Bank of Russia

INDUSTRIAL SECTOR PRODUCTIVITY: GROWTH DRIVERS

Analytical Note

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Abstract

This analytical note presents the findings of a survey of industrial firms commissioned by the Bank of Russia to study labour productivity levels and growth over 2014–2016.[1] The survey documents significant variation in labour productivity levels and growth across the sample. The divergence between the highest and lowest productivity levels within some industries is more than tenfold. The gap further widened between 2014 and 2016. This serves to confirm the conclusion of prior research that the Russian economy is witnessing a growing gap in productivity between the most and the least productive firms.[2]

According to the survey, the high heterogeneity in labour productivity levels across industries is driven by the dominance of larger firms and exporters among high-productivity firms compared with other sample firms. Supposedly, the former usually have more opportunities to accumulate physical and human capital, intangible assets and to develop technology. The latter invest with the particular goal of boosting productivity to support their competitive edge abroad. However, the survey data reveal that not all large firms and exporters can boast high productivity.

Among the key factors that have slowed down productivity growth, the firms list a lack of own funds for investment, a limited number of markets, asset depreciation, poor staff qualifications and a lack of access to new technology. Sample firms with relatively high productivity see potential for further growth in expanding production through additional capacity, improvements in the quality of human capital, adoption of cutting-edge technology and the overhauling of business processes. Low-productivity firms cite the lack of own funds as a major barrier. Fixed asset upgrades and the downsizing of staff remain key avenues for increasing labour productivity growth. Such firms are likely to be either limited in funding or unaware of the importance of investment in human capital.

A study of firms' behavior patterns during the 2014–2016 recession has revealed that low-productivity firms usually maintained or lowered their output. They adjusted to the crisis largely by laying their workforce off. However, some producers retained their staff or dismissed them less intensively than required by the decline in output, which drove an even larger drop in labour productivity, but which helped preserve low-productivity jobs. Positive productivity growth in the case of the high-productivity firms in the sample was largely due to increased output amid a flat or rising staffing level.

According to the findings of the survey, the tighter competition in the economy needed to boost labour productivity growth will push inefficient, low-productivity firms from the market and help re-allocate labour to more productive firms. Faster access to foreign markets is another avenue for ramping up labour productivity and investment in the economy.

[1] The survey relies on a questionnaire produced by the Bank of Russia's Research and Forecasting Department (the list of questions can be found in the Annex below). The conclusions have a relative nature with regard to the specific sample and may not fully reflect the situation in the industrial sector in general. However, the research findings can be applied to identify the reasons for variations in intra- and inter-industry productivity, as well as the factors that drive productivity growth in the industrial sector. The sample is largely composed of a panel of industrial firms that are known to be regular respondents to economic surveys. The survey was conducted as follows: questionnaires were sent to the panel by email, with subsequent electronic collection of data. The sample totalled 481 firms. Respondents were either top executives or the heads of economic units.

[2] E.g., Bessonova E.V. (2018).

Introduction

Labour productivity is an essential condition for a competitive economy and its sustainable growth is critically important for long-term economic growth.

As domestic and foreign research indicates, labour productivity levels and growth rates may be extremely heterogeneous even within one industry. Studying the size of and the reasons for such heterogeneity can offer insight into the potential and the conditions needed to accelerate GDP growth (productivity convergence) at the level of individual industries, and the role of capital quality and volume in these processes.

Labour productivity is an unobserved indicator. Furthermore, there is no single approach to estimating it. The choice of one or another instrument depends on the application of the indicator and the availability of data.

Productivity research has been increasingly focusing on the analysis of micro-level, or firm-level, data. Among the key advantages of this approach is the opportunity for researchers to study the drivers behind productivity growth or decline at the firm level that are often overlooked in macroeconomic statistics.

Our research relies on a survey of industrial enterprises commissioned by the Bank of Russia's Research and Forecasting Department. The survey findings have been used to assess the scale of inter- and intra-industry heterogeneity in labour productivity among the sample in 2014–2016, diagnose the reasons behind the gap in productivity levels and growth, and identify factors that could help drive labour productivity at these firms.

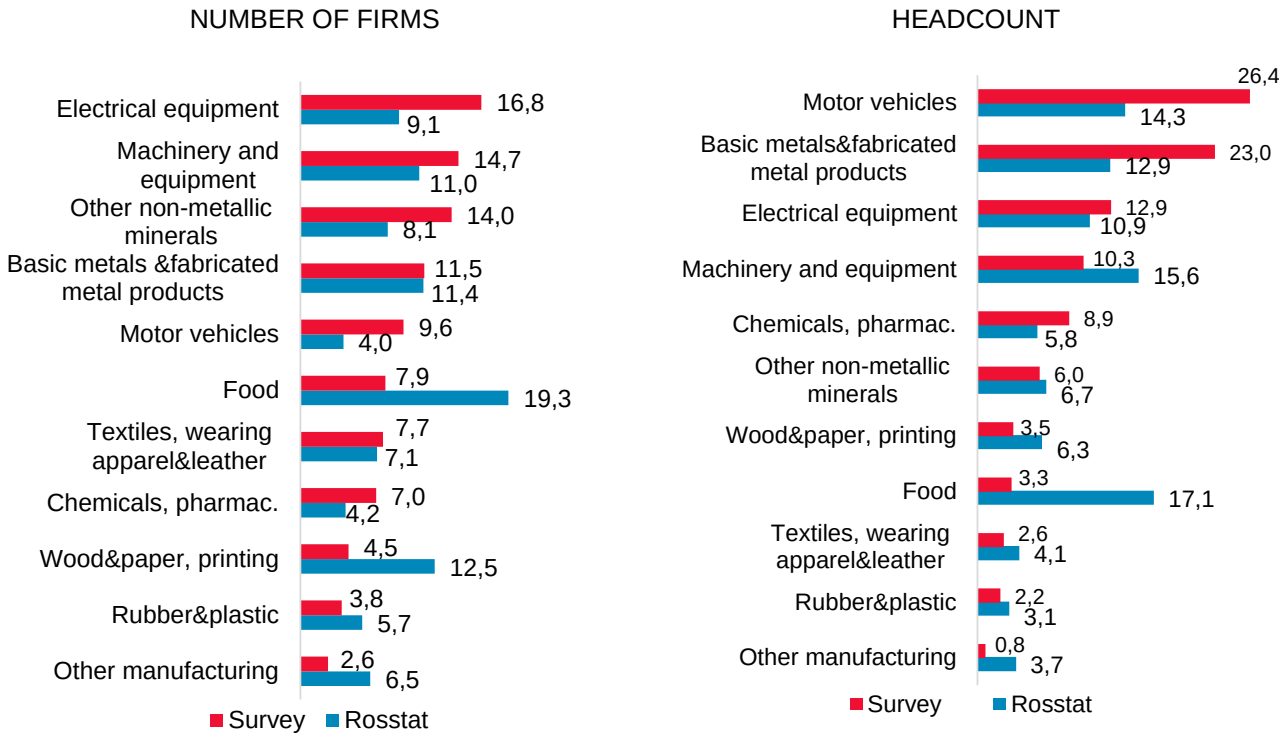
1. Sample

The survey covered firms across a variety of manufacturing industries and Russian regions in the 2014–2016 period.[3] Four hundred eighty-one questionnaires were submitted. Most of the respondents were either top executives or the heads of economic units.

Benchmarked against an industry breakdown of the Russian manufacturing sector by the number of firms and their headcounts, the sample population reveals a bias towards some types of activities (*Figure 1*). Since we do not seek to estimate productivity in the manufacturing sector in general, but to study it at the level of selected industries and firms, this particular feature of the sample is not critical to the analysis.

[3] The survey was conducted in late 2017.

INDUSTRY-LEVEL DISTRIBUTION OF MANUFACTURING FIRMS ACCORDING TO SURVEY FINDINGS AND ROSSTAT DATA, 2016 (%)[4] *Figure 1*



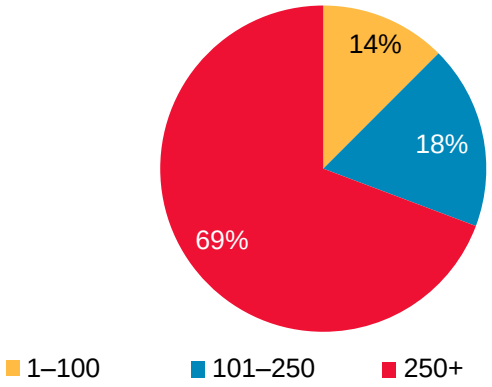
Source: authors' estimates based on Rosstat data, firm-level survey.

Given the focus of the research, it is more important to understand the level of representation across firms of different sizes. We use the eligibility criteria for small and medium-sized businesses defined in Russian law: average headcount and a sales revenue ceiling.[5] In terms of headcount, the sample is dominated by big firms (250+ workers) (*Figure 2)*. In terms of revenue, big businesses (with more than two billion rubles in revenue) account for just 30%, while the share of small firms (with annual revenue under 800 million rubles) is up to 52% (*Figure 3*). This is a sign that a large number of firms with high headcounts, which qualifies them as big businesses, demonstrate the low sales revenue figures which put them into the small and medium-sized categories. Such firms fall into the yellow sector of the firm set of the sample population (*Figure 4*).

[4] Rosstat data excluding micro-firms.

