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Research article

Market and home production earnings gaps in Russia

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Abstract: This study assesses the evolution of earnings across different groups of workers during Russia's 2000–2013 oil boom and amidst the 2014–2015 oil bust and a trade war. Unconditional quantile regressions and growth incidence curves are applied to nine household surveys for 2000–2016 to estimate earnings gaps across urban/rural, farming/non-farming and gender divides at various earnings quantiles. Gaps in pre-fiscal formal labor market earnings and informal non-market home production are assessed, distinguishing the roles of workers' endowments differentials and returns differentials in production markets. Earning gaps are found to be pervasive, with rural and some female-headed households receiving lower returns on their human capital in part because they lack employment opportunities. Rural Russian households face mobility barriers and lack decent employment opportunities, thus lacking incentives for skill investment. Rural households tend to be less educated and face low returns on their various marketable characteristics. Gender gaps were particularly high historically, particularly among lower quantile groups, but have been steadily falling over the past decade. Growth incidence curves reveal that the 2014 shocks affected particularly harshly the farming and urban households, both immediately and over the following years. We conclude that Russia should strengthen its rural assistance programs and lower the mobility and resettlement barriers to improve rural households' access to education and employment.

Keywords: wage gap decomposition; unconditional quantile regression; home production; Russian Federation; trade restrictions

JEL Codes: F16, J31, D31

1. Introduction

In 2020, Vladimir Putin constitutionally extended his rule for years to come, so it is valuable to appraise the economic achievements under his prior two decades in power. This study assesses the evolution of earnings across different groups of workers during Russia's 2000–2013 oil boom and amidst the 2014–2015 oil bust and a trade war.

Putin ascended to power on the heels of a 1999–2000 uptick in growth in the Russian economy from a decade-long slump. For the following 13 years, the economy was booming, only briefly slowed by the worldwide recession and the oil shock of 2008–2010. The economy only came to a halt in 2014 when the combination of plummeting oil and iron ore prices, currency depreciation, US and EU sanctions and Russia's retaliatory bans on food imports took their toll on various groups of workers. Workers turned to informal markets and home production to fill the hole in their budgets. At the same time, Russia is said to have increasingly experienced a return to cultural conservatism and a resurgence of patriarchy, or outright misogyny in informal parts of the society, influenced by nationalist and identity politics.

In light of this volatile development, our study aims to take stock of the changes in earnings of different socio-economic groups. Using household income surveys for the years 2000–2016, we evaluate workers' labor earnings and home production for their own use as complementary aggregates of workers' outcomes and welfare. The first one measures raw compensation for workers' labor services in mostly formal labor markets before fiscal distortions, while the latter covers activities outside of formal markets and outside of the state redistribution system, before taxes, contributions and indirect and in-kind subsidies and taxes.

Our primary contribution to empirical literature on economic development in Russia is to assess households' reliance on formal labor market production and informal non-market home production for their own consumption. We evaluate earnings gaps in these activities between privileged and disadvantaged groups, namely, urban vs. rural, non-farming vs. farming and male- vs. female-headed households. Home production is viewed as an important tool in households' coping productive mechanism, facilitating secure access to food or other necessities and services when formal labor markets and food supply chains are affected.

In the analysis of gaps in these alternative measures of income, we assess the role of workers' endowments of market-valued characteristics and market returns on these endowments. We decompose the earnings gaps by source and evaluate their trends across seventeen years. The study covers periods of positive growth as well as the crisis years of 2008–2010 and 2014–2015, and it contrasts the pre- versus post-crisis trends for various groups.

The study is closely related to Calvo et al.'s (2015) decomposition of wages during 2002–2012 and Dang et al.'s (2019b) report on earnings and employment-status mobility in Russia during 1994–2015, relying on regressions and growth incidence curves (GIC). These studies do not analyze market or non-market earnings gaps between demographic groups, and they do not decompose them into endowment and returns effects. Ours is the first study to highlight the relation between market and non-market earnings of various groups of Russian households amid a volatile economic and political environment.

The rest of the study is organized as follows. Section 2 briefly reviews the history of inequality in Russia. Section 3 introduces our methodological approach. Sections 4 and 5 report the main results and discuss their implications for the situation in Russia today.

2. Background

The Russian economy experienced a continuous decline throughout the 1990s as measured by the gross domestic product per capita, on account of chaotic structural changes in the economy including a "shock therapy" privatization of industry and real estate (Boycko et al., 1995; Kosareva et al., 2000). Inequality of incomes skyrocketed (Novokmet et al., 2018). Private markets struggled to put in use the vast stock of physical and human capital released following the regime change, amid a regulatory vacuum (Brainerd, 1998). In lower parts of the earnings distribution, wage protections dissipated. Union representation waned as membership fell, and unions were pushed to reorient toward operating in a "social partnership" with the state (Clarke, 2005). Real minimum wages collapsed from 25 percent of mean wages in 1992 to as low as 4 percent in 2000 (Lukiyanova and Vishnevskaya, 2016).[1]

In 2000, international and domestic economic developments and political events brought recovery and normalization to Russia's economic sectors. Following the resignation of the embattled Boris Yeltsin, Vladimir Putin took control of institutions under the campaign slogan "the stronger the state, the freer the people." Tax and welfare reforms lowering taxes, a series of industry and property-ownership reforms and pacts agreed to between the Kremlin and Russia's industrial leaders led to improved fiscal compliance by businesses and more effective governance in labor markets (Guriev and Rachinsky, 2005; Ivanova et al., 2005; Gorodnichenko et al., 2009)—even if it also led to greater consolidation of market power by conglomerates, disadvantaging and indeed destruction of independent businesses and loss of personal freedoms in society.

