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RECONFIGURATION OF COOPERATION TIES OF RUSSIAN MANUFACTURING FIRMS UNDER ECONOMIC SANCTIONS

Abstract: A This paper is focused on one important direct consequence of economic sanctions introduced in 2022: namely, on the necessity to change the suppliers of raw materials, components and equipment in Russian manufacturing firms that historically had long-term cooperation ties with the partners from Europe. The main goal of the paper is to investigate the immediate response to the break of contracts and cooperation agreements, namely, (a) what firm-specific features are associated with the managerial decision to change the suppliers, (b) what is the scale of import substitution and (c) what is the geographical structure of new cooperation partners.

This study is based on the results of the representative survey of 1860 Russian manufacturing firms. It was conducted with CEOs in 2022 and covers firms with more than 10 employees. The survey reports the information on a variety of firm characteristics such as size, age, location, ownership, international trade, cooperation ties, investment and innovation, etc.

We provide the empirical evidence that sanctions shock of 2022 turned out to be extremely painful for the current supply structure and forced enterprises to look for solution to compensate for gaps in cooperation chains. We tested several hypotheses to identify those characteristics of the company that are associated with the reconfiguration of suppliers of raw materials/materials, parts/components or technological equipment. In the econometric analysis, we use probit regression controlling for firm size measured as number of employees, industry heterogeneity and regional territorial effects. Our finding confirmed that it was systematic importers who turned out to be the most vulnerable and affected group because of the imposition of sanctions, and it was this group that began to actively seek a replacement for contractors who had cancelled cooperation. The most technologically advanced firms and active innovators were found to be in the group of those who immediately replaced suppliers in the first months after the imposition of sanctions. Another finding is a significant positive role of the supply chain digitalization.

We have shown that it was European suppliers that Russian firms most often changed in 2022: 80% of firms that changed foreign suppliers indicated Europe as the region of previous supplies. At the same time, in 2/3 of cases, the reason for the replacement was the unilateral refusal of the partner from further deliveries – i.e. the replacement was forced. This was only partially offset by switching to Russian suppliers, although it should be noted that the share of such replacements (from a foreign supplier to a domestic one) turned out to be higher than expected. According to indirect data, enterprises managed to find an alternative within Russia for 30-40% of European partners but most of the changes in the network of foreign suppliers were not related to import substitution as significant part of the imports have switched to China.

Keywords: manufacturing firms, sanctions, supply chains, Russia

INTRODUCTION

The developed and flexible system of firms' supply-chains is the important and immanent part of the market economy and reflects the interplay between the necessity to improve firm's competitiveness by looking for suppliers with more attractive prices/quality and the need to low down transactions costs and risks by establishing sustainable cooperation with long-term suppliers. The globalization trends in recent decades resulted in development of more complicated

