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UNDERSTANDING TWENTY YEARS OF INEQUALITY AND POVERTY TRENDS IN RUSSIA

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The distribution of income in Russia changed significantly over the past 25 years. This paper examines the factors that have been driving the fall in inequality and poverty over two recent decades in the Russian Federation. Changes in earnings from public and private sectors and pensions have been the main sources of changes in the income distribution between 1994 and 2015. Falling inequality and poverty were the result of a decrease in the dispersion of private sector earnings and an increase in the levels of pensions and public sector earnings. Neither the evolution of socio-demographic characteristics nor the level or structure of employment alone had big impacts.

JEL Codes: D31, C14, I30

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1. Introduction

The distribution of income has changed globally over the past 30 years. There has generally been a trend towards rising income inequality in many industrialized countries (OECD, 2021). These trends and its determinants have been studied extensively (DiNardo *et al*., 1996; Hyslop and Maré, 2005; Ferreira *et al*., 2017; Biewen *et al*., 2019). However, some emerging economies experienced a *fall* in income inequality, including Brazil, Peru, Uruguay (Balestra *et al*., 2018). Recent research has documented that this has been the case in Russia too over most of the last two decades (Calvo *et al*., 2015; Dang *et al*., 2020). Despite this, the level of income inequality in Russia remains high by international standards (OECD, 2015).

The literature on inequality in Russia mainly focused on documenting inequality trends, finding a sharp but relatively brief increase in income inequality in the 1990s (Commander *et al*., 1999; Milanovic, 1999; Jovanovic, 2001; Flemming and Micklewright, 2020) which had gradually reversed after 2000 (Denisova, 2007; Gorodnichenko *et al*., 2010; Lukiyanova and Oshchepkov, 2012; Dang *et al*., 2020). The recent study by Novokmet *et al*. (2018) investigated the evolution of top income shares since 1905 by combining survey and tabulated tax data on entrepreneurs. It provides evidence that survey-based inequality for Russia tends to be under-estimated, and that over 1905–2015 period Russia has experienced larger

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increase in inequality than China and ex-communist countries. Dang *et al*. (2020) focused on documenting inequality trends and understanding income mobility, and showed that switching from a part-time to full-time job, from lower-skill to higher-skill job, or staying in formal sector has been significantly associated with reduced downward mobility and increased income growth. Calvo *et al*. (2015) come the closest to our study by investigating factors behind wage inequality changes and concluding that employment type and returns to employment are the most relevant factors for explaining wage inequality variations. While understanding changes in wage structure is important, a broader approach is however necessary to understand changes in entire household income inequality and poverty as these not only depend on individual labor incomes, but also on household structures, public transfers or other non-market incomes.

We examine determinants of the changes in the income distribution between 1994 and 2015, sorting out the contribution of market forces (employment and private sector earnings), state intervention (transfers and public sector earnings) and general long-term socio-demographic forces. We apply a semi-parametric decomposition method similar to those used in, e.g. Hyslop and Maré (2005), Biewen and Juhasz (2012), Larrimore (2014). Like much of the recent research, we use data from the Russian Longitudinal Monitoring Survey—Higher School of Economics. This survey is the only database that offers a wide range of socio-demographic characteristics of individuals together with detailed information on household incomes consistently collected since 1994. Our results complement previous studies on inequality in Russia, which documented similar trends, but which did not attempt to account for the observed changes in household income inequality and poverty.

Since the early 1990s, the Russian economy has been subject to macroeconomic volatility, with high inflation, economic stabilization and growth, then economic stagnation and geopolitical crises. Furthermore, Russia has experienced extensive reforms, including changes in income taxation, family policies, educational reforms which might have a significant impact on the monetary well-being of households. The combination of these factors makes a study of the relative importance of different potential determinants of inequality and poverty trends since 1994 particularly relevant.

To preview our finding, we find a gradual decrease in income inequality and poverty and an increase in income levels since the early 2000. This evidence is consistent with previous literature covering similar period (Gorodnichenko *et al*., 2010; Lukiyanova and Oshchepkov, 2012; Calvo *et al*., 2015; Dang *et al*., 2020). Decomposition results suggest that changes in socio-demographic characteristics and labor market outcomes did not have any impact on the decrease in income inequality and poverty. Falling inequality and poverty is the result of changes in earnings from public and private sectors and pensions. Neither other income sources nor other benefits has affected income distribution dynamics. Increase in earnings from private sector had the largest positive effect on income levels, while increase in pensions had the largest equalizing effect on incomes and on poverty reduction. Separating out the effect of changes in income levels and changes in income dispersion, we find the largest effects from increases in levels of pensions and earnings from public sector and decrease in dispersion of earnings from private sector.

The remainder of the paper is organized as follows. Section 2 briefly describes Russia's development over 1994–2016 years. In Section 3 we introduce the data source. Section 4 presents general trends in income inequality and poverty. Section 5 describes the evolution of possible determinants of the observed changes in income distribution. Section 6 presents methods, and Section 7 presents the results. Section 8 concludes.

2. Setting the Scene: Russia's Economic Conditions 1992–2016

The end of the 20th century associates with the collapse of the Soviet Union. It brought an unprecedented scope and speed of changes, which affected more than 250 million people. These changes were price liberalization, establishment of new economic institutions and property rights, high inflation, and, in the end, sovereign debt default in 1998. The majority of Russians were suffering from a severe and worsening recession, reflected in a decline of real earnings starting right after the Soviet collapse.

Figure A1 in the Online Appendix summarizes a few of the key statistics about the Russian economy. By the period 2000 to 2008, thanks to increasing oil prices, Russia was enjoying economic growth. On average GDP was growing by 26 percent on annual base. The rates of inflation were moderate and fluctuating on average between 11 percent and 15 percent. Real income per capita increased from 2,281 rubles in 2000 to 15,000 rubles in 2008. The unemployment rate decreased to 6.2 percent by 2008 compared with 13.5 percent in 2000 (Russian Statistical Office, 2009, pp. 130, 167, 680). The economic growth had a non-negligible impact on well-being of Russian families in general, but poor households benefited from it relatively more, and previous research has shown that the economic growth had a pro-poor character (Gorodnichenko *et al*., 2010; Dang *et al*., 2020). Such was the economic situation before the financial crisis in 2008—stable GDP growth, financially stable economy, surplus of state budget, increase in real individual income and decrease in unemployment. But in 2008 the financial crisis hit and Russia experienced a massive shock with an increase in capital outflow, the fall of oil prices by 35 percent from 2008 to 2009 (and, thus of large public revenues), a decrease in GDP by 26.4 percent, a fall in real income per capita, and a rise in unemployment (OPEC, 2021; The World Bank, 2021). The financial crisis marked the end of sustained economic growth and the beginning of a bumpy-ride development. Looking at the post-crisis period, we see uneven dynamics: fast and momentary economic recovery in 2010–2011, economic stagnation in 2012–2015, and growth in 2016. These dynamics largely follow ups and downs of oil prices.[1]

In sum, the gradual decline in inequality and poverty mentioned above happened in a period of strong economic growth overall, but which was also affected by significant economic volatility. While it is easy to think how economic growth

[1]See, for example, Ito (2012), Alekhina and Yoshino (2019), Pönkä and Zheng (2019) for research on the impact of oil prices on macroeconomic indicators in Russia in the period covered by our analysis.

pushed up average incomes, the mechanisms that lead to a reduction in poverty and income inequality are less clear, as our analysis shows.

