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# ABSTRACT

# Shifts in Composition of Jobs: Upgrading, Downgrading or Polarization? The Case of Russia 2000-2019*

In this study, we explore the changing employment structure in the Russian economy since 2000. Does it change through a consequent substitution of relatively worst (in terms of quality) jobs by better jobs? Or through the destruction of middle quality jobs? Or do we observe stagnation and conservation of the job structure? Structural change of this sort can be brought by various factors among which technological progress and international trade that shape demand for labor of different quality and complexity play a special role. In search for clues to these questions, the authors use large data sets that cover two sub-periods divided by the 2008/9 crisis. The estimates presented in the paper allow the rejection of the polarization hypothesis and they document a fast upgrade of the job structure during the 1st sub-period and a stalemate during the 2nd one. Apparently, risks of job polarization are likely to be minimal until economic growth is recovered and a movement to the technological frontier is accelerated.

**JEL Classification:** J21, J24, J31, J62

**Keywords:** job, job structure, employment, polarization, wage distribution

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## 1. Introduction

The Russian employment has experienced transformation that goes along various dimensions. Some sectors and occupations shrink, others emerge and expand. Technological progress updates requirements for skills that workers must possess. Long-term tenures have ceased to exist as a norm and frequent mobility has become a norm. Continuous job creation and job destruction are at the core of this process. As an outcome, we observe rapid changes in the composition of jobs with multiple implications for the economy and workers' well-being. What is the cause of these transformations? On the supply side, rising educational attainment in younger cohorts which replace older and low educated cohorts seems to be a key factor. The female employment has aways been high and in-migration, though significant and statistically non-transparent, has helped to sustain low paid jobs. On the demand side, mainly technological developments and globalization of trade shape changing demand for skills.[2]

During the nineties, the concept of Skill Biased Technological Change (or SBTC) became very popular among economists. According to it, mass computerization drives up demand for skilled labour with IT and related skills, and therefore it raises wages for this group of workers. The closer to the technological frontier a worker locates, the larger wage gains he/she may accrue. Those who are further down from the frontier gain little or may even lose. Therefore, technical progress drives variation in earnings and, therefore, increases inequality.

From the early 2000s, the alternative view on how technical progress and computerization might affect job structure has gained popularity. The main idea of this concept (Routine Biased Technological Change – RBTC) is that technical progress affects routine and non-routine jobs asymmetrically, shifting demand for labour from the former to the latter. It results in the destruction of routine jobs – both skilled and low-skilled – located usually in the middling part of the ordered job distribution. The routine nature of a job means that job tasks can be formalized and then taken over by computers, industrial robots or AI. Hollowing out of the middle part of the distribution is associated with mobility of workers, who are taking up these jobs, towards lower quality jobs, higher quality jobs, or out of employment. This process that is called polarization, even if not expands unemployment, brings welfare losses since many workers have to accept less skilled and less paid employment. This concept has become very popular and has

[2] These changes are typical for any industrialized economy. For transition countries, an additional factor is their adjustment to the market economy. However, CEE countries have finished this adjustment with the EU accession. For the post-Soviet countries, this process has been stretched over time and has not always been consequential.

attracted many scholars (see, eg, Autor, Katz, Kearney, 2008; Autor, Dorn, 2013; Goos, Manning, 2007; Goos, Manning, Salomons, 2009; Goos, Manning, Salomons, 2014; Spitz-Oener, 2006; Fernandez-Macıas, 2012; Fernandez-Macıas, Hurley, 2017; Oesch, Piccitto, 2019).

What do observed tendencies in transformation of job structures in the Russian economy tell us about patterns? Do these patterns point at upgrading, downgrading, polarization, or at anything else mixed over the period? Answering this question may have an academic, as well as a policy-relevant interest. It helps better understand labour market dynamics and the well-being of different groups of workers.

This is the second time that we address the issue of how job structures have been evolving in Russia. In our earlier paper (Gimpelson and Kapeliushnikov, 2016), following the work of Fernandez-Macías (2012), we apply various criteria for job quality (wage and education based) and conclude that there has been no evidence for job polarization in the sense as defined in a few papers by Fernandez-Matias et al. (2012, 2017). In 2000-2012, the structure of jobs evolved in the direction of upgrading. The number of bad jobs was on the decline and the number of good jobs was on the increase. In other words, the main trend for this period was a contraction of lower segments in the wage distribution and an expansion of its upper segments. These trends were especially evident for the sub-period of 2000-2008, or prior to the 2008 crisis. The post-crisis sub-period (2010-2012), considered in that study, was rather short and characterized by a fast recovery. During the first sub-period the intensity of the structural change was higher than in the second one. In relative terms, the cumulative compression of the 1$^{st}$ quintile was 7–8 pp., the cumulative expansion of the 5$^{th}$ made 8–10 pp, and changes in the middling quintiles were hardly visible.

What could drive this change? The main contributor to the disappearance of bad jobs is a sharp contraction of agricultural employment. In the case of good jobs, the wage criteria point at market services and construction. Employment contraction in manufacturing was associated with job losses in three middling quintiles exclusively. As a result, only in manufacturing we can see some signs of polarization.

In this paper, we consider a longer period that spans from 2000 to 2019. Our analysis utilizes two types of microdata – Labour Force Surveys for 2000, 2008 and 2019, and Sample Survey of Population Incomes for 2016. Both surveys are administered by Rosstat (the Russian Statistical Service) and they use large and representative samples.

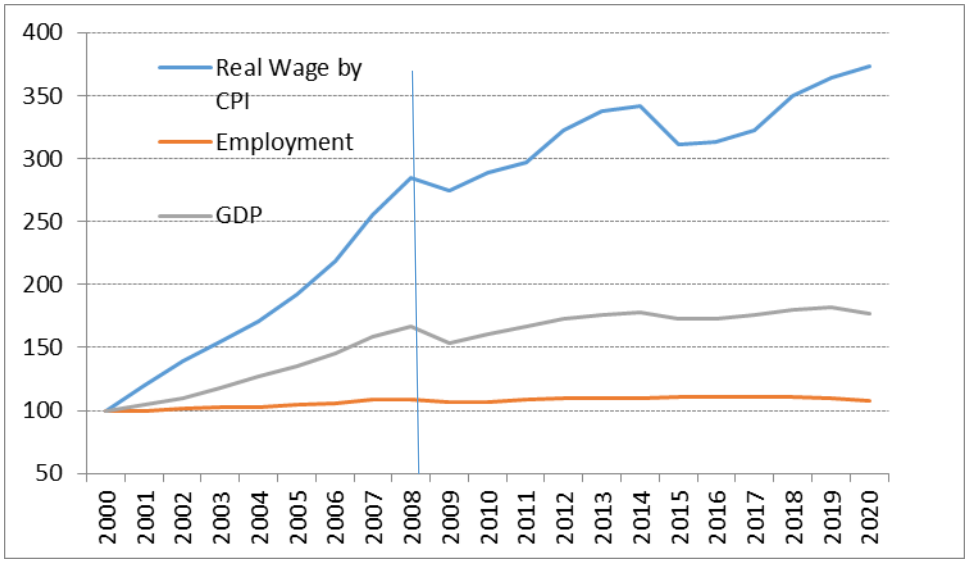
The paper consists of 9 Sections and is structured in the following way. Section 2 provides a short review of previous work. Section 3 presents in a stylized way the main trends on the

Russian labour market over the study period. Section 4 outlays the empirical approach adopted for the study, including the job concept and its application. In Section 5, we explain data issues, including data sets, main variables and specifics of their design. Section 6 discusses general changes in distribution of workers by job quintiles over selected periods. In Section 7, we present regression estimates and changes in regression-based conditional probabilities for being in particular job quintiles. Section 8 brings labour demand into the discussion and section 9 concludes.

## 2. Main trends: two decades in the 21st Century

Fig.1 presents a short macroeconomic history of the period that goes from 2000 to 2019. It suggests a very bumpy development and illustrates specific features of the Russian labor market adjustment. The main point here is that all macro-shocks over the period are absorbed by falling wage costs, not by employment change. As to growth periods, they see wage growth but little employment gain.[3]

Figure 1. Dynamics of main indicators, 2000-2019




Source: Rosstat

The selected period contains two sub-periods. The first one lasts until 2008 inclusively and the second one goes on since. The differences in economic growth, employment and wages between those periods are presented in table 1.

Table 1. Dynamics of selected indicators, % to 2000 and 2008

| | 2008 (2000=100%) | 2019 (2008=100) |
|---|---|---|

[3] For specific institutional features that explain this *modus operandi* of the Russian labour market see Gimpelson and Kapeliushnikov (2013)

| | | |
|---|---|---|
| Real GDP | 166 | 110 |
| Real wage (CPI defl) | 285 | 127 |
| Employment | 109 | 101 |

Source: Rosstat

The first sub-period (2000-2008) saw an intensive recovery of the Russian economy after the 1998/99 crisis. The recovery was driven by sweeping rise in hydrocarbon prices and by weakening the Russian Rouble relative to major currencies. Russia had also at its disposal large stock of the underutilized physical and human capital, they could rapidly be engaged for productive purposes. At the same time, Russia continued its economic reforms and tried to integrate deeper in the world economy. This policy helped attract investments and assure investors. Over the first sub-period, the real GDP grew by 66%, real consumers wage rose by 185%, and the economic structure experienced a profound change. Least productive industries kept downsizing and the service sector got a boost. Meanwhile, the total employment gained almost 10%, partially due to some increase in younger working cohorts, partially due to rise in employment rate for the older cohorts. The 2008 world crisis arrived at Russia in full scale, though with delay by one year, and put the end to this "happy" period.

