

## **R&D and performance in agricultural sector.**

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### **Short version**

Many researchers agree that productivity varies more in agricultural sector than in other economic sectors across different countries (Lagakos and Waugh 2013; Gollin et al. 2014). Partially it can be explained by inefficiencies in agricultural sectors of developing countries (Restuccia et al. 2008; Alvarez-Cuadrado and Poschke 2011). Another reason is that for the last several decades technological trends have a huge impact on agricultural productivity all over the world and the R&D policy is beginning to play an important role in the agricultural sector's development (Piesse and Thirtle, 2010, Zouaghi and Sánchez, 2016.).

There is an extensive literature trying to find relationship between R&D, economic growth and productivity (Alston et al., 2009, Cirera et al., 2015, Gormley, 2016). According to many authors the impact of R&D expenditure on productivity could be nonlinear (Heisey et al. 2011; Huffman and Evenson, 2006). Some researches indicate that technology impact may be negative for agricultural production in certain countries (Matulov and Cechura 2016).

Differences in R&D performance across countries can be explained by specifics of scientific landscape. One of the main characteristics of scientific landscape is degree of specialization in certain research areas. Some authors suggest that specialization may play an important role in research, innovation and economic performance (Urraca-Ruiz and Laguna-Molina, 2016, De Lucio et al., 2002). But industry convergence which is often closely related to convergence in research areas forces researches to increase the level of specialization of their studies for better performance (Yegros-Yegros et al., 2015, Saracco et al., 2015, Caviggioli, 2016) and hence decrease the reverse parameter - level of research specialization for countries.

Close relationship between agricultural segments in value chains, new industrial technologies applied in agriculture across segments, convergence of food production and pharmaceutical industry are few of many reasons to diversify agricultural research for countries despite historically and geographically determined specialization (Abramo, 2015, Sanyang, 2016, Hansson et al, 2013). The emerging trend toward open innovation in agriculture is also playing an important role in R&D landscape (Sarkar and Costa, 2008, Bigliardi and Galati, 2013, Hossain, 2015, Saguy and Sirotinskaya, 2014). Collaboration between research centers, diversified firms as well as wide scope of agricultural SMEs, farmers in domestic and international markets lay down perfect foundation for global diversification as well as local specialization of agricultural production (Wood et al., 2014, Hua, 2015).

Approaches to R&D policy differ from country to country which may establish different patterns for productivity growth (Payumo and Sutton, 2015). Chen et al. (2015) discovered that technological specialization across industries in terms of R&D expenditures positively affect economic performance of different countries. But they stressed out that the performance might depend on the country level of R&D intensity. Impact of R&D specialization on productivity is very controversial according to researches. Our study focuses on agricultural sector to evaluate research diversification on productivity in the context of government's expenditures on science. 75 countries with different economics including Russian were analysed by their R&D expenditures on agricultural science in comparison with scientific diversification.

Countries with very diversified research areas accompanied with relatively low R&D expenditure were shown to exhibit not only lower productivity growth but slow technology

development in agricultural sector as well. The study results suggest that there is a certain threshold below which R&D expenditure may not have any perceptible impact on productivity.

Research policy and strategic planning play a key role in agriculture development according to many researches including Öborn et al. (2013), Greiner et al. (2014). In Russian agriculture we witness strong dependence on import technologies, low R&D expenditures and very diversified research objectives. Agriculture R&D in Russia should be much more focused and specialized. There is no point in supporting existing research centers. Probably GERD should be directed to fewer areas (e.g. biotechnology). For example in Israel the optimal balance between research specialization and diversification accompanied with relatively high R&D funding resulted in very high productivity in agriculture.

In this paper we study this hypothesis by looking at impact of specialization in agricultural science on productivity and compare different countries by the level of R&D expenditures. Taking a closer look at Russian agriculture sector we analyze trade data to estimate the level of dependency on foreign technologies. We discuss R&D policy implications and come to final conclusions. We believe that there is a threshold below which R&D funding of agricultural segment has no effect on productivity. We may also conclude that high-quality research in agricultural science stimulate the development of agricultural sector. We think that recent developments in agricultural science could provide much better future performance of Russian agriculture.