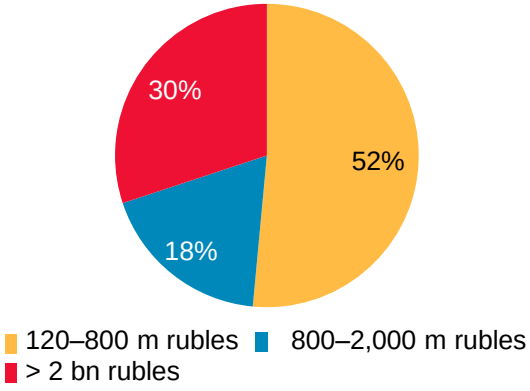
[5] Small and medium-sized businesses are as defined by Federal Law No. 209-FZ, dated 24 July 2007, 'On the Development of Small and Medium-Sized Businesses in the Russian Federation.' The average headcount shall not exceed threshold values: up to 100 workers for small firms and 101-250 workers for medium-sized firms. Firms with 250+ workers fall into the large business category. Sales revenue (VAT exclusive) shall not exceed the threshold values set by the Government of the Russian Federation. Decree No. 702, dated 13 July 2015 and effective as of 2016, by the Government of the Russian Federation defines the revenue ceiling for small firms at 800 million rubles, and two billion rubles for medium-sized firms. Firms with revenue higher than two billion rubles fall into the big business category.

FIRM DISTRIBUTION BY HEADCOUNT IN 2016 (SHARE OF RESPONDENTS, %) *Figure 2*



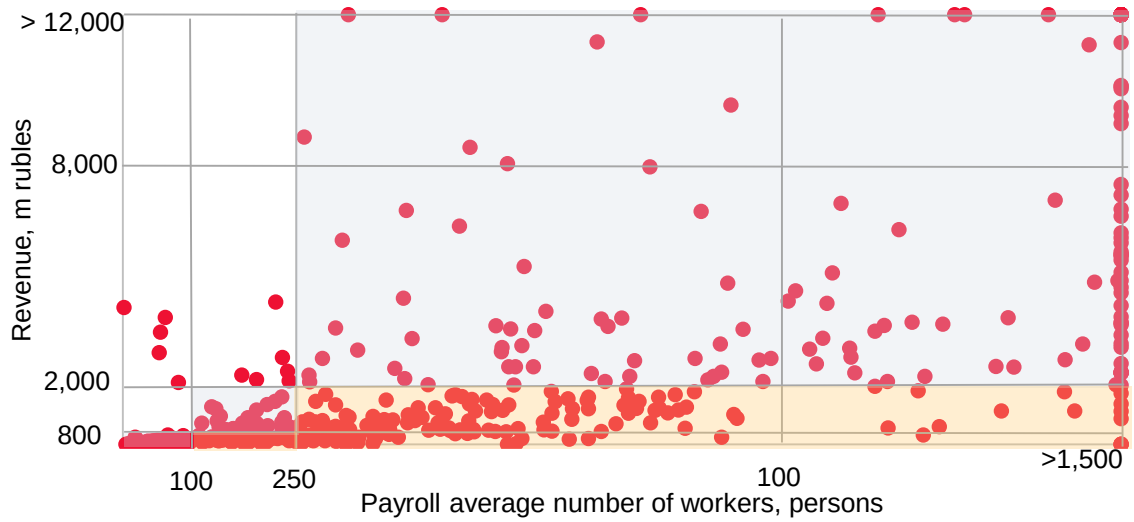
Source: firm-level survey.

FIRM DISTRIBUTION BY REVENUE IN 2016 (SHARE OF RESPONDENTS, %) *Figure 3*



Source: firm-level survey.

FIRM SET OF THE SAMPLE POPULATION *Figure 4*

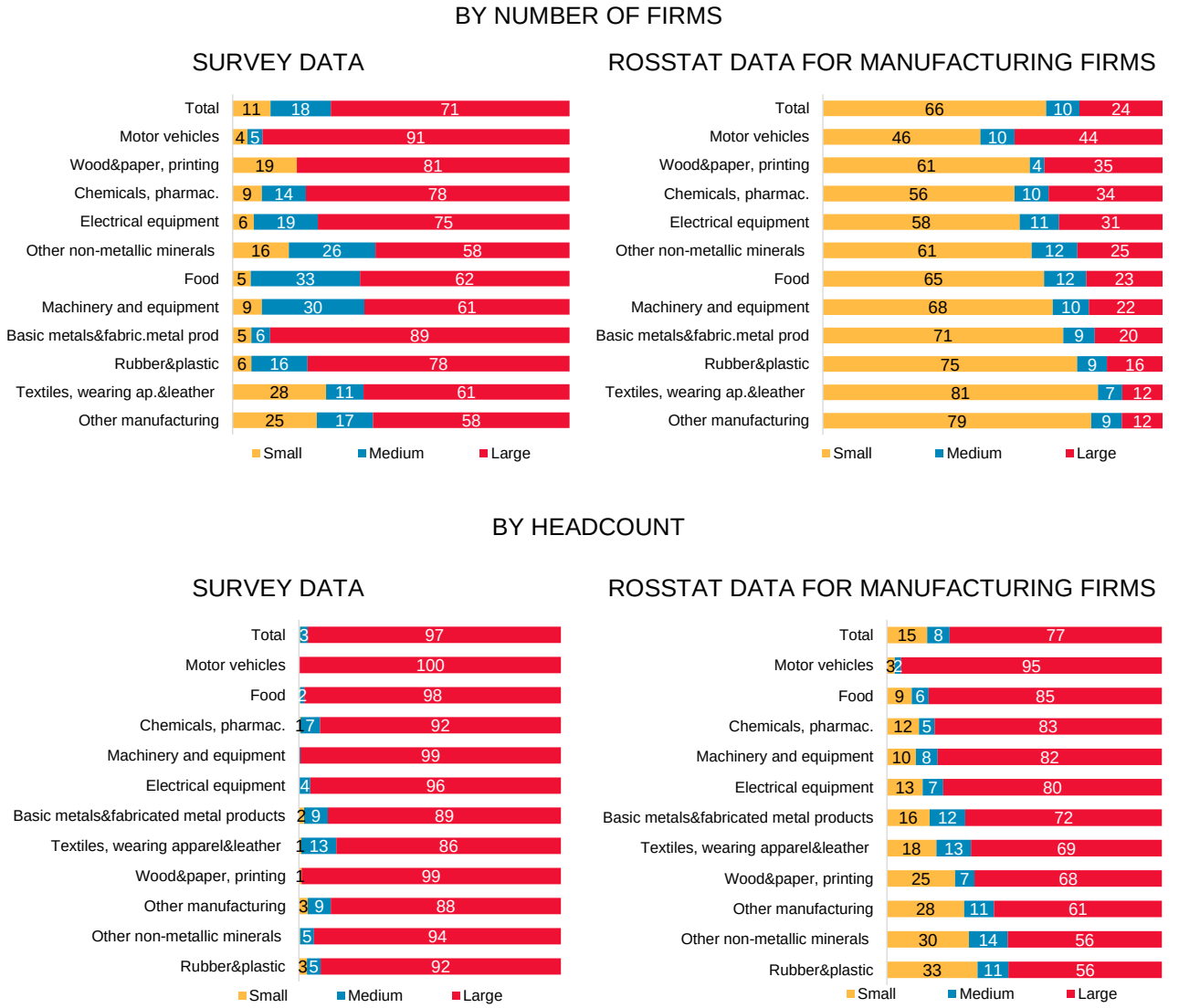


Source: firm-level survey.

The classification of firms as small- or medium-sized depends on the higher value of the two criteria.[6] As a result, large firms account for 71% of the sample, 8% are medium-sized, and 21% are small firms (*Figure 5*). The breakdown by headcount is dominated by large firms (97%), with medium-sized (3%) and small firms (1%) trailing behind. This breakdown of the sample population is different from the composition of the Russian manufacturing sector as a whole as of 2016, with a larger share of big businesses.

[6] As per Federal Law No.209-FZ, dated 24 July 2007, 'On the Development of Small and Medium-Sized Businesses in the Russian Federation.'

FIRM DISTRIBUTION BY SIZE IN LINE WITH THE HEADCOUNT AND REVENUE CRITERIA, 2016 (%)[7] *Figure 5*



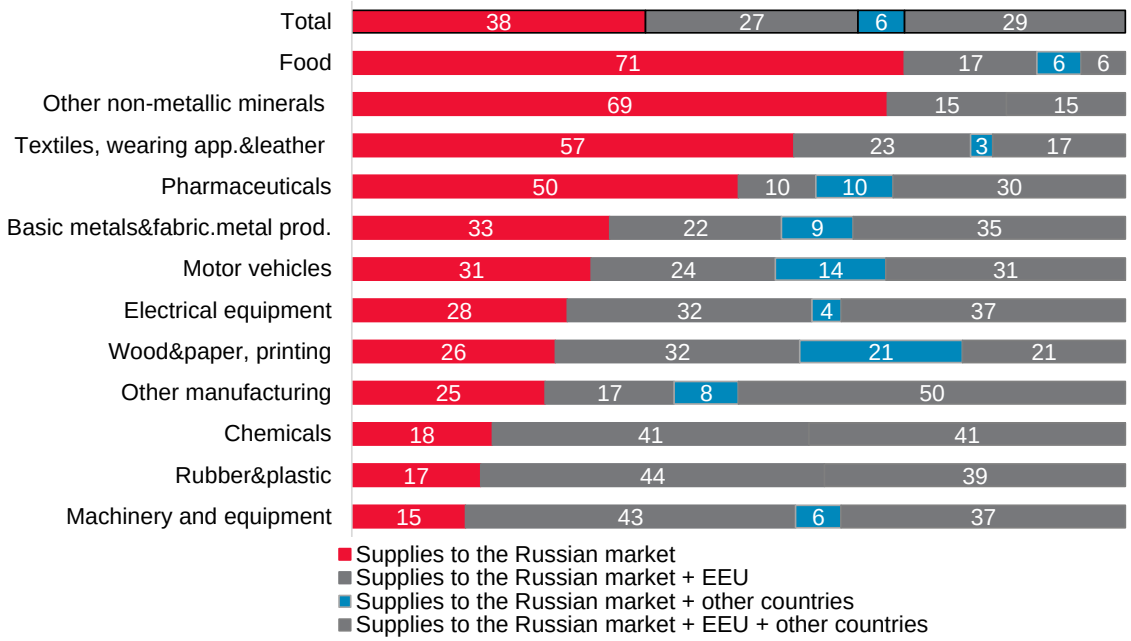
Sources: authors' calculations based on Rosstat data, firm-level survey.

