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## Working Paper

# A tale of two transitions: Mobility dynamics in the People's Republic of China and Russia after central planning

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# A TALE OF TWO TRANSITIONS

MOBILITY DYNAMICS IN THE PEOPLE'S REPUBLIC  
OF CHINA AND RUSSIA AFTER CENTRAL PLANNING

*Kristina Butaeva, Lian Chen, Steven N. Durlauf, and Albert F. Park*

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## ABSTRACT

This paper examines intergenerational mobility in the People's Republic of China (PRC) and Russia during their transitions from central planning to market systems. We consider mobility as movement captured by changes in status between parents and children. We provide estimates of overall mobility, which involves mobility during transition to a system's steady state, as well as steady state mobility, which captures long-run mobility independent of transitional dynamics or shifts in the marginal distribution of outcomes across generations. We further decompose overall mobility into structural and exchange components. We find that the PRC exhibits more overall educational mobility than Russia, mostly because of greater structural mobility, whereas Russia exhibits greater steady-state educational mobility. In contrast, both overall and steady state occupational mobility are similar in the PRC and Russia. Comparing these results to the United States (US), we find steady state mobility in education is substantially higher in the US and Russia compared to the PRC, but occupational steady state mobility is comparable in all three countries.

**Keywords:** intergenerational mobility, education, occupation, transition economy

**JEL codes:** J62, I25, P36

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# 1 INTRODUCTION

The end of central planning and the emergence of market economies in the People's Republic of China (PRC) and Russia represents one of the major economic and social transformations of the past century. While the effects of these transitions on overall economic activity have been widely studied, there is comparatively less work on the evolution of various dimensions of inequality in these societies. This paper adds to this still nascent literature by studying intergenerational mobility dynamics in the PRC and Russia.<sup>1</sup> As education and occupation are both measured discretely, we use Markov chain methods to characterize intergenerational mobility. We focus on measures that characterize mobility as movement—i.e., the extent to which children can differ from their parents.

Many measures of intergenerational mobility have been developed for Markov chain transition matrices (Bartholomew, 1967; Conlisk, 1990; Dardanoni, 1993; Prais, 1955; Shorrocks, 1978). Here, we focus on mobility as movement between class of parents and children. We do this as the data under our sample explore the relationship between parents who grew up and became adults under central planning and children who grew up in a market economy. Hence, the “escape” of new generations from the structures that produced parental outcomes is a natural focus for analysis. In an appendix, we consider other ways to conceptualize mobility.<sup>2</sup>

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<sup>1</sup> Educational intergenerational mobility (IGM) in the PRC is studied by Huo and Golley (2022); Xie, Dong, Zhou, and Song (2022), and in Russia by Gugushvili (2017); Roshchina (2012); Yasterbov (2016). Examples of studies on occupational IGM include Sun, Lei, and Liu (2021); Xie et al. (2022); Zhou and Xie (2019) for the PRC, and (Bessudnov, 2016; Gerber and Hout, 2004; Gugushvili, 2017; Marshall, Sydorenko, and Roberts, 1995; Yasterbov, 2016) for Russia. Income IGM in the PRC has been analyzed by (Congbin and Weifang, 2008; Fan, Yi, and Zhang, 2021; Gong, Leigh, and Meng, 2012; Huang, Huang, and Shui, 2021; Yan and Deng, 2022; Zhigang and Lin, 2013), and in Russia by Borisov and Pissarides (2020). Most of these papers employ variants of linear models as opposed to Markov chain models, whose value we discuss below.

<sup>2</sup> Appendix D presents results based on classical measures from the economics literature, including intergenerational elasticity (IGE) and intergenerational correlation (IGC) derived from linear models, as well as traditional sociological measures estimated using log-multiplicative layer effect models. While some of the obtained results are consistent with our main findings, others diverge, which demonstrates the additional informational content of our measures. Appendix F provides a supplementary analysis of intergenerational mobility using memory-based measures. These measures yield the same cross-country ranking of mobility as our preferred steady state mobility index, although memory measures per se have a different conceptual interpretation. The Appendixes are available at <http://dx.doi.org/10.22617/WPS250383-2>.

Operationally, for the generation of parents in our study, we trace out the way status iterates across future generations, where the parent–child Markov transition matrix is invariant.<sup>3</sup> This approach produces mobility curves that illustrate how a given parent’s status filters across near and distant generations. The mobility curve approach, by focusing on all future generations, avoids a limitation of some Markov chain mobility measures, such as use of the second largest eigenvalue (Conlisk and Sommers, 1979; Shorrocks, 1978; Sommers and Conlisk, 1979), which measure mobility only after many generations have elapsed. These exercises thus should not be interpreted as forecasts. Rather, these curves reveal information about the persistence of current parental status across future generations if the current transition process linking parents to children were to remain constant. As such they constitute a way to extract the full informational content on intergenerational dependence from a given transition matrix.

We augment these calculations with some novel measures of mobility. Any study of mobility between parents and children in the PRC and Russia during this period must account for the fact that the observed mobility is generated by an evolving dynamical system; this evolution is part of what determines mobility. Sociology distinguishes between structural and exchange mobility (Broom and Jones, 1969; Featherman, Jones, and Hauser, 1975; Matras, 1961) for this reason. Structural mobility typically refers to mobility induced by changes in the cross-sectional distribution of outcomes. A classic example of structural mobility is the evolution of the occupational distribution resulting from movements away from agriculture. Exchange mobility refers to mobility that depends only on the probability transition function. Motivated by these ideas, we propose measures of structural and exchange mobility that naturally derive from mobility as movement. Structural mobility is measured as that mobility that is induced by the fact that the cross-sectional density is evolving. Exchange mobility is defined as the difference between overall mobility and structural mobility. Further, we propose a new measure of mobility, steady state mobility, for mobility that is intrinsic to the mechanisms linking parents and children. Here, we follow the logic of distinguishing between economic growth induced by

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<sup>3</sup> Here we follow Blume, Cholli, Durlauf, and Lukina (2025), who propose such calculations for memory across generations.

transition dynamics and growth that will occur in an economy near its steady state (Bernard and Durlauf, 1996; Durlauf, Johnson, and Temple, 2005). This differs from the way that exchange mobility is conventionally characterized because the measure respects the fact that the aggregate mobility experiences of a population do depend on the cross-section distribution of parental outcomes.

While the PRC and Russia cases both involve transitions from central planning to market economies, they contain important differences. First, the Russian transition is associated with regime collapse, whereas the PRC transition was implemented by the same regime. Second, the Russian transition was a variant of shock therapy, whereas the PRC pursued gradual reforms. Third, the PRC and Russia started their transitions from very different initial stages of economic development. Russia was already an industrialized, urban economy, whereas the PRC was poor and mostly agrarian. As a result, we will also explore ways to interpret differences between mobility patterns in the PRC and Russia given these dissimilarities in their transitions.

Our study makes two important empirical contributions. First, we document the very high levels of overall mobility in the PRC and Russia during these 3 decades of transition. With regard to education, the probability of changing educational class for children is very high for the PRC (52%–53%) and for Russia (45%–46%). These differences occur at different levels of education as mobility in the PRC is driven by children who, unlike their parents, complete either high school or college. For Russia, mobility owes entirely to increased college attendance. Similar results hold for occupational mobility. Overall mobility rates are closely aligned for the PRC (57%–58%) and Russia (54%–57%). However, the underlying sources are very different. Occupational mobility in the PRC is driven by movements out of agriculture whereas Russian mobility is driven by shifts away from the manufacturing sector.

Second, we demonstrate these dramatic changes owe largely to structural rather than exchange mobility. Approximately 68%–81% of individuals in the PRC and 57%–68% in Russia who transitioned out of their parental educational class did so as a result of the gap between the cross-sectional distribution of parental and child educational attainment. The structural component of occupational mobility accounts for 60% of the changes in

occupational classes between parents and children in the PRC. A similar trend is observed in Russia, where structural mobility is responsible for 50% of class shifts in the father-to-child sample. In the mother-to-child sample, we observed relatively smaller structural mobility, at 13%, as women in the former Soviet Union already held higher positions within the occupational structure.

After accounting for the effects of structural changes, our analysis indicates that educational steady state mobility implies individuals in Russia have a higher probability of moving out of their parental class at a steady state (42%) compared to those in the PRC (19% for father-to-child and 27% for mother-to-child samples). In contrast, the level of occupational steady state mobility is similar in the PRC and Russia, with both countries exhibiting a probability of exiting the parental class of 50%–55%.

Finally, our comparative analysis of intergenerational mobility in the transitioning societies of the PRC and Russia, alongside the more mature US, reveals higher levels of educational steady state mobility in the US and Russia compared to the PRC. Occupational steady state mobility is found to be quite similar across all three countries.

The paper is organized as follows. Section 2 provides a historical background for the transitions in the PRC and Russia. Section 3 describes the data and sample construction, and summarizes the key educational and occupational variables. Section 4 defines the Markov chain mobility measures. Section 5 presents the results of the analysis of educational intergenerational mobility in the PRC and Russia. Section 6 reports the key findings regarding occupational intergenerational mobility. Section 7 concludes.

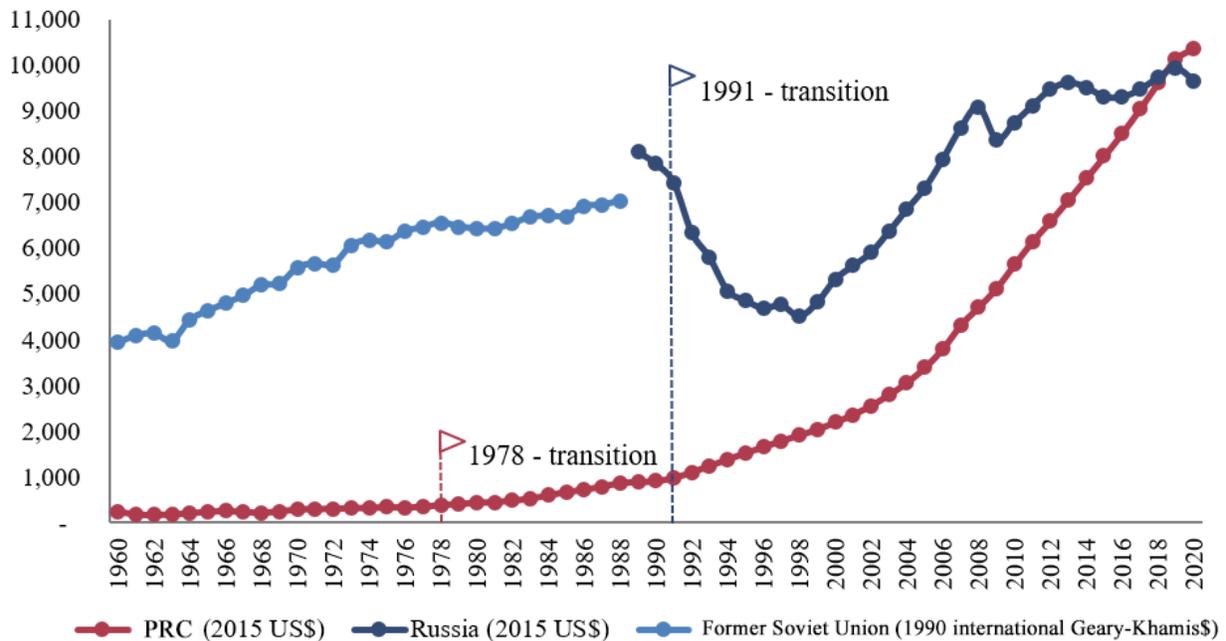
## **2 HISTORICAL BACKGROUND**

Studying the two largest transition economies, the PRC and Russia, we begin by describing the economic environment for the population cohorts to be studied and comparing the evolution and relative speed of market reforms in each country.

## 2.1 Initial Conditions

The majority of parents in our samples were born between 1950 and 1970, with an average birth year close to 1960. The Communist Revolution led the establishment of the PRC in 1949 under Chairman Mao Zedong, initiating a period of ambitious socialist central planning, including the First Five-Year Plan and the Great Leap Forward. Meanwhile, in the former Soviet Union, the communist regime had already been established for about 30 years. The country was recovering from World War II, and the era of Stalin was ending. In 1953, Khrushchev became the First Secretary of the Communist Party, beginning “The Khrushchev Thaw,” a time when stringent social repression was relaxed and a wave of positive social, cultural, and economic reforms began.

