How high can you climb? Earnings inequality and intragenerational earnings mobility in a developing country: Evidence from Thai tax returns

Athiphat Muthitacharoen [1]   Trongwut Burong [2]

This version: February 2023

Abstract

This paper investigates inequality and intragenerational economic mobility among formal workers in a developing country with large inequality. Understanding economic mobility is important because it shapes our perception of inequality. Despite its significance, evidence on intragenerational mobility, especially that based on administrative data, is relatively limited in developing countries. Using Thailand's tax return data, we study the evolution of earnings inequality, estimate medium-term earnings mobility, and examine the heterogeneity of mobility across age, gender and employment arrangement. Our analysis yields three main findings. First, annual earnings inequality rises during the 2009-2018 period. We find that the inequality is largely permanent, and its increase is primarily driven by top-earnings workers. Second, we find that medium-term mobility follows a U-shaped pattern across the earnings distribution, with extremely high persistence at the top. Our suggestive comparison indicates that Thailand's earnings mobility is among the lowest in the pool of evidence from both developed and developing countries. Third, there is a considerable heterogeneity in mobility regarding employment arrangement. Workers in less-formal jobs have much lower upward mobility than those in more-formal employment. Our findings also indicate significant heterogeneity in mobility with respect to gender and age. These findings highlight the importance of ensuring that any increase in inequality caused by the Covid-19 crisis does not become permanent, as well as improving access to opportunities for vulnerable workers.

---

[1] Faculty of Economics, Chulalongkorn University (Thailand): athiphat.m@chula.ac.th (Corresponding author)
[2] Revenue Department (Thailand)

1. Introduction

The Covid-19 crisis has brought to light several long-standing social conflicts, including wage disparities. The heightened global concern about inequality is unsurprising given that the pandemic struck at a time of high inequality in many countries. The pandemic impact is also likely to be disproportionately large on low-wage workers, particularly those in less-secure jobs. Of equal importance, however, is the issue of intragenerational earnings mobility.[3] Having a sense of mobility is important because it influences how we perceive inequality. Increased intragenerational mobility may help alleviate concerns about high inequality, whereas decreased mobility may exacerbate them.

Despite its significance, evidence on intragenerational income/earnings mobility is relatively limited in developing countries. The majority of research (e.g. Kopzcuk et al., 2010; Jansson, 2021; Carr and Wiemers, 2022) focuses on advanced economies, possibly due to the availability of administrative and register data. Research on intragenerational income mobility in developing countries tend to rely on household survey data which provide good coverage of low- and middle-income groups but may be subject to underrepresentation at the top of the distribution as well as underreporting of income (Yang et al., 2020).

Using a panel of de-identified tax returns from Thailand during 2019-2018, this paper provides a highly granular picture of earnings inequality and intragenerational earnings mobility among formal workers in the developing-country context. We examine the evolution of earnings inequality, estimate medium-term earnings mobility, and examine its heterogeneity across gender, age and employment arrangement.

---

[3] Jantti and Jenkins (2015) distinguishes 4 concepts of intergenerational income mobility: positional change, individual income growth, reduction of long-term inequality and income risk. This study focuses on the first concept; that is, the positional movements along the income/earnings distribution.

There are at least two factors that make Thailand and its tax returns data an appropriate choice for the study of inequality and intragenerational mobility in developing countries. First, Thailand has been known for having one of the greatest unequal income distribution in the world. Its income inequality is largest among Southeast Asian countries and ranks in the third quartile globally (Yang et al., 2020). Second, Thai employers are generally required to withhold income tax from employee wages as well as freelancer compensation. This allows us to obtain a comprehensive picture of earnings inequality and mobility for formal workers. Tax returns data is also typically more reliable than survey data, which may experience self-reporting issues and is likely to miss individuals with high income (Ravallion, 2022).

Our findings indicate the rising annual inequality over the 2009-2018 period. The inequality is mostly due to the multi-year component, and its increase is largely driven by the highest-earnings groups. As in most other countries, Thailand's medium-term mobility follows a U-shaped pattern along the earnings distribution. Persistence, however, is especially high for those in the top decile. Although evidence from different countries is not completely comparable, we try to improve comparability by reproducing our mobility results using comparable measurement. While only indicative, we find that Thailand has one of the lowest levels of earnings mobility in the pool of evidence from both developed and developing countries. This is true for overall persistence, upward mobility and top 1% persistence.

We also document a significant heterogeneity in earnings mobility. Despite having higher overall mobility, women have lower upward mobility than men. Young workers have relatively high mobility, which declines sharply with age. Finally, there is a clear pattern of worker division based on job formality. Workers with more-formal jobs have significantly larger upward mobility than those with less-formal jobs.

Our findings complement the literature on intragenerational income/earnings mobility in the following ways. First, we use the population of tax return data to investigate the positional movement of earnings in a developing-country context. This enables us to examine movement in a wide range of granularities, including those at the very top of the distribution.

Second, our comparison provides policymakers with a basic understanding of where international evidence on economic mobility stands relative to that of a developing country with large and persistent inequality.

Third, our heterogeneity analysis adds to the body of research on trends in occupational mobility (e.g. Jarvis and Song, 2017; Kye et al., 2022). Our findings stress the importance of not treating all formal workers uniformly. We show that, in the developing-countries context, economic mobility can vary significantly between workers with different levels of job formality. Upward mobility is especially lower for workers who are in less-formal jobs, i.e., those with fewer benefits and likely less job security.

The remainder of this paper is organized as follows. The following section discusses related studies. Section 3 describes data and methodology. Section 4 discusses empirical findings. Section 5 concludes the study.

2. Related studies

Our paper speaks to two strands of the exiting literature. The first strand is the literature on intragenerational earnings/income mobility, which has largely concentrated on advanced economies. Kopczuk et al. (2010) makes a seminal contribution by using Social security administrative data to show that long-term earnings mobility increased alongside annual inequality in the US between 1950 and 1980. Carr and Wiemers (2022) demonstrate that long-term earnings mobility in the United States has decreased from 1980 to 2011, reversing an earlier trend. Acs and Zimmerman (2008), Auten and Gee

(2009), Auten et al. (2013) and Splinter (2021) investigate income mobility for the US as well. Examples of other studies for developed countries include Saez and Veall (2005) for Canada, Jenderny (2016) for Germany, Oh and Choi (2018) for South Korea, Aghion et al. (2019) for France, Burdin (2020) for Uruguay, and Jansson (2021) for Sweden.

The empirical evidence on earnings mobility in the developing-country context is much more limited. For example, Zeng and Zhu (2022) uses the China Household Finance Survey to focus on top earnings. It finds that earnings mobility above the 90th percentile exhibits the inverted U-shape over 2011-2017. Other examples include Khor and Pencavel (2006) for China, Martinez et al. (2014) for the Philippines, and Nguyen and Nguyen (2020) for Vietnam.

The second strand is the literature on inequality in Thailand. Studies based on household surveys have illustrated a decline in Thailand's income inequality over the past decades (see, for example, Kilenthong, 2016; Poggi et al., 2016; Wasi et al., 2019; Lekfuangfu et al., 2020). Other examples of studies on Thailand's income distribution include Jenmana (2018), Vanitcharearnthum (2019) and Muthitacharoen and Phongpaichit (2020). While studies in this literature typically rely on surveys or tax tabulations, we complement them by using a panel of tax return data to demonstrate rising earnings inequality among formal workers and identify the extent to which it is permanent.

3. Data and methodology

This section describes our dataset construction and methods for measuring inequality and mobility. We use a panel of de-identified tax return data for the population of Thai individual income tax filers from 2009-2018. Tax return data includes taxable income, tax deductions, and basic demographic information such as age and household size. In

Thailand, filing a tax return is generally mandatory for everyone who earns above the minimum threshold.[4]

Our focus is on inequality and mobility of earnings, which is defined as the sum of all wages and labor compensation. Following Kopczuk et al. (2010) and Carr and Wiemers (2022), we reduce the impact of workers with low labor-force participation by focusing on those with annual earnings at least one-fourth of the full-year minimum wage in 2018 (indexed to inflation). To concentrate on those whose primary source of income is earnings, we include only workers with earnings at least 50% of their gross income in each year.[5] We concentrate on pre-tax earnings which is the standard focus of inequality and mobility studies. To take into account inflation, we adjust earnings to the 2018 level.

Workers have the option of filing their tax returns individually or jointly with their spouse. During our study period, approximately 80% of tax filers chose to file their returns individually. Furthermore, only 5% of those who filed joint tax returns reported earnings from their spouses. This suggests that the earnings reported on tax returns are primarily those of individuals. Consequently, we use the terms worker and tax filer interchangeably to refer to a tax-filing unit in this study. In our baseline analysis, we do not adjust for differences in family size because it is more transparent. However, we provide robustness tests where earnings are adjusted for family size by dividing it with the square root of the reported number of family members. This follows the practice used in previous studies that typically based are on US tax returns such as Auten and Gee (2009) and Congressional Budget Office (2021).

---

[4] The minimum tax-filing threshold during the period of study is 60,000 baht per year or 120,000 baht per year if having only wage income. These are about USD 1,700 and 3,400, respectively (based on the exchange rate in October 2022). In 2018, these are roughly 25% and 50% of GDP per capita, respectively. It should be noted that even if one's earnings is below the filing threshold, filing a tax return may be advantageous because it allows one to recover withheld taxes.