It is safe to say that the survey mainly covers large firms. A sizeable differentiation in revenue is instantly apparent: despite a relatively high headcount, some firms report revenue figures that are typical of small- and medium-sized businesses. Presumably, not all large firms are highly productive and there is a gap in labour productivity within the group. Mindful of the idiosyncrasies of the sample, we apply the criteria for high and low productivity in a relative sense and with regard to the sample population, rather than to the Russian manufacturing sector in general.

The bias of the sample towards large firms is due to the significant share of exporters. Of the total group, 62% are exporters, with the remaining 38% catering to the domestic market only (*Figure 6*).

[7] Small businesses exclude micro-firms.

SUPPLY STRUCTURE OF THE SAMPLE FIRMS BROKEN DOWN BY INDUSTRY (SHARE OF RESPONDENTS, %) *Figure 6*



Source: firm-level survey findings.

2. Bias in labour productivity estimates: impact of methodological concepts

Labour productivity has traditionally been estimated in terms of labour input efficiency through a diverse set of indicators. In particular, labour productivity can be estimated by means of production intensity, which is the ratio of a firm's revenue to its headcount. This paper applies the same method.[8] It would be fair to point out, however, that using output per worker to estimate labour input efficiency may result in a bias in labour productivity estimates due to the disregard for differences in working hours. In this context, output per hour worked[9] is a more insightful indicator, since the same number of workers may work longer hours and produce greater output, but this does not mean that they are more productive (OECD, 2001). Also, productivity analysis in the context of hours worked is particularly important in the Russian labour market, which is known to adjust to shocks not so much through changes in unemployment figures as through changes in pay and hours, resulting in part-time employment in some industries (Gimpelson, Kapelyushnikov, 2015; Gurvich, Vakulenko, 2016; Kapelyushnikov, 2017).

[8] Based on the survey data, labour productivity per worker at firm i in year t is calculated as follows: $Productivity_{it} = \frac{Gross\ revenue\ in\ year\ t,\ million\ rubles_i}{Average\ payroll\ number\ of\ workers\ in\ year\ t,\ persons_i}$. The average labour productivity in an industry is the arithmetic mean of the labour productivity of all firms in that industry.

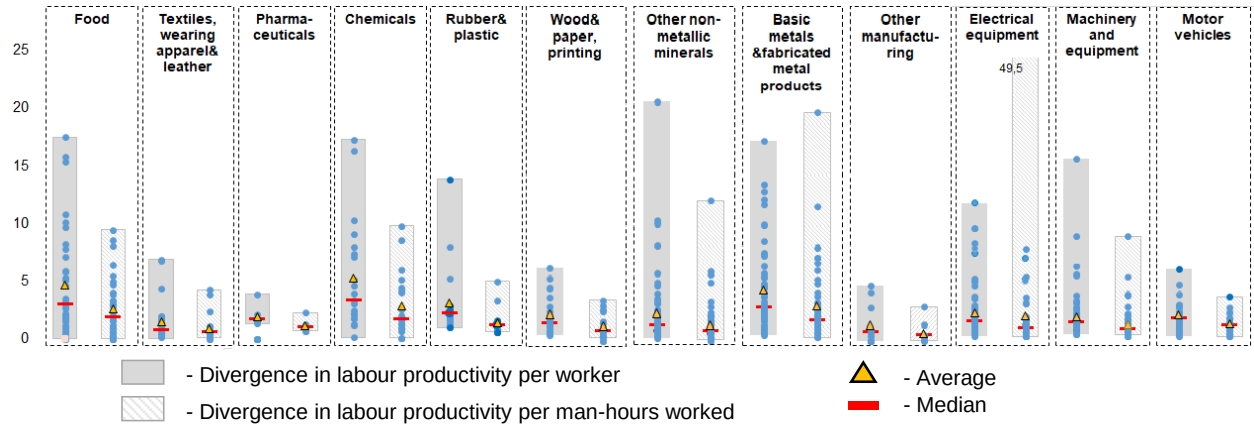
[9] Labour productivity per hour worked at firm i in year t is calculated as follows: $\text{Productivity}_{it} = \frac{Gross\ revenue\ in\ year\ t,\ million\ rubles_i}{Man-hours\ worked\ in\ year\ t,\ hours_i}$. The average labour productivity in an industry is the arithmetic mean of the labour productivity of all firms in that industry.

The survey data reveal significant inter- and intra-industry dispersion in labour productivity per worker. For instance, the highest average industry productivity level in the sample population in 2016 was observed in chemicals, the lowest in textiles, wearing apparel and leather (excluding other manufacturing), with an almost fourfold gap between the two industries. An even bigger divergence was recorded within certain industries (food, chemicals, basic metals and fabricated metal products, other non-metallic minerals, and machinery and equipment), where the gap may be as high as tenfold (*Figure 7*).

In the case of labour productivity per hour worked, inter- and intra-industry heterogeneity is lower. Due to the more or less even distribution of responses on man-hours worked compared with the headcount figures, the gap in average industry productivity per hour worked is less significant for most industries (*Figure 7*).

A study of labour productivity per worker in combination with average man-hours[10] reveals why a particular industry may boast higher productivity: whether it is longer hours or higher staff productivity per hour. Following a comparison of the indicators, we can split firms from different industries into four groups. Our distribution is accurate solely for the sample group, given its idiosyncratic features, however, the findings given below have been confirmed by economic developments underway during the period in question.

LABOUR PRODUCTIVITY PER WORKER AND LABOUR PRODUCTIVITY PER HOUR WORKED* (MILLION RUBLES) *Figure 7*



**Excluding outliers in textiles, wearing apparel and leather, wood, paper and printing, other non-metallic minerals, and motor vehicles.*

Source: firm-level survey.

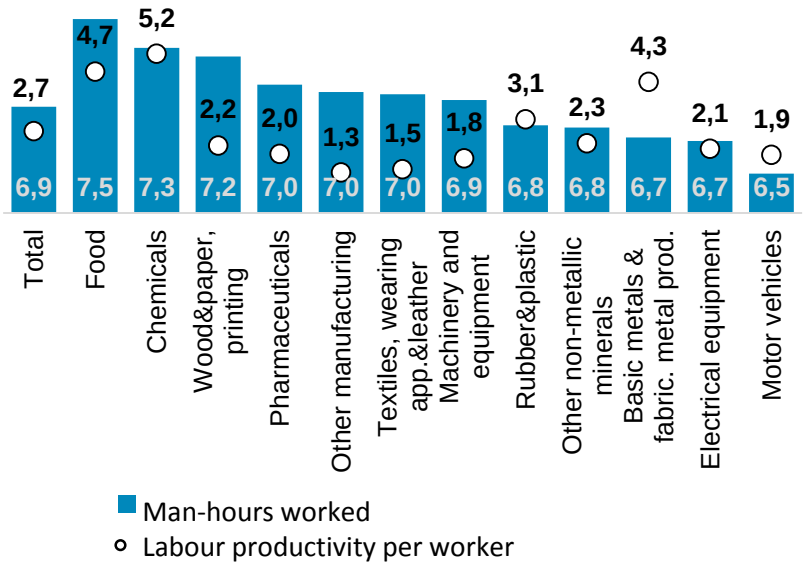
The first group features highly productive activities with high labour productivity (higher than the sample average of 2.7 million rubles) and relatively long hours worked per day (higher than the sample average of 6.9 man-hours). According to the survey, the group consists of the high-productivity industries of food and chemicals. There are clear reasons for this: the past years have seen these industries become the key drivers in the manufacturing sector due to import

[10] The average number of man-hours worked at firm i in year t is calculated as follows: $\text{Number of hours worked}_{it} = \frac{\text{Number of man-hours worked in year t, hours}_i}{\text{Average payroll number of workers in year t, persons}_i} / \text{Average number of working days in a year}$; where the average number of working days in a year is 247. The average industry number of man-hours worked is the arithmetic mean of the man-hours worked in the firms in that industry.

substitution and higher export potential in chemicals, while productivity growth has come as a result of vigorous investment since the early 2000s (*Figure 8*).

AVERARE LABOUR PRODUCTIVITY PER WORKER (MILLION RUBLES) AND AVERAGE MAN-HOURS BROKEN DOWN BY INDUSTRY

Figure 8



Source: firm-level survey.

The second group features industries demonstrating low labour productivity (lower than the sample average of 2.7 million rubles) despite a relatively high number of hours worked per day (higher than the sample average of 6.9 man-hours). As a rule, these firms face limited competition, operate under inefficient management, lack qualified, highly productive staff and/or operate with low capital-labour ratios. Given the sample parameters, these are textiles, wearing apparel and leather, pharmaceuticals, and wood, paper and printing, as well as other manufacturing. In 2016, these industries exhibited modest growth. In the case of textiles, wearing apparel and leather, and pharmaceuticals, this was driven by the partial substitution of imports, while in wood, paper and printing it was due to the higher export appeal of some types of manufactured products following considerable depreciation of the ruble. However, there is an extreme degree of heterogeneity within the industries. Investment focused on selected products which found space for growth both externally and domestically (non-wovens, major basic woodworking goods used in the production of end products).

The third group consists of industries with low labour productivity and relatively low hours worked. In this case, firms are likely to be struggling with orders. This might be due to temporary (cyclical output downturn) or permanent factors (structural shifts in demand, overall production inefficiency, etc.). According to the survey, these are firms in the fields of machinery and equipment and construction materials. Languid investment and consumer demand following the 2014 crisis cut output in these industries. Corresponding structural changes in the manufacturing sector were driven by lower investments in fixed assets in machinery and equipment and construction materials (down 21.6% and 29.7% in 2016 versus 2015, respectively[11]). The only two industries supported by state subsidies were agricultural equipment and railway trains.

[11] According to Rosstat data.

There is a separate group, which includes metals (including fabricated metal products) and rubber and plastic industries, where relatively high productivity per worker goes along with average man-hours lower than the sample average. This may be a sign of part-time employment in these industries. Due to unfavourable prices in the global market and shrinking domestic demand for metal products in 2015–2016, some metal plants witnessed part-time work weeks or idle capacity. This is corroborated by Rosstat data demonstrating growth in part-time workers in basic metals and fabricated metal products which was higher than the manufacturing sector average during that period.

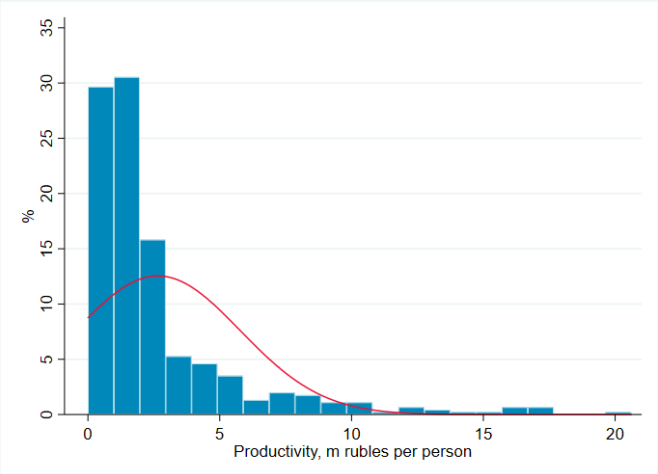
Thus, estimates of labour productivity dispersion may be affected by the method employed. However, man-hour reports are not always accurate and are susceptible to volatility in response to changes in the economic environment (due to higher or lower overtime). As part of this survey, firms reported production indicators for 2016, a year which saw an economic slowdown in some industries. This is why further analysis focuses on labour productivity estimates based on the average payroll number of workers.

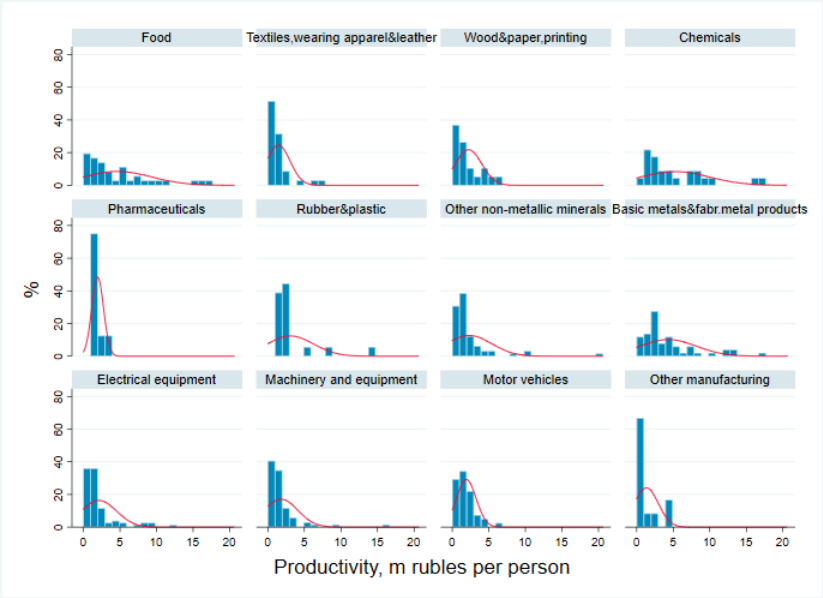
3. Labour productivity heterogeneity

As we mentioned in the previous chapter, the survey data reveal both intra- and inter-industry divergence in labour productivity levels among the sample firms. The distribution in productivity across the sample is characterised by rightward (positive) asymmetry, indicating an insignificant share of high-productivity firms (*Figure 9*). The leaders are more than ten times more productive than the majority of firms. The median productivity in the sample is 1.6 million rubles and the average is 2.7 million rubles per worker per year.

At the industry level, positive asymmetry of the distribution is typical of most activities (*Figure 9*). However, chemicals, food, basic metals and fabricated metal products display quite a broad divergence in productivity among firms, which is responsible for industry-level median values higher than the sample average (*Figure 10*). Other industries have a higher share of low-productivity firms. The median productivity value in these industries is lower (most of all, in textiles, wearing apparel and leather; electrical equipment; machinery and equipment; and construction materials), possibly due to the low capital-output ratio, human capital qualification and limited access to markets.

FIRM DISTRIBUTION BY LABOUR PRODUCTIVITY, 2016 (GENERALLY ACROSS THE SAMPLE AND BY INDIVIDUAL INDUSTRY) *Figure 9*

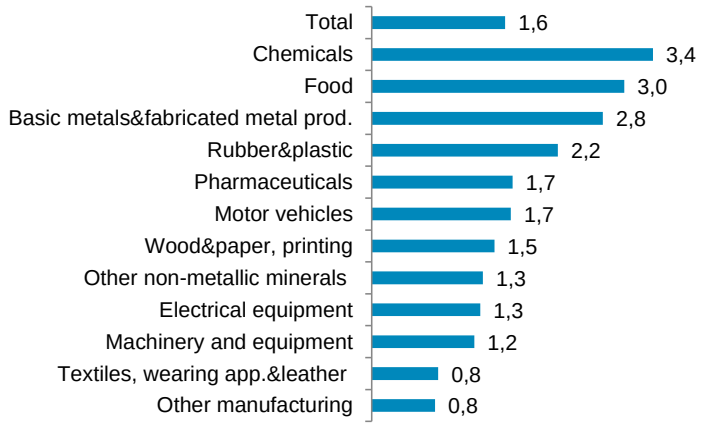




Source: firm-level survey.

MEDIAN LABOUR PRODUCTIVITY LEVEL PER WORKER FOR FIRMS FROM DIFFERENT INDUSTRIES (MILLION RUBLES)

Figure 10



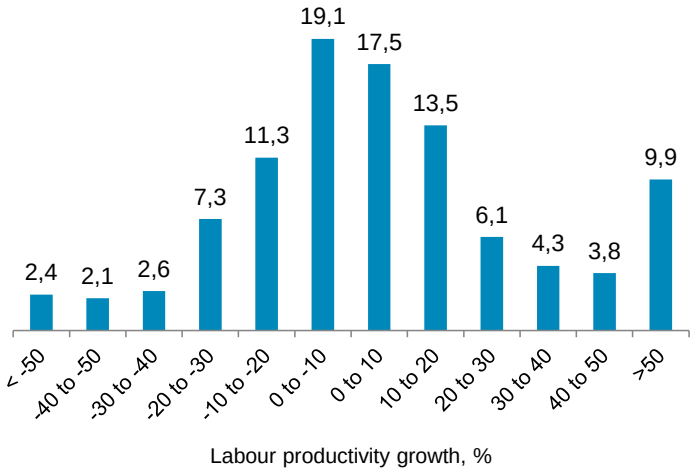
Source: firm-level survey.

The heterogeneity across firms has been fully reflected in the productivity growth figures (*Figure 11*).[12] Generally across the sample, about half of the respondents (55%) reported labour productivity growth between 2014 and 2016. The median growth figure was 3.4%, while the average was 8.6%. The 2014–2016 economic crisis had a varying impact on firms in our sample belonging to different industries. The most productive industries according to the survey, chemicals and food, (*Figure 10*) showed high productivity growth during that period (*Figure 12*). Firms in these industries capitalised on the significant depreciation of the ruble, which promoted the active substitution of imports in food (including due to counter-sanctions), and in the chemical industry stimulated new import substitution capacity in deep processing and higher exports. Manufacture of textiles, wearing apparel and leather, construction materials, machinery and equipment, and motor vehicles, which generally demonstrated low productivity in our sample, witnessed negative labour productivity growth.

[12] The calculation of labour productivity gain employs a deflator that reflects the inflation component of changes in a firm's revenue compared with the baseline period. The Producer Price Index for the corresponding industry was used as the deflator.

FIRM DISTRIBUTION BY PRODUCTIVITY GROWTH IN 2014–2016 (SHARE OF RESPONDENTS, %)

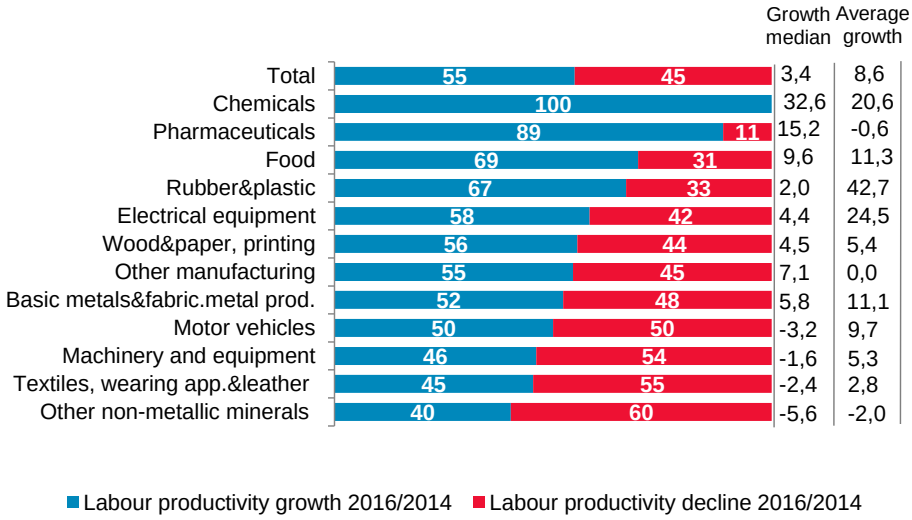
Figure 11



Source: firm-level survey.

