiration from the intergenerational Great Gatsby curve, we also employ a scatter plot to visualize the relationship; however, our units are not different countries at the same point in time but rather different cohorts of the same country.

Then, to answer our second research question related to the existence – and the possible worsening over time – of 'unequal mobility', we move to the micro level and exploit the individual-level estimates of earnings mobility: by measuring individual mobility in a way that separates unpredictable income changes from long-term upward mobility following Nichols et al. (2008) and Nichols and Rehm (2014), we study the combination between the two and their relation to the lifetime income. This approach allows for a transparent and intuitive detection of vulnerabilities related to wage dynamics.

Following a cohort approach, we fix a common age window for all workers; we need some assumptions about which is the best moment for observing one's career and getting the best proxy of the lifetime earnings experience.[4] We fix the age at 35-45, a long and central phase of the career when we assume formal education is completed and retirement is still a long way off.

[4]This issue is usually a concern in the literature on intergenerational mobility because, when analysing the effect of parents' characteristics on children's outcome, it is crucial not to disregard at which stage of life parents and children are observed. For example, Haider and Solon (2006) and Böhlmark and Lindquist (2006), respectively for the US and Sweden, find evidence that the difference between current and lifetime earnings for men is minimized around age 35. Conversely, a simple rule does not emerge for women, who display more variety in their life-cycle income patterns especially because of maternity periods. Nybom and Stuhler (2016) warn that age-earnings profiles may be worker, country or cohort-specific even for male workers, so the choice of the same point in age for every worker may be misleading.

Inequality and mobility measurement We include in the baseline analysis zero earnings to take into account periods of non-employment that may have a strong impact on economic well-being. Most of the results are compared with the case of only positive earnings to infer how much periods of non-employment affect inequality and mobility estimates. Moreover, we adopt a personal-level perspective rather than a household-level one not simply because of data limitations, but also because we want to track personal income experiences 'gross' of behavioural choices related to family formation. Importantly, our analysis includes both women and men.

For measuring inequality, we use the General Entropy index of degree two for the reasons we will explain in Section 2.2.2 and distinguish *overall* – across people and time –, *permanent* – based on long-term income experience –, and *average cross-sectional* inequality – the mean of period-by-period snapshot inequality. The more mobility is in place, the more permanent inequality departs from the other two measures.

Regarding mobility, we rely on a vast set of indices for two reasons. First, mobility is a multifaceted phenomenon, and different measures of it are not alternatives but complementary. Second, in our effort to find an empirical relation between intragenerational inequality and mobility, the association linking a specific concept of mobility to inequality is not a priori determined. Therefore, besides remaining agnostic with respect to the sign of the relationship, we let it also vary according to the concept of mobility used in each case.

The indices of mobility are presented in Section 2.2.1 and 2.2.2 divided into *bi-periodical* – based on a comparison between an origin and a destination income – and *dynamics* measures – based on the income movements in each period between origin and destination points (Jenkins, 2011). We also explain for some indices the graphical tools we employ to visualize mobility patterns. Importantly, we attempt to classify each of the measures as 'good' or 'bad' for the society and the individual, without using formal welfare evaluation methods but simply through reasonable arguments.[5] This classification is crucial for interpreting the inequality-mobility trade off and drawing conclusions in terms of intergenerational fairness.

Measuring 'unequal mobility' The aim of this part of the work is to see whether, and how much, «[...] unpredictable income changes combine with low levels of long-term (upward) income mobility and [...] this concerns mostly the most vulnerable population groups.»[6] We follow two steps: first, we choose the three measures of, respectively, *unpredictable income changes*, *low levels of long-term (upward) income mobility*, and *vulnerability*. To separate unpredictable income changes and long-term (upward) income mobility, we rely on the 'income risk decomposition' proposed by Nichols et al. (2008) and described in detail in Section 2.2.2. It proxies long-term predictable mobility through the steepness of an indi-

[5] For a social-welfare evaluation approach incorporating the 'insecurity aversion' of individuals, see Gottschalk and Spolaore (2002) and Jäntti et al. (2014).

[6] OECD (2018), p. 65.

vidual linear trend, and unpredictable income changes through the intensity of deviations from that trend. To measure vulnerability, we choose a classical notion of 'permanent' income – i.e. average earnings in the time window observed. This is a measure of the long-term economic well-being of people: it summarises their economic possibilities and accounts for the fact that the ability to save and borrow to address income shocks is strictly linked to overall income potential.

Once we have the estimates of 'good' mobility, 'bad' mobility, and permanent income, we employ a *heat map* graphical tool to study their correlation. The hypothesis of unequal mobility would be verified if we find good mobility to be negatively correlated with bad mobility but positively related to permanent income: people enjoying better overall economic conditions would also benefit from smooth and positive income growth and be protected by unexpected income shocks, while the reverse would be true at the bottom of the permanent income distribution. The heat map will allow us to visualise the permanent income distribution as a function of combinations of good and bad mobility levels.

2.2 Measuring intragenerational income mobility

2.2.1 Bi-periodical indices

Bi-periodical mobility indices are based on the comparison between an *origin* and a *destination* income distribution computed in two different periods, the second being later than the first. As stated above, in our setting each worker is observed in the age window 35-45: therefore, we choose as origin income the earnings averaged from age 35 to 37, and as destination income the earnings averaged from age 43 to 45.[7] Once origin and destination incomes are defined, *relative* or *positional* mobility indices compare the two income distributions measuring changes in relative positions, while *absolute* mobility indices compare one's own income value at destination with that at origin, regardless of relative position, and then aggregate such changes through a simple average.[8]

Positional mobility As a first bi-periodical index, we use a modification of the Hart (1976) mobility index employing a Spearman's rank correlation coefficient ρ with ranks normalized in the interval $[0, 1]$:

$$\text{Rank mobility} = 1 - \rho_n = 1 - cov(r_o, r_d) \tag{1}$$

r_o and r_d being the origin and destination normalized ranks.[9] With this procedure, the origin and destination income distributions are forced to be standard uniforms; therefore, the beta coefficient from a linear regression of the rank of destination on the rank of origin

[7] Averaging income in a short interval to slightly smooth it is a standard procedure to build mobility measures mitigating the effect of year or age-specific shocks.

[8] For a detailed explanation of income mobility indices, see Jäntti and Jenkins (2015).

[9] The rank is obtained by ordering people from the lowest to the highest level of income and normalized using the formula $\frac{rank-1}{max(rank)-1}$. We order the zeros by adding random numbers from a uniform distribution.

is the simple covariance between the two. Being based on income ranks rather than on income values, ρ_n measures how much the rank of destination increases with the rank of origin: a correlation of -1 indicates perfect rank reversal, one of 0 indicates no monotonic relation between the two distributions – i.e. origin independence –, and a correlation of 1 indicates complete dependence, that is no rank mobility.

To look graphically at this notion of mobility, we plot the line fitted through the scatter plot of r_d on r_o together with the 45 degrees line that is the place of complete immobility for comparison. Moreover, we look at non-linearities by plotting the average rank of origin and destination inside 10 equal-sized bins for both variables; it may be the case that different parts of the origin income distribution are more mobile than others, so that the average hides important differences depending on the starting point.

Again based on the comparison between the normalized rank at origin and that at destination, we use a measure of 'average jump' following the idea of Bartholomew (1967). Separating rank movements *to the right* and *to the left*, we define the average jump up as the mean rank difference for those improving their position ($\sum_{i:r_d>r_o}(r_d - r_o)$) and the average jump down as the same measure but for those who end up in a lower rank ($\sum_{i:r_d<r_o}(r_d - r_o)$). Since normalized ranks lie in the interval [0,1], the jump is the average fraction of the income distribution climbed up or passed when falling down, giving a proxy of the 'distance' covered in the process of positional mobility and allowing to inspect any asymmetry in it.

Another possibility of measuring relative mobility is by comparing the two positions in terms of income *quantiles* and computing the aggregate probability to change quantile through a *transition matrix* – i.e. looking at the share of people reaching a certain destination quantile given the origin position. Let $i = 1, ..., q$ be the quantile of origin income and $j = 1, ..., q$ be the quantile of destination income; then, n_{ij} is the number of people moving from quantile i to quintile j, and $n_{i.}$ is the number of people starting from quantile i whatever their destination quantile. We compute for each cohort the probability of reaching a higher quantile as $\sum_{j>i} \frac{n_{ij}}{n_{i.}}$, of falling into a lower quantile as $\sum_{j<i} \frac{n_{ij}}{n_{i.}}$, of exit from the bottom quantile as $\sum_{j\neq 1} \frac{n_{1j}}{n_{1.}}$, and of falling from the top quantile as $\sum_{j\neq q} \frac{n_{qj}}{n_{q.}}$.

Absolute mobility Measures of absolute mobility do not consider income positions, but rather income value changes from origin to destination. The typical index of absolute mobility is the average income growth in the population (Fields and Ok, 1999). Let y_o be the origin income and y_d be the destination income. While Fields and Ok (1999) use $ln(y_d) - ln(y_o)$ to measure individual income growth, we use $(y_d/y_o) - 1$ to include zero earnings.[10] When measured directly on income, the growth rate may assume very high values and some outliers may bias the aggregate index if the aggregation rule is the simple average as in Fields and Ok (1999). Therefore, we adopt two alternative strategies to

[10]There are cases in which the growth rate is not defined being the denominator $y_o = 0$. We assign a growth rate of 0 if $y_o = y_d = 0$, and a growth rate of 1 if $y_o = 0$ and $y_d > 0$.

address this issue: as a first solution, we compute the *median* rather than the mean income growth across workers, being the former far less sensitive to high values. Second, we keep the average aggregation rule but using a bounded underlying growth rate proposed in Davis and Haltiwanger (1992), $g_{DH} = (y_d - y_o)/(\frac{y_d+y_o}{2})$. This growth rate is symmetric around zero and lies in the interval [-2; 2]. [11]

2.2.2 Indices of dynamics

Income risk decomposition Among the possible mobility indices of dynamics, summarizing individual income movements in a population, we choose the method proposed in Nichols et al. (2008) and applied in Nichols (2010), Nichols and Rehm (2014), Latner (2018), and OECD (2018). Called 'income risk decomposition', this method separates permanent inequality, mobility and volatility through the decomposition of an inequality index with longitudinal data. Overall inequality – across people and time – is measured through a subgroup decomposable index (Shorrocks, 1984), and individuals themselves are the population subgroups.

Nichols et al. (2008) uses the Generalized Entropy (GE from now on) index with parameter $\alpha = 2$ because it has some desirable properties: (i) the family of the GE indices share with the more classical Gini coefficient the Lorenz consistency property, but also allows additive subgroup decomposability; (ii) it does not require log transformation of income, allowing the inclusion of zeros.[12] (iii) it is half the squared coefficient of variation, so it is a dimensionless index. This last property is particularly useful for analyses that compare different countries or the same country in different periods, since it removes the effect of overall income level from the measure of inequality.

Let $i = 1, ..., L$ workers be followed for $t = 1, ..., T$ periods, for a total of $N = LT$ observations. Applying a decomposition by 'people subgroups', the *between-group* inequality component measures permanent inequality across workers — i.e. inequality in average incomes over the observed time window –, while the *within-group* inequality component measures average personal inequality over time, which is a combination of mobility risk and volatility. Formally, let y_{it} be the annual real gross earnings of worker i at time t, $\bar{y}$ be the average annual earnings among all $N = LT$ observations in the time window T for the L workers in the sample, and $\bar{y}_i$ be the average earnings of worker i in the window T – i.e. her permanent earnings. Then, the overall inequality across people and time in the window T can be decomposed as in Equation (2):

[11] It is monotonically related to the traditional growth rate g, and the relation is $g = \frac{2g_{DH}}{2-g_{DH}}$ (Davis and Haltiwanger, 1992). The two measures are approximately equal for small values.

[12] When the parameter α is neither 0 (Mean Log Deviation) nor 1 (Theil Index), all the GE indices can be computed using income without log transformation.

$$GE_2 = \frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(y_{it}-\bar{y})^2\right] = \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(\bar{y_i}-\bar{y})^2\right]}_{\text{Between-workers inequality (B)}} + \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(y_{it}-\bar{y_i})^2\right]}_{\text{Within-worker inequality (W)}} \tag{2}$$

The between-workers inequality is the variance of individual-level average income $\bar{y_i}$, divided by twice squared average income $\bar{y}$. It corresponds to the definition of long-term inequality as the dispersion in permanent incomes. On the other hand, the within-worker inequality is the average across workers of the individual-level variance of income over time, again divided by twice the squared mean income. We do not need to weigh the personal variances since all the individuals are observed for the same number of years in this formulation.

As a further and crucial step, the numerator of the within-worker inequality component can be further decomposed into what Nichols et al. (2008) calls 'mobility risk' and 'volatility'. In practice, the individual income process is seen as made of three components: (i) the average, permanent, income; (ii) a linear trend summarizing smooth and directional income growth; (iii) volatility around the income trend. Equation (3) models this process:

$$y_{it} = \alpha_i + \beta_i t + \epsilon_{it} \tag{3}$$

If time t is centred at zero, α_i coincides with the permanent income $\bar{y_i}$, and the income trend $\beta_i t$ is demeaned – i.e. has mean zero. The choice of a linear trend, which may be controversial when considering the entire life-cycle income pattern that is usually modelled as convex, can be considered particularly suitable when looking at incomes in a medium-short age window sufficiently far from retirement. Moreover, a linear trend is theoretically preferable because of its smooth pattern: if we believe that 'good' mobility for the individual is a predictable income path, directional and not affected by relevant and frequent fluctuations, a linear pattern seems to be the most reasonable and transparent choice.

As discussed in Nichols et al. (2008), the length of the period T must be at least three (two observations to estimate a linear trend, and the third to allow deviation from it). However, the variance of the idiosyncratic error term used to characterize volatility will tend to be dramatically understated for small lengths. We decide to adopt here a wide range T=11 since our data allow us to follow the workers continuously for many years.