supply chains and the growth of both the share of international contracts and the use of imported intermediate goods and equipment.
While Russian manufacturing firms have been following those general trends, it should be noted that cooperation networks common to market economies started to form in Russia rather late – mostly in the 2000-s. In the soviet-type planned economy the supply chains were fixed by the state system and enterprises has no choice in picking the supplier or customer. During the transformation crisis of the 90-s that followed the market reforms the previous established links between firms collapsed due to the bankruptcy of many firms and the appearance of new trade barriers between the Eastern European countries (former SEV - Council for Mutual Economic Assistance) and Commonwealth of Independent States (CIS) countries - former republics of the Soviet Union. During the transition period (1992-1998) Russian manufacturing output declined by 60%. The decline was much higher in such industries as investment machinery, electronics, military production and in high-tech sectors in general, some subindustries such as machine tools production have constricted 20 times and more.
The new, market oriented, cooperation networks started to form in Russian manufacturing during the recovery growth of 1999-2008 when the Russian economy benefited from high world energy prices and demonstrated the annual growth rates of about 7%. The manufacturing production almost doubled in those 10 years. The growing production needed new investments and the increased supply of intermediate goods. Those needs only partly could be satisfied by the growth of domestic production and it was natural for Russian firms to use import as a source of the growth. It should be noted that Russian manufacturing firms at the time were mostly focused on the increasing their shares at the domestic markets and to less extent on the markets of CIS countries while the main source of export revenues of Russia came from the energy export to Europe (due to existing export infrastructure). The newly formed global value chains for Russian enterprises by 2009 typically looked like this: importing complicated intermediates and equipment from Europe and selling finished goods to domestic clients of CIS countries. The dependence on import equipment were particular high: according to surveys data by 2009 approximately 39.9% of medium and large manufacturing firms had large investments in machinery, and among them, 91.4% had reported purchases of imported equipment (Kuznetsov et al. 2011). The economic shock of 2008-2009 was not prolonged and had no serious consequences for the supply chains of Russian manufacturing firms. The growth rates though after the initial recovery slowed down and by the end of 2013 in manufacturing industry they were close to zero. The supply networks continued to be oriented to Europe though there were a slow evolution towards higher role of suppliers from Asia (mostly from China).
The next shock to the established cooperation and supply links could have been (but actually was not) the economic crisis of 2014 combined with several waves the western sanctions introduced after the annexation of Crimea region ("reunification of Crimea and Russia" in Russian interpretation). The risks to international supply chains have been one of the most often mentioned expected negative consequences of sanctions by CEOs of Russian manufacturing firms: more than 20% of firms regardless of their size were expecting problems in this sphere. (Golikova &Kuznetsov 2017).
However, those risks have not actually come true. The survey of firms conducted 4 years later in 2018 demonstrated no significant changes in neither volumes nor directions of import of intermediates or equipment. European countries continued to be the major counterparts of Russian manufacturing as a source of raw materials, details and components, technological equipment.
In this paper we shall try to analyze the first reaction of Russian manufacturing enterprises' supply chains to the much more severe shocks of 2022 sanctions. We presume that (as it commonly happens) the reaction was heterogeneous and we are interested in finding which features of firms facilitate the quick adjustment to sanctions in terms of re-configuring their supply network, in particular – the decisions to change domestic or foreign supplier in 2022.

1. SUPPLY CHAINS MANAGEMENT IN THE TIMES OF ECONOMIC SANCTIONS: LITERATURE REVIEW

Recent massive reconfiguration of global and local supply chains is an evident result of pandemic Covid-19 and geopolitical tensions of Russia-Ukraine conflict. While the first event has already been well covered empirically in the literature (Ivanov,&Dolgui, 2020; Lafrogne-Joussier, Martin,& Mejean, 2023; Vega, Arvidsson, &Saïah, 2023; Browning et al., 2023; Bednarski, Roscoe, Blome, &Schleper, 2023; Queiroz, Ivanov,Dolgui, &Fosso, 2022) , the second one is at the very early stage of exploration due to the novelty of the event, scarce reliable empirical and statistical data on micro-level. Not surprising, that most recent literature reviews on supply chains reconfiguration (Al Naimi, Faisal, Sobh, R., &Bin, 2022; Bednarski, Roscoe, Blome, &Schleper, 2023) do not cover yet this "hot topic".
Our paper refers to the stream of literature on the effects of sanctions' shocks and adjustment strategies that companies implement to provide the resilience of business in the turbulent times. The focus of the relevant studies on micro-level is either on companies from countries – sanctions' senders, mainly from EU countries (Crozet, Hinz, Stammann,&Wanner, 2021; Brasili,&Harasztosi, 2023; Aksoy, Baur, Flach,&Javorcik, 2022; Lastauskas, Proškutė,& Žaldokas, 2023) or on companies from target states – Iran, Zimbabwe, China and Russia (Yang, Askari, Forrer,& Teegen,, 2004; Cheratian, Goltabar,& Farzanegan,2023; Ghasseminejad, & Jahan-Parvar, 2021; Sun et al., 2022; Ahn, & Ludema, 2020; Golikova.& Kuznetsov, 2017; Nigmatullina, 2021; Meyer, Fang, Panibratov, Peng, &Gaur, 2023; Miromanova, 2023) .

Strategic adaptation to external shocks and subsequent restructuring of business processes takes from several months to several years and in some cases can lead to a complete change of the business model (Morgan, Anokhin, Ofstein, &Friske, 2020), including new configuration of supply chains (Ollagnier, Timmermans, Brueckner, 2020).

One of the most acute problems after the introduction of sanctions restrictions is uncertainty and risks in supply chains due to changes in geopolitical conditions, and a spill over effect that goes beyond direct targets via several avenues: direct relationships, access to foreign markets, access to technology and logistics failure (Shalpegin, Kumar, &Browning, 2023). Non-targeted firms in the same supply chain that targeted firms suffer from contagion effect and suffer from reduced sales and increased costs of products (Sun, Makosa, Yang, Darlington, Yin, &Jachi, 2022).