FIRM DISTRIBUTION BY LABOUR PRODUCTIVITY GAIN IN 2014–2016 BY INDUSTRY (SHARE OF RESPONDENTS, %)

Figure 12



Source: firm-level survey.

Bessonova (2018) pins the source of the high heterogeneity across Russian firms in labour productivity levels and growth on the productivity gap between the most efficient firms and those trailing behind. The leaders win a significant share of the markets, and the share of output by low-productivity firms declines, however, they remain in the market, retaining labour and capital at inefficient production facilities. To find out whether these findings match the survey data, we select a group of the most productive firms for each activity where labour productivity falls into the upper decile of the industry-level distribution. Firms with a productivity level lower than the industry median will be classified as less productive. We emphasise that hereinafter we refer to relative productivity levels with regard to the idiosyncrasies of our sample.

According to the survey, the period in question (2014–2016) saw a widening of the gap between the leaders and the less productive firms. The most productive firms in the sample group increased their productivity by 15.6%, while firms lagging behind saw their productivity decrease by 8.9% (*Figure 13*).

A broadening gap between the most and the least productive groups was observed in almost all industries (*Figure 14*).

The biggest gap was seen in the highly productive industries of chemicals and food, due to the faster development of the most efficient firms amid more modest gains among low-productivity firms (catch-up development) (*Figure 13, Figure 14*). Based on the development model, this category may also include electrical equipment, where productivity gains were reported by both high and low productivity firms.

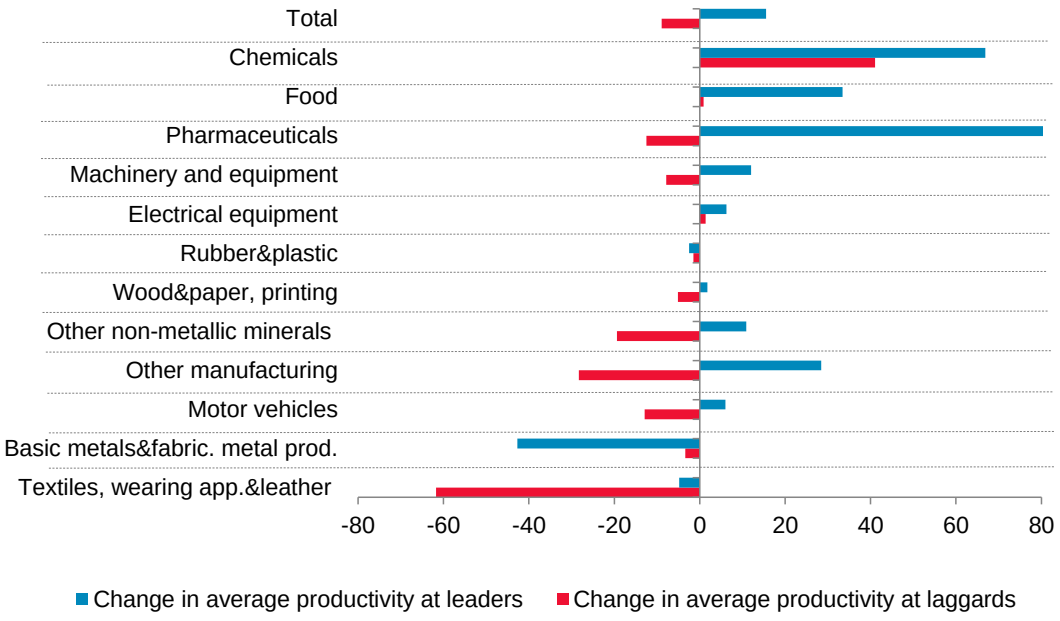
Faster growth in the case of highly productive firms was recorded in other industries, too: machinery and equipment, motor vehicles, construction materials, pharmaceuticals, other manufacturing, and wood, paper and printing. At the same time, however, lagging firms reported productivity declines, which resulted in a widening of the labour productivity gap between the two groups.

Other industries (basic metals and fabricated metal products, textiles, wearing apparel and leather, and rubber and plastic) witnessed a decline in productivity at both the sample leaders and laggards. In manufacture of basic metals and fabricated metal products experienced a slowdown in the initially productive firms due to unfavourable prices in 2016, as we mentioned earlier, and the use of part-time employment by many firms.

Thus, the survey evidence confirms earlier conclusions that progress in technology is driven by a small share of the most productive firms (Bessonova, 2018), while other firms demonstrate relatively low productivity growth, slowing down productivity gains at the industry level and in the economy as a whole.

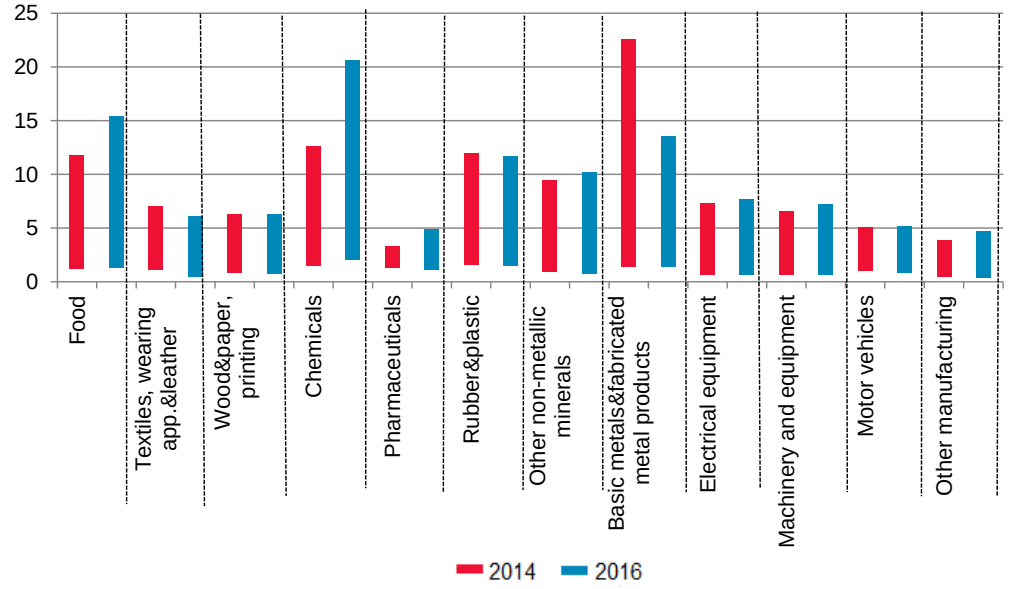
CHANGE IN AVERAGE LABOUR PRODUCTIVITY AS REPORTED BY THE MOST AND LEAST PRODUCTIVE FIRMS OF THE SAMPLE GROUP (2016/2014, %)

Figure 13



Source: firm-level survey.

LABOUR PRODUCTIVITY GAP BETWEEN THE MOST AND THE LEAST PRODUCTIVE FIRMS OF THE SAMPLE GROUP (MILLION RUBLES PER WORKER)* *Figure 14*



**The high is the average labour productivity level as reported by the most productive firms (top 10% of firms by productivity in 2016). The low is the average labour productivity level as reported by the least productive firms (firms with labour productivity lower than the industry median in 2016).*
Source: firm-level survey.

4. Heterogeneity factors

Prior research links high heterogeneity in productivity levels and growth rates with the prevalence of large firms among the most productive firms (Bessonova, 2018; Forlani, Martin, Mion, Muûls, 2016). As a rule, such firms have more opportunities to accumulate physical and human capital and intangible assets and to develop technology. A number of papers confirm that higher productivity is usually reported by firms that have access to foreign markets, since exporters prioritise investment in productivity gains to maintain their competitive edge abroad (Criscuolo, Martin, 2003; Forlani, Martin, Mion, Muûls, 2016).

The sample mainly focuses on firms that are classified as large firms (71%) under the criteria set by Russian law for small and medium-sized enterprises. Large firms are firms which have headcounts of more than 250 workers or revenues of more than two billion rubles. The remaining 29% fall into the small- and medium-sized categories. Despite this, the divergence in the sample in terms of headcount remains quite large. For instance, the group of large firms may be further divided with a subcategory of ‘major’ firms with staffs of 1,000 or more (24% of the sample). There is also massive differentiation in revenue among large firms, since a significant number of them record revenues at the level of small- and medium-sized enterprises. This is likely to be a sign of low efficiency in the financial performance of such firms.

The survey evidence confirms conclusions made by prior research: as a rule, larger firms and exporters show higher labour productivity and growth rates (compared to the average and median values) (*Figure 15*). For instance, the group of leaders (top 10% of the sample) is mainly dominated by major firms and firms with the highest headcounts, most of which have access to foreign markets (*Figure 16*). However, exporters and large firms are not always highly productive.