Going on with the decomposition, substituting the income process described in Equation (3) in the within-worker component of inequality, we obtain:

$$W = \frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(\alpha_i + \beta_i t + \epsilon_{it} - \bar{y_i})^2\right] \tag{4}$$

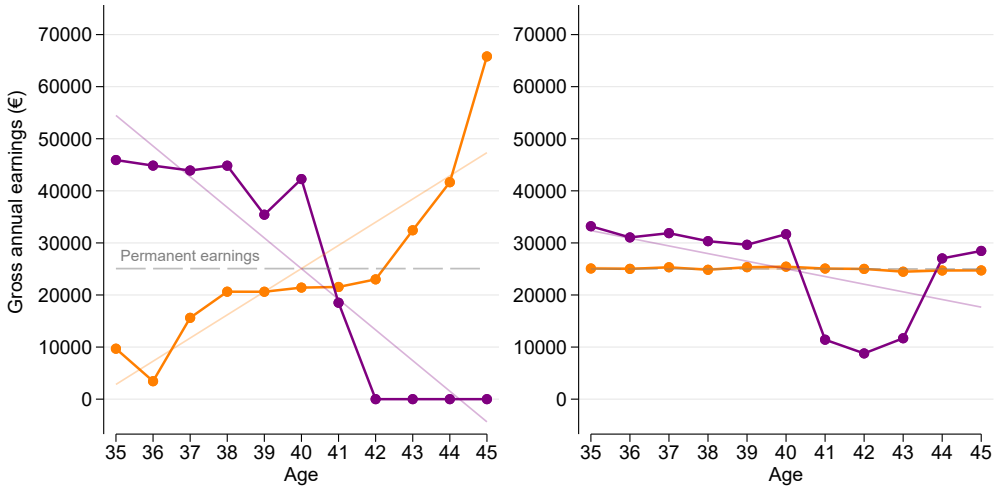
Since $\alpha_i = \bar{y_i}$ by construction, we end up with

$$W = \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(\beta_i t^2)\right]}_{\text{Mobility risk}} + \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(\epsilon_{it}^2)\right]}_{\text{Volatility}} + \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(2\beta_i t\epsilon_{it})\right]}_{\text{Residual component}} \quad (5)$$

According to this further decomposition, aggregate mobility risk is the mean-normalized average across people of the individual variance of the income trend, while volatility is the mean-normalized average across people of the individual mean squared residual from the personal trend.[13] There is a residual component of covariance which has a very small order of magnitude and is negligible in the computations.

Why the income risk decomposition Figure 1 shows four examples of income trajectories taken from our data to look at very different income experiences and see the motivation under our choice of Nichols et al. (2008) method. For each worker, the figure shows the per-

Figure 1: Very different earnings trajectories



Note: The figure plots four representative career paths taken from real data. The four workers have approximately the same 'permanent earnings' (average earnings in the age window) but very different economic experiences in terms of direction and steepness of income trend (the solid line). Annual earnings are real (2015 price level) and gross of personal income taxes and social contributions and include income from any source. *Source*: AD-SILC data 1975-2018.

manent earnings in the age window from 35 to 45 (dashed grey line), a linear trend (solid lines), and the actual earnings records. We selected four workers with approximately the same permanent earnings: if average income is taken to proxy their economic well-being, we can say that there is no (permanent) inequality and the four workers enjoy the same level of well-being. However, they have completely different patterns over time: in the left panel, we see a worker with an exceptional career progression, ending up at age 45 with an income more than 6 times higher than the level at age 35, and enjoying quite smooth

[13] To see why $\left[\sum_{i=1}^{L}\frac{1}{T}\sum_{t=1}^{T}(\beta_i t^2)\right]$ is the individual-level variance of the points on the linear trend $\{\beta_i t\}_{t=1}^{T}$, remember that time t is centred at zero and the trend is demeaned, so that its average is zero by construction.

growth over time. In contrast, the other worker in the left panel experiences downward mobility and loses his job at the age of 42 after one year of halving his previous income.

The careers described in the left panel are good examples to understand why a simple measure of volatility measuring the dispersion of income deviation from the mean misses accounting for the existence of a 'good', desirable variability of income. In fact, attributing every deviation from the mean of the worker with a steep career progression to volatility means assuming that positive income growth is actually perceived as instability.

In the right panel of Figure 1, we compare a worker with a completely flat income in the window, and one experiencing a large drop (more than 2/3) at age 41 with a recovery thereafter. A flat income trajectory in the middle of one's career is not a good sign, since the accumulation of experience is not rewarded. On the other hand, the large and persistent (for two periods) income drop suffered by the person in purple in the right panel needs to be ensured through savings accumulated before or through borrowing relying on future earnings.

The framework described enables to look at income experience as a three-dimensional phenomenon: the permanent component reflects overall experience, the result of variations in various directions that may offset each other; the mobility component reflects the 'smoothness' of the career progression; the volatility component reflects its instability.

Good and Bad mobility To reinforce this framework developed by Nichols et al. (2008), we introduce a novelty to ease the interpretation of the results from a welfare point of view: the mobility risk component in Equation (4) is neutral with respect to the direction of the income trend; it measures the intensity, the speed of linear mobility, regardless of its direction. This is certainly a shortcoming for the interpretation, since we may consider desirable a rise in mobility risk which may actually come from an acceleration of 'linear falls'.[14] To rule out this possibility, we further decompose the mobility risk: we divide the L workers into two types according to the direction of the income trend. $u = 1, ..., U$ are those with an upward linear trend, and $d = 1, ..., D$ those with a downward one. Mobility risk can be expressed as the sum of *upward* and *downward* mobility risk as follows:

$$\text{Mobility risk} = \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{u=1}^{U}\frac{1}{T}\sum_{t=1}^{T}(\beta_u t)^2\right]}_{\text{Upward mobility risk}} + \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{L}\sum_{d=1}^{D}\frac{1}{T}\sum_{t=1}^{T}(\beta_d t)^2\right]}_{\text{Downward mobility risk}} \tag{6}$$

Therefore, We end up with a conceptual framework according to which overall inequality is the sum of permanent inequality, upward and downward mobility risk, volatility, and a residual component. The permanent inequality component is the part of inequality that is not smoothed out over time by mobility; it is due to differences in permanent income across workers, so it reflects inequality across people in terms of their lifetime economic possibilities. On the other hand, the upward mobility component is the expression for 'good'

[14] We thank Philippe Van Kerm for making this point during a presentation of the first version of this paper.

mobility, because it measures the intensity of smooth and linear income growth, which is the kind of absolute mobility that we consider more desirable for people and for the so. Finally, we include the sum of the downward mobility and the volatility components in a concept of 'bad' mobility: income changes that follow a linear progression but go down are equivalent to fluctuations, since they are neither desirable nor predictable during mid-career.

$$GE_2 = \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{LT}\sum_{i=1}^{L}\sum_{t=1}^{T}(\bar{y_i}-\bar{y})^2\right]}_{\text{Permanent inequality}} + \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{LT}\sum_{u=1}^{U}\sum_{t=1}^{T}(\beta_u t)^2\right]}_{\text{Good mobility}} + \underbrace{\frac{1}{2\bar{y}^2}\left[\frac{1}{LT}\sum_{d=1}^{D}\sum_{t=1}^{T}(\beta_d t)^2\right] + \frac{1}{2\bar{y}^2}\left[\frac{1}{LT}\sum_{i=1}^{L}\sum_{t=1}^{T}{e_{it}}^2\right]}_{\text{Bad mobility}} \tag{7}$$

3 Data

Data source We need for our analysis longitudinal data covering a long part of individuals' careers. For this purpose, we use a selection of the Administrative-SILC (AD-SILC) dataset developed by merging through fiscal codes the waves from 2004 to 2017 of the IT-SILC survey (the Italian component of the European Union Statistics on Income and Living Conditions, EU-SILC) with social security records collected by the Italian National Social Security Institute (INPS). The INPS archives record employment and earnings histories of all individuals working in Italy from the moment they enter the formal labour market; reliable earnings data are available from 1974 for employees in the private sector and later on for other types of employment. In the version of the dataset employed in this work, the latest year of observation is 2018.

In addition to the demographic characteristics, the administrative component allows to have detailed information on the gross annual earnings, allowances, the weeks worked in the year and the type of employment contract, while not suffering from attrition problems and without top coding. On the other side, the survey component provides information on the level of education, which is always a great absentee in micro-level analyses using administrative data while being an important determinant of income.

This dataset is particularly suited for our analysis because of two characteristics that are crucial and rare in the existing literature on income mobility: (i) workers are followed for a large part of their career, allowing us to distinguish between short and long-term mobility; (ii) they are followed *continuously* as long as they participate in the formal labour market – without memory biases and, mostly, the gaps from attrition characterizing panel data from surveys. This latter feature largely improves the analysis: volatility is traditionally considered to be a short-term issue and requires observations very close in time, while mobility can be studied both as a short and long-term phenomenon. Having a long span of income records without 'holes' allows us to study mobility and volatility at same time looking also at their interaction.

The sample obtained allows for observing the income history of workers born between 1940 and 1973. We divide the sample into 30 five-year-long cohorts of birth, each of which overlaps with the preceding one for every year but the last one, from 1940-1944 to 1969-1973. Therefore, we observe earnings patterns from 1975 (when those born in 1940 are 35 years old) to 2018 (when those born in 1973 are 45 years old), and each cohort covers a calendar period of 15 years (for example, the first cohort 1940-1944 covers the period 1975-1989). All the analyses are performed *within* each cohort to allow comparison of intragenerational inequality and mobility over time.

Sample selection The sample is restricted excluding individuals without Italian citizenship, since the retrospective panel under-represents them in older cohorts. We focus on those working as employees in the private sector, which is the only category covering a very long-time span in INPS archives.[15] We use as a measure of economic well-being real (2015 price level) annual earnings from any job, also including allowances for sickness, maternity, unemployment and CIG, and gross of personal income taxes and social contributions.[16] Our aim is to capture through this measure of income the overall economic experience of workers before redistribution. The choice of annual earnings reflects our interest in economic well-being that includes the intensity of work during the year – in terms of weeks worked in the year and hours worked in the week -, as well as the hourly wage. The bottom and top 0.1% of the earnings distribution in each year are dropped to minimize measurement errors that may occur at the tails and to get rid of serious outliers.

It is possible that some workers, especially women in older cohorts, are out of the sample if they don't have any job for which social contributions are due to the INPS in the year. Those must be cases - without even sickness, maternity, unemployment, and CIG allowances, which we observe in the administrative archives -, spent either in non-employment, in inactivity, or in undeclared work. We assume that in the out-of-archives years the income from work is zero, so as to take into account periods of non-employment. We believe the treatment of the zeros to be a major issue in the mobility analysis: if the interest is in the overall economic well-being of a person, ignoring periods of non-employment and focusing on positive incomes naturally leads to a biased picture of reality.

As a final restriction, we select workers observed *continuously* for eleven years (from age 35 to age 45) with either positive or zero income from labour. Those workers with periods spent in jobs other than private employment or with missing information when 35-45 are excluded, since we do not want to impute zero earnings to people who are actually working in a different form. Unfortunately, we are not able to distinguish periods of non-

[15] On average, the dependent sector (public and private) represented about 69% of total employment at the end of the 70s, 71% at the end of the last century, about 75% in 2010 and 77% in 2018 (source ISTAT).

[16] The Cassa Integrazione Guadagni (CIG) is a short-work scheme for supporting the wages of employees for which firms going through specific crisis events request a reduction or a suspension of the employment relationship. It is limited in time and subject to specific requirements for both the employer's nature, the type of crisis, and the employment contract.

employment from informal work.[17] To avoid the inclusion of people mostly out of the labour market, we restrict the sample to workers with at least six years of positive earnings when 35-45. Importantly, while this will be our baseline sample, we will also check the differences in results when using a reduced sample from which zero earners are excluded for comparison.

Summary statistics Table 2 for the baseline sample, and Table 3 for the restricted sample excluding zero earners report in the Appendix for each cohort summary statistics on annual gross earnings and the composition of the sample in terms of gender, education and geographical area.[18] The sample includes 26,645 workers including those with at most five periods of non-employment when aged 35-45, and 21,849 workers when including only positive earnings. We can clearly observe in our sample that the Italian labour market has faced relevant structural changes linked to increasing women participation (women were 29.9% of workers in the first cohort, 45.2% in the last) and to the educational upgrading (workers with tertiary education were 2.7% in the first cohort, 14.8% in the last one). As regards the level and variability of earnings, we confirm with our data the well-known stagnation in average income from labour from the 90s coupled with increasing standard deviation.

4 Results

As a first set of results, we briefly look at the trend across subsequent cohorts of the indices of intragenerational inequality and mobility described in Section 2 and reported for three representative cohorts (the first, the last, and one in the middle) in the Appendix in Table 4 with the percentage variation from the first to the last cohort.[19]

4.1 Bi-periodical mobility patterns

Positional mobility The left and centre panels in Figure 2 plot the indices of positional mobility. Starting from quintile mobility, we see that between 20 and 25% of workers within each cohort move to a different quintile, and that the probability of moving to a higher or a lower quintile is almost symmetric: more than 50% of workers remain in their origin quintile when they reach age 43-45 and, among those who move, half improve their position, and half worsen it. Looking at the tails of the income distribution, we find that between 30 and 35% of workers starting in the bottom quintile at age 35-37 manage to get

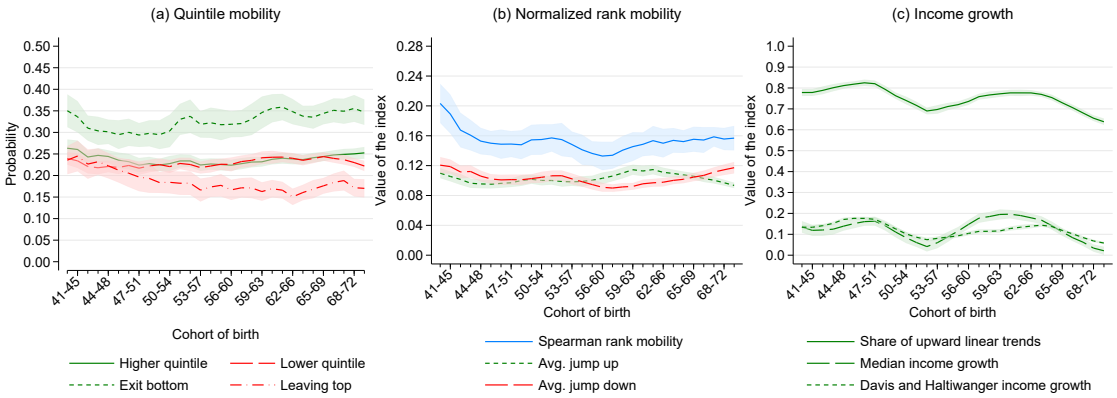
[17] According to ISTAT estimates, undeclared work involved 14.5% of employment in 1995, 12.4% in 2005, and 12.8% in 2018, with slightly lower percentages if excluding self-employed.

