

The impact of technological innovation on the foreign trade of industrial companies from developing countries

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Annotation. This article describes and with the help of collected data from export firms from Russia empirically grounded J-shaped relationship between investment in technological innovation and successful implementation of the strategy on the external markets of industrial companies in developing countries: the more significant investments of industrial enterprises in technological innovation, the higher the efficiency of their activities on foreign markets (volumes of non-resource exports).

Keywords: foreign trade activity, technological innovations, Russian industrial companies.

Влияние технологических инноваций на внешнеторговую деятельность промышленных компаний из развивающихся стран

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Аннотация. В данной статье рассмотрена и с помощью обследования данных от экспортных фирм из России эмпирически обоснована J-образная связь между вложениями в технологические инновации и успешностью реализации стратегии на внешних рынках промышленных компаний из развивающихся стран: чем больше вложения промышленных компаний в технологические инновации, тем выше результативность их деятельности на внешних рынках (объемы несырьевого экспорта).

Ключевые слова: внешнеторговая деятельность, технологические инновации, российские промышленные компании.

The entry of companies into foreign markets in the modern global economy is rightfully considered an essential condition for successful business growth and development. Internationalization allows companies to diversify their activities, expand their geographical presence, gain access to the resources of other countries, commercialize innovations, and increase their performance and competitiveness in the domestic market. In the wake of an extraordinary increase in access to information and new markets in recent years (primarily due to advances in information technology and globalization), firms in developing countries are experiencing a continually changing landscape in the market for their products [22]. On the one hand is providing much-needed knowledge flows into developing economies, while also forcing firms to improve their competitiveness on the other. In such a situation, one would expect firms (especially those which export) to invest in new technology and introduce new and improved products in their markets. However, our understanding of innovation and its economic impact is still limited when it comes to developing countries; most mainstream economists tend to assume that openness and easy access to foreign technology is all that matters in improving firms' productivity in the context of developing countries [7].

Until recently, firms based in developing countries did not pay much attention to innovation and internationalization, mainly for historical reasons and political events. Moreover, “internationalization, similar to innovation, has long been ignored by emerging market firms, and although scientists have studied the implications of the internationalization of emerging market firms, we do not have an adequate understanding of what makes emerging market firms internationalize” [18: p.301].

The relationship between innovation and internationalization has been widely studied from the perspective of developed economies. According to the resource approach, innovation can be considered a strategic resource [19], which allows firms to enter international markets and achieve a competitive advantage by offering customers solutions with added and new sources of value compared to competitors. Given that internationalization intensifies the pressure of competition on firms, and as

the pool of firms competing for the same domestic customers grows, innovation should ultimately help increase international expansion.

From a theoretical point of view, the assumption prevails that innovation directly affects the likelihood that a firm will start export operations [5]. Indeed, through internationalization, innovative firms can take advantage of the competitive advantages gained in domestic markets in more markets [12]. At later stages, the linearity of these relationships becomes more blurred, and, according to many, the relationship between innovation and international expansion becomes reciprocal [6]. For example, based on the prospect of export-based training, firms expanding in foreign markets may collect additional knowledge to help them create more innovative products [13]. In addition, internationalized firms can gain access to additional resources related to innovation, such as qualified researchers, developers, and technology, using their competitive strategies [12].

Empirical studies confirm the existence of a positive and linear effect of the innovative capabilities of the company on its international expansion [5]. Some studies suggest that this relationship may also be influenced by the industry context due to the different levels of dynamism that characterize different sectors [10] or because of the target market context [4]. However, it remains unclear whether this relationship has the same form both for firms entering the international market from developing countries and for firms from developed countries.

Other recent empirical studies [2; 8] show that developing multinational corporations have begun expansion in the following areas:

- growth primarily due to exports to developed countries, gaining knowledge through partnerships with transnational corporations from developed countries;
- imitation of business models of companies from developed countries, the implementation of mergers and acquisitions within the home region;
- investment in other developing countries.

That is, companies from emerging economies begin the process of internationalization to collect resources or critical knowledge, which may be

technological know-how, human resources, managerial skills, global brands or R&D capabilities [21].