[5] Gross income can be divided into three main types: earnings, capital income and business income.

For our inequality analysis, we restrict our data to individuals aged 25-60 in order to focus on the working-age population. The sample for the annual inequality analysis consists of 45.2 million observations (Table 1). The average real earnings is 473,037 baht.

Table 1: Data description

Panel A: Summary statistics for real earnings				
	N	**Mean**	**Median**	**SD**
Annual inequality analysis	45,254,000	473,037	330,060	625,029
Baseline med-term mobility	5,768,854	490,509	353,422	607,897

Panel B: Breakdown in the heterogeneity analysis for the medium-term mobility section					
Gender	**% in 2009**	**Job formality**	**% in 2009**	**Age**	**% in 2009**
Female	52.9%	High	38.2%	25-30	25.3%
Male	47.2%	Low	37.9%	31-35	21.8%
				36-40	19.6%
				41-45	17.3%
				46-50	16.0%

Notes: This table describes basic summary statistics of the datasets used in our analyses. Earnings are in 2018 baht.

We measure annual inequality using 3 main metrics: Gini coefficients, variance of log earnings and mean log deviation. This allows us to obtain a complete picture of inequality based on measures that place emphasis on different parts of the earnings distribution.

One may divide annual inequality into two components: multi-year inequality, which is a more lasting source of inequality, and variability, which is a more transitory source. Following Shorrocks (1978), Kopczuk et al. (2010), and Splinter (2021), we define variability as follows:

$$Variability = Inquality_{Annual} - Inquality_{Multiyear}, \qquad (1)$$

where annual inequality is the average value of the annual inequality measure over the 5-year period and multi-year inequality is the inequality measure based on the 5-year average earnings. In the decomposition analysis, we require workers to be in the sample

throughout the 5-year period to ensure consistency. That is, for a given year t, each worker has to earn at least the minimum level in all five years: t-2, t-1, t, t+1 and t+2.

Next, we consider medium-term earnings mobility. We investigate the movement across the earnings distribution from 2009 to 2018. We impose age restrictions to 25-50 in 2009 to limit the number of workers who are still in school and those who retire. We include those who filed tax returns and met our requirements in both 2009 and 2018. The attrition is low due to the use of the population of tax filers. There are around 2.8 million filers who are in the sample in both 2009 and 2018 (Table 1).

We employ three approaches: transition matrices, rank-rank regression and upward mobility. In our main analysis, we rank workers relative to the panel population (cohort). That is, the comparison is only to the other workers who are in the sample in both years of interest. This approach is similar to a cohort analysis—allowing us to isolate effects of potential changes in the age structure of the population and effects of new entrants to the labor force.

Transition matrix represents a simple way to illustrate the movement into and out of the income group. Workers are divided into 10 deciles based on their earnings in the respective year. We focus on the persistence probability, that is, the probability of being in the same earnings decile in both starting and ending years. A larger persistence probability increases lower mobility.

We adapt the rank-rank regression methodology from Chetty et al. (2014) which studies intergenerational mobility. The model can be written as

$$r_{i,t+n} = \beta_0 + \beta_1 r_{i,t} + \varepsilon_i, \qquad\qquad (2)$$

where $r_{i,t}$ denotes percentile rank of worker i in the earning distribution in year t, and ε_i denotes an error term. β_1 represents the degree of relative income mobility. It represents the association between a tax filer's positions in the income distribution in year t and $t+n$.

A steeper slope (β_1) implies less mobility. β_0 represents absolute mobility in the ranks. Its higher value indicates a greater absolute increase in ranks for those with extremely low earnings.

It should be noted that the rank-rank regression requires the assumption that the association between the beginning and ending percentiles is constant across the distribution of earnings. Figure A1 in the appendix depicts average ending rank in 2018 by starting rank in 2009 and demonstrates that the correlation is nearly linear across the entire distribution.

Our third approach considers the extent to which one can make a significant upward movement in the earnings distribution. It is important to distinguish this from broad mobility, which includes any movement regardless of direction. We compute the probability of moving up at least two deciles across the entire earnings distribution based on the starting decile. This provides a comprehensive picture of economic progress across the distribution.

4. Empirical findings

This section begins with the evolution of annual earnings inequality. We then examine how much annual inequality can be attributed to multi-year inequality. Finally, we present our findings on medium-term mobility, including how it compares internationally and its heterogeneity.

4.1 Annual earnings inequality

Figure 1 illustrates annual earnings inequality from 2009 to 2018 using 3 measures: Gini coefficients, variance of log earnings and mean log deviation. All three measures consistently indicate an increase in the earnings inequality over the period. The Gini coefficients rise from 0.43 in 2009 to 0.45 in 2018 (Panel A of Figure 1). While the Gini coefficient emphasizes the middle of the distribution, using measures that are more

sensitive to the bottom of the distribution yields consistent results. The variance of log earnings rises from 0.58 to 0.64 over the period (Panel B of Figure 1), whereas the mean log deviation rises from 0.32 to 0.36 (Panel C of Figure 1).

Figure 1: Annual earnings inequality measures, 2009-2018

A) Gini coefficients

B) Variance of log earnings

C) Mean log deviation
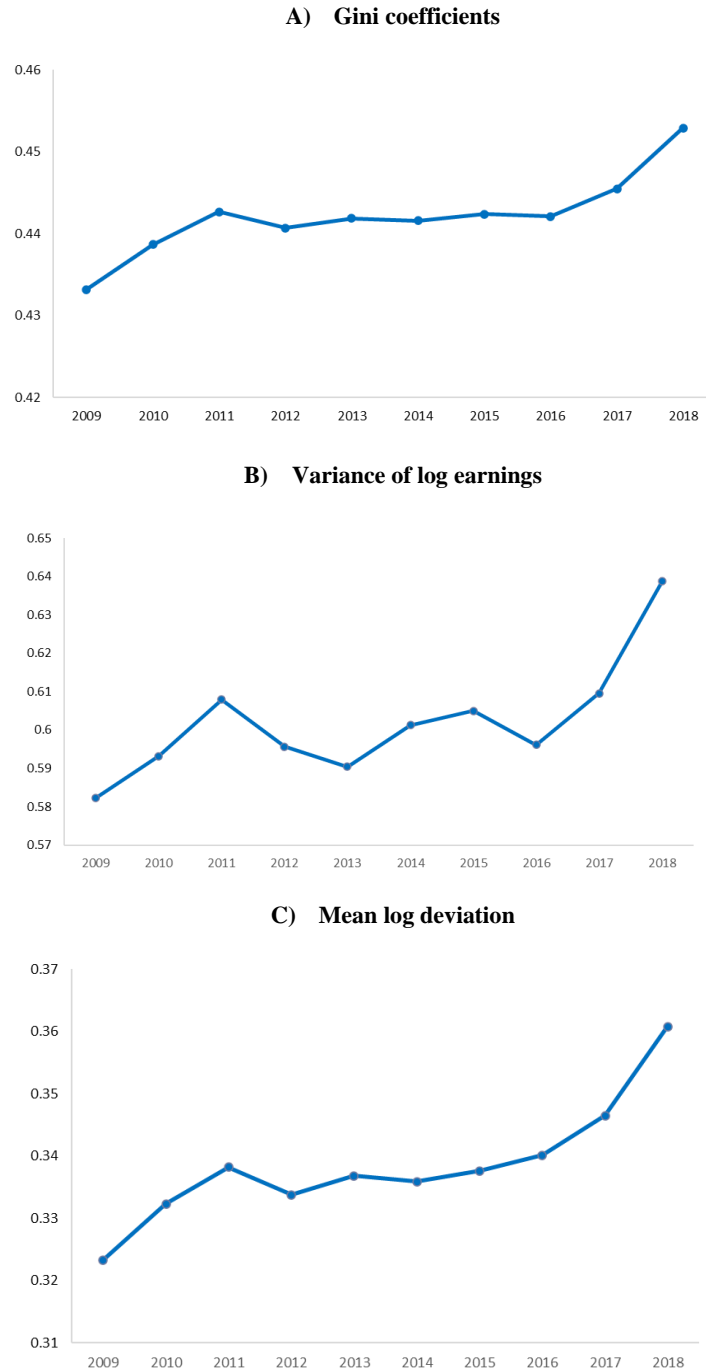
Notes: This figure shows annual earnings inequality measures (Gini coefficients, variance of log earnings and mean log deviation) over the 2009-2018 period.

An important question is where the increase in inequality is occurring in the earnings distribution. To answer that question, we construct two percentile ratios in Panel A of Figure 2. The (log) percentile annual earnings p50/p20 ratios illustrate inequality in the lower half, while the p90/p50 ratios measure inequality in the upper half.