[18] In this work, we include the two main islands of the country (Sicily and Sardinia) in the macro area "South".

[19] Table 6 and 7 in the Appendix report all the indices for the 30 cohorts with standard errors obtained through 100 bootstrap repetitions. The normal-based confidence intervals at 95% confidence level in Figure 2 and 4 are based on those standard errors.

out of it after 10 years, while between 15 and 25% of those who start from the top quintile end up in a lower position.

Figure 2: Earnings mobility patterns



Note: The figure plots several intragenerational mobility indices for 30 five-year-long rolling cohorts of birth of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. IT-SILC sample weights are used to compute the indices and normal-based confidence intervals (95%) are obtained through 100 bootstrap repetitions. *Source*: AD-SILC data 1975-2018.

These indices uncover a relevant persistence in income positions in 10 years in middle-career, and the existence of 'sticky floors' – low positions hard to escape from – and 'sticky ceilings' – high positions that are unlikely to be left. The ceiling seems to be 'stickier' than the floor: less than one-fifth of the top earners change position after 10 years, meaning that being a top earner is a persistent status. Moreover, if we look at trends across cohorts, the probability of leaving the top decreases by 28%: from 0.24 for cohort 1940-1944, to 0.17 for cohort 1969-1973.

Measuring mobility through changes in normalized ranks, we see that the correlation between origin and destination positions is high (between 0.80 and 0.85) making the Spearman's mobility index lie between 0.15 and 0.20. The mobility index decreased by 23% from the first to the last cohort, but the drop occurred mainly for the first cohorts and then mobility remained stable at lower levels. Looking at the direction of rank changes after 10 years, also in this case we find symmetry in the movements: workers climbing the income ladder, as well as those who fall down, cross about 10% of the income distribution.

Absolute mobility The right panel in Figure 2 plots the median income growth for each cohort, the average growth à la Davis and Haltiwanger, and the share of workers enjoying an upward linear trend at age 35-45.[20] Interestingly, the three indices tell the same story

[20]We do not show in the graph the average income growth because the standard errors for some cohorts are too wide to make the estimates credible (see Table 6 in the Appendix). As explained in Section 2.2.1, the average growth rate is very sensitive to outliers; including zero earners and measuring origin income as an individual mean at age 35-37, we may have very small values of origin income that result in outstanding levels of growth. We see this also by comparing the level of mobility including zero earners in Table 4 (61% growth for the first cohort!) with that for positive earners only in Table 5 (19%) in the Appendix. For this reason, we

in terms of patterns across cohorts: with some cyclicalities, the long-run trend of income growth across generations is markedly decreasing: 56% less median income growth from the first to the last cohort, and 84% less average growth à la Davis and Haltiwanger. We move from a picture of 13% income growth after 10 years for workers born in 1940-1944, to one between 2 and 6% for those born between 1969 and 1973.[21] Finally, the share of upward trends is consistent with this picture: the probability of experiencing smooth upward growth is 18% lower for the last cohort (0.64) than for the first one (0.78). A value of 0.64 means that almost 40% of the workers belonging to the last cohort do not benefit from 'good' mobility in the central phase of their careers.

Non-linearities What we have seen so far provides an average picture of intragenerational mobility as measured by bi-periodical indices. However, average values may hide very different behaviours along the income distribution. To inspect such non-linearities in the association between origin and destination income, we rely on the graphical tool in Figure 3: for three cohorts of birth (again the first, the last, and one in the middle), we plot destination income against origin income using the *value* in Euros in the left panel, and the *normalized rank* in the right one. Since a full scatterplot would be unreadable, we average income (left panel) and income ranks (right panel) in 10 bins, and also plot the linear fit of the full scatter. The reference to read the graph is the 45-degree line, which is the place of perfect immobility.

We see that in the left panels the fitted line is always above the 45-degree line, meaning that, in general, destination income is higher in value than origin income, and confirmed by the positive average growth we measured (Figure 2 and Table 4). However, the slope changes: for cohort 1940-1944, the bottom of the origin distribution experiences on average greater income growth than the top, while the reverse is true for the subsequent cohorts.[22] Looking at the scatter points, clear non-linearities emerge: the middle-class of origin distribution has almost stagnating income, even falling for the last cohort, while the bottom and the top experience the highest income growth levels. There seems to be no reversion to the mean in place – i.e. the higher the income, the lower the growth –, but rather a U-shape pattern of income growth.

A similar picture emerges from the right panels showing normalized rank mobility. Positional mobility is a zero-sum game – if someone goes up, someone else has to go down –, so the fitted line cannot be completely above or completely below it. This way, absolute income growth is ignored and the cohorts can be compared in terms of positional mobility

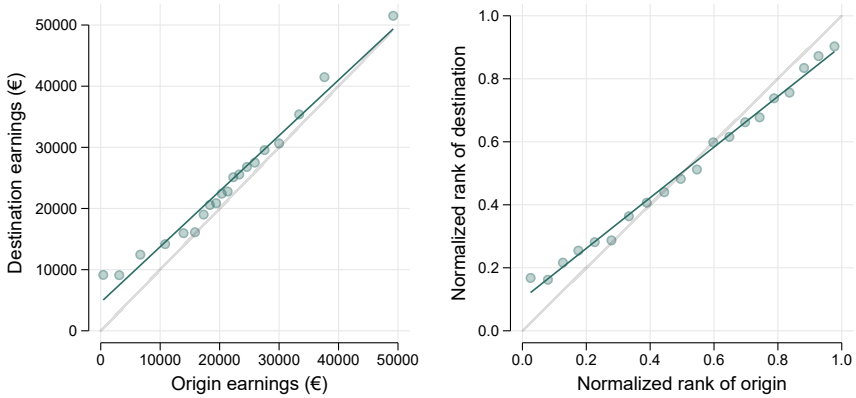
rely on the more robust alternatives described in the text to aggregate absolute income growth.

[21] This evidence can not be simply attributed to zero-income women in older cohorts – who therefore experienced more growth at entry – because it is also confirmed by results using only positive earnings (Figure 11 in the Appendix).

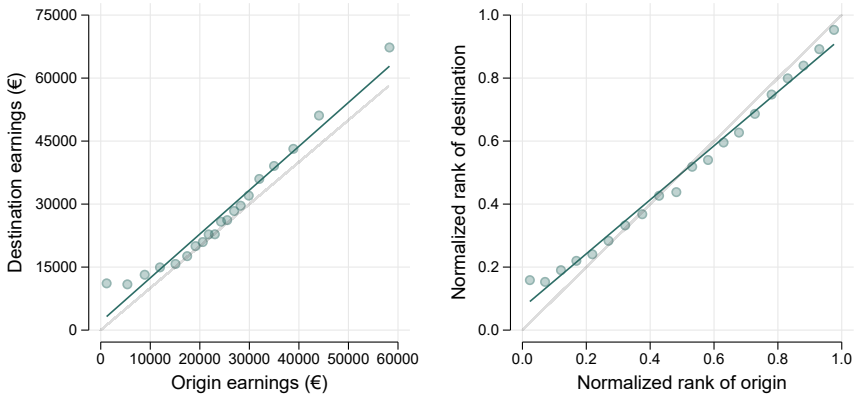
[22] Cohorts 1940-1944 to 1945-1949 are the only two cohorts completely covered during age 35-45 by the Scala Mobile - 'elevator' - wage indexation mechanism adopted in Italy from the 1970s to the early 1990s. Since it was designed for granting the same absolute wage increase to all employees in a period of sustained inflation, the mechanism induced mechanically greater proportional wage changes at the bottom of the distribution (Manacorda, 2004).

Figure 3: Correlation between origin and destination earnings

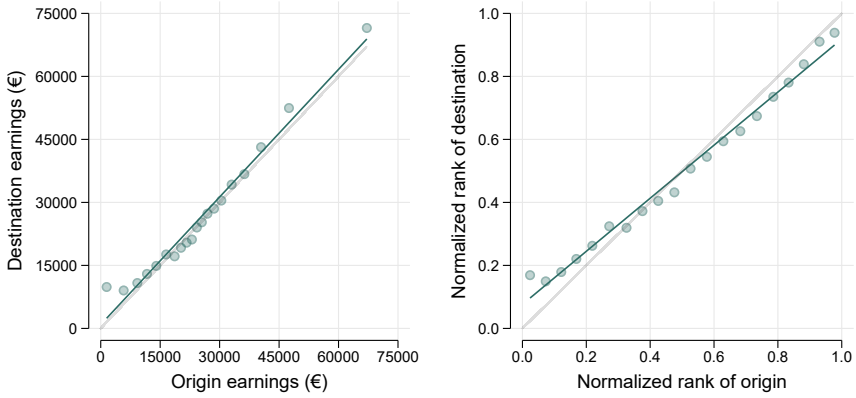
a) Cohort 1940-1944



b) Cohort 1955-1959



c) Cohort 1969-1973



Note: The figure plots for three cohorts of birth the linear fit of destination earnings on origin earnings (left panels), and of destination income rank on origin income rank. The points are the average y-variable and x-variable inside 10 equal-sized bins. The 45-degree line is the place of perfect immobility, where destination income/rank is perfectly predicted by origin income/rank. The sample includes employees observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. Annual Earnings are real (2015 price level) and gross of personal income taxes and social contributions and include income from any source. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

alone. We see a process of mean reversion – those in the lower half of the origin distribution tend to improve their ranking, while those in the top half tend to worsen it –, but with the very top more sheltered from this process and closer to maintaining its position. If we exclude zero-income workers (Figure 13 in the Appendix), we no longer see workers at the bottom improving their position on average, signalling that the "bottom-out" phenomenon is driven mainly by the exit from non-employment, while low-income workers tend to remain low-income workers also after 10 years.

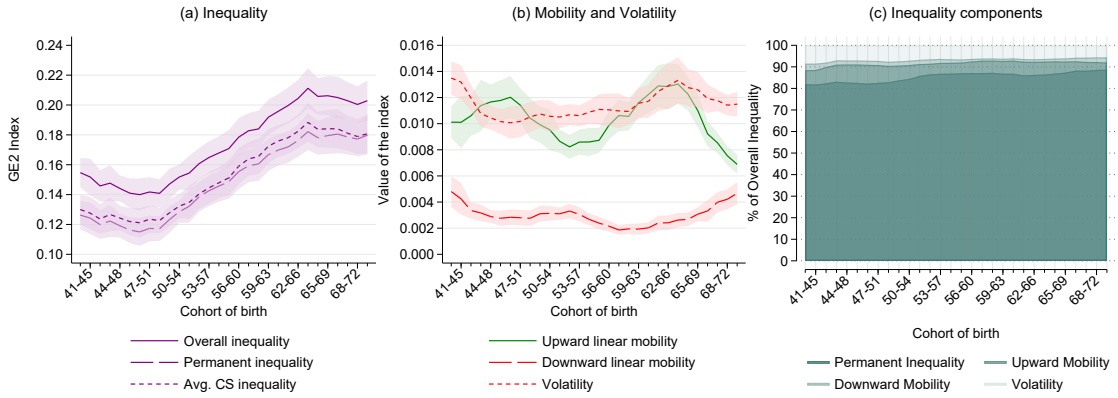
4.2 Income risk components

We now move to the intragenerational indices of dynamics, shown in Figure 4. In the left panel of the figure, we plot the within-cohort levels of inequality as measured by the GE2 index. We notice a relevant long-run trend of rising earnings inequality, increasing by 39% from the first to the last cohort (60% if excluding zero earnings) if measured by the average cross-sectional GE2. Comparing the pattern of average and overall inequality with the permanent one gives a first clue about income mobility: the more they depart from each other, the more people experience income movements, according to the decomposition in Equation (2). However, mobility can come from very different income trajectories, more or less growing, and more or less stable.

To inspect the details of mobility, we plot in the central panel in Figure 4 the three separate elements of within-worker inequality – upward linear mobility, downward linear mobility, and volatility –, and in the right panel the per cent contribution of each element to overall inequality. The intensity of upward linear mobility is always greater than that of downward mobility, but their difference becomes very narrow for recent cohorts due to a long-run trend of declining good mobility (-32% from the first to the last cohort). Moreover, the level of average individual volatility seems to be close to that of upward smooth mobility and less cyclical. In the whole period, volatility diminished by 15%. These patterns are similar if we exclude zero earnings, with the main difference being the relationship between good mobility and volatility: individual volatility remains for most cohorts lower than good mobility but for the most recent cohorts. This suggests that periods of non-employment have a strong impact on the level of volatility, but for recent cohorts the instability is greater than good mobility even without the impact of the zeros.

Finally on the income risk decomposition, the right panel of Figure 4 reveals that overall inequality is mainly due to persistent differences across workers (more than 80%), while the rest is for one-third 'good' and for two-thirds 'bad' individual mobility. Importantly, the share of overall inequality attributable to persistent differences increases across cohorts: from 81 to 89% including zero earnings, and from 84 to 91% for positive earnings.

Figure 4: Income risk components



Note: The figure plots cohort-by-cohort the overall (across people and time) intragenerational inequality and its components according to the decomposition described in Section 2.2.2. The indices are computed for 30 five-year-long rolling cohorts of birth of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Inequality is measured through the general entropy index of degree 2. Workers with zero earnings for at most five years are included. IT-SILC sample weights are used to compute the indices and normal-based confidence intervals (95%) are obtained through 100 bootstrap repetitions. *Source*: AD-SILC data 1975-2018.

4.3 The inequality-mobility trade off

Given the picture of inequality and mobility provided in the previous section, we now move to study the correlation between the two. Table 1 (and Table 8 in the Appendix for only positive earnings) reports the correlation coefficients between each of the mobility indices explained in Section 2.2 and the three notions of inequality we employed in this work – namely overall inequality, permanent inequality and average cross-sectional inequality. As a first interesting result, the magnitude of the correlation does not change much for the three notions of inequality, confirming that overall and average inequality are driven by permanent differences across workers.

If we look at the two cross-country intragenerational Great Gatsby curves taken from Gangl (2005) and Guvenen et al. (2022) (Figure 10 in Appendix), we see that Italy is a middle-high inequality country, but its relative position in terms of mobility depends on the index used.[23] This is why we want to study the correlation between inequality and mobility by employing several different concepts of income dynamics.

Indeed, we see that the correlation is heavily dependent on the index used, but some regularities emerge. In terms of the sign of the association, there seems to be a trade-off between inequality and mobility as measured by the Spearman index, the average and median income growth, the probability of having an upward linear trend, and the probability of leaving the top quintile after 10 years. On the contrary, a complementarity emerges between inequality and mobility as the probability of changing quintile, the average jump,

[23]The expression 'Great Gatsby curve' is due to a speech by Alan Krueger in 2012, chair of the Council of Economic Advisers at the time. It is the graphical representation of the positive relationship between cross-sectional inequality (measured by the Gini index) and intergenerational earnings persistence (measured by the intergenerational income elasticity) across countries.

Table 1: Table of inequality-mobility correlation

			Overall Inequality	Permanent Inequality	Avg. Inequality
		1 - ρ_n	-0.001	-0.038	-0.046
		Avg. Jump up	0.380	0.353	0.380
	Relative	Avg. Jump down	0.022	0.034	0.064
	indices	Pr(upper quintile)	0.318	0.298	0.280
Biperiodical		Pr(lower quintile)	**0.560**	**0.541**	**0.556**
mobility		Pr(exit from bottom)	**0.757**	**0.762**	**0.751**
indices		Pr(falling from top)	**-0.725**	**-0.752**	**-0.753**
	Absolute	Avg. Income growth	-0.236	-0.251	-0.208
	indices	Median Income growth	-0.473	**-0.521**	-0.475
		DH Income growth	-0.080	-0.114	-0.063
		Pr(upward linear trend)	**-0.581**	**-0.623**	**-0.579**
Indices of		Avg. upward mobility	-0.087	-0.140	-0.086
dynamics		Avg. downward mobility	0.097	0.093	0.057
		Avg. Individual volatility	**0.709**	**0.669**	**0.678**

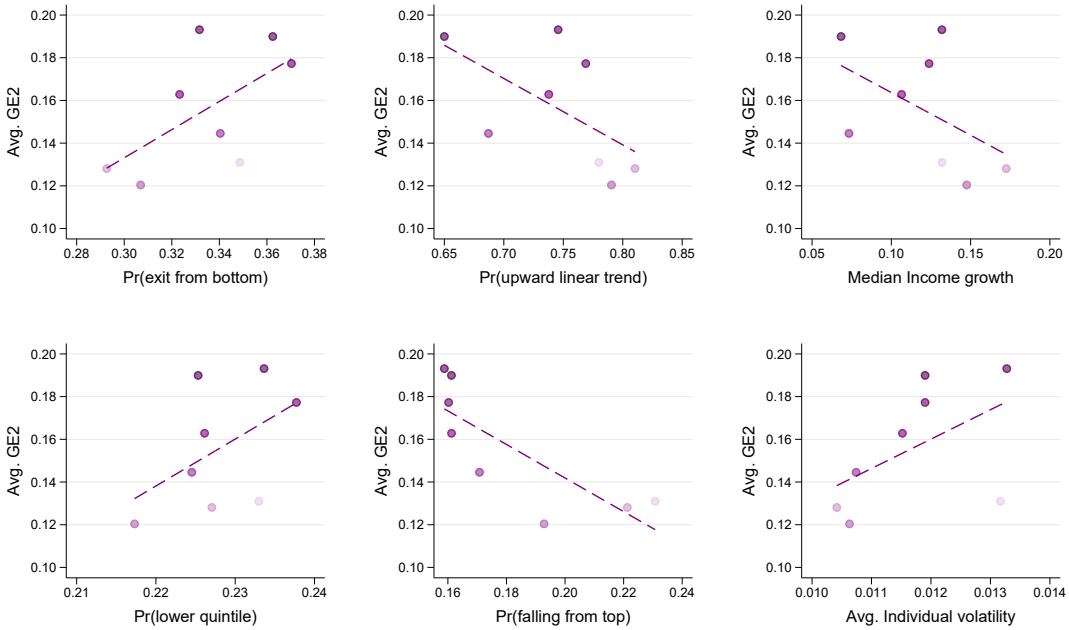
Note: The table reports the cohort-level correlation between earnings mobility and inequality indices. All the coefficients are significant at 95% confidence level unless the number is in light grey. We highlight in bold the correlations greater or equal to 0.5. The underlying basis for computing the indices are 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

the probability of exit from the bottom quintile, the intensity of downward mobility risk, and the average individual volatility. The pattern is puzzling: while it is clear that there is a trade-off between inequality and most of the notions of 'good' mobility, we also find a positive association between inequality and the probability to escape from the bottom of the distribution.

The key to explaining this puzzle are the non-employed. If we compare the correlations in Table 1 with those for the indices excluding zeros in Table 8, we notice that when only positive earnings are included the results are remarkably clear: there is a trade-off between inequality and every notion of good mobility, while inequality is positively linked to the three measures of bad mobility we have – namely, the average jump down, the intensity of downward mobility risk, and average volatility. This gives us two important results: first, the cohorts experiencing a higher level of inequality do not see it compensated by good mobility, but rather suffer the effects of the worst notion of mobility which is instability. Second, since we know that by including the zeros a positive correlation emerges between inequality and the probability of leaving the bottom quintile, this means that the most unequal cohorts experience more mobility at the bottom due to workers exiting the non-employment status.

In terms of magnitude, two correlations dwarf the others: the negative correlation between inequality and the probability to leave the top (-0.75 including zeros, -0.80 excluding them), and the positive one between inequality and volatility (0.69 including zeros, 0.87 excluding them). The former has no unique interpretation: from an individual-welfare perspective, leaving the top quintile after 10 years is a bad, since it is a downgrading in the income ladder. However, from a social welfare point of view having low mobility at the top – sticky ceilings – is a risk in terms of inequality of opportunity, concentration and strengthening of power, to the point of being a threat to the functioning of democracy. On the contrary, the welfare interpretation of the complementary between inequality and volatility is much simpler, being volatility undesirable for its unpredictability.

Figure 5: intragenerational Great Gatsby curves



Note: The figure plots average within-cohort inequality measured through the GE2 index against several measures of intragenerational mobility. The selected measures of mobility are those with a correlation with inequality greater than 0.5 in Table 1. Only the cohorts of birth overlapping for one year are shown for clarity (1940-1944, 1944-1948, ..., 1968-1972), and the colour of the circle gets darker for more recent cohorts. The inequality and mobility indices are computed on a sample of employees in the private sector in Italy observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

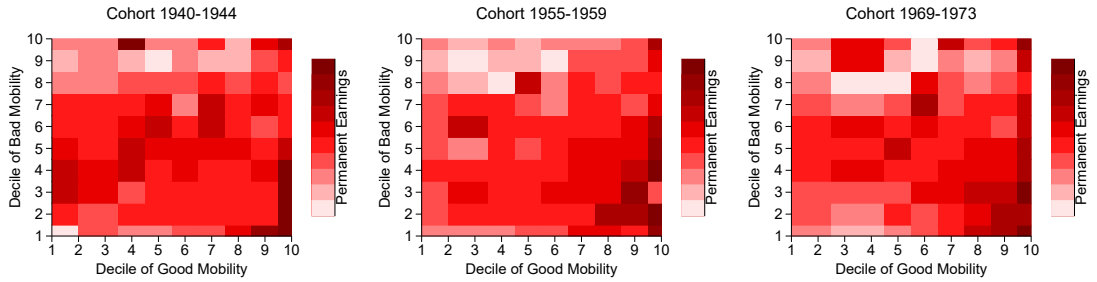
Focusing only on the mobility indices that show a high correlation (>0.5) with the level of inequality, we plot in Figure 5 and 14 the cross-cohort intragenerational Great Gatsby curves. On the y-axis, there is always the average GE2 inequality index, while on the x-axis there are several indices of mobility. The curves are informative beyond what we already saw in Table 1 because we can also 'locate' the cohorts in the graph: using a darker color for the most recent cohorts, we see that there has been a gradual shift from one generation to the next toward greater inequality coupled with stickier ceilings, lower growth, and greater

instability.

4.4 Evidence on 'unequal mobility'

Besides the aggregate dynamics, we are interested in investigating who has been most impacted by the different types of mobility we are measuring. Figure 6 shows for three different cohorts (1940-1944, 1955-1959, and 1969-1973) the average decile of permanent earnings when 35-45 by combinations of decile of good mobility (x-axis) and bad mobility (y-axis). Good mobility is measured as the steepness of the upward linear trend, while bad mobility is the sum of the steepness of the downward linear trend and volatility around the trend. Darker areas in the heat maps indicate the 'places' of the mobility combination where richer people are concentrated.

Figure 6: Heat map of unequal mobility



Note: The figure shows for three cohorts of birth the 'heatmap' of decile of permanent earnings – average income at age 35-45 – for the combination of deciles of 'good' (x-axis) and 'bad' (y-axis) mobility. Darker areas indicate a greater decile of permanent earnings. 'Good' and 'bad' mobility are estimated through the income risk decomposition à la Nichols described in Section 2.2.2 and measure, respectively, smooth upward income growth and individual income volatility. The sample includes employees in the private sector in Italy observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

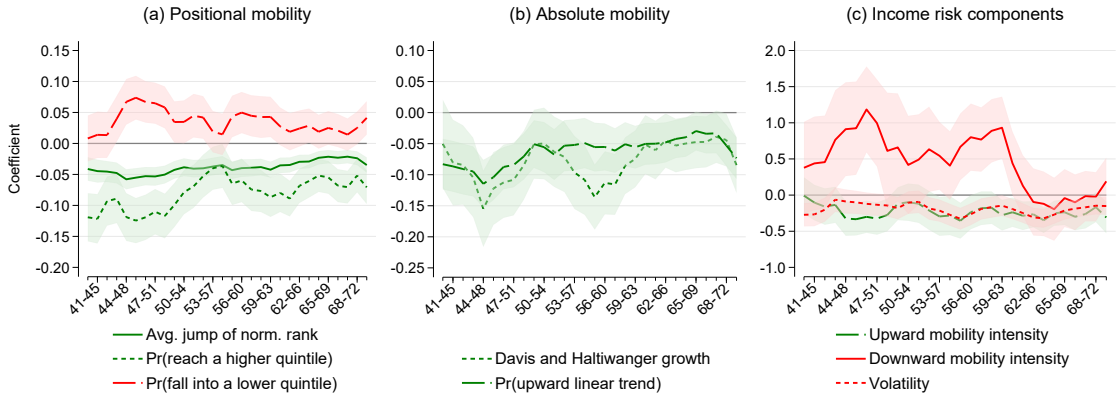
We see in Figure 6 gradually darkening colour from the upper left corner to the lower right corner, with a more distinct pattern for the two youngest cohorts: low-permanent income people tend to be concentrated in the first half of the distribution of good mobility, and at the top of the distribution of instability, and the reverse is true for high-permanent income recipient. We interpret it as evidence of unequal mobility in place. Looking at figure 15 in the Appendix to compare these results with the case of only positive earnings, we notice two interesting differences. First, for the oldest cohort (1940-1944) permanent income is distributed rather independently of mobility. Second, for the other two cohorts permanent income follows the distribution of good mobility, but not that of instability: richer people benefit on average from greater smooth growth, but the burden of volatility is shared across the distribution. Therefore, a relevant component of unequal mobility are the transitions to and from non-employment: they lead to a permanent low-income state worsened by high levels of instability.