3. Data

Like much of the research on income distribution in Russia cited above, we use the Russian Longitudinal Monitoring Survey "RLMS-HSE" (National Research University "Higher School of Economics" and OOO "Demoscope" together with Carolina Population Center, 2021). The survey has been managed by the Carolina Population Center, the University of North Carolina and the Higher School of Economics in Moscow. It is a nationally representative panel and cross-sectional survey that is conducted annually since 1994 (with the exception in 1997 and 1999). Kozyreva *et al*. (2016) show that distribution of households in the RLMS-HSE matches the Russian Census well. The survey is designed as a multistage probability sample taking into account geographical factors, level of urbanization and ethnicity. Three largely populated units, Moscow city, Moscow region and Saint Petersburg, are designed as self-representing strata. The RLMS-HSE surveys households in only 38 out of Russia's 85 regions, but these are covering 96 percent of the whole Russian population (Kozyreva *et al*., 2016).

The RLMS-HSE dataset includes both household-level and individual-level variables for each individual living in a sampled household. According to the RLMS-HSE design, households are defined as a group of people living together in a given domicile and sharing common income and expenditures. Sample sizes vary between 4,000 and 8,000 households, covering between about 8,000 and 18,000 individuals (see Figure A2 in the Online Appendix). The initial sample has been followed up longitudinally but several refreshment samples have been added in the course of the survey, with a large new sample added in 2010.[2] The survey has therefore been used both as a repeated cross-section and as a panel data.

Despite its relatively small sample size, the RLMS-HSE appears to be the most appropriate data source for our purpose. The much larger Rosstat Household Budget Survey has also been used for inequality and poverty analysis in Russia (Yemtsov, 2003; Kolenikov and Shorrocks, 2005), but it collects limited income and employment information and has been reported to underestimate household incomes (Russian Statistical Office, 2017a). Since 2012, Rosstat is conducting the Population Income Survey, a large survey collecting detailed income information in a way similar to the European Union Statistics on Income and Living Conditions. However, the PIS only covers a short period of time to date, and does not cover, notably, the Great Recession period. It is worth noting that the declining trends in poverty and inequality as measured by RLMS-HSE and PIS in the few overlapping years are very similar (see Figure A3 in the Online Appendix).

A caveat of much survey based research for inequality analysis is the "missing rich" problem. The richest Russians are unlikely to be represented in the

[2]About 1,600 new households have been added in 2010. This refreshment has impacted the evolution of socio-demographic characteristics of the sample (fewer pensioners and more children) and labor market participation. However, as we show later, it did not have any significant impact on the income distribution trends.

RLMS-HSE samples, nor in the official Rosstat surveys. Reassuringly however, comparing inequality trends based on the RLMS-HSE data with the trends shown in Novokmet *et al*. (2018) which attempt to address under-coverage of top incomes, we find different levels but similar evolution in inequality measures over the same period, that is increase in inequality over 1994–1999 years and decrease over 2000–2015 years (see Figure A3 in the Online Appendix).[3] To the extent that our analysis focuses on accounting for trends rather than levels of inequality, we remain confident about the relevance of RLMS-HSE data. We also use inequality measures including the Gini index and percentile ratios that are not too sensitive to top incomes (Jenkins and Van Kerm, 2009). Finally, although the very rich may not be represented in the survey it may nevertheless be important to analyze income evolution and its determinants for "the Other 99 percent" of the Russian population, to paraphrase Autor (2014).

The main variable of interest is real monthly equivalized net household income. Total net income includes all private sources of income (earnings, home food production, help from other family member etc.), state transfers (pensions, benefits for children, employment benefits etc.) minus taxes. We adjust the net total income for inflation and regional price differences, as prices vary greatly on a regional level in Russia. All income variables are expressed in rubles in prices of 2015 in Moscow. To do so, we first use national consumer price indices for 1994–2015 to convert all incomes to 2015 equivalent prices. We then use regional cost-of-living indices for 2015 provided by the Federal Statistical Service of Russia to adjust for regional price differences.

Real income is then converted to single-adult equivalent income using the OECD modified equivalence scale. According to this scale the head of household receives a weight of 1, other household members over 14 years receive a weight of 0.5 and those under 14 years are assigned a weight of 0.3 (Hagenaars *et al*., 1994). All individuals are assigned the single-adult equivalent real monthly income of the household to which they belong.

Our analysis of the drivers of trends in inequality will separately examine trends in five main sources of income: (i) earnings from public sector employment, (ii) earnings from private sector employment, (iii) pensions, (iv) other public transfers, (v) and other private income sources. The other transfers is a sum of all possible benefits which might be received by a household including child benefits, unemployment benefits, fuel benefits, housing benefits etc. Other private income sources include capital income, rental income, home food production etc. Any income flows received from the property sales are excluded due to highly irregular and its consumption related nature. All sources are adjusted to 2015 Moscow prices as described above.

[3]For discussion on the top income adjustments by Novokmet *et al*. (2018) see Kapeliushnikov (2020).

4. Trends in Inequality and Poverty

Before turning to the main part of our analysis, we present in Figure 1 our RLMS-HSE-based estimates of general trends in the income distribution over the period 1994–2015.

Income inequality first increased over the 1994–1998 period, reached its peak in 1998, then gradually decreased between 1998 and 2015. Similar evidence was found in the previous studies on inequality in Russia with similar income definition, unit of analysis, adjustments to household size and inflation, and same period coverage (Gorodnichenko *et al*., 2010; Novokmet *et al*., 2018; Dang *et al*., 2020). In the first period, the Gini coefficient increased from 0.33 in 1994 to reach its maximum at 0.51 in 1998 and mean real income decreased. The period after the default on Russia's sovereign debt in 1998 is associated with continued decreases in income inequality: the Gini index decreased from 0.49 in 1998 to 0.29 in 2015 and inequality had fallen below its 1994 levels by 2015.[4] The data also show a tremendous and continuous rise in income levels since 1998: from an average of 7,200 rubles in 1998 to 32,511 rubles in 2015.[5]

Figure A4 in the Online Appendix presents a growth incidence curve (GIC) estimate between 2000 and 2015 showing the growth rate of incomes across different percentiles of the income distribution. The growth of the incomes below the 70th percentile was higher than the growth rate of the average income. The income of the lowest 5th percentiles increased by almost six times from 2000 to 2015, while the richest 5th percentiles by two times. This echoes the findings described above, i.e. there was a large (proportional) increase in income levels of the poorest since 1998.

As living standards vary greatly across Russian regions, trends in inequality and poverty might differ as well. We report inequality and average income estimates in urban and rural areas on Figure A5 in the Online Appendix. The average income in urban settlements is higher than in rural areas. Rural and urban income levels follow similar trends however, which is very close to the values of the country's average income. There were no significant differences in income trends between rural and urban areas, and the above-mentioned documented trends in inequality and poverty do not merely follow from income differences between urban and rural areas.

In sum, we confirm the now well documented decrease in income inequality, poverty rates and ratios of income percentiles reported over the last 20 years in Russia. The lower part of income distribution has undergone substantial changes over the past 20 years with marked increases in income levels and aggregate income shares. At the same time, average income levels increased rapidly across the income distribution throughout the period. Regional analysis of income dynamics does not reveal marked differences in those trends across urban and rural areas.

[4]Poverty rates (not shown for brevity) followed very similar trends, with even stronger declines in the post 1998 period.