**Figure 2: Annual percentile ratios, 2009-2018**

A) Log(p50/p20) and Log(p90/p50)   B) Log(p99/p50)
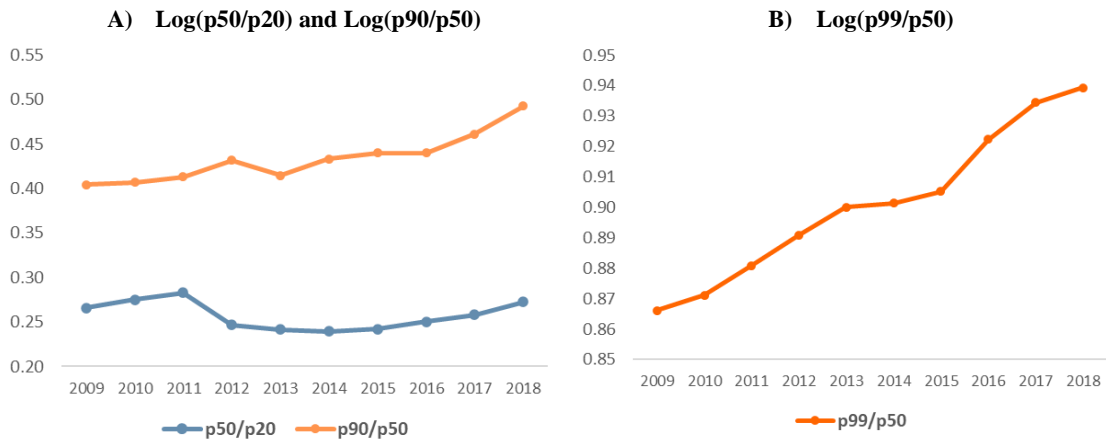
Notes: This figure shows ratios of annual percentiles over the 2009-2018 period. Panel A displays log(p50/p20) and log(p90/p50) while Panel B shows log(p99/p50).

Throughout the period, the p50/p20 series are nearly constant. This contrasts with the p90/p50 series which steadily increases. This suggests that the rise in inequality has been primarily driven by changes in the top half of the distribution. Panel B of Figure 2 plots the (log) percentile annual earnings p99/p50 to further investigate the change in inequality at the very top. Remarkably, the p99/p50 series accelerates over time. This implies that a sizable portion of the gains at the top occurred above the 90th percentile.

An examination of annual earnings shares displays a consistent picture of the inequality change during the period. Figure 3 depicts the share of total earnings allocated to various earnings groups, with a particular emphasis on the top quintile. In 2009, the bottom 50% accounted for 21.6% of total earnings, and its share has steadily declined to 21.1% in 2018. On the contrary, the top 1%'s share increases from 9.2% in 2009 to 11.1%

in 2018. This strongly suggests that the top of the distribution has been primarily responsible for the change in inequality over the period.

Figure 3: Annual earnings shares, 2009-2018
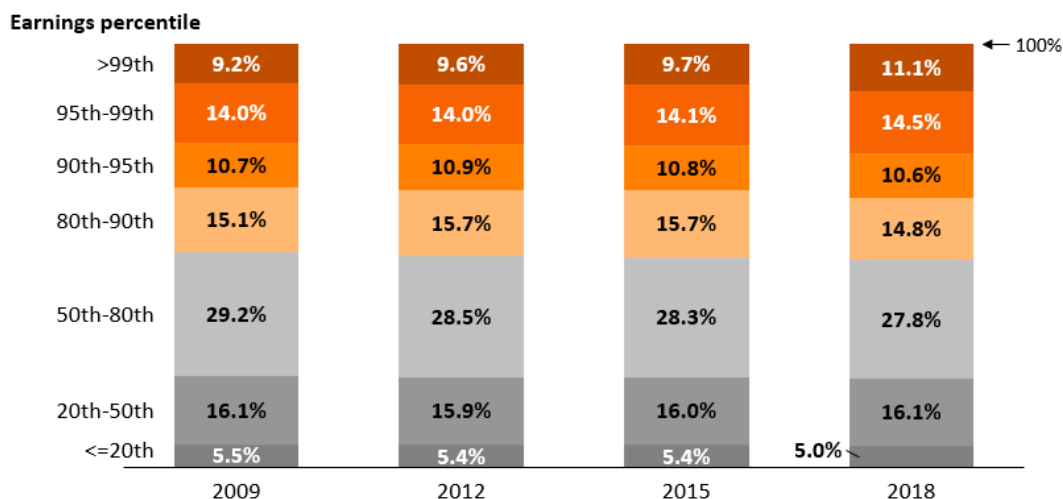
Notes: This figure shows annual earnings shares by earnings percentile groups over the 2009-2018 period.

Table 2 illustrates a sensitivity exercise where we compute annual earnings inequality using earnings with adjustment for family size. All three inequality measures exhibit an increasing trend from 2009 to 2018 and are in line with our baseline estimation.

Table 2: Annual earnings inequality based on earnings with adjustment for family size 2009-2018

|	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Gini	0.42	0.43	0.43	0.43	0.44	0.44	0.44	0.44	0.44	0.45
Variance of log earnings	0.53	0.54	0.56	0.56	0.56	0.56	0.57	0.56	0.57	0.59
Mean log deviation	0.30	0.31	0.32	0.32	0.32	0.32	0.33	0.33	0.33	0.34

Notes: This table shows a robustness test where annual inequality measures are computed using earnings with family-size adjustment.

4.2 Annual vs. 5-year inequality

To what extent is annual inequality due to multi-year inequality, which is a relatively permanent source of inequality? Furthermore, how much of the increase in

annual inequality discussed above can be attributed to multi-year inequality? To answer these questions, we compute the Gini coefficients using the average earnings over a 5-year period and compare it to the average value of the annual Gini coefficients over the same 5-year period. For each year t, we calculate the measure that is centered on that year (t-2, t-1, t, t+1 and t+2). For example, the average annual Gini in 2011 is the average value of annual Gini over 2009-2013 while the multi-year Gini in 2011 is the Gini associated with the average income during 2009-2013. Figure 4 depicts this comparison over the 2011-2016 period. The annual Gini follows the same trend as that shown in Figure 1. It rises from 0.42 in 2011 to 0.43 in 2016. Interestingly, the 5-year Gini runs nearly parallel to the annual Gini during the period.

Figure 4: Annual vs. 5-year Gini coefficients, 2011-2016
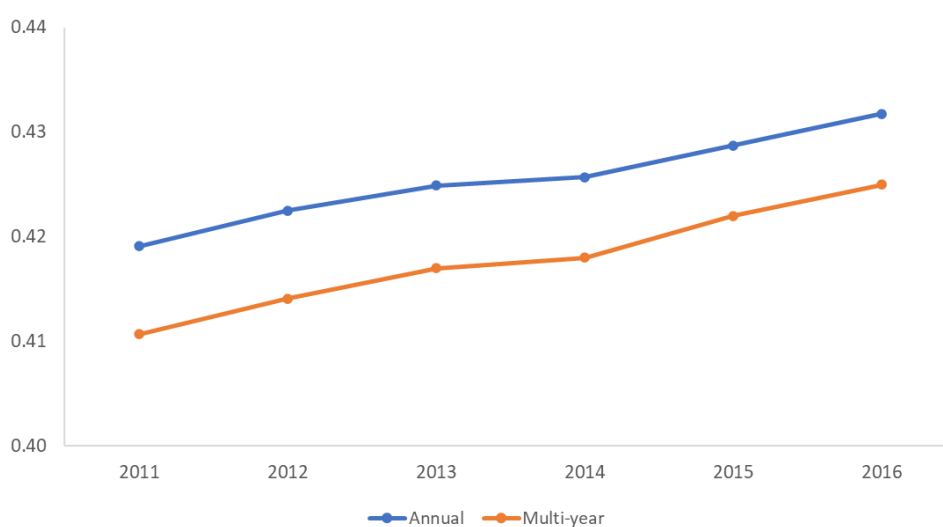
Notes: This figure compares Multi-year Gini (Gini coefficients based on average earnings over a 5-year period) and Annual Gini (average value of the annual Gini coefficients over the same 5-year period).

Panel A of Table 3 shows annual inequality, 5-year inequality and variability in 2011 and 2016 for Gini, variance of log earnings and mean log deviation. For Gini coefficients, multi-year inequality accounts for 98.0% of annual inequality in 2011, which has risen slightly to 98.4% in 2016. Our findings, therefore, imply that the annual earnings inequality is primarily permanent and this has changed very little between 2011 and 2016.

13

A similar pattern emerges for variance of log earnings and mean log deviation. We find consistent results when using earnings with family-size adjustment (Panel B of Table 3).

Table 3: Annual vs. 5-year earnings inequality, 2011 and 2016

| | Earnings inequality | | | | | |
| | 2011 | | | 2016 | | |
	Annual	**5-year**	**Variability**	**Annual**	**5-year**	**Variability**
Panel A: Baseline						
Gini	0.419	0.411	0.008	0.432	0.425	0.007
		(98.0%)	(2.0%)		(98.4%)	(1.6%)
Variance of log earnings	0.526	0.492	0.034	0.537	0.504	0.033
		(93.5%)	(6.5%)		(93.8%)	(6.2%)
Mean log deviation	0.298	0.283	0.015	0.304	0.290	0.014
		(95.0%)	(5.0%)		(95.4%)	(4.6%)
Panel B: Sensitivity test (based on earnings with adjustment for family size)						
Gini	0.418	0.408	0.010	0.437	0.428	0.009
		(97.5%)	(2.5%)		(97.9%)	(2.1%)
Variance of log earnings	0.508	0.467	0.040	0.521	0.483	0.039
		(92.0%)	(8.0%)		(92.6%)	(7.4%)
Mean log deviation	0.293	0.275	0.018	0.302	0.285	0.017
		(93.8%)	(6.2%)		(94.3%)	(5.7%)

Notes: This table shows annual inequality, 5-year inequality and variability in 2011 and 2016 for Gini, variance of log earnings and mean log deviation. Panel A shows our baseline estimate, while Panel B shows a robustness test using earnings with family-size adjustment. Numbers in parentheses indicate % of annual inequality.