5 Heterogeneity

As a further and final insight into intragenerational mobility, we look at possible heterogeneity linked to relevant socio-demographic characteristics of workers – namely the gender, the highest level of education, and the area of work. To explore the differences in mobility by these categories, we regress separately for each cohort the several individual-level measures of mobility – one at a time – on indicators for being a woman, tertiary graduate, and working in the South or Islands of Italy, controlling for the rank of origin:

$$\text{Mobility}_i = \beta_0 + \beta_1 W_i + \beta_2 T_i + \beta_3 S_i + R_{oi} + \epsilon_i \tag{8}$$

Figure 7: Gender differences in earnings mobility



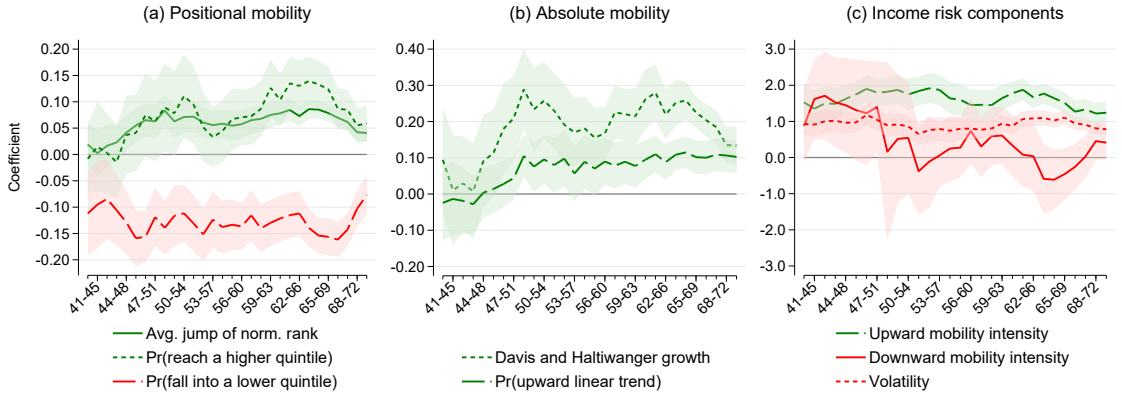
Note: The figure plots by cohort of birth the coefficient of an indicator variable for being women in several OLS linear regressions of mobility measures controlling for being a tertiary graduate, working in the South of Italy, and for the normalised rank at age 35-37. The mobility variables in panel (c) are taken in log. The regressions are fitted separately for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 7 plots the coefficient β_1 for several measures of mobility. In terms of positional mobility (panel a), we find relevant gender asymmetries: women are always less likely to reach a higher quintile than men, while for some cohorts they are more likely to worsen their position after 10 years. Even if the gap is decreasing across cohorts, in the last cohort women are still less likely than men to step up by about 7pp, and more likely to step down by about 4pp, despite equal education, area of work, and rank of origin. If we compare these results with those excluding zero earnings (Figure 16 in the Appendix), we discover that the higher probability to fall into a lower quintile for women is due to the transition to non-employment, while the lower probability to step up stays there: a glass ceiling makes it harder also for women attached to the labour market to improve their position as compared to a man.

Gender differences emerge also in terms of absolute mobility: women's income growth, as well as their probability of having an upward linear trend, is systematically dominated

by men's one. Even in this case, there is a long-run trend of reduction of this gap, but it is still there for the recent cohorts (-8.5pp for income growth, -7.3pp for the probability of an upward trend). When excluding zeros, with less cyclicality, the gender gap remains at the same level. Finally, looking at gender differences in the income risk components, we see the impact of the increase in female participation: up to recent cohorts, women had slightly lower upward mobility risk and volatility, but a great disadvantage in terms of downward mobility risk. When excluding the zeros, most of the coefficients lose significance across cohorts, and also the gender differences in upward mobility risk and volatility seem to disappear for recent cohorts. Moving to the differences in mobility by level of education,

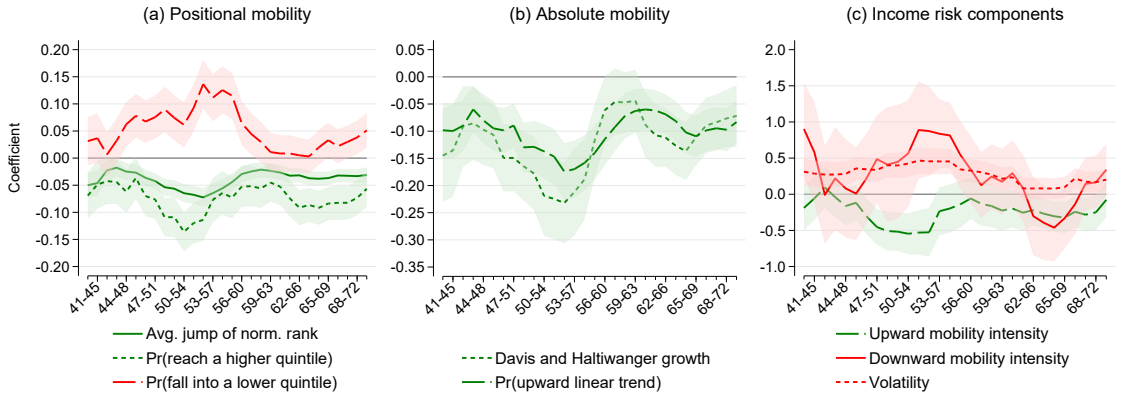
Figure 8: Education differences in earnings mobility



Note: The figure plots by cohort of birth the coefficient of an indicator variable for being a tertiary graduate in several OLS linear regressions of mobility measures controlling for being a woman, working in the South of Italy, and for the normalised rank at age 35-37. The mobility variables in panel (c) are taken in log. The regressions are fitted separately for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

we see in Figure 8 the coefficient β_2 of the indicator for tertiary education given gender, area of work and rank of origin. We find a clear and sizable advantage related to education in terms of positional mobility and earnings dynamics: tertiary graduates are more likely to improve their ranking after 10 years, but even more so they are sheltered from falling into a lower quintile (between 10 and 15pp of advantage). However, this positional mobility advantage is shrinking for recent cohorts. In terms of absolute mobility, tertiary graduates have acquired a considerable advantage of growth (between 10 and 30pp), and they also experience higher levels of upward mobility intensity while being affected by more volatile earnings. As a final dimension of heterogeneity, we look at the differences in individual-level mobility by macro area of work. Figure 9 shows the coefficient β_3 for workers in the South and Islands of Italy, given gender, education and rank of origin. The picture resembles that of women: there is a 'geographical gap' in terms of positional mobility, being workers in the South more likely to step down and less likely to step up but with a converging pattern across cohorts. The gap in absolute mobility is reducing over time but is indeed very huge (between 5 and 20pp), and also the income risk components are not randomly

Figure 9: Geographical differences in earnings mobility



Note: The figure plots by cohort of birth the coefficient of an indicator variable for working in the South of Italy in several OLS linear regressions of mobility measures controlling for being a woman, being a tertiary graduate, and for the normalised rank at age 35-37. The mobility variables in panel (c) are taken in log. The regressions are fitted separately for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

distributed across geographical areas: it is less likely for workers in the South to benefit from good mobility (but the gap is zero for some cohorts), while they are the ones with more volatile earnings.

6 Conclusions

We started our investigation by asking whether income inequality can be more acceptable if coupled with a high degree of mobility along the income distribution that makes the inequality burden widely shared through 'changing fortunes' (Jenkins, 2011). Our analysis of the correlation between intragenerational inequality and mobility for the case of Italy prompts us toward a negative answer. Indeed, we find evidence of an empirical trade-off between income inequality and 'good' mobility, and complementarity with the worst notions of mobility – i.e. those related to income insecurity. Instead of being combined with more mobility, the rising inequality experienced by Italian cohorts of workers in the last decades has been increasingly set in stone: younger cohorts are burdened with greater gaps to start with that are not transitory and are reproduced even ten years later.

In a poorly mobile society as the one we have described, measuring permanent inequality or simply the cross-sectional one does not make a big difference; however, this is something that needs to be proved in the first place and not taken for granted. And it could, in any case, change from society to society and from generation to generation. We think that this work, besides shedding some new light on the link between inequality and mobility in the Italian case and the intragenerational context, has made relevant methodological contributions, or at least important discussion points. The first one is related to the inclusion of zeros: we

showed how much sensitive the measurement of mobility is to the zeros, and we tried to interpret case-by-case the possible impact of periods of non-employment. When the focus is on income mobility, including its aspect of insecurity, we cannot leave out of the picture exactly those who are more mobile, if only on the extensive margin.

A second methodological contribution is related to the very notion of intragenerational mobility. In the wide range of possible definitions, concepts and methodological details, we decided not to choose so as not to create constraints. This non-choice allowed us to analyze different aspects of mobility and its association with inequality, also being able to break it down into its components that even go in opposite directions in terms of individual and social well-being. With a single concept of mobility, this would not have been possible.

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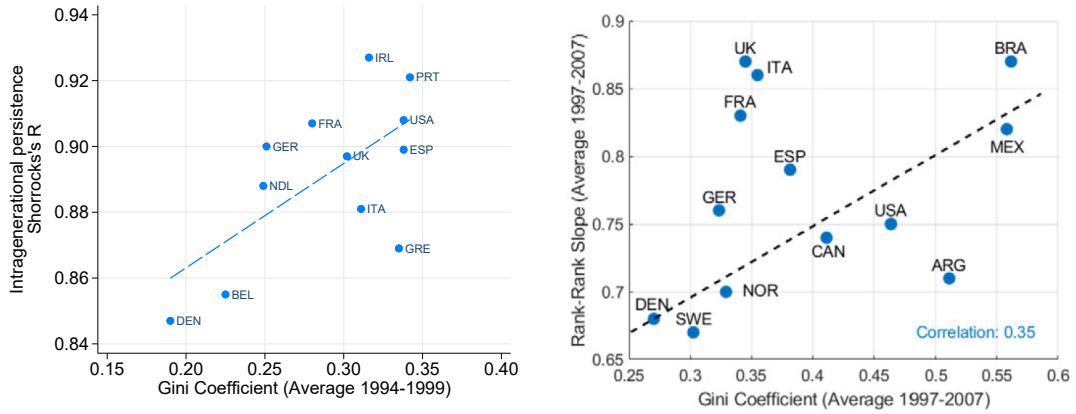
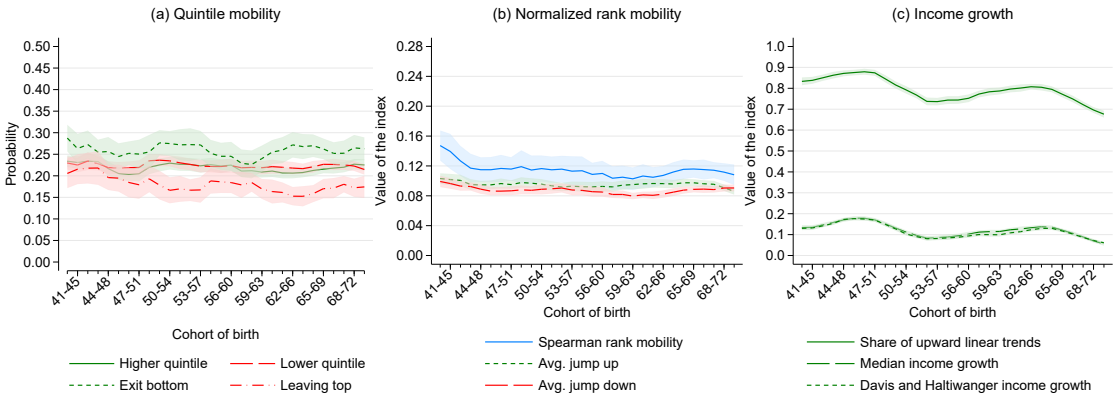
A Additional figures and tables

Figure 10: Intragenerational Great Gatsby curves



Source: Left panel: authors' elaboration from Gangl (2005) (Table 1, p. 150), Panel Study of Income Dynamics and the European Community Household Panel. Right panel: Guvenen et al. (2022) (Fig. 12, p. 1356), GRID data.
Note: Shorrocks's R index (Shorrocks, 1978) is the ratio between inequality (Gini index) computed on average income and the average cross-sectional inequality in the same period. It measures how much of the snapshot inequality is due to persistent income differences. The Rank-Rank slope is the beta coefficient of a linear regression of the income rank at the end of the period on the income rank at the beginning of the period.

Figure 11: Mobility patterns – only positive earnings



Note: The figure plots several intragenerational mobility indices for 30 five-year-long rolling cohorts of birth of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Only workers with positive earnings every year when aged 35-45 are included. IT-SILC sample weights are used to compute the indices and normal-based confidence intervals (95%) are obtained through 100 bootstrap repetitions. *Source*: AD-SILC data 1975-2018.

Table 2: Summary statistics

		Annual earnings (€)								
Cohort	N	Mean	SD	p10	p50	p90	Zeros	Women	Tertiary	South
1940-1944	2,952	22,137	12,259	3,614	21,997	36,210	6.0	29.9	2.7	20.1
1941-1945	2,837	23,355	13,190	6,006	22,960	36,574	4.5	30.4	3.8	21.4
1942-1946	2,983	22,941	13,760	3,091	22,427	37,994	6.0	31.7	2.8	20.6
1943-1947	3,126	23,716	13,015	6,173	23,338	38,813	4.2	30.8	3.7	21.9
1944-1948	3,235	24,975	13,577	7,770	23,600	42,616	2.7	31.4	3.0	23.3
1945-1949	3,322	25,561	13,612	8,699	24,907	39,277	4.1	32.6	4.6	20.7
1946-1950	3,414	25,381	13,314	8,768	24,609	40,502	3.7	33.9	3.2	22.7
1947-1951	3,335	25,678	13,846	7,449	25,027	41,121	4.7	31.2	3.9	19.8
1948-1952	3,238	25,728	13,696	8,079	24,751	41,960	4.4	30.8	3.5	27.3
1949-1953	3,186	25,253	14,334	6,352	24,317	43,740	4.2	33.6	4.5	26.0
1950-1954	3,178	25,629	14,475	5,736	24,824	41,928	6.1	36.0	4.6	18.8
1951-1955	3,240	25,929	14,995	7,181	25,189	42,359	4.3	31.2	4.5	22.8
1952-1956	3,320	26,023	14,907	7,419	25,009	45,262	4.7	35.4	2.7	18.2
1953-1957	3,402	25,585	14,281	6,326	24,191	43,574	4.2	39.0	4.4	20.8
1954-1958	3,490	26,294	14,749	7,684	25,398	43,088	4.8	36.2	4.2	23.6
1955-1959	3,555	26,557	15,424	9,879	24,536	43,765	3.3	35.0	4.4	18.7
1956-1960	3,573	26,388	16,360	5,281	25,238	45,993	4.9	35.1	4.7	21.6
1957-1961	3,648	25,295	14,183	7,274	24,157	44,686	4.2	35.9	6.7	28.6
1958-1962	3,828	26,282	15,694	8,902	23,652	47,507	3.8	40.8	6.1	20.8
1959-1963	4,028	24,160	15,148	5,805	22,907	43,873	4.3	36.2	5.2	28.0
1960-1964	4,282	25,002	15,858	6,403	23,632	44,232	5.3	35.8	6.8	25.0
1961-1965	4,584	26,176	15,587	7,752	24,737	46,530	3.7	36.2	6.4	25.5
1962-1966	4,854	24,040	15,546	5,803	22,893	42,133	5.2	41.4	7.5	22.5
1963-1967	5,048	24,749	16,611	5,165	22,800	44,776	4.8	36.0	6.6	24.2
1964-1968	5,171	25,185	16,796	6,276	23,206	45,721	4.3	42.5	6.7	26.4
1965-1969	5,258	27,501	18,941	7,638	24,571	48,408	4.3	39.1	8.5	23.7
1966-1970	5,308	25,352	17,042	6,165	23,716	44,052	4.1	40.6	7.4	25.7
1967-1971	5,285	24,897	15,895	6,622	23,670	42,786	5.2	42.5	11.6	28.2
1968-1972	5,243	26,060	17,518	6,878	23,713	47,433	4.4	43.8	14.1	27.3
1969-1973	5,173	26,036	17,001	5,671	24,284	46,201	4.9	45.2	14.8	24.4
All	26,645	25,262	15,500	6,584	23,894	43,332	4.6	37.2	6.9	23.7

