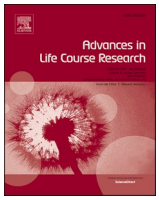
Advances in Life Course Research 58 (2023) 100565

Contents lists available at ScienceDirect

Advances in Life Course Research

journal homepage: www.elsevier.com/locate/alcr



The intragenerational mobility of the top income earners during financial crises, a story of a cohort

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ARTICLE INFO

JEL classification:
E320 Business Fluctuations
Cycles
J690 Mobility
Unemployment and Vacancies: Other
D310 Personal Income
Wealth and Their Distributions

Keywords:
Income Distribution
Inequality
Economic crises
Social mobility

ABSTRACT

In this study, we explore the dynamics of the intragenerational mobility of the top income earners during financial crises. We analyze panel data on the income levels of a cohort consisting of 22,601 individuals in Israel born between 1963 and 1973, for the period between 1995 and 2013. Studying a specific cohort allows us to focus on the changes caused by period effects, rather than cohort replacement distortions. We use common intragenerational mobility measurements before, during, and after two major recessions- the Dot.com crisis and the Global Financial Crisis of 2008- which occurred during the analyzed period. However, since these are usually descriptive, we adopt a methodology that enables us to calculate confidence intervals of these measurements and thus test for changes over time. Our results show if the two crises had any effect on the intragenerational mobility of the top income earners of the analyzed cohort, it was a minor and transitory effect.

1. Introduction

Income inequality has risen in many advanced economies in the past several decades (OECD, 2011). Due to this ongoing rise in inequality, accompanied by the Global Financial Crisis of 2008, different protest movements such as Occupy Wall Street have shifted their attention to social and economic mobility of the top income earners.

Indeed, the income concentration of this segment of the population attracted much research attention (e.g., Atkinson, chap. 1, 2007; Bjorklund et al., 2012; Dell, chap. 9, 2007; Saez and Veall, 2005; Salverda and Atkinson, 2007; Piketty et al., 2018; Piketty, 2014). Yet, research regarding its mobility patterns remains scarce (e.g., Jenderny, 2016; Auten et al., 2013; Saez and Veall, 2005; Jantti et al., 2010). Moreover, we know little about the impact of macroeconomic shocks on intragenerational mobility in general and on the upper fractiles in particular (see, for example, El Herradi and Leroy, 2019 and Yu, 2010).

Several arguments indicate the importance of understanding the intragenerational mobility of the top fractiles. First, the mobility of the top income earners offsets some of the problems arising from income concentration, such as the political power of those who have economic power and the fact that the benefits of growth are enjoyed by a smaller group. When the top income earners are mobile, it may mitigate income concentration at the top (Kopczuk, 2010), such that economic and political power shifts between individuals, and a bigger portion of the population benefits from growth. Second, there is no reason to believe that the mobility patterns of different income groups are similar. Therefore, focusing on a specific income group can deepen our understanding of mobility in a society. This, in turn, can allow a more nuanced interpretation of income inequality (Splinter, 2021).

Furthermore, understanding the patterns of intragenerational mobility may contribute to our understanding of intergenerational mobility patterns. Typically, intergenerational mobility is assessed by analyzing cross-sectional data regarding the income or rank of parents and their offspring. However, this approach may not fully distinguish between intergenerational and intragenerational mobility patterns, as some mobility could be attributed to movements within the same cohort rather than across different cohorts (Yaish, 1995). Given the consistent findings of previous studies that show that Israel has high intergenerational mobility (e.g., Aloni and Krill, 2017; Heller, 2020), studying intragenerational mobility could assist in understanding the extent to which this mobility is driven by within-cohort factors.

In this paper, we analyze the intragenerational mobility of the top

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https://doi.org/10.1016/j.alcr.2023.100565
Received 21 March 2023; Received in revised form 7 August 2023; Accepted 17 August 2023
Available online 22 August 2023

fractiles in Israel and its dynamics during two financial crises: The Dot.com crisis, which was followed in Israel by *The Second Intifada*,[1] and the Global Financial Crisis of 2008. To do so, we focus on following a cohort over time: we use longitudinal income data of 22,601 individuals who were born in Israel between 1963 and 1973 and were traced from 1995 to 2013.

Generally, macroeconomic shocks might affect intragenerational mobility by repositioning individuals across the income distribution. This paper specifically focuses on financial crises that have mainly affected certain sectors, namely the high-tech sector in the Dot.com crisis, and the real estate and financial sector in the Global Financial Crisis of 2008. These types of financial crises disproportionately affect the top earners, since the top earners are mostly employed by, or hold shares of, firms that are directly affected by such a crisis (Atkinson and Morelli, 2011). Thus, this kind of crisis may increase top earner's mobility, by reshuffling the top fractiles and allowing new members to take their place. This, in turn, could mitigate the negative consequences associated with income concentration at the top.

Although focusing on a cohort means we lose some of the representativeness of our results, it has several advantages for measuring mobility. First, several studies show that changes to population-level income distribution can be a result of cohort replacement (Heikkuri and Schief, 2022; Lemieux, 2006; Card and Lemieux, 2001). By studying a cohort, we reduce the concern that our results are driven by this effect. Second, individuals often compare their status with their age peers, rather than the entire population (Jansson, 2021), thus following a cohort can better reflect the experience of the individuals. Lastly, the cohort we are studying entered the labor market before the two recessions and experienced both of them at similar working age. This allows us to study mobility during recessions without worrying about individuals exiting the labor market before a recession or entering after it.[2] The data include both employment and business incomes.[3] Such a long period is quite unique in the intragenerational mobility literature of top income earners, where the period analyzed ranges between six years (Jenderny, 2016) and ten (Auten and Gee, 2009), with one exception of nineteen years (Saez and Veall, 2005). Furthermore, both crises occurred in the middle of the analyzed period, enabling us to be among the first to look at intragenerational mobility in permanent income and its patterns during transitory shocks to income.

Intragenerational mobility is defined in this paper in two ways: First, as the probability of staying in the same fractile over time. Second, as the extent of income variations experienced by individuals within an income fractile. Macroeconomic shocks mostly affect the stability of different income fractiles, as individuals in the industries affected by the crisis may either lose their job or experience a decline in their income that is larger than the average decline in the economy. Hence, we expect the recessions analyzed in this paper to impact the persistence of the top fractiles in the intragenerational perspective, rather than the intergenerational perspective.

We measure intragenerational mobility using two of the most frequently used measures in the literature. The first measure is the persistence rate, which estimates the probability of an individual who belonged to a specific fractile at a certain year, to belong to the same fractile after a given number of years. Usually, the persistence rate is calculated as the share of individuals who stay in the same fractile. We use a different methodology, employing a linear probability model. This model allows us to calculate confidence intervals and test whether mobility is changing over time.

The second measure we use is the Top Income Mobility (TIM) curve. This measure, introduced by Shorrocks (1978)b), exploits the equalizing effect mobility has on top income concentration. The TIM curve is measured by comparing the annual income distribution of the top fractiles to their permanent income distribution.[4]

Using these two methods we find that the persistence of the top fractiles remained stable during the two crises, indicating that the crises are associated with a transitory and minor effect on the persistence of the top fractiles. This is a surprising result, as many of the members of the top fractiles were employed in the high-tech and financial industries. Since these two industries suffered from massive lay-offs and losses during the crises, we would expect to see a severe and long-lasting impact on the stability of the top fractiles.

In addition, we find that the intragenerational mobility of the top income earners has declined in the analyzed period. This implies that the high intergenerational mobility in Israel is not driven by within-cohort mobility, but rather by other factors such as immigration and ethnic diversity, as suggested by previous studies (Tyree et al., 1979; Yaish, 1995, 2001, 2002, 2004).

It is important to note that our data does not permit causal inference. Hence, the results of this study should not be interpreted as a cause-and-effect relationship between crises and mobility. Furthermore, our results indicate the resilience of the top fractiles to financial crises. Attempting to assign causal effects to the lack of change would be futile, as it is impossible to attribute causality to stability[5]. Nonetheless, the data and the method we use allow us to follow a cohort over time, and analyze its mobility before, during and after a financial crisis.

2. Literature review

The research regarding top income earners is mainly focused on their income shares. Such studies were conducted in many countries, including France (Atkinson and Piketty, 2007), Germany (Dell, chap. 9, 2007), Canada (Saez and Veall, 2005), the UK (Atkinson, chap. 1, 2007), the Netherlands (Salverda and Atkinson, 2007) and the U.S (Atkinson and Piketty, 2007). The evolution of the shares of the top income earners in the vast majority of the countries was strikingly similar: a substantial fall in the first half of the 20th century, followed by a rise since the 1980 s. This increase in income concentration was accompanied by a decrease in income volatility (Sabelhaus & Song, 2009, 2010),[6] which implies that not only did the top fractiles have a larger share of the cake, but they are also less prone to losing it.