The economy and workers' living conditions embarked on a continuous rally for the following 14 years. Household incomes rose, and inequality declined as growth and structural changes in the economy favored the middle class (Gorodnichenko et al., 2010). By 2009 real minimum wages rose 13-fold, returning to 25 percent of mean wages and to the level of minimal regional subsistence (Lukiyanova and Vishnevskaya, 2016). Trade unions once again rose in importance in terms of advancing workers' working conditions and protections. Putin's administration also expanded social programs and increased public-sector wages and pensions.

During 2008–2010, a worldwide recession and the concurrent fall in raw-resource prices dealt a blow to Russia's fiscal position and to labor markets. The crisis did not particularly affect the bottom three income-decile groups, so the development was relatively pro-poor, but upper deciles experienced declining earnings for their services and rents for their capital and business ventures. In the labor market, wage compression at the top was observed, and the number of high-income jobs declined, as corporations were affected by plummeting public oil revenues (Gimpelson, 2016; Hlasny, 2019, 2020a). Private firms without state backing struggled to get back up on their feet for two or more years. Labor productivity dipped on account of the falling value of output, and private-sector firms were forced to reduce employment and wages.

By 2011 the economy recovered, and Russia was formally reclassified by the World Bank from an upper-middle income country to a high-income country. This was short-lived, however, since in 2014 the economy came to a halt when the combination of US and EU sanctions introduced in the spring, Russia's retaliatory bans on food imports enacted in the summer and plummeting of oil and

[1] Evidence from outside of household surveys suggests that 1990s growth was highest at the top of the income distribution, because of capital rents and capital gains. Even though the year 2000 tax reform resulted in improved compliance, significant wealth continues to be hidden from public scrutiny or stashed abroad (Novokmet et al., 2018). As a result, true inequality in Russia may be on par with the notoriously high inequality in the US.

iron ore prices in the fall took their toll. Like in 1998, the ruble lost one half of its value. Workers in the most affected sectors turned to informal activities to overcome the constraints in formal labor and output-goods markets. In 2015 Russia was demoted again to the upper-middle income country tier.

2.1. Inequality

The economic development of the past two decades was not distribution-neutral but affected vertical and horizontal equity. Income inequality as measured by the Gini coefficient soared throughout the 1990s and only slightly abated at the turn of the millennium. Inequality then fell continuously in the 2000s, except for the recessionary years of 2008 and 2015–2016. This equalization occurred in the middle of the income distribution as well as in the tails, as evidenced by a declining Gini coefficient and income ratios (Calvo et al., 2015). The Gini coefficient of pre-fiscal labor market income per adult equivalent slid near monotonically by 2016.

Following Russia's annexation of Crimea, income inequality fell as high-income individuals were squeezed by targeted sanctions and asset freezes and tumbling capital and business incomes. Meanwhile, the working poor were protected by social protection policies, including minimum wages and formal employment contracts, and in some sectors the working poor benefited by turning to informal work such as secondary jobs in farming and home production, where their productivity increased amid import substitution (Barseghyan, 2019).

Changing inequality is also a product of the changing socio-economic and demographic composition of the Russian society (Table A.3), with implications for the relative wages that members of each group could earn. The development and equalization processes had different effects on different social groups and the income gaps across them. The representations of rural vs. urban, female vs. male headed, non-employed vs. employed and employed by an SME vs. large employer evolved across the society's earnings quintiles (Table A.4). Prior to the 2000s, rural-urban income gaps were large and growing, particularly among the unskilled workforce, on account of a fall in real-terms rural earnings and their "demonetization." This was reversed in the post-2000 years thanks to a policy push for improving rural living conditions and assisting farms and gradually expanding economic opportunities in rural areas (Wegren, 2014). The between rural/urban groups component of the Gini coefficient declined throughout the 2000s and then stagnated during the 2010s (Table A.5).

The rising inequality in the 1990s manifested itself through substantial interregional income gaps. These have been attributed to differentials in demographic factors, geographical distance to markets and export patterns (Fedorov, 2002), wage adjustment to shocks and social and redistributive policies (Remington 2011; Durand-Lasserve and Blöchliger, 2018). Differential price levels had only a small effect on the real income gaps (Kolenikov and Shorrocks, 2003). The level of inter-regional inequality remained high in recent years (Mahler, 2011; also refer to studies evaluated by Gluschenko, 2010, 2011b), only slightly dented by the equalizing forces of local economic growth (Guriev and Vakulenko, 2012). Hlasny (2020a) found that workers in disadvantaged regions faced lower earnings on account of their inferior access to decent employment opportunities, but they were also less educated and received lower returns on their observable marketable endowments, including job experience. These studies suggest that opportunities for labor mobility in Russia are improving only slowly and that inadequate regional housing options, limited transportation infrastructure and region-varying employment protection and social policy play an unrelenting role in it (Gluschenko, 2010; Leonard et al., 2016; Durand-Lasserve and Blöchliger, 2018).

Gaps between formal and informal incomes explain a large share of interregional and urban-rural inequality. Earnings between the formal and informal sectors clearly differ in their level and degree of inequality, with both of these favoring the formal group (Lukiyanova, 2015). Nevertheless, the influence of informal earnings on inequality is falling over time. In fact, the fall in interregional inequality leading up to the crisis year of 2014 can be partly attributed to the increase in informal incomes in disadvantaged and rural places and their negative association with other income sources, including formal urban incomes (Malkina, 2017). Social transfers, for their part, had a weak redistributive effect in terms of bridging the gap between those privileged and those in need. In a study of households' adaptation to deprivation, Dang et al. (2019a) concluded that Russian households' subjective welfare did not adapt even to chronic downturns, which may indicate that households' attainments and opportunities in the non-money-metric sphere were inadequate to assuage their income losses.

This study evaluates income gaps for the years 2000–2016 including the period after the crisis years of 2014–2015. This is done across a number of demographic lines, for alternative pre-versus-post fiscal income concepts from formal-versus-informal activities and across income deciles.

3. Analytical approach and data

Understanding the earnings differentials among households in the lower and upper parts of income distributions is important because of their implications for economic polarization, poverty incidence and impact incidence of economic shocks. Economic growth does not fall equally on all participants in the society. Understanding the incidence of growth across income quantile groups is crucial for evaluating the existence of poverty traps, identifying vulnerable groups and designing appropriate policy responses. The following paragraphs describe the methods used in this study to assess the cross-sectional earnings gaps between pairs of demographic groups and the incidence of growth over time. Finally, motivation for using specific pairs of demographic groups and income types is provided.

Identifying the drivers of between-group inequality has traditionally relied on the regression-based Blinder–Oaxaca decomposition, which distinguishes the differentials in endowments, differentials in the returns to those endowments and other unmeasured factors between pairs of demographic groups. The endowment effect is the "explained" part of the differential associated with differences in the values of household characteristics between the two groups of households, such as age, education, employment of the head, residence and geographic region. The returns effect is the "unexplained" part of the differential due to differences in returns to individual characteristics between the two social groups—attributable to some latent form of segmentation, inefficiency or discrimination in the market for human capital. Lastly, the earnings gap is subject to a residual that cannot be attributed to any observable differences in endowments or returns to them between the two groups.

The standard decomposition estimates the contribution of endowments and their returns to the gap in group means. Meanwhile, covariates are typically expected to have systematically different effects at different quantiles of the income distribution. Conditional quantile regressions have been suggested for estimating differences in the quantiles of income distributions, conditional on the values of the treatment variables. Now, this approach also relies on restrictive assumptions. One, individuals whose treatment variables undergo change in value are assumed to retain their ranking among their peers with the same new values as among their peers with the original values (same quantile of the conditional income distribution). The position and ranking of other individuals are assumed unchanged.

By implication, changes in the distribution of treatment variables in the population—say, urbanization rate, prevalence of farming in the population or gender ratio – are assumed to have no partial or general equilibrium effects on the conditional income distributions, a limiting assumption.

One parametric solution to the shortcomings of conditional quantile regressions is the unconditional quantile regression (UQR) technique, implemented by estimating a re-centered influence function (RIF) (Firpo et al., 2009). This method requires estimating the conditional distribution of income on covariates only at one point of the overall distribution, and it has good properties compared to nonparametric estimators (Firpo et al., 2009; Fournier and Koske, 2012). This technique has been used by Ivanova et al. (2015) and Calvo et al. (2015) to study wage gaps in Russia up to the year 2010.

The RIF method consists of two stages: estimating the UQR on log annual household earnings per adult equivalent of the two groups of interest — in our case rural/urban households, households engaged in farming activities or not and households with female/male heads—and then constructing a counterfactual distribution that would prevail if the disadvantaged group (e.g., rural households) received the returns pertaining to the privileged group (urban).

The comparison between the counterfactual and the empirical distribution allows us to estimate the part of the income gap attributable to differences in household characteristics (*endowment effect*), the part attributable to differences in returns to these characteristics (*returns effect*) and a part due to other unmeasured factors between the pairs of demographic groups. The endowment and returns effects are assigned to each of household's specific characteristics (e.g., age, or employment sector of the head).