It may be interesting to investigate the protracted nature of the increase in the earnings share of the top 1% during the period. Figure 5 depicts a comparison of the average annual earnings share over a 5-year period and the earnings share of the 5-year average earnings. We find that the 5-year measure rises at a much faster pace than the annual measure. This suggests that the concentration of earnings at the very top is becoming more permanent.

Figure 5: Top 1% earnings share—Annual vs. 5-year, 2011-2016
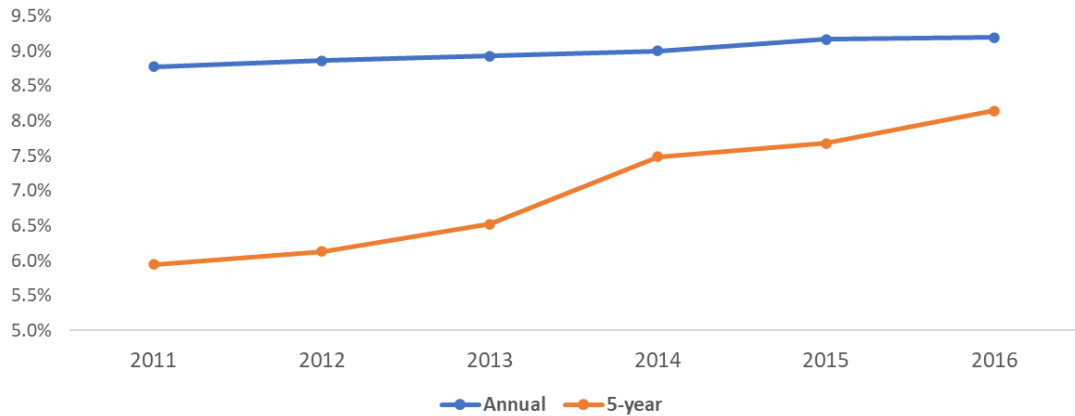
Notes: This figure focuses on top 1% earnings share and shows average annual earnings share over a 5-year period (denoted Annual) and the earnings share of the 5-year average earnings (denoted 5-year).

4.3 Medium-term mobility

Baseline mobility findings

Figure 6 depicts the probability of remaining in the same earnings decile in 2009 and 2018 based on the transition matrix.[6] Overall, about 35.4% of workers remained in the same earnings decile between 2009 and 2018. The persistence exhibits the U-shaped pattern across the earnings distribution as observed in other countries (e.g. Jansson, 2021; Carr and Wiemers, 2022).

However, persistence is high at both ends of the distribution, especially at the top. For workers in the starting bottom decile, 50.9% of them remain there in 2018. On the other hand, 69.0% of workers in the top decile in 2009 remain in the same group nearly a decade later. Furthermore, as shown in Figure 7, the persistence probability during the

---

[6] All transition matrices in this section are available upon request.

same time period for top 5%, top 3% and top 1% workers are 63.1%, 58.6% and 54.7%, respectively.

Figure 6: Probability of remaining in the same decile by starting decile (2009-2018)
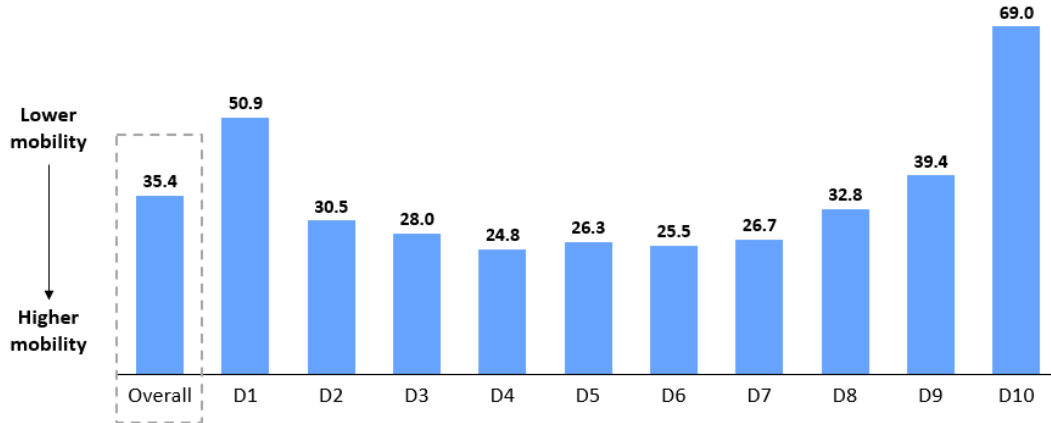
Notes: This figure shows the probability of remaining in the same earnings decile in 2009 and 2018. Higher persistence probability indicates lower mobility.

Figure 7: Probability of remaining in the top 5%, top 3% and top 1%
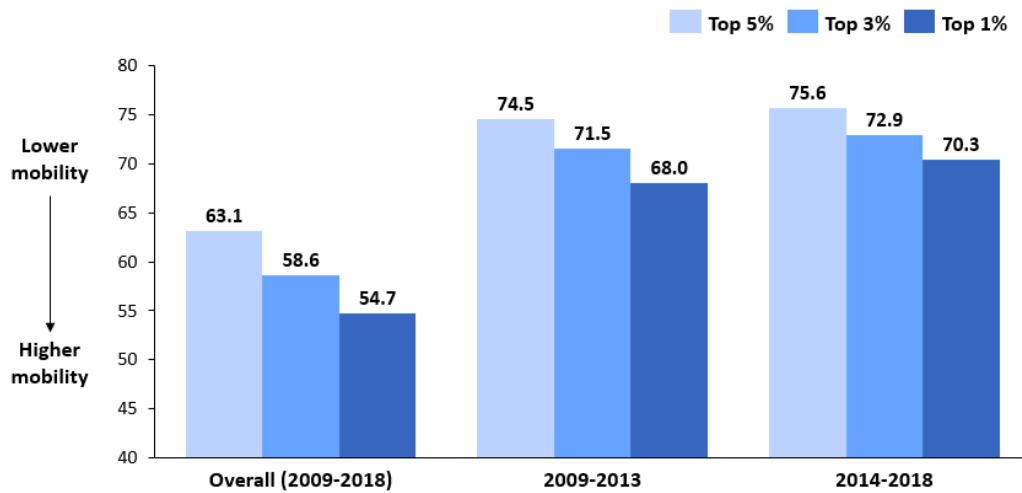
Notes: This figure shows the probability of remaining in top 5%, top 3% and top 1% over three time periods (2009-2018, 2009-2013 and 2014-2018). Higher persistence probability indicates lower mobility.

Next, we present the rank-rank regression result (Table 4). Overall, the slope coefficient, or the average correlation between one's 2009 rank and the same worker's 2018 rank, is 0.79.

Table 4: **Rank-rank regression results**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Overall 2009-18	Robustness: with family-size adjustment	Robustness: mobility relative to population	Period 1: 2009-13	Period 2: 2014-18	Female	Male	High job formality	Low job formality	Age 25-30	Age 31-35	Age 35-40	Age 41-45	Age 46-50
Rank	0.792***	0.745***	0.726***	0.870***	0.871***	0.775***	0.795***	0.793***	0.736***	0.750***	0.780***	0.850***	0.893***	0.925***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	10.526***	12.899***	26.195***	6.560***	6.538***	11.475***	11.344***	15.145***	7.433***	16.681***	11.860***	5.876***	1.902***	-1.693***
	(0.021)	(0.022)	(0.022)	(0.018)	(0.016)	(0.030)	(0.037)	(0.041)	(0.026)	(0.039)	(0.042)	(0.045)	(0.047)	(0.055)
Observations	2,884,427	2,884,427	2,884,427	2,954,951	3,511,022	1,493,006	1,331,865	1,103,057	1,094,190	730,232	629,055	565,057	497,792	462,291
R-squared	0.627	0.554	0.588	0.757	0.758	0.605	0.617	0.681	0.575	0.496	0.599	0.691	0.729	0.701

Notes: This table presents the rank-rank regression results. Standard errors are heteroscedasticity-robust and clustered at individual level. Numbers in parentheses indicate standard error. ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively.