Available research on the mobility of the top fractiles is mainly concerned with intragenerational mobility. There are two main mobility measures relevant for this study that are used in the literature: The persistence rate and the Top Income Mobility (TIM). Studies using the persistence rate were conducted in Canada (Saez and Veall, 2005), France (Landais, 2008), the U.S (Auten et al., 2013; Auten and Gee, 2009; Kopczuk et al., 2010), Norway (Aaberge et al., 2013) and Germany (Jenderny, 2016). The TIM was used to measure mobility in

[1] The second intifada was a Palestinian uprising between the years 2000 and 2005. During this period, Israel suffered a series of suicide bombings and rockets attacks and engaged in attacks against Palestinian targets. More than 4000 Israelis and Palestinians were killed in these events.

[2] Several studies find that the macro-conditions at the time of entering the labor market have a long-lasting effect on employment and earnings, for example, see Schwandt and Von Wachter (2019) and Rothstein (2021).

[3] The data include employment income for the entire period, while business data are available from 1999 to 2013.

[4] A third mobility measure, proposed by Jenderny (2016), exists in the literature: the Individual Rank Standard Deviation (IRSD). This measure, however, does not allow analyzing the mobility patterns over time. Since our paper is focused on the impact of transitory economic shocks on mobility patterns, we do not use the IRSD.

[5] It is indeed possible that other factors caused the few fluctuations we do find in the data. But as stability is the main finding of this paper, and the fluctuations are temporary in nature, it is beyond the scope of this paper to explore these possible factors and their possible causal relationship to stability.

[6] Some studies, however, found an increase in income volatility, e.g. (Dynan et al., 2012) and Moffitt and Gottschalk (2002).

Canada (Saez and Veall, 2005), Norway (Aaberge et al., 2013) and Germany (Jenderny, 2016). Our contribution to this literature is twofold: First, we examine how these two measures behave before, during and after macroeconomic shocks. Second, to statistically test the effect of the crises on mobility, we improve the methodology used in measuring the persistence rate.

Although mobility has attracted much attention in recent years, we know little about the impact of macroeconomic events on mobility. One of the few studies that explore the relation between mobility and macroeconomic events is Yu (2010), who analyzed how the economic stagnation in Japan affected job mobility. Yu finds that voluntary job turnover among male workers increased, and the gender gap in economic instability shrank. Another study is El Herradi and Leroy (2019), who examine the impact of monetary policy on top income shares in twelve advanced countries. They find that monetary tightening has a negative effect on income concentration at the top. Finally, a recent study explored the effect of banking crises on the top income shares (Morelli, 2018), and found that the income concentration declines after a banking crisis, but the decline is temporary.[7] We differ from this work in two important ways: First, we analyze the mobility of the top income earners and its dynamics, rather than income concentration. Second, we follow individuals within the top fractiles, rather than following the top fractiles per se. As such, we can examine whether the income concentration among the top income earners is stable over time, not because of the stability of the fractiles themselves, but because the individuals themselves stay in the same fractiles.

While research regarding top income shares and mobility is becoming more prevalent, in Israel it remains scarce. Most of the research regarding mobility in Israel concerns intergenerational mobility across the entire income distribution (Aloni and Krill, 2017; Frish and Zussman, 2009; Beenstock, 2002). Generally, these studies found that intergenerational mobility in Israel is high, compared to other developed countries. A recent paper by Heller (2022) examined the intergenerational mobility of different income fractiles, and found that the mobility is the highest at the bottom of the income distribution, gradually diminishing as income increases until reaching the 90th income percentile, and then begins to increase with income for the top 10%.

Several studies have analyzed intragenerational income mobility in Israel. For instance, Romanov and Zussman (2003) employed diverse mobility measures to investigate intragenerational mobility across the entire income distribution during the period of 1993–1996. Another study by Cordoso et al. (2010) focused on intragenerational mobility in different sectors (public and private) between 1988 and 1995.

However, the number of studies examining the intragenerational mobility of distinct income groups in Israel is limited to two. The first study, conducted by Endeweld (2012), explored intragenerational mobility by gender and by income quintile. This study employed various mobility measures and analyzed data for three periods: 1990–1995, 1995–2000, and 2000–2005. The second study by Ben-Naim and Belinsky (2012) investigated the mobility of top income earners in Israel between 1999 and 2009, utilizing the persistence rate[8]. Both studies find that the mobility of the top income groups is decreasing over time.

Our results on persistence rates are consistent with these two studeis, but we differ from them in several aspects: First, we examine the dynamics of intragenerational mobility of top fractiles before, during and after financial crises. Second, we use an additional measure pertaining to Israeli data that was never used before: The TIM curve[9]. Third, we follow a cohort over time, rather than studying the entire population, reducing the concerns for cohort replacement effects. Lastly, our study utilizes a longer time period compared to both previous studies, and we analyze it as a whole rather than dividing it into sub-periods as done in Endeweld (2012). These additional procedures further deepen our understanding of the mobility of the top fractiles in general, and those in Israel in particular.

3. Financial crises and their Impact on Israel and the top fractiles

In the period analyzed Israel endured two financial crises: the Dot.com crisis in 2000, followed by the *Second Intifada,* and the Global Financial Crisis of 2008. The fact that the time period of our dataset includes these crises, as well as the years after recovery, enables us to examine the resilience of the top fractiles to these crises.

These financial crises can be clearly seen in Fig. 1: the GDP growth was substantially lower during these two shocks, in the years 2001–2003 and 2009. Furthermore, the unemployment rate rose during these two shocks: from 11.2% in 1999 to 13.4% in 2003, and from 7.7% in 2007 to 9.5% in 2008.

Yet, the Israeli economy recovered relatively fast from these crises. While the recovery from the Global Financial crisis still cannot be seen in all macroeconomic variables – the nominal interest has only during 2022 rose from historically low levels and the exchange rate has not recovered to its levels before the crisis – the economic variables which are important to our analysis, GDP growth, and employment, returned to its before-crises levels, by the end of 2004 and 2009.

The Dot.com crisis, which struck Israel between the years 2001 and 2003, had a severe impact on incomes across the income distribution, as can be seen in Figs. 2 and 3. One of the main reasons for this impact is the *Second Intifada*: the terror attacks had a severe impact on tourism and overall consumption, which caused a general decline in incomes.

There are several reasons to think that such crises may affect

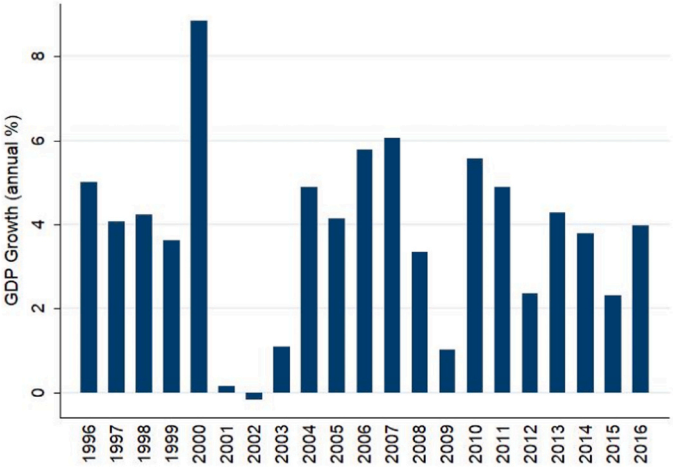

Fig. 1. Annual real GDP growth.
Source: Israel Central Bureau of Statistics. Note: GDP is calculated at market prices, expenditure approach, in 2015 prices.

[7] In another related study, Sarkar and Tuomala (2021) explore how asset bubbles are related to the top income shares.

[8] The research was later expended to the year 2010–2011, see Ben-Naim (2013).

[9] Similar to our study, Endeweld (2012) is also using a mobility measure based on Shorrocks, b) (1978a). However, she employs a distinct measure that is only suitable for analyzing the entire income distribution, unlike the TIM curve utilized in our research.

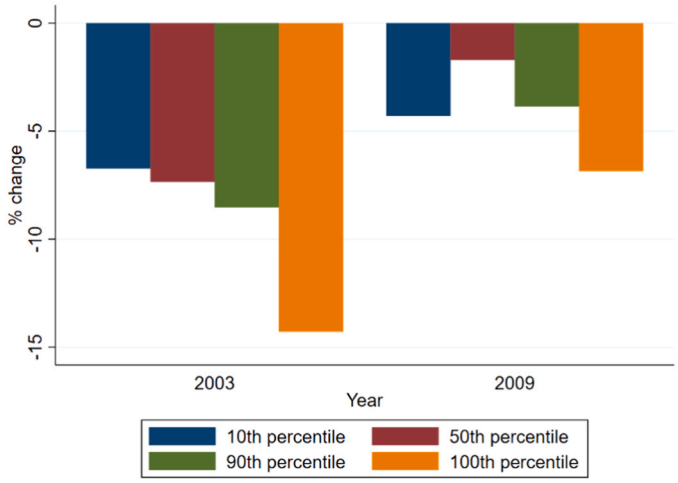

Fig. 2. Change of average employment income by percentiles.
Source: Own computation, based on data from the household expenditure surveys conducted by Israel Central Bureau of Statistics. Note: The expenditure survey is a cross-sectional survey conducted every year. Incomes were normalized to 2014 New Israeli Shekels (NIS) as a base year. The graph represents the change in the average employment income of the percentile from year t-1 to year t = 2003,2009.

