Spatial structure and economic network formation of manufacturing exports in Russia

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Abstract

This part of our long-term empirical project is devoted to: (a) building a per-region data base of Russian exporting firms; (b) finding the region-specific, firm-specific, destination-specific and sector-specific determinants of export success in manufacturing.

1 Introduction

Contemporary Russian manufacturing export looks less competitive than that in comparable countries like China, Brazil and maybe even India. Such unfavorable comparison in competitiveness holds true first of all for typical technique (cars, phones, TV sets, refrigerators, etc.), except for military exports and helicopters. Same goes for clothes and other common manufacturing goods. Common explanation is relatively high Russian wages but
reasonably low quality, in comparison with other developing countries. However, some specific kinds of goods produced by domestic enterprises find a way to foreign markets. What are the determinants of success and what can federal or local governments do to foster successful export practices?

To answer this and similar questions, the Center for Market studies and Spatial Economics has launched a far-aimed empirical project on Russian enterprises. Building a spatial data base of Russian firms will be helpful for many empirical studies, the first step being this investigation of exports. We have already gathered data from Ruslana, Fira, Spark-Interfax on firms profiles, financial data (all enterprises). We composed these data with geographical location and export status and destination (partial data). We have restructured this data base in the form appropriate for our studies. Now we should combine these data with export volumes and with product classification. Also we are planning to use some additional information from official resources.

Using these data, we suppose to find out, what are the determinants of export success in certain manufacturing sectors across Russian regions, taking into account firms heterogeneity and export destinations. Basic hypotheses are the following:

1. Firm-specific cost and knowledge of demand at destination are crucial for success. Big/old firms that have accumulated technology and business ties, have therefore a comparative advantage. However, small firms are often those who are mobile, experimenting with new opportunities/destinations.

2. Among externalities helping export, important one is the exchange of knowledge in big cities. We expect that, other things equal, cities’ external-
ities are important for some industries’ success and they may form regional clusters of exporters (agglomeration effect). Other externalities favorable for locating exporters in big cities are intermediaries and B2B services.

3. *Specific regional advantages* consist in closeness to the borders and ports (say, Kaliningrad and Vladivostok), wage and quality of the work force, institutions, etc. We expect to notice essential spatial concentration of some exports and explain them.

We start the study with constructing a data base, then proceed to exploratory data analysis. It includes descriptive statistics: which disaggregated sectors have advantage in which regions/destinations. After accomplishment of this preliminary step, we suppose to consult with a group studying Russian trade in New Economic School in order to refine our data and to concentrate on most interesting sectors/effects. Afterwards we are planning to test our main hypotheses on several sectors, to explain the trade volume per origin-destination pair: Why, where and how much does a firm export?

As to policy implications, there is an interest to such studies. Nowadays Russian government tends to boost export activities and *competitiveness*. In particular, governmental trade representatives (torgpredstva) are enforced. To ease information acquisition, the web-site of Ministry of Economic Development gives detailed instructions for Russian exporters how to start exporting, including selection of trade partner. As for financial support, Eximbank of Russia (a government-owned export-import bank) provides financial guarantees for export. Countries are divided into several categories concerning the limit for annual financing: from most risky countries to safe ones. Our project could make such assistance more directed and realistic.
The government should be aware where success is expected, and correctly anticipate the outcome.

2 Literature Overview

There are many papers that demonstrate firms’ heterogeneity in export behavior, there is a variety of results. Studying geography of trade among Irish exporters, Lawless (2009) shows skewed pattern: the majority of firms export (on average) to only 6 markets or less, about 17% reach more than 10 markets and only 3% of firms use 25 markets or more. Using a matrix of transition probabilities, Lawless has found positive effects of market coverage upon firm size and productivity.

Similar results on market coverage distribution were found for French firms (Eaton, Kortum, Kramarz 2004) and US firms (Bernard, Jensen, Schott 2007): there is an evidence of high concentration of exporting activity among few firms. Additionally, Eaton, Kortum, Kramarz find a proxy for geographical barries in terms of the gravity model. Bernard, Jensen, Schott apply basic gravity equation to examine the specific characteristics of firms and products that create the distance effect.

Evidence from Slovenia (De Loecker 2007) shows that on average firms sell to 3-4 destinations, mainly Europe, one third of export going to North America and Asia. The developed regions create learning-by-exporting effect on productivity gains. De Loecker uses matched sampling techniques in order to catch a causal effect of exporting on productivity.