Figure 1: Evolution of Gross Domestic Product per Capita over Time

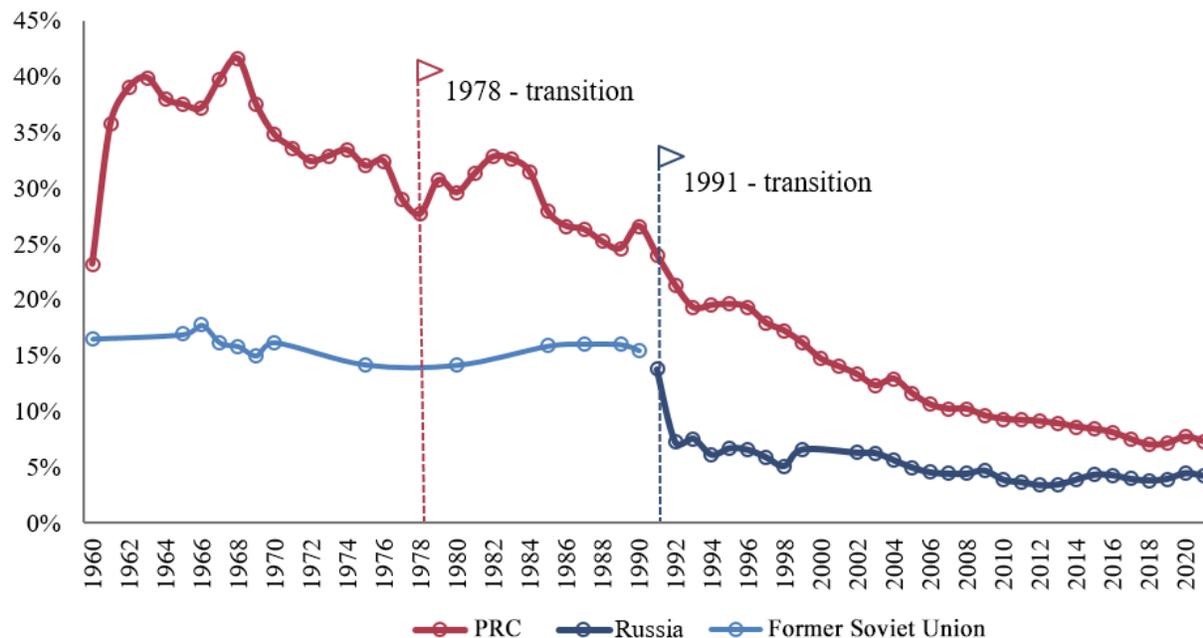


Notes: This figure illustrates the evolution of gross domestic product per capita in the PRC and Russia from 1960 to 2020. Red and blue flags indicate the beginning of market reforms in the PRC and Russia, respectively.

Sources: Maddison (2006); Our World in Data. [www.ourworldindata.org](http://www.ourworldindata.org).

By the 1960s and 1970s, the communist regime in the former Soviet Union had reached a more advanced stage, with urbanization, industrialization, and educational reforms well entrenched, unlike the active development phase in the PRC. In contrast, during this

Figure 2: Evolution of the Primary Sector's Share in Gross Domestic Product over Time

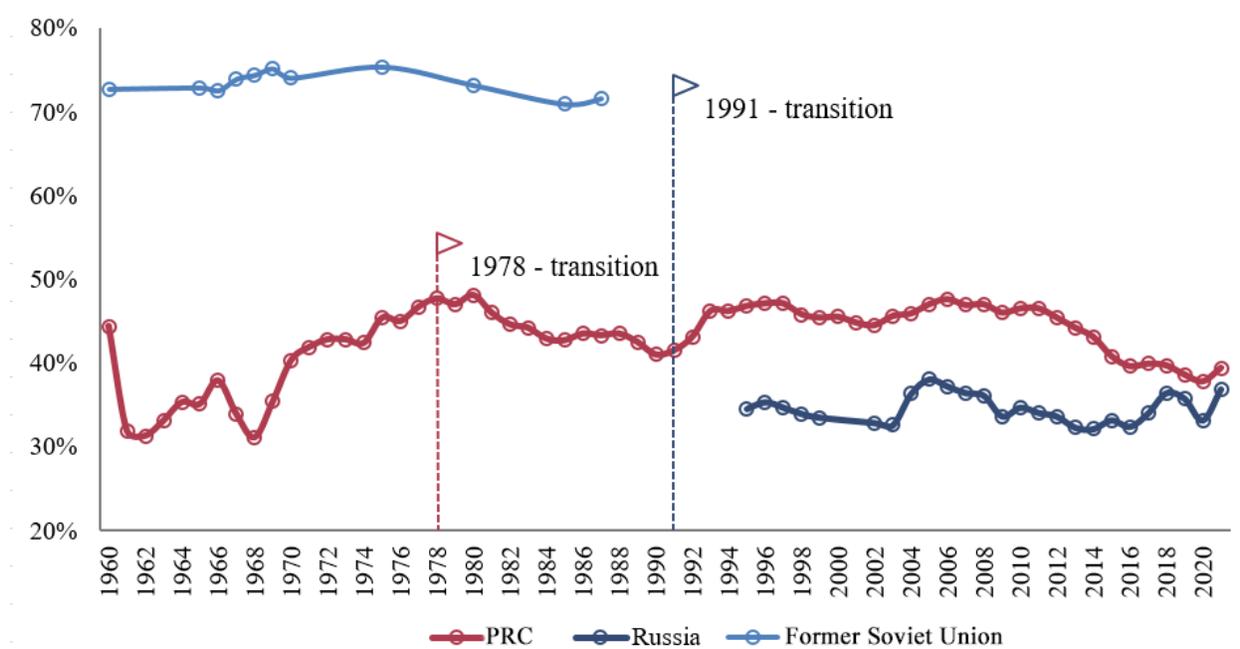


Notes: This figure illustrates the evolution of the share of primary industry in gross domestic product in the PRC and Russia from 1960 to 2020. Red and blue flags indicate the beginning of market reforms in the PRC and Russia, respectively.

Sources: Исторические материалы. [www.istmat.org](http://www.istmat.org); Federal State Statistics Service of the Russian Federation; National Bureau of Statistics of China; Our World in Data. [www.ourworldindata.org](http://www.ourworldindata.org).

same period, the PRC remained primarily an agricultural, less-developed nation. Gross domestic product (GDP) per capita in the former Soviet Union was about 20 times higher than in the PRC, and the former Soviet Union also had significantly higher annual growth rates (Figure 1). In the PRC, the primary sector accounted for approximately 37% of GDP, whereas it comprised only 16% of GDP in the former Soviet Union (Figure 2). About 82% of the PRC's population lived in rural areas (Appendix A, Figure A1), with 80% of rural workers engaged in agriculture (Appendix A, Figure A2). In comparison, only 42% of the former Soviet Union's population lived in rural areas, and merely 5% were involved in agriculture. At that time, the former Soviet Union had already developed into a mature industrialized economy that was playing a leading role globally in science and technology (Kim, 2015). Secondary industry, comprising manufacturing and construction, accounted for 74% of GDP in the former Soviet Union, compared to only 35% in the PRC (Figure 3).

Figure 3: Evolution of the Secondary Sector's Share in Gross Domestic Product over Time



Notes: This figure illustrates the evolution of the share of secondary industry in gross domestic product in the PRC and Russia from 1960 to 2020. Red and blue flags indicate the beginning of market reforms in the PRC and Russia, respectively.

Sources: Исторические материалы. [www.istmat.org](http://www.istmat.org); Federal State Statistics Service of the Russian Federation; National Bureau of Statistics of China; Our World in Data. [www.ourworldindata.org](http://www.ourworldindata.org).

Educational reforms began significantly earlier in Russia than in the PRC. The former Soviet Union introduced a 7-year compulsory education law in 1949, while the PRC established a 9-year compulsory education program only in 1986. By the early 1970s, the gross enrollment rate in secondary education was approximately 30% in the PRC, compared to over 90% in the former Soviet Union (Appendix A, Figure A3). Notably, prior studies on education in the former Soviet Union highlight significant inequality in access to higher education. Gerber and Hout (1995) pointed out that, after World War II, while secondary education expanded widely, higher education did not grow at the same rate, benefiting mainly the more advantaged social classes during the Soviet era.

## 2.2 Market Transition

In both countries, the children included in our sample were born between 1978 and 1997. The average birth year of children in the China Family Panel Studies (CFPS) is

1987, compared to 1986 in the Russia Longitudinal Monitoring Survey conducted by the National Research University Higher School of Economics (RLMS-HSE). This indicates that children in the PRC sample were born shortly after the onset of the PRC's market reforms in 1978, whereas most children in the Russian sample were born before the start of Russia's economic transition in 1991.

Among the significant structural changes, the most notable is the dramatic decline in the share of secondary industry in Russia, which dropped from around 70% in the 1980s to 35% in the 1990s, immediately following the transition (Figure 3). Sachs and Woo (1994) highlighted that excessive reliance on heavy industry and state sector employment during the Soviet era posed a major barrier to a successful transition. This reliance led to decreased flexibility in adapting the occupational structure to meet the growing and shifting demands of consumers for goods and services in a more market-oriented system. Bessudnov (2016) identified key changes in occupational structure resulting from the post-Soviet industrial crisis. These changes included a decrease in the share of less skilled technical workers, an expansion of the services sector, and a stable percentage of professionals and managers within the labor force. Referring to the concept of “advantages of backwardness” from Gerschenkron (1962) and Fischer (1993), Sachs and Woo (1994) suggest the transformation of occupational structure in the PRC—from low-productivity agriculture to higher-productivity industry—was easier than in the former Soviet Union. In the PRC, the share of primary industry in GDP fell from around 30% in the 1970s to 10% in the 2000s. In contrast, Russia saw a drop from 15% to 5% during the same period (Figure 2). Concurrently, employment in the agriculture sector fell from 80% to 44% in the PRC and from 17% to 11% in Russia (Appendix A, Figure A2).

The Russian economy faced a severe crisis following the collapse of the former Soviet Union. From 1991 to 1998, GDP per capita dropped by 60% (Figure 1), returning to pre-transition levels only in 2006–2007. This “shock therapy” phase was characterized by extremely high inflation and prolonged and deep recession (Sachs and Woo, 1994). In contrast, the PRC's transition from a planned economy to a market economy was much smoother, with no years of negative growth. In fact, the 1980s and 1990s in the PRC were decades of rapid industrialization and economic growth. The PRC's gradual reforms

have been praised for their ex-post coherence in sequencing that enabled institutions and leaders to adapt gradually to a market-based system.

In 1999, the PRC initiated a significant expansion of higher education. By the 2010s, the gross enrollment ratio for secondary education in the PRC had reached nearly 100%, matching Russian levels (Appendix A, Figure A3). Roshchina (2012) noted that, following the market transition in Russia, there was a boom in both the demand for and the supply of higher education. Between 1995/96 and 2009/10, the number of universities increased by 50%, while the number of students rose from 2.7 million to 7 million. Despite these advancements, considerable inequalities in access to higher education still exist (Roshchina (2012)). Unlike during the Soviet era, higher education in contemporary Russia is no longer state-funded, resulting in individuals having to cover their own educational costs. Over time, tuition fees have increased, and, as a result, poorer families continue to experience substantial barriers to accessing higher education.

### **3 DATA**

#### **3.1 Survey Description**

Panel data make it possible to link the adult outcomes of a large number parent–child pairs. The data for the PRC come from five waves of the CFPS,<sup>4</sup> a panel survey conducted by the Institute of Social Science Survey at Peking University. The CFPS sample is nationally representative and accounts for approximately 95% of the PRC’s population.<sup>5</sup> The sample size varies from 12,000 to 15,000 households, translating to about 30,000 to 37,000 individuals across different years. For Russia, the data come from the RLMS-HSE, a long-time panel study conducted by the National Research University Higher School of Economics. This study has 24 annual waves available from 1994 to 2019.<sup>6</sup> The RLMS-HSE is the only representative micro-survey in Russia with a substantially large panel component. The data consist of both a repeated cross-sectional part, which is

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<sup>4</sup> Namely, CFPS 2010, CFPS 2012, CFPS 2014, CFPS 2016, CFPS 2018.

<sup>5</sup> Since 2012, five provinces (Liaoning, Henan, Shanghai, Guangdong, and Gansu) have been oversampled, allowing for regional analysis at the provincial level.