[5]Previous studies on Ukraine, Kazakhstan, Kyrgyzstan also document large increase in average income levels since 2000 (Esenaliev and Steiner, 2012; Bykova *et al.,* 2018).

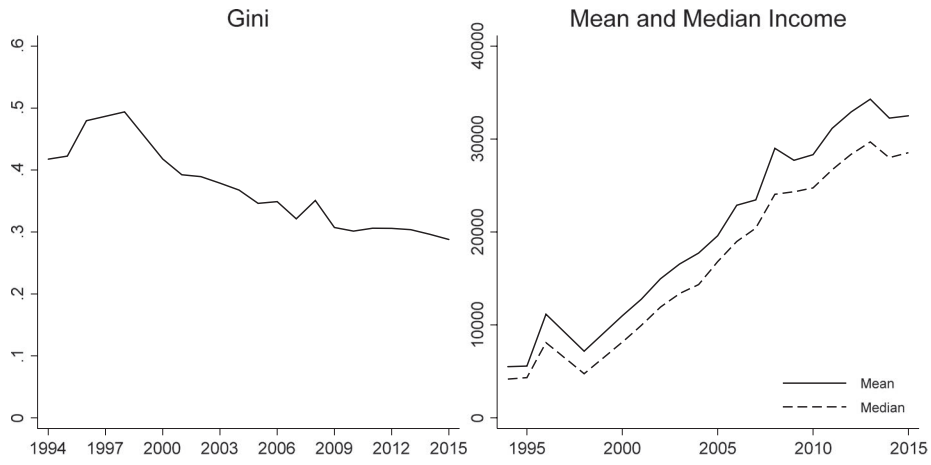

Figure 1. Inequality and Poverty Trends in Russia: 1994–2015

Notes: Income is measured as the sum of all private sources, state transfers minus taxes. All incomes are adjusted for inflation and regional price differences by adjusting consumer price indices for 1994–2015 to 2015 prices in Moscow. The modified OECD equivalence scale is applied to account for difference in household size.

Source: The RLMS-HSE 1994–2015, own calculations.

5. Trends In Potential Determinants

In this section we describe the evolution of possible determinants of changes in income inequality and poverty. We divide them into three categories: socio-demographic factors (household type, family composition, age, share of pensioners in the household, family structure etc.), labor market participation factors (employment status and employment type) and earnings and transfers (earnings, pensions, benefits etc.). Such a selection of potential drivers is standard in decomposition analysis of inequality and poverty (see Hyslop and Maré, 2005; Fiorio, 2011; Biewen *et al*., 2019; Sologon *et al*., 2021). It reflects the combination of forces that can determine changes in the distribution of equivalized household income, namely the evolution of market incomes, notably labor incomes, of replacement incomes, but also of the composition of households since households are assumed to pool and shares resources.

5.1. *Changes in household types and other socio-demographic attributes*

Household structures have changed significantly over the period under study, with a tendency towards smaller households. Figure A6 in the Online Appendix shows the evolution of six types of households: single pensioner (type 1), multiple pensioners (type 2), single adult without children (type 3), multiple adults without children (type 4), single adult with children (type 5), multiple adults with children (type 6). There has been a remarkable decrease in the population share of households composed of multiple adults with children and, correspondingly, an increase in the share of multiple adults without children. We also observe a

moderate increase in the share of households consisting of single pensioners and share of single adults without children. Similar tendencies were also found in other countries (Ferreira *et al*., 2017; Biewen *et al*., 2019).

Not only has the composition of families changed, but also its socio-demographic attributes. Figure A7 in the Online Appendix shows the evolution of household sizes, proportion of households with children, proportion of pensioner households, proportion of households composed of individuals with tertiary education. We define a "small family" as consisting of up to two family members. We see trends towards smaller households, households without children and households with pensioners. This combines effects of ageing of the population, fertility decline, and changes in partnership formation.[6] Figure A7 also shows a large increase in the share of household with at least one adult having higher education.

5.2. *Changes in labor market participation*

A second group of factors potentially driving the fall in inequality and poverty are changes in labor market participation. This factor is potentially important as Russia experienced economic growth over the years 2000–2008. During this period, unemployment rate decreased from 10.6 percent to 5.6 percent, which accounts for 2.7 millions of people entering the labor market (Russian Statistical Office, 2009, p. 130).[7]

We consider people to be employed if (a) they are currently working; or (b) they are on paid leave; or (c) they are on unpaid leave; or (d) they are self-employed; or (e) they are farmers. Those people that do not fall into one of these categories are considered to be non-working (e.g., students, pensioners, actively and passively unemployed). We consider people to work full-time if they report working more than 120 hours per month at their main job. The evolution of changes in labor market participation is shown in Figure A8 in the Online Appendix which reports the share of households with no to more than three employed individuals (Figure A) and the share of households with no to more than two members working *full-time* (Figure B).

Figure A8 exhibits an uneven pattern in unemployment trends (as measured by the share of households in which no individual has a (full-time) job): first it increased over the years 1994–1998, then it decreased reaching its minimum in 2008, and finally it began to increase again to the level of 1998. Interestingly, the trends of families with two and no one working individuals follow opposite paths. Similar tendency is observed for full-time employment. Perhaps surprisingly, the share of families with one working individual accounts for 30 percent and the pattern remains stable across the whole period.

[6]Reassuringly, the introduction of a large refreshment sample in the RLMS-HSE in 2010 hardly affects the trends observed. We are therefore confident that the demographic trends recorded are genuine and do not merely reflect ageing of the RLMS-HSE longitudinal samples.

[7]There is no doubt that substantial share of economic activity is not registered or partially registered. Our RLMS-HSE sample includes both formal and informal employment. Also see Lehmann and Zaiceva (2015) for evidence that determinants of informal employment are stable over time.

5.3. *Changes in separate income sources*

As the next group of factors, we consider changes in different sources of market and non-market incomes: (i) earnings from public sector employment, (ii) earnings from private sector employment, (iii) pensions,[8] (iv) other public transfers, (v) and other private income sources. Figure A9 in the Online Appendix shows the evolution of the mean of each of these five components. Earnings from public and private sectors are the largest components of total household incomes and they record a persistent increase throughout the period 1998–2013 (except in 2008). Pensions form the third largest source of income and they too increased sharply over time (especially between 2007 and 2011). Earnings from the private sector had the largest increase and this pattern can be explained by the growth in employment in the private sector. Other income sources have remained largely constant since 1998.

Having documented the changes in the distribution of income and having identified changes in potential drivers (the trend towards smaller households, an educational expansion, an overall increase in employment, and a rapid increase in pensions and in earnings from public and private sector employment), we now attempt to quantify the relative contribution of each of these factors to the trends in inequality and poverty.

6. Methodology

We assess the contribution of different drivers by constructing counterfactual distributions that simulate trends that would have been observed had the various drivers remained fixed to their values at the turn of the century. As we explain below, confronting the observed series of inequality or poverty indicators to the simulated series gives us a plausible indication of the impact the various drivers had on income distribution changes.

We adopt a hybrid semi-parametric strategy to construct the counterfactual series similar to Hyslop and Maré (2005), Biewen and Juhasz (2012), Larrimore (2014), Deutschmann (2019). In a nutshell, changes in the socio-demographic characteristics of households and changes in labor market participation are assessed by using the reweighting procedure proposed by DiNardo *et al.* (1996). Counterfactual distributions holding constant changes in the distribution of earnings and of pensions are created by subtracting actual sources of income from the household-level records and adding simulated household-level incomes.

We apply this method stepwise. First, changes in socio-demographic characteristics of families are held constant to the year 2000 (taken as reference year throughout the analysis), and new inequality and poverty measures are re-estimated. Then, changes in socio-demographic characteristics together with changes in labor market outcomes are being examined. Finally, we come to the last step of the analysis where we keep distinct income sources constant conditional on socio-demographic characteristics and labor market participation.

[8]The old-age pension is a sum of a flat rate pension and dependent-on-salary points that are collected over years of employment.

6.1. *Stage 1: Changes in socio-demographic attributes*

Suppose we are interested in estimating changes in the distribution of income between two periods (period 0 and period t) and we relate these changes to shifts in household characteristics. Then the counterfactual distribution in which distribution of household characteristics as in period 0, but everything else changes over time (period t) is given by:

$$f_c(y) = f_t(y|t_x = 0) = \int_x f_t(y|x)\, dF_0(x) \tag{1}$$

where $f_t(y|x)$is income distribution density function for households with characteristics x in period t, $F_0(x)$is the distribution of characteristics x in period 0 and $f_t(y \mid t_x = 0)$denotes the counterfactual income density function that would be observed at time t if household characteristics were distributed as in period 0. The actual distribution of income in the base period would be given as $f_0(y|t_x = 0)$. The reweighting approach follows as:

$$f_c = f_t(y|t_x = 0) = \int_x f_t(y|x)\, dF_t(x)\, \frac{dF_0(x)}{dF_t(x)} = \int_x f_t(y|x)\, \omega(x)\, dF_t(x) \tag{2}$$

where $\omega(x)$ is a reweighting factor that is applied to the distribution of income in period t.

Applying Bayes' rule $= \Pr(B|A) * \Pr(A)/\Pr(B)$ we can rewrite the reweighting factor as:

$$\omega(x) = \frac{Pr(x|t=0)}{Pr(x|t=1)} = \frac{\Pr(t=0|x) \times \Pr(x)}{\Pr(t=0)} \times \frac{\Pr(t=t)}{\Pr(t=t|x) \times \Pr(x) \times \Pr(t=t)} = \frac{\Pr(t=0|x)/\Pr(t=0)}{\Pr(t=t|x)/\Pr(t=t)} \tag{3}$$

Accordingly, the reweighting factor $\omega(x)$ can be easily estimated: $\Pr(t=0)$ and $\Pr(t=t)$ are proportions of time periods in the sample, and $\Pr(t=0|x)$ and $\Pr(t=t|x)$ can be estimated by regressing t on characteristics x in a pooled sample of period 0 and period t data. Once the reweighting factor is estimated, we re-estimate inequality and poverty trends and compare these counterfactual estimates with the actual estimates.

6.2. *Stage 2: Changes in socio-demographic characteristics and labor market participation*

The second stage considers changes in labor market outcomes e conditional on the characteristics x. The counterfactual distribution is the distribution where we keep distribution of socio-demographic characteristics x and distribution of labor market outcomes e conditional on these characteristics as in the period 0. It is obtained by combined simulation of the distribution of socio-demographic

characteristics and of employment conditional on socio-demographic characteristics. That is:

$$
\begin{aligned}
f_c\left(y|t_x=0,t_e=0\right) &= \int_e\int_x f_{tj}\left(y|x,e\right)dF_{0j}\left(e|x\right)dF_{0j}\left(x\right) \\
&= \int\int f_{tj}\left(y|x,\ e\right)\left[\frac{dF_{0j}\left(e|x\right)}{dF_{tj}\left(e|x\right)}\right]dF_{tj}\left(e|x\right)\left[\frac{dF_{0j}\left(x\right)}{dF_{tj}\left(x\right)}\right]dF_{tj}\left(x\right) \\
&= \int_e\int_x \Psi_{x|j}\Psi_{e|x,\,j}f_{tj}\left(y|x,e\right)dF_{tj}\left(e|x\right)dF_{tj}\left(x\right)
\end{aligned} \tag{4}
$$

where $\Psi_{x|j}$ and $\Psi_{e|x,j}$ are reweighting factors, which can be rewritten as:

$$
\Psi_{x|j} = \frac{Pr_j(x|t=1)}{Pr_j(x|t=0)} = \frac{Pr_j\left(t=1|x\right)\times Pr_j(t=0)}{Pr_j\left(t=0|x\right)\times Pr_j(t=1)} \tag{5}
$$

$$
\Psi_{e|x,j} = \frac{dF_{1j}\left(e|x\right)}{dF_{0j}\left(e|x\right)} = \frac{Pr_{1j}(e|x)}{Pr_{oj}(e|x)} \tag{6}
$$

The reweighting factors are estimated by a set of probit regressions. Comparing results from stage 1 and stage 2 captures the contribution of employment trends.

6.3. *Stage 3: Changes in separate income sources*

Next we consider changes in the components of total household income. We fix income sources conditional on household characteristics to the base period 0 and re-estimate inequality and poverty trends. The simulation involves modifying household income data directly and recovering the counterfactual distribution as the distribution of the simulated household incomes. The simulation used to account for the change in earnings from public sector employment is as follows (we proceed similarly for all other sources):

$$
y_{tj}^{c} = y_{tj}^{total} - y_{tj}^{earn_{pub}} \times \left(1 - \frac{\hat{y}_{0j}^{earn_{pub}}\left(x\right)}{\hat{y}_{tj}^{earn_{pub}}\left(x\right)}\right) \tag{7}
$$

where y_{tj}^{total} is total household income for individuals in household j in period t, $y_{tj}^{earnpub}$ are earnings from public sector employment of household j in period t, $\hat{y}_{tj}^{earn\_pub}\left(x\right)$ are *expected* earnings from public sector employment of household j in period t conditional on household j's labor market and demographic characteristics. What equation (7) does is to replace the value of one income components by a rescaled value where rescaling is proportional to the growth rate of that source between t and the reference period 0 (and growth is conditional on household characteristics

x and labor market outcomes e). Conditional expectations are obtained by OLS regression. This manipulation generates a counterfactual distribution in which the level of one source is held to its year 0 mean, that is, it *freezes* the evolution of the source. As for the previous stages, the further apart is the simulated distribution from the observed distribution, the stronger has been the contribution of the source of interest. We consider changes of different income sources separately.

6.4. *Stage 4: Changes in relative levels and dispersion*

Aggregate income levels have increased substantially across most sources between 1994 and 2015. We therefore also construct a simulation which sorts out the growth rate of different sources relative to each other. To do so, we modify equation (7) by uprating the frozen source according to the growth rate of aggregate incomes. The counterfactual distribution for, say, pensions, is then given by:

$$(8) \qquad y_{tj}^{c} = y_{tj}^{total} - y_{tj}^{pen} \times \left(1 - \frac{\widehat{y}_0^{pen}(x)/\mu_0}{\widehat{y}_t^{pen}(x)/\mu_t}\right) = y_{tj}^{total} - y_{tj}^{pen} \times \left(1 - \frac{\widehat{y}_0^{pen}(x)}{\widehat{y}_t^{pen}(x)} \times \frac{\mu_t}{\mu_0}\right)$$

where μ_0 is average total household income in base period 0, μ_t is average total household income in period t. Pension income in period t is rescaled by a factor that holds the relative importance of pensions in total income constant to the base year. So, unlike in step 3, we capture here the evolution of pensions *relative* to the evolution of aggregate incomes.