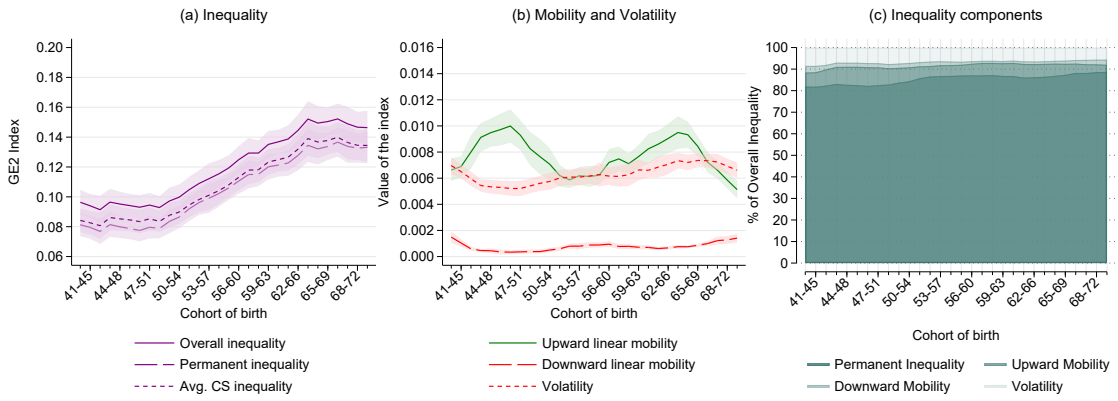
Note: The table reports the number of workers and summary statistics for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Workers with zero earnings for at most five years are included. Annual Earnings are real (2015 price level) and gross of personal income taxes and social contributions and include income from any source. The percentage of zero earnings, women, tertiary graduates, and workers in the South of Italy are reported. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Table 3: Summary statistics – only positive earnings

		Annual earnings (€)							
Cohort	N	Mean	SD	p10	p50	p90	Women	Tertiary	South
1940-1944	2,362	25,520	11,196	14,572	23,898	38,412	24.1	3.2	18.2
1941-1945	2,278	25,567	10,997	14,364	24,113	38,300	26.0	3.4	18.8
1942-1946	2,439	26,381	11,335	15,145	24,813	39,198	26.6	3.5	19.7
1943-1947	2,590	27,202	12,127	15,595	25,321	40,571	26.0	4.1	20.8
1944-1948	2,706	27,375	12,030	15,603	25,611	41,121	26.7	3.8	21.5
1945-1949	2,800	27,700	12,118	15,766	25,976	41,458	27.1	3.8	21.7
1946-1950	2,872	28,101	12,332	16,318	26,206	42,176	27.2	3.8	21.5
1947-1951	2,793	28,333	12,399	16,259	26,466	42,707	27.4	4.3	21.4
1948-1952	2,698	28,289	12,153	16,218	26,521	42,679	28.1	4.0	21
1949-1953	2,636	28,545	12,562	16,347	26,443	43,323	29.1	4.4	19.8
1950-1954	2,616	28,977	12,908	16,602	26,738	44,495	29.4	5.0	18.8
1951-1955	2,684	29,100	13,405	16,258	26,781	44,891	31.1	5.2	18.1
1952-1956	2,733	29,251	13,729	16,156	26,797	45,593	31.3	4.9	17.2
1953-1957	2,811	29,377	13,990	15,802	26,831	46,141	32.2	5.2	17.0
1954-1958	2,874	29,423	14,171	15,226	26,932	46,413	32.7	5.1	17.1
1955-1959	2,934	29,230	14,320	14,702	26,570	46,524	33.7	5.3	17.5
1956-1960	2,934	29,423	14,604	14,541	26,519	47,530	33.2	5.9	18.5
1957-1961	2,990	29,217	14,731	13,942	26,243	47,707	34.4	6.2	19.3
1958-1962	3,115	29,310	14,750	14,062	26,252	47,845	34.1	6.3	19.2
1959-1963	3,246	28,924	14,850	13,396	25,879	47,689	34.3	6.4	19.9
1960-1964	3,429	28,801	14,968	12,916	25,857	47,790	34.7	6.4	20.6
1961-1965	3,657	28,448	14,914	12,235	25,624	47,259	34.6	6.7	21.1
1962-1966	3,896	28,317	15,200	11,875	25,507	47,175	35.3	7.1	21.1
1963-1967	4,068	28,370	15,847	11,478	25,486	47,597	36.5	8.0	21.5
1964-1968	4,225	28,725	16,018	11,706	25,779	47,963	37.0	8.9	21.8
1965-1969	4,324	28,762	16,105	11,783	25,811	47,697	37.9	9.7	22.2
1966-1970	4,405	28,861	16,367	11,782	25,935	47,886	39.5	10.3	21.7
1967-1971	4,380	28,940	16,256	11,958	26,056	48,022	40.2	11.7	22.7
1968-1972	4,356	28,944	16,140	12,086	25,977	48,328	41.0	13.2	22.9
1969-1973	4,279	29,093	16,159	12,273	26,054	48,596	41.7	15.0	22.2
All	21,849	28,520	14,449	13,547	25,972	45,675	33.5	7.0	20.5

Note: The table reports the number of workers and summary statistics for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Only workers with positive earnings in all years are included. Annual Earnings are real (2015 price level) and gross of personal income taxes and social contributions and include income from any source. The percentage of zero earnings, women, tertiary graduates, and workers in the South of Italy are reported. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 12: Income risk components – only positive earnings



Note: The figure plots the overall (across people and time) intragenerational inequality and its components according to the decomposition described in Section 2.2.2. The indices are computed separately for 30 five-year-long rolling cohorts of birth of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Inequality is measured through the General Entropy Index of degree 2. Only workers with positive earnings every year when aged 35-45 are included. IT-SILC sample weights are used to compute the indices and normal-based confidence intervals (95%) are obtained through 100 bootstrap repetitions. *Source*: AD-SILC data 1975-2018.

Table 4: Earnings inequality and intragenerational mobility indices

			Cohort 1940-1944	Cohort 1955-1959	Cohort 1969-1973	% Variation
Inequality		Overall GE2	0.155	0.171	0.203	*31.0*
		Permanent GE2	0.126	0.149	0.180	*42.9*
		Avg. CS GE2	0.130	0.151	0.181	*39.2*
Biperiodical mobility indices	Relative indices	1 - ρ_n	0.203	0.136	0.157	*-22.7*
		Avg. Jump up	0.110	0.100	0.094	*-14.5*
		Avg. Jump down	-0.121	-0.095	-0.117	*-3.3*
		Pr(upper quintile)	0.263	0.225	0.252	*-4.2*
		Pr(lower quintile)	0.240	0.226	0.222	*-7.5*
		Pr(exit from bottom)	0.350	0.318	0.347	*-0.9*
		Pr(falling from top)	0.236	0.177	0.170	*-28.0*
	Absolute indices	Avg. Income growth	0.613	0.469	0.423	*-31.0*
		Median Income growth	0.134	0.093	0.058	*-56.7*
		DH Income growth	0.135	0.116	0.021	*-84.4*
Indices of dynamics		Pr(upward linear trend)	0.778	0.720	0.639	*-17.9*
		Avg. upward mobility	0.0101	0.0087	0.0069	*-31.7*
		Avg. downward mobility	0.0048	0.0024	0.0047	*-2.1*
		Avg. Individual volatility	0.0135	0.0111	0.0115	*-14.8*

Note: The table reports the earnings inequality and intragenerational mobility indices for three five-year-long cohorts of birth of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Inequality is measured through the General Entropy Index of degree 2. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Table 5: Earnings inequality and intragenerational mobility indices – only positive earnings

			Cohort 1940-1944	Cohort 1955-1959	Cohort 1969-1973	% Variation
Inequality		Overall GE2	0.096	0.119	0.146	*52.1*
		Permanent GE2	0.081	0.106	0.133	*64.2*
		Avg. CS GE2	0.084	0.108	0.134	*59.5*
Biperiodical mobility indices	Relative indices	1 - ρ_n	0.147	0.109	0.108	*-26.5*
		Avg. Jump up	0.103	0.092	0.086	*-16.5*
		Avg. Jump down	-0.099	-0.086	-0.090	*-9.1*
		Pr(upper quintile)	0.234	0.223	0.225	*-3.8*
		Pr(lower quintile)	0.230	0.222	0.215	*-6.5*
		Pr(exit from bottom)	0.288	0.245	0.263	*-8.7*
		Pr(falling from top)	0.206	0.186	0.174	*-15.5*
	Absolute indices	Avg. Income growth	0.191	0.136	0.095	*-50.3*
		Median Income growth	0.130	0.087	0.061	*-53.1*
		DH Income growth	0.134	0.094	0.056	*-58.2*
Indices of dynamics		Pr(upward linear trend)	0.833	0.744	0.676	*-18.8*
		Avg. upward mobility	0.0066	0.0062	0.0051	*-22.7*
		Avg. downward mobility	0.0015	0.0009	0.0014	*-6.7*
		Avg. Individual volatility	0.0070	0.0063	0.0066	*-5.7*

Note: The table reports the earnings inequality and intragenerational mobility indices for three five-year-long cohorts of birth of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Inequality is measured through the General Entropy Index of degree 2. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Table 6: Indices of bi-periodical mobility