Companies with high R&D costs enter their domestic and international markets almost simultaneously, with foreign affiliates not perceived as simple additions to the domestic market, but rather as an essential component of a global presence [20]. Companies with a low level of R&D, as a rule, primarily focus on their domestic market, while striving to begin internationalization from neighbouring countries with a low level of cultural distances.

The main purpose of this paper is to contribute to the thin developing country literature by using firm level data from a key export oriented manufacturing sector in Russia.

We assume that, compared to companies located in more developed markets, companies entering the international market from emerging markets face additional challenges and limitations.

Firstly, they are usually smaller, which means they can use fewer resources and opportunities compared to firms in developed markets. Before developing specific strategic opportunities that will enable them to achieve a sustainable competitive advantage abroad, many of these companies must develop high threshold strategic abilities that they lack to achieve parity with existing participants already competing in this market [17].

Secondly, international expansion is a gradual process, which is based on the previous accumulation of market knowledge and organizational experience, which many companies from developing countries do not have (for historical, political reasons, etc.). [11]. Therefore, these companies have to overcome the «burden of backwardness», which makes achieving the goals of their internationalization even more difficult.

This reasoning leads us to argue that the traditional arguments used to support the relationship between innovation and internationalization may need to be adapted to the case of firms from developing regions. In particular, with a low level of innovation, firms show a limited inclination and ability to expand abroad. Indeed, a certain level

of international expansion can be achieved with low levels of innovation; for example, firms can receive unsolicited orders from foreign buyers because of their competitiveness in cost.

Alternatively, firms could benefit from a strategic partnership with a more developed foreign company by gaining experience [1].

Hatzikian [9] argues that linear relationships may not adequately describe performance implications. Exploring the non-linear relationship between innovation and firms' performance in Greek firms, he found that innovation intensity follows a U-shaped curve depending on the firm's productivity. The generalized results show that in the early stages of participation in innovative activities, the effectiveness of the company is negative. Over time, firms learn to manage and develop their innovative activities and achieve superior results. Márquez-Ramos-Zarzoso and Martínez [14] also investigated the impact of technological innovation on international indicators, and the results show that technological innovations have a positive and non-linear effect on export performance.

However, we assume that an industrial company with a low level of innovation will generally be more reactive than proactive towards internationalization. Therefore, we expect that a low level of innovation in the company will correspond to a low level of internationalization.

Companies from developing countries that are actively investing in the development of their innovative abilities have to put in more effort and time than firms based in more developed markets to achieve significant results in international expansion.

This difference is the result of the time and investment needed to bridge the gap associated with the previously described alien burden and underdevelopment.

Thus, we expect that industrial companies from developing countries with a medium level of innovation will not be able to transfer their nascent innovative abilities to foreign markets, which will lead to limited results in international expansion.

Besides, we expect industrial companies with a higher level of innovation to have a greater likelihood of achieving positive results in international expansion, as

these firms take advantage of the advantageous combination of their innovative capabilities and the advantages associated with their access to low-cost resources and opportunities for their domestic markets.

H1: There is a J-shaped connection between technological innovation and the level of international activity of industrial companies from developing countries.

We have collected data from industrial export companies from Russia. Our study was based on one key export informant in a firm, and not on several informants from each firm. Email invitations were sent from the university's email address to the leading decision-maker on the export of the company, which is a registered exporter. A stratified sample of industrial enterprises is representative of the aggregate of enterprises with the number of employees from 100 to 10 thousand people. As previously written, 379 questionnaires were sent to specialists and middle and senior managers of industrial companies involved in export activities. In total, 126 Russian industrial companies took part in the survey.

The sampling restriction is its bias towards companies located in Moscow and the Moscow region, St. Petersburg and the Leningrad region due to the better availability of respondents.

Many studies have found complementarity between product and process innovation [3; 22]. Thus, the questionnaire included standard questions for measuring process (product and process) and innovation based on the idea that the company usually simultaneously apply various methods to improve the efficiency of innovation firm [15; 16; 22]. Thus, the technological innovations in our study were put into action using a composite index of innovative products and processes. In addition, we have collected data on various characteristics of a technological product and technological innovations to improve the quality of results [16].

Technological innovations of the product and process were measured using a five-point Likert scale adapted from the research of Wadho and Chaudhry [22]. The elements that were measured included: how successfully the company introduces new products to the market, the speed of developing new products, the use of the latest technological innovations, the modernization of existing products, the technological

competitiveness of the company, the introduction of the latest technological innovations in the company's processes and their relevance in the processes.

Regarding the measurement model (Table 1), we estimated the reliability of the variables using the Cronbach coefficient alpha. The calculated coefficients corresponded to the recommended minimum level of reliability - 0.7.

The reliability of the composite variables of technological innovation and the international operations of the company were evaluated by the composite reliability [Werts et al., 1974]. We checked our indicators of technological innovation and the international activities of companies using factor analysis, in which the factor load values were at a high level and were above the threshold of 0.5.

Table 1

Measurement model

Composite variable	Items	Composite reliability	Factor load
Technological Innovation (TI)	The number of new products that your company introduced to the market.	0.752	0.506
	New product development speed.		0.617
	Use the latest technological innovations in your new products.		0.578
	Improving the appearance and performance of existing products.		0.517
	Technological competitiveness of your company.		0.704
	The speed of adoption of the latest technological innovations.		0.721
	The rate of change of processes, methods and technologies.		0.736
Company International Activities (IP)	Your company's goals in the international market have been achieved.	0.814	0.736
	Your company has achieved the turnover goals set for international activities.		0.801
	The success rate in foreign markets in your company is satisfactory.		0.765
	The level of sales in your company has grown due to access to foreign markets.		0.747
	Internationalization has a positive effect on the profitability of your company.		0.833

We also evaluated multicollinearity by examining tolerance and dispersion inflation factor (VIF). Since the results did not show that the VIF values exceeded 5, we are sure that in our study there are no problems of multicollinearity. Thus, there are no results in unstable parameter estimates that could make it difficult to assess the impact of technological innovation on the work of international companies.

To test the relationship between technological innovation and the international activities of the company, we performed a curvilinear regression analysis and tested the quadratic effect using the hierarchical multiple regression approach to test the non-linear effect. Models 1 (Table 2) and 2 (Table 3) explain the relationship between technological innovation (TI) and international company activities (IP). In model 1, linear regression is tested, and a high value of R^2 (0.507) indicates that 50.7% of the IP variance can be attributed to a change in the predictor (TI), and the relationship between TI and IP is statistically significant.

When TI^2 is added to the model, R^2 of the model increases to 0.554. Change in R^2 between the first and second models is also statistically significant and positive, which means that the trend in the quadratic effect is increasing, and the beta value indicates that there is a J- shaped upward slope.

Table 2

Variable	Model 1			
	B	Ci	std. Error	p
Intercept	0.662	0.293 - 1.031	0.186	<0.01
Ti	0.817	0.674 - 0.961	0.072	<0.01
amount observations		126		
R^2 / adj. R^2		0.507 / 0.503		
F-statistics		127.422		

Table 3. Model 2

Variable	B	Ci	std. Error	p
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Intercept	0.039	-0.452 - 0.531	0.248	0.875
Ti	1.598	1.148 - 2.049	0.072	<0.01
Ti ²	0.185	0.09 - 0.287	0.051	<0.01
amount observations	126			
R ² / adj. R ²	0.5 54 / 0.5 47			
F-statistics	76 . 36			

Thus, technological innovations and their square coefficient are significant predictors of the effectiveness of international firms, providing support for our hypothesis, which implies the presence of a J-shaped relationship between technological innovations and indicators of international companies.

Confirming that product innovations and process innovations are related to international activities in a J-shaped relationship, we support the view that, in the context of Russian companies, there are features in how the resources and capabilities of the company support the process of international expansion. In particular, we can conclude that the level of international expansion increases faster when firms have a high level of product and process innovation.

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