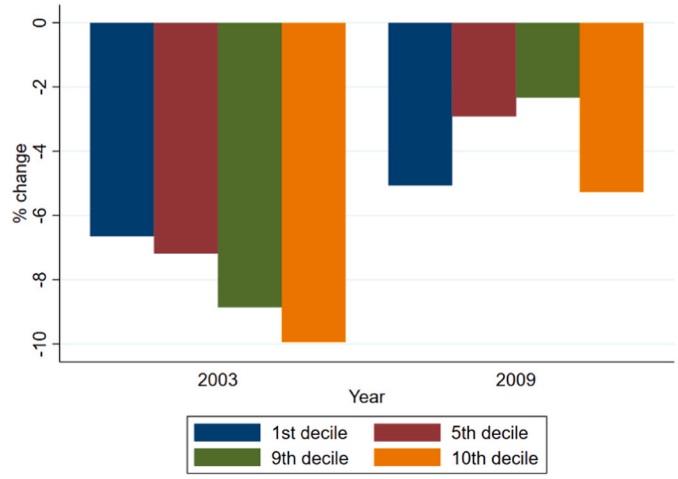

Fig. 3. Change of average employment income by deciles.
Source: Own computation, based on data from the household expenditure surveys conducted by Israel Central Bureau of Statistics. Note: The expenditure survey is a cross-sectional survey conducted every year. Incomes were normalized to 2014 New Israeli Shekels (NIS) as a base year. The graph represents the change in the average employment income of the decile from year t-1 to year t = 2003,2009.

different segments of our cohort in a different manner. First, some sectors are hit more severely in a recession, and if these sectors are more intensive in specific types of labor (say, skilled labor), they will be more affected by the shock. The Dot.com crisis, has arguably hit severely the high-tech sector, compared to more traditional ones. Since this sector is high-skilled labor intensive, and since high-skilled workers usually occupy the higher deciles of the income distribution, it is conceivable that the Dot.com crisis affected the mobility among the top deciles more than the bottom deciles.

Second, in an open economy, a crisis may be imported from abroad due to its effect on the exchange rate. In such a case, as the exchange rate declines, the exporting firms are the ones hit more severely. In a fully competitive environment, these firms are the most productive ones, and as such, they are the ones who pay the highest wages. Therefore, the top deciles are, again, the ones who are the most affected by such an event.[10] [11].

From an empirical point of view, there is some evidence that aggregated shocks have affected different parts of the income distribution in a different manner. De Labier-Longuet Marx (2018), for example, provides empirical evidence that in France, an environmental shock of an additional day with more than 30 degrees Celsius reduces income for all deciles, but more so for the bottom deciles. In reviewing the Great Recession, Kaplan and Violante (2018) argue that the "drop in aggregate consumer demand and the contemporaneous breakdown in bank lending to businesses … resulted in a severe contraction of labor demand which materialized unevenly across different occupations and skill levels." We can conclude, then, that it seems reasonable to assume, as we do in this paper, that major economic recessions may affect differently rich and poor households.

In line with these arguments, there are reasons to presume why the Dot.com crisis should have affected the intragenerational mobility of the top income earners. The high-tech industry, which was at the heart of the crisis, was one of the largest employers of the top fractiles. The losses this industry suffered due to the crisis[12] resulted in massive layoffs in the high-tech industry (as visible in Fig. 2), which in turn impacted the incomes of the top fractiles. And indeed, the income of the top fractiles suffered the highest decrease.

The Global Financial Crisis of 2008 impacted the entire income distribution as well. But again, there are reasons to think that it had a particular effect on the intragenerational mobility of the top fractiles. As evident from Fig. 4.a and 4.b, 41% of the members of the top fractiles in Israel were employed in the financial or high-tech sectors on the eve of the crisis, while the corresponding figure for the bottom 99% is 9.2%. The crisis could have affected wages in these sectors either directly, due to the losses the financial and high-tech sector encountered,[13] or indirectly, as funds for investment in the high-tech sector were lower during the crises. Finally, since the high-tech sector relies on exports, it could have been negatively affected also due to the appreciation of the Israeli Shekel.[14] As can be seen in Fig. 5, the export-to-GDP ratio fell sharply during both crises. Moreover, the export of services, which includes the high-tech sector, fell by 19% in 2009.[15] Indeed, Figs. 2 and 3 show that the average incomes of the top fractiles declined dramatically during the crisis.

4. Data

We use a panel of individuals born in Israel between 1963 and 1973. This panel is part of a larger dataset constructed by the Israel Central Bureau of Statistics that merges data of parents and their offspring. The parents were surveyed in the 1983 census, when their offspring were in their parental home, and their children were then traced in the 1995

[10] The COVID 19 crisis, on the other hand, hurt more the lower part of the income distributions, as during quarantines, the lower deciles were less able to work from home.

[11] There is a wide literature that aggregated shock generate different responses in consumption-saving decisions among rich and poor people. In fact, DSGE models move towards heterogenous agents models, where heterogeneity is materialized in income. For a review of this literature, see Kaplan and Violante (2018).

[12] the profitability of the High-tech sector decreased from 20% to 9% in the years 1999–2000 (Friedmann, 2017)

[13] The five biggest banks in Israel lost more than 80% of their profits in 2008 (Rabinovich, 2009).

[14] Israel is a small open economy, which relies on exports of final goods and services. Hence, an appreciation of the currency may affect employment seriously. Despite the Bank's intervention in the foreign exchange market, the Israeli Shekel appreciated by 17.2%.

[15] For comparison, the export of goods excluding diamonds and tourism export fell by 8.5% and 9.8%, respectively.

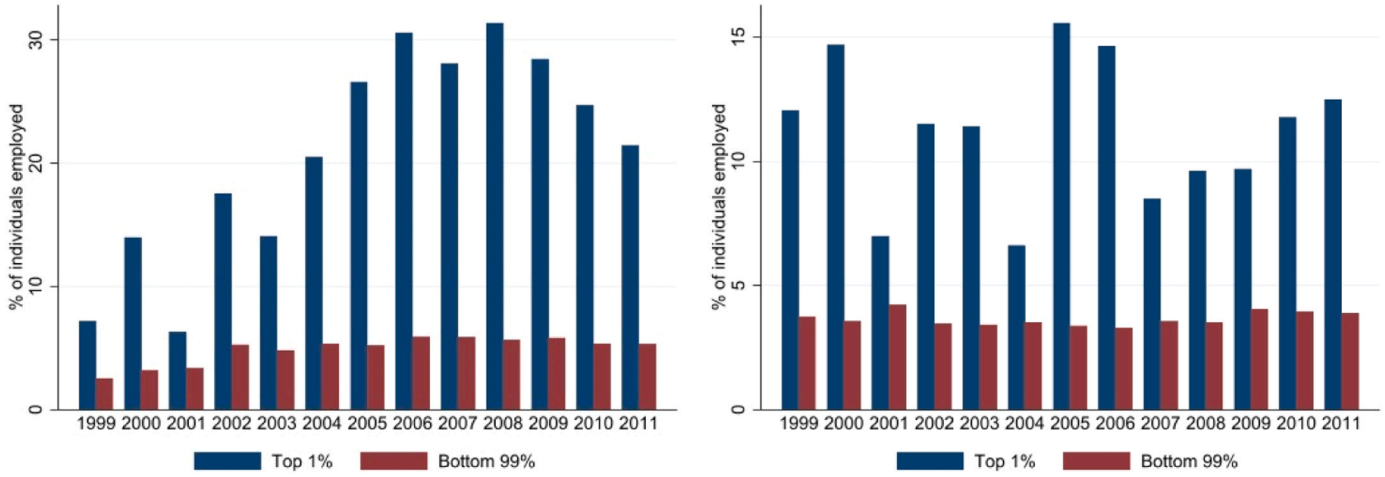

Fig. 4. a: Percentage of the top 1% and bottom 99% who were employed in the high-tech sector. b: Percentage of the top 1% and bottom 99% who were employed in the banking and insurance sector.
Source: Own computation, based on data from the household expenditure surveys conducted by Israel Central Bureau of Statistics.

