The International Trade and Supply Chains Firms in Russia : ARDL Analysis

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Abstract

This study aims to analyze the influence of international trade and supply chain companies with related variables, namely tax revenues and high-tech exports in Russia. We use the World Bank as an additional source for statistical data, namely data from 2007 to 2021. Two alternative time series models will be used to investigate the following variables. Factors in this study include tax revenue and high-technology exports since it demonstrates a link between the two variables over both the long and short terms, with the dependent variable being the trade of Russian federation. We find that the factors that we estimate have various relationships with increased trade flow in Russia, in the short term the value of trade in previous years are still one of the important factors influencing trade this year, with tax revenue being the dominant factor influencing trade This year. The ARDL test finds that when tax revenue increases, it will provide a positive sentiment towards an increase in the value of trade in Russia. This is different from other variables such as current high-tech exports, where when there is an increase it will make a negative contribution to the increase in trade in Russia.

Background

The way people manufacture things changes as technology changes from time to time. The industrial revolution 4.0 entered the world in recent years, causing disruptions and forcing many parties to reconsider how they constructed their supply chains to generate the necessary output. Future rivalry and crises will need the supply chain to continue utilizing technology advancements (Brandao & Godinho-Filho, 2022).

Technology frequently plays a role in the development of remedies to any current issues, including problems encountered in the supply chain. Technology is also important for companies or countries doing international business (Liu, Yang, Hao, & Song, 2022). Advanced technology greatly influences the management of multinational corporations from their worldwide value chains. It is a technology that is changing the way companies select locations, select custom regulatory frameworks, exchange information, manage networks for digital platforms, and oversee human resources. We can expect these technologies to become even more important for multinational companies and changes to the composition of global value chains in the future to take place (Kunkel, Matthess, Xue, & Beier, 2022). Besides being able to influence company

management, information technology also indirectly affects the financial performance of a company through operational performance (Jamalnia, Gong, & Govindan, 2023).

Maximizing investment in information technology can bring companies to profitability and have high effectiveness. This information technology can also be used to predict the company's future (Li & Fu, 2022; Alim, 2022). In this era of globalization, technology is developing rapidly compared to other fields, this also affects the global supply chain (Paola, Cosimato, & Vona, 2023). Measuring supply chain performance is a process of measuring each activity or indicator in a company's supply chain. Performance measurement is very necessary in a company because the results of measurements taken can be used as feedback containing information about the successful achievement of a target in accordance with a predetermined plan. In addition, measurement results can provide information regarding detailed indicators or performance activities that are below company standards and require improvement, so that companies can make adjustments and evaluations (Fritz, 2022; Qader, Junaid, Abbas, & Mubarik, 2022).

One indicator of the assessment of the success of a company is the ability to maintain its existence. That is, companies need to have added value or competitive advantage from similar companies or competitors. Competitive advantage is the company's ability to meet the expectations, desires, needs, income and willingness of service users. If the conditions of competition are low or even there is no competition, then the company does not need the product. Conversely, if the level of competition is higher, the product becomes more important in the company (Liu, Xie, & Li, 2023). Supply chain integration focuses on the relationship between suppliers, customers and the company itself, which must be managed properly. How can suppliers take responsibility for product quality, good and long-term relationships with suppliers and customers, and so that product distribution from upstream to downstream reaches the end user in a timely manner (Wu, Ji, & Gu, 2023).

Innovation strategy is the most important factor in company performance (Zhou, 2020). There are two categories of innovation: radical innovation and gradual innovation. Different innovation processes need various knowledge and expertise and affect how well a company's consumers and rivals get along. An industry's primary answer that is drastically different and unique is known as radical innovation. The invention known as incremental innovation, on the other hand, introduces little alterations and improvements to current procedures. All significant factors that might improve a company's competitiveness are covered by the function of innovation in enhancing corporate performance, including processes, products, markets, management, and so forth. The fear of organizations in implementing innovation is the amount of costs that must be invested. This fear is actually unfounded because innovation does not have to start with something sophisticated and costly, but more importantly, it is institutionalized, consistent and sustainable. Innovation strategies to provide maximum service, minimize complaints and establish long-term relationships with customers are at the heart of the freight services business. forwarding and it is the company's job to improve the company's performance (Baghersad & Zobel, 2021; Rico & Borrás, 2018).