		Relative mobility						Absolute mobility		
Cohort	1-ρ_n	Jump up	Jump down	Upper quintile	Lower quintile	Exit from bottom	Falling from top	Avg. growth	Median growth	Avg. DH growth
1940-1944	0.203	0.110	-0.121	0.263	0.240	0.350	0.236	0.613	0.134	0.135
	(0.013)	(0.003)	(0.006)	(0.010)	(0.008)	(0.020)	(0.017)	(0.115)	(0.006)	(0.014)
1941-1945	0.189	0.105	-0.119	0.260	0.234	0.336	0.245	0.552	0.134	0.119
	(0.013)	(0.003)	(0.005)	(0.011)	(0.009)	(0.019)	(0.018)	(0.077)	(0.005)	(0.014)
1942-1946	0.168	0.102	-0.112	0.243	0.221	0.310	0.227	0.913	0.141	0.121
	(0.012)	(0.004)	(0.004)	(0.008)	(0.008)	(0.015)	(0.018)	(0.221)	(0.004)	(0.014)
1943-1947	0.161	0.096	-0.112	0.247	0.218	0.304	0.232	0.895	0.153	0.125
	(0.010)	(0.003)	(0.004)	(0.008)	(0.008)	(0.017)	(0.016)	(0.190)	(0.004)	(0.013)
1944-1948	0.153	0.095	-0.106	0.244	0.221	0.301	0.223	0.993	0.171	0.139
	(0.009)	(0.003)	(0.004)	(0.007)	(0.007)	(0.014)	(0.015)	(0.335)	(0.005)	(0.011)
1945-1949	0.150	0.095	-0.102	0.236	0.219	0.295	0.212	0.951	0.177	0.151
	(0.008)	(0.003)	(0.003)	(0.009)	(0.008)	(0.017)	(0.015)	(0.306)	(0.004)	(0.012)
1946-1950	0.149	0.096	-0.101	0.232	0.223	0.300	0.205	0.933	0.176	0.161
	(0.010)	(0.003)	(0.004)	(0.009)	(0.008)	(0.016)	(0.016)	(0.286)	(0.004)	(0.010)
1947-1951	0.149	0.097	-0.101	0.224	0.217	0.294	0.196	0.604	0.172	0.163
	(0.009)	(0.003)	(0.003)	(0.008)	(0.008)	(0.014)	(0.017)	(0.256)	(0.005)	(0.011)
1948-1952	0.148	0.100	-0.101	0.227	0.222	0.298	0.193	0.716	0.15	0.141
	(0.010)	(0.004)	(0.004)	(0.008)	(0.008)	(0.015)	(0.017)	(0.280)	(0.005)	(0.012)
1949-1953	0.155	0.102	-0.103	0.224	0.225	0.295	0.184	0.600	0.126	0.111
	(0.010)	(0.003)	(0.003)	(0.007)	(0.007)	(0.017)	(0.012)	(0.149)	(0.005)	(0.013)
1950-1954	0.155	0.100	-0.104	0.228	0.221	0.303	0.184	0.545	0.102	0.084
	(0.010)	(0.003)	(0.004)	(0.009)	(0.008)	(0.019)	(0.013)	(0.187)	(0.005)	(0.014)
1951-1955	0.157	0.100	-0.106	0.234	0.228	0.330	0.182	0.545	0.086	0.061
	(0.009)	(0.003)	(0.004)	(0.008)	(0.007)	(0.018)	(0.014)	(0.218)	(0.005)	(0.011)
1952-1956	0.155	0.099	-0.107	0.234	0.226	0.337	0.182	0.444	0.074	0.041
	(0.011)	(0.004)	(0.004)	(0.007)	(0.008)	(0.020)	(0.014)	(0.137)	(0.005)	(0.012)
1953-1957	0.148	0.098	-0.102	0.224	0.218	0.319	0.166	0.337	0.081	0.060
	(0.009)	(0.003)	(0.004)	(0.007)	(0.007)	(0.016)	(0.014)	(0.070)	(0.005)	(0.014)
1954-1958	0.141	0.099	-0.098	0.227	0.222	0.322	0.173	0.451	0.087	0.087
	(0.010)	(0.004)	(0.003)	(0.007)	(0.008)	(0.018)	(0.012)	(0.142)	(0.005)	(0.012)
1955-1959	0.136	0.100	-0.095	0.225	0.226	0.318	0.177	0.469	0.093	0.116
	(0.008)	(0.003)	(0.003)	(0.007)	(0.007)	(0.018)	(0.013)	(0.110)	(0.004)	(0.010)
1956-1960	0.133	0.103	-0.091	0.224	0.226	0.319	0.167	0.719	0.104	0.148
	(0.010)	(0.004)	(0.003)	(0.006)	(0.008)	(0.015)	(0.012)	(0.284)	(0.005)	(0.011)
1957-1961	0.134	0.106	-0.090	0.227	0.232	0.321	0.171	0.833	0.114	0.177
	(0.009)	(0.004)	(0.003)	(0.007)	(0.007)	(0.016)	(0.012)	(0.284)	(0.005)	(0.012)
1958-1962	0.141	0.110	-0.091	0.231	0.235	0.330	0.171	0.967	0.114	0.185
	(0.010)	(0.004)	(0.003)	(0.006)	(0.007)	(0.019)	(0.012)	(0.306)	(0.005)	(0.011)
1959-1963	0.145	0.115	-0.092	0.232	0.241	0.346	0.163	0.959	0.116	0.195
	(0.010)	(0.004)	(0.002)	(0.006)	(0.008)	(0.019)	(0.011)	(0.340)	(0.004)	(0.012)
1960-1964	0.149	0.113	-0.096	0.238	0.242	0.356	0.169	1.008	0.128	0.196
	(0.008)	(0.004)	(0.003)	(0.006)	(0.008)	(0.017)	(0.010)	(0.215)	(0.005)	(0.010)
1961-1965	0.153	0.115	-0.097	0.240	0.243	0.359	0.166	0.798	0.134	0.190
	(0.010)	(0.003)	(0.003)	(0.007)	(0.006)	(0.016)	(0.010)	(0.133)	(0.006)	(0.012)
1962-1966	0.150	0.111	-0.098	0.238	0.240	0.348	0.151	0.732	0.139	0.179
	(0.010)	(0.003)	(0.003)	(0.006)	(0.006)	(0.015)	(0.010)	(0.115)	(0.005)	(0.010)
1963-1967	0.154	0.110	-0.100	0.237	0.235	0.338	0.161	0.669	0.144	0.168
	(0.008)	(0.003)	(0.003)	(0.006)	(0.006)	(0.012)	(0.009)	(0.099)	(0.004)	(0.009)
1964-1968	0.152	0.108	-0.102	0.241	0.239	0.335	0.168	0.567	0.137	0.141
	(0.008)	(0.002)	(0.003)	(0.006)	(0.006)	(0.014)	(0.011)	(0.060)	(0.005)	(0.010)
1965-1969	0.155	0.106	-0.105	0.244	0.244	0.344	0.176	0.510	0.119	0.111
	(0.009)	(0.002)	(0.003)	(0.006)	(0.005)	(0.013)	(0.009)	(0.055)	(0.003)	(0.010)
1966-1970	0.154	0.103	-0.107	0.248	0.240	0.351	0.184	0.487	0.102	0.084
	(0.009)	(0.002)	(0.003)	(0.006)	(0.005)	(0.014)	(0.011)	(0.056)	(0.004)	(0.009)
1967-1971	0.159	0.100	-0.111	0.249	0.237	0.349	0.188	0.513	0.084	0.062
	(0.007)	(0.002)	(0.003)	(0.006)	(0.006)	(0.015)	(0.012)	(0.082)	(0.004)	(0.009)
1968-1972	0.156	0.097	-0.114	0.250	0.230	0.356	0.172	0.414	0.068	0.034
	(0.008)	(0.002)	(0.004)	(0.006)	(0.005)	(0.016)	(0.010)	(0.069)	(0.003)	(0.009)
1969-1973	0.157	0.094	-0.117	0.252	0.222	0.347	0.170	0.423	0.058	0.021
	(0.008)	(0.002)	(0.004)	(0.007)	(0.006)	(0.015)	(0.011)	(0.071)	(0.003)	(0.010)

Note: The table reports the bi-periodical indices of intragenerational mobility for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed from age 35 to 45. Workers with zero earnings for at most five years are included. The standard errors in parenthesis are obtained through 100 bootstrap repetitions. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

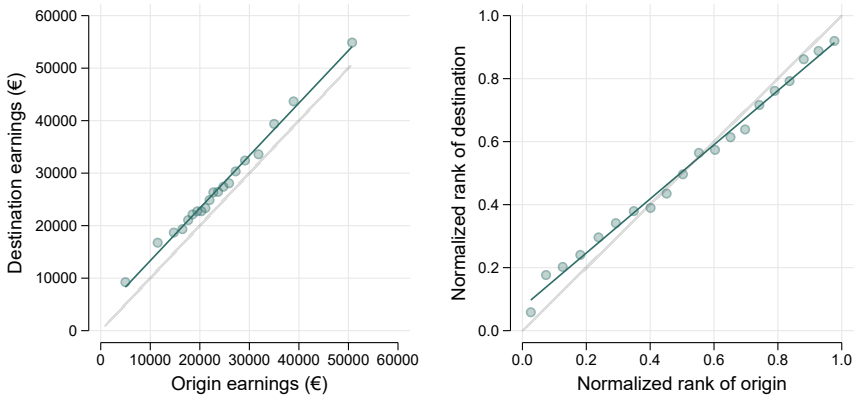
Table 7: Indices of earnings inequality and mobility

	Inequality			Mobility			
Cohort	Overall GE2	Permanent GE2	Avg. CS GE2	Upward trend	Upward mobility	Downward mobility	Volatility
1940-1944	0.155	0.126	0.130	0.778	0.0101	0.0048	0.0135
	(0.005)	(0.005)	(0.005)	(0.009)	(0.0006)	(0.0006)	(0.0007)
1941-1945	0.152	0.124	0.128	0.779	0.0101	0.0042	0.0132
	(0.006)	(0.005)	(0.006)	(0.009)	(0.0010)	(0.0006)	(0.0007)
1942-1946	0.146	0.120	0.124	0.789	0.0106	0.0034	0.0120
	(0.005)	(0.005)	(0.005)	(0.010)	(0.0008)	(0.0003)	(0.0005)
1943-1947	0.148	0.122	0.127	0.801	0.0114	0.0032	0.0108
	(0.006)	(0.005)	(0.006)	(0.009)	(0.0010)	(0.0003)	(0.0005)
1944-1948	0.144	0.119	0.124	0.811	0.0117	0.0029	0.0104
	(0.004)	(0.004)	(0.004)	(0.008)	(0.0007)	(0.0002)	(0.0005)
1945-1949	0.141	0.116	0.122	0.818	0.0118	0.0028	0.0102
	(0.005)	(0.004)	(0.005)	(0.007)	(0.0008)	(0.0003)	(0.0005)
1946-1950	0.140	0.115	0.121	0.825	0.0120	0.0028	0.0101
	(0.005)	(0.005)	(0.005)	(0.008)	(0.0008)	(0.0003)	(0.0006)
1947-1951	0.142	0.117	0.124	0.821	0.0114	0.0028	0.0102
	(0.005)	(0.004)	(0.005)	(0.008)	(0.0007)	(0.0003)	(0.0006)
1948-1952	0.141	0.117	0.123	0.793	0.0104	0.0028	0.0105
	(0.005)	(0.004)	(0.004)	(0.009)	(0.0008)	(0.0003)	(0.0006)
1949-1953	0.147	0.123	0.128	0.763	0.0099	0.0031	0.0107
	(0.005)	(0.005)	(0.005)	(0.008)	(0.0007)	(0.0003)	(0.0005)
1950-1954	0.152	0.129	0.132	0.740	0.0095	0.0031	0.0106
	(0.004)	(0.004)	(0.004)	(0.009)	(0.0008)	(0.0003)	(0.0006)
1951-1955	0.154	0.132	0.135	0.717	0.0087	0.0031	0.0105
	(0.006)	(0.006)	(0.006)	(0.009)	(0.0005)	(0.0002)	(0.0004)
1952-1956	0.161	0.138	0.140	0.690	0.0082	0.0033	0.0107
	(0.005)	(0.005)	(0.005)	(0.008)	(0.0005)	(0.0003)	(0.0004)
1953-1957	0.165	0.143	0.145	0.697	0.0086	0.0031	0.0106
	(0.005)	(0.005)	(0.005)	(0.011)	(0.0005)	(0.0003)	(0.0004)
1954-1958	0.168	0.146	0.148	0.711	0.0086	0.0027	0.0109
	(0.006)	(0.005)	(0.005)	(0.009)	(0.0005)	(0.0002)	(0.0005)
1955-1959	0.171	0.149	0.151	0.720	0.0087	0.0024	0.0111
	(0.006)	(0.006)	(0.006)	(0.008)	(0.0005)	(0.0002)	(0.0006)
1956-1960	0.178	0.155	0.159	0.736	0.0099	0.0022	0.0111
	(0.006)	(0.006)	(0.006)	(0.009)	(0.0005)	(0.0002)	(0.0006)
1957-1961	0.183	0.159	0.164	0.758	0.0106	0.0019	0.0110
	(0.006)	(0.006)	(0.006)	(0.007)	(0.0006)	(0.0002)	(0.0007)
1958-1962	0.184	0.161	0.165	0.767	0.0106	0.0019	0.0109
	(0.006)	(0.006)	(0.006)	(0.008)	(0.0005)	(0.0002)	(0.0005)
1959-1963	0.192	0.167	0.172	0.772	0.0116	0.0019	0.0116
	(0.006)	(0.006)	(0.006)	(0.008)	(0.0006)	(0.0002)	(0.0006)
1960-1964	0.196	0.170	0.176	0.777	0.0122	0.0020	0.0117
	(0.006)	(0.005)	(0.005)	(0.008)	(0.0007)	(0.0002)	(0.0006)
1961-1965	0.200	0.172	0.178	0.777	0.0129	0.0024	0.0125
	(0.006)	(0.005)	(0.006)	(0.008)	(0.0008)	(0.0003)	(0.0008)
1962-1966	0.204	0.176	0.182	0.776	0.0128	0.0024	0.0129
	(0.006)	(0.006)	(0.006)	(0.007)	(0.0009)	(0.0003)	(0.0009)
1963-1967	0.211	0.182	0.188	0.769	0.0130	0.0026	0.0133
	(0.007)	(0.006)	(0.007)	(0.006)	(0.0008)	(0.0003)	(0.0009)
1964-1968	0.206	0.178	0.184	0.754	0.0123	0.0027	0.0128
	(0.006)	(0.006)	(0.006)	(0.007)	(0.0006)	(0.0003)	(0.0007)
1965-1969	0.206	0.180	0.184	0.729	0.0110	0.0031	0.0126
	(0.007)	(0.006)	(0.006)	(0.007)	(0.0006)	(0.0003)	(0.0007)
1966-1970	0.205	0.181	0.184	0.706	0.0092	0.0033	0.0119
	(0.007)	(0.007)	(0.007)	(0.007)	(0.0005)	(0.0004)	(0.0006)
1967-1971	0.203	0.179	0.181	0.680	0.0085	0.0040	0.0118
	(0.006)	(0.006)	(0.006)	(0.008)	(0.0004)	(0.0004)	(0.0004)
1968-1972	0.200	0.177	0.179	0.656	0.0075	0.0042	0.0114
	(0.006)	(0.006)	(0.006)	(0.007)	(0.0004)	(0.0004)	(0.0004)
1969-1973	0.203	0.180	0.181	0.639	0.0069	0.0047	0.0115
	(0.007)	(0.007)	(0.007)	(0.008)	(0.0004)	(0.0004)	(0.0005)

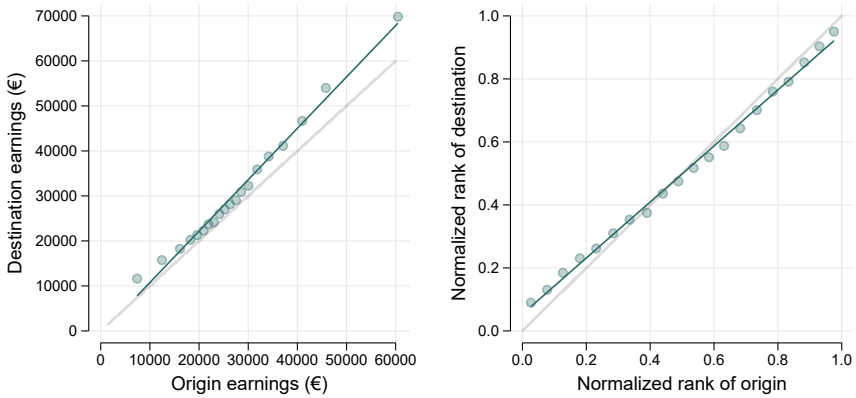
Note: The table reports the earnings inequality indices and the indices of dynamics of intragenerational mobility for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed from age 35 to 45. Inequality is measured using the General Entropy Index of degree 2. The standard errors in parenthesis are obtained through 100 bootstrap repetitions. Workers with zero earnings for at most five years are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 13: Correlation between origin and destination earnings – only positive earnings