The second sub-period (2009-2019) marked a deep change in economic policy and domestic and international politics at large. The changes did not come over night but accumulated gradually. Initially, the post-crisis (2008-09) economic recovery emerged as a key issue, but soon the Russian authorities began to "sovereignize" the policy by gradual decoupling from the world economy. The latter trend accelerated after the annexation of Crimea in 2014, and "maintaining social stability" emerged as one of key political goals. The May 2012 Presidential Decree assumed that the so called "National Projects" would drive economic development by targeting productivity and wage growth, and by creating 25 million so called "high skilled jobs". By 2019 the these targets were not achieved. In sum, over the 11 years period the Russian GDP grew by 10%, or with the annual rate of less than 1%, real wages gained 27% (or less than 2,5% per annum), and the total employment, having faced rigid demographic constraints, barely changed at all.[4]

However, the structural change within employment that started earlier continued.

The share of workers with the university level education grew from 22% in 2000 to 27% in 2008 and further on to 34% in 2019. As to absolute numbers, this was the rise from 14 million to 19,2 million, and then to 25 million. These figures reflect a massive inflow of new human capital.

[4] From 2012 to 2019, labour productivity increased by 8,9%, or it grew, on average, by 1,3% per year 2000/2008 (Rosstat https://rosstat.gov.ru/folder/11186)

There is also a visible change at the opposite pole of the educational spectrum. The share of low educated workers (with basic education and lower) decreased from 9,7% in the beginning to 3,9% by the end of the period. All educational shifts contributed to moving along the wage distribution.

The industrial (sectoral, by NACE) composition of employment changed over time as well. Employment contraction in Agriculture (A) and Manufacturing (C) emerged as a key tendency. Fractions of these activities decreased by 8,8 and 5,1 pp, correspondingly. During the first sub-period, Wholesale and retail trade (G) and Construction (F) gained employment but later during the second one their growth slowed down or even reversed.

As to the occupational composition, it changed in the same direction. The shares (in the total employment) of Professionals (ISCO2) and Service workers and shop and market sales workers (ISCO5) expanded; simultaneously, the shares of agricultural (ISCO6), semiskilled and unskilled (ISCO 8-9) occupational groups decreased. The 2008/09 crisis slowed down the transformation but did not change the direction the occupational structure took to evolve in previous years.

As this brief outlook shows, there were significant job shifts over the whole study period. If such factors as educational upgrading, increased fraction of Professionals, and contracted agricultural employment contributed to shifting the wage distribution rightwards, employment expansion in Wholesale and retail trade could counteract and even reverse the trend. An alternative scenario, when job clusters in the middling part of the wage distribution expand at the expense of low and high paying jobs, cannot be completely ruled out as well. Which of these tendencies has finally prevailed is an empirical question that deserves further exploration and that we address in Section 6.

## 3. Our Empirical Approach

The key concept applied in this study relates to what makes “a job”. The “job” here is defined as a cell constructed by intersecting two dimensions: i) in what sector of activity an individual is employed, and ii) in what occupation he/she is. For each of these dimensions there is the standard statistical classification (industrial and occupational). Therefore, our analytic unit is not an individual but a group of workers belonging to one of the two-dimensional cells.[5] This

[5] The definition differs from a canonical one used in labor economics, which treats an occupied employment position as a job.

definition goes in line with that was used in a number of previous studies (Wright and Dwyer, 2003; Fernandez-Macıas, 2012; Fernandez-Macıas & Hurley, 2017).[6]

Wright and Dwyer (2003), who were the first who introduced this approach into academic research, underlined its two major advantages over studying individual wage growth. First, they believed "that the cells in the occupation-by-sector matrix tap real categories of jobs created in an economy". Second, "the earnings potential embodied in an employment expansion is better measured by the growth of job categories than simply by individual earnings" (Ibid: 295). In our understanding, considering jobs as two dimensional cells allows structure employment evolution in an intuitively simple and visual way.

The empirical analysis exploits a simple idea: that the changes in allocation of workers across job cells manifest changes in the quality of jobs. We can use means, ratios, or median values of variables in order to measure cells and rank them according to their quality. Wages, educational indicators, and job satisfaction are among such potential measures (Oesch and Piccitto, 2019).[7] Job cells ranked in this way make a continuum – an axis that goes from the "worst" to the "best" jobs. Changes in size and composition of cells (or their groupings) over time show how occupational and industrial structures evolve and what factors drive the evolution. Reallocation of workers along the axis towards jobs that belong to better paying industries/occupations is associated with income growth.[8] A movement in the opposite direction leads to lower incomes. Though we use income/wage data for ranking cells only, we should note that any movements across cells correlate with income mobility.

One of the crucial assumptions in this approach is that the ranking of jobs remains stable over time. This assumption does not look too problematic for our analysis, since we are interested in the aggregate clusters of jobs – wage quintiles for the job cells, and most moves between cells are moves within the same quintile.

As we have noted above, we consider the period from 2000 to 2019 as consisting of two sub-periods (2000-2008 and 2009-2019). For several reasons, we do not include in our analysis data for 2020. First, given the introduced anti-COVID epidemiological constraints, the Rosstat

[6] This approach was first suggested in CEA (1996). "Job Creation and Employment Opportunities: The United States Labor Market, 1993-1996." Washington DC: Office of the Chief Economist. http://babel.hathitrust.org/cgi/pt?id=coo.31924069091811;view=1up;seq=7

[7] In our previous study (Gimpelson, Kapeliushnikov, 2015) we utilized a few different wage and educational indicators. Results are similar.

[8] In this study, we understand employment reallocation as absolute or relative aggregate change across quintiles, not as individual job-to-job transitions.

modified the way it administered the LFS data collection. It shifted rapidly from in-person interviewing (standard in the pre-covid period) to ad-hoc telephone interviewing with poorly controlled sample selection. Besides that, the survey questionnaire was seriously shortened and simplified in order to make it manageable for the new mode of data collection. This made the 2020 LFS data hardly comparable with the data for previous years.

But having the year 2020 excluded from our analysis, could we overlook any significant structural change? We do not think so. As Gimpelson (2022) shows, during the COVID crisis both separations from jobs (including firings as well as voluntary quits) and hirings were notably reduced. But simultaneous decrease in both components of the labour reallocation leads to preserving the pre-covid employment structure, not to speeding up the structural change. Such counter-cyclical movement of both components of reallocation in case of anti-covid constraints is not a specific Russian phenomenon. Though the UK labour market, known as one of the most quantitatively flexible, reacts to shocks usually by job displacements, in 2020, it saw firings rates lower than on average during the same months in previous five years (Wadsworth, 2020).

For analytical purposes, we divide the distribution of cells by wage quintiles, using the first year as the baseline. Then we look at changes in allocation of workers across quintiles in 2008 and 2019 (the end years of each sub-period) relative to the baseline year. Reallocation across quintiles over time documents employment and job shifts. We can discuss them in aggregate terms as well as in major socio-demographic breakdowns (paying special attention to sex, age, education and urban/rural dimensions). Of course, within (quintiles) changes can take place as well; however, this approach ignores them as qualitatively insignificant.

## 4. Data issues

For our estimations, we use two major data sources, both collected by Rosstat. The first source is the standard Labour Force Survey (LFS), tailored according to the ILO guidelines. The LFS contains detailed information on employment including individual socio-demographic characteristics, occupations and economic activity. However, it does not contain any wage and income information. We use LFS data for the years 2000, 2008 and 2019, and consider the age range from 18 to 69. Employment rates for age groups beyond this range are very small.

The second source is the Household Survey of Incomes and Participation in Social Programs (SIPSP) for 2016. This survey collects wage and income data during the whole calendar year what makes the problem of seasonality and irregular payments irrelevant. It also contains

detailed individual data on economic activity and occupation. Correspondingly, as our main wage measure, we use accumulated annual labour income at main job divided by number of working months. The main reason for choosing 2016 is in the sample size and data quality. For that year, the survey exploited the enlarged sample of about 160 thousand households and provides data on annual labour incomes. Unfortunately, datasets of similar quality and size for earlier (and later) years do not exist. In the case of smaller samples, jobs cells contain a small number of observations what introduces large statistical errors. Besides that, any available alternatives for individual earnings data require several additional assumptions, which also affect accuracy of estimates, what we would prefer to avoid here (Gimpelson and Kapeliushnikov, 2016)

For constructing job cells, we rely upon standard classifications NACE and ISCO. In 2000 and 2008, Rosstat used earlier versions (NACE 1 and ISCO-88), but later it switched to the updated versions (NACE 2 and ISCO-08). Since new versions are richer and more detailed, we recoded 2016 and 2019 data in order to harmonize with the earlier (2000, 2008) data sets. For this recoding, we applied a crosswalk module suggested in [Ganzeboom, Treiman, 2015] and considered a number of specific reclassifications adopted by Rosstat. At the 2-digit level of disaggregation, this gives us about 1300 original industry-occupational job cells, but deleting zero employment cells leaves us with 854 jobs or observations.[9]

Job cells in the SIPSP data set are matched with job cells in the 2000 LFS, and then we divide all cells ranked along the wage axis by quintiles. The first quintile made by the lowest paid job cells accounts for around 20% of all employed. The second one with 20% of the total employment includes job cells that follow, and so on. Then we project these quintiles on the employment data for 2008 and 2019. This procedure allows tracking changes in composition of quintiles over time. Though wages in nominal (and real) terms could change at different speed in different cells, we assume that the relative positions of cells remained constant across the study period.[10] For example, if an engineer in Manufacturing in 2000 was better paid than a construction

[9] Cells may have zero employment because some occupations in particular industries may not exist each year or period. Therefore, intersecting formally these two dimensions we get non-existing jobs or combinations. Most of the non existing jobs belong to impossible and non-existing industry#occupation combinations. There are no cases when a job did not exist initially but emerged later on, or vice versa.