<sup>6</sup> Except 1997 and 1999, when the RLMS-HSE was not carried out.

representative at the national level, and a panel part. The sample size for the RLMS-HSE varies from 4,000 to 8,000 households and approximately 11,000 to 18,000 individuals each year. Like the CFPS,<sup>7</sup> the RLMS-HSE utilizes multi-stage stratified probability sampling procedures.<sup>8</sup>

### **3.2 Sample Construction**

We obtain a representative sample of children from specific birth cohorts and construct variables using data from all available survey years to maximize the number of child–parent pairs. Our approach involves three key steps. First, we choose a baseline year for the children’s sample in each dataset that maximizes the number of parent–child pairs with valid data. This is 2018 for the CFPS, which is a short panel, and 2011 for the RLMS-HSE.

Second, from the chosen wave, we selected individuals aged 22 to 40 in the latest survey wave. This age range follows existing literature (Fan et al., 2021; Solon, 1992), and is motivated by a straightforward rationale: (i) setting the lower bound at 22 reduces the likelihood that children are still in school; and (ii) setting the upper bound at 40 increases the chances of finding parents for matching child–parent pairs in the data. If multiple children come from the same family, we include all of them in our sample, considering this set of observations is representative of people aged 22 to 40 at the time of the latest survey. As a robustness check, Appendix H presents results when only the eldest son in each household is included in the sample.

Third, we match these children to their parents. We obtain parental information directly from parents who are co-residents in any survey wave and indirectly from questions answered by children about non-co-resident parents. In constructing pairs, we not only utilize data from the baseline year but also trace backward and forward across survey waves to gather as much information as possible. A child–parent pair is considered valid if we find at least one parent’s information on age, education, or occupation. Parents include biological parents, stepparents, and spouses of biological or stepparents. If different

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<sup>7</sup> For more information on sampling procedures, please refer to the CFPS official website: <https://www.issf.pku.edu.cn/cfps/en>.

<sup>8</sup> For more information, please refer to the RLMS-HSE website: <https://www.hse.ru/en/rlms>.

spouses appear across survey waves, for the CFPS we select the spouse who appeared first; for the RLMS-HSE we choose the spouse recorded before the child reached the age of 10. Following these procedures, our final sample includes 8,788 child–parent pairs for the PRC and 3,718 for Russia.

### 3.3 Summary Statistics

Table B1 in Appendix B reports descriptive statistics for the constructed samples. In the PRC, the average age of children in our sample is 31 at the time of the latest survey wave. The average ages of fathers and mothers are 59 and 56 years, respectively. In the RLMS-HSE sample, the average ages of children, mothers, and fathers are approximately 1–2 years older than those in the CFPS sample. The share of males among children in both samples is slightly higher (by 2 percentage points) than the official statistics: our CFPS sample has 53% of males compared to the 51% males reported by the National Bureau of Statistics of China (NBS) in 2018, while the RLMS-HSE sample has 48% males compared to 46% reported by the Federal State Statistics Service (FSSS) of Russia (Appendix B, Table B2). The same issue of gender bias in the RLMS-HSE sample was highlighted by Borisov and Pissarides (2020). Like Borisov and Pissarides (2020), we partially address this issue by presenting our results separately for fathers and mothers.

Table 1: Distribution of Educational Attainment

	People's Republic of China			Russia		
	Children	Fathers	Mothers	Children	Fathers	Mothers
Primary school and below	0.15	0.49	0.66	0.00	0.00	0.00
Middle school	0.31	0.32	0.22	0.06	0.05	0.05
High school	0.20	0.15	0.09	0.54	0.85	0.80
College and above	0.34	0.04	0.02	0.40	0.10	0.15

Notes: This table shows the distribution of educational attainment among children and their parents in our constructed samples from the China Family Panel Studies (CFPS) and the Russian Longitudinal Monitoring Survey (RLMS-HSE). Survey weights were applied to compute these shares.

Source: Authors' calculations.

Table 1 indicates that parents in Russia have a significantly higher level of education compared to those in the PRC. This is expected, as educational reforms began much earlier in the former Soviet Union than in the PRC. In the PRC, the gross secondary

Table 2: Distribution of Occupational Classes

	People's Republic of China			Russia		
	Children	Fathers	Mothers	Children	Fathers	Mothers
High-skilled occupations	0.42	0.19	0.12	0.45	0.27	0.46
Middle-skilled occupations	0.22	0.10	0.12	0.25	0.14	0.31
Low-skilled occupations	0.36	0.72	0.75	0.31	0.60	0.24

Notes: This table shows the distribution of three major occupational classes among children and their parents in our constructed samples from the China Family Panel Studies (CFPS) and the Russian Longitudinal Monitoring Survey (RLMS-HSE). Survey weights were applied to compute these shares.

Source: Authors' calculations.

education enrollment ratio increased from around 40% in the 1980s to nearly 100% in the 2010s, whereas in Russia it has remained stable over time, fluctuating between 90% and 100% (Appendix A, Figure A3). In the PRC sample, 19% of fathers have “high school and above” education, which is slightly higher than the 11% of mothers with similar qualifications (Table 1). In contrast, in Russia, 95% of both fathers and mothers have attained “high school and above” education. Additionally, a larger proportion of women in Russia hold a “college and above” degree. This trend of higher educational attainment among women compared to men in the former Soviet Union was documented by Titma, Tuma, and Roosma (2003). Despite these stark differences in the educational attainment of parents in Russia and the PRC, the distribution of education among children is much more comparable between the two countries, reflecting the PRC’s significant progress in implementing educational reforms during the study period.

In our PRC sample, approximately 72% of fathers and 75% of mothers hold low-skilled occupations, primarily working as farmers. Among the children, the largest group (42%) holds high-skilled occupations (Table 2).<sup>9</sup> Similarly, in Russia, around 45% of children have high-skilled jobs, but only about 1% of parents were involved in agriculture, as shown in Figure B2 in Appendix B. The low share of farmers among Russian parents can be attributed to the early industrialization in the former Soviet Union (1928). Notably, the occupational specialization of fathers compared to mothers is much less uniform in

<sup>9</sup> Our baseline occupational classification is the international International Standard Classification of Occupations (ISCO)-08 system used in the RLMS-HSE. To ensure comparability, we first matched the Chinese Standard Classification of Occupations (CSCO) from the CFPS to ISCO-08, and then aggregated it into three broad occupational classes.

Russia than in the PRC (Appendix B, Figures B1-B2). Previous studies describe the gender imbalance in the distribution of occupations in the former Soviet Union under socialism, with women more prevalent in managerial and professional occupations, as well as in white-collar work (semi-professionals, clerks, sales, and services). In contrast, a larger share of males than females held very top managerial positions, though this class is relatively small; and the majority of men belonged to the industrial working class, which constitutes a larger share of the class structure (Marshall et al., 1995; Titma et al., 2003). This observation is consistent with the occupational distribution in our parental sample constructed from the RLMS-HSE. According to Titma et al. (2003), the higher education levels and prevalence of women in white-collar jobs was a consequence of high male mortality during World War II, which pushed women into the workforce and likely motivated them to pursue higher education to avoid physically demanding labor.

Tables B3 and B4 in the Appendix B present data representativeness checks, comparing the distribution of education and occupation among children in our samples with official statistics from Russia and the PRC. The comparison shows no significant discrepancies.

#### **4 MARKOV CHAIN MOBILITY MEASURES**

Markov chain transition matrices are a natural way to model the conditional probability structure linking the class of parents and children given the categorical nature of our outcome variables. Markov chains allow for richer characterizations of the persistence of parental class across generations than linear measures.<sup>10</sup> Markov chain models have been utilized to study the intergenerational transmission of social class in sociology since Prais (1955).<sup>11</sup> A recent review by Song (2021) highlights the ongoing significance of these models.

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<sup>10</sup>Intergenerational elasticities (*IGE*) and intergenerational correlations (*IGC*) have been the workhorse statistics for assessing intergenerational persistence. Appendix D compares the proposed Markov chain measures with the traditional *IGE* and *IGC*, using several illustrative examples.

<sup>11</sup>For an extensive review of Markov chain mobility measures, see Boudon (1973), Dardanoni (1993), and Van de Gaer, Schokkaert, and Martinez (2001).

To introduce the mobility measures used in this paper, consider a setting with  $n$  social classes. Let  $P$  be the transition matrix, where each entry  $p_{ij}$  represents the probability that an individual born to parents in class  $i$  transitions to class  $j$ . The dynamics of population outcomes then evolve according to:

$$\mu^t = \mu^{t-1} \cdot P, \quad (1)$$

where  $P$  is an  $n \times n$  matrix of transition probabilities  $p_{ij}$ , and  $\mu^t$  is the distribution of classes among every subsequent generation  $t$ . If the transition matrix is primitive,<sup>12</sup> as  $t \rightarrow \infty$ , the marginal distribution converges to what is called the invariant or steady state distribution, denoted as  $\mu^*$ . Mobility measures are thus derived from the dynamics of this system as it moves to its steady state.

Considering mobility as movement, we can distinguish between “exchange” and “structural” mobility, concepts that have been widely studied in the sociology literature (McClendon, 1977; Sobel, 1983; Sobel, Hout, and Duncan, 1985).<sup>13</sup> This distinction is particularly important when examining educational and occupational intergenerational mobility in transition economies such as the PRC and Russia. Intuitively, when economies undergo structural changes (e.g., rapid development, economic transition), significant exogenous shifts in educational or occupational structures ( $\mu^t$  versus  $\mu^{t+1}$ , in our notation) can mechanically inflate standard mobility indices (like *IGE* or *IGC*). Consequently, conflating the trends in structural and exchange mobility might lead to misleading conclusions (Jarvis and Song, 2017).

The stabilization of the marginal distribution at  $\mu^*$  over time is a key property that allows us to apply the classical definition of exchange mobility—defined as the extent of movement between classes in the absence of changes in marginal distributions (Berger and Snell, 1957). In this study, we adopt a decomposition framework from the sociology literature that distinguishes between overall, structural, and exchange mobility (also

<sup>12</sup>There exists power  $k$  such that  $P^k$  is a positive matrix.

<sup>13</sup>In this paper, we primarily use the “movement” definition of mobility to analyze patterns in the PRC and Russia. However, Appendix F provides supplementary results based on memory measures, along with a detailed explanation of the conceptual differences between the two approaches to measuring intergenerational mobility.

referred to as “circulation“ mobility) (Broom and Jones, 1969; Featherman et al., 1975).<sup>14</sup> This approach originates in the work of Matras (1961).

We define *overall mobility* as the expected fraction of dynasties whose class changes from generation  $t$  to generation  $t + 1$ :

$$OM^t(P, \mu^t, t) = 1 - \sum_i \mu_i^t \cdot P_{ii}. \quad (2)$$

Overall mobility can be decomposed into two parts: exchange and structural mobility. *Structural mobility* is defined as the part of movement that changes the marginal distribution of generations across classes:

$$SM^t(P, \mu^t, t) = \|\mu^t - \mu^t \cdot P\|_{TV} = \frac{1}{2} \cdot \sum_i |\mu_i^t - \mu_i^{t+1}|. \quad (3)$$

*Exchange mobility* is defined residually as the part of movement that does not change the cross-sectional distribution across classes at  $t$ :

$$EM^t(P, \mu^t, t) = OM(P, \mu^t, t) - SM(P, \mu^t, t). \quad (4)$$

Structural mobility vanishes over time because as  $t \rightarrow \infty$  marginal distributions converge to the steady state distribution  $\mu^*$ . Therefore, at the steady state, overall mobility converges to exchange mobility. We refer to this measure as *steady state mobility*, which is computed as:

$$SSM(P, \mu^*) = 1 - \sum_i \mu_i^* \cdot P_{ii}. \quad (5)$$

The distinction between *overall* and *steady state mobility* moves beyond the structural/exchange dichotomy in previous studies. Structural mobility and exchange mobility capture the ways that the transition affects mobility. Steady state mobility, in contrast, addresses the counterfactual question: “What level of intergenerational

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<sup>14</sup>These measures are also used in Butaeva, Durlauf, and Shapoval (nd).

movement would persist across generations in the long run once the underlying Markov process has stabilized?”

Finally, note that overall mobility  $OM$  can also be decomposed into upward and downward mobility. To achieve this, equation (2) can be estimated separately for individuals who improve their class relative to their parents, defining upward overall mobility, and for those who experience a decline in class compared to their parents, defining downward mobility.