Finally, we further refine the simulation by allowing for different trends in each source. The simulation is obtained from equation (7) by rescaling all period t incomes by its own growth rate, e.g. for pensions:

$$(9) \qquad y_{tj}^{c} = y_{tj}^{total} - y_{tj}^{pen} \times \left(1 - \frac{\frac{\widehat{y}_0^{pen}(x)}{\mu_0^{pen}}}{\frac{\widehat{y}_t^{pen}(x)}{\mu_t^{pen}}}\right) = y_{tj}^{total} - y_{tj}^{pen} \times \left(1 - \frac{\widehat{y}_0^{pen}(x)}{\widehat{y}_t^{pen}(x)} \times \frac{\mu_t^{pen}}{\mu_0^{pen}}\right)$$

where $\mu_0^{pen}$is average pension in base period, $\mu_t^{pen}$is average pension in period t. What this final simulation captures is the evolution of each source across different socio-demographic groups, that is, only the "between group" differences in the evolution of pensions from the base year.

7. Results

We now examine our full set of results. We contrast the observed evolution of a series of inequality or poverty indicators to a simulated series that holds the factor of interest fixed to 2000 values. The larger is the difference between the two series, the larger has been the role of the evolution of the factor held constant. The indicators we report here are the Gini coefficient and the mean income. Estimates for the poverty rate, and three percentile ratios—P90/P10, P90/P50 (for upper half evolution) and P10/P50 (for lower half evolution)—are available in the Online Appendix.

The choice of the year 2000 as a reference period is largely arbitrary, but our results are robust to changing in the base year.[9] We calculate bootstrap confidence intervals for all differences between the observed and the simulated series. The bootstrap takes into account stratification across regions and household-level clustering.

Figure 2 presents results of the reweighting analysis for the 1st and 2nd groups of possible determinants: changes in socio-demographic characteristics (panel a) and in labor market participation (panel b).[10] The figures show two lines: the blue line is actual estimate and the orange line is counterfactual estimate. They are connected by an arrow which shows the direction of the impact of the determinant.[11] One should read the counterfactual figures as showing "what would have happened to income inequality and poverty if the determinant's value had not changed since 2000?;" and the answer is provided by the orange line. If the arrow goes down, then the estimated impact of the determinant has been negative (that is, it contributed to reducing the inequality or poverty indicator), and if the arrow goes up, then the impact has been positive. Statistical significance is conveyed by the pattern of the arrows. If the arrow is solid, then the change is significant at 5 percent, that is, the 95% confidence interval of the difference between the observed and simulated estimates does not cover zero; if it is dashed, it is not statistically significant.

The simulations clearly show that keeping socio-demographic characteristics and labor market participation constant to 2000 would not have made any difference to income distribution trends. Neither of inequality nor poverty measures would differ from its actual values. The secular trend towards smaller families, the increase in tertiary education, and the trends in unemployment can be discarded as drivers of distributional change. The only series that is affected is mean income which has increased after 2005 less than it would have, had the socio-demographic characteristics of the population not changed from 2000. Perhaps surprisingly, it seems that the trends towards smaller families and the reversal of unemployment in recent years has offset the expansion of tertiary education in driving incomes upwards.

Figure A12 in the Online Appendix presents observed and counterfactual growth incidence curves between 2000 and 2015. The income growth of every income percentile has been lower than it would have if socio-demographic characteristics and labor market participation had remained as in 2000. But the impact has been evenly distributed across the distribution and therefore did not impact inequality measured.

The big impacts are to be found in the distribution of income components. The first set of counterfactual results for changes in earnings and pensions are illustrated in Figure 3. The evolution of earnings from public sector employment (panel a) has resulted in decreases in the Gini index (and also in the poverty rate, P90/P10 and P90/P50 ratios, as shown in Figures A13–A15 in the Online Appendix). These effects are statistically significant, but relatively small in magnitude, when assessed

[9]The Online appendix contains results for 1995, 2005, 2010 and 2015 taken as reference years (Figure A12).

[10]See also Figures A10 and A11 in the Online Appendix.

[11]Dots replace arrows when the difference between actual and counterfactual estimates is too small to be represented by an arrow.

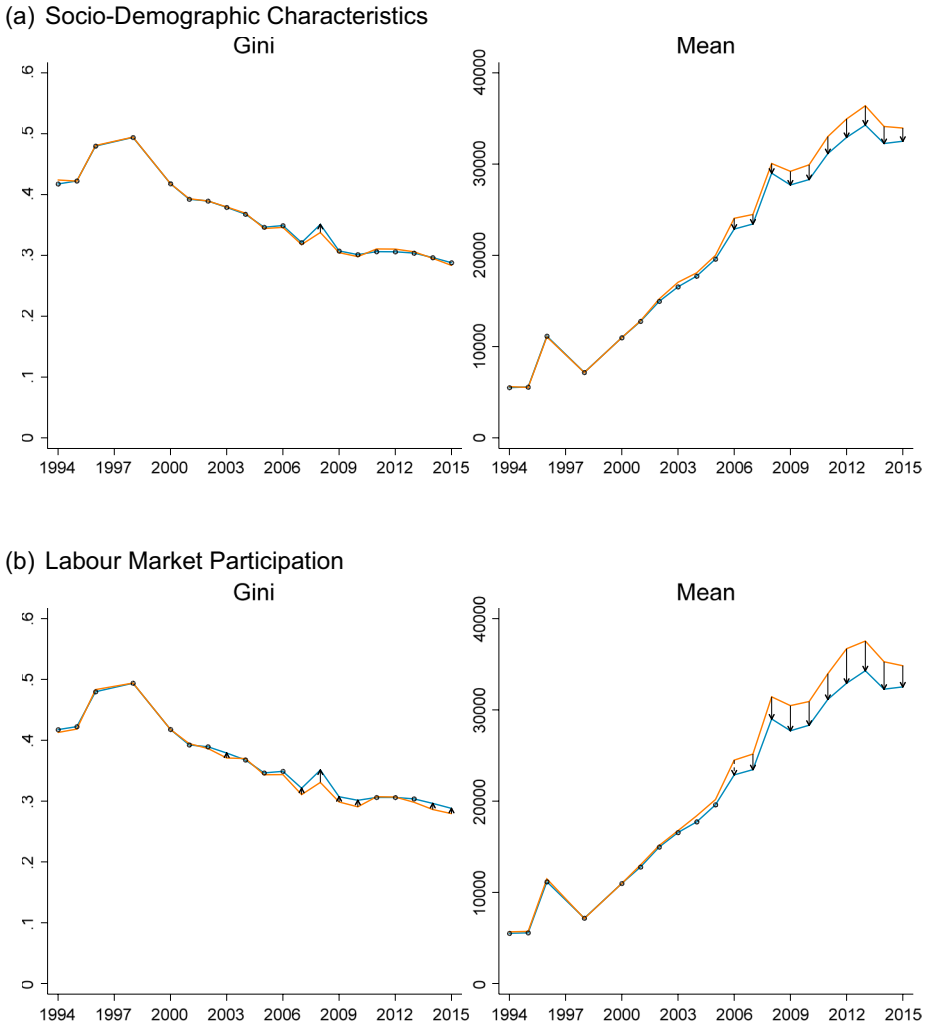

Figure 2. Impact of Changes in (a) Socio-Demographic Characteristics and (b) Labor Market Participation

Notes: Blue line is actual estimate; orange line is counterfactual estimate. Arrows show the direction of the impact of determinant. Solid arrows represent impacts that are statistically significant at 95% significance levels.