FIRM LABOUR PRODUCTIVITY LEVEL AND GROWTH BROKEN DOWN BY SIZE AND EXPORT CAPABILITY

Figure 15

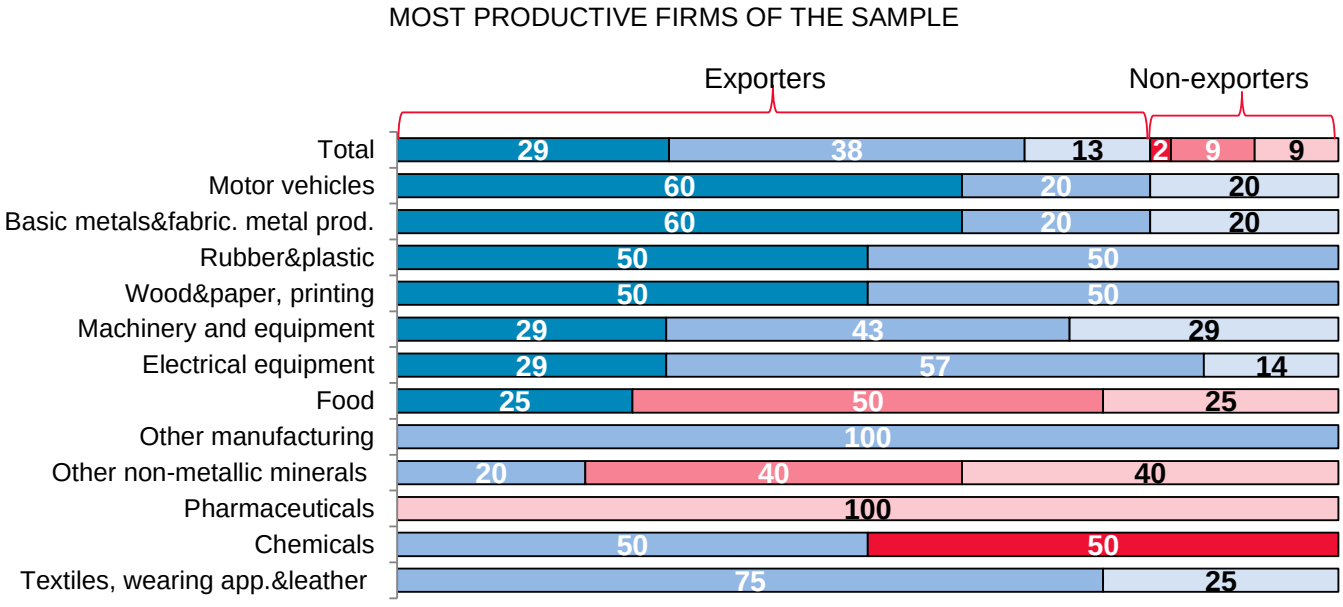
		Labour productivity, million rubles/worker		Productivity growth, %	
		average	median	average	median
Head-count	>250	2,9	1,8	9,5	5,2
	101-250	2,4	1,3	10,7	-0,1
	<100	1,8	1,3	0,7	-4,6
Revenue	> 2 bn rubles	5,3	3,7	16,5	9,2
	800-2,000 m rubles	2,8	1,8	14,5	3,4
	< 800 m rubles	1,2	0,9	2,0	-2,1
Headcount &revenue	Large	2,9	1,8	10,1	5,2
	Medium	2,3	1,2	7,9	-1,6
	Small	1,4	1,2	1,3	-4,1
Export capa-bility	Exporters	3,0	1,7	12,0	5,3
	Non-exporters	2,2	1,3	3,1	-0,5

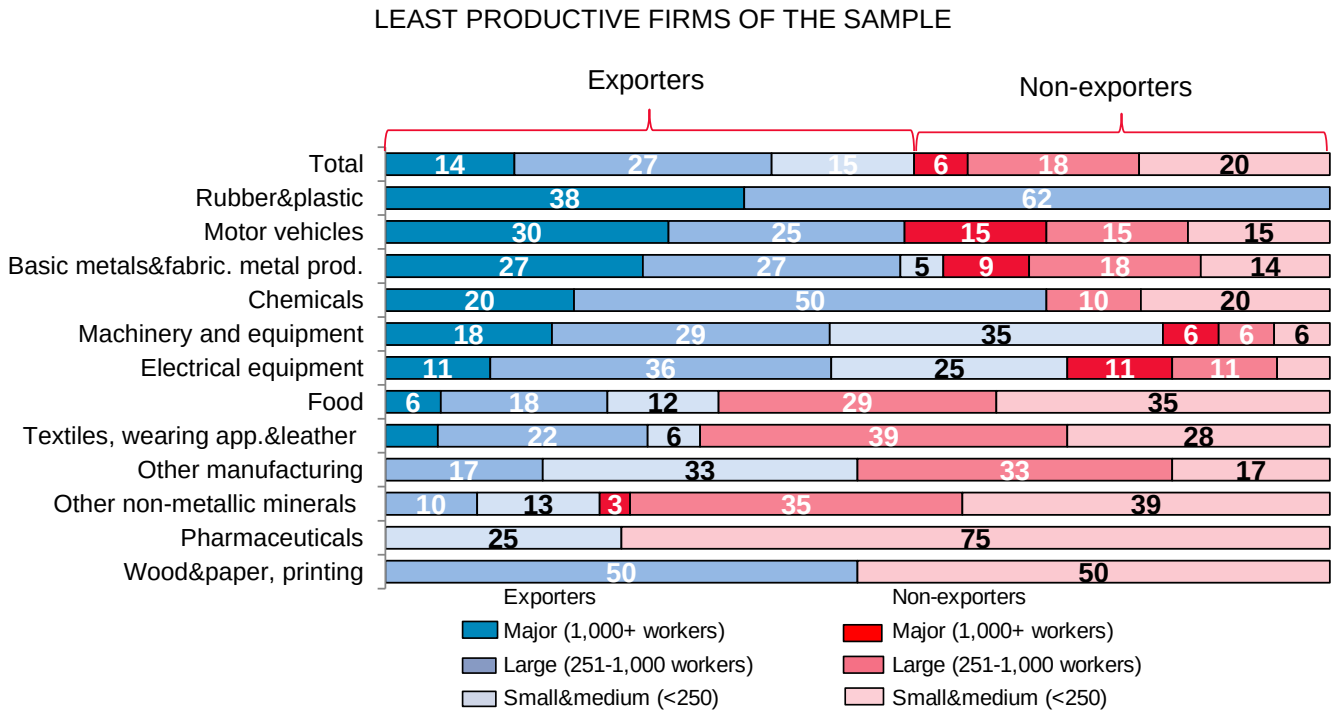
Source: firm-level survey.

For instance, major and large firms account for 78% of the leading group, and 80% of the leaders are exporters. One third of the firms are major industrial production companies with staffs of 1,000 or more. However, highly productive non-exporters also make up a large share of some industries. Most of all, this is true in the highly productive industries, chemicals and food, where growth in investment was reported even before 2014. Following the events of 2014, growth was supported through import substitution amid the depreciation of the ruble. Construction materials and pharmaceuticals may be regarded as exceptions to the pattern, with a high share of small- and medium-sized enterprises among the most productive firms.

MOST AND LEAST PRODUCTIVE FIRMS BROKEN DOWN BY HEADCOUNT AND EXPORT CAPABILITY (SHARE OF RESPONDENTS, %)

Figure 16





Source: firm-level survey.

There is a significantly higher share of non-exporters (66% vs 20%) and a lower share of major and large businesses (down to 65%) among the laggards (with labour productivity lower than the industry-specific median in our sample). However, some industries still report a relatively high share of major exporting firms (with staffs of 1,000 or more) (machinery and equipment, basic metals and fabricated metal products, and chemicals). This may be driven by the idiosyncrasies of the sample. Still, some firms in machinery and equipment and fabricated metal products receive state orders and export products as part of inter-governmental agreements and contracts (including as part of military and defence cooperation). Such producers face low competition both domestically and externally, which presents less incentive for further growth. Low-productivity businesses may also include important large local firms (in basic metals and fabricated metal products, chemicals, machinery and equipment) which would be heavily exposed to social risks in the case of mass layoffs, which limits their downsizing options.

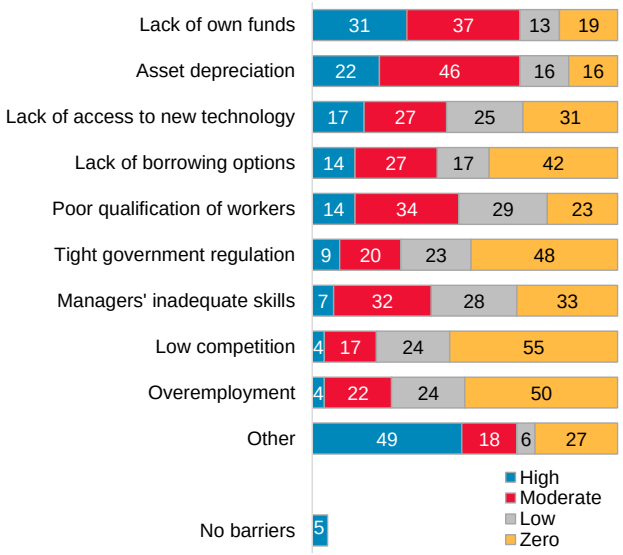
5. Labour productivity growth drivers

The respondents identified the key factors that slowed down labour productivity growth in 2014–2016: a lack of own funds for investment, asset depreciation, poor staff qualification and lack of access to new technology. The first two factors proved to be the most significant: 68% of the firms reported a strong or moderate impact from these factors (*Figure 17, Figure 18*). These issues are quite typical of all Russian firms. To a lesser extent, according to the survey, productivity growth is constrained by a deficit in managerial knowledge and skills, borrowing constraints, tight government regulation, overemployment compared with production needs, and low competition.

Furthermore, the firms identified a number of other important factors (*Figure 17, Figure 18)* that they believe undermine incentives to boost productivity. Firstly, the absence of markets limits prospects for output expansion. Demand for higher productivity is also stifled by a low capacity utilisation rate at some enterprises. Cumulatively, these factors have a bigger impact than any of

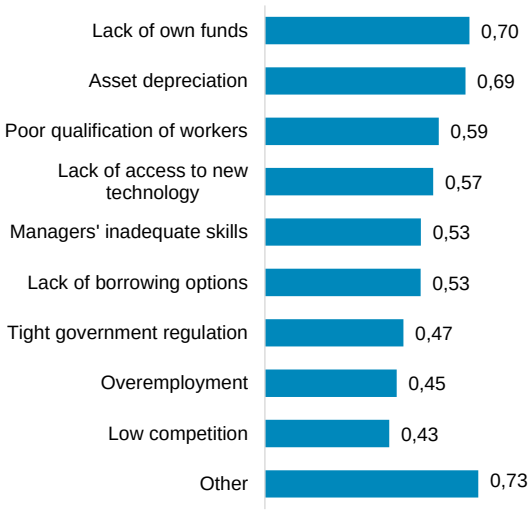
the individual factors listed earlier. Therefore, new markets, both domestic and foreign, are key to boosting labour productivity. In their turn, new markets stimulate investment in new capacity.