To analyze class-specific heterogeneity in mobility patterns, we employ a well-established measure from the Markov chain literature—mean time to exit each initial class (Kemeny, Snell, et al., 1969):

$$MTE_i(P) = (1 - P_{ii}) \cdot \sum_{t=1}^{\infty} t \cdot P_{ii}^{t-1} \quad (6)$$

The  $MTE$  estimates how many generations, on average, it takes for descendants to exit from each social class.

## 5 EDUCATIONAL MOBILITY

We begin by presenting the estimated educational transition matrices for the PRC and Russia. Table 3 and Table 4 report the matrices along with 95% bootstrap confidence intervals (CIs) for the transition probabilities.<sup>15</sup> Several insights can be drawn from these tables. First, the point estimates of transition probabilities are similar for the father-to-child and mother-to-child samples, suggesting the transmission of educational class from father to child and from mother to child is the same in each country. Second, in both the PRC and Russia, the elements of transition matrices above the main diagonal are higher than those below, suggesting a greater prevalence of upward educational intergenerational mobility. This means that, in both countries, most children attain higher levels of education than their parents. Third, when comparing transition probabilities across different initial parental educational levels, we find that (i) children whose parents have a middle school education

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<sup>15</sup>Throughout this paper, we use standard percentile bootstrap confidence intervals.

or below have around a 1.6 times higher chance of surpassing their parents' education level in Russia (77%–83%) compared to the PRC (49%–50%); (ii) children of parents with a high school degree have a much lower chance of receiving a lower degree in Russia than in the PRC, but have a substantially higher chance of attaining a college degree or higher in the PRC than in Russia; (iii) children of parents with a college degree and above are much more likely to achieve the same level of education in the PRC (over 90%) compared to Russia (around 60%).

Table 3: Educational Transition Matrices for the People's Republic of China

Child		Middle and below	High school	College or above
Father	Middle and below	0.51 [0.50,0.53]	0.21 [0.20,0.22]	0.28 [0.27,0.29]
	High school	0.27 [0.24,0.29]	0.23 [0.20,0.25]	0.51 [0.48,0.53]
	College or above	0.03 [0.01,0.05]	0.11 [0.08,0.14]	0.86 [0.82,0.89]
Child		Middle and below	High school	College or above
Mother	Middle and below	0.50 [0.49,0.51]	0.21 [0.20,0.22]	0.29 [0.28,0.30]
	High school	0.18 [0.16,0.21]	0.16 [0.13,0.18]	0.66 [0.63,0.69]
	College or above	0.02 [0.00,0.04]	0.08 [0.04,0.12]	0.90 [0.86,0.94]

Notes: This table presents the educational transition matrices for the People's Republic of China. The numbers in brackets indicate 95% confidence intervals, calculated from 1,000 bootstrap samples.

Source: Authors' calculations.

Figures 4 and 5 document the evolution of educational distributions within the Markov chain framework for mother-to-child and father-to-child samples in the PRC and Russia. Namely, the figures display the educational distribution among parents and children, as well as the steady state distribution, denoted as  $\mu^*$ , following the notation in Section 4. The distributions of parental and child classes have already been presented in Section 3 (Table 1). Three more observations can be made here. First, there is minimal difference between distributional patterns from the father-to-child and mother-to-child samples in each country. Second, the steady state educational distribution  $\mu^*$  in the PRC differs significantly from the current parental and children's distributions, indicating a large number of generations between the current stage of the Markov process and the steady state. Conversely, in Russia, the steady state distribution is very similar to the children's

Table 4: Educational Transition Matrices for Russia

Father \ Child	Middle and below	High school	College or above
	Middle and below	0.17 [0.11,0.23]	0.70 [0.63,0.77]
High school	0.05 [0.04,0.06]	0.55 [0.53,0.56]	0.40 [0.39,0.42]
College or above	0.01 [0.00,0.02]	0.37 [0.32,0.42]	0.62 [0.57,0.67]

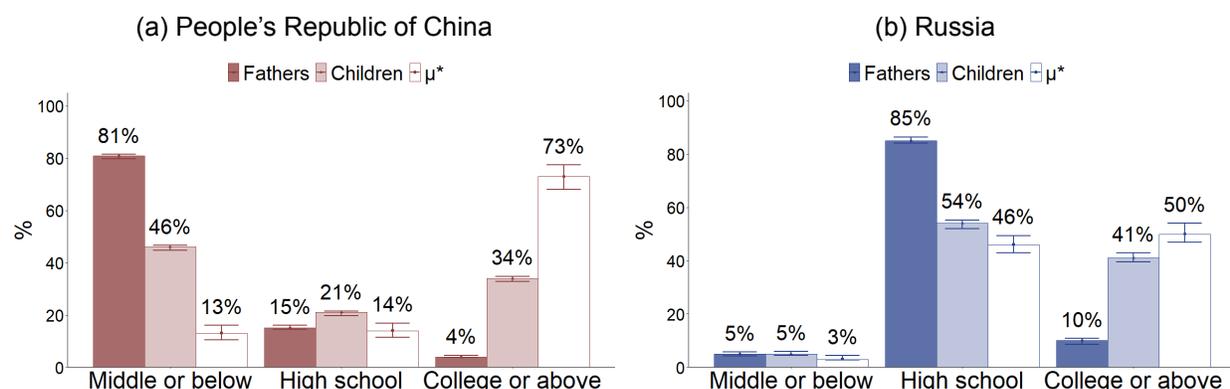
  

Mother \ Child	Middle and below	High school	College or above
	Middle and below	0.24 [0.18,0.30]	0.68 [0.61,0.74]
High school	0.05 [0.04,0.06]	0.56 [0.55,0.58]	0.39 [0.37,0.40]
College or above	0.02 [0.01,0.03]	0.37 [0.33,0.41]	0.61 [0.57,0.65]

Notes: This table presents the educational transition matrices for Russia. The numbers in brackets indicate 95% confidence intervals, calculated from 1,000 bootstrap samples.

Source: Authors' calculations.

Figure 4: Distribution of Educational Attainment in Father-to-Child Samples

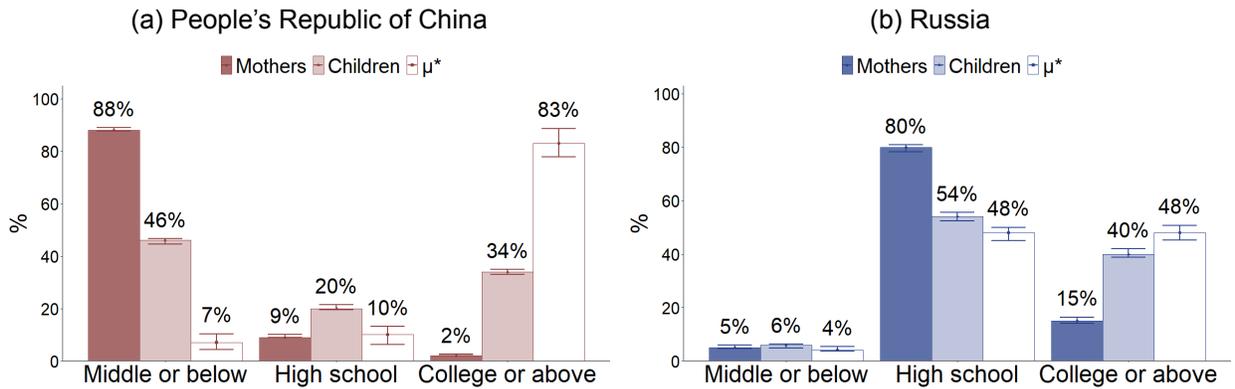


Notes: These figures illustrate the evolution of educational distribution from fathers to children, and ultimately to the steady state distribution  $\mu^*$ , in the People's Republic of China and Russia. Error bars indicate 95% confidence intervals, derived from 1,000 bootstrap samples.

Source: Authors' calculations.

distribution of education. Third, notably, the steady state distribution itself indicates a more favorable expected equilibrium for the PRC compared to Russia. In the PRC, the majority of the population (73%–83%) is projected to attain a college degree or higher, whereas in Russia, the population will be nearly evenly split between those with a high school education and those with a college degree or higher.

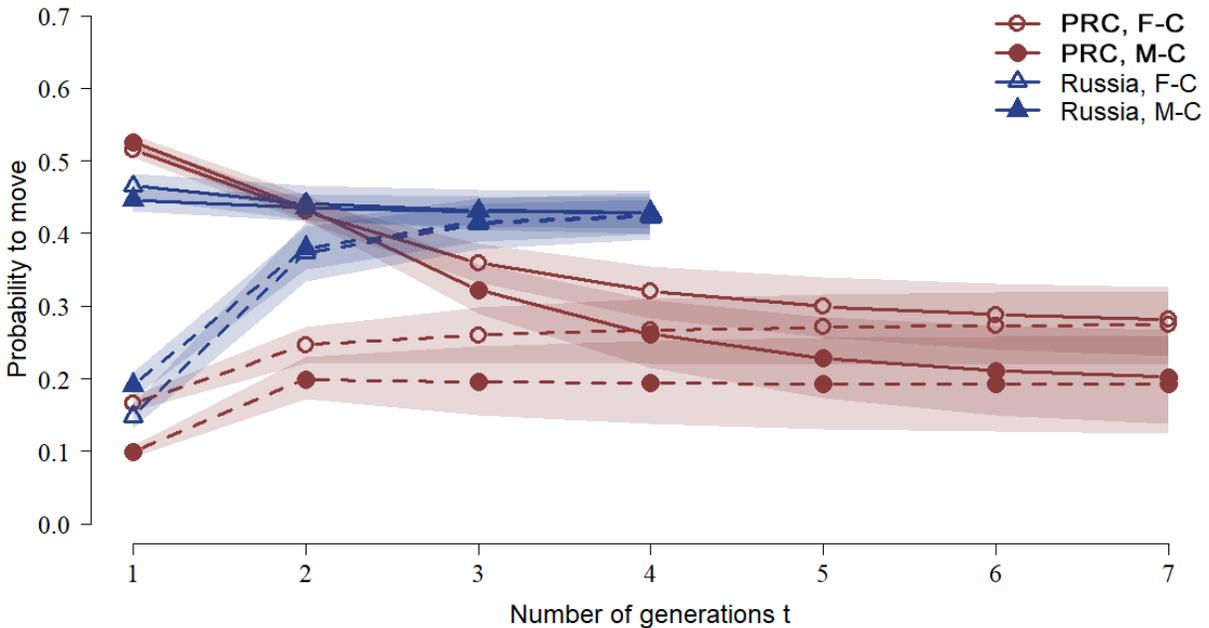
Figure 5: Distribution of Educational Attainment in Mother-to-Child Samples



Notes: These figures illustrate the evolution of educational distribution from mothers to children, and ultimately to the steady state distribution  $\mu^*$ , in the People's Republic of China and Russia. Error bars indicate 95% confidence intervals derived from 1,000 bootstrap samples.

Source: Authors' calculations.

Figure 6: Dynamics of Overall, Structural, and Exchange Educational Mobility



PRC = People's Republic of China.

Notes: This figure plots overall mobility  $OM^t(P, \mu^t, t)$  (solid lines), exchange mobility  $EM^t(P, \mu^t, t)$  (dashed lines), and structural mobility  $SM^t(P, \mu^t, t)$  (the vertical distance between solid and dashed lines) for father-to-child (F-C) and mother-to-child (M-C) samples. Steady state mobility  $SSM(P, \mu^*)$  is represented by the final (rightmost) point on each mobility curve, where overall mobility equals exchange mobility. Shaded areas represent 95% confidence intervals derived from 1,000 bootstrap samples.

Source: Authors' calculations.

Table 5: Estimates of Overall, Structural, and Exchange Educational Mobility Measures

	Father-to-child		Mother-to-child	
	PRC	Russia	PRC	Russia
OM, t=1	0.515	0.466	0.526	0.446
OM upward, t=1	0.469	0.387	0.507	0.346
OM downward, t=1	0.046	0.079	0.019	0.100
SM, t=1	0.350	0.317	0.427	0.255
EM, t=1	0.166	0.148	0.099	0.191
SSM, t*	0.274	0.423	0.192	0.424

PRC = People's Republic of China.

Notes: This table present the results on estimated movement mobility measures from eq. (2) - (5): overall mobility  $OM^t(P, \mu^t, t)$ , structural mobility  $SM^t(P, \mu^t, t)$ , and exchange mobility  $EM^t(P, \mu^t, t)$ .