So far, we consider only the likelihood of persisting in one's current earnings decile. Another important indicator of mobility is the degree to which one can make a large movement up the earnings ladder. Figure 8 depicts the probability of moving up at least two deciles in 2018, based on their 2009 decile. Overall, the probability of such upward movement is 19.0%. For those in the first decile in 2009, the probability of moving up to at least the third decile in 2018 is 29.1%. Such upward mobility, however, is increasingly more difficult for those in the higher starting decile. Moving from the 8th decile in 2009 to the top decile in 2018, for example, is much less likely, with 5.5% chance.
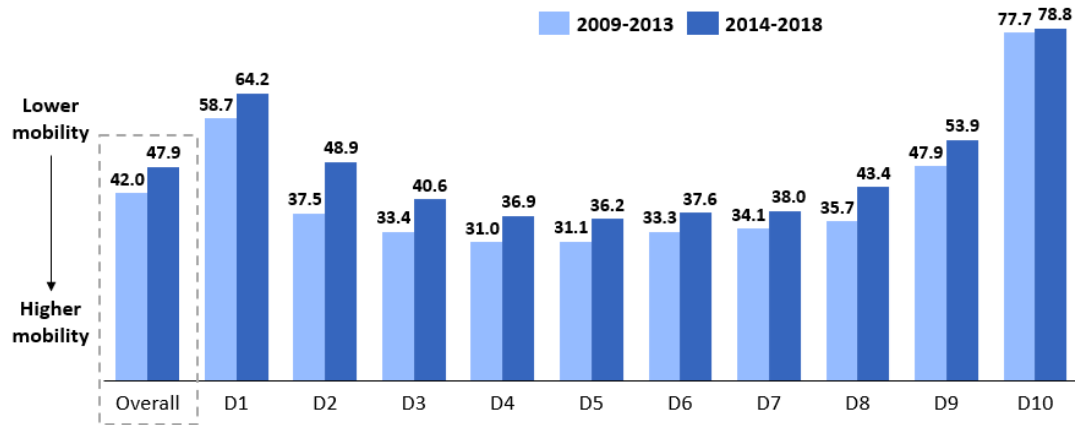
Figure 8: Probability of moving up at least two deciles conditional on starting decile (2009-2018)
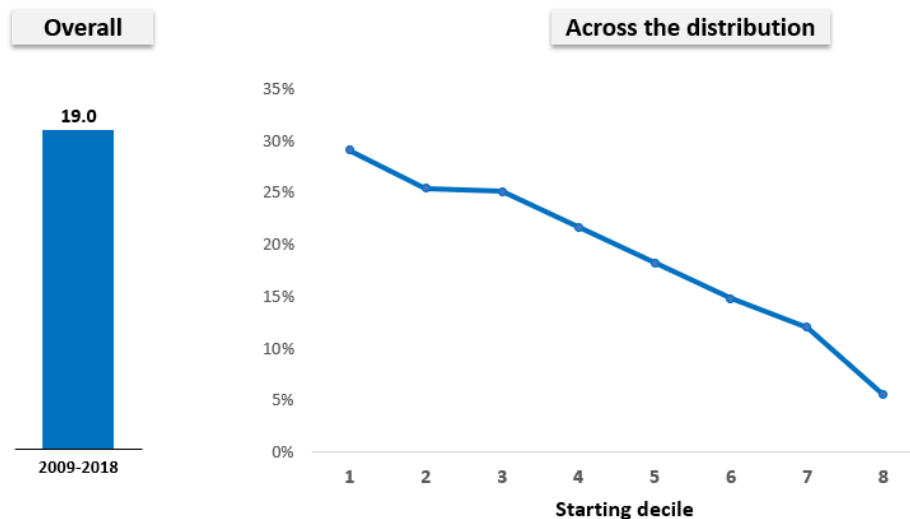
Notes: This figure shows the probability of moving up at least two deciles in 2018, based on their 2009 decile. The left panel shows the overall probability, while the right panel shows the probability across the starting earnings decile.

Next, we divide our study period into two subperiods: 2009-2013 and 2014-2018. Our findings based on the transition matrix indicate that overall persistence is larger in the 2014-2018 period. The likelihood of remaining in the same decile rises from 42.0% in the first subperiod to 47.9% in the second (Figure 9). This decrease in mobility is also seen across the earnings distribution.

Figure 9: Probability of remaining in the same decile by starting decile (2009-2013 and 2014-2018)

Notes: This figure shows the probability of remaining in the same earnings decile in two time periods (2009-2013 and 2014-2018). Higher persistence probability indicates lower mobility.

Upward mobility also declines over the 10-year period. Overall, the probability of upward movement is 13.5% during 2014-2018, compared to 11.6% during 2009-2013 (Figure 10). That decline is also consistent across the entire earnings distribution.

Figure 10: Probability of moving up at least two deciles conditional on starting decile (2009-2013 vs. 2014-2018)
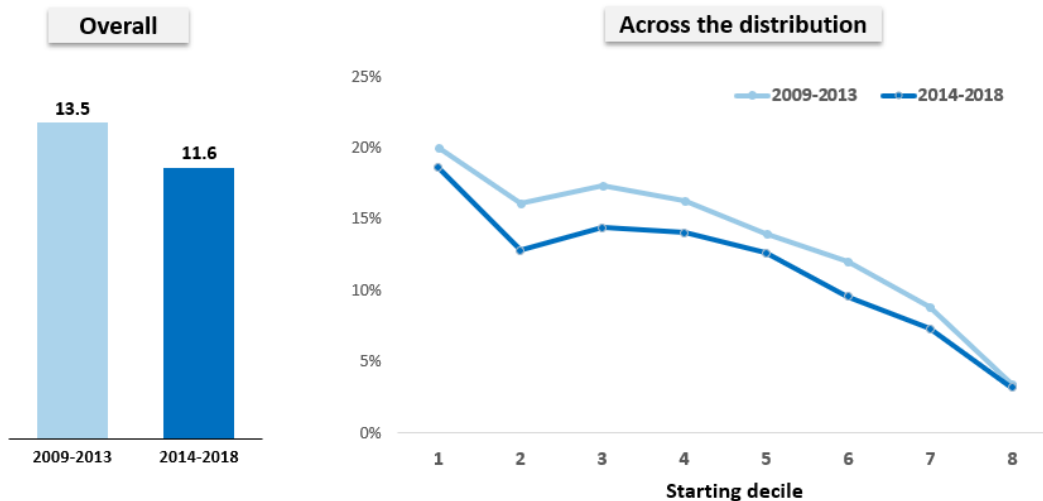
Notes: This figure shows the probability of moving up at least two deciles in the ending year, based on their decile in the staring year. It focuses on two time periods (2009-2013 and 2014-2018). The left panel shows the overall probability, while the right panel shows the probability across the starting earnings decile.

We also investigate how sensitive our baseline findings are to our chosen approach. We show the mobility results based on earnings that is adjusted for differences

in family size. Our findings show that there is no significant difference from our main findings (Table 5 and Column 2 of Table 4).

Table 5: **Robustness test for the medium-term earnings mobility analysis**

	Overall	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Overall mobility (Probability of remaining in the same decile conditional on starting decile)											
Baseline	35.4%	50.9%	30.5%	28.0%	24.8%	26.3%	25.5%	26.7%	32.8%	39.4%	69.0%
With adjustment for family size	29.3%	44.3%	26.4%	21.4%	19.7%	18.4%	18.2%	20.6%	26.2%	33.0%	65.1%
Upward mobility (Probability of moving up at least two deciles conditional on starting decile)											
Baseline	19.0%	29.1%	25.4%	25.1%	21.6%	18.2%	14.8%	12.0%	5.5%		
With adjustment for family size	24.0%	35.0%	32.0%	29.7%	27.3%	24.4%	21.1%	15.9%	7.1%		

Notes: This table shows a robustness test that uses earnings with adjustment for differences in family size.

International comparison

To put our estimates into context, we compare them to studies from other countries. Table 6 shows comparison of intragenerational earnings/income mobility findings across both developed and developing countries. Although the findings are not fully comparable across studies due to data and methodology, we attempt to increase comparability by reproducing our mobility results using comparable time horizon and measurement. We focus on three indicators: overall persistence (probability of changing earnings/income decile), upward mobility (probability of moving upward at least 2 earnings/income deciles) and top 1% persistence (probability of remaining in top 1%).

Our findings indicate that Thailand has one of the lowest levels of earnings mobility in the pool of collected evidence. While it is roughly comparable to France's from 2001 to 2015 (Aghion et al. 2019), its overall persistence was consistently greater

20

than the rest of the evidence. Thailand's upward mobility is greater than that of China in the early 1990s (Khor and Pencavel 2006) and comparable to that of Vietnam from 2004 to 2014. (Nguyen and Nguyen 2020). It is, however, lower than all of the other evidence. Finally, Thailand's top 1% persistence is highest across the board.

It is important to note that the international comparison here is only suggestive. Despite our efforts to improve study compatibility, there are still important factors that may make comparison difficult such as differences in unit of observations, income types and sample scope.

