

**Direct investment and costs of production: empirical results of modeling costs structure applied to Russian industry in 2005-2009**

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In the applied theory of exogenous or endogenous economic growth it is usually assumed that investment leads to capital accumulation with no influence on technological progress. On the other hand, at the firm level investment is aimed at developing innovative technologies (process innovations) which lower firms' production costs per unit of output. However, when a firm decides to make an investment it may consider other reasons besides improving production process. Firms may also invest in expanding the range of goods produced, i.e. invest in product innovations associated with the extensive growth. The question arises: Do investments matter?

In our study we analyze the relationship between investment processes and the dynamics of production costs. We discuss the influence of different types of investment, including fixed investment, R&D investment, and foreign direct investment, on the structure of costs (material costs, fuel and energy consumption, and wages). The aim we pursued was to find out whether higher investments lower costs of production per unit of output controlling for the dynamics of relative prices. If our hypothesis of investment significance for production process and technological progress is not rejected, it means investments are efficient.

We base our study on the official statistics on seventeen key industries in Russian mining and manufacturing sectors, electricity, gas, and water supply sector. The data is taken from the Federal State Statistics Service (Rosstat), and it covers the period from 1<sup>st</sup> quarter of 2005 to 2<sup>nd</sup> quarter of 2009. Until 2005 Russian industrial statistics were based on the OKONKh industrial classification. Starting from 2005 the OKVED classification (harmonized with NACE European Classification of economic activities) has been introduced. Unfortunately, the continuity of official industrial statistics failed after 2004. We discuss a possible way of recalculating industrial time series in 1995-2004 retrospectively using tables of correspondence; however, the results do not seem to be very fruitful.

So econometric modeling encounters serious limitations due to the small sample problem. Our previous empirical results suggest that there is the statistically significant relationship in several manufacturing industries. To verify our hypothesis of investment efficiency we assume that the long-run equilibrium found 1995-2004 remains unchanged after 2005, as it takes time to develop and use innovative technologies which lower production costs. We test for cointegration between costs per unit of output and investment, taking into account the possibility of structural breaks in the data which covers the beginning of the current crisis. Bootstrap approach is used to make inference on the parameter estimates. Our results suggest that the effect of investment on costs varies across the industries, and the overall efficiency of investment can be seriously questioned. No investment efficiency found in mining sector which accounts for more than a half of total investment in Russian industry.

*Keywords:* costs per unit of output, technological progress, direct investment, Russian industry, cointegration, structural breaks, bootstrap