The method uses the following linear influence function re-centered so that its mean reflects the θ^{th} quantile of the log annual earnings per adult equivalent (y):

$$E[RIF(y, Q_\theta)/X] = X\beta + \varepsilon \tag{1}$$

Here, $(y; Q_\theta/X) = q_\theta + IF(y, q_\theta)$. $RIF(y, Q_\theta)$ is the re-centered influence function of the θ^{th} quantile of y estimated by computing the sample quantile Q_θ and the density at that point by the kernel approach. q_θ is the population θ^{th} quantile of the unconditional distribution of the variable of interest y, and $IF(y, q_\theta)$ is the influence function. X is a matrix of regressors of five types: household-head characteristics, including age, age squared, gender and marital status; binary indicators for the head's education level; binary indicators for the head's employment status and sector; household characteristics including household size and ratio of those below 14 or above 65 years of age in the household; geographic location and residence indicators. The predicted values of earnings-quantile gaps for pairs of demographic groups are decomposed into the endowment and returns effects as follows:

$$\hat{Q}_\theta^i - \hat{Q}_\theta^j = \left(\bar{X}^i - \bar{X}^j\right)\hat{\beta}_\theta^i + \bar{X}^j\left(\hat{\beta}_\theta^i - \hat{\beta}_\theta^j\right) \tag{2}$$

Here, the differences in the pairs of statistics refer to the between-group gaps between the privileged (urban, non-farming, male-headed) and disadvantaged (rural, farming, female-headed) groups. $\hat{Q}_\theta$ is the θ^{th} unconditional quantile of log real annual earnings per adult equivalent, $\bar{X}$ is the vector of the means of covariates, and $\hat{\beta}_\theta^k$ is the estimate of the unconditional quantile partial effects of group k. $X^j\hat{\beta}^i$ is the θ^{th} quantile of the unconditional counterfactual distribution that would have prevailed for group j if they received group i's returns to their characteristics. The first term, $\left(\bar{X}^i - \bar{X}^j\right)\hat{\beta}_\theta^i$, or the endowment effect, is the contribution of the differences in distributions of

household characteristics to inequality at the θ^{th} unconditional quantile. The second term, $\bar{X}^j\left(\hat{\beta}_\theta^i - \hat{\beta}_\theta^j\right)$, or the returns effect, is the inequality due to differences in the returns to household characteristics at the unconditional θ^{th} quantile.

3.1. Welfare aggregates

As alternative measures of economic outcomes and welfare, we use annual labor market income and home production for own use, all deflated and normalized per adult equivalent. The typically used disposable income is a relevant measure of household welfare, but it conflates the effects of formal market earnings, non-market returns on households' various endowments, private transfers and fiscal interventions.

Labor income is a clearer, more transparent measure of pre-fiscal returns to households' endowments in the market for human capital. This covers income from regular and casual paid employment, as well as self-employment income, including business profits and household production. This income is more tractable and amenable to systematic decomposition.[2]

Finally, households' non-monetary consumption derived from home production for their own use is used to test a conjecture regarding households' transitions between market and non-market activities amid crisis in the formal markets. Home production for own use—including goods production, owner-occupied imputed rent and use value of durables—is known to be an important supplement to household incomes. It is used as the best available proxy for households' security of access to food and necessities when formal labor markets and food supply chains are affected (food consumption is not available in the Russian surveys in the LIS database).

Labor income exhibits a near-monotonic decline in inequality throughout the 2000–2016 period (except for a small 2010–2011 jump). For home production, by contrast, there is no consistency across waves, as the levels of income and inequality measures fluctuate from year to year. Taken at face value, this may reflect households' coping strategies amid the fluctuating economic reality.

These alternative income concepts are standardized per adult equivalent, in deference to literature emphasizing the differential resource requirements of adults and children and the economies of scale in meeting household members' needs. Using appropriate adult-equivalence scales is critical for comparing welfare across households at different income quantiles (Abanokova et al., 2022).

Households' residence in urban versus rural areas and reliance or not on farming are evaluated as demarcations of demographic groups facing different economic conditions amid shocks in raw-material prices and export and import restrictions, particularly in the agricultural sector. Because gender is associated with farming and rural statuses, we use gender as another delineation of privileged/disadvantaged groups amid the external shocks of the past decade.[3]

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[2] We could check whether the endowment and returns effects are more clearly visible with labor income than with the more encompassing final post-fiscal disposable income. In fact, focusing on final disposable household income would show similar patterns as those observed for labor income in Fig. A.1–A.3 below. This is due to the fact that labor income is a major component of total disposable income, even when we are subtracting taxes and social contributions.

[3] Gender is also used to evaluate a conjecture that gender equality has given ground to cultural conservatism proliferating in Russia since Putin's accession to power. Additional analyses were performed on Asian vs. European administrative regions, agriculture vs. industry employment, SME employers vs. large employers and single vs. married household heads. These variables are thought to be less relevant to the current undertaking or are only available for a subset of years. The results are available on request.

3.2. Data

Data for this study come from nine Russian household surveys for the years 2000–2016 in the database of the Luxembourg Income Study (LIS): the 2000, 2004, 2007 and 2010 Russian Longitudinal Monitoring Survey (RLMS) and the 2011, 2013, 2014, 2015 and 2016 Survey of Incomes and the Participation in Social Programs (PIS). These surveys are largely harmonized, although they differ in their survey design (based on different census years), and the PIS covers much larger samples of the population. Having four waves for the RLMS and five waves for the PIS facilitates checking the consistency of results over time.

Comparing the distributions of incomes across the RLMS and PIS reveals that the level and inequality of incomes increased from 2010 to 2011, showing that incomes in the PIS are slightly higher and more dispersed than in the RLMS (Table A.2). This is the case for both formal labor market earnings and non-market home production. Home production makes up 8 percent of income in the RLMS but as much as 20 percent in the PIS.