Source: The RLMS-HSE 1994–2015, own calculations. [Colour figure can be viewed at wileyonlinelibrary.com]

against the overall changes observed in the series. They had a positive effect on mean income levels and the P10/P50 ratio. For example, if earnings from the public sector were frozen at 2000 values, then in 2015 average income would be 27,000 rubles instead of 32,500 rubles. The fact that the P10/P50 ratio would be lower indicates that the evolution of earnings from the public sector improved incomes for those in the lower part of income distribution.

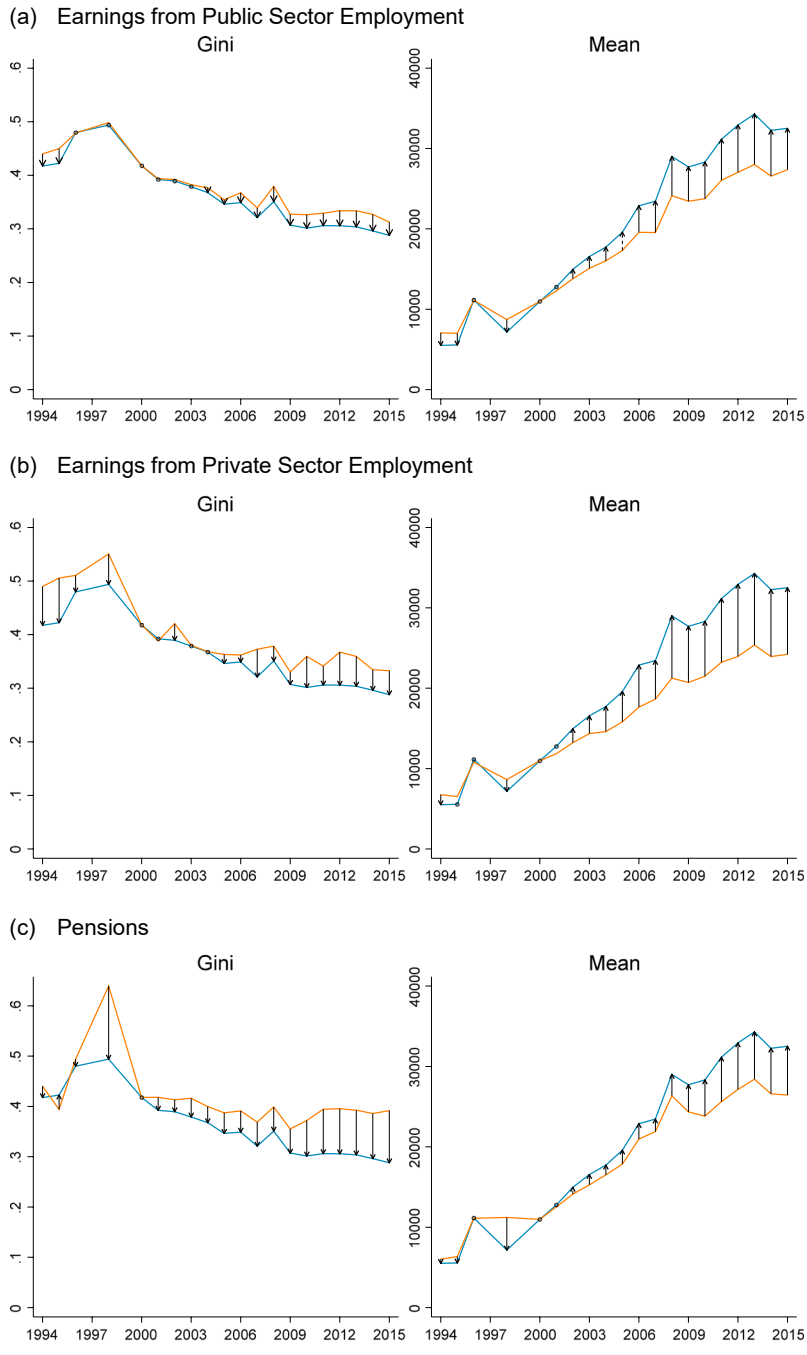

Figure 3. Impact of Changes in (a) Earnings from Public Sector Employment, (b) Earnings from Private Sector Employment and (c) Pensions

Notes: Blue line is actual estimate; orange line is counterfactual estimate. Arrows show the direction of the impact of determinant. Solid arrows represent impacts that are statistically significant at 95% significance levels.

Source: The RLMS-HSE 1994–2015, own calculations. [Colour figure can be viewed at wileyonlinelibrary.com]

Results for private sector earnings (panel b) are similar to those for public sector earnings, but they are bigger in magnitude. They also grew faster at the bottom and resulted in reductions in both poverty and inequality. Keeping earnings from the private sector constant have larger simulated effects on the income distribution than earnings from the public sector. For example, increase in earnings from the private sector had led to a decrease of the Gini index from 0.33 to 0.29 for 2015. While an increase in earnings from the public sector had led to a decrease from 0.31 to 0.29 for the Gini index in 2015. This difference is because, on the one hand, earnings from the private sector are in absolute terms larger than earnings from the public sector, and, on the other hand, the share of individuals employed in the private sector was increasing since the fall of the Soviet Union. We also observe that changes in private sector earnings brought the largest impact on the income levels: if earnings from the private sector would be fixed at its 2000 values, then average income in 2015 would be 25,000 rubles compare to 32,500 rubles.

The next explanatory factor is the evolution of pensions (panel c). Although the evolution of pensions has been smaller in magnitude than the evolution of earnings (see Figures A9 and A15 in the Online Appendix) it had remarkably large impacts on inequality and poverty indicators—larger than earnings. The difference between actual and counterfactual Gini indices is equal to 11 points, and is 15 points for the poverty rate in 2015. We find the largest positive impact on the P10/P50 ratio: if pensions would be at their 2000 level, then the P10/P50 ratio would be equal to 0.28 compared to 0.52 in 2015 (see Figure A15 in the Online Appendix for P10/P50).

The counterfactual analysis for the remaining components of household income can be found in the Online Appendix, Figures A16 and A17. Other income sources and other benefits do not explain much of the changes in income distribution. As a matter of exception, only "other private income sources", in particular home food production, played a role for the inequality and poverty reduction over the early 1994–1998 years.

We provide the more detailed pattern of income growth for different income percentiles over 2000–2015 years in Figure A18 in the Online Appendix. The growth incidence curve shows how the increase in pensions brought the growth at the bottom of the income distribution: if pensions were fixed at their 2000 level, then in 2015 income growth of the 10th percentile would be equal to 1.9 in comparison to the observed 4.5. The increase was especially large below the median. Changes in private sector earnings have resulted in increases in income levels at every income percentile. Changes in public sector earnings had resulted in increased income growth too, but with somewhat smaller magnitudes than private sector earnings. There are small but statistically significant impacts of changes in other income sources and other benefits on income growth.

Summing up so far, we find that changes in socio-demographic characteristics together with labor market participation do not explain the reduction in income inequality, poverty and increase in income levels. Changes in earnings from private and public sectors, and pensions are the main determinants of the decrease in income inequality and poverty. Earnings from the private sector had large impacts on income levels. Increases in pensions had the strongest equalizing effect on inequality by improving the incomes of those at the lower end of income

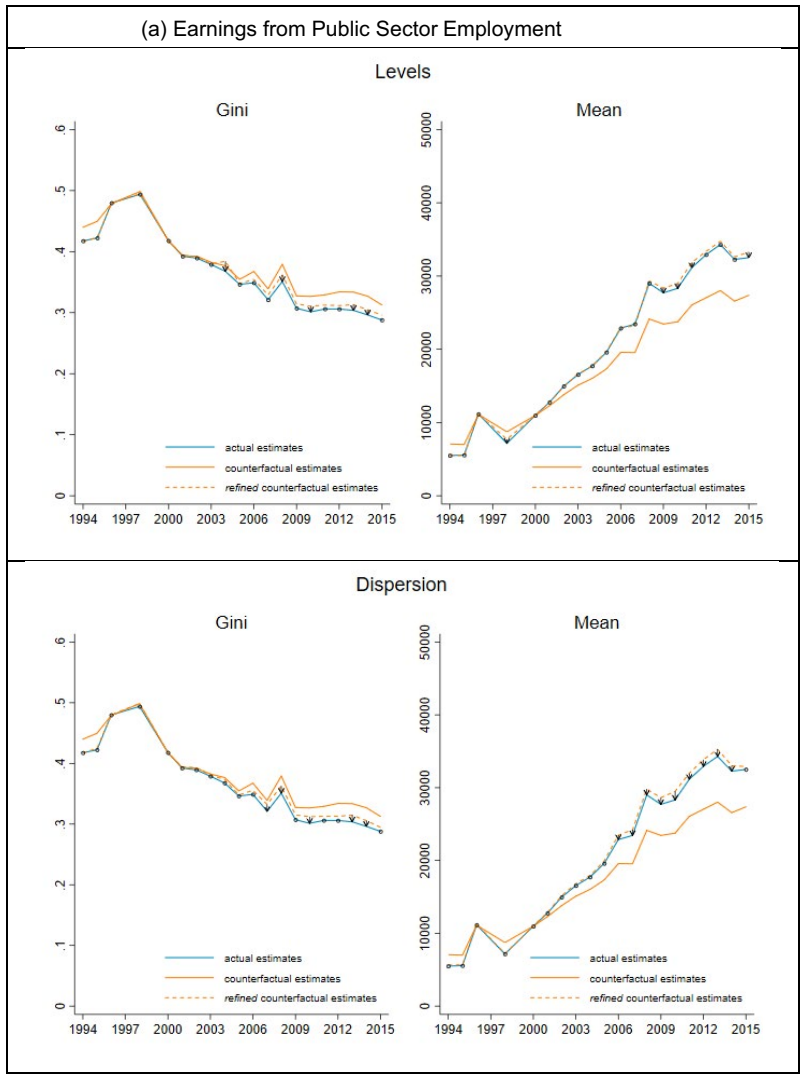

Figure 4. Impact of Changes in Levels and Dispersion of (a) Earnings from Public Sector, (b) Earnings from Private Sector and (c) Pensions

Notes: Blue line is actual estimate; orange line is counterfactual estimate. Arrows show the direction of the impact of determinant. Solid arrows represent impacts that are statistically significant at 95% significance levels.

Source: The RLMS-HSE 1994–2015, own calculations. [Colour figure can be viewed at wileyonlinelibrary.com]

distribution. Other income sources and other benefits do not explain changes in income inequality and poverty.

To conclude the analysis, we refine the simulation to isolate two more "subtle" income components effects: (i) the evolution of each source *relative* to the aggregate incomes in order to pick up the impact of the change in the income portfolio

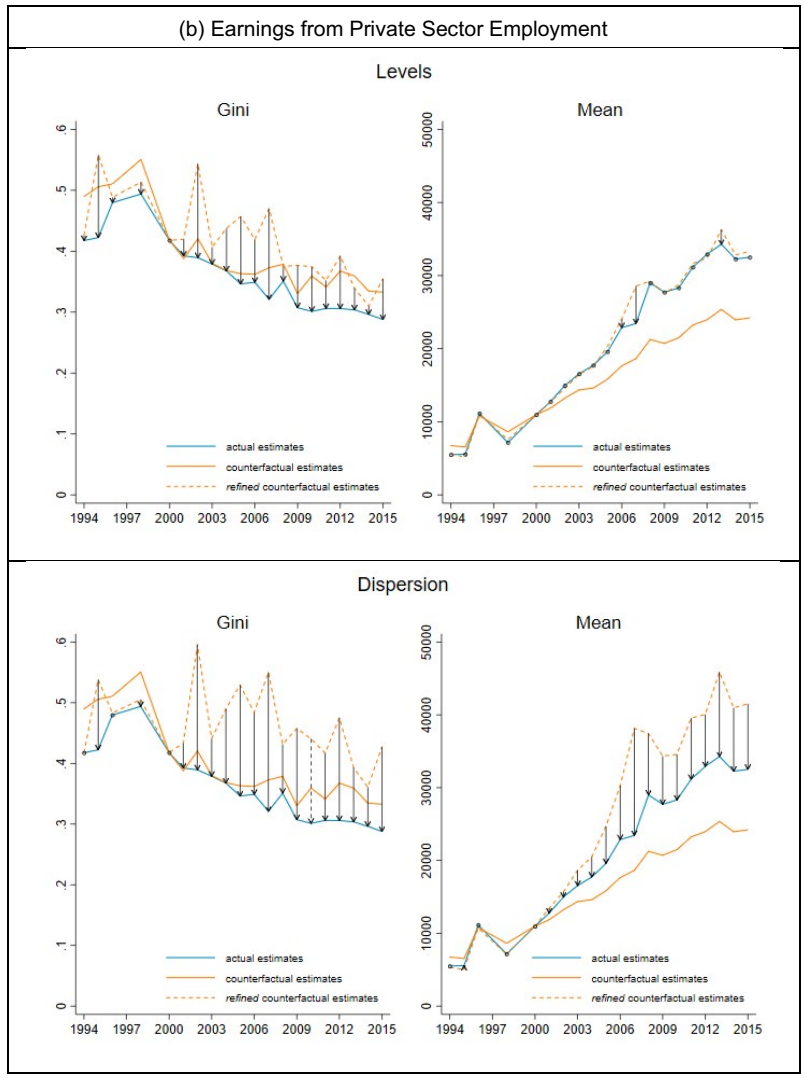

Figure 4. (continued)

composition separately from the overall drift in the levels of all sources; and (ii) the evolution of the "between group" differences in expected earnings/pensions across household characteristics. The more detailed analysis is conducted only for those three income sources which contributed to the changes in income inequality.

Results are presented in Figure 4. The figure shows trends of actual estimates (blue line) and counterfactual estimates (orange solid line and orange dashed line). Note that the "orange" estimates are the same estimates as shown in the previous step. The orange dashed line stands for the "refined" counterfactual estimates.