Table 6: Comparison of intragenerational earnings/income mobility findings across countries

			Global evidence				**Comparison using Thailand's evidence**			
Study	**Country**	**Mobility Period**	**Mobility measurement**	**Overall persistence**	**Upward mobility**	**Top 1% persistence**	**Overall persistence**	**Upward mobility**	**Top 1% persistence**	**Mobility period**
Developed countries										
Aghion et al. (2019)	France	4 years (2001-2015)	Income	46.6%	17.2%	-	44.5%	12.6%	69.2%	Average 4-year periods during 2009-2018
Auten and Gee (2009)	US	9 years (1996-2005)	Income	33.4% (Quintile-based)	33.7% (Quintile-based)	38.5%	55.1% (Quintile-based)	28.7% (Quintile-based)	54.7%	9 years (2009-2018)
Auten et al. (2013)	US	5 years (2005-2010)	Income			27%	39.1%	15.0%	66.6%	5 years (2009-2014)
Burdin (2020)	Uruguay	7 years (2009-2016)	Income	32.5%	20.4%	52.2%	37.9%	16.4%	60.0%	7 years (2009-2016)
Fairfield and De Luis (2015)	Chile	4 years (2005-2009)	Income	-	-	64.4%	44.5%	12.6%	69.2%	Average 4-year periods during 2009-2018
Jenderny (2016)	Germany	Average 3-year periods during 2001-2006	Income	-	-	65%	51.7%	10.0%	74.7%	Average 3-year periods during 2009-2018
Kopczuk et al. (2010)	US	Average 5-years periods during 1978-1999	Earnings	-	-	60%-65%	39.1%	15.0%	66.6%	5 years (2009-2014)
Hérault et al. (2021)	Australia	Average 5-years periods	Income	-	-	29%-38%	39.1%	15.0%	66.6%	5 years (2009-2014)

| Study	Country	Period	Measure							Period
		during 1991-2017								
Oh and Choi (2018)	S. Korea	7 years (1998-2005)	Earnings	36.4% (Quintile-based)	37.6% (Quintile-based)	-	58.09% (Quintile-based)	26.7% (Quintile-based)	60.0%	7 years (2009-2016)
Oh and Choi (2018)	S. Korea	5 years (2005-2010)	Earnings	36.4% (Quintile-based)	37.6% (Quintile-based)	-	60.6% (Quintile-based)	25.4% (Quintile-based)	66.6%	5 years (2009-2014)
Developing countries										
Khor and Pencavel (2006)	China	5 years (1990-1995)	Income	33.4% (Quintile-based)	17.2% (Quintile-based)	-	60.6% (Quintile-based)	25.4% (Quintile-based)	66.6%	5 years (2009-2014)
Martinez et al. (2014)	Philippines	6 years (2003-2009)	Income	28%	27%	-	39.1%	15.4%	63.0%	6 years (2009-2015)
Nguyen and Nguyen (2020)	Vietnam	Average 4-years periods during 2004-2014	Income	-	12.6% (From bottom 40% to a higher quintile)	-	44.5%	10.1% (From bottom 40% to a higher quintile)	69.2%	Average 4-year periods during 2009-2018
Zeng and Zhu (2022)	China	Average 2-years periods during 2010-2016	Earnings	-	-	40.1%	57.3%	7.6%	78.7%	Average 2-year periods during 2009-2017

Notes: This table compares intragenerational earnings/income mobility findings across countries. Overall persistence is based on decile movement unless indicated otherwise. Mobility evidence for Thailand is based on earnings.

Heterogeneity of earnings mobility

The remainder of the discussion focuses on mobility heterogeneity over gender, job formality and age. It should be noted that all ranks in the subgroup analyses are based on positions in the overall sample.

We begin with mobility heterogeneity with respect to gender. Overall, both the transition matrice and the rank-rank regression indicate that female workers have slightly higher mobility than male workers. (Figure 11 and Columns 9-10 of Table 4). This is consistent with Jansson (2021) and Carr and Wiemers (2022), both of which show that income mobility is higher for women in the US and Sweden respectively.

Figure 11: Probability of remaining in the same decile by staring decile: gender job formality and age (2009-2018)
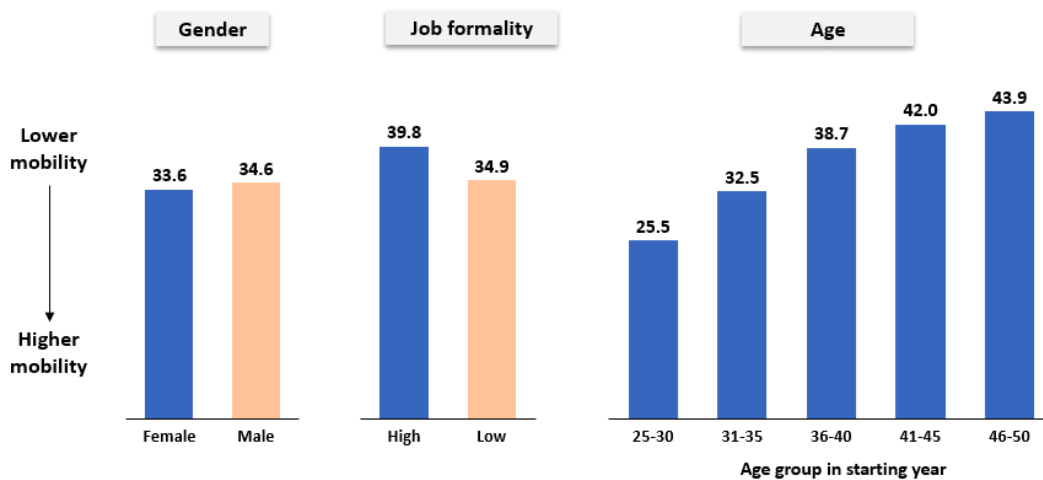
Notes: This figure shows the heterogeneity in the probability of remaining in the same earnings decile in 2009 and 2018 with respect to gender, age and job formality. Higher persistence probability indicates lower mobility.

In contrast to overall mobility, our findings indicate that female workers have relatively lower upward mobility. Male workers have an 22.3% chance of moving up at least two deciles, while female workers have a 20.6% chance (Figure 12). Upward mobility is roughly similar between the two genders up to the 5th decile. Above the 6th decile, however, male workers have consistently larger upward mobility.

Figure 12: Probability of moving up at least two deciles conditional on starting decile by gender (2009-2018)
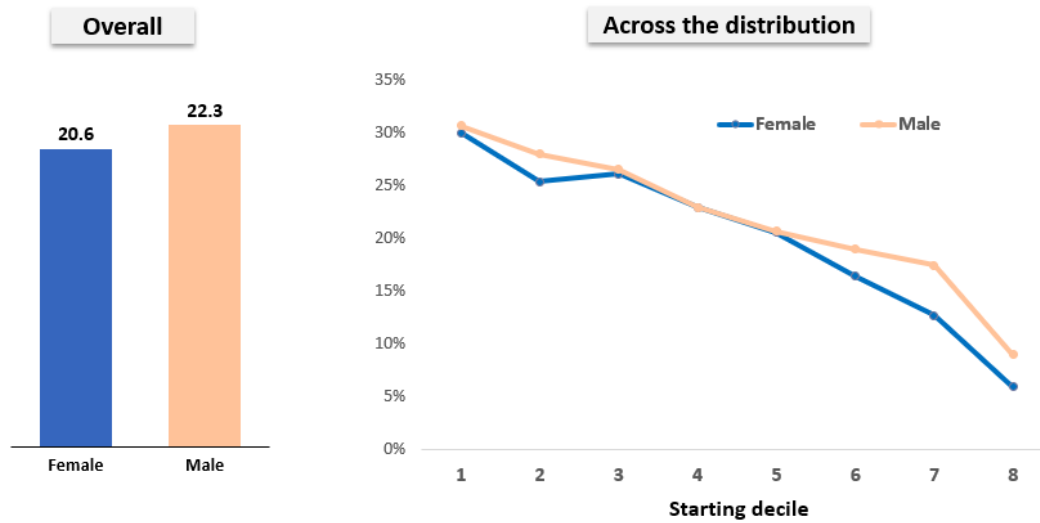
Notes: This figure shows the probability of moving up at least two deciles in 2018, based on their decile in 2009. It focuses on female and male workers. The left panel shows the overall probability, while the right panel shows the probability across the starting earnings decile.

Next, we consider the heterogeneity with respect to workers' employment arrangement. Although all workers in our study are formal workers, there is a degree of formality associated with their jobs. At one extreme of the spectrum are jobs that have long-term contracts and come with full benefits like pension and paid time off. On the other end of the spectrum are those with minimal benefits and no job security. It might be useful to understand how workers' mobility varies depending on how formal their jobs are, as opposed to treating all formal workers uniformly.

We proxy for job formality using information on a worker's provident fund contributions. A provident fund is a type of pension fund that is voluntarily established by employers and requires contributions from both employers and employees. A worker's provident fund contribution therefore indicates that a worker has a job with an employer

who offers pension benefits. This could imply a higher level of job security than job without such benefit.[7]

In line with this, we classify workers who make provident fund contributions in both starting and ending years as belonging to the high job formality group. The low job formality group, on the other hand, consists of those who do not report any provident fund contribution in both years. In our panel, 38.2% (37.9%) of all workers are in the high (low) job formality group (Figure 13). We do not focus on workers who switch between jobs with and without provident fund contribution, which is relatively uncommon (roughly 24% of all workers).