The Gini coefficients and Lorenz curves for labor income show steadily declining inequality over the years (with a small bump during the transition from RLMS to PIS). This decline is best visible in the top tail of the income distribution, and the decline is largest between 2000, 2004 and 2007. In the following years, the improvements in inequality were minor. For home production we observe a very different pattern. Inequality—particularly in the top tail – was rising sharply during 2000–2004, stagnating during 2004–2007 and rising more until 2010. After the transition to PIS data, this inequality is estimated to be much lower and slowly declining across the span of 2011–2016.

4. Main results

Fig. A.1–A.6 illustrate the main results of this study for the gaps in labor market income (Fig. A.1–A.3) and in home production for own use (Fig. A.4–A.6) between households with rural or urban residence, households engaged in farming or not and households with female or male head. (Tables A.3–A.19 in the appendix provide the full regression results.) Percentage income gaps in the incomes of the disadvantaged groups relative to the incomes of the privileged groups are shown for selected income deciles. Moreover, the gaps are separated into the gaps due to systematic differentials in household endowments, which may augment the value of workers' market labor and home productivity and may have bearing on households' earning capacity (also referred to as the explained gap), and gaps due to systematic differentials in the measured returns to household endowments that cannot be attributed to the observed sets of endowments (the unexplained gap).

Fig. A.7 presents the results of the quasi difference-in-difference analysis of income growth incidence for various treated-versus-control groups (i.e., rural vs. urban, farming vs. non-farming and female vs. male), for pairs of years before, during and after the trade-regime and economic-climate change (i.e., 2011–2013, 2013–2014, 2014–2016). Fig. A.1–A.6 thus illustrate cross-sectional income gaps between disadvantaged and privileged groups across different years, while Fig. A.7 focuses on dynamic gaps in income growth.

4.1. Gaps in labor market income

Fig. A.1 illustrates the results of regressions on the rural-urban gaps across the deciles of households' labor-market income per adult equivalent. (Tables A.3–A.5 show the results at the 2nd, 5th

[median] and 8th deciles.) Adding together the endowment and returns effects, we see that the rural–urban gaps have hovered evenly around 30 percent of urban incomes and have kept their magnitude or even increased over the years. The gaps were up to 32 percent in the middle of the income distribution up to 2010 and increased to 41–45 percent in the following years, possibly on account of the change in the survey instrument in 2011. Surprisingly, the gaps were smaller in the bottom income quantiles (11–29 percent post-2011) and higher at the top (39–53 percent).

In 2011, the rural-urban gaps jumped and have only slightly abated since then. This may be on account of the change in our survey instrument in 2011, but to the extent that the 2011–2016 PIS is more reliable than the 2000–2010 RLMS, this suggests that the income gaps may have been large even in prior years. There was a temporary jump in the rural-urban gaps in 2014. The gaps at the median and at the bottom quintile jumped. Some evidence that rural-urban gaps in labor income rose during 2014 can thus be found at the bottom of the distribution. At the 20th percentile, the overall gap rose significantly from 19 to 29 percent before falling to 23 percent in 2015.

At the same time, the income gap at the top quintile showed no uptick and continued declining from its peak in 2011. These observations are consistent with the conjecture that the trade-regime shock in 2014 affected vulnerable households relying on food trade and consumption the most – the rural and poor—the hardest. However, whether this can be attributed to the trade-regime and economic shocks or other events in 2014 is not certain.

Across various quantiles and years, the rural–urban gaps are approximately equally due to endowment and returns differentials between rural and urban households. Rural households possess lower education, inferior status and sector of employment and poor access to geographic markets; and at the same time, they receive lower returns on their education and employment even if they are equally endowed as urban households.[4] Hence, there appear to be enduring barriers to adequate educational and employment opportunities in rural markets, and the rural and urban markets remain structurally segregated, preventing equalization of returns on human capital and of earnings. Over time, the rural-households' shortfall in endowments and returns to endowments fluctuates, but the lower return on education and employment status is a consistent feature among the poorest rural households. These households face the strongest and time-enduring income gap due to the returns effect.

Next, Fig. A.2 evaluates the gaps in labor income per adult equivalent between households engaged in farming and those who do not farm. This income gap is relatively small, and the total gap is similar across various income quantiles, as well as across the years, with only a small change around the year 2011. At the median of the distribution, the gap was slightly favoring farming households in 2000–2004 but switched to favoring non-farming households by 10–12 percent in 2007–2010 and 14–18 percent in all subsequent years.

Among the bottom two deciles of the distribution, the gap was in favor of farming households in all years; meanwhile, among the top two deciles, the gap was essentially zero in 2000 but turned to 13–21 percent in favor of non-farming households since then. Except for a noticeable change in 2011, due to the change in survey instrument, the gap remained at similar values across the years without

[4] We find the existence of persistent regional inequality across Russian administrative regions, and this inequality remains or rises systematically across all income quantiles. This does not corroborate the findings in existing studies that regional incomes have been converging in Russia (Guriev and Vakulenko, 2012). Because regional inequality can arise for various reasons and is not necessarily linked to nationwide trade shocks, we have opted not to use regions to delineate treated or control groups of households in relation to the trade shocks.

any jump in 2014. There is thus no evidence of a change in the composite income gap between the farming and non-farming households in 2014.