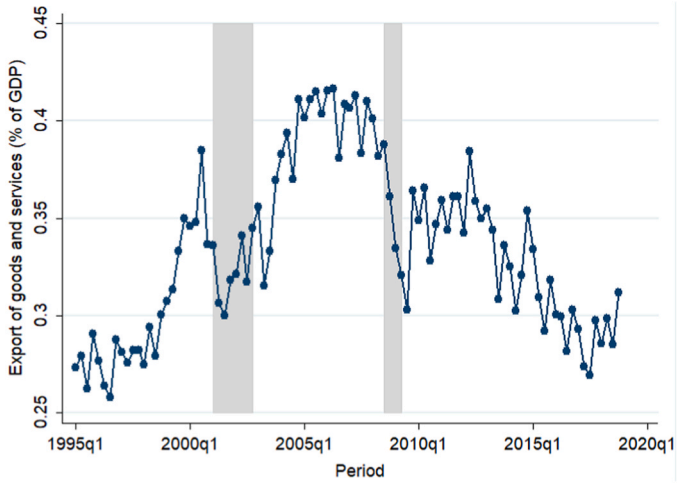

Fig. 5. Export of goods and services as percentage of GDP. *The grey highlighted sections correspond to the Dot.com crisis and the Global Financial Crisis of 2008.
Source: Own computation, based on data from the Israel Central Bureau of Statistics and the Bank of Israel.

census by their unique national ID number. Since this paper is focused on intragenerational mobility, we use a sample of the children alone, which consists of 25,085 individuals. Because each census consists of 20% of the population, the sample constitutes 4% of Israel's population in 1983.[16] This cohort of individuals is then merged with another dataset from the Israeli Tax Authority, which reports the annual gross employment incomes of each individual in the sample for the years 1995–2013, and the gross business income for the years 1999–2013. The employment incomes are based on registered annual gross earnings as reported by the employers. The business incomes are based on registered annual gross earnings that originated from self-employment. Both the employment and business earnings in the dataset are before personal income taxes and all deductions. In addition, all incomes were normalized to 2014 New Israeli Shekels (NIS) as a base year.[17] We followed a standard practice in analyzing such data and excluded individuals from the sample whose average total earnings from both business and labor was lower than NIS 1000 a year. After excluding the very low-income earners, our sample contains 22,601 individuals for whom we have income data for the entire period.

Our dataset, however, does not include information regarding wealth or capital incomes. While wealth and capital incomes may play a significant role when discussing mobility, especially of top fractiles, they should not affect the results of this paper. Note that our sample consists of individuals between the ages of 22–32 at the beginning of the analyzed period. This means that they did not spend enough time in the labor force to gain meaningful wealth or capital.[18] Second, this paper is focused on intragenerational mobility. Then, if some individuals have wealth or capital from inheritance, it is an intergenerational mobility issue, and thus beyond the scope of this paper.

We focus our analysis on employment income since the data on this income covers a longer period: from 1995 to 2013. Business income, on the other hand, only covers the years 1999–2013. The longer period allows us to better understand the relationship between mobility and financial crises, as it also covers the years preceding the Dot.com crisis. Note that the analyzed period ends well before any other macroeconomic shock that directly impacted lower income fractiles, such as the COVID-19 crisis, thus ensuring that our results are not biased due to these shocks. We also analyze total income (defined as the sum of employment and business income) as a robustness check. To assure that the existence of individuals with zero incomes does not bias our results, we also use as a robustness check a sub-sample of individuals who reported positive incomes in the entire analyzed period. This sub-sample contains 10,533 individuals. The summary statistics of the different income concepts in the different samples are presented in Appendix Table A.1.

For each of these types of income, we calculate the permanent income, which is defined as the arithmetic mean of annual incomes over a specific time period. We calculate the permanent income for periods of three, five, and fifteen years. Finally, for each individual, we assign the fractile to which he/she belongs, based on his/her position relative to all other individuals in the sample. This is done both for annual and

[16] Although Israel is a deeply divided society (Yaish, 2004), in the top fractiles, there is very little variation in the demographic characteristics, and therefore the analysis based on these characteristics is omitted.

[17] 1 US Dollars= 3.5 NIS in 2014

[18] Previous studies show that the age-wage curve is increasing in age, and peaks at retirement age. For example, see Land and Russell (1996), Saez and Zucman (2016) and Martinez (2020).

permanent income. The permanent income for the entire sample and the top fractiles is presented in Table 1. Surprisingly, the permanent incomes over 3, 5, and 15 years are almost identical, suggesting that even a 3-year period is long enough to be considered as permanent income. These results corroborate a common practice to proxy permanent income by averaging out three annual incomes (Solon, 1992; Lee and Solon, 2009).

In most previous studies, scholars have used cross-sectional data, including individuals in different stages of the life cycle in the analysis. In this study, we are following a cohort over time. One way to show the differences between our method and the conventional method of examining trends for the whole population is by using the logic of the age-period-cohort (APC) model (even though we do not apply one here). The main idea of an APC model is that any outcome can be attributed to three types of effects: age effect, the changes due to events over the life course (for example the education period or the family building period); period effects, changes due to events of a specific year (such as macro-economic recessions); and cohort effects, caused by the replacement of an older cohort by a younger one (Glenn, 2005; Fosse and Winship, 2019).

When one examines the mobility of the top income earners for the whole population over time, changes could be due to any of these three effects: cohort effects; age effects, and period effects. Although our focus on one relatively narrow cohort cannot eliminate age and period effects, it overcomes the cohort effects that steam from cohort replacement processes. For example, Heikkuri and Schief (2022) find that the replacement of older cohorts by young cohorts plays a major role in the evolution of aggregate inequality in the United States. By focusing on a specific cohort, we can eliminate the cohort effects.

In addition, the age effect might be strong: individuals may experience different economic conditions at fixed ages (Ben-Porath, 1967; Solon, 1992). Young individuals tend to experience an upward trend in their income as they accumulate human capital, whereas older individuals may experience different trends. Indeed, empirical studies that followed life-cycle earnings found supporting evidence for these different trends (Heckman et al., 2003; Lagakos et al., 2018). This effect can be observed in the Israeli data as well. Fig. 6 presents the mean and standard deviation of employment income by age in Israel in 2005 (the middle of our analyzed period). It can be seen that the mean employment income increases with age for ages 25–35 and decreases for ages 60–65. Older ages are also characterized by larger standard deviations, meaning that their incomes are more dispersed.

Thus, by focusing on a cohort, we are studying a population that experiences the same life course events at the same time. That is, we can ask and test whether mobility increases or decreases with age (at a fixed period of time) and how rates of getting in or out of the top one percent change over the life course. Such questions cannot be answered with the "conventional" method of examining trends of mobility for the entire population. What is more, by following up a cohort we can relate changes in mobility to recessions or any other changes in the structure of the economy or labor market throughout the period covered by the data. There is, however, a tradeoff in focusing on a cohort rather than a population. While we reduce the effect of cohort replacement, we compromise representativeness, because we cannot be sure that other cohorts behave the same way.

Table 1
Permanent total incomes.

	3 years	5 years	15 years	Observations
Entire sample	110,639	110,470	110,140	22,601
Top 10%	365,340	367,686	360,695	2260
Top 5%	459,347	462,789	452,630	1130
Top 1%	720,046	726,116	710,262	226

Note: Total income is defined as the sum of employment and business incomes. all incomes were normalized to 2014 New Israeli Shekels (NIS) as a base year. The permanent income over x years is calculated as the average of all x years permanent incomes.

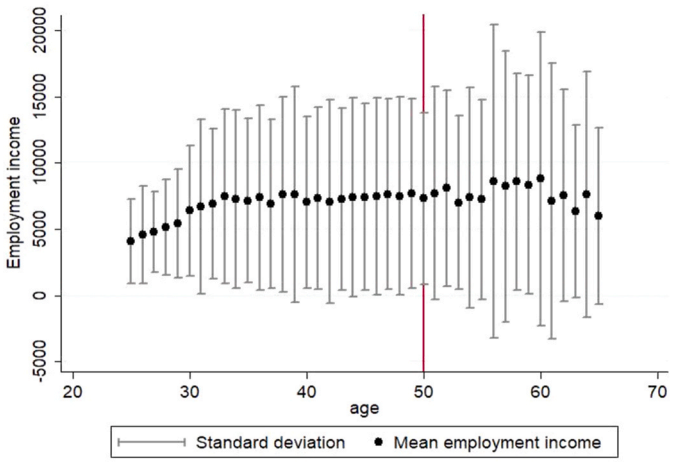

Fig. 6. Mean employment income by age, 2005.
Source: Own computation, based on data from the 2005 household expenditure survey conducted by Israel Central Bureau of Statistics.

As mentioned above, our sample comprises only individuals who were in their parental home in 1983, and thus excludes all adult immigrants of the 1990 s post-soviet immigration wave. Immigrants usually have low-income levels in the first years in their new country and relatively high mobility in the following years, as they acquire the necessary human and social capital (Cardoso, 2006). These two effects might bias mobility measures. Thus, focusing only on individuals who did not immigrate as adults helps in overcoming this potential bias.

5. Methodology

In this section we present the mobility indicators we use in the paper: The Persistence Rate and the TIM. Each measure sheds light on a different angle of mobility and overcomes hurdles from the other measure.

The persistence rate estimates the extent to which the top income earners were prone to rank changes. It offers several advantages. Firstly, it enables following the change in mobility over time, as it can be calculated for different starting points and varying periods. Second, it is very comprehensive and easy to interpret, making it a highly useful tool. Lastly, it is the most common tool used for measuring top-income mobility, allowing us to compare our results to previous studies. Note, however, that it is important to approach this comparison cautiously. Our study differs from other studies in the literature, as we focus on following a specific cohort over time rather than analyzing the entire population. Nonetheless, comparing our results to other studies can aid in understanding the patterns and magnitude of the mobility in our analyzed cohort by providing a wider context.