IMPACT OF BARRIERS TO LABOUR PRODUCTIVITY GROWTH (SHARE OF RESPONDENTS, %) *Figure 17*



Source: firm-level survey.

BARRIERS TO LABOUR PRODUCTIVITY GROWTH (RII)[13] *Figure 18*



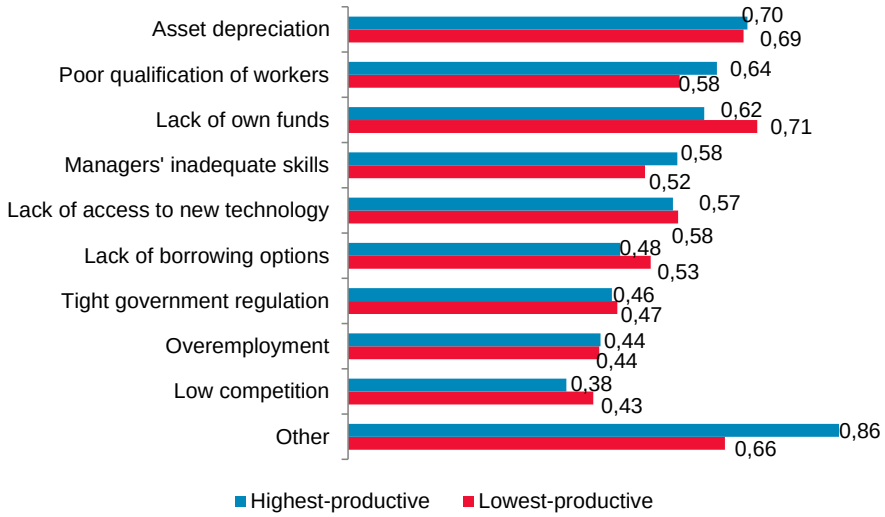
Sources: firm-level survey, authors' estimates.

The firms that we classify as productivity leaders and laggards within the sample vary in their assessment of labour productivity barriers. While highly productive firms see the high level of depreciation of their production facilities as the key barrier that limits their competitiveness, less productive firms link low productivity to a lack of financial opportunities, most of all own funds, which limit investment in higher production efficiency (*Figure 19*). Productivity leaders rank this factor as third in importance, following asset depreciation and low staff qualification. In essence, depreciation of fixed assets is a reduction in the value of the means of labour due to progress in research and technology. The inadequate level of state-of-the-art capacity may be driven by limited access to new cutting-edge equipment. This may be due to a lack of the appropriate equipment available domestically or to reasons that make it impossible to purchase it abroad.

Also, the more productive firms, compared with the rest of the sample, voice bigger concerns over inadequate staff qualification and managerial skills, while the laggards are less aware of the advantages of top-quality human capital.

[13] The Relative Importance Index (RII) is calculated as follows: $RII = \frac{4*w_s+3*w_m+2*w_w+1*w_n}{4*\sum_i w_i}$, where w_s is the share of firms which reported it as a strong factor, w_m is the share reporting moderate impact, w_w the share reporting weak impact, and w_n the share reporting no impact.

LABOUR PRODUCTIVITY BARRIERS FOR HIGHLY PRODUCTIVE AND LESS PRODUCTIVE FIRMS (RII) *Figure 19*



Sources: firm-level survey, authors' estimates.

In an effort to boost labour productivity, firms employed a variety of methods that sought to intensify the utilisation of fixed assets as well as to make more efficient use of human capital. However, it is important to remember that the survey relied on firm-level data for 2014–2016, when slower economic growth may have affected the intensity of measures to increase labour productivity.

According to the survey, high wear-and-tear of fixed assets forced the firms to give priority to upgrades of production facilities as a way to ramp up productivity in the preceding years (54% of respondents) (*Figure 20*).

Staff downsizing was the second most popular measure (46% of the respondents). Redundancies were one of the main ways to cut production costs to raise the return on business processes. The share of firms that launched layoffs was quite high in almost all industries (at least 40%).

Only 36% of the respondents pointed out the need to improve staff qualification. Russian firms have made insufficient investment in human capital so far, more often opting for redundancies, i.e. changing staff quantity rather than quality.

New capacity and technology were introduced by as few as 35% and 30% of the firms respectively. Promoting innovations as well as expanding production may result in losses if the extra products do not match expected demand. That is why these steps are taken by bigger firms that usually have well-designed business strategies and guarantees that they will be financially sustainable.

About 28% of the respondents cut indirect costs to increase labour productivity. Some firms said they raised pay to incentivise higher labour productivity (20%).

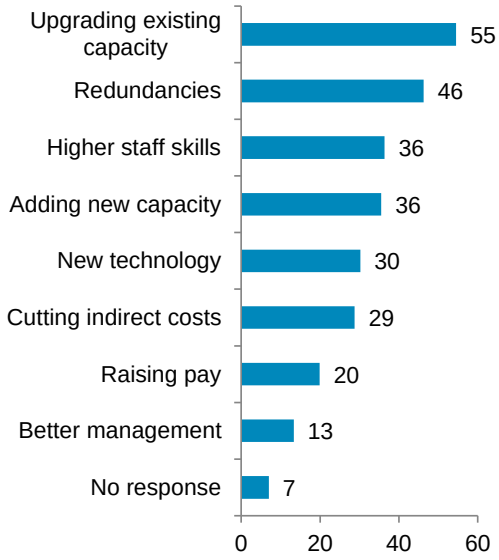
Only 13% of the firms were able to make their management more efficient. The firms do not seem to appreciate the importance of streamlining business processes to increase the efficiency of labour management.

In terms of the next steps to be taken to boost labour productivity, the responses reveal roughly the same list of efforts, with the same priorities (*Figure 21*). One exception is that firms would put a stronger focus on expansion investments (adding new capacity), rather than investing in the

maintenance and upgrade of existing facilities, which was the case until recently. Unlike the previous activities to increase productivity, the firms plan to give higher priority to new technology and management efficiency going forward. The share of firms which report these plans is higher than that of those which took such action in the past.

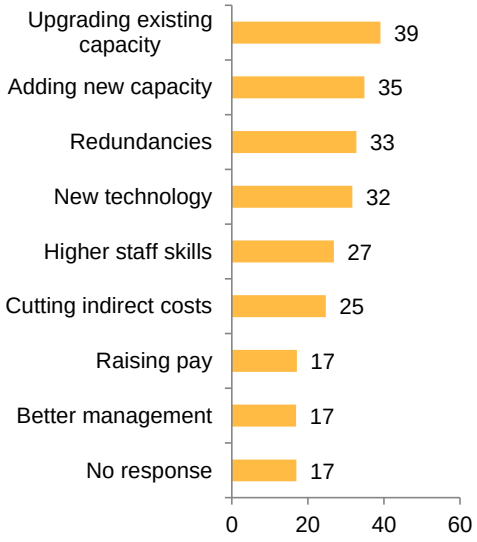
17% of the firms provided no answer about plans to boost the efficiency of labour utilisation. It is likely that such firms lack a deep understanding of the issue and solutions, and, correspondingly, incentives to boost productivity.

PRIOR ACTION TO INCREASE LABOUR PRODUCTIVITY (SHARE OF RESPONDENTS, %) *Figure 20*



Source: firm-level survey.

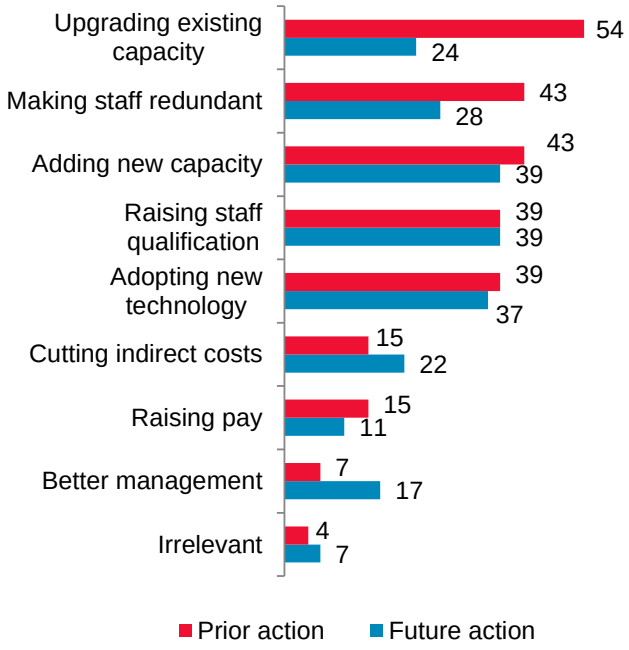
FUTURE ACTION TO INCREASE LABOUR PRODUCTIVITY (SHARE OF RESPONDENTS, %) *Figure 21*



Source: firm-level survey.