According to Baghersad & Zobel (2021) service innovation is a term used to describe new services offered by businesses, innovative work practices used by businesses, and the provision of customers with cutting-edge technology to satisfy their needs. Customer services will be delivered more quickly thanks to the technologies employed in subsequent advancements. Meanwhile, service innovation, according to Fritz (2022), is a new endeavour undertaken by a business that creates new services, new procedures, or new processes to boost added value for the services offered by the business. The company's performance will increase as a result of its

innovation. This study aims to analyze the influence of international trade and supply chain companies with related variables, namely tax revenues and high-tech exports in Russia.

Research Methods

We use the World Bank as an additional source for statistical data, namely data from 2007 to 2021. Two alternative time series models will be used to investigate the following variables. Factors in this study include tax revenue and high-technology exports since it demonstrates a link between the two variables over both the long and short terms, with the dependent variable being the trade of Russian federation. This is the econometric model we use:

$$TRA_t = \beta_0 + \beta_1 TRA_{t-1} + \beta_2 TRA_{t-2} + \beta_3 TR_t + \beta_5 TR_{t-1} + \beta_6 HT_t + \beta_7 HT_{t-1} + \beta_8 HT_{t-2} + e_t$$

Where the trade is TRA, TR is tax revenue, HT is high-technology exports, the error term is e, and time series is t. Dynamic ARDL was used in the study. Zhang et al. (2021) claim that ARDL is a regression method that includes the lag of both the dependent and independent variables simultaneously. Using this model can analyze long-term relationships when the explanatory variables are a mixture of 1(1) and 1(0).

Table 1. Descriptive variable

Variable	Explanation	Data type
Trade	Trade is the total of goods and services exports and imports expressed as a percentage of GDP.	Percent
Tax Revenue	Tax revenue is the term used to describe mandatory payments made to the federal government for public purposes. Fines, penalties, and the majority of social security contributions are exempt from some mandatory transfers. Refunds and adjustments for tax money that was incorrectly collected are considered negative revenues.	Percent
High-Technology exports	Products having a high R&D focus, such as those in the aerospace, computer, pharmaceutical, scientific instrument, and electrical equipment industries, are classified as high-technology exports.	Percent

Result and Discussion
Based on the factors of the study, descriptive data are shown in Table 2.

Table 2. Descriptive data

	TRA	TR	HT
Mean	48.99440	12.49989	10.68465
Median	48.43506	12.93349	9.688114
Maximum	53.38247	16.55131	15.95212
Minimum	46.03087	9.183122	6.951376
Std. Dev.	2.363206	2.042628	2.720060
Skewness	0.429599	0.393091	0.636439
Kurtosis	1.907618	2.505923	2.590662
Jarque-Bera	1.207200	0.538871	1.117362
Probability	0.546840	0.763811	0.571963
Sum	734.9160	187.4984	160.2697
Sum Sq. Dev.	78.18643	58.41259	103.5822
Observations	15	15	15

Mean, min, max, and standard deviation are used to express the findings of descriptive statistics. TRA Minimum 46.03, TRA Maximum 53.38, and TRA Standard Deviation 2.36. HT Minimum 6.95, HT Maximum 15.95, HT Standard Deviation 2.72, etc. The ARDL model should not be used to forecast the value without first performing a stationary test. By looking at the error component, which also incorporates any possibility for autocorrelation, the ADF algorithm may determine if a series is stationary or not. The results are as follows:

Table 3. Unit Root Test

	Unit Root	ADF Test stat.	Signif.	Be told
TRA	Level	-3.383023	0.0320	Stationer
TR	Level	-2.269538	0.1935	
	First Diff	-2.877207	0.0750	
	Second Diff	-4.670787	0.0049	Stationer
High-Technology exports (HT)	Level	-1.763994	0.3809	
	First Diff	-3.268239	0.0389	Stationer

