Unlike many other ex-socialist and ex-Soviet countries, Russia shows persistent positive balances in both trade and current accounts [1, 2]. Over the period 1994–2016, Russian current account and trade balance were 5.7% and 8.9% of GDP, respectively. At least in part, this should be attributed to its export performance. This research is aimed to reveal the determinants of Russia’s exports and to formulate policy implications.

HYPOTHESIS

The theory and empirical studies indicate that exports mainly respond to changes in exchange rates and trading partner’s income. A cheaper domestic currency and a higher income of partner countries increase exports. Price competitiveness (currency depreciation) strategy is known as a key mechanism to boost export performance. For example, China has been many times accused of trying to control or manipulate the exchange rate of its currency. Continuous undervaluation of Renminbi partially explains Chinese surplus in its international trade and current accounts [3].

In the case of the Eurozone economies, price competitiveness is no more an option to influence export performance in mutual trade. Thus, other explanatory variables of export performance and external imbalances must be found. This is the subject of abundant literature [4, 5]. Export composition has been recently noted as a key explanatory variable of export performance of the Eurozone countries with their major partners [6].Explicitly, the evidence suggests a positive correlation between the share of high technology items in total exports, because they are high added value goods, and the demand is inelastic. The available evidence suggests that if their share in exports is high enough then one should expect a positive direct effect on the country’s export performance. In addition, it is possible to expect indirect effects, conditioning price and income elasticities. Price elasticity is smaller and income elasticity is larger when total exports consist of higher shares of high technology export products [6]. At the same time, export diversification is relevant for stability and economic growth, and this is well stablished in the literature [7, 8, 9, 10].

Given all this, the working hypothesis of this research is that a higher share of crude petroleum and natural gas in total exports is positively related to export performance. Although crude petroleum and natural gas are not high added value goods, the demand for them is inelastic. We test this hypothesis in the case of...
Russia where these products take the prevailing share of exports (in 2016, crude petroleum represented 26.1%).

DATA AND EMPIRICAL SPECIFICATION

The data were taken from OECD STAN Bilateral Trade Database by Industry and End-use category (BTDIxE), World Bank World Development Indicators (WDI), IMF International Financial Statistics (IFS), and the U.S. Energy Information Administration (EIA). The data set consists of annual observations for the period 1996–2016 in a bilateral framework between Russia and its 48 major partners. The sample size and period of study are principally limited by the degree of data availability on bilateral trade.

Following [6], the dependent variable is bilateral real total exports ($E$) measured as the ratio of total exports (in U.S. dollars) to the USA consumer price index (2010 = 100). On average, $E$ equals US$4.404.001 (SD = US$7.367.241). To provide a better idea about the performance of bilateral Russian exports Figure 1 shows the average bilateral real exports as a ratio of Russian real GDP over the period 1996–2016. Exports considerably increased from 1999 to 2008, but we can observe two relevant falls as a result of the global financial crisis in 2008 and RUR’s plunge in 2014–2015 triggered by Ukraine-related events and sharp fall in international oil prices.

Real bilateral exchange rate and the real income of partner countries are the key explanatory variables of the volume of bilateral exports. This research measures the real exchange rate ($RER$) as 1 partner’s currency to RUR and uses the real GDP ($Y$) to approach income elasticity. Note that the higher $RER$, the larger the depreciation of RUR. The data to calculate $RER$ were taken from IFS, where information is in national currency per U.S. dollar, period average. Then, data were converted to RURs per national currency, and like other authors, due to data availability, consumer price index (CPI) is used to obtain real exchange rates [6]. Figure 2 shows the real exchange rate of U.S. dollar and Euro to RUR over the period 1996–2016.

In the case of Eurozone countries, the role of export composition ($EC$) in explaining export performance has been underlined in [6]. The evidence suggests a positive effect on bilateral export volume of exports consisting of higher shares of high technology goods (high added value goods with an inelastic demand). In the Russian case, these goods represent a low percentage of Russian exports, in our sample the average is 0.02 (SD = 0.05). On the contrary, crude petroleum and natural gas are highly relevant in Russian exports, the sample average
is 0.33 (SD = 0.25). Figure 3 shows the trend of this variable over the years 1996–2016.

Because the demand of crude petroleum and natural gas is inelastic and these products are highly relevant in Russian exports, this research claims that this kind of export composition should also positively affect export performance. Following [6], the baseline model to test this hypothesis is given by equation (1):

\[
\ln E_{Pt} = \beta_0 + \beta_1 \ln Y_{Pt-1} + \beta_2 \ln E_{Pt-1} + \beta_3 \ln RER_{Pt-1} + \beta_4 \ln EC_{Pt-1} + \beta_5 Z_{Pt} + e_p + v_{Pt}
\]

Subscripts \( p \) and \( t \) indicate partner country and time. \( \ln \) indicates a logarithmic transformation of the variables, consequently, the coefficients measure elasticities. \( Z \) represents control variables: yearly oil price, time dummy variables, and dummy variables for Commonