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### **Widening Productivity Gap in the Russian Economy: Firm-Level Analysis**

We study TFP growth in Russia in 2009-2015 using firm-level data. We use stochastic frontier analysis to estimate TFP growth rates and the distance to the production possibility frontier for each firm in the sample. Stochastic production functions were estimated separately for 282 industries, mainly for three- or four-digit industries in NACE 1.1 classification.

We decomposed TFP growth rates into the rate of technological change, change in technological efficiency and the return to scale term. We observe quite a significant rate of technological progress which kept rising over the period of observation, from 3% to 9% annually on average. At the same time, the average efficiency level has been falling permanently at a rate of about 12% over the post-crisis period.

The results obtained suggest that the crisis took a heavier toll on the laggards. We observe a significant productivity decline in the first three years after the crisis for less efficient firms, with the TFP fall continuing in this group until the end of the period, although slowing slightly. The leaders also show a downward productivity trend in 2009–2010 but the decline was not as dramatic, with productivity levels remaining stable since 2011 for this group.

The diffusion of new technologies from national leaders to less efficient enterprises is very limited and the productivity gap between leaders and laggards have kept widening over the post-crisis period mainly owing to declining productivity at less efficient firms. The most efficient enterprises have gradually increased their market shares, but inefficient enterprises do not leave the market.

In addition, we split our sample into three groups which reflect different degrees of involvement in the production and use of information and communication technologies (ICT). The highest TFP growth rates are observed at firms which are themselves engaged in the production of ICT. The crisis did not affect firms in this group, which showed increasing annual growth rates in 2009–2015. By contrast, we observe slowed TFP growth in the ICT-using sector and a fairly moderate upward catching-up trend in non-ICT intensive sectors in the post-crisis period.

Survival analysis shows that the conditional probabilities of exit are substantially lower for less efficient firms if we control for the size and industry dummies, with this effect holding on different subsamples. In manufacturing and in industries which do not extensively use new technologies the conditional probabilities of exit for leaders are also lower than for catching up firms. Nevertheless in these sectors the conditional probabilities of exit for less efficient firms remain lower than for leaders. Only in ICT-producing industries the exit rates are do not depend on firms' efficiency levels.

The high survival rates of inefficient firms in Russian economy could have different

explanations: separation of the regional product markets, specifics of the Russian labor market, government (local, regional or federal) support. In this study we test the hypothesis that support from the authorities could help an inefficient firm to survive. To test this hypothesis we combine our dataset with the BEEPS data. In Russia, the last round of this survey was conducted in 2011, which allows us to check if winning a government contract helps inefficient firms survive in subsequent years.

For more efficient firms (leaders and catching-up firms), we do not find statistically significant difference in the probability of exit in relation to winning a government contract. At the same time, in the group of laggards the probability of exit from the market is lower for the firms which were awarded a government contract. There could be two explanations why getting financing from the state contract support inefficient firms in the market. On one hand, laggard firms could be affiliated with authorities and state contract shelters this companies from competition. On the other hand, local and regional governments could try to replace social policy with support for laggard firms to avoid high unemployment in the region. In either case, additional government support reduces incentives for inefficient firms to innovate to win competition with more efficient market players and preserve the status quo with a high share of inefficient companies in the economy.

Our results reveal that the productivity gap between technology leaders and laggard firms accumulated over the observed period. Technology diffusion from leaders to less efficient firms in Russia stays rather limited resulting in relatively low average TFP growth. The market share of less efficient firms shrinks over time but they do not exit the market. As a result, the scarce resources stay locked in inefficient production.