Panel (a) for earnings from public sector employment shows almost no impact from the differential growth compared to total income, nor any impact of changes

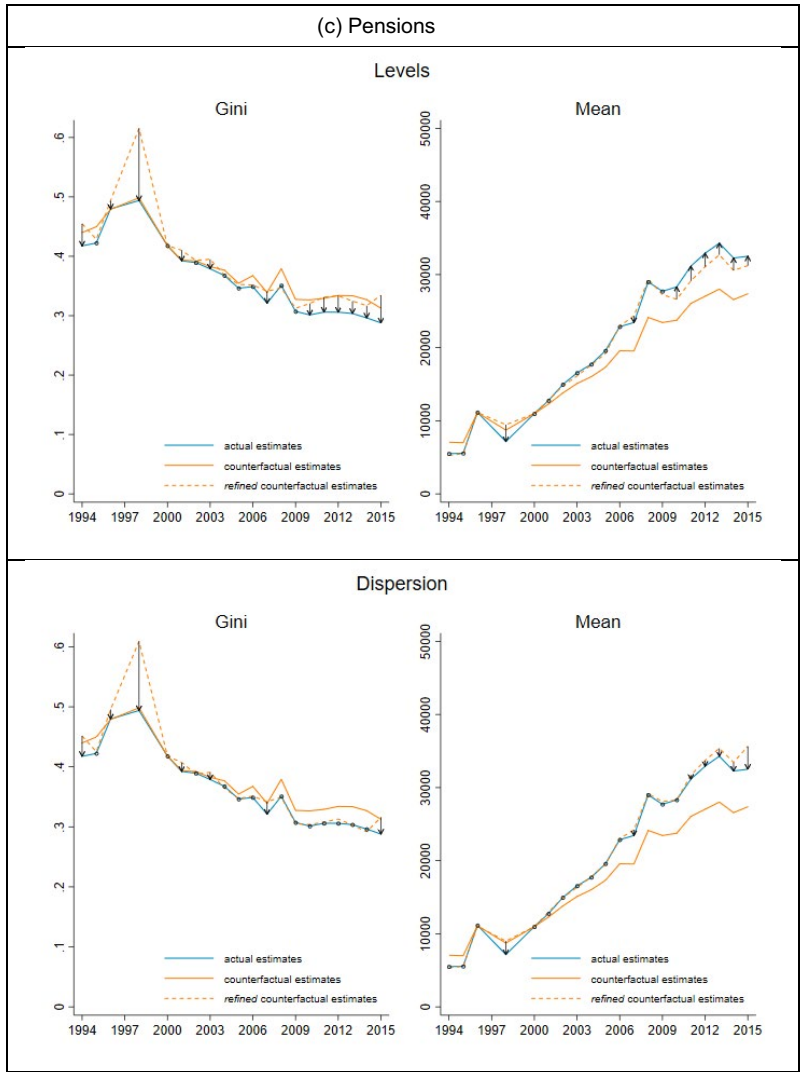

Figure 4. (continued)

in between-group differences. All impacts are driven by the increase in the level of earnings across the board, rather than be a reallocation of the portfolio of household incomes towards public sector earnings or by different growth rates for different household types.

Panel (b) shows results for private sector earnings. In sharp contrast with earnings from public sector employment, (i) the faster increase in private sector earnings compared to total incomes in itself contributed to the reduction in inequality and (ii) changes in the relative private sector earnings of different household types also tended to push inequality down. Taken together, these results indicate that the growth in private sector employment resulted in a

reallocation of the earnings portfolio of, primarily low income families, towards private sector earnings. This resulted in an evolution of the income portfolio and in between-group earnings differences that led to a compression of the overall income distribution.

Finally, panel (c) shows that, very much like public sector earnings, it is the overall increase in pensions rather than a change in its structure across the population that explains its large impact on inequality and poverty reported above. This is unsurprising since pensions are by definition tied to old-age households and not a source that is easily reallocated in household income portfolios.

8. Conclusion

This paper aimed at explaining changes in income inequality and poverty in Russia between 1994 and 2015, that is, over 20 years after the fall of the Soviet Union. Previous literature on inequality in Russia has documented a sharp but relatively brief increase in income inequality in the 1990s that reversed after 2000. We complement these studies by addressing the question of what factors were responsible for the changes in the entire income distribution. To do so, we adapt the semi-parametric approach developed by DiNardo *et al*. (1996) so as to quantify the role of a range of potential determinants. We focus specifically on three groups of possible determinants: changes in socio-demographic characteristics, changes in labor market participation and the evolution of income sources reflecting both market incomes and public transfers. All of these factors have changed significantly over the period covered by the analysis and could therefore be believed to be potential drivers of distributional change.

Our counterfactual analysis suggests that changes in socio-demographic characteristics together with labor market participation cannot explain the changes in income inequality and poverty in Russia between 1994 and 2015. Explanations are to be found in the evolution of income sources, mainly earnings from public sector employment, earnings from private sector employment and pensions. The evolution of these sources have resulted in a reduction of inequality and poverty after 2000. The expansion of pensions had the largest impact as it increased incomes sharply at the bottom of the distribution. Furthermore, the expansion of private sector earnings has been associated with a change in the structure of earnings across household with different socio-demographic characteristics and this reduced total income inequality. We therefore present evidence for a combination of both state intervention and market forces, which allowed for inequality and poverty to decline after the sharp increase observed just after the fall of the Soviet Union.

The decline in inequality and poverty observed in Russia had parallels in other upper middle income countries. Brazil, notably, has been shown to experience a fall in income inequality and poverty rates from 2001 to 2015 too. The forces behind these similar trends appear somewhat different however. If changes in the distribution of earnings appear central in both countries, Tsounta and Osueke (2014) and Neri (2018) show that educational expansion played a key role in the decline of inequality in Brazil, and in Latin America more generally.

This did not appear relevant to the Russian experience. Different factors appear to drive similar trends, but it is notoriously hazardous to draw conclusions from studies using different data and methods and which consider different sets of candidate determinants. Whether trends will remain similar is also an open question.

The analysis does not come without potential limitations. Specifically, our analysis does not cover the evolution of income of the richest in Russia, as household surveys fail to capture the richest and the wealthiest. The trends we examine are however consistent with research that has attempted to address the undercoverage of top incomes, and we argue that it is still of importance to analyze changes in the income of "the other 99 percent" of the population.

The study was motivated by simultaneous changes in the income distribution and reforms in economic, social, public policies since 1994 in Russia. Although it is not possible here to disentangle the impact of specific reforms, we trust our simulation analysis helps with understanding the nature of impact of the state intervention, market forces, and socio-demographic changes on changes in inequality and poverty in contemporary Russia.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's web site:

Supplementary Material

Figure A1. Economic Development in Russia 1992–2016

Figure A2. Participation of Households, Individuals and Children in the RLMS-HSE

Figure A3. Inequality Trends in RLMS-HSE, LIS and WID

Figure A4. Growth Incidence Curve 2000–2015

Figure A5. Gini and Average Income in Rural and Urban Russia: 1994–2015

Figure A6. Changes in Family Types in Russia: 1994–2015

Figure A7. Changes in Socio-Demographic Household Characteristics

Figure A8. Changes in Labor Market Participation

Figure A9. Evolution of Average Income Sources

Figure A10. Impact of Changes in Socio-Demographic Characteristics

Figure A11. Impact of Changes in Labor Market Participation

Figure A12. Growth Incidence Curve for 2000–2015

Figure A13. Impact of Changes in Earnings from Public Sector

Figure A14. Impact of Changes in Earnings from Private Sector

Figure A15. Impact of Changes in Pensions

Figure A16. Impact of Changes in Other Income Sources on Changes in Income Distribution

Figure A17. Impact of Changes in Other State Benefits on Changes in Income Distribution

Figure A18. Growth Incidence Curve for 2000–2015

Figure A19. Counterfactual Results for 1995, 2005, 2010, 2015 taken as Reference Year