Recent review of studies in manufacturing industry identifies the research gap and importance of analysis how manufacturers can make in-time response to mitigate the risks of supply chain vulnerability by the reconfiguration of supply chain. According to Roscoe et al. (2022) it includes the choice of suppliers and their location, storage facilities and method of transporting goods. Management decisions deal with diversification of sourcing locations, monitoring of new regulations and compliance, analysis of possibility to shorten supply chains and organize new logistics aimed to improve agility to react to geopolitical concerns (Kanike, 2023; Shalpegin, Kumar,&Browning, 2023). Roscoe et al. (2022) found that these decisions are constrained by perceptions of institutional pressure and potential disruption risk and take into consideration relative mobility of suppliers and supply chain assets.

The adaptation of firms to the sanctions regime in Russian case requires an immediate response to shocks that can lead to a shutdown of the production process and a subsequent reassessment of risks and opportunities that could be realized in the medium term. Key success factors in mitigating strategies are learning capability and agility (Müller, Hoberg, &Fransoo, 2023) and collaboration with supply network partners (Azadegan, & Dooley, 2021).

Empirical evidence on the significance of supply problems for Russian manufacturing enterprises is rather scarce. The most close to our research are two waves of surveys of organized by the Institute of Economic Policy (IEP) in 2022 and 2023 (Chugunov, 2023; Russian companies have revealed, 2023). The sample of the survey is about 1000 enterprises. The results of these two waves gives an opportunity to compare the respondents' estimates immediately after the introduction of the first packages of sanctions introduced in 2022 that indicates an assessment of potential risks and threats and the real effects 10 months later after some adjustment measures on the firm level were undertaken. Empirical evidence suggest that during this time frame a small progress in substitution of foreign suppliers by local producers was done. At the same time, near-shoring in “friendly” states brought some benefits as the share of firms with complains about lack of alternative suppliers in these countries decreased by 10 p.p. Perception of problems with maintenance of the imported equipment also reveals a positive trend. The forced change of suppliers of intermediaries and equipment, as well as an increase in logistics costs, which underwent drastic changes over the year due to a reduction in supplies from Europe and reorientation to supplies from China were among the factors that affected an increase in costs.

European firms also had to adjust to sanctions’ regime and incorporate changes in supply strategy. According to the representative survey of the IFO Institute, in Germany in 2022 87% of firms had taken some measures to ensure the resilience and robustness of supplies (or a set of measures), among which, most often - in 68% of cases, firms indicated an increase in stocks and diversification of suppliers (65%). More than half of the firms noted more thorough monitoring of supply chains (54%), redistribution of orders between existing suppliers (38%), while increased vertical integration (insourcing) was much less popular measure (Aksoy, Baur, Flach, &Javorcik, 2022).

Large scale survey of European Investment Bank which covers all EU countries in its 7th wave revealed that that more than half of firms associate problems with global logistics and access to materials and services with the COVID-19 pandemic and military events in Ukraine (Brasili, &Harasztosi, 2023). Active adjustment measures include two main strategies: diversification (increase of supplying partners’ number) or focus on domestic markets and suppliers. Econometric estimations revealed heterogeneous response to supply shocks. Younger, larger and more productive firms as well as innovative and using digital technologies were more likely to implement active reconfiguration of supply chains and more often chose diversification than focusing on domestic markets and suppliers. In general, the authors of the report emphasize that management of supply chains has become much more complicated and risky. To avoid or lessen the risks companies have to use stockpiling or increase the number of potential suppliers (and their locations) on the local markets, while diversification in foreign markets is not available to every company. This, according to the researchers, may lead to an increase in the efficiency gap between leading and lagging firms.

In general, the economic consequences of economic sanctions for supply chain participants are harmful both for the firms from countries – senders and targets. According to Chinese researchers (Jin, Meng, Wan, &Wang, 2023) besides rising trade costs the probability of supply chain disruption between them increase by 4% and, correspondingly, reduce the probability of establishing new ties by 8.5% as a result of increased policy uncertainty, decline of political trust and negative public sentiments. The discussion on the main trends in reconfiguration of supply chains - a shift from a former trend on globalization to “near-shoring” or “friend-shoring” is going on now (Gong, Hassink, Foster, Hess, &Garretsen, 2022; Javorcik, Kitzmueller, Schweiger, Yıldırım, 2022; Alfaro, &Chor, 2023) and need more empirical evidence from developed and transition economies.

2. DATA AND DESCRIPTIVE ANALYSIS

The empirical database we use was drawn from the survey of 1860 Russian manufacturing firms with more than 10 employees. The survey was conducted by a surveying company in 70 regions across Russia in August-November 2022. Face-to-face interviews were conducted with the top managers (CEOs and CFOs). The random structured sample has been constructed to be representative in terms of distribution by industry and size of the firm, although it is not representative for Russian regions. In this paper if not reported otherwise we re-weight our results to be representative for general population of firms. For comparisons we also use the results of similar surveys conducted in 2014 and 2018[1].

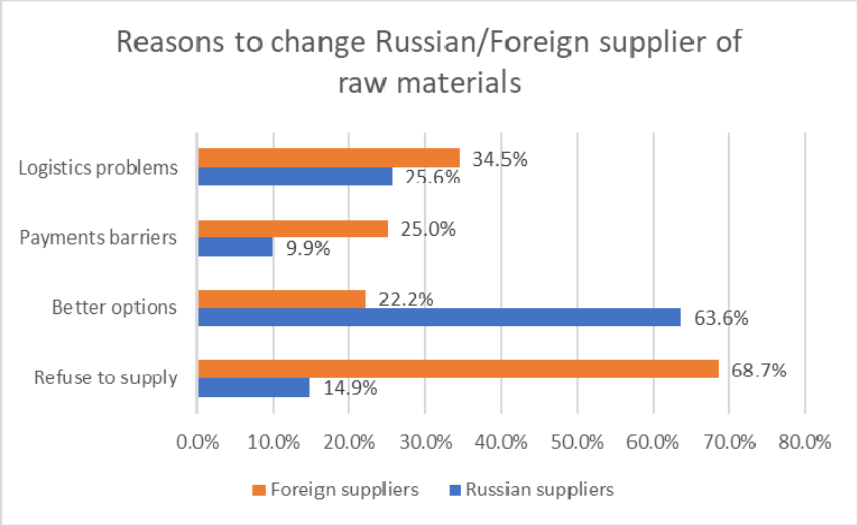
As we have mentioned by the end of 2010s Russian firms has created a developed and more or less efficient cooperation networks typical for many developing countries: large-scale import of technologies and equipment as well as the import of raw materials, details and components. To some extent, it is a model similar to China but opposite to Chinees case, Russian model was oriented mostly on domestic markets and neighbor countries. Due to the growth of specialization and the increase outsourcing the supply chains became more complicated that is reflected in the growing average number of suppliers. The date of 2018 survey showed the average number of suppliers for a single firm of about 30 and in 2022 it was 44. Evidently this figure variates pending on the size of firms - from 35 for small firms to 112 for large firms - and the industry (type of economic activity). Naturally, firms are always in search for better opportunities and new suppliers though they mostly prefer long-term relationships keeping the "core supply network": for about 2/3 of suppliers the relationships last for 5 years or more. And this share varies little by size groups or industries.

The sanction shock of 2022 became the grave blow to the established cooperation networks of firms and made it necessary to intensify the search for new suppliers: about 25% of firms has changed suppliers in 2022.

The external nature of supply chains shock of 2022 can be demonstrated by the fact that changes in the pool of foreign suppliers happened twice more often than in the pool of Russian suppliers. The impact of sanctions on the supply chains is evident if we compare the reported reasons for changing Russian or foreign suppliers (Fig.1 and Fig.2).

While the change of domestic supplier is mostly driven by finding better options (price/quality), the main reason to change foreign supplier is the broken contracts and refuse to continue supplies. Nevertheless, problems with payments and logistics were important reasons to change not only foreign but Russian suppliers as well. It is important to note that changes in the pool of suppliers of both domestic and foreign has a definite geographical dimension. The change of foreign supplier to the Russian one are not often. In most cases we see the switch of import from "unfriendly" countries to other countries (mostly to China). Figure 3 demonstrates the sharp decline in the share of imported intermediate goods from Europe and corresponding increase of China as a source of such import.

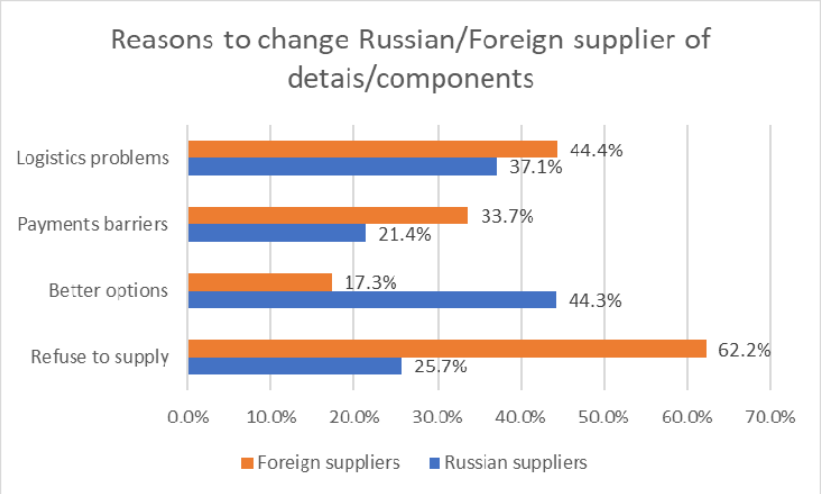
Figure 1. The share of respondents reporting different reasons for the decision to change supplier (% of those who did changed Russin/Foreign supplier of raw materials



Source: Survey data, unweighted

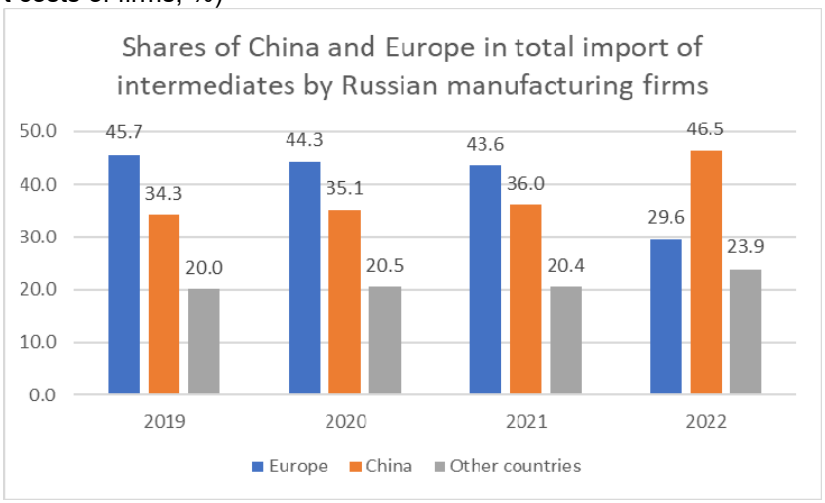
[1] More details concerning the surveys can be found at https://iims.hse.ru/rfge/.

Figure 2. The share of respondents reporting different reasons for the decision to change supplier (% of those who did changed Russian/Foreign supplier of details or components)



Source: Survey data, unweighted

Figure 3. The dynamics of import of intermediates from China and Europe (share of import in total intermediates import costs of firms, %)



Source: Survey data

3. METHODOLOGY

Basing on the literature review and our descriptive analysis we shall verify the following hypotheses:
H1. Firms involved into global value chains (i.e. regular two-way traders) and more broadly, in foreign trade, i.e. regular importers and exporters have higher probability to be damaged by sanctions and, thus, are more active in changing suppliers.
H2. The cooperation networks of firms that established strategic partnerships with domestic and foreign partners before 2020 are more sustainable other and firms with such partnerships are less likely to change their suppliers.
H3. The more competitive firms – active in innovations and in using digital technologies - are more active in adjusting their supply chains as they are better informed and have better opportunity for finding an alternative supplier.
We are estimating probit models to assess the determinants that affect the probability for a firm to change their local or foreign supplier. We should stress that as our survey data covers the period of September-November 2022 we can only estimate the "quick response" to the 2022 sanctions shock, i.e. we cannot catch the fact of the changes in supply chains if they happen at the later day.
We include three group of factors into the analysis: (1) involvement into global trade; (2) the development of a firm's cooperation network; (3) the quality of management of supply chains.
The structure of the model is as follows:

$$Pr(Change\ of\ suppliers) = \alpha 1(Globalization\_indicators_i) + \alpha 2(Partnership\ network)) +$$
$$+ \alpha 3(Competitiveness\ indicators) + \alpha 4(individual\ firm\ level\ controls) + \alpha 5(Sectoral\_controls) + \varepsilon$$

The model is estimated separately for change of suppliers of raw materials, of details and components and for changes of equipment suppliers.

Measures

For globalization indicator we use categorical variable where (1) is the group of two-way traders, i.e. firms with regular export activity in 2019-2021 and regular activity in importing raw materials/details and components/equipment in the same period; (2) firms involved only in import activity but selling exclusively to domestic Russian market; (3) exporting regularly without using imported inputs; (4) firms not involved in international trade. The group (4) is the reference category in our regressions.

We further presume that established partnership relations make network more stable and decrease the probability of changing suppliers. We shall estimate the impact of both domestic strategic partnerships and international partnerships.

We shall use regular product innovation activity and the usage of Suppliers Chains Management (SCM) digital technology as proxy indicators of more technologically advanced and more competitive firms.

The block of firm level controls includes the categorical variable of firm size: small firms (below 100 employees) as a reference category, medium firms (100-249 employees) and large firms (above 500 employees), the logarithm of overall number of suppliers and product specialization of the firm (the logarithm of the share of main product in the total revenue). Sectoral differences are controlled by Pavitt taxonomy of industries where the group of supplier dominated industries is a reference category. We also use a dummy variable of CEO being a controlling owner as it may be relevant for the perception of sanctions' risks. The list of variables and the coding can be found in Table 1.

Table 1. List of the variables and coding

VARIABLES	Description
CHANGE_SUP_RAW	Dummy variable equals 1 if a firm has changed one or more suppliers of raw materials in 2022
CHANGE_SUP_DET	Dummy variable equals 1 if a firm has changed one or more suppliers of details/components in 2022
CHANGE_SUP_EQ	Dummy variable equals 1 if a firm has changed one or more suppliers of technological equipment in 2022
FT_reg_raw/det/eq1	The classification of firms by the type of their involvement into international supply chains. Group 1 include firms with regular export activity in 2019-2021 AND regular activity in importing raw materials/details and components/equipment in the same period.
FT_reg_raw/det/eq2	Group 2 include firms with no regular export activity in 2019-2021 AND regular activity in importing raw materials/ details and components/equipment in the same period.
FT_reg_raw/det/eq3	Group 3 include firms with regular export activity in 2019-2021 AND no regular activity in importing raw materials/ details and components/equipment in the same period.
FT_reg_raw/det/eq4	Group 4 include firms with no regular export activity in 2019-2021 AND no regular activity in importing raw materials/details and components/equipment in the same period.
SCM digital_technology	Dummy variable equals 1 if a firm reported using SCM (supply chains management) digital technologies, zero otherwise.
New_prod_regular_3year	Dummy variable equals 1 if a firm introduced new products annually in 2019-2021, zero otherwise.
OLD_RUS_PART	Dummy variable equals 1 if a firm has strategic partnership established before 2020 with one or more Russian companies, zero otherwise.
OLD_FOR_PART	Dummy variable equals 1 if a firm has strategic partnership established before 2020 with one or more foreign companies, zero otherwise.
CEO_controlled	Dummy variable equals 1 if the CEO is a controlling owner or a member of the family controlling a firm, 0 – Hired CEO or coo-owner without controlled stakes.
log_suppliers_num	Logarithm of number of suppliers a firm has in 2022
SIZE1	Small firm with less than 100 employees
SIZE2	Medium-sized firm Small 100-249 employees
SIZE3	Large firm with 500 or more employees
logmain_prod_rev_share	Logarithm of the share of the main product in the annual revenue of a firm
Pavitt_taxanomy2	Group 1-supplier dominated, Group 2 – scale/information intensive, Group 3 – specialized suppliers, Group 4 – science-based

The results of probit-model estimations are reported in Table 2.