Using Portuguese firm-level data, Bastos and Silva (2010) found on aver-
age 3.4 markets per firm and 7% firms exporting to more than 10 markets; only higher-productivity and higher-quality firms enter the distant markets. They estimated the determinants of export values on firm-product-country level using OLS.

Export dynamics in Colombia (Eaton et al. 2007) shows gradual expansion into new export markets, where geographical expansion and likelihood to survive depend on initial destination market. As to China’s exporters, Manova and Zhang (2009) confirm previous results that trade is concentrated; only several firms deal with a large number of countries. It is worth mentioning that the papers named also provide explanations why firms export.

As to Russia, the only similar study, to the best of our knowledge, has been conducted by Kapelko and Volchkova (2013). They found that survival among exporters is very dynamic: about 48% from the sample of the exporting firms exported only in one year of the period 2003-2010. Using firm level data, they investigate impact of visa restrictions on export costs for firms, with the help of the two-stage procedure proposed by Helpman, Melitz, Rubinstein (2008). There are strong negative effects of visa restrictions on trade volume, and information component of distance costs is crucial in destination selection. We build on this study and also on ideas and observations expressed by N.Volchkova: importance of commodity exhibitions (where exporters and importers meet each other), importance of governmental trade representatives abroad, personal ties among exporters and importers and so on.

Our project follow the latter study from the policy perspective: it is also
government oriented. We base on the same theoretical framework, on firm-destination pairs. As Kapelko and Volchkova, we focus on manufacturing sector and similar time period of Russian trade. However, there are differences in hypotheses and questions: they study the effects of visa restrictions, and associate visa restrictions both with variable and fixed costs. By contrast our project focus on firm-specific market-access costs and spatial externalities among the exporters, using similar Russian data.

As to methodology, we would like to supplement usual Melitz (2003) view on international trade with the network formation idea, see how match among firms and destinations is reached.

3 Methodology

We plan to answer our questions by estimating the gravity model. However, instead of classical estimation of country-country pairs of export and import, we are going to estimate only export firm-destination pairs, according to our goals and firm-level data. We base on Helpman-Melitz-Rubinstein (2008) approach to two-stage estimation of extensive and intensive margins of trade, as in Kapelko and Volchkova.\footnote{It is based on Melitz (2003) theoretical framework in standard setting: monopolistic competition, Dixit-Stiglitz demand, Pareto distribution of firms’ productivities, fixed cost of entry and iceberg trade costs.} The idea is first to use the complete sample of firms (exporters and non-exporters) for finding the determinants of probability of becoming an exporter, and on the next stage to use the sample of exporters and trade volumes. On the first stage, we estimate the probit
equation:

\[ p_{ij} = V_j + F_j + y_j + f_i + \epsilon_{ij}, \]

i.e., the probability of exporting depends on variable export costs per country \(V_j\), fixed costs per country \(F_j\), destination GDP \(y_j\) and firm’s fixed effect \(f_i\). These fixed effects are the object of further study. Namely, approximate TFP per firm can be revealed from the financial data reported by firm and combined with the size and regional position of the firm. This comparison should tell us regional effects.

Further, we need to estimate the determinants of exports flows \(q_{ij}\). Again, instead of classical country-country pairs, we consider firm-destination pairs. Basic econometric specification for estimation bilateral trade flows between each firm-country pair is given by:

\[ q_{ij} = \beta_0 + \lambda_j + \chi_i - \gamma d_{ij} + w_{ij} + \beta_{\eta ij} \eta_{ij} + e_{ij}, \quad (1) \]

where \(q_{ij}\) is the export volume from firm \(j\) to country \(i\), \(\lambda_j\) and \(\chi_i\) are the corresponding fixed effects, \(d_{ij}\) is the distance, \(w_{ij}\) controls for the fraction of firms that export (estimated at the first stage), \(\eta_{ij}\) corrects for sample selection, \(e_{ij}\) is i.i.d. error term. In doing so, we have in mind a stylized gravity equation like \(q_{ij} = y_j / T_{ij}^{\gamma}\) where \(q_{ij}\) is the trade volume, \(y_j\) is the market size of the destination (GDP), \(T_{ij}\) is some composite including distance from the firm to destination and firm-specific trade costs, and \(\gamma\) is the power of distance influence (we can find \(\gamma\) from usual gravity estimation). The firms’ fixed effect estimated in (1) can be interpreted as “personal costs” \(T_{ij}\) to reach destination. We decompose them into geographical distances (that we
We would like to know influence of: (i) firms’ individual efficiency; (ii) regional externalities; (iii) specific regional effects. To reveal component of externalities within $T_{ij}$ variable, we estimate the spatial interaction model, following specifications provided by Behrens, Ertur and Koch (2009) and LeSage, Pace (2008). We divide it into two-stage procedure as well. It is a spatial gravity model that accounts for firm-origin neighbour spillover effects. The general specification of spatial autoregressive probability model to start export is not constructed yet. The general specification of spatial autoregressive bilateral trade flows model is the following:

$$q_{ij} = \rho_i W_i q_{ij} + \rho_j W_j q_{ij} + \rho_w W_w q_{ij} + \beta_0 + \lambda_j + \chi_i + e_{ij},$$

where $\rho_i$, $\rho_j$ and $\rho_w$ coefficients account for firm-origin, country-destination, and origin-to-destination dependences, $\lambda_j$, $\chi_i$ are destination and firm’s fixed effect respectively. $W$ is a spatial weight matrix, the idea being that trade volumes $q_{ij}$ among neighboring firms can influence each other. When this influence turns out significant and positive, it signals positive externalities like knowledge sharing and pooling common services. From this general model more specific models can be derived, imposing various restrictions on $\rho$ parameters.

Using different specifications, we expect to find that the closer is a firm to the border, the higher is the probability of exporting with contiguous foreign markets and higher the volume of trade. Also, the probability to start exporting and trade volumes should be higher where firms are surrounded...
by trade intermediaries and partners from whom they learn. Since we are interested in estimating both selection into markets and volume of trade, all these estimations are applied to samples of all firms and sample of exporters.

There are also some additional ideas. First, we can use activization of governmental trade representatives abroad in 2011-14 as an experiment (shock) that reveals importance of destination-country information. Similar shocks are commodity exhibitions abroad: how many new trade ties are created and how it influences the trade flows? Which regional governments of Russia are active in organizing informational support and does it really have an effect? Another interesting shock is introduction of financial intermediation (factorization) for Russian trade.

4 Data

Currently we have Russian firm-level data for period 2003-2012 on firms’ profiles and main financial variables gathered from Ruslana - Bureau van Dijk database (based on official mandatory financial reports gathered by Rosstat).

Export activities (indicator whether firm is an exporter or not, export destinations) of firms are also gathered from Ruslana database. It contains information on firm-country-year triplets for the same time period. Due to lack of the data on volume of trade flows, we are going to obtain additional database on firm-product-country level with trade volumes.

Also data on exporters can be gathered from official online sources (Ministry of Economic Development, customs data, B2B platforms). Preliminary
descriptive statistics on available export data (Table 1) is provided in Appendix. Considerable number of missing values is a well-known issue and we are working on data collection in order to fill it. Also we include sample map (Figure 1) of exporters locations in Russia (manufacturing only).

5 Timetable

There is one participant in current project - Maria Kuznetsova. Maria Kuznetsova is a research assistant in the Center for Market Studies and Spatial Economics, undergraduate student in Higher School of Economics on Spatial Economics programme. Preliminary timeline plan is provided below.

Table 1: Project timeline

<table>
<thead>
<tr>
<th>Task</th>
<th>Estimated time (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data exploration</td>
<td>1</td>
</tr>
<tr>
<td>Data analysis</td>
<td>2</td>
</tr>
<tr>
<td>Literature overview</td>
<td>2</td>
</tr>
<tr>
<td>Methodology</td>
<td>2</td>
</tr>
<tr>
<td>Results elaboration</td>
<td>1</td>
</tr>
</tbody>
</table>
6 Appendix

Table 2: Top 6 most popular destinations for Russian exporters

<table>
<thead>
<tr>
<th>Export destination</th>
<th>Number of exporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ukraine</td>
<td>531</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>496</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>409</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>391</td>
</tr>
<tr>
<td>Germany</td>
<td>389</td>
</tr>
<tr>
<td>Latvia</td>
<td>376</td>
</tr>
<tr>
<td>Any destination (all exporters)</td>
<td>620</td>
</tr>
<tr>
<td>NA</td>
<td>136391</td>
</tr>
</tbody>
</table>

Figure 1: Geolocation of exporters in Russia for Manufacturing 'C' section (NACE Rev 2, main section code)
References