Figure 13: Distribution of workers by job formality groups and movement in 2009 and 2018
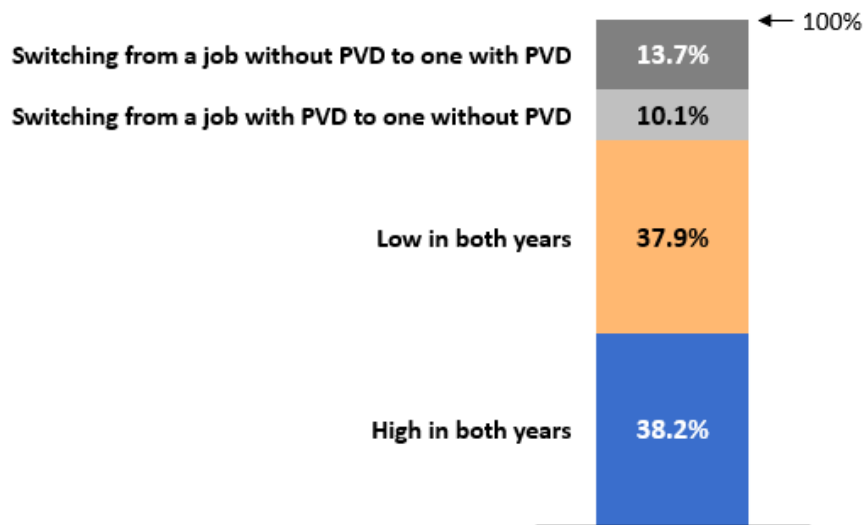
Notes: This figure shows the distribution of workers by job formality groups and movement in 2009 and 2018. 'High in both years' consists of workers in jobs with a provident fund in both starting and ending years. 'Low in both years' consists of workers in jobs without a provident fund in both starting and ending years. The other two groups consist of workers who move between jobs with and without a provident fund. PVD denotes provident fund.

Even though we only consider provident fund status in 2009 and 2018, it is important to note that workers tend to have the same status in all of the years in between.

---

[7] Employers are less likely to provide benefits to employees whose employment prospects are uncertain (Kalleberg et al. 2000).

We find that 76% (58%) of workers in the high (low) formality group file tax returns every year between 2009 and 2018, and 86% (92%) of those workers are in the job with (without) provident fund in all of the intervening years. This suggests a strong pattern of worker division based on job formality level. Selection into those job-formality groups may be nonrandom and it is likely correlated with factors such as education and ability.

Our findings indicate that workers in the low job formality group have relatively greater overall mobility. The low-formality group has a 34.9% chance of remaining in the same decile in both years, while the high-formality group has a 39.8% chance (Figure 11). This is consistent with the rank-rank regression result (Columns 6-7 of Table 4).

In terms of upward mobility, we find a striking difference between the two groups. The overall upward mobility is 13.8 for those in the low job formality group versus 21.1% for those in the high job formality group (Figure 14). Across the earnings distribution, the low formality group has lower upward mobility than the high formality group, with the difference being greater for those with low earnings. These findings imply that, while workers in the low job formality group have slightly higher broad mobility, they have considerably lower chances of making a significant upward movement than those in the high job-formality group.
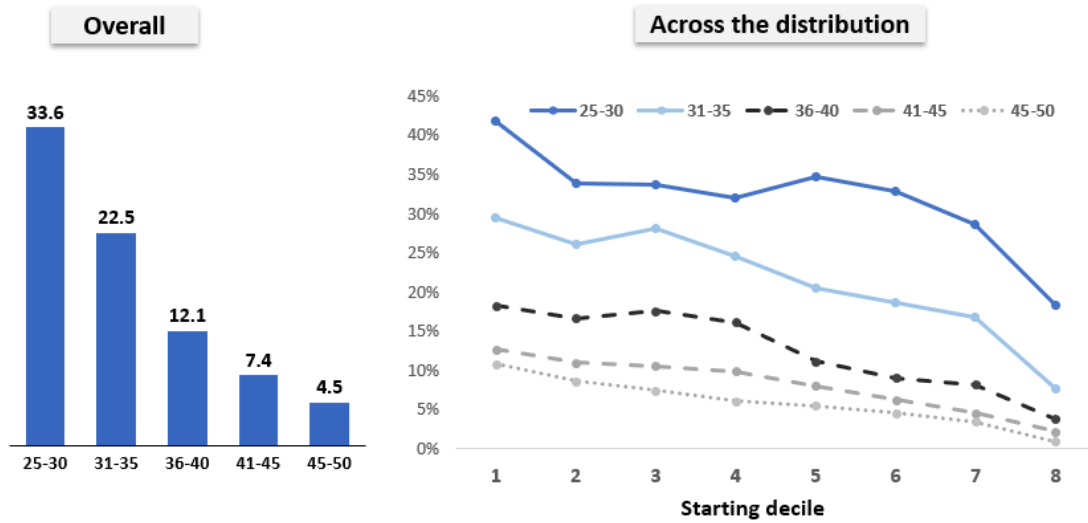
Figure 14: Probability of moving up at least two deciles conditional on starting decile by job formality (2009-2018)
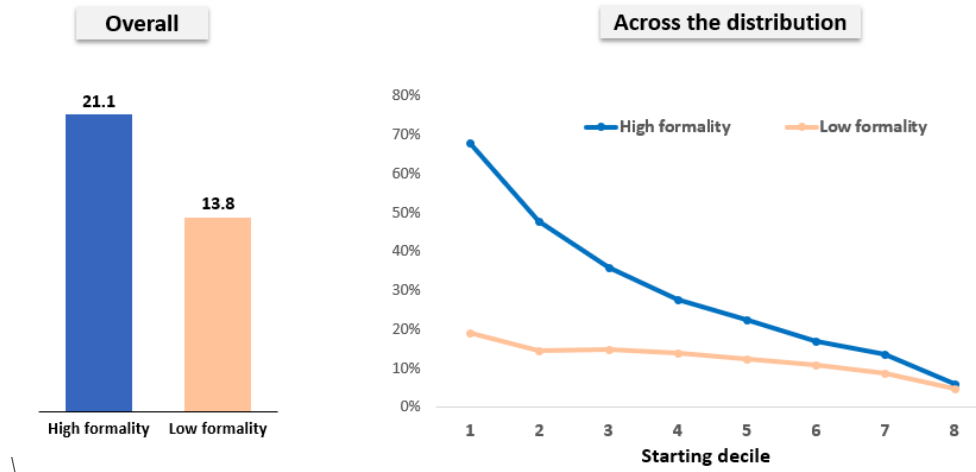
Notes: This figure shows the probability of moving up at least two deciles in 2018, based on their decile in 2009. It focuses on workers in high and low job formality groups. The left panel shows the overall probability, while the right panel shows the probability across the starting earnings decile.

Finally, we divide workers into 5 groups based on their age in 2009 (25-30, 31-35, 36-40, 41-45 and 46-50). This allows us to consider how mobility evolves over the lifecycle. Almost half of workers in the sample are 25-35 in 2009 (Table 1). Both the persistence probability and the rank-rank regression indicate that mobility declines with age (Figure 11 and Columns 8-12 of Table 4). This is also true for upward mobility (Figure 15).

Figure 15: Probability of moving up at least two deciles by age groups (2009-2018)

Notes: This figure shows the probability of moving up at least two deciles in 2018, based on their decile in 2009. It focuses on workers in 5 age groups (25-30, 31-35, 36-40, 41-45 and 46-50 in 2009). The left panel shows the overall probability, while the right panel shows the probability across the starting earnings decile.

5. Conclusion, implications and limitations

Understanding economic mobility is critical especially in the post-pandemic world where the crisis has left a permanent scar on income distributions in many countries. This article uses a panel of tax returns from Thailand to provide a highly granular picture of earnings inequality and intragenerational earnings mobility among formal workers.

We obtain three main findings. First, we document rising annual earnings inequality over the 2009-2018 period and show that the annual inequality is primarily permanent. Our findings indicate that the top of the distribution is primarily responsible for the rise in inequality. The top 1%'s share increases from 9% in 2009 to 11% in 2018, while the bottom half's share falls from 22% in 2009 to 21% in 2018. Further, over 90% of the annual inequality is due to the 5-year inequality, which is a relatively permanent source. We also find that the concentration of earnings at the top has become more permanent over the period.

Second, Thailand's medium-term mobility follows a U-shaped pattern along the earnings distribution. Overall, about 35% of workers remained in the same earnings decile over 2009-2018. Persistence is especially high in the top decile, at 69%. Mobility also declines over the course of the study. The persistence probability rises from 42% over 2009-2013 to 48% over 2014-2018. Thailand's earnings mobility is also relatively low when compared to international evidence.

Third, our findings show a significant gender, age, and work arrangement heterogeneity in earnings mobility. Female workers have lower upward mobility than male workers, with the difference being most noticeable at the top of the distribution. Mobility also declines sharply with age. We further document a strong pattern of worker segregation based on their work arrangement. Workers in the low job-formality group have remarkably lower upward mobility than those in the high formality group. This emphasizes the significance of leveling the playing field for vulnerable workers and increasing their access to opportunities.

There are at least three reasons why the lessons from Thailand's tax return data can be generalized and useful for other countries. First, the pandemic occurred at a time of large inequality in many countries. Our findings highlight the importance of identifying its source and ensuring that the post-pandemic inequality surge does not become permanent. Second, our comparison provides insight into where existing evidence on economic mobility stands in comparison to a developing country with large inequality. Third, and perhaps more importantly, our heterogeneity analysis suggests that workers in certain vulnerable pockets may have significantly lower upward mobility. This underlines the importance of improving access to opportunities for low-income workers, particularly those in less-secure jobs, who are likely to be among those hardest hit by the crisis.