Decomposing the overall farming/non-farming gap into the endowment and returns effects, we find that the endowment effect is around zero in 2000 but turns significantly negative in all the following years, indicating that farming households possess a disadvantaged set of human capital relative to non-farming households. This is larger in magnitude in the upper half of the income distribution. By contrast, we find that positive returns effect accrues to poorer farming households, making the overall gap small or positive. This implies that poorer farming households — those up to roughly the 6th decile of income until 2007 and those in the bottom 2–3 deciles in 2010–2016 — receive higher returns on their characteristics compared to similarly endowed non-farming households. It is unclear where this premium comes from. At face value, it suggests that farming income does supplement other labor earnings among (similarly situated) poorer households.

The final analysis conducted on labor incomes involves the evaluation and decomposition of gender gaps. Fig. A.3 evaluates the income gaps between female and male headed households.[5] The total gap has been around 20 percent and time stable across all years since 2007, at all income quantiles. (It was estimated larger but fluctuating in earlier years.) However, decomposing the overall gap into the endowment and returns effects reveals interesting trends over time. The endowment effect was positive, favoring female-headed households, in 2000, but it turned negative in all but the lowest decile group in all subsequent years. Hence, female households appear to be less endowed with market-valued characteristics than similarly situated male households, except in the bottom decile, where female and male households have comparable sets of endowments. The returns effect used to be significantly negative in the bottom half of the income distribution, favoring male households, and less negative in the top half of the income distribution during 2000–2011. Since then, the returns effect has become less negative and has turned positive among the bottom decile of households. In sum, female households persistently earn lower labor income than comparable male households. This is in part because they are less endowed with the various types of market-valued human capital but also because they earn lower returns on their human capital. A structural change appears to have occurred around the year 2013, when the returns effect diminished, particularly so among households in the top half of the income distribution and in the bottom decile group.

4.2. Gaps in home production for own use per adult equivalent

To assess the role of non-market production to households' well-being, we review the incidence of the value of home production for own use across different socio-economic groups. These results can be compared to the findings in the previous section to infer how own production supplements households' explicit earnings and how it affects the observed between-group inequality. The composite gap was positive in 2000–2010 across all but the highest quantile groups, favoring rural households, but turned significantly toward favoring urban households in the years since 2011. This may be due to the change in the survey instrument in 2011 or a change in economic circumstances.

[5] Households may assign income to their female members to lower their tax liability. Whether this affects income reporting and the formal designation of household heads in surveys is unclear, since respondents are reminded that their responses are anonymous and not shared with tax authorities. Similar concerns arise with respect to the level of income reported or the decision to respond to the survey in the first place (Hlasny, 2020b).

On the one hand, the gap favoring urban households may be surprising, because we may expect home production of goods and produce to be more prevalent in rural households. We may worry whether the PIS (and the RLMS) survey captures home production adequately. On the other hand, home production for own use covers goods production, owner-occupied imputed rent and use value of durables, and it is expected that the value of these components (including food prices and rent) is higher in urban areas. Moreover, urban households tend to be wealthier and have a greater stock of durables. To the extent that food prices rose during 2008–2011 (Götz et al., 2013; Johnson, 2013) and urban rental prices were rising throughout the 2000s (Drobyshevsky et al., 2009), the change between 2000–2007, 2010 and 2011–2016 may also reflect structural changes in the economy.

Decomposing the home-production gap into the endowment and returns effects, we find that the endowment effect has been consistently negative (except for the lowest two deciles in 2014–2016) and stronger among richer households, favoring the urban group. On the other hand, the returns effect was large and positive (and growing with home-production quantile) in the years up to 2010, but it switched to being large and negative (and similar across home-production quantiles) since 2011. Rural households are thus estimated to have substantially lower endowments which they can use for their own consumption. Prior to 2010, rural households appeared to be able to attain higher-value consumption from their endowments than comparably endowed urban households, but since then their returns fell below those in urban areas. This could be real, due to structural price adjustments in the economy (Gluschenko, 2011a), or non-real, due to a change in survey instruments in 2011.

Next, we appraise gaps in home production between farming and non-farming households. Similarly, as for the rural-urban gaps, Fig. A.5 shows that in 2000–2010 the gap favored poorer farming households compared to poorer non-farming households (and favored farming households in all quantiles in 2000), but it turned to favoring non-farming households ever since. The overall consumption gap, in the middle of the consumption distribution, was estimated at 46 percent in 2013, 34 percent in 2014 and 22–25 percent in 2015–2016. This overall gap has been roughly half as large among poorer households (13–15% in 2015–2016 at the 20^{th} percentile) but twice as large among richer households (53–61% in 2015–2016 at the 80^{th} percentile).

Decomposing the overall gap, we find that the endowment effect was small and positive up to the year 2010 but switched to being negative since (in all but the lowest population decile). At face value, this suggests that farming households had a greater stock of endowments conducive to their own consumption prior to 2010, but since then they have been overtaken by non-farming households. Similarly, the returns effect was positive across most quantiles of the consumption distribution up to the year 2010 but has turned negative since. In sum, this suggests that manual production of food and other necessities – by rural and farming households — may have played a greater role as a component of "home production for own consumption" in the 2000s but has since been overshadowed by the value of imputed rent and the value of durables that are not produced manually in the household and that are more extensive among urban and non-farming households.