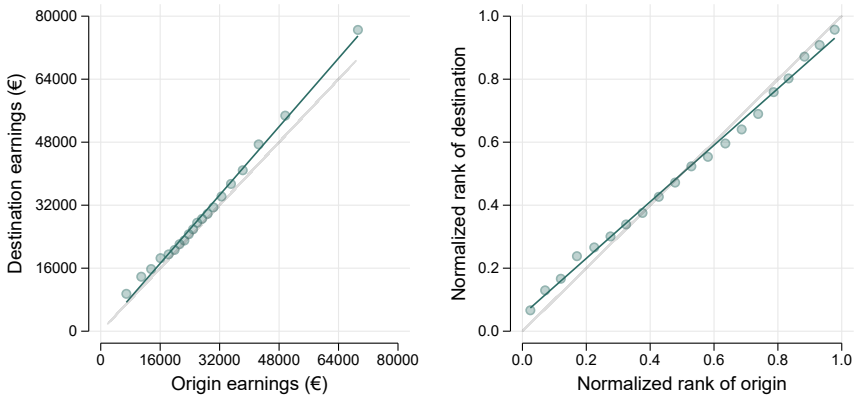
a) Cohort 1940-1944



b) Cohort 1955-1959



c) Cohort 1969-1973



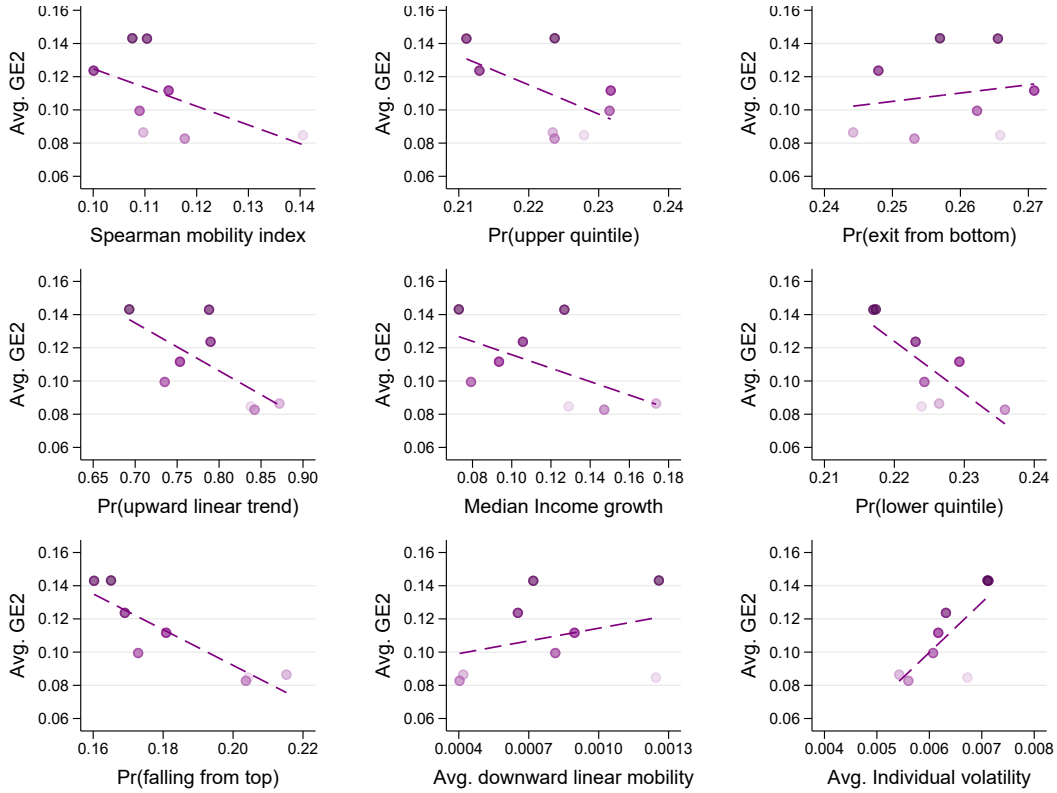
Note: The figure plots for three cohorts of birth the linear fit of destination earnings on origin earnings (left panels), and of destination income rank on origin income rank. The points are the average y-variable and x-variable inside 10 equal-sized bins. The 45-degree line is the place of perfect immobility, where destination income/rank is perfectly predicted by origin income/rank. The sample includes employees observed every year from age 35 to 45. Annual Earnings are real (2015 price level) and gross of personal income taxes and social contributions and include income from any source. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Table 8: Table of inequality-mobility correlation – only positive earnings

			Overall Inequality	Permanent Inequality	Avg. Inequality
Biperiodical mobility indices	Relative indices	1 - ρ_n	**-0.537**	**-0.536**	**-0.547**
		Avg. Jump up	-0.452	-0.468	-0.461
		Avg. Jump down	0.454	0.450	0.459
		Pr(upper quintile)	**-0.515**	-0.490	**-0.518**
		Pr(lower quintile)	**-0.695**	**-0.688**	**-0.694**
		Pr(exit from bottom)	-0.190	-0.176	-0.197
		Pr(falling from top)	**-0.794**	**-0.806**	**-0.795**
	Absolute indices	Avg. Income growth	-0.495	**-0.534**	-0.493
		Median Income growth	**-0.538**	**-0.577**	**-0.536**
		DH Income growth	**-0.538**	**-0.577**	**-0.537**
Indices of dynamics		Pr(upward linear trend)	**-0.682**	**-0.714**	**-0.681**
		Avg. upward mobility	-0.215	-0.259	-0.211
		Avg. downward mobility	**0.584**	**0.606**	**0.577**
		Avg. Individual volatility	**0.880**	**0.880**	**0.873**

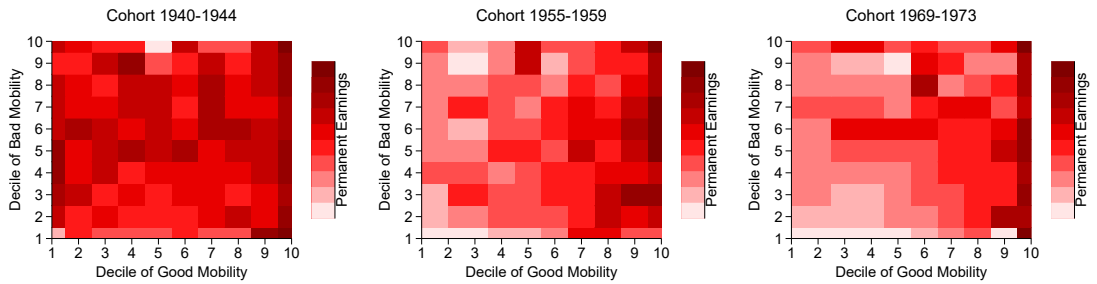
Note: The table reports the cohort-level correlation between earnings mobility and inequality indices. All the coefficients are significant at 95% confidence level unless the number is in light grey. We highlight in bold the correlations greater or equal to 0.5. The underlying basis for computing the indices are 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy. The workers are observed every year from age 35 to 45. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 14: intragenerational Great Gatsby curves – only positive earnings



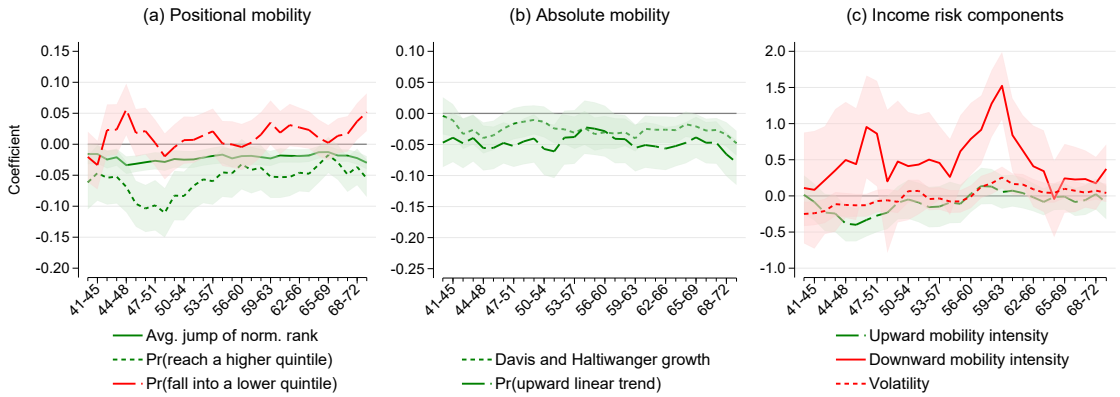
Note: The figure plots average within-cohort inequality measured through the GE2 index against several measures of intragenerational mobility. The selected measures of mobility are those with a correlation with inequality greater than 0.5 in Table 1. Only the cohorts of birth overlapping for one year are shown for clarity (1940-1944, 1944-1948, ..., 1968-1972), and the colour of the circle gets darker for more recent cohorts. The inequality and mobility indices are computed on a sample of employees in the private sector in Italy observed every year from age 35 to 45. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 15: Heat map of unequal mobility – only positive earnings



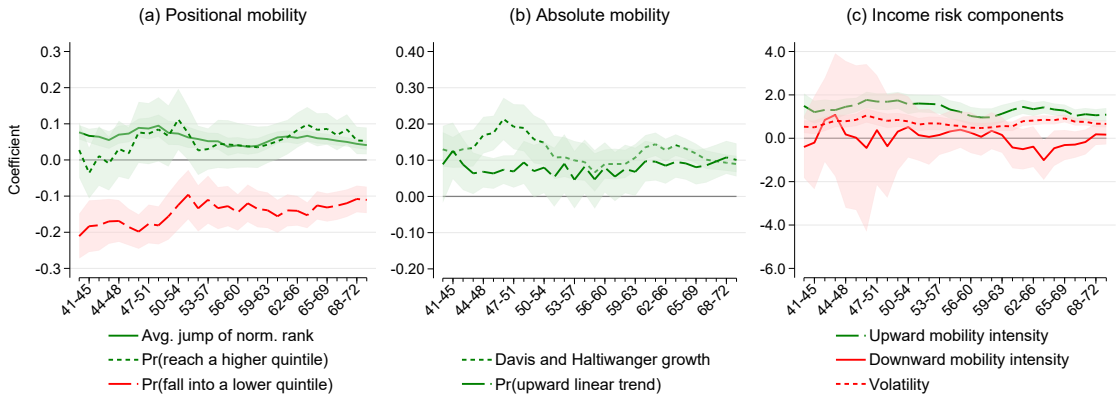
Note: The figure shows for three cohorts of birth the *heat map* of decile of permanent earnings – average income at age 35-45 – for the combination of deciles of 'good' (x-axis) and 'bad' (y-axis) mobility. Darker areas indicate a greater decile of permanent earnings. Good and bad mobility are estimated through the income risk decomposition à la Nichols described in Section 2.2.2 and measure, respectively, smooth upward income growth and individual income volatility. The sample includes employees in the private sector in Italy observed every year from age 35 to 45. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 16: Gender differences in earnings mobility – only positive earnings



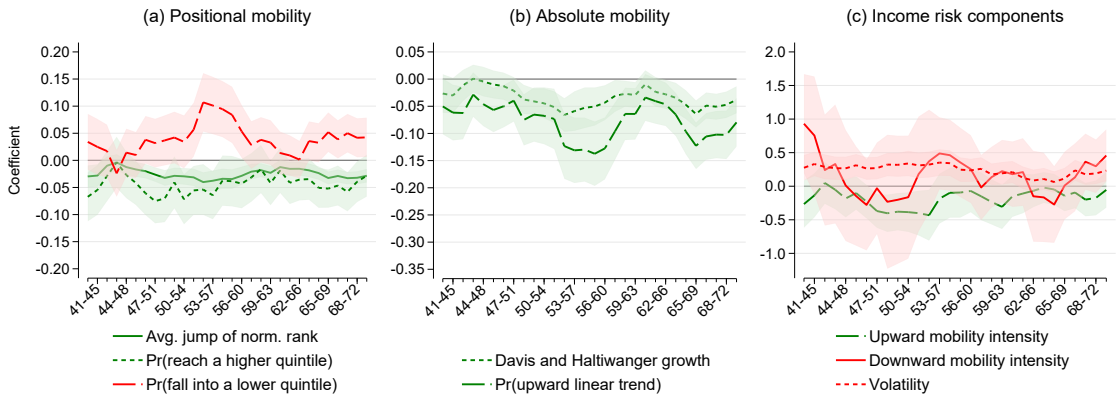
Note: The figure plots by cohort of birth the coefficient of an indicator variable for being women in several OLS linear regressions of mobility measures controlling for being a tertiary graduate, working in the South of Italy, and for the normalised rank at age 35-37. The mobility variables in panel (c) are taken in log. The regressions are fitted separately for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed every year from age 35 to 45. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 17: Education differences in earnings mobility – only positive earnings



Note: The figure plots by cohort of birth the coefficient of an indicator variable for being a tertiary graduate in several OLS linear regressions of mobility measures controlling for being a woman, working in the South of Italy, and for the normalised rank at age 35-37. The mobility variables in panel (c) are taken in log. The regressions are fitted separately for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed every year from age 35 to 45. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.

Figure 18: Geographical differences in earnings mobility – only positive earnings



Note: The figure plots by cohort of birth the coefficient of an indicator variable for working in the South of Italy in several OLS linear regressions of mobility measures controlling for being a woman, being a tertiary graduate, and for the normalised rank at age 35-37. The mobility variables in panel (c) are taken in log. The regressions are fitted separately for 30 five-year rolling cohorts of birth (1940-1944 to 1969-1973) of employees in the private sector in Italy observed every year from age 35 to 45. Only workers with positive earnings every year when aged 35-45 are included. The observations are weighted using IT-SILC sample weights. *Source*: AD-SILC data 1975-2018.