Source: Authors' calculations.

Next, we examine the overall, structural, and exchange mobility introduced in Section 4. Figure 6 shows that children in our constructed samples (for  $t = 1$ ) have a higher probability of not following their parents' educational class in the PRC ( $OM^{t=1}$  is around 52%–53%) than in Russia ( $OM^{t=1}$  is 45%–46%), reflecting the common perception of high mobility in the PRC. From Table 5, we see that upward mobility prevails in both countries and accounts for more than 90% ( $OM^{t=1}_{upward}/OM^{t=1}$ ) of mobility in the PRC and around 80% in Russia.<sup>16</sup> However, in both countries, most overall mobility is driven by structural changes. The probability of leaving the parental educational class owing to changes in educational structure ( $SM^{t=1}/OM^{t=1}$ ) accounts for 68% of overall mobility in the father-to-child sample and 81% in the mother-to-child sample in the PRC. In Russia, these shares are 68% and 57%, respectively. Therefore, in each country, structural mobility accounts for more than half of the overall mobility. In the PRC, most of the parents in our sample had only middle school or lower schooling, while the subsequent generations have sharply shifted toward higher levels of education. The substantial difference in the distribution of education between parents and children owes to the timing of major educational reforms in the PRC, including a compulsory education law in 1986 and the expansion of tertiary education in the 1990s. Only a small portion of parents in our PRC sample benefited from these reforms. In contrast, major educational reforms started

<sup>16</sup>The complete set of mobility measure estimates for each generation  $t$ , up to the steady state, is presented in the Appendix E.

much earlier with the 7-year compulsory education law introduced in 1949 in the former Soviet Union. Figures 4 and 5 illustrate that, in Russia, the major shift in educational distribution between parents and children occurs at the higher levels of education: it is a shift from predominantly high school degrees to college and higher levels of education.<sup>17</sup>

From Figure 6 we can also see that current exchange mobility ( $EM^{t=1}$  represented by the first points at dashed lines) is relatively small and rather similar for the father-to-child sample in the PRC and the mother-to-child sample in Russia (and vice versa). In other words, the estimated  $EM^{t=1}$  suggests that in both the PRC and Russia the current likelihood of participating in movements not altering the educational structure is around 10%–20%. We argue that a fairer cross-country comparison is provided by comparing intergenerational mobility at the steady state  $SSM$ . If societies are in their steady states, mobility is substantially larger in Russia ( $SSM = EM^{t=4}$  is around 42% for both father-to-child and mother-to-child samples) compared to the PRC ( $SSM = EM^{t=7}$  is 27% in the father-to-child sample and 19% in the mother-to-child sample). This implies, that under current educational mobility patterns, if the observed transition probabilities persist across future generations, Russia will become a more mobile society at the steady state than the PRC.

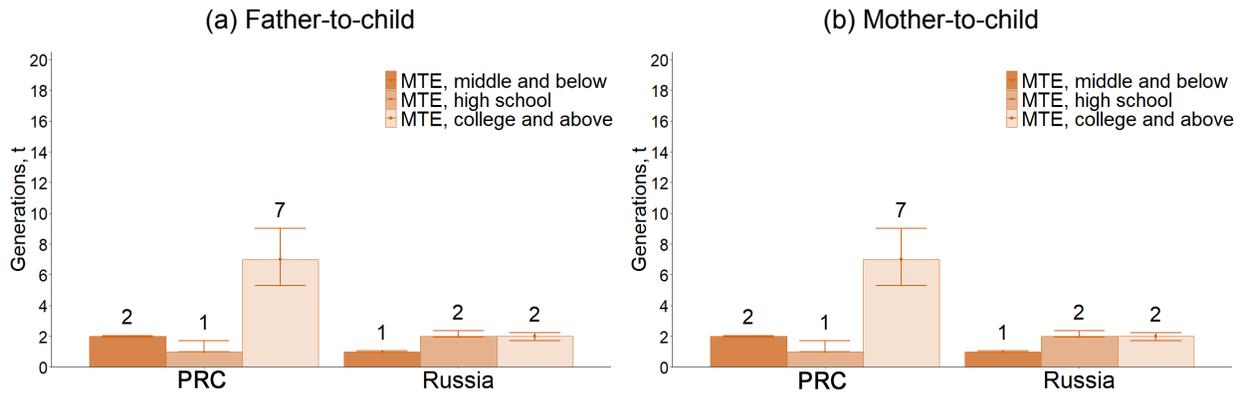
## 5.1 Heterogeneity

The results on mean time to exit each educational class, presented in Figure 7, offer insights into class-specific patterns of intergenerational mobility in the PRC and Russia. In the PRC, once individuals complete college, their descendants tend to remain in this class for a long time. On average, it takes seven generations in the father-to-child sample and 10 generations in the mother-to-child sample for downward mobility to occur from this educational tier. High school graduates are the most mobile, with descendants exiting after just one generation on average. Those with “middle and below” education exhibit slightly more persistence, with an average of two generations needed to exit this class in the PRC. In contrast, mobility in Russia is notably higher across all educational classes.

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<sup>17</sup>The development of education and major educational reforms in the PRC and Russia are discussed in more detail in Section 2.

Figure 7: Mean Time to Exit Each Educational Class



PRC = People's Republic of China.

Notes: These figures display the mean time to exit  $MTE$  each educational class, as defined in equation (6), separately for father-to-child and mother-to-child samples in the PRC and Russia. The error bars represent 95% confidence intervals derived from 1,000 bootstrap samples.

Source: Authors' calculations.

The “high school” and “college and above” classes each take, on average, two generations to exit, while those with “middle and below” education exit in just one generation.

Overall, our results on educational mobility suggest steady state exchange mobility in Russia is significantly greater than in the PRC. At the steady state, individuals in Russia have an almost three times higher (42%) likelihood of moving to an education class different than that of their parents compared to in the PRC (19%–27%). The overall mobility of the current generation of parents and children  $OM^{t=1}$  demonstrates an opposite pattern, but this difference owes entirely to differences in structural mobility. Therefore, the new mobility measures we introduce enable us to avoid the misleading conclusion that educational mobility is higher in the PRC than in Russia.

## 5.2 Comparison to the United States

In this subsection, we compare intergenerational educational mobility in the PRC and Russia with that in the US. This comparison highlights some valuable properties of the measures proposed in Section 4 when comparing intergenerational mobility in societies that exhibit substantial structural changes with that in stable developed economies.

The examination of educational transition matrices for the US reveals two main observations. First, as seen in Table 6, the point estimate of educational transition probabilities for father-to-child and mother-to-child samples are similar, just as in the PRC and Russia. Second, upward mobility is only slightly higher than downward mobility. In the US, children whose parents have a middle school or lower education have about a 90% chance of attaining a higher level of education, compared to around 80% in Russia and 55% in the PRC. Additionally, there is almost no chance of achieving only a middle school or lower education if one’s parents graduated from high school or above. The differences between upward and downward educational mobility that we observe in the US are less pronounced in the PRC and Russia.

Table 6: Educational Transition Matrices for the United States

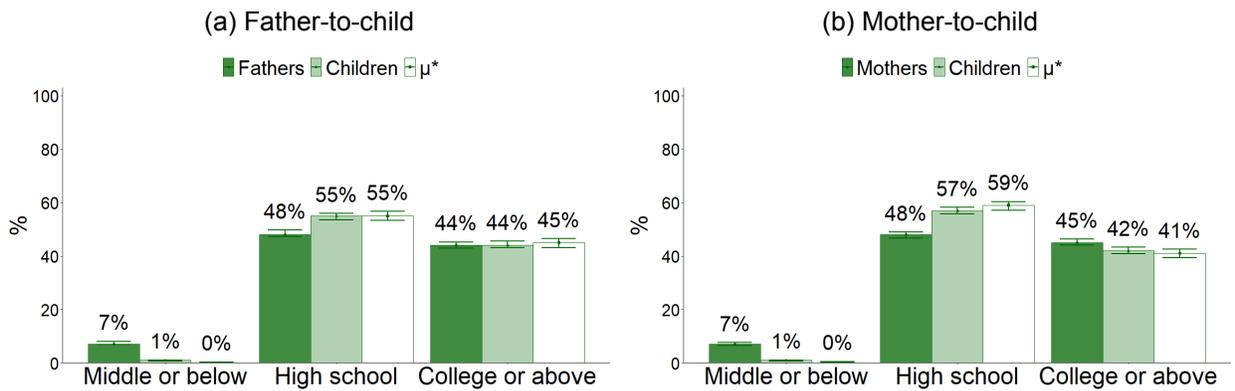
		Child		
		Middle and below	High school	College or above
Father	Middle and below	0.09 [0.07,0.12]	0.64 [0.60,0.69]	0.27 [0.23,0.30]
	High school	0.00 [0.00,0.00]	0.70 [0.68,0.71]	0.30 [0.28,0.31]
	College or above	0.00 [0.00,0.00]	0.36 [0.35,0.38]	0.63 [0.62,0.65]
		Child		
		Middle and below	High school	College or above
Mother	Middle and below	0.09 [0.06,0.11]	0.67 [0.63,0.71]	0.24 [0.20,0.27]
	High school	0.00 [0.00,0.01]	0.72 [0.71,0.74]	0.27 [0.26,0.29]
	College or above	0.00 [0.00,0.00]	0.39 [0.38,0.41]	0.61 [0.59,0.62]

Notes: This table presents the educational transition matrices for the United States. The numbers in brackets indicate 95% confidence intervals, calculated from 1,000 bootstrap samples.

Source: Authors’ calculations.

Figure 8 shows that the evolution of the distribution of education is similar between mother-to-child and father-to-child samples. The distributions align with expectations for a mature, developed economy—a very low share of individuals with middle school education and below, and a substantial share with high school education and above, among both parents and children. The steady state distribution closely resembles the current children’s distribution, suggesting that the Markov chain process in the US is already close to the steady state. The steady state distribution itself suggests a slightly less favorable expected equilibrium compared to Russia, but a substantially more favorable one than in the PRC.

Figure 8: Distribution of Educational Attainment in the United States

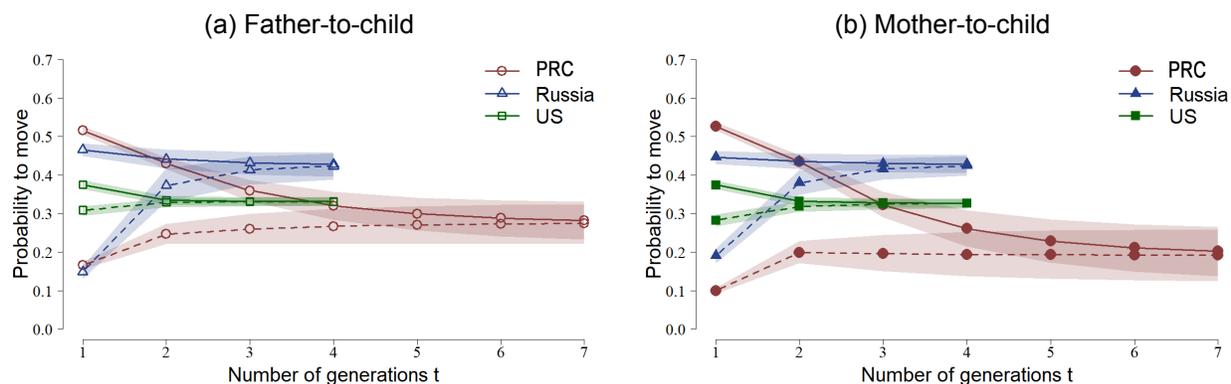


Notes: These figures illustrate the evolution of educational distribution from fathers (mothers) to children, and ultimately to the steady state distribution  $\mu^*$ , in the United States. Error bars indicate 95% confidence intervals, derived from 1,000 bootstrap samples.

Source: Authors' calculations.

In this equilibrium, the proportion of individuals with a college degree or higher is slightly lower than that of high school graduates.