The final analysis of home production involves the study and decomposition of gender gaps. In fact, Fig. A.6 illustrates that there is very little overall gender gap, of at most a few percentage points, across the bulk of consumption quantiles and years. Female and male headed households have similar distributions of home consumption.

The lack of an overall gender gap masks the differential roles of the endowment and returns effects. During 2000–2004, the endowment effect was small and negative across most consumption quantiles, favoring male households. During 2007–2010 the endowment effect fell to zero, and since 2011 it became positive, favoring female households (according to the PIS survey). By contrast, during

2000–2004, the returns effect started out positive across most consumption quantiles but has turned small and negative in all subsequent years (except for the bottom-most and top-most deciles, where it has been zero or positive). While female heads exhibit higher educational attainment and household composition than those in male-headed households, female households also receive lower returns on their demographics, employment status and household composition compared to similarly endowed male-headed units. This suggests that human capital valuable in labor markets may not be conducive to home production and may even be associated with lower levels of home production. Home production for own consumption, reflecting the non-monetary return on households' capital and household labor, may operate as a substitute for income earned in formal labor markets, a plausible proposition especially in view of the trade restrictions imposed in latter years on many formal sectors by the Russian government and Russia's trading partners.

Tables A.3–A.19 in the appendix report the full regression results corresponding with Fig. A.1–A.6. In particular, the gaps at various income deciles are decomposed using decile-specific regressions. Instead of showing nine regressions (for the 1^{st}–9^{th} deciles) for each income concept and each pair of treated–control groups, we show only the regressions at the 2^{nd}, 5^{th} (median) and 8^{th} deciles, viewed as representative of income gaps faced by large diverse shares of the population. Tables A.3–A.19 are thus split into sets of three regressions for the 2^{nd}, 5^{th} and 8^{th} deciles. These tables report the individual endowment and returns effects for each household characteristic: demographics of household heads (age, age squared, marriage status), education, employment status and sector, member-composition and size of households and administrative region of residence. These characteristics may affect pre-fiscal income directly if human-capital markets value them or offer allowances for them or if they imply the presence of more working members contributing more to household income per adult equivalent.

4.3. Growth incidence for various groups and various years

The availability of multiple waves of surveys and the pooled cross-sectional data setup allow us to estimate GICs for various demographic groups and various pairs of years. Performing this exercise for the years before, during and after the year 2014 economic shock (2011–2013, 2013–2014 and 2014–2016), we can isolate the effect of the shock on vulnerable groups, namely, rural, farming and female-headed households. This can be interpreted as a quasi difference-in-difference analysis of a shock treatment on vulnerable groups. Fig. A.7 shows the GICs for the two income concepts (labor income and home production for own use) and the three pairs of years, separately for rural/urban, farming/non-farming and female/male households.

Fig. A.7*i* shows that during 2011–2013, the rural and urban groups experienced the same profile of high growth in labor income, nearly the same across income quantiles, except for the extreme ends, where rural households fared worse than their urban counterparts. Prior to the economic shock, rural households across much of the income distribution fared clearly worse than their urban counterparts, with urban households seeing rates of income growth that were twice as high or higher. During the year of the shock, rural and urban poor fared similarly (between the 10^{th} and 40^{th} percentile), but rural rich performed better than urban rich, particularly in the top 20 percent of the income distribution. During 2014–2016, urban households were again hurt more than rural households, which can be seen across the entire income distribution.

Fig. A.7*ii* shows the income growth trends for farming vs. non-farming households. During 2011–2013, farming households experienced an even profile of positive growth, except at the top end of the income distribution, where farming households saw lower growth, and non-farming households saw

higher growth. During 2013–2014, income growth fell to zero among the lower half of farming households and turned slightly negative among the upper half of farming households. Non-farming households performed slightly worse, except in the bottom decile, where their growth outperformed that among farming households. During 2014–2016, both farming and non-farming households saw negative income growth of similar magnitude across the bulk of the income distribution, but farming households fared particularly poorly, with incomes declining by some 6 percent per year (4% among non-farming households, respectively). This finding is surprising, because it is the opposite of our finding for the rural/urban growth. We have concluded that rural households were somehow sheltered from the 2014 trade shock compared to urban households, but here we find that farming households were more exposed than non-farming households. Whether this is on account of rising fuel prices or depletion of resources on farms is unclear.

Fig. A.7*iii* completes this analysis of labor income growth by comparing growth between female and male households. Interestingly, we find that male households saw lower income growth rates than female households in all of the evaluated years. During 2013–2014, income growth was near zero among female households up to the 4th quintile, and only in the top quintile the growth was strongly negative. By contrast, male households in the lower 4 quintiles saw slightly negative growth, with near-zero growth in the top quintile (exceeding growth among rich female households). During 2014–2016, male households again faced lower (negative) income growth than female households, of similar magnitudes across all income quantiles.

In sum, farming households and poorer male households appear to have been more exposed to the 2014 shock than their non-farming and female counterparts, respectively. Hence, the lower performance of farming households and poorer male households extends to their labor earnings and is not limited to non-labor components of total disposable income, such as capital income or transfers.