From the table above it can be concluded that the TR variable is stationary at the second difference, HT at the first difference, and TRA at the data level. ARDL estimation can be continued because all data is stationary.
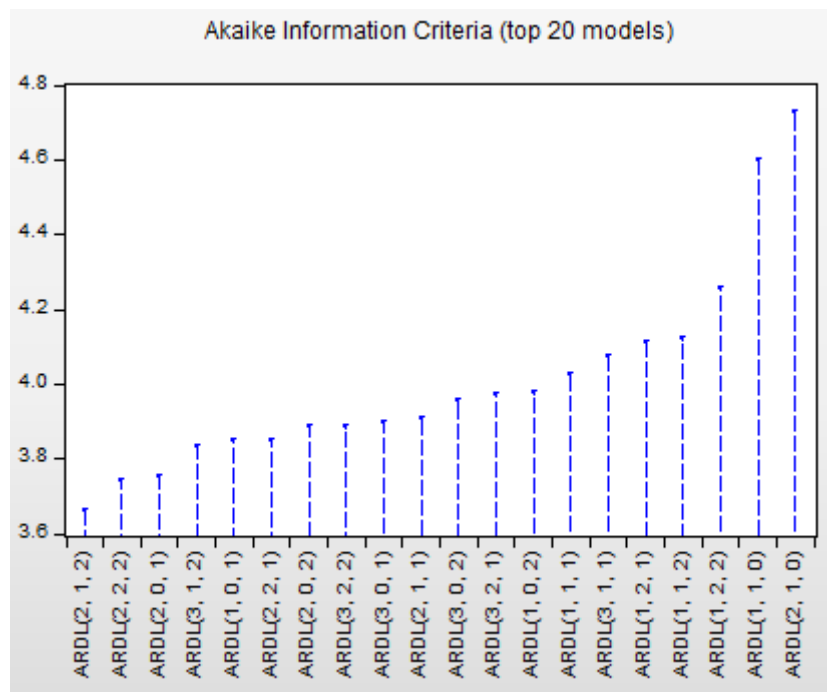
Figure 1. AIC Optimum Lag Test

In order to determine which lag should be utilized in the subsequent test, optimal lag testing is conducted; as observed in the aforementioned image, the best recommendation is the 2,1,2 lag.

Tabel 4. Bounds test

Stat. Test	Worth	Signif. I(0)	Signif. I(1)
F-stat.	0.402731	2.63	3.35
K	2	3.1	3.87
		3.55	4.38
		4.13	5

This shows that the four variables under study— trade, tax revenue, and high-technology exports are cointegrated throughout time or move in the same direction because the F statistic value is greater than its the significant value.

Tabel 5. Autoregressive Distributed Lag results

	Coeff.	Std. Error	t-Stat.	Prob.*
TRA(-1)	0.166540	0.512588	0.324900	0.7615
TRA(-2)	0.105912	0.405298	0.261320	0.8067
D(TR,2)	0.760846	0.664871	1.144351	0.3163
D(TR(-1),2)	0.100509	0.752484	0.133570	0.9002
D(HT)	0.712606	0.437328	1.629454	0.1785
D(HT(-1))	-0.653364	0.549506	-1.189001	0.3002
D(HT(-2))	-0.072717	0.588810	-0.123498	0.9077
C	35.16586	31.52472	1.115501	0.3271

| R-squared | 0.626110 | Adjusted R-squared | -0.028198 |

The R-squared value of the ARDL model is 0.62, which means that each of the independent variables—tax revenue and High-Technology exports —could explain 86% of the variance in the trade(TRA). This demonstrates how well the research paradigm was used in this study.

Judging from the ARDL estimation results, because the relationship between TRA and TRA variables (-2) shows a t-statistic of 0.261320 which is greater than the coefficient of 0.105912, this means that the TRA factor two years earlier was a factor that influenced the flow of TRA. Furthermore, the relationship between the TRA and TR(-1) variables shows a t-statistic value of 0.133570 which is greater than the coefficient value of 0.100509, this means that the TR factor a year ago is a factor that influences the current TRA. This shows that in Russia the influence of tax revenues in the current and previous years is still one of the strong factors affecting trade this year. Other variables such as high-tech exports have a significant inverse relationship with trade in Russia.

Table 6. Model test results

	Coeff.	Std. Error	t-Stat.	Prob.
C	35.16586	31.52472	1.115501	0.3271
TRA(-1)*	-0.727548	0.650213	-1.118938	0.3258
D(TR(-1), 2)	0.861355	1.173578	0.733956	0.5037
D(HT(-1))	-0.013475	0.627418	-0.021477	0.9839
D(TRA(-1))	-0.105912	0.405298	-0.261320	0.8067
D(TR, 3)	0.760846	0.664871	1.144351	0.3163
D(HT, 2)	0.712606	0.437328	1.629454	0.1785
D(HT(-1), 2)	0.072717	0.588810	0.123498	0.9077

In order to be able to carry out an economic analysis of the effects of REC in Cambodia, it is not enough to only based on short-term information, it is also necessary to analyze the long-term effects. From the long-term ARDL estimation results as shown in Table 5, it can be seen that the TR variable in the previous year was significant and had the highest coefficient of 0.760846. Then followed by the previous year's TRA which was also significant and had a coefficient of -0.727548. This means that in the long term, the previous year's TR variable plays a greater role in increasing TRA in the long term, followed by the previous year's TRA variable.