[2] According to Pianta M., Coveri, A., Reljic J. The Sectoral Innovation Datebase, 1994-2016. Methodological notes. MPRA paper No 106780, March 2021, p.11

Table 2. Determinants of changing supplier of raw materials/details&components/equipment in 2022

	(1)		(2)		(3)	
VARIABLES	**CHANGE_SUP_RAW**		**CHANGE_SUP_DET**		**CHANGE_SUP_EQ**	
	Coeff.	St.dev	Coeff.	St.dev	Coeff.	St.dev
FT_reg_raw1	1.151***	(0.112)	1.301***	(0.143)	1.282***	(0.210)
FT_reg_raw2	0.809***	(0.0963)	1.063***	(0.131)	1.054***	(0.196)
FT_reg_raw3	0.159	(0.146)	0.271**	(0.136)	-0.398	(0.299)
SCM digital_technology	0.278**	(0.131)	0.283	(0.188)	0.264*	(0.141)
New_prod_regular_3year	0.193*	(0.108)	-0.132	(0.133)	-0.103	(0.120)
OLD_RUS_PART	-0.0158	(0.167)	-0.0555	(0.0790)	-0.343***	(0.121)
OLD_FOR_PART	-0.397***	(0.100)	-0.352***	(0.103)	-0.616***	(0.125)
CEO_controlled	-0.256***	(0.0697)	-0.156**	(0.0734)	-0.0819	(0.163)
log_suppliers_num	0.127***	(0.0395)	0.0515**	(0.0230)	0.164***	(0.0540)
Medium firm	0.00322	(0.0637)	0.160***	(0.0490)	0.178*	(0.0934)
Large firm	-0.190	(0.149)	0.122	(0.0942)	0.251***	(0.0658)
logmain_prod_rev_share	-0.373***	(0.135)	-0.691***	(0.155)	-0.534***	(0.155)
_IPavitt_2	0.288**	(0.112)	0.0614	(0.0892)	0.157	(0.102)
_IPavitt_3	0.110	(0.0723)	0.226***	(0.0730)	0.243**	(0.106)
_IPavitt_4	0.276**	(0.136)	0.0798	(0.0946)	0.150	(0.369)
Constant	0.159	(0.542)	1.384**	(0.668)	-0.125	(0.666)
Observations	1,732		1,732		1,394	

We have checked several other specifications that we have not reported here due to the lack of space. In particular, we included the pre-crisis (2021) share of Europe or China in the overall import of intermediate goods. The findings are ambiguous: for raw materials and details the higher share of Europe in imported supplies significantly increases the probability of changing supplier while the higher share of China in supplies significantly decrease the probability. But the dependence on import from one of those regions has no impact on the probability of changing equipment suppliers. Those results confirm a rather evident fact that re-configuration of supply networks was the result of Western sanctions.
We have also checked for robustness of our results by including other variables in the regressions such as the date of the interview, job position of the respondent and others. Though the coefficients for those additional variables are significant in some specifications, our main results are robust.
In general, our results support our hypotheses. Involvement of firms into global value chains increases the probability of prompt supply chains' reconfiguration by substitution of suppliers. The coefficients for partnerships are significant for foreign partners in case of intermediate goods and decrease the probability of changes in supply chains. The local strategic partnerships have significant and negative effect only for change of equipment suppliers and probably are due to the firms that prefer to use the equipment from local producers. Quick replacement of suppliers in the supply network is significantly higher for more competitive firms that are active in terms of innovations and the use of digital technologies in SCM.

4. CONCLUSION

The sanctions of 2022 had actually a strong impact on Russian manufacturing firms. More than half of the respondents reported sanctions to have a strong negative or mostly negative consequences. Most of those negative effects are associated with the damage to supply chains: broken contracts, problems with financial transactions with partners and h logistics. Our preliminary results show, first, that more globalized companies had to adjust their supply chains more often: the probability of changing suppliers of intermediate goods (raw materials, details and components) is highest for firms involved in two-way foreign trade and significant for those that depend on imported intermediates an/or equipment. Second, we see that technologically advanced and more competitive firms and firms in science-based industries were the most vulnerable to supply chains shocks. Third, our preliminary results show that the shock to supply chains can be successfully mitigated by creating more sophisticated networks that includes strategic partnership frameworks. Our results confirm the similarities of Russian and European firms in reaction to sanction damage to supply chains. Our contribution is in more nuanced investigation highlighting the positive role of domestic and foreign partnerships in providing robustness of supply chains, taking into account technological level of industries, firm product specialization, number of suppliers, perception of risks by different categories of respondents.

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