Finally, Fig. A.7*iv–vi* performs this analysis on home production for own consumption. Because of smaller sample sizes, these GICs are not estimated accurately at the bottom tails, showing implausibly high or low income growth rates. Ignoring these irregularities at the bottom, we find that urban households fared better than rural households prior to the shock but fared significantly worse during and after the shock, particularly during the shock years 2013–2014. The same can be said about non-farming households. They outperformed farming households during 2011–2013 but performed significantly worse during 2013–2014 (and as well as the farming group in the subsequent years). For female versus male households, there is weak evidence that income growth favored male households during 2011–2013 and slightly during the shock years 2013–2014 but favored female households during 2014–2016, perhaps in a process of mean-reversion of fortunes.

Fig. A.10 thus shows that the events of 2014 were not a temporary event but a start of a longer-term transition to a new normal. Economic outcomes of all of the evaluated demographic groups declined during the year 2014 and then declined further in the following two years. According to the results, the most adversely affected groups included households engaged in farming and urban households. Between male and female households, female households may have been hurt more in the immediate aftermath, but male households appear to have been affected more in the longer term.

5. Concluding remarks

This study aimed to take stock of development and inequality in various segments of the Russian economy as pertaining to workers' outcomes since the turn of the century, amid changing economic conditions, trade regimes and cultural tendencies.

We have highlighted the differential trends in households' formal labor market income and non-market home production for their own use—both normalized by adult equivalent, deflated by GDP deflator and transformed into logarithmic terms—to assess the outcomes of different groups of workers before the effect of fiscal distortions. The first outcome variable, labor income (covering the bulk of workers' total pre-fiscal earnings, in all but the highest quantile groups), is amenable to analysis using human capital theory and is decomposable by source; and the second outcome (capturing the use value of household resources and production) is a measure of households' non-market activities and self-sufficiency in the face of market failures.

We have investigated the composition and evolution of earnings inequality across rural/urban, farming/non-farming and female/male divides, as well as across quantiles of the respective income distributions. To estimate cross-sectional effects of various household characteristics and the returns to them at different income quantiles, we have used UQRs estimated with the aid of re-centered influence functions. To estimate dynamic evolution of between-group gaps, we have estimated growth incidence curves, and we have arranged them in a quasi difference-in-difference setup to identify the effect of economic shocks in 2014 on the outcomes of vulnerable ("treated") and other ("control") groups.

Our main findings are that urban-rural gaps are pervasive. The identified between-group income gaps differ substantially across income quantiles, justifying the use of quantile regressions. Rural–urban gaps have endured or even increased over time, particularly among lower quantile groups. Gaps between households engaged in farming and those that do not farm are relatively low. Gender gaps were historically high, again, particularly among lower quantile groups, but have been steadily falling over the past decade.

These gaps are due in part to human-capital endowment differentials and in part to differential returns to endowments. Rural households appear to be held back by lower stocks of education, mobility barriers and lack of access to better employment opportunities, and they thus lack incentives for skill investment. They receive lower returns on the various components of human capital. Female households, while being typically more educated, also lack access to decent employment opportunities in the formal private sector. Female households face lower returns on their heads' education and employment statuses. Finally, farming households typically possess a disadvantaged set of human capital relative to non-farming households.

These results highlight the importance of access to decent employment opportunities in various parts of the Russian economy. In rural areas, markets may not exist to utilize workers' skills efficiently, or workers face discrimination compared to similarly endowed urban workers. Female workers presumably face "glass ceiling" restrictions on career growth. To promote equalization of living conditions across regions, regulators at the regional and federal levels should strive to integrate markets better and facilitate better matches between employers and workers. In terms of research agenda, our findings suggest that other manifestations of job inequality — across employment sectors or across employers of different sizes — may be present and should be assessed.

Our analysis of home production for own consumption brought several surprises. We have found large consumption gaps favoring urban relative to rural households and non-farming relative to farming households. This presumably reflects the makeup of the variable — the significant role of imputed rent and the use value of durables, rather than agricultural or other manual production. The gaps favoring urban and non-farming households increase substantially as one moves from lower-quantile groups toward richer groups.

Regarding the economic shocks of the year 2014, we have found little evidence of structural effects of the shocks on between-group inequalities or their composition. Our dynamic analysis of income growth across socio-economic groups confirmed that. The analysis using a set of growth incidence curves revealed that the events of year 2014 were not a temporary event but were the first step in a deepening economic crisis. Economic outcomes of all of the evaluated demographic groups declined during the year 2014 and then declined further in the following two years.

In particular, for formal labor earnings, the shock events of the year 2014 started a contractionary trend, but the brunt of the decline was felt only in the following years. Households engaged in farming and urban households were affected strongly adversely. Between male and female households, female households may have been hurt more in the immediate aftermath, but male households appear to have been affected more in the longer term. The one group experiencing notably the largest decline in labor earnings is female-headed households with top earnings prior to 2014, who appear to have been affected most acutely by the external shocks, in terms of their job prospects and compensation. This group saw a 15–25 percent reduction in labor earnings. By contrast, home production for own use declined substantially right away in 2014 for many demographic groups studied here (urban, non-farming, male but also female households) and continued declining at a slower pace in the following years.

Conflict of interest

All the author declares no conflicts of interest in this paper.

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