Figure 9: Dynamics of Overall, Structural, and Exchange Educational Mobility: A Comparison with the United States



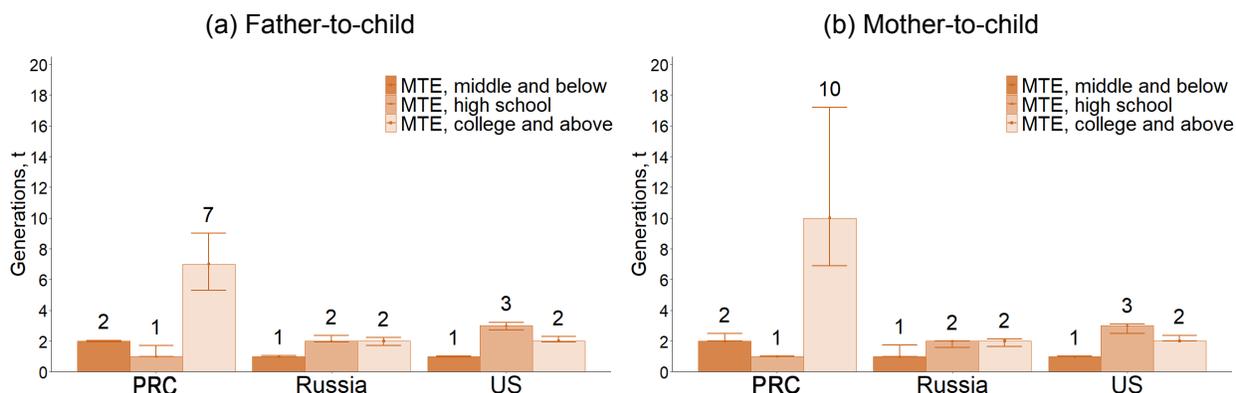
PRC = People's Republic of China, US = United States.

Notes: These figures plot overall mobility  $OM^t(P, \mu^t, t)$  (solid lines), exchange mobility  $EM^t(P, \mu^t, t)$  (dashed lines), and structural mobility  $SM^t(P, \mu^t, t)$  (the vertical distance between solid and dashed lines) for father-to-child (F-C) and mother-to-child (M-C) samples. Steady state mobility  $SSM(P, \mu^*)$  is represented by the final (rightmost) point on each mobility curve, where overall mobility equals exchange mobility. Shaded areas represent 95% confidence intervals, derived from 1,000 bootstrap samples.

Source: Authors' calculations.

Our results from (Figure 9) suggest that, in comparison to Russia and the PRC, in the US children have the lowest current probability of deviating from their parents' educational class ( $OM^{t=1} = 0.38$ ). The share of upward mobility in total overall mobility in the US (52%–56%) is also smaller than in Russia ( $\sim 80\%$ ) and the PRC (91%–96%). In the US, the educational system was already well developed in the parental generation, with most parents having at least a high school education. Consequently, fewer children changed their educational class. Compulsory education laws in the US were introduced around the 1930s and all major educational reforms occurred before our parental cohorts were born. Structural mobility in the US is substantially lower than in Russia and the PRC, accounting for only 18%–25% of overall mobility. However, for current children and parents, the probability of movements unrelated to changes in distributional structure  $EM^{t=1}$  is higher in the US ( $\sim 30\%$ ) than in Russia and the PRC (10%–20%). At the steady state, mobility  $SSM$  is much lower in the PRC than in the US and Russia (Table E1, Appendix E): the probability of intergenerational changes in educational classes is 42% in Russia, 33% in the US, and only 19%–27% in the PRC.

Figure 10: Mean Time to Exit Each Educational Class: A Comparison with the United States



PRC = People's Republic of China, US = United States.

Notes: These figures display mean time to exit  $MTE$  each educational class, as defined in equation (6), separately for father-to-child and mother-to-child samples in the People's Republic of China, Russia, and the United States. The error bars represent 95% confidence intervals derived from 1,000 bootstrap samples. Source: Authors' calculations.

The class-specific movement measures estimated for the US are similar to those observed in Russia (Figure 10). The only notable difference is that, in the US, mean time to exit high school is slightly longer—averaging three generations compared to two in Russia.

Comparisons with the US highlight how, by accounting for “exogenous” structural changes, we can make more accurate cross-country comparisons. Our comparative analysis of intergenerational educational mobility across the three countries shows that, net of the effect of structural changes, Russia is more mobile than the US and the PRC. As a robustness check, we also estimate movement mobility measures based on only eldest children for all three countries, and we find very similar results (Appendix H).

### 5.3 Comparison to the Conventional Mobility Measures

In Appendix F, we present the results of the additional analysis of intergenerational mobility using two sets of measures commonly applied in the literature: those typically utilized in economics (derived from the linear models) and those used in sociology (derived from uniform and log-multiplicative layer effect models). First, the estimates of

intergenerational correlation  $IGC$  in both father-to-child and mother-to-child samples, as well as intergenerational elasticity  $IGE$  in the father-to-child sample, indicate that Russia exhibits higher mobility than the US, and both countries are substantially more mobile than the PRC. These findings are consistent with our main results based on the steady state exchange mobility. However, in the mother-to-child sample, the  $IGE$  suggests that the US is more mobile than Russia, while both countries remain more mobile than the PRC. Second, we find that our baseline results on educational mobility align with the findings from the log-multiplicative layer effect model introduced by Xie (1992). The estimate of the parameter  $\phi_k$  from the latter indicates that both Russia and the US exhibit significantly higher exchange mobility compared to the PRC.

## 6 OCCUPATIONAL MOBILITY

In this section, we analyze occupational intergenerational mobility. We start by examining occupational transition matrices and the evolution of the distribution of occupations across generations in the PRC and Russia. Tables 7 and 8 show that point estimates of occupational transition probabilities are similar for mothers and fathers in each country, as observed previously for educational transition probabilities. However, Figures 11 and 12 reveal significant differences in occupational distributions between fathers and mothers in Russia. This discrepancy owes to gender imbalances in the former Soviet Union's occupational structure: men were primarily engaged in low-skilled labor, mainly as manufacturing workers, while women dominated high-skilled labor. As a result, the steady state distributions  $\mu^*$  differ between mother-to-child and father-to-child samples in Russia (and not so much in the PRC), resulting in gender discrepancies in occupational mobility estimates from those two samples.

The transition matrices in Tables 7 and 8 present a less striking pattern of upward mobility compared to educational intergenerational mobility. The elements above the main diagonal of the transition matrices are not that much higher than those below the main diagonal in both countries. In the PRC, children from middle-skilled families have about a 20% chance of ending up in low-skilled occupations, while in Russia, this probability

Table 7: Occupational Transition Matrices for the People’s Republic of China

		Child		
		Low-skilled	Middle-skilled	High-skilled
Father	Low-skilled	0.41 [0.40,0.43]	0.22 [0.21,0.24]	0.36 [0.35,0.38]
	Middle-skilled	0.24 [0.21,0.28]	0.27 [0.24,0.30]	0.49 [0.45,0.52]
	High-skilled	0.24 [0.22,0.27]	0.21 [0.19,0.24]	0.54 [0.51,0.57]
	Child			
Mother	Low-skilled	0.44 [0.42,0.45]	0.21 [0.20,0.22]	0.35 [0.34,0.37]
	Middle-skilled	0.20 [0.18,0.23]	0.28 [0.25,0.31]	0.52 [0.49,0.55]
	High-skilled	0.18 [0.15,0.20]	0.22 [0.19,0.25]	0.60 [0.57,0.64]
	Child			

Notes: This table presents the occupational transition matrices for the People’s Republic of China. The numbers in brackets indicate 95% confidence intervals, calculated from 1,000 bootstrap samples. Source: Authors’ calculations.

Table 8: Occupational Transition Matrices for Russia

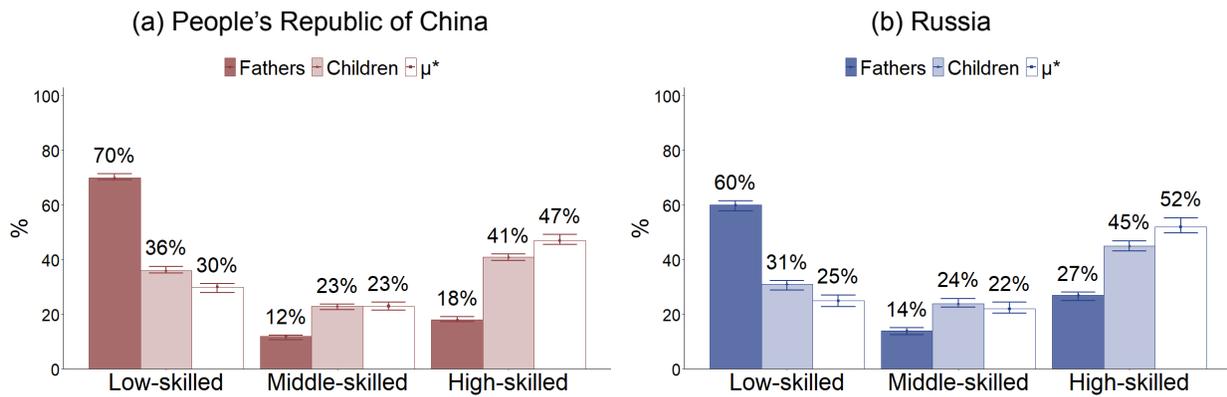
		Child		
		Low-skilled	Middle-skilled	High-skilled
Father	Low-skilled	0.37 [0.35,0.39]	0.26 [0.24,0.28]	0.37 [0.34,0.39]
	Middle-skilled	0.29 [0.24,0.34]	0.26 [0.22,0.30]	0.45 [0.41,0.50]
	High-skilled	0.17 [0.15,0.21]	0.19 [0.16,0.22]	0.64 [0.60,0.67]
	Child			
Mother	Low-skilled	0.42 [0.38,0.45]	0.29 [0.25,0.32]	0.30 [0.26,0.33]
	Middle-skilled	0.34 [0.31,0.37]	0.30 [0.27,0.34]	0.36 [0.33,0.39]
	High-skilled	0.22 [0.20,0.24]	0.18 [0.16,0.20]	0.60 [0.57,0.62]
	Child			

Notes: This table presents the occupational transition matrices for Russia. The numbers in brackets indicate 95% confidence intervals, calculated from 1,000 bootstrap samples. Source: Authors’ calculations.

is around 30%. The likelihood of these children moving up to high-skilled occupations is approximately 50% in the PRC and 40% in Russia. For children born into high-skilled families, the probability of holding a lower than high-skilled occupation is around 40% in both countries. Additionally, children from low-skilled families in both Russia and the PRC have about a 60% chance of upgrading their occupational class.

The comparison of the steady state occupational distributions to the current children’s occupational distribution, as shown in Figures 11 and 12, suggests preliminarily that the

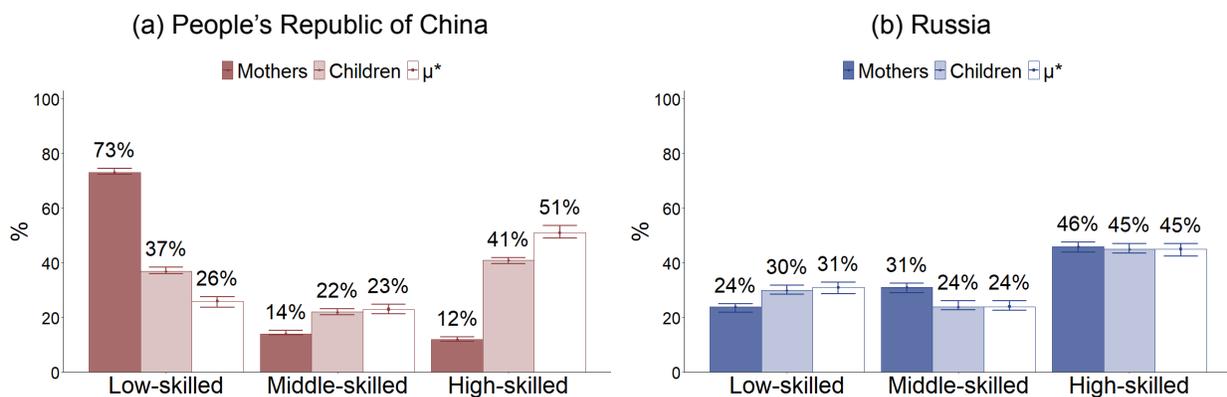
Figure 11: Distribution of Occupational Classes in Father-to-Child Samples



Notes: These figures illustrate the evolution of occupational distribution from fathers to children, and ultimately to the steady state distribution  $\mu^*$ , in the People's Republic of China and Russia. Error bars indicate 95% confidence intervals, derived from 1,000 bootstrap samples.

Source: Authors' calculations.

Figure 12: Distribution of Occupational Classes in Mother-to-Child Samples



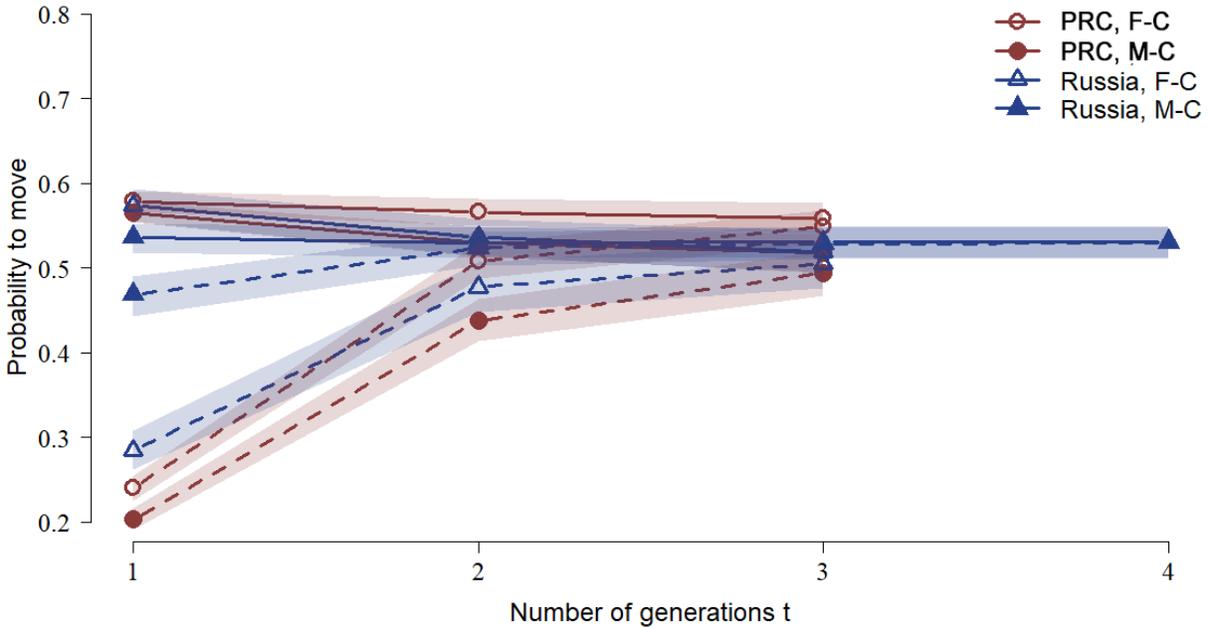
Notes: These figures illustrate the evolution of occupational distribution from mothers to children, and ultimately to the steady-state distribution  $\mu^*$ , in the People's Republic of China and Russia. Error bars indicate 95% confidence intervals, derived from 1,000 bootstrap samples.

Source: Authors' calculations.

Markov chain processes are nearing the steady state in the father-to-child samples in both the PRC and Russia, as well as in the mother-to-child sample in the PRC. In the mother-to-child sample in Russia, the Markov chain appears even closer and almost already at a steady state, with the steady state distribution of occupations closely matching the current children's distribution. A more rigorous analysis of the distance to the steady state is presented in Appendix F. Notably, the steady state distribution itself indicates an equally

favorable expected equilibrium for the PRC and Russia, with both countries exhibiting comparable proportions across occupational attainment classes at  $\mu^*$ .

Figure 13: Dynamics of Overall, Structural, and Exchange Occupational Mobility



PRC = People's Republic of China.

Notes: This figure plots overall mobility  $OM^t(P, \mu^t, t)$  (solid lines), exchange mobility  $EM^t(P, \mu^t, t)$  (dashed lines), and structural mobility  $SM^t(P, \mu^t, t)$  (the vertical distance between solid and dashed lines) for father-to-child (F-C) and mother-to-child (M-C) samples. Steady state mobility  $SSM(P, \mu^*)$  is represented by the final (rightmost) point on each mobility curve, where overall mobility equals exchange mobility. Shaded areas represent 95% confidence intervals, derived from 1,000 bootstrap samples.

Source: Authors' calculations.

Table 9: Estimates of Overall, Structural, and Exchange Occupational Mobility Measures

	Father-to-child		Mother-to-child	
	PRC	Russia	PRC	Russia
OM, t=1	0.579	0.574	0.565	0.536
OM upward, t=1	0.467	0.438	0.488	0.248
OM downward, t=1	0.111	0.136	0.077	0.288
SM, t=1	0.339	0.289	0.363	0.067
EM, t=1	0.240	0.285	0.203	0.469
SSM, t*	0.549	0.504	0.494	0.530

PRC = People's Republic of China.

Notes: This table present the results on estimated movement mobility measures from eq. (2) - (5): overall mobility  $OM^t(P, \mu^t, t)$ , structural mobility  $SM^t(P, \mu^t, t)$ , and exchange mobility  $EM^t(P, \mu^t, t)$ .

Source: Authors' calculations.

The analysis of overall, exchange, and structural occupational mobility reveals less substantial differences between the PRC and Russia, compared to the results for educational mobility. As seen in Figure 13 and Table 9, the probability of children having a different occupation skill level than their parents  $OM^{t=1}$  is slightly higher in the PRC (57%–58%) than in Russia (54%–57%).<sup>18</sup> In the PRC, upward mobility dominates overall mobility, accounting for around 81%–86% of all class changes ( $OM^{t=1}_{upward}/OM^{t=1}$ ). In Russia, upward mobility accounts for 76% of overall mobility in the father-to-child sample and only 46% in the mother-to-child sample. The decomposition of overall mobility into structural and exchange mobility provides a more detailed picture. In the PRC, the probability of movement owing to changes in occupational structure ( $SM^{t=1}/OM^{t=1}$ ) is around 60%. As previously noted, structural mobility in the PRC is largely driven by industrialization and the shift of labor out of the agriculture sector (see Figure 2 in Section 2).<sup>19</sup> In Russia, for the father-to-child sample, the probability is around 50%, but in the mother-to-child sample it is just 13%. The gender difference in structural mobility in Russia can be explained by the difference in occupational patterns of men and women during the Soviet era, described earlier. After the collapse of the former Soviet Union, the industrial sector in Russia stagnated (Figure 3 in Section 2), leading to more structural mobility between fathers and their children compared to mothers. Interestingly, exchange mobility in the Russian mother-to-child sample is larger than in the father-to-child sample in Russia and in both samples in the PRC.

In the long run, after accounting for structural changes, our key measure of occupational steady state mobility  $SSM$  is very similar for the PRC and Russia. The likelihood of children having a different occupational skill level than their parents at the steady state is 50%–55% in the PRC and 50%–53% in Russia. Conditioning on confidence intervals shown by the shaded areas in Figure 13, this difference is not statistically significant.

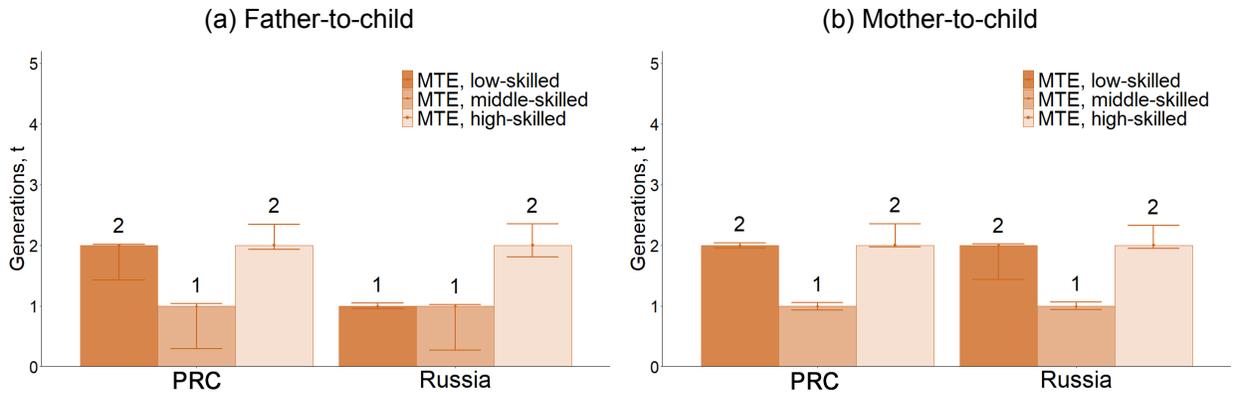
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<sup>18</sup>The complete set of mobility measure estimates for each generation  $t$ , up to the steady state, is presented in Appendix E.

<sup>19</sup>The outflow of labor from the agriculture to the non-agriculture sector during the PRC's market transition is also documented by Zhou and Xie (2019).

## 6.1 Heterogeneity

Figure 14: Mean Time to Exit Each Occupational Class



PRC = People's Republic of China.

Notes: These figures display the mean time to exit  $MTE$  from each occupational class, as defined in equation (6), separately for father-to-child and mother-to-child samples in the People's Republic of China and Russia. The error bars represent 95% confidence intervals derived from 1,000 bootstrap samples.

Source: Authors' calculations.

The results for class-specific movement measures (Figure 14) indicate high mobility across all occupational classes in both the PRC and Russia, with no more than two generations required to exit any class in the Markov chain. The least “sticky” skill level, conditioning on confidence intervals, is the middle-skilled occupation level in both countries, as well as low-skilled occupation level in the father-to-child sample in Russia.

Overall, the results on occupational intergenerational mobility indicate that the PRC and Russia have comparable levels of mobility. The exchange mobility index reveals no statistically significant difference between the two countries in the likelihood of individuals deviating from their parental occupational class at the steady state. Notably, the analysis of occupational mobility shows distinctions in intergenerational mobility when comparing father-to-child and mother-to-child samples in Russia. The findings from the father-to-child sample suggest a greater level of structural mobility compared to the mother-to-child sample, which makes sense given gender imbalances in occupational distribution that were prevalent during the Soviet era (as it was discussed in the Section 3).

## 6.2 Comparison to the United States

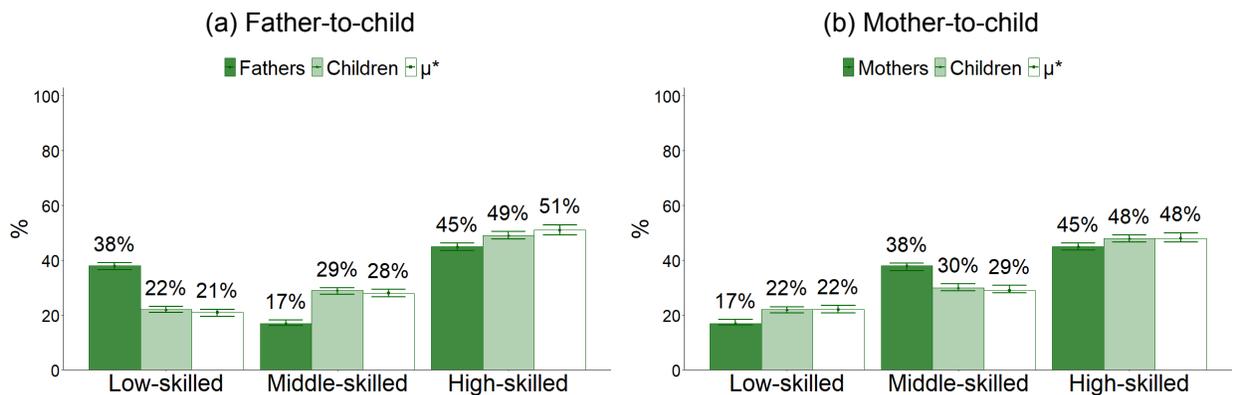
Table 10: Occupational Transition Matrices for the United States

		Child		
		Low-skilled	Middle-skilled	High-skilled
Father	Low-skilled	0.30 [0.27,0.32]	0.34 [0.32,0.36]	0.37 [0.35,0.39]
	Middle-skilled	0.27 [0.24,0.30]	0.32 [0.29,0.35]	0.41 [0.38,0.44]
	High-skilled	0.14 [0.13,0.15]	0.23 [0.22,0.25]	0.63 [0.61,0.65]
		Child		
		Low-skilled	Middle-skilled	High-skilled
Mother	Low-skilled	0.37 [0.34,0.41]	0.27 [0.24,0.30]	0.36 [0.33,0.39]
	Middle-skilled	0.24 [0.22,0.26]	0.36 [0.34,0.38]	0.40 [0.38,0.42]
	High-skilled	0.14 [0.13,0.15]	0.27 [0.25,0.29]	0.59 [0.57,0.61]

Notes: This table presents the occupational transition matrices for the United States. The numbers in brackets indicate 95% confidence intervals, calculated from 1,000 bootstrap samples.  
Source: Authors' calculations.

From Table 10, it is evident that the primary patterns observed in the transition matrices for the PRC and Russia are also found in the US: (i) we see similar transition probabilities in the father-to-child and mother-to-child samples; and (ii) upward mobility is slightly greater than downward mobility, although this difference is less pronounced compared to educational transition matrices.

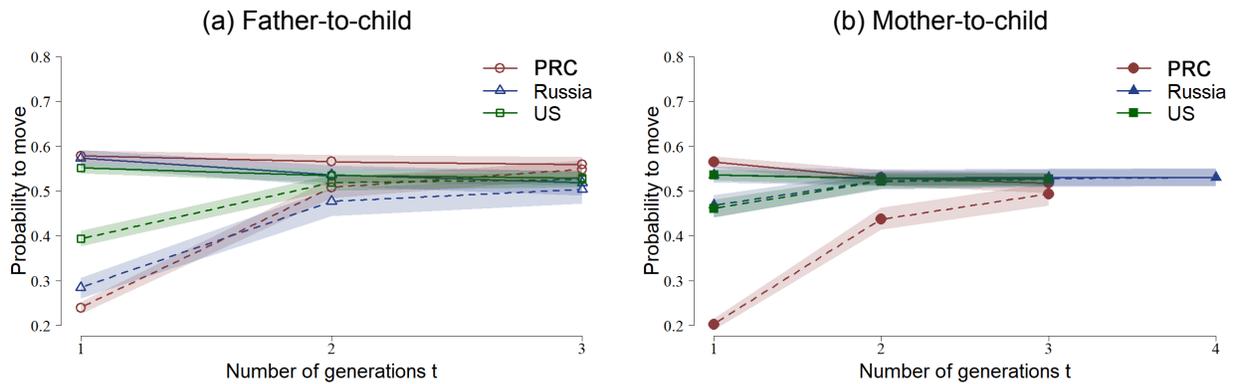
Figure 15: Distributions of Occupational Classes in the United States



Notes: These figures illustrate the evolution of occupational distribution from fathers (mothers) to children, and ultimately to the steady state distribution  $\mu^*$ , in the United States. Error bars indicate 95% confidence intervals, derived from 1,000 bootstrap samples.  
Source: Authors' calculations.

Figure 15 illustrates the stable and high level of economic development in the US. In the PRC and Russia, most fathers, and a significant portion of mothers in the PRC, are engaged in low-skilled labor. In the US, high-skilled labor already prevails in both parental and children samples. The distribution of occupation in the steady state looks similar to the current children’s distribution, which is suggestive of the Markov process being close to the steady state. Qualitatively, the steady state distribution in the US is also similar to those observed in the PRC and Russia, characterized by a higher concentration of individuals in high-skilled occupations.

Figure 16: Dynamics of Overall, Structural, and Exchange Occupational Mobility: A Comparison with the United States



PRC = People’s Republic of China, US = United States.

Notes: These figures plot overall mobility  $OM^t(P, \mu^t, t)$  (solid lines), exchange mobility  $EM^t(P, \mu^t, t)$  (dashed lines), and structural mobility  $SM^t(P, \mu^t, t)$  (the vertical distance between solid and dashed lines) for father-to-child (F-C) and mother-to-child (M-C) samples. Steady state mobility  $SSM(P, \mu^*)$  is represented by the final (rightmost) point on each mobility curve, where overall mobility equals exchange mobility. Shaded areas represent 95% confidence intervals derived from 1,000 bootstrap samples.

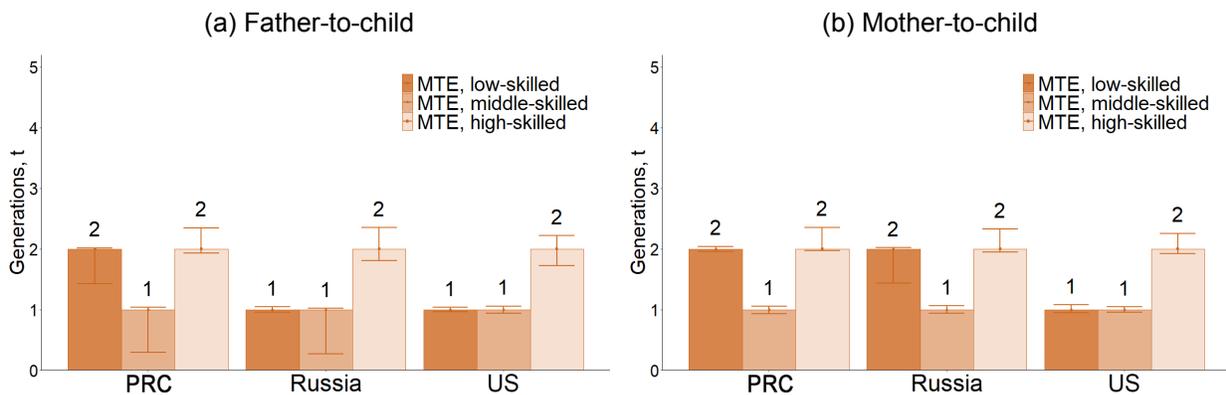
Source: Authors’ calculations.

The analysis of movement mobility measures suggests the probability of children having a different occupational skill level than their parents  $OM^{t=1}$  is similar across all three countries (Figure 16).<sup>20</sup> Upward mobility accounts for around 50%–60% of overall mobility in the US and in the mother-to-child sample in Russia. In the PRC and in the father-to-child sample in Russia, this share is higher ( $\sim 80\%$ ). Table E2 in Appendix E shows that the share of structural mobility  $SM^{t=1}$  in overall mobility  $OM^{t=1}$  in mother-to-

<sup>20</sup>See Appendix C for a comparison of transition matrices and cross-sectional distributions.

child samples is similarly small in the US and Russia (around 13%–14%), but substantially higher in the PRC (64%). In the father-to-child sample, the share of movement related to structural changes is substantially higher in the PRC (59%) and Russia (50%) compared to the US (29%). These findings align with the previously discussed differences in cross-generational occupational distributions in the three countries. In the long run, net of the effect of structural changes, our preferred measure of steady state mobility shows that the probability of intergenerational changes in occupational skill levels is similar across all three countries: 50%–55% in the PRC, 53% in the US, and 50%–53% in Russia.

Figure 17: Mean Time to Exit Each Occupational Class: A Comparison with the United States



PRC = People’s Republic of China, US = United States.

Notes: These figures display the mean time to exit  $MTE$  each occupational class, as defined in equation (6), separately for father-to-child and mother-to-child samples in the PRC, Russia, and the US. The error bars represent 95% confidence intervals derived from 1,000 bootstrap samples.

Source: Authors’ calculations.

The results for class-specific movement measures in the US also suggest high mobility across all occupational classes (Figure 17). Based on mean time to exit ( $MTE$ ), it takes no more than two generations to move out of any occupational skill level. Among all classes and across all three countries, the middle-skilled occupations consistently are the least “sticky”—or the most mobile.

Overall, our comparative analysis across the three countries shows that, using the baseline steady state exchange mobility measure, all three countries exhibit similar levels of occupational intergenerational mobility. As a robustness check, we also assess occupational mobility by examining movement measures using only the eldest child

sample for all three countries (Appendix H); the results are very similar to the baseline results.

### **6.3 Comparison to the Conventional Mobility Measures**

Our comparisons with conventional intergenerational mobility measures from the economics literature, presented in Appendix F, indicate that occupational mobility in the PRC exceeds both that in Russia and that in the US. This conclusion is based on standard intergenerational elasticity  $IGE$  and intergenerational correlation  $IGC$  measures derived from linear models. This reveals a significant divergence between results from linear models and our baseline results using Markov chains. The parameter estimate  $\phi_k$  from the log-multiplicative layer effect model (Xie, 1992), commonly used in sociology literature, also indicates greater occupational exchange mobility in the PRC than in both Russia and the US within the father-to-child sample. In contrast, for the mother-to-child samples, Russia exhibits greater mobility than both the PRC and the US, even though our baseline results using Markov chain models show no statistically significant differences in steady state mobility across the three countries.

## **7 CONCLUSION**

This paper studies intergenerational mobility of educational and occupational status in the PRC and Russia during the emergence of market economies in these countries. Understanding mobility in the context of economic transition requires carefully distinguishing between structural mobility and exchange mobility. We operationalize this distinction for mobility as movement calculations. Further, we propose a new mobility statistic, steady state mobility, which captures the expected fraction of dynasties that experience a change in class, once transition has been completed. Together, these measures allow for a rich characterization of mobility in the PRC and Russia the past 30 years.

With regard to education, we find that the probability of changing educational classes for children is substantially higher in the PRC (52%–53%) than in Russia (45%–46%).

However, around 68%–81% of the measure for the PRC is attributable to structural change, in particular the rapid development of an educational system that led to much higher levels of educational attainment of children compared to their parents, the majority of whom did not advance beyond primary education. For Russia also, around 57%–68% of the overall mobility is attributable to shifts in educational structure. Decomposing overall mobility into structural and exchange components shows that, for both countries, structural mobility dominates overall mobility. However, the PRC exhibits lower mobility than Russia at the steady state, where children change educational classes with 19%–27% probability in the PRC compared to 42% in Russia.

With regard to occupational mobility, we find that overall mobility is slightly higher in the PRC (57%–58%) than in Russia (54%–57%). However, once one considers structural and exchange mobility differences, more complex patterns emerge. Changes in the marginal distribution of parents and children exhibit a common pattern for the PRC regardless of whether one considers mothers or fathers: parents in low-skilled occupations often have children who enter high-skilled occupations. We find a similar pattern for fathers and children in Russia, but not for mothers and children. These differences reflect the nature of economic transitions in the two countries. The PRC's structural changes consisted mainly of a transition from agriculture to industry. However, in Russia, the shift in the father and child distribution reflects the shrinking of the industrial sector after the collapse of the centrally planned economy, and gender differences in mobility findings reflect gender imbalances in the occupational structure during the Soviet era. We find that, for the PRC, 60% of the overall occupational mobility is structural, whereas in Russia we find relatively small structural occupational mobility in the mother-to-child sample (13% of overall mobility) compared to the father-to-child sample (50%). Our steady state mobility measure suggests there is no statistically significant difference in the probability of intergenerational changes in occupational skill levels at the steady state in both countries (50%-55%).

Finally, our paper provides a comparison between intergenerational mobility in transitioning societies in the PRC and Russia with the mature society of the US. We find that educational steady state mobility is substantially higher in Russia and the US than in

the PRC. Occupational steady state mobility exhibits similar levels in all three societies, which differs from findings using conventional measures of intergenerational mobility.

Together, these results demonstrate that the traditional sociological distinction between structural and exchange mobility is essential in understanding how the transition from central planning to a market economy has affected intergenerational mobility in Russia and the PRC. Our analysis shows how, even with high overall mobility, in the absence of further changes in the transition matrix linking parents to children, the PRC will eventually become less mobile in education (and equally mobile in occupational skill levels) compared to Russia and the US.

We regard these results as establishing stylized facts for the mobility processes of the PRC and Russia. A natural next step is the consideration of structural models of mobility that link the Markov transition probabilities to underlying mechanisms. This advance would allow for predictions about the trajectories of future mobility matrices and thereby open new channels for understanding structural, exchange, and steady state mobility. It is worth noting that long-term advances in our measurement calculations will of course be facilitated when a third generation is observed for the PRC and Russia. Butaeva et al. (nd) and Durlauf, Kim, Lee, and Song (2024) demonstrate how evolving Markov transition matrices can produce novel ways to think about mobility.

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## **A Tale of Two Transitions**

### *Mobility Dynamics in the People's Republic of China and Russia After Central Planning*

This paper analyzes intergenerational mobility in the People's Republic of China (PRC) and Russia during their shift from central planning to market economies. The result shows that the PRC exhibits more overall educational mobility, while Russia exhibits greater steady-state educational mobility. However, both overall and steady state occupational mobility are similar in the PRC and Russia. Compared to the United States (US), the result also suggests that steady state mobility in education is substantially higher in the US and Russia than in the PRC, but occupational steady state mobility is comparable in all three countries.

### **About the Asian Development Bank**

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