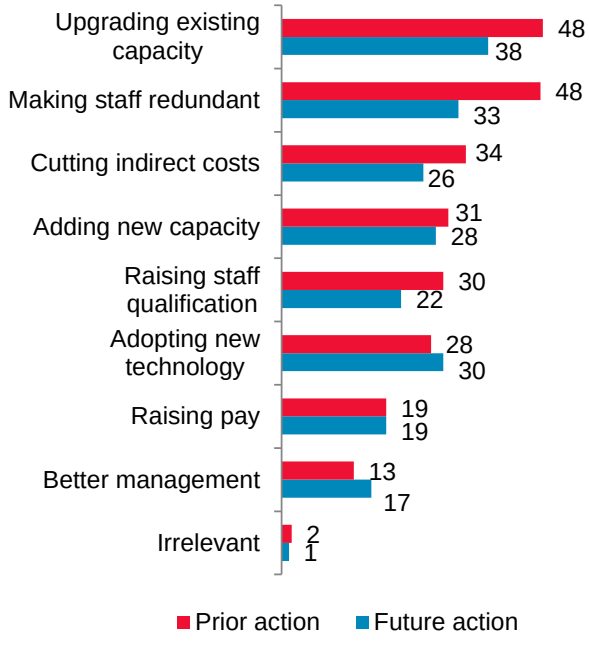
The most and least productive firms in the sample pursue somewhat different policies to raise productivity. The leaders are beginning to give primary consideration to enhancing human capital, installing new capacity, and adopting new technology, and they understand the need to revamp management processes in order to stimulate productivity (*Figure 22*). Upgrading existing capacity and staff downsizing are no longer as relevant as they used to be. Less productive firms, unlike productivity leaders, are more concerned with the need to cut indirect costs that are not immediately related to production and possibly driven by government overregulation of the business and production processes (*Figure 23*). Faced with a group-specific lack of financing, which undercuts investment, these firms will continue to rely on upgrading fixed assets and downsizing their staffs as the key avenues toward improving labour productivity.

PRIOR AND FUTURE ACTION TO INCREASE LABOUR PRODUCTIVITY: MOST PRODUCTIVE FIRMS (SHARE OF RESPONDENTS, %) *Figure 22*



Source: firm-level survey.

PRIOR AND FUTURE ACTION TO INCREASE LABOUR PRODUCTIVITY: LEAST PRODUCTIVE FIRMS (SHARE OF RESPONDENTS, %) *Figure 23*

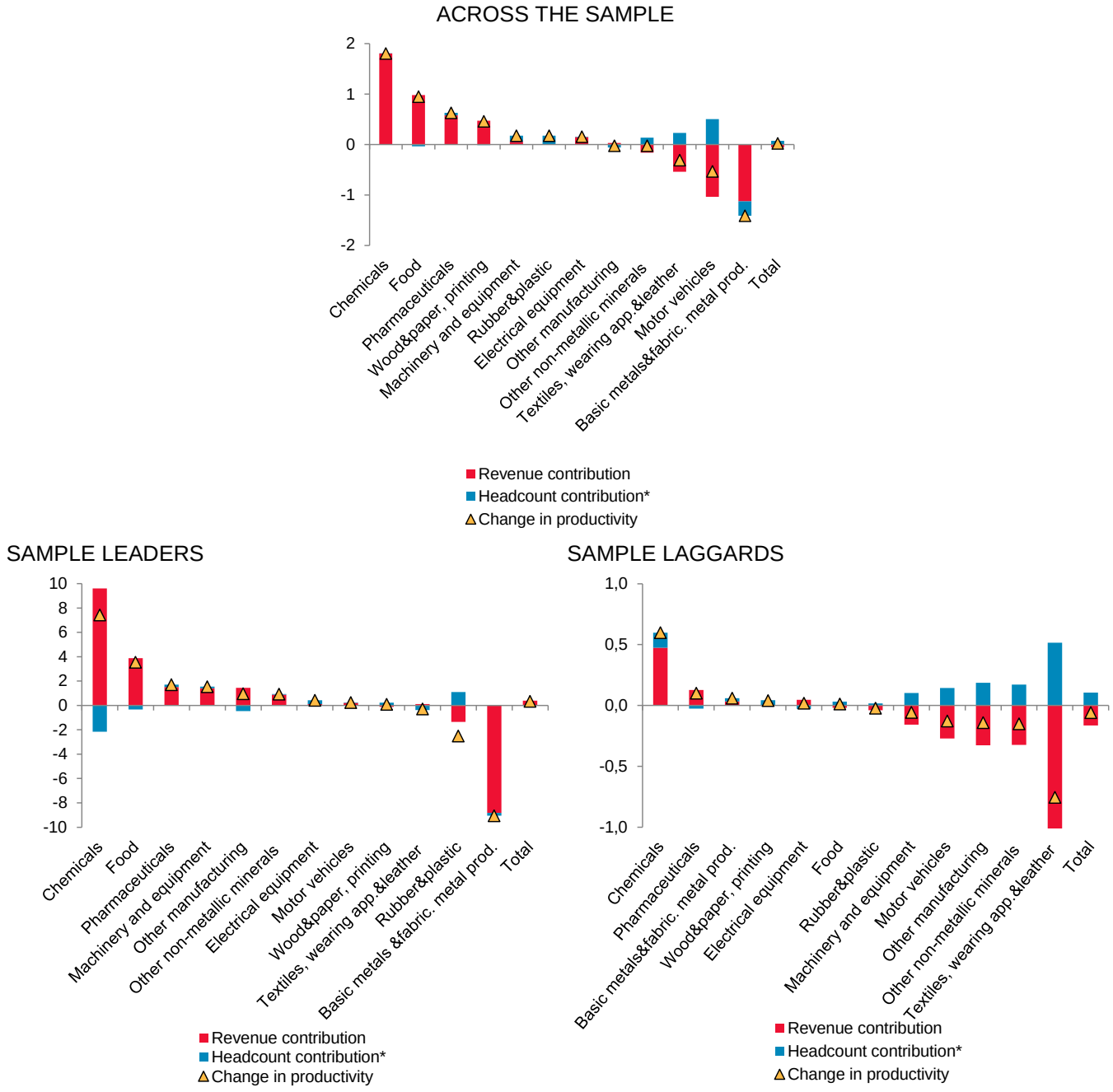


Source: firm-level survey.

According to prior research, real wage elasticity to unemployment in Russia is significantly higher than in most developed and emerging economies, including transition countries (Gurvich, Vakulenko, 2016). In 2014–2016, the Russian labour market adapted to the crisis largely through price adjustment, i.e. lower real pay, and, to a lesser extent, through lower payroll (Kapelyushnikov, 2017). As our survey indicates, highly productive and less productive firms used different methods to adjust to the crisis.

During that period, highly productive firms displayed stable output despite falling aggregate demand for manufacturing products (except for basic metals and fabricated metal products, which faced unfavourable global market conditions). Higher output by such companies was largely supported by flat headcounts (and in some cases marginal growth), contributing to positive labour productivity growth (*Figure 24*). It was technology and organisational improvements in business processes that made the key contribution to raising productivity.

FACTOR CONTRIBUTION IN RAISING LABOUR PRODUCTIVITY IN 2014-2016 (MILLION RUBLES) *Figure 24*



** Higher headcounts have a negative effect on productivity.*
Source: firm-level survey.

As a rule, industrial firms with relatively low productivity reported flat or lower output during the 2014–2016 recession. They adjusted to the crisis through layoffs. However, some producers retained their staffs or made them redundant less intensively than the output decline required, which prompted an even bigger drop in labour productivity at those firms and preserved less productive employment (*Figure 24*).

Re-allocation of the workforce between firms or industries with varying productivity levels has an impact on aggregate productivity growth in the economy as a whole (McMillan, Rodrik, 2011; Barnett et al., 2014; Voskoboynikov, Gimpelson, 2015). Labour re-allocation from low- to high-productivity firms, particularly in cases of labour shortage, may have provided the key impetus for long-term productivity growth (Harris and Moffat, 2013; Disney, 2003). By mid-2019,

unemployment in Russia hit a new historical low (4.4%) amid a shrinking labour force. The situation in the labour market stifles plans for the expansion of production, with downside risks to further growth in the economy and inflation. Tighter competition in the economy, along with the exit of low-productivity firms, will stimulate aggregate productivity growth. Faster access to foreign markets is another avenue for raising labour productivity and investment in the economy.

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Annex

Firm-level survey questionnaire:

1. Please specify your activity type using the codes of the Russian Classification of Economic Activities (OKVED2)
2. Please specify the current number of workers.
3. Please specify your ownership type.

(Options: 1) 100% state-run and/or municipal; 2) 100% private (no government stake); 3) mixed Russian ownership (private + state/municipal); 4) mixed Russian and foreign ownership or 100% foreign ownership; 5) other).

4. Please specify the firm's 2016 gross revenue (in million rubles).
5. Please specify the average payroll number of workers in 2016 (excluding double jobbers and non-payroll number of workers) (persons).
6. Please specify the number of man-hours worked by payroll workers in 2016.
7. Please specify changes (between 2014 and 2016) (in %) in the following performance indicators in the past three years: 1) gross revenue; 2) average payroll number of workers; 3) average annual hours worked.

(Options: up ___%, no change, down ___%).

8. Please specify the negative impact of the following factors on labour productivity growth: 1) lack of borrowing options for investment; 2) lack of own funds for investment; 3) managers' inadequate knowledge and skill level; 4) poor qualification of specialists and workers; 5) asset depreciation, low capital-labour ratio; 6) lack of access to new technology; 7) overemployment compared with production needs; 8) tight government regulation; 9) low competition; 10) other; 11) no barriers.

(Options: high\moderate\low\zero).

9. Please specify the three most effective measures to raise labour productivity in 2014–2016 and going forward.

(*Options: 1) upgrading existing capacity; 2) adding new capacity; 3) adopting new technology; 4) raising staff qualification; 5) making staff redundant; 6) raising pay; 7) making management more efficient; 8) cutting indirect costs; 9) other; 10) productivity growth is not relevant)*.

10. Please give a rough estimate of sales broken down by geography in 2016.

(Options: 1) Russian market ___%; 2) EEU ___%, 3) all other countries___%).

11. Please specify the markets the firm expects to supply its products to in 2017.

(Options: 1) Russian market; 2) EEU; 3) other markets).