[10] Since we apply wage data for job cells as they were in 2016 to the 2000 LFS, one cannot exclude that their distribution could change for the better. In this case, job change that might take place in early years could be overestimated.

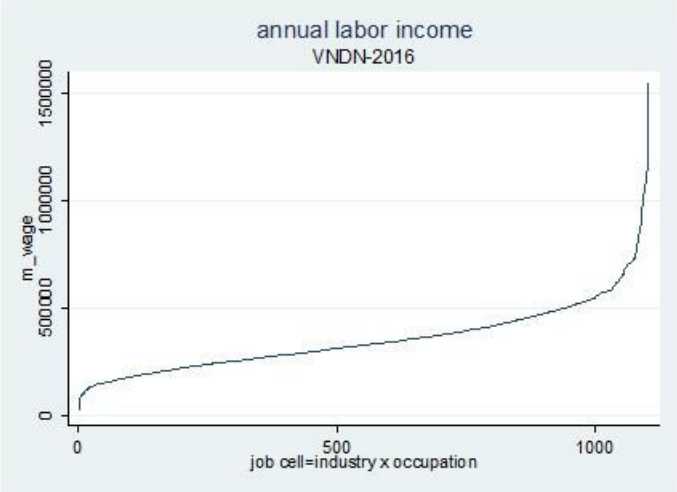
worker, this ranking did not change though the absolute wage ratio could move in any direction. Table 2 presents selected features of the surveys used.

Table 2. Classifications used in the selected data sets.

| | Industry classification | Classification of occupations | # obs |
|---|---|---|---|
| LFS 2000 | NACE 1 | ISCO88 | 149,881 |
| LFS 2008 | NACE 1 | ISCO88 | 169,314 |
| LFS 2019 | NACE 2 | ISCO 08 | 507,511 |
| SIPSP 2016 | NACE 2 | ISCO 08 | 141,133 |

Fig.2 presents distribution of all job cells by the mean annual wage. It suggests that about 5% of the highest paid cells contribute disproportionally to the total variation. Average annual wage in these cells exceeds 700,000 Rbl (what made about 60,000 Rbl or less than 1,000 $ per month in 2016).

Figure 2. Distribution of all job cells by the mean annual wage




Source: Authors' estimates

Further on, we explore changes in the composition of job cells aggregated in quintiles according to their average monthly wage.

## 5. Changes in Quintiles by Sub-Periods (2000-2008 and 2008-2019)

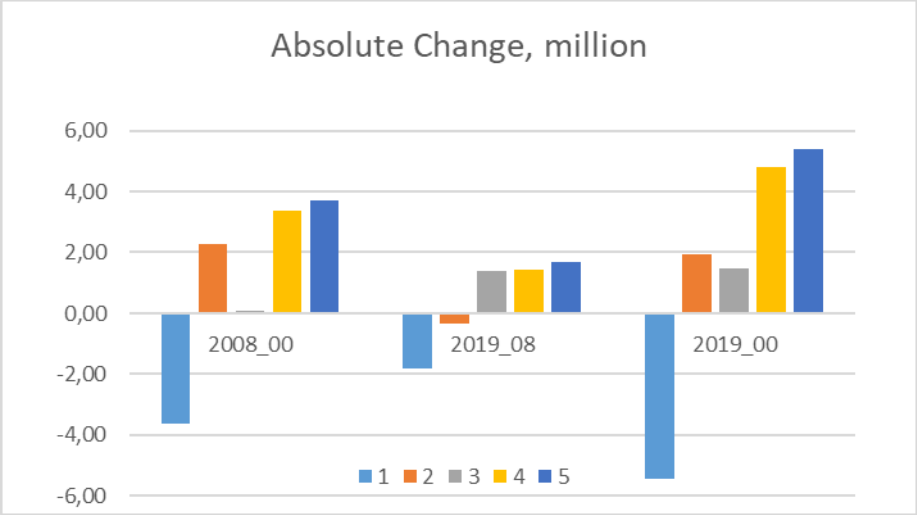
*Changes in absolute terms*

The starting point for our analysis is the allocation of all employees across job quintiles in 2000. Fig.3 presents a stylized history of industry-occupational change over the period under study.

During the first sub-period (2000-2008), total employment increased by about 5,6 million persons, among which 3,7 million add to the highest – the fifth quintile. In contrast, the first quintile lost 3,6 million. Quintiles in the middle (from the 2nd to the 4th) gained about 5,7 million in sum. About 60% of this gain belonged to the 4thquintile.

After this evidently successful upgrade in the employment structure, the 2nd sub-period (2008-2019) looks more disappointing. In general, changes over this 11-year interval seem to go in the same direction, but they were sluggish and uneven. The total employment gain made 2,4 million, while the top quintile added 1,7 million. Though a significant supplement, it was much smaller than the gain during the 1st sub-period. The two lowest quintiles lost 2,1 million. If the idea of polarization assumes that the middling part of the distribution tends to hollow out, we observe a different picture. Though in a very sluggish form, the upgrading continued.

Figure 3. Absolute Change in Jobs by Quintiles, million




Source: Authors' estimates using Rosstat data (see Section 4)

By the end of the 1st sub-period, the job cells making the top quintile expanded their employment, thanks to the inflow of young urban residents with university level diplomas. The bottom quintile lost workers markedly. During the 2ndsub-period, the rate of absolute change was much lower.

What could drive the change? We may note two potential and complementary mechanisms. First one is associated with job-to-job mobility when individuals move from low paid jobs to higher paid (and vice versa), meanwhile changing occupation and/or industry. One can detect this type of mobility either using panel data that allow tracing the same individuals over time, or using synthetic pseudo-panels that show within cohort job change. Data we are using in this study allows the second approach, not the first one.

Another mechanism is associated with demographic trends affecting the age composition of labour supply. They can favor upgrading of jobs or counteract this tendency. For example, representatives of younger and better educated cohorts, entering the labour market, may land in higher positioned quintiles.[11] Meanwhile, an older and less educated cohort, exiting from the labour market, leaves less prestigious jobs, which get destroyed then. If the entering cohort is more numerous than the exiting one, the difference may contribute to the upgrade. That said, our analysis may focus on entering and exiting age cohorts in our cross-sections. Since employment rates in the age group of 30-49 years old are and remain very high, we do not expect here any significant change (in the rates) induced by inflow into employment or outflow from it.

In 2008, the number of workers in age 18-29 was more than that in 2000 by 2,3 million.[12] Many of these additional workers got employment in the middling or upper quintiles. Employment of older workers increased as well (by 4,3 million) and some of them also landed in the middling or upper quintiles. Two factors were at work here – the exit of the least educated and low skilled workers (from the older group) from the labour force and entry of new and relatively skilled (from the younger one). During the 1st sub-period, the strong substitution effect driven by rapid wage growth could bring some of them from outside the labour force back to jobs. In favor of this explanation speaks the fact that, in 2008, the number of workers in the age 50+ was by 4,5 million (what made 6,5% of the total employment) more than that in 2000.

In the second sub-period, the direction of the demographic change got partially reversed. The size of the younger cohort (in employment) began declining while that of the older expanded. If employment in the older group kept growing (by 2,9 million), employment of the younger group shrank by 4,4 million compared to that in 2008, and by 7,2 million compared to that in 2000. This means that the inflow of younger and better educated workers, those who could pretend for better jobs, contracted sharply. Employment of the older group continued to expand. This is one of the reasons why, in the period that goes from 2008 to 2019, job upgrading was less intense and marked than in the previous period.

*Changes in relative terms*

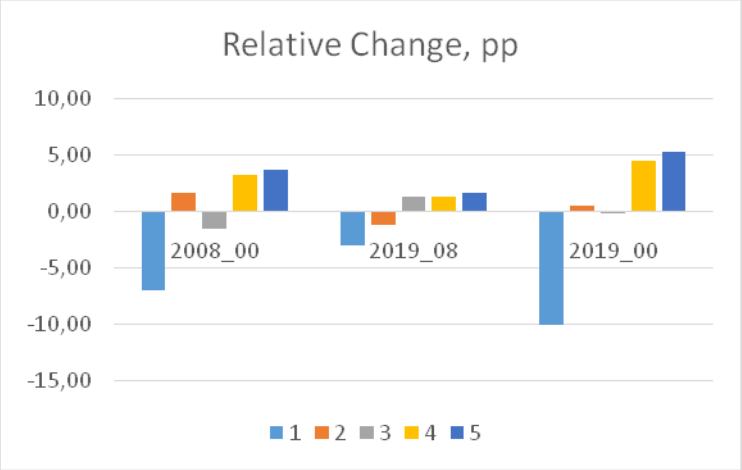
Fig.4 illustrates the same changes across quintiles but measured in relative terms. By 2008, the fraction of employment belonging to the first quintile decreased by 7 pp. The second quintile gained 1,7 pp and the third one lost 1,6 pp. However, the population of the two top quintiles

[11] The opposite mechanism when younger workers entering the labour market get precarious and low paid jobs is also possible. But all available evidence does not suggest this negative scenario.
[12] Authors' estimates based on the LFS data.

increased by 6,9 pp with the lead of the 5th one. These shifts mean significant upgrades in the structure of jobs. Changes in the extreme quintiles are especially salient.