Conclusion

We find that the factors that we estimate have various relationships with increased trade flow in Russia, in the short term the value of trade in previous years are still one of the important factors influencing trade this year, with tax revenue being the dominant factor influencing trade This year. The ARDL test finds that when tax revenue increases, it will provide a positive sentiment towards an increase in the value of trade in Russia. This is different from other variables such as current high-tech exports, where when there is an increase it will make a negative contribution to the increase in trade in Russia

References

Alim, M. (2022). Impact of Taxes and Technological Improvement for Economic Growth,. *Tamansiswa Accounting Journal International, 4 (1)*, 72-77.

Baghersad, M., & Zobel, C. (2021). Assessing the extended impacts of supply chain disruptions on firms: An empirical study. *International Journal of Production Economics, 231 (1)*, https://doi.org/10.1016/j.ijpe.2020.107862.

Brandao, M., & Godinho-Filho, M. (2022). Is a multiple supply chain management perspective a new way to manage global supply chains toward sustainability? *Journal of Cleaner Production, 375 (1)*, https://doi.org/10.1016/j.jclepro.2022.134046.

Fritz, M. (2022). A supply chain view of sustainability management. *Cleaner Production Letters, 3 (1)*, https://doi.org/10.1016/j.clpl.2022.100023.

Jamalnia, A., Gong, Y., & Govindan, K. (2023). Sub-supplier's sustainability management in multi-tier supply chains: A systematic literature review on the contingency variables, and a conceptual framework. *International Journal of Production Economics, 255 (1)*, https://doi.org/10.1016/j.ijpe.2022.108671.

Kunkel, S., Matthess, M., Xue, B., & Beier, G. (2022). Industry 4.0 in sustainable supply chain collaboration: Insights from an interview study with international buying firms and Chinese suppliers in the electronics industry. *Resources, Conservation and Recycling, 182 (1)*, https://doi.org/10.1016/j.resconrec.2022.106274.

Li, S., & Fu, T. (2022). Abatement technology innovation, worker productivity and firm profitability: A dynamic analysis. *Energy Economics, 115 (1)*, https://doi.org/10.1016/j.eneco.2022.106369.

Liu, C., Yang, S., Hao, T., & Song, R. (2022). Service risk of energy industry international trade supply chain based on artificial intelligence algorithm. *Energy Reports, 8 (1)*, 13211-13219. https://doi.org/10.1016/j.egyr.2022.09.182.

Liu, G., Xie, Z., & Li, M. (2023). Does economics and management education make managers more cautious? Evidence from R&D of Chinese listed firms. *Research in International Business and Finance, 64 (1)*, https://doi.org/10.1016/j.ribaf.2022.101847.

Paola, N., Cosimato, S., & Vona, R. (2023). Be resilient today to be sustainable tomorrow: Different perspectives in global supply chains. *Journal of Cleaner Production, 386 (1)*, https://doi.org/10.1016/j.jclepro.2022.135674.

Qader, G., Junaid, M., Abbas, Q., & Mubarik, M. (2022). Industry 4.0 enables supply chain resilience and supply chain performance. *Technological Forecasting and Social Change, 185 (1)*, https://doi.org/10.1016/j.techfore.2022.122026.

Rico, P., & Borrás, B. (2018). Entrepreneurship, firms creation and regional performance. *European Journal of Management and Business Economics, 28 (2)*, 158-173.

Wu, Y., Ji, Y., & Gu, F. (2023). Identifying firm-specific technology opportunities in a supply chain: Link prediction analysis in multilayer networks. *Expert Systems with Applications, 213 (B)*, https://doi.org/10.1016/j.eswa.2022.119053.

Zhang, L., Godil, D., Bibi, M., Khan, M., Sarwat, S., & Anser, M. (2021). Caring for the environment: How human capital, natural resources, and economic growth interact with environmental degradation in Pakistan? A dynamic ARDL approach. *Science of The Total Environment, 774*, 56-72.

Zhou, C. (2020). The effects of outward FDI and export on firm productivity in emerging markets: Evidence from matching approach. *Economics Letters, 195 (1)*, https://doi.org/10.1016/j.econlet.2020.109462.