While the persistence rate is a very useful tool, there are inherent limitations associated with this method. Notably, since income inequality at the top is typically large (OECD, 2014; Ruiz and Woloszko, 2016), individuals at the top may experience large income changes without any rank movement. Consequently, the persistence rate, relying on rank changes, may fail to capture such income shocks. Furthermore, it might be sensitive to inequality: In cases where inequality is low, even a minor income change can result in a rank shift, whereas in high-inequality scenarios, such a change may prove insufficient to alter an individual's rank (Aaberge and Mogstad, 2013). Thus, if inequality fluctuates greatly from year to year, this sensitivity should be considered.

The most common procedure to calculate the persistence rate is, statistically descriptive. To overcome this, we use a linear probability

model, which allows us to calculate confidence intervals, and to examine whether mobility is changing over time.

The TIM curve, in contrast, estimates the extent of income variations experienced by the top income earners, and enables us to estimate this mobility, which is not visible in rank-based indicators (such as the persistence rate). In addition, this tool enables the measurement of a mobility rate which is relative to the concentration of income at the top. This allows us to compare our results to those found in other countries, with less concern regarding the sensitivity of the results to inequality (Jenderny, 2016).

Nonetheless, the TIM curve is subject to certain drawbacks. It is less widespread than the persistence rate. Additionally, unlike the persistence rate, the TIM curve does not track the trajectories of specific individuals over time. Rather, it focuses on income concentration at the top, disregarding the identity of the individuals within that group and whether they remain consistent over time.

Taking both measures, then, should provide a fuller depiction of trends in intragenerational income mobility. By analyzing the Persistence rate and the TIM curve before, during, and after the Dot.com crisis and the Global Financial Crisis of 2008, we can examine whether the intragenerational mobility of the top fractiles reacted to these financial crises. In what follows, we explain in greater detail how we calculate each measure.

5.1. The persistence rate

The persistence rate is the probability of individuals who belonged to the top fractile in a specific year to stay in the same fractile in the consecutive year(s). This measure is common in the literature (e.g., Jenderny, 2016; Jantti et al., 2010; Auten et al. (2013)). A common descriptive procedure to compute the persistence rate is to divide the number of individuals who belonged to the analyzed fractile in both t and $t+\tau$ by the number of individuals who belonged to this fractile in time t. Such a procedure might be vulnerable for statistical inference, as one cannot calculate confidence intervals. To overcome this problem, we introduce an alternative method to estimate the persistence rate, using a simple linear probability model.[19]

Consider the following model:

$$Per_i^{t+\tau} = \alpha + \beta \bullet Per_i^t + \epsilon_i, \tag{1}$$

where Per_i^t is a dummy variable that equals 1 if individual i belonged to fractile ϕ at time t and zero otherwise, and ϵ_i is a random noise. Note that such a model is based on two dummies, and as such its coefficients have an economic significance, which enables us to calculate the persistence rate.[20] [21].

Our population has two groups. The first one consists of all individuals who did not belong to fractile ϕ at year t. For this group $Per_i^t = 0$. The other group, whose individuals were in fractile ϕ at year t, is the one for which $Per_i^t = 1$. The intercept, α, equals the mean of $Per_i^{t+\tau}$ among those who were not in fractile ϕ in time t. Hence, the intercept provides us the upward mobility to fractile ϕ between years t and $t+\tau$.

Next, note that the persistence rate is the probability that an individual who belonged to fractile ϕ in year t, also belonged to the same fractile in year $t+\tau$. This is the mean of the second group (i.e., those whose $Per_i^t = 1$), which equals $\alpha + \beta$. Hence, our linear probability model provides a useful tool to measure both the upward mobility into the top fractiles and the persistence rate, as well as to test whether it is changing over time. This allows us to test if both α and β are statistically different from zero. Furthermore, we wish to show that $\alpha + \beta \neq 1$, which implies no intragenerational mobility. To do so, we use the statistical rule that: $\mathrm{var}(\alpha+\beta) = \mathrm{var}(\alpha) + \mathrm{var}(\beta) + 2\mathrm{cov}(\alpha,\beta)$. Letting $\frac{1}{n}\sum_{i=1}^{n} Per_i^t = \overline{Per^t}$, it can be shown that $\mathrm{cov}(\widehat{\alpha},\widehat{\beta}) = -\mathrm{var}(\widehat{\beta}) \bullet \overline{Per^t}$ and thus $\mathrm{var}(\widehat{\alpha}+\widehat{\beta})$ can be computed as:

$$\mathrm{var}(\widehat{\alpha}+\widehat{\beta}) = \frac{\mathrm{var}(\widehat{\varepsilon_i})}{n} + \left(\overline{Per^t}^2 - 2\overline{Per^t} + 1\right)\mathrm{var}(\widehat{\beta})$$

Where $\mathrm{var}(\widehat{\varepsilon_i})$ and $\mathrm{var}(\widehat{\beta})$ are estimated from the regressions.

Following Jenderny (2016), Jantti et al. (2010) and Auten et al. (2013), we set τ to 1, 3 and 5 years.

The persistence rate discussed above is unconditional of survival in the years between t and $t+\tau$. We also derive the conditional persistence rate: the probability of an individual who belonged to the top fractile in year t to stay in the same fractile in all of the years between $t+1$ and $t+\tau$. We do so by estimating the same linear probability model described in Eq. (1), where $Per_i^{t+\tau}$ equals one if the individual belonged to fractile ϕ in all years between $t+1$ and $t+\tau$, and 0 otherwise. As explained above, $\widehat{\alpha}+\widehat{\beta}$ equals the mean value in $Per_i^{t+\tau}$, of the individuals who belonged to fractile ϕ in t, which in this case equals the conditional persistence rate.

5.2. Top income mobility measure

This mobility measure is based on Shorrocks (1978a), who showed that in a more mobile economy, the concentration of top income earners tends to decline as the analyzed period increases. Intuitively, since in a mobile society individuals experience income changes throughout the years, the permanent income distribution is less concentrated than the annual income distribution. Thus, the higher the mobility, the higher the difference between these two distributions.

Following Aaberge and Mogstad (2013), we measure the mobility of the top 1, 5, and 10 fractiles of income earners by comparing the annual income shares of those fractiles to their permanent income shares. In particular, for each sub-period of three and five years between the years 1995 and 2013, we calculate the permanent income of each individual. Based on the permanent incomes, we calculate the permanent income share of the top 1%, 5%, and 10%. Then we calculate the annual income share of those fractiles. Finally, we calculate the Top Income Mobility (TIM) curve, defined as the difference between the two income shares. Let Z_t denote the annual income share of the fractile at stake at year t and let $Z_{\tau,T}$ denote the permanent income share between the years τ and T of the same fractile. Then, the TIM is given by:[22].

$$TIM = \frac{1}{T}\sum_{t=\tau}^{T} Z_t - Z_{\tau,T} \tag{2}$$

A higher TIM implies more mobility, because if individuals move between income groups, average annual top income concentration ($\frac{1}{T}\sum_{t=\tau}^{T} Z_t$) is higher than the concentration of the average income ($Z_{\tau,T}$). Note that the TIM curve does not enable us to compare groups of different sizes, because it is an absolute measure. In order to compare our results to those found in other studies, we follow Jenderny (2016) and compute the relative TIM:

[19] As will be explained below, our variables are binary, and hence our linear probability model is identical to ANOVA.

[20] See appendix B.

[21] We calculate the persistence rate using the common descriptive procedure and reach the same results.

[22] The permanent income is calculated as the average income for both three and five years. Thus, for each year we calculate total permanent income as the sum of the permanent income of all individuals, and the total income of the top fractile as the sum of permanent income of all the individuals who belong to this fractile, based on their permanent income. Z ;T is defined as the fraction between the two.

$$TIM_t^{rel} = \frac{\frac{1}{T}\sum_{t=\tau}^{T} Z_t - Z_{\tau,T}}{\frac{1}{T}\sum_{t=\tau}^{T} Z_t} \quad (3)$$

6. Results

6.1. Persistence Rate

6.1.1. Overall trend

Figs. 7, 8 and 9 present the one-year, three-years and five-years persistence rate for the top 1%, 5% and 10% of employment income earners, respectively. As explained in Section 5.1, the persistence rate is derived by the linear probability model described in Eq. (1) and calculated as $\widehat{\alpha} + \widehat{\beta}$. The lower and upper bounds in these figures correspond to the 95% confidence interval. Each year in the horizontal axis represents the first year of the analyzed sub-period. As can be seen in the figures, $\widehat{\alpha} + \widehat{\beta}$ is significantly lower than 1 (that is, no mobility) and higher than 0 (that is, almost full mobility) for all fractiles and for one, three and five years.