Change during the next eleven years is less visible. The two bottom quintiles kept shrinking – their contraction made 3 and 1 pp relative to the 2008 level. The middling quintile turned from contraction to expansion and added 1,3 pp (relative to 2008). The fourth and the fifth quintiles gained 1,3 and 1,5 pp. Therefore, we observe further upgrading, but much more sluggish given that the changes were quantitatively smaller and stretched over a longer period.

Fig. 4. Relative Changes in Quintiles by Sub-Periods, pp



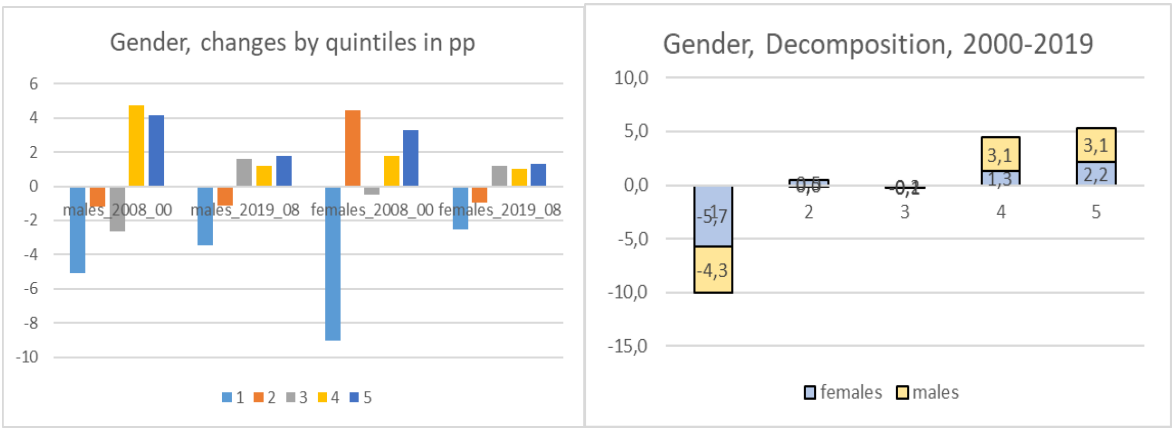

Source: Authors' estimates using Rosstat data (see Section 4)

*Patterns of reallocation by major demographic groups*

***Gender***. There are gender differences in the evolution of jobs (Fig. 5). Reallocation of men from bad jobs (located in the 1st and 2nd quintiles) to better paid jobs was marked in the first sub-period and continued during the second sub-period, though at a slower pace. The 3d quintile became a recipient and gained 1,6 pp, while earlier it was a donor having given out about 2,6 pp.

Reallocation of female workers went a bit differently. The first sub-period saw a massive hollowing out of the first quintile, partially to the benefit of the second quintile, partially to the top ones. It was associated with rapid contraction of low paid jobs in agriculture and manufacturing where fraction of the female employment was significant. The middling quintile lost slightly. During the second sub-period, two lower quintiles lost, and the rest gained. Though the change was towards upgrading the employment structure, it was relatively small.

Fig.5a. Relative Changes in Quintiles by Sub-Periods, by gender, pp
Fig.5b. Decomposition of Changes in Quintiles by Sub-Periods, by gender, pp




Source: Authors' estimates using Rosstat data (see Section 4)

Another angle of looking at the reallocation over time is through the decomposition of the observed change by gender. This decomposition is presented at Fig. 5b. Downsizing of the bottom quintile was largely due to women who were leaving these jobs, while the employment expansion in the upper quintiles was provided mainly by men moving into these jobs. In other words, when considering the full period under analysis, we see that male workers have benefited more than female workers from employment creation in the best paid jobs. Female workers have benefited by leaving the least paid jobs, though not always by getting the best ones.

***Type of Residence***. Fig.6a suggests that the job reallocation in urban and rural areas went differently. Sharp employment contraction in the agricultural sector contributed to the reallocation from rural areas. Rural employment in the first quintile decreased by 20 pp by 2008, while it expanded in other quintiles. During the 2nd sub-period, two lower quintiles sent workers out to the three higher positioned quintiles. In sum, the upgrading took place during the whole period under our study.

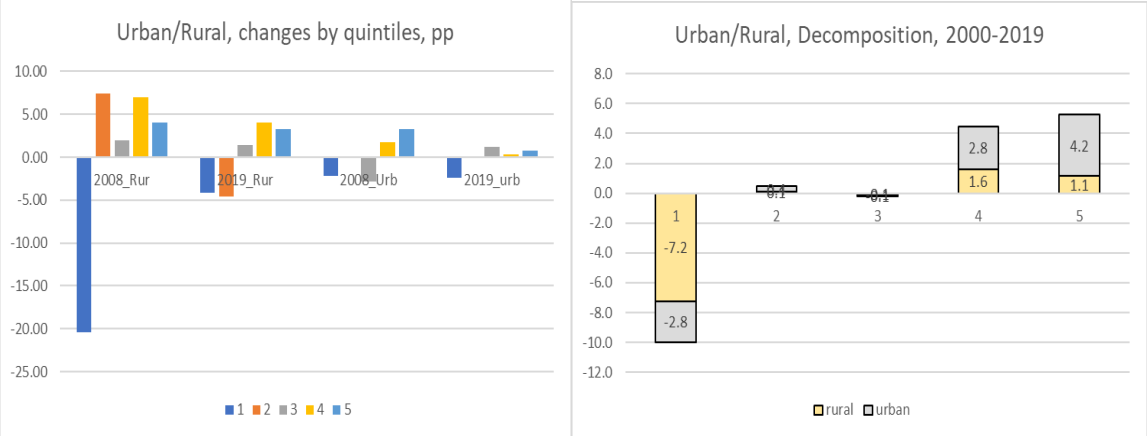
Urban employment was also exposed to restructuring and reallocation but the change over time in relative terms was more modest. In the 1st sub-period, the reallocation went from the quintiles

1-3 to the quintiles 4 and 5, and the latter emerged as the principal recipient, having gained 3,3 pp. Interestingly, in the 2nd sub-period the 3d quintile was the main beneficiary with 1,2 pp gain.

Therefore, the rural population was actively leaving low paid jobs and the contracted rural employment experienced impressive upgrade in terms of reallocation across quintiles. For urban residents, the effect was much smaller and close to statistically insignificant.

Fig.6a. Relative Changes in Quintiles by Sub-Periods, by Rural/Urban Population, pp

Fig.6b. Decomposition of Changes in Quintiles by Sub-Periods, by Type of Residence, pp




Source: Authors' estimates using Rosstat data (see Section 4)

In this case the decomposition (Fig.5b) reveals a clear asymmetry as well. The dominant contribution in downsizing at the bottom of the job ladder comes from rural residents, while the topping up the upper part was brought by urban workers.

***Education.***

Employment changes across quintiles by education level are illustrated by Fig.7. We consider three educational levels – higher (university level), college (post-secondary but not higher) and high school or less. Each of these groups contains roughly a third of the total employed labour force. In Russia, a post-secondary vocational education that provided by two-years colleges remains very widespread.

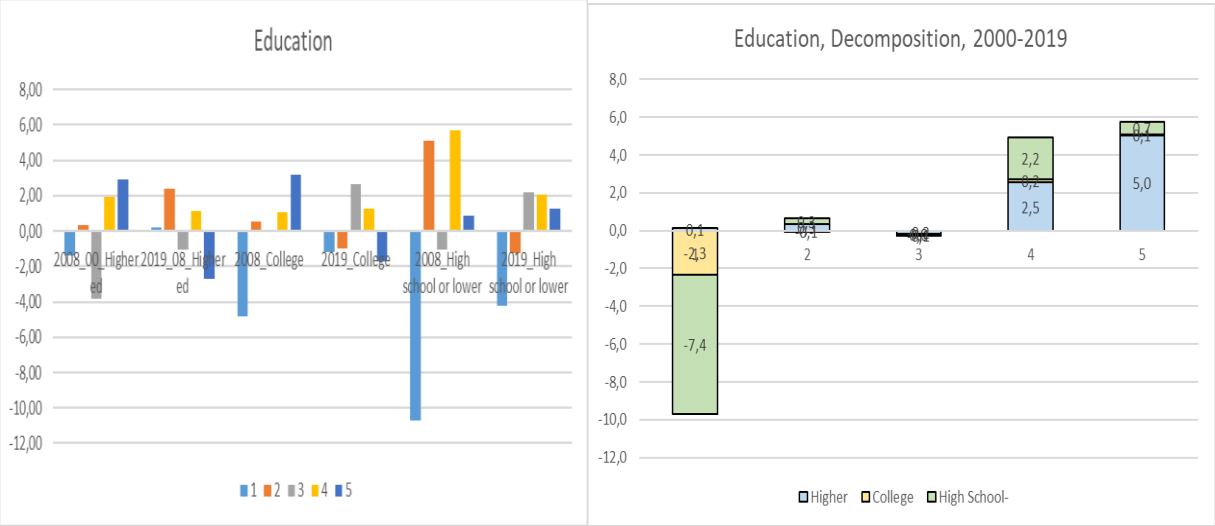
During the 1st sub-period, individuals with university level diplomas moved actively from the 1st and 3rd quintiles to jobs in the 4th and, especially, to the 5th quintile. The 2nd sub-period saw movement in the opposite direction when the 2d quintile expanded while the 5th lost its members.

As to college graduates, the 1st sub-period brought them a significant upgrade as well. Their presence in the 1st quintile decreased by 5 pp, while in the 5th it increased by 3,2 pp. The 2nd sub-period brought a partial reverse making the 3d quintile the major employment gainer.