Finally, due to limitations in the coverage of tax return data, we emphasize that this study focuses only on labor earnings among formal workers. It takes neither business and capital income nor workers in the informal economy into account. We leave those issues as potential avenues for future investigation.

Declaration

Funding: No funding was received for conducting this study.

Conflict of interest: The authors have no conflicts of interest to declare that are relevant to the content of this article.

6. References

Acs, G., & Zimmerman, S. (2008). Economic Mobility from 1984 to 2004. *Washington, DC: Economic Mobility Project*.

Aghion, P., Ciornohuz, V., Gravoueille, M., & Stantcheva, S. (2019). *Anatomy of Inequality in France*. *Mimeo*

Auten, G., & Gee, G. (2009). Income mobility in the United States: New evidence from income tax data. *National tax journal*, *62*(2), 301-328.

Auten, G., Gee, G., & Turner, N. (2013). Income Inequality, Mobility, and Turnover at the Top in the US, 1987-2010. *American Economic Review*, *103*(3), 168-72.

Burdín, G., Vigorito, A., de Rosa, M., & Vilá, J. (2020). Was falling inequality in all Latin American countries a data-driven illusion? income distribution and mobility patterns in Uruguay 2009-2016. IZA Discussion Paper No. 13070.

Carr, M. D., & Wiemers, E. E. (2022). The Decline in Long-Term Earnings Mobility in the US: Evidence from Survey-Linked Administrative Data. *Labour Economics*, 102170.

Chetty, R., Hendren, N., Kline, P., & Saez, E. (2014). Where is the land of opportunity? The geography of intergenerational mobility in the United States. *The Quarterly Journal of Economics*, *129*(4), 1553-1623.

Congressional Budget Office. (2021). *The Distribution of Household Income, 2018*. Washington DC.

Fairfield, T., & Jorratt De Luis, M. (2016). Top income shares, business profits, and effective tax rates in contemporary Chile. *Review of Income and Wealth*, *62*, S120-S144.

Hérault, N., Hyslop, D., Jenkins, S. P., & Wilkins, R. (2021). Rising top-income persistence in Australia: Evidence from income tax data. Melbourne Institute Working Paper No. 20/21, September 2021.

Jäntti, M., & Jenkins, S. P. (2015). Income mobility. In *Handbook of income distribution* (Vol. 2, pp. 807-935). Elsevier.

Jansson, B. (2021). Income inequality and intragenerational income mobility in Sweden from 1983 to 2010: Following two birth cohorts. *Social Indicators Research*, *158*(2), 751-773.

Jarvis, B. F., & Song, X. (2017). Rising intragenerational occupational mobility in the United States, 1969 to 2011. *American sociological review*, *82*(3), 568-599.

Jenderny, K. (2016). Mobility of top incomes in g ermany. *Review of Income and Wealth*, *62*(2), 245-265.

Jenmana, T. (2018). Democratisation and the emergence of class conflicts: Income inequality in Thailand, 2001-2016. *Mimeo*

Kalleberg, A. L., Reskin, B. F., & Hudson, K. (2000). Bad jobs in America: Standard and nonstandard employment relations and job quality in the United States. *American sociological review*, 256-278.

Khor, N., & Pencavel, J. (2006). Income mobility of individuals in China and the United States. *Economics of Transition*, *14*(3), 417-458.

Kilenthong, W. (2016). Finance and Inequality in Thailand. *Thailand and the World Economy*, 34(3), September-December 2016.

Kopczuk, W., Saez, E., & Song, J. (2010). Earnings inequality and mobility in the United States: evidence from social security data since 1937. *The Quarterly Journal of Economics*, *125*(1), 91-128.

Kye, B., Hwang, S. J., Kim, J., & Choi, Y. (2022). Intragenerational occupational mobility of South Korea, 1998–2017: Implications of the gendered life course approach for mobility and inequality studies. *Research in Social Stratification and Mobility*, *77*, 100660.

Lekfuangfu, W. N., Piyapromdee, S., Porapakkarm, P., & Wasi, N. (2020). *Myths and Facts about Inequalities in Thailand*. Discussion Paper (No. 144). Puey Ungphakorn Institute for Economic Research.

Martinez Jr, A., Western, M., Haynes, M., & Tomaszewski, W. (2014). Is there income mobility in the Philippines?. *Asian-Pacific Economic Literature*, *28*(1), 96-115.

Muthitacharoen, A., & Phongpaichit, P. (2020). The unequal benefits of tax subsidies for household saving and investment: Evidence from Thailand's tax return data. *Southeast Asian Journal of Economics*, *8*(2), 1-24.

Nguyen, C. V., & Nguyen, L. T. (2020). Intra-generational and intergenerational social mobility: Evidence from Vietnam. *Journal of Asian and African Studies*, *55*(3), 370-397.

Oh, H., & Choi, Y. J. (2018). Limited income mobility: empirical evidence from Korea. *Social Indicators Research*, *138*(2), 665-687.

Poggi, C., Sanchez Martin,M.E., Peamsilpakulchorn, P., Chavapricha, R., Sondergaard, L., Kuriakose, S., Mohib, S.A., Lathapipat, D., Arin, T., Luo, X., Reungsri, T., Jithitikulchai, T. (2016). *Thailand - Systematic country diagnostic: getting back on track - reviving growth and securing prosperity for all*. Washington, D.C.: World Bank Group.

Saez, E., & Veall, M. R. (2005). The evolution of high incomes in Northern America: lessons from Canadian evidence. *American economic review*, *95*(3), 831-849.

Shorrocks, A. (1978). Income inequality and income mobility. *Journal of Economic Theory*, *19*(2), 376-393.

Splinter, D. (2021). Income Mobility and Inequality: Adult-Level Measures from the US Tax Data Since 1979. *Review of Income and Wealth*, Advanced online publication.

Yang, J., Wang, S., & Dewina, R. (2020). *Taking the Pulse of Poverty and Inequality in Thailand.* Washington, DC: World Bank Group.

Wasi, N., Paweenawat, S. W., Ayudhya, C. D. N., Treeratpituk, P., & Nittayo, C. (2019). *Labor Income Inequality in Thailand: the Roles of Education, Occupation and Employment History*. Discussion Paper (No. 117). Puey Ungphakorn Institute for Economic Research.

Vanitcharearnthum, V. (2019). Top income shares and inequality: Evidences from Thailand. *Kasetsart Journal of Social Sciences*, 40(1), 40-46.

Zeng, T., & Zhu, S. (2022). The mobility of top earnings, income, and wealth in China: Facts from the 2011–2017 China household finance survey. *Journal of Asian Economics*, *80*, 101461.

Appendix

Figure A1: Mean ending rank by starting rank (2009-2018)
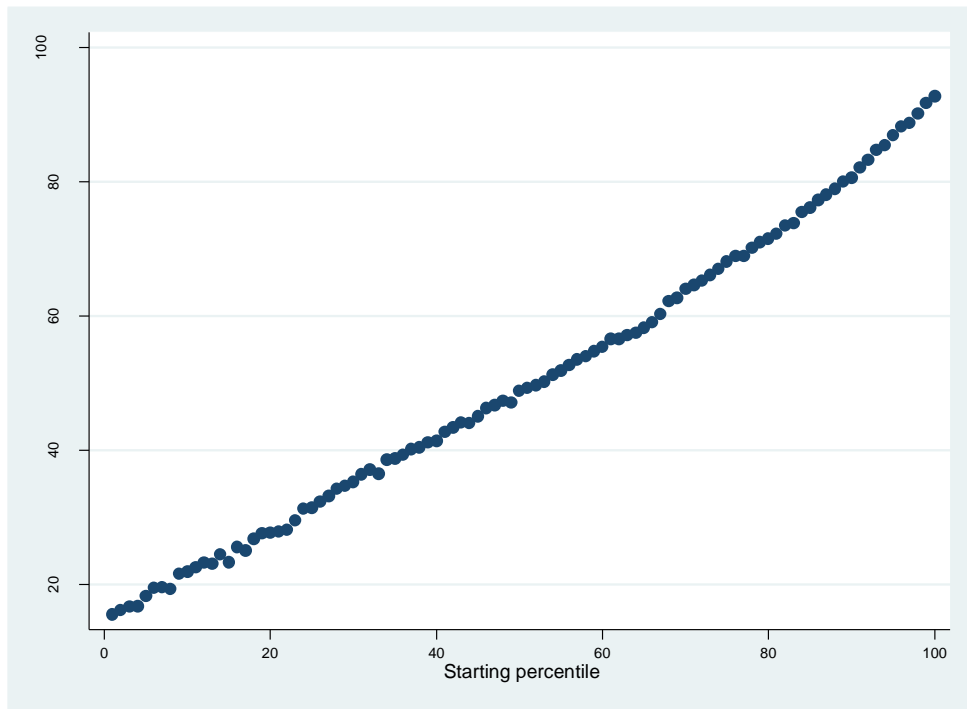
Notes: This figure presents nonparametric binned scatter plots of the relationship between earnings percentiles in 2009 (X-axis) and in 2018 (Y-axis).