As evident in Figs. 7, 8 and 9, all income groups of the cohort show an increasing trend in their one-year, three-years and five-years persistence rate. The persistence rate of the top 5% in 1995 was 65% after one year, 50% after three years and 42% after five years, and rose by the end of the period to 84%, 70% and 64%, respectively. The equivalent persistence rate of the top 10% was 69% after one year, 56% after three years and 51% after five years, and they rose by the end of the period to 86%, 76% and 69%, respectively. Note that the lower bound of the persistence rate of the top 5% and 10% in the latest two years is higher than the upper bound in the first two years, suggesting that this upward trend is statistically significant. For the top 1%, The one-year persistence rate rose from 55% to 72%, the three-years persistence rate rose from 37% to 54%, and the five-years persistence rate rose from 28% to 51%.[23]

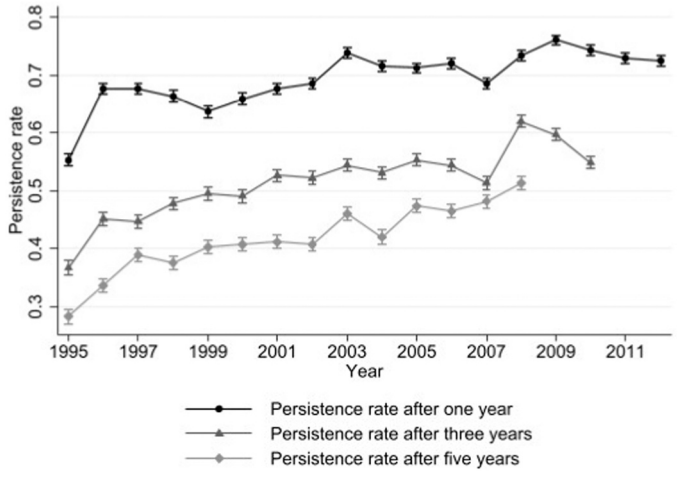

Fig. 7. Persistence rate of the top 1% employment income earners.
Source: own computation based on data from the Israel Central Bureau of Statistics and the Israeli Tax Authority. Notes: The persistence rate is derived by the linear probability model described in Eq. (1) and calculated as $\widehat{\alpha} + \widehat{\beta}$. The lower and upper bounds correspond to the 95% confidence interval. Each year in the horizontal axis represents the first year of the analyzed sub-period.

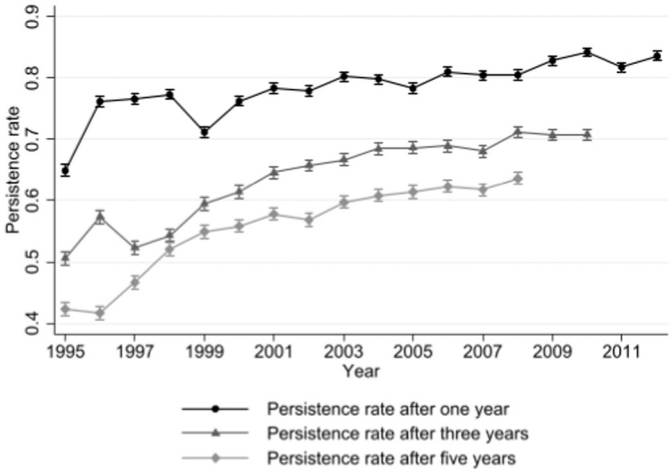

Fig. 8. Persistence rate of the top 5% employment income earners.
Source: own computation based on data from the Israel Central Bureau of Statistics and the Israeli Tax Authority. Notes: The persistence rate is derived by the linear probability model described in Eq. (1) and calculated as $\widehat{\alpha} + \widehat{\beta}$. The lower and upper bounds correspond to the 95% confidence interval. Each year in the horizontal axis represents the first year of the analyzed sub-period.

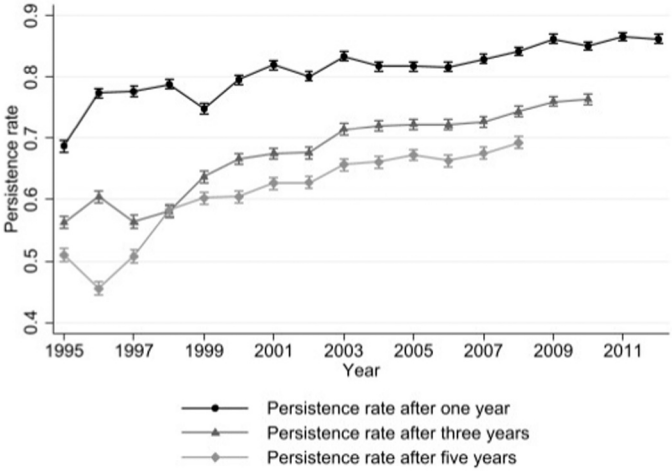

Fig. 9. Persistence rate of the top 10% employment income earners.
Source: own computation based on data from the Israel Central Bureau of Statistics and the Israeli Tax Authority. Notes: The persistence rate is derived by the linear probability model described in Eq. (1) and calculated as $\widehat{\alpha} + \widehat{\beta}$. The lower and upper bounds correspond to the 95% confidence interval. Each year in the horizontal axis represents the first year of the analyzed sub-period.

To compare the persistence rate of the top fractiles in this study to that of top fractiles in other countries, we turn to the persistence rate of total income, as other studied included more than employment income in their analysis. Note, however, that these studies used a sample consisting of the entire population and did not follow a specific cohort over time. Thus, we are comparing the mobility of the cohort studied in this paper, to those of the entire population in other countries. Our calculation for the Israeli cohort shows that in 2001–2006, the one-year

[23] To ensure that the results are not biased by choice of income concept, the persistence rate was also calculated for total income, and for samples that contains only positive incomes. The persistence rate in all income concepts follow the same trend as in Figs. 7, 8 and 9. The results can be found in the supplementary online material—now shown in online appendix C.

persistence rate of the 1% was between 64% and 69%, and the three-years persistence rate was between 47% and 48%. The corresponding figures for the top 5% were 77%– 78% and 63%– 66%. Jenderny (2016), for example, found that between the years 2001 and 2006, the one-year persistence rate of the top 1% in Germany was 75% and the three-years persistence rate was 65%, and for the top 5% it was 85% and 75%, respectively. Thus, the German persistence rate for both fractiles and time lags are higher than the persistence rate found in this paper. In Finland, on the other hand, the one-year persistence rate of the top 1% was 64.7% in the years 2001–2002 (Jantti, chap. 8 et al., 2010), similar to the persistence we find.

The persistence rate of the 1% between the years 1999–2009 in the U.S. was calculated conditionally.[24] The conditional persistence rate of the top 1% in the U.S ranged from 52% to 66% after one year, 29–43% after three years and 21–32% after five years (Auten et al., 2013). The equivalent figures for the top 1% of our sample are: 63–70%, 33–40%, and 21–25% (see supplementary online material—now shown in appendix C). Thus, for the top 1% of the Israeli cohort, we find a higher one-year persistence rate than in the US, but lower three-years and five-years persistence rate.

6.1.2. Financial crises and the persistence rate

We now turn to examine the persistence rate during the Dot.com crisis and the Global Financial Crisis. As evident from Figs. 7, 8 and 9, the three income groups of the cohort experienced a large increase in the one-year persistence rate in the years 1995–1997, following by a decrease in 1999.[25] One possible explanation is the booming high-tech industry that demonstrated high growth from 1995, which eventually resulted in the Dot.com bubble that preceded the Dot.com crisis (Cohen and Shiller, 2011). More importantly, the persistence rate continued to follow its upwards trend even during the crisis, suggesting that the persistence rate of the top fractiles of our cohort was unaffected by the Dot.com crisis. The only exception is a decline in the one-year persistence rate of the top 10% in 2002. However, this decline is only marginally significant. This suggests that the intragenerational mobility of the top fractiles showed incredible resilience to the Dot.com crisis, even though the crisis had a substantial impact on the Israeli economy.

As for the Global Financial crisis of 2008, Figs. 8 and 9 show stability of the top 5% and 10% of the analyzed cohort during the crisis. They continued their upward trend in persistence rate during and after the crisis. This result is valid for any period we analyze: one, three, or five years. The only exception is a moderate decline in the one-year persistence rate of the top 10% in the year 2010. However, this decline is not statistically significant. For the top 1%: Fig. 7 shows that at the peak of the crisis, the top 1% experienced a sharp increase in its one-year and three-years persistence rate. While this increase is statistically significant, the persistence rate returned to its pre-crisis level during the following years.

Another indication for the temporary nature of the persistence rate's response to the crisis can be seen when analyzing it for a longer period. Unlike the one-year or three-years persistence rate, the five-years persistence rate does not display even a temporary decline during the crisis. This suggests that if the Global Financial crisis had any effect on the intragenerational mobility of the top earners of the Israeli cohort, it has transitory and small.