However, we see the most sweeping change for workers with the education not higher than the secondary. During the 1st sub-period, their presence in the lowest quintile jobs decreased by almost 11 pp. They emerged additionally in the 2nd and the 4th quintiles, where their fractions increased by 5 and 6 pp, correspondingly. During the 2nd sub-period, they continued leaving jobs in the first quintile and topped up jobs in the quintiles from 3 to 5. However, this change was modest.

Fig.7a. Relative Changes in Quintiles by Sub-Periods, by Education, pp

Fig.7b. Decomposition of Changes in Quintiles by Sub-Periods, by Education, pp




Source: Authors' estimates using Rosstat data (see Section 4)

Decomposition of the aggregate change over the whole period by educational attainment suggests that the contraction of the 1st quintile was driven largely by exits of low educated workers. They do not show up proportionately in higher quintiles what allows hypothesize that many of them either advanced their education within the period or left the labour force. On the contrary, the top quintiles expanded by pulling university educated workers in.

***Age.***

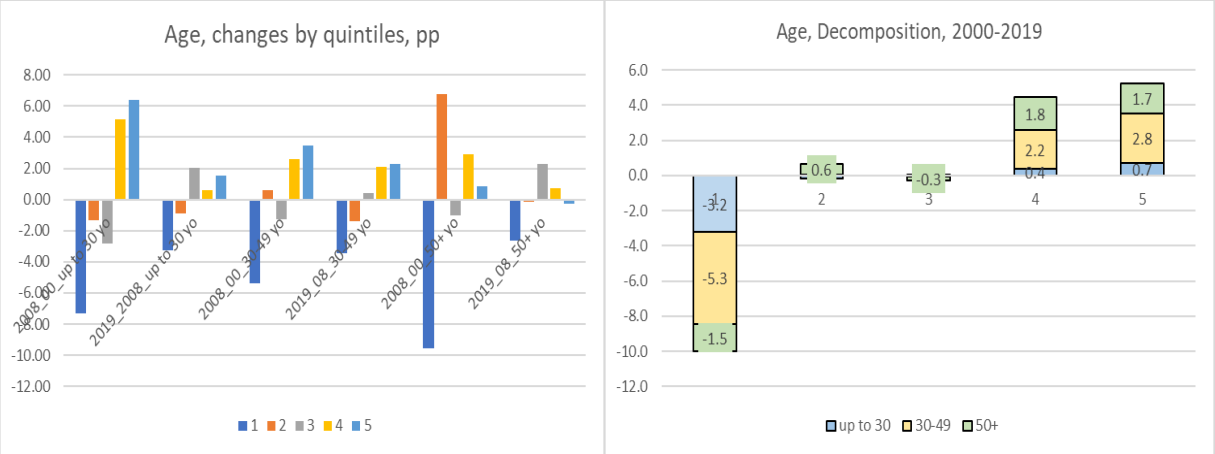
We divide all workers in our samples into three age groups. These are young workers (up to 30 years old), prime-age (30-49) and the group of older workers in age 50+. Looking at the reallocation through the prism of this dimension (figure 8), we also see intensive change during the 1st sub-period and a much more modest one during the 2nd sub-period. This relates to all age groups, but the youngest group emerges as the main beneficiary from the reallocation. This is especially evident in the case of the 1st sub-period when in the two top quintiles the young population increased its presence by 5 and 6 pp, correspondingly. All quintiles from 1 to 3 lost young people, but the most significant shrinkage was in the 1st quintile, where the share of this

age group decreased by 9 pp. The upgrade continued during the next sub-period, though with less intensity, and with the quintile in the middle gaining most employment.

For middle age groups, the outcome of the 1st sub-period looks like that of the young group, though the size of reallocation was smaller. A modest upgrade continued after 2008. As to the senior age group, we observe its mass outflow from the 1st quintile (by 10 pp) to topping up the 2nd quintile (+6,8 pp) and the 4th (+2,9 pp). The outflow of this group continued during the 2nd sub-period, though with lesser intensity, and the middling quintile got the main gain (+2 pp).

Fig.8a. Relative Changes in Quintiles by Sub-Periods, by Age, pp

Fig.8b. Decomposition of Changes in Quintiles by Sub-Periods, by Age, pp




Source: Authors' estimates using Rosstat data (see Section 4)

After decomposing the aggregate changes by quintiles (Fig.8b), we see that younger and middle-aged workers contributed most to compressing the bottom part, while middle aged and older group helped the top quintiles to grow. This outcome is a consequence of multidirectional changes in sub-periods.

***Cohorts.***

Discussion on the age effects needs additional comments. Unfortunately, we cannot separate technically the effect of age from the effect of cohort (Rosen 1975; Rubinstein and Weiss 2007). Age is a biological characteristic: younger people are physically healthier and may possess stronger cognitive abilities, which tend to decline with age due to laws of nature. Belonging to a particular cohort/generation defined by year of birth and by timing of socialization is largely a

socio-economic parameter that affects education, values and worldview in general. It contributes to how and when individuals enter the labour market and how they are endowed for that.

In 2000, the cohort of those in their twenties included individuals born in the 1970es[13]. They got education and entered the labour market in the 1990es, when Russia was going through painful reforms and formation of the market economy. By the early 2000s, they were ready to grasp gains from the starting economic boom. This gave them additional comparative advantages over other cohorts, which entered the market earlier or later.

As is well known, entering the labour market during the boom period promises significant and enduring benefits, while entering in recession leaves long lasting scars [Kahn 2010; Von Wachter 2020]. By 2000, older cohorts had already experienced the planned economy and were endowed with the Soviet education, less fitted to requirements of market economy. Neither such education, nor such experience did not emerge as a valuable asset (Gimpelson, Kapeliushnikov and Ostchepkov, 2018).

To follow cohorts over time, having panel data would be most promising strategy, but the LFS is not a panel, and we cannot trace inter-quintile mobility of particular individuals. However, we can observe mobility of cohorts, using the aggregate synthetic panels for that. For example, the cohort of those born in the 70es (it was in their twenties by 2000) can be followed during next 20 years. By 2008, they, in their mass, were in age of 30-39, and by 2019 they were in their 40es. Likewise, the cohort of those born in the 60es of the XX Century was in age 30-39 by 2000, and we can follow it during next 20 years.

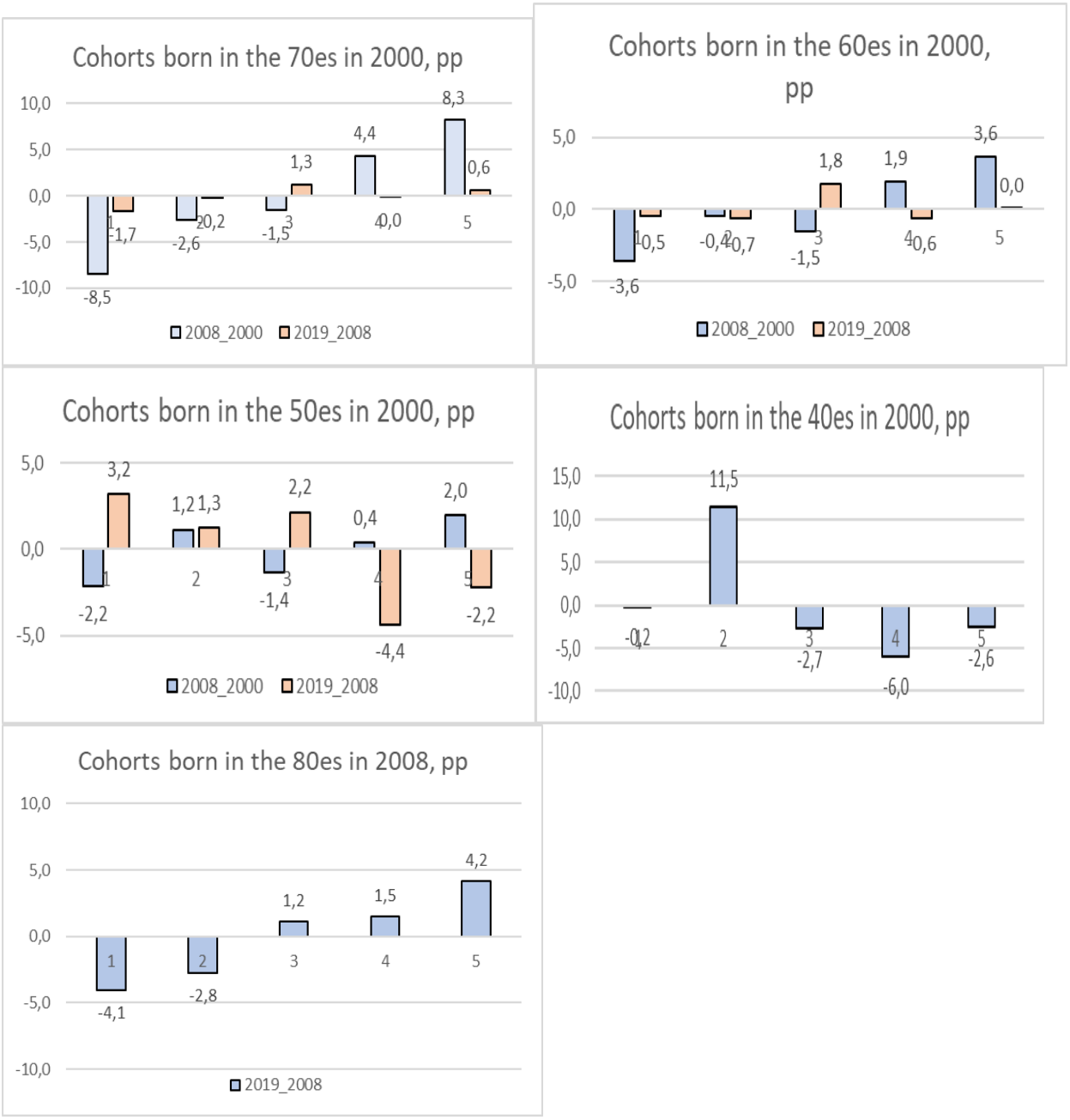
Correspondingly, we can observe how cohorts change their place and composition on the quintile ladder. If there is a change, it could be associated with intra-cohort industry-occupational mobility across job cells belonging to different quintiles. This is a demand driven process. In case of no such mobility, the inter-quintile change could be driven by the entry of new younger cohort into employment and by the exit of the older one.

The analysis by cohorts is presented in Fig. 9. We start with looking at the cohort that was 20-29 years old in 2000. This cohort improved its quintile placement by 2008, but the further shift by 2019 was more modest, if there was any. There was barely any visible growth in the 5$^{th}$ quintile but some reduction in the 1$^{st}$ one. For the previous cohort (for those who were in their 30es in 2000) the 1$^{st}$sub-period was also gainful though to a lesser extent than for the younger cohort. A

[13] Correspondingly, those in their 30es were born in the 1960es, in their 40es – in 1950es, and so on.

worsening in the 2nd one becomes evident. For the cohort of those who were in the 40es in 2000, the first decade did not bring any gains but the second decade brought losses. Its members moved down to the 1st quintile while their presence in the two upper quintiles shrank. As to the cohort of those born in 1940es (they were in their 50es in 2000), the economic boom did not prevent the slide down the quintile ladder. Their contribution to the 2st quintile increased by more than 10 pp, and this happened at the expense of the higher quintiles.

Figure 9. Changes in Quintiles by Cohorts and by Sub-Periods, pp

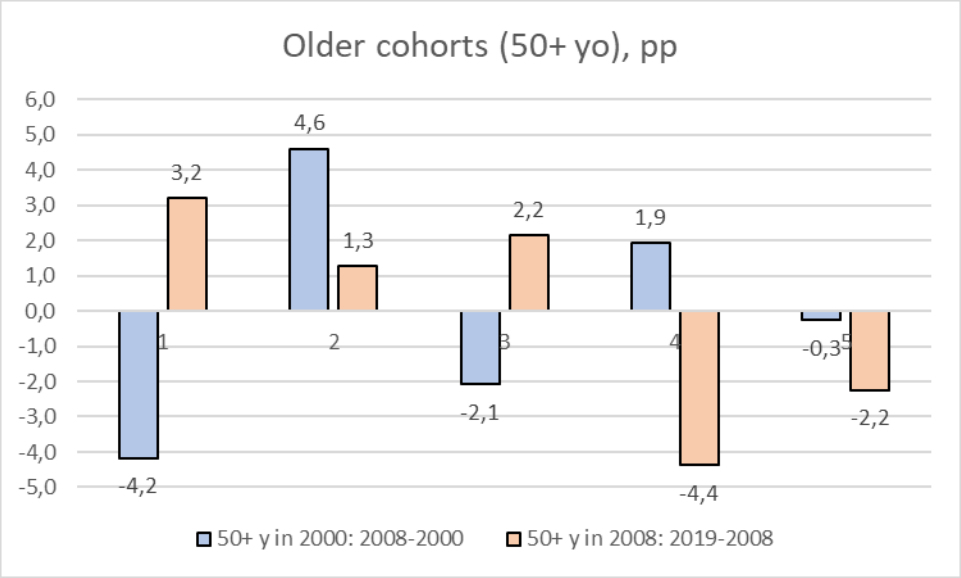



Source: Authors' estimates using Rosstat data (see Section 4)

We can also get an insight into the "success" of those, who, in 2008, belonged to the cohort of those born in the 1980es (the bottom panel of Fig.9). At that time, they were in their 20es. In our data, this cohort appears visible in the second sub-period only and it shows a modest upgrade. Their placement in the 5th quintile increased by 4 pp, in the 4th – by 1,5 pp, and in the 3d – by 1 pp. Comparing this upgrade with that of those in their 20es in the first sub-period suggests that the window of opportunity got much narrower. This analysis suggests that the upgrade in the 1stsub-period was largely localized within the youngest group. By 2008, they occupied positions higher than those they could get, if they were starting the career 8-10 years earlier or later. In 2000, employment of the 20-year-olds made 14,1 million, while in 2008 – by 2,4 million more. If we select within this cohort those with higher education, their employment almost doubled – from 2,5 million to 4,8 million. Both supply and demand factors worked in a concerted way: the demographic wave brought to the labor market an additional inflow of educated labour force, while the economic growth boosted the demand for labour and opened new jobs. The preceding cohorts won much less, and the location on the quintile ladder for those who were 40+ year old in 2000, did not improve. The 2nd sub-period was equally unsuccessful for all cohorts and age groups.

If our focus on the youngest cohort highlights terms and opportunities for labour market entry, looking at the older cohort reveals jobs from which individuals can exit into non-employment. We select cohorts of those who were in their 50es in 2000 and 2008, and explore their allocation across quintiles in the following years. Outcomes for these cohorts differ by the sub-periods. During the 1st sub-period the major change was in shrinking participation in the bottom quintile (by 4 pp) and expanding in the 2nd one (by 4,5) pp. Two top quintiles in sum expanded, though not by much. During the 2nd sub-period, the reallocation went in the opposite direction with the expanding share of the cohort in the lower quintile jobs.

Figure 10. Change for older cohorts (50+ year old) by Sub-Periods, pp




Source: Authors' estimates using Rosstat data (see Section 4)

Our descriptive analysis in the breakdown by socio-demographic characteristics suggests that inter-quintile shifts had different speed and intensity for different groups and in different time periods. The first sub-period saw a rapid upgrading reallocation along all dimensions. For the second one, we document a sluggish upgrade close to stagnation, and even a slight reverse for some groups. Naturally, various factors driving these outcomes could act in a concert. At the next step, we apply simple econometric tools in order to see a more multidimensional picture.

## 6. Chances to be in better jobs: regression-based simulations.

As the next step, we regress the variable for belonging to particular quintile on individual characteristics in order to account for observed heterogeneity. Regression coefficients allow estimate relevant conditional probabilities. We do it for different years and for an average worker as well for typical representatives of different socio-demographic groups. Changes in conditional probabilities over time show the direction and intensity of the reallocation process under study.

We begin with estimating a simple equation in the following specification:

(1) $Q\_TILE=\beta X+ TER + YEAR + \varepsilon$,

where the quintile number makes the dependent variable, which takes discrete values from 1 to 5. The right hand side includes the set of X={gender, age, education, type of residence}. *TER* and *YEAR* are fixed effects for region and year, correspondingly, and $\varepsilon$ goes for noise. The robust standard errors are estimated accounting for intra-regional clusterisation. Since our dependent variable is ordinal, we apply ordered probit (specifications 5 to 8). However, for simplicity of interpretation we estimate it using OLS as well (specifications 1 to 4) and treating the dependent

variable as continuous. As we can see in table 3, the results are qualitatively and quantitatively similar. Our specifications do not include industry and occupation dummies since their interaction makes our dependent variable.

The regression coefficients are collected in Tab.3. Columns 1-3 and 6-8 are for the years 2000, 2008 and 2019 respectively. Columns 4 and 8 present estimates for the pooled sample in which all cross-sections are taken together.

Table 3. Coefficients for *OLS* and *oprobit* estimations, the dependent variable is the quintile number (1-5).

| | OLS | | | | Oprobit | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 (2000) | 2 (2008) | 3 (2019) | 4 (pool) | 5 (2000) | 6 (2008) | 7 (2019) | 8 (pool) |
| Males | 0.578*** | 0.647*** | 0.692*** | 0.644*** | 0.504*** | 0.562*** | 0.617*** | 0.562*** |
| Age | | | | | | | | |
| 30-49 | 0.116*** | 0.025*** | 0.051*** | 0.062*** | 0.101*** | 0.024*** | 0.047*** | 0.055*** |
| 50-69 | -0.013 | -0.085*** | -0.083*** | -0.060*** | -0.031** | -0.075*** | -0.074*** | -0.057*** |
| Educ | | | | | | | | |
| College | -0.879*** | -0.814*** | -0.772*** | -0.810*** | -0.812*** | -0.792*** | -0.757*** | -0.775*** |
| highscho.. | -1.431*** | -1.438*** | -1.283*** | -1.378*** | -1.308*** | -1.351*** | -1.221*** | -1.284*** |
| Urban | 0.818*** | 0.487*** | 0.364*** | 0.551*** | 0.744*** | 0.424*** | 0.328*** | 0.492*** |
| Year | | | | | | | | |
| 2000 | | | | -0.183*** | | | | -0.178*** |
| 2019 | | | | 0.025** | | | | 0.018* |
| _cons | 3.068*** | 3.657*** | 3.691*** | 3.524*** | | | | |
| N | 138859 | 160634 | 488720 | 788213 | 138859 | 160634 | 488720 | 788213 |
| r2_a | 0.309 | 0.296 | 0.268 | 0.293 | | | | |

Source: Authors' estimates using Rosstat data (see Section 4)

Notes: Reference categories are females, age 18-29, higher education, rural residence, and year 2008. Robust SE are clustered in regions. *, **, *** refer to conventional significance levels of 10%, 5% and 1%, correspondingly.