6.2. Top Income Mobility

6.2.1. Overall trend

Figs. 10–12 presents the TIM curve of the top 1%, 5% and 10% of the analyzed cohort, calculated for sub-periods of 3 and 5 years. Each year in the horizontal axis represents the median year of the analyzed sub-period. It is evident from Fig. 12 that the TIM curve of the top 10% was decreasing during the period, when calculated for sub-periods of 3 and 5 years: from 1.8 and 2.2 in 1997, to 0.9 and 1.4 in 2011, respectively. Hence, for both sub-periods, the top 10% of the cohort is experiencing a downward trend in mobility.

The TIM curve if the top 5%, presented in Fig. 11, fluctuated around 0.7 when calculated for a sub-period of 3 years, but decreased when taking a longer sub-period of 5 years: from 1.4 in 1997–1 in 2011. This indicates that the mobility of the top 5% is declining in the long run.

While the TIM of the top 5% and 10% show a downward trend, the mobility of the top 1%, as evident from Fig. 10, was relatively stable: between the years 1997 and 2011, the TIM curve of the 1% fluctuated around 0.3 when calculated for a sub-period of 3 years, and around 0.5 for a sub-period of 5 years.[26]

Comparing our results to those from studies conducted in other countries, we turn to the TIM calculated for total incomes, as those studies included business income in their analysis. Note that the population used in this paper is different than that used in other studies: we study a cohort over time, while other use cross-sectional data. The TIM for total income in Israel, Norway and Germany are presented in Table 2. We find that for both the absolute and relative TIM, the mobility of the top 1%, 5% and 10% in the Israeli cohort was higher than the mobility of the corresponding fractiles in Germany (Jenderny, 2016). In addition, while the top 10% in our sample is more mobile than its Norwegian counterpart throughout the period, the mobility of the top 1% and 5% in our sample is lower by the end of the period (Aaberge et al., 2013).

6.2.2. Macroeconomic shocks and the TIM

When analyzing the TIM curve around the Dot.com crisis and the Global Financial Crisis of 2008, we reach similar conclusions as in Section 6.1.1: if the two crises had any effect on the TIM curve, it was minor and transitory.

Analyzing the Dot.com crisis in Figs. 10–12, we see an increase in the TIM of the top 10% when calculated for 3 years, however, this increase is only temporary as the TIM continues its trend in the following year. Another evidence for the transitory nature of this shock is the fact that this increase disappears when calculating the TIM for a longer period of 5 years, indicating it did not affect the mobility of the top 10% in the longer run. In addition, there is a minor increase in the TIM curve of the top 1%, for both sub-periods. However, this is followed by a decline in the following year, as the TIM curve of the top 1% returns to its initial value. Nonetheless, the top 5% continued its downward trend during the crisis, suggesting it was not affected by the crisis.

When analyzing the Global Financial Crisis of 2008, we see a very similar picture: taking the TIM calculated for a sub-period of three years, there is a moderate increase of the TIM curve of the top 5% in 2008 and a decrease in the curve of the top 10% in 2010. Both trends are not visible in the following year, and not visible when taking a longer period of 5 years. This indicates that if the crisis effected mobility, this effect was only temporary. The top 1% show no special response to the crisis.

As explained is Section 5, the persistence rate measures mobility in

[24] For a detailed explanation, see Section 5.1.

[25] As members of the top 1% are also a part of the top 5% and 10%, it is possible that this decrease in persistence is driven by the 1% alone. To examine that, we calculate the upwards mobility for each percentile and for each group of 5 percentiles. Upwards mobility is defined as the proportion of group members who either maintained their position or progressed to a higher percentile. The findings are presented in appendix table C.1, revealing that the top 1% exhibits lower mobility compared to the lower percentiles within the top 5% and 10%. Thus, the observed trend in mobility among the top 5% and 10% cannot be attributed solely to the mobility of the top 1%.

[26] The TIM curve is also calculated for total income, and for a sample that contains only positive incomes. The results can be found in the supplementary online material—now shown in Appendix D. For all income concepts the TIM curve shows a downward trend, indicating our results were not biased by choice of income concept.

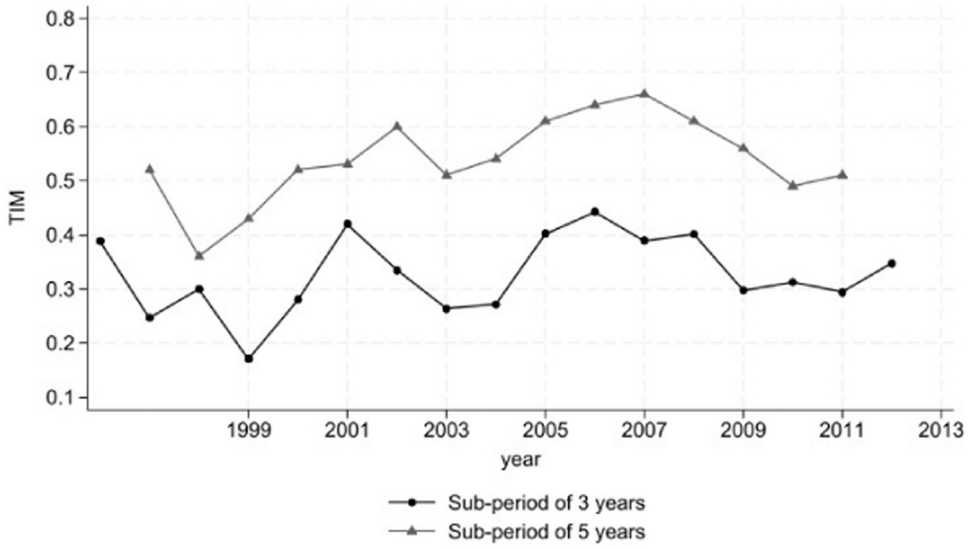

Fig. 10. TIM of the top 1% employment income earners.
Source: own computation based on data from the Israel Central Bureau of Statistics and the Israeli Tax Authority. Notes: The TIM curve is derived as described in Eq. (2). Each year in the horizontal axis represents the median year of the analyzed sub-period.

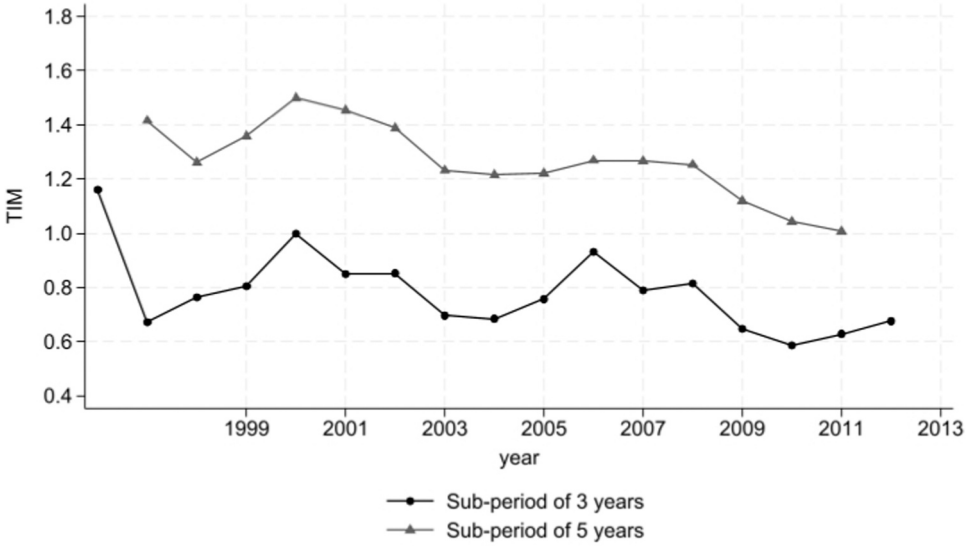

Fig. 11. TIM of the top 5% employment income earners.
Source: own computation based on data from the Israel Central Bureau of Statistics and the Israeli Tax Authority. Notes: The TIM curve is derived as described in Eq. (2). Each year in the horizontal axis represents the median year of the analyzed sub-period.

terms of movements between fractiles, while the TIM measures mobility in terms of income variation. The TIM curve indicates that the intra-generational mobility of the top income earners of the cohort was resilient to the Global Financial Crisis of 2008 and the Dot.com crisis, responding to the crises only temporarily. This is surprising since it implies that the sharp decline in incomes the top fractiles experienced during both crises[27] did not translate to a change in mobility and had no impact on their long run trend.

7. Conclusions

The Global Financial Crisis and the rising income inequality have shifted the attention to intragenerational mobility of the top fractiles. We contribute to this strand of the literature in several ways: First, by focusing on a specific cohort whose members are all in the same stage in the life cycle, we estimate only the part of the mobility which is the result of market forces, rather than other distortions caused by the replacement of an older cohort by a younger cohort. Second, we use the TIM curve, which was never used before to measure mobility in Israel. Finally, we exploit the Dot.com crisis and the Global Financial Crisis to analyze the dynamics of intragenerational mobility among top income earners during major financial crises.

Examining a panel of incomes of 22,601 individuals for the period between 1995 and 2013, we present several results: First, using different measures of mobility, we show that the mobility of the top income earners of the analyzed cohort has declined in the period analyzed. This result is robust to different income concepts and different sub-periods that we analyze. The declining intragenerational mobility contrasts with the high intergenerational mobility found in Israel, suggesting that

[27] See Section 3.

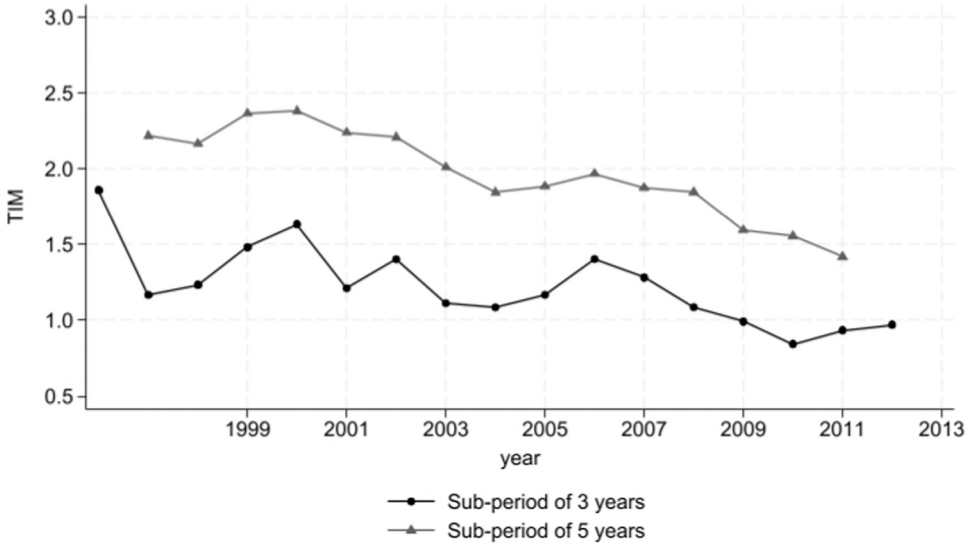

Fig. 12. TIM of the top 10% employment income earners.
Source: own computation based on data from the Israel Central Bureau of Statistics and the Israeli Tax Authority. Notes: The TIM curve is derived as described in Eq. (2). Each year in the horizontal axis represents the median year of the analyzed sub-period.

Table 2
Comparison of top income earners' mobility in Israel, Norway and Germany.

		Absolute TIM			Relative TIM (%)			
		Israel						
Year	2001	2002	2003	2004	2001	2002	2003	2004
Top 10%	1.19	1.36	1.15	1.01	3.33	3.9	3.28	2.79
Top 5%	0.87	0.87	0.76	0.68	3.7	4.00	3.47	2.9
Top 1%	0.5	0.36	0.34	0.29	6	5.29	4.85	3.9
		Norway						
		Absolute TIM			Relative TIM (%)			
Year	2001	2002	2003	2004	2001	2002	2003	2004
Top 10%	0.81	0.8	0.81	0.9	2.5	2.37	2.27	2.54
Top 5%	0.73	0.71	0.78	0.91	3.25	2.97	2.96	3.53
Top 1%	0.63	0.62	0.78	0.96	6.04	5.23	5.57	7.37
		Germany						
		Absolute TIM			Relative TIM (%)			
Year	2001	2002	2003	2004	2001	2002	2003	2004
Top 10%	0.43	0.4	0.41	0.4	1.55	1.46	1.45	1.41
Top 5%	0.37	0.35	0.34	0.34	1.99	1.88	1.8	1.76
Top 1%	0.25	0.23	0.22	0.23	3.18	2.95	2.73	2.66

Source: Germany: Jenderny (2016), Norway: Aaberge et al. (2013)
Notes: The TIM is calculated for a sub-period of 3 years. The years in the table indicate the first year of the sub period.

the mobility observed between different cohorts is likely driven by other factors, such as immigration, rather than within-cohort factors. Second, by analyzing the persistence rate and the TIM of the cohort we show that despite transitory changes in income levels, the relative position of the upper fractiles persisted in being higher and increasing over time, even during the Dot.com crisis and the Global Financial Crisis of 2008. This suggests that the top fractiles were very resilient to the crises in terms of intragenerational mobility, even though a large portion of the top fractiles was employed in the financial and high-tech sectors.

Financial crises are known to have a long-lasting effect on income distribution. Past studies have shown that such shocks may be an opportunity for reshuffling income groups and reducing inequality in the years following the shocks (see Atkinson and Morelli, 2011). Our results show that even though the two crises discussed in this paper impacted severely the incomes of the top fractiles, this impact was temporary and did not change the overall trend of declining mobility within this cohort. Our results seem consistent with Morelli (2018), who found that banking crises had a temporary effect on the income concentration of the top fractiles in the US. If the downwards trend in mobility found in this paper is evident in additional cohorts, and is accompanied by an increase in inequality, this might imply that the social polarization of the Israeli society is deepening. This suggests that the adverse effects of income concentration, such as the fact that growth may not reach the majority of the population and that those with economic power might accumulate political power, are more severe.

Today, the world is likely to face a severe crisis caused by the Coronavirus pandemic. Unlike the Dot.com and the Global Financial Crisis of 2008, the current pandemic has affected disproportionally the lower income fractiles (Kristal and Yaish, 2020; Yaish et al., 2021, and many more): the social distancing that is used to reduce the Coronavirus transmission requires adjusting to on-line working, the top fractiles are employed in job and sectors that are more easily adjusted to such work, compared to lower-income fractiles. Hence, there are reasons to believe that the current crisis will have little, if any, impact on the mobility of the top income fractiles.

Our results suggest that even if the crisis caused by the Coronavirus will be followed by a financial crisis, this financial crisis might not offset the adverse effect of the Coronavirus on inequality. As the crises analyzed in this paper had only a transitory impact on the mobility of the top fractiles, policy makers will have to intervene to make this impact long-lasting, and to exploit this shock to reshuffle those at the top.

Competing interests

none.

Code availability

Not applicable for this research.

Funding

The study was supported by the Israel Science Foundation, grant number 575/14.

Data Availability

This study was performed in the Israel Central Bureau of Statistics (ICBS) research room using de-identified Microdata (direct identifiers removed from data) in files prepared specifically for this project. Confidential data, not available.

Appendix A

Table A1
Summary statistics.

	Observations	Mean	Standard Deviation	Minimum	Maximum
Entire sample					
Permanent total income	25,085	99,243	112,974	0	4340,400
Permanent employment income	25,085	84,119	96,920	0	3623,900
Sample excluding permanent total incomes smaller than 1000					
Permanent total income	22,601	110,140	113,871	1000	4340,400
Permanent employment income	22,601	93,183	97,947	0	3623,900
Sample containing positive incomes only					
Permanent total income	10,533	153,828	120,064	8550	1990,100
Permanent employment income	8665	142,257	104,652	7550	1245,800

Note: The permanent income corresponds to the mean income over 15 years. Incomes were normalized to 2014 New Israeli Shekels (NIS) as a base year.

Appendix B. Deriving β

Let λ denote the persistence rate and ϕ the analyzed fractile (ϕ=0.01 when analyzing the top 1%, for example). Then,

$$\widehat{\beta} = \frac{\mathrm{cov}(per_i^{t+\tau}, per_i^t)}{\mathrm{var}(per_i^t)^2} = \frac{\sum_i (per_i^{t+\tau} - \overline{per}_i^{t+\tau})(per_i^t - \overline{per}_i^t)}{\sum_i (per_i^t - \overline{per}_i^t)^2} = \frac{\lambda - \phi}{1 - \phi} \tag{5}$$

where the last equality stems from the definition of the persistence rate. Note that with no mobility (that is, a persistence rate of 1), the estimated coefficient equals 1, whereas with full mobility (that is, a persistence rate of 0), the estimated coefficient is negative. Hence, an estimated coefficient of 0 implies a high rate of mobility, in which $\lambda = \phi$. Clearly, one can derive λ from $\widehat{\beta}$ for any chosen ϕ.

Appendix C

Table C1
Upward mobility assessed on equally-sized groups, calculated for employment incomes.

% of group members who stayed at the same or higher percentile after 5 years				% of group members who stayed at the same or higher percentile after 3 years			
1999–2004				**1999–2002**			
Percentile	Upwards mobility	Percentile	Upwards mobility	Percentile	Upwards mobility	Percentile	Upwards mobility
71–75	49.2	95	34.07	71–75	42.12	95	30.97
76–80	46.02	96	33.63	76–80	37.61	96	28.76
81–85	44.16	97	38.5	81–85	38.67	97	35.84
86–90	43.1	98	38.05	86–90	41.59	98	37.61
91–95	47.96	99	38.94	91–95	48.67	99	45.13
96–100	54.96	100	40.27	96–100	59.47	100	49.56

Source: own computation based on data from the Israel Central Bureau of Statistics and the Israeli Tax Authority.

Appendix D. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.alcr.2023.100565.

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