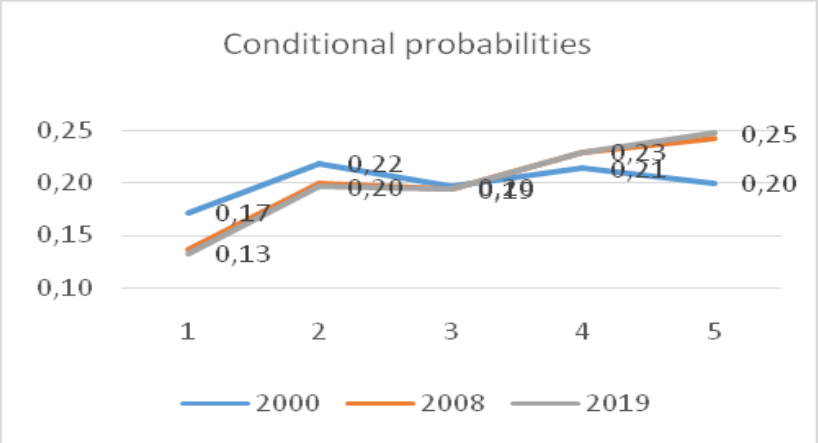
All regressions tell us the expected and consistent story. Being male, in middle age (30-49), having higher education, and residing in urban area increase chances for belonging to higher quintile. On the contrary, such characteristics as being female, pre-retirement or retirement (50+) age, low level of education, and rural residence tend to increase likelihood for getting a job at

lower quintiles. For an individual with the set of reference characteristics the mean quintile increased from 3.1 to 3.7. Specifications 4 and 8, estimated with the pooled dataset, tell the similar story but add the time fixed effect. Coefficient for 2019 dummy is positive and significant (relative to 2008) at 5% and 10% level in specifications 4 and 8, but its value is quantitatively small.

We can ask what chances are for being in a particular job quintile given that all observed characteristics are taken constant. For that, we use probit estimates and estimate conditional probabilities for getting in the quintile $j=\{1\ldots5\}$ for each year in our pooled sample. Results are presented in the following figures.

The likelihood that a worker with characteristics fixed at their means enters the bottom quintile decreased from 0,17 in 2000 to 0,14 in 2008 (+3 pp), and then barely changed. Chances of being in the top quintile increased correspondingly from 0.2 to 0.25. The likelihood of being in the middle did not change. Again, we see a notable upward shift in jobs in the first sub-period and stagnation after.

Fig.11. Conditional probabilities for being in quintiles 1 to 5, in 2000, 2008 and 2019.




Source: Authors' estimates using Rosstat data (see Section 4). Note: conditional probabilities for an average worker.

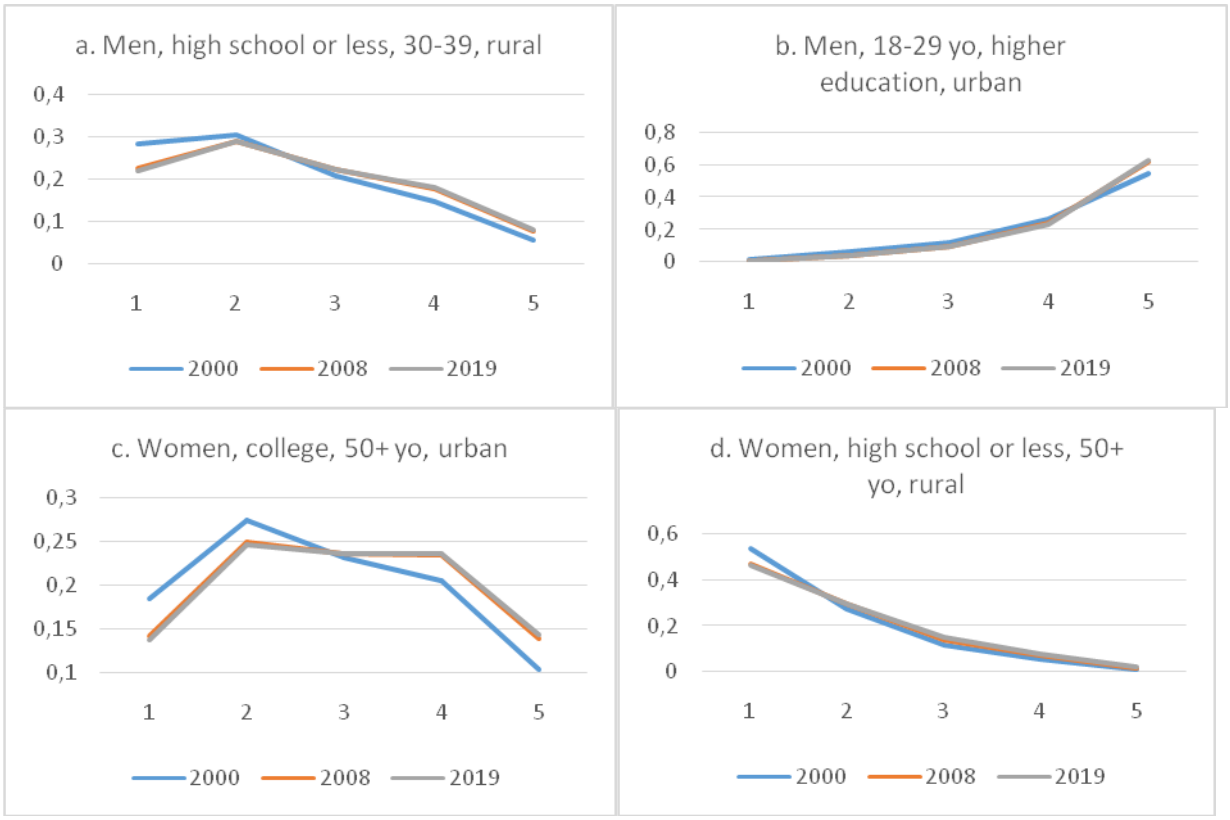
Patterns of the inter-quintile dynamics are highly heterogeneous. Though all groups moved in the same direction, their points of departure and arrival may differ. Fig.12a-d present conditional probabilities for individuals with sets of individual characteristics to be in particular quintiles in selected years. Combinations of values for the independent variables (gender, age, education, residence) in our econometric exercise allow to construct many smaller groups. Here – for simplicity - we focus on four of them, only giving priority to inter-group contrasts.

- Fig.12a shows conditional probabilities for middle-aged men, residing in rural areas, and having education at the school level or less. This group is present in all quintiles with the maximum likelihood (at 0.3) in the 2nd one. The main change was in the 1st sub-period, when the probability of being at the bottom decreased from 0.28 to 0.22. At the same time, probabilities of being in the 4th or 5th quintiles increased as well. The 2nd sub-period brought little change to this group.

- The panel 12.b looks at young urban men with the university level education. Over half of them are located at the top quintile and the likelihood of being there increased from 0,55 to 0,62 during the 1st sub-period with no visible change after. This group occupies actively the 4th quintile as well with the probability of 0,24.

- Panels 12c-d are both about women. Fig. 12c deals with those residing in cities, college educated and in age close to retirement. They largely occupy middling positions (quintiles 2-4). The significant upgrade that this group experienced during the 1st sub-period could partially be due to exiting from the low paid jobs. Fig. 11d is about rural women with low (high school and less) education also in pre-retirement ages. Though we observe decreasing probability for belonging to the bottom quintile, the latter prevails over years. Again, the 2nd sub-period saw little change.

Fig 12. Conditional probabilities belonging to particular quintiles, by sets of individual characteristics, years 2000, 2008 and 2019.
Fig.12a. Men, high school or less, 30-39, rural
Fig.12b. Men, 18-29 yo, higher education, urban
Fig.12c. Women, college, 50+ yo, urban
Fig.12d. Women, high school or less, 50+ yo, rural




Source: Authors' estimates using Rosstat data (see Section 4)

In summary: we document that industry-occupational composition of jobs experienced significant upgrade during 2000-2008 against the background of fast economic growth. The upgrade stopped later when the economy turned from growth to stagnation. Filling up polar (1 and 5) quintiles changed most while probability of being in the middle remained almost constant. Young and better educated individuals took better jobs straightaway when they were entering the labour market, while older and less educated, who were exiting the labour force, left the bottom quintile jobs. This does not mean that the third quintile became a dead-end on the way to a better

life, but just reflects the fact that the middling jobs remain stable and still in demand. If the idea of polarization is associated with hollowing out the middling part of job distribution, we do not observe any signs of this process. If changes in inter-quintile distribution are largely driven by movement of age cohorts (and some industrial restructuring – we explore in the next paragraph), then the contribution of inter-job mobility is likely to be limited.

## 7. Industrial restructuring and inter-quintile change

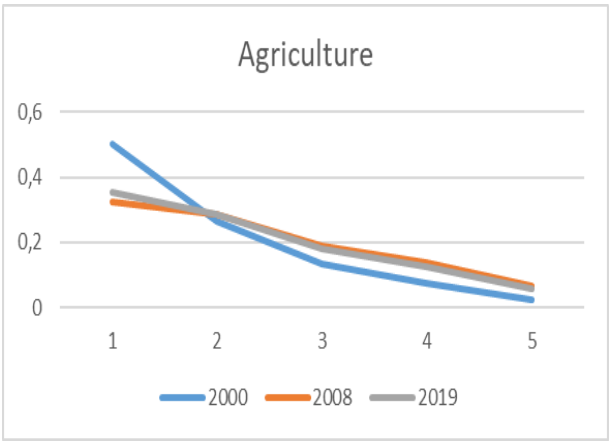
Inter-quintile distribution of employment can change due to demand shifts causing decline and rise of industries. Firms in older and less efficient industries are destroyed, bringing thus employment reduction, while new and more efficient industries create additional employment. How could industrial change be associated with inter-quintile (re)allocation? How does the 1st sub-period compare in this respect to the 2nd one?

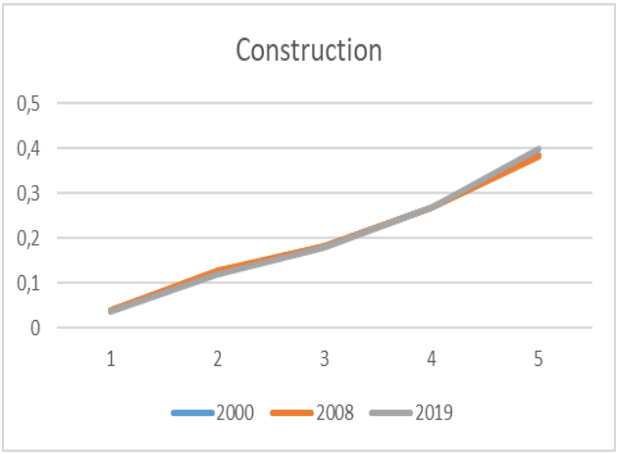
As the next step, the industry dummies are added to the baseline equation (1) used above and interact with the year fixed effect. All industries are aggregated into 7 groups, among which are agriculture, construction, manufacturing, trade/sales, other market services, nonmarket services, and other industries. Coefficients λ tell us how industry effects change over time.

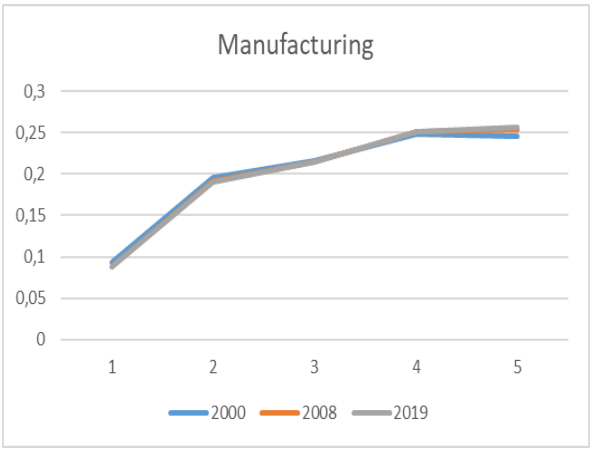
$$Q\_TILE = \beta X + \sum \gamma * INDUSTRY + \sum\sum \lambda\ INDUSTRY * YEAR + TER + YEAR + \varepsilon,$$

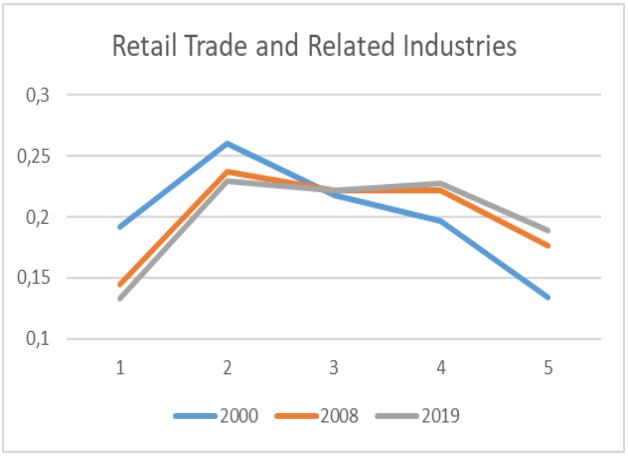
We estimate equation (2) using ordered probit and simulate conditional probabilities of being in a particular quintile for all selected industries, controlling for individual characteristics. These estimates relate to those workers who are employed in a given industry at a given year and do not account for a potential mobility. Below we present conditional probabilities for the most important aggregate industries (Fig. 13).

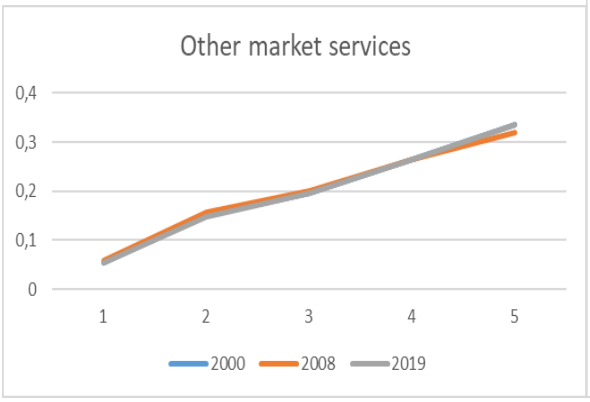
Figure 13. Conditional probabilities belonging to particular quintiles, by major industries, years 2000, 2008 and 2019

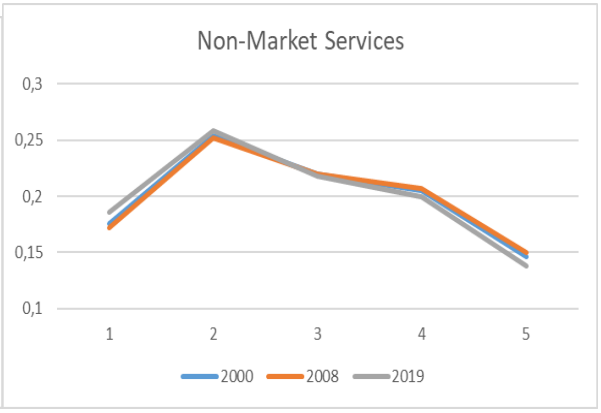



Source: Authors' estimates using Rosstat data (see Section 4)

Inter-quintile distributions (Fig 13) can be divided into a few groups. First, this is the pattern of monotonous (or close to that) decrease of probability along the inter-quintile distribution. The case of agriculture is the most salient. The probability of belonging to the 1st quintile for agricultural workers exceeds 0,5 but declines to 0 in the 5th quintile. In other words, this relates to low paid activities in which workers are concentrated in the low quintiles. Second, this is the

pattern of increasing probability. In the IT sector it increases from minimal values to 0,7 in the 5th quintile. A similar story is observed in other market services and construction. These are relatively high paid activities.

Third, this is a ∩-shaped trajectory when conditional chances for being in the middling part are higher. Examples are trade/sales and non-market services, in which most workers are concentrated in the middling jobs.

The figures show how conditional probabilities over quintiles change over time. We observe here the same pattern that we discussed earlier. This is a rapid upgrading until 2008 and then the turn to stagnation during the following years. Such evolution in the job structure corresponds with the general trend in the Russian economic development.

## 8. Conclusions

Our paper explores the evolution of job structures in the Russian economy during a recent period (2000-2019) and concludes that there are no visible signs of job polarization. The key trend over the period is a progressive upgrading when the fraction of bad jobs declines and the fraction of good jobs increases. In relative terms, the cumulative shrinkage of jobs in the first quintile made about 10 pp, while the cumulative expansion of two top quintiles was also about 10 pp. Changes concerning the middle part of the quality scale are hardly visible. Changes in the lower part of the distributions were concentrated in a relatively few large industry-occupational cells. Our conclusion concerning the upgrade of jobs is correct for both sub-periods. However, the intensity of the reallocation was much higher in the first sub-period than in the second one, which could be considered a stagnation period. Socio-demographic groups differed in their contribution to job reallocation. Low educated women in rural areas played a major role in compressing the bottom quintile, while urban educated men did so into expansion of the upper two. Young and prime-age workers experienced major losses in the lower part of the job quality scale, while prime-age and older workers contributed to topping up the upper part.

Our analysis does not suggest that the Russian labour force has entered or come close to the polarization phase. There are no signs of this in any of the sub-periods under the study. Is it surprising? Of course not, since the polarization scenario is a consequence of a deep penetration of the ICT and technological progress into jobs along the whole quality scale. Russia is not a member of the club of the most advanced countries and has just tried to catch up the leaders during the boom period. Neither the globalisation could be a driver, given the Russia specialization in exporting natural resources. The turn from growth to stagnation and frequent crises of different nature affect negatively both the rate of job upgrade as well as substitution of

routine middling jobs. To the better or worse, this development could decrease chances for polarization in the foreseeable future.

If the COVID induced crisis brought a temporary freeze into labour reallocation and, therefore, sped down any structural change, the year 2022 marked the radical break with the past trends. The Russian military invasion of Ukraine in February 2022 prompted Western nations to impose a wide array of economic sanctions. Both imports to Russia and exports from Russia were drastically reduced, disrupting supplies and the production of goods and services. Many Western companies halted all transactions with Russian clients or withdrew completely. In response, the Russian government announced a wide program of nearly total import substitution. These events radically modified both supply and demand sides of the Russian economy, affecting all industries and most workers. Sanctions and import substitution have combined in what can be seen as a single devastating shock to Russia's economy.

Before the recent crisis, most occupational change in Russia was driven by labor reallocation from industry and agriculture into services. It made a substantial contribution to productivity growth and the efficiency of the Russian economy. The new question is whether a reverse is possible, and, if so, with what consequences. The shock and the import-substitution that followed are likely to affect the structure of economic activity and to cause technological degradation and a shift to more primitive jobs. As a result, we can expect that a wider use of regressive (outdated) technologies is likely to stimulate reallocation of higher skilled labor to lower skilled tasks. Looking through this prism, downward job shifts are becoming more likely than ever before, making the polarization scenario even less likely. However, this is not a turn from a movement towards "bad" polarization to a "good" upgrade but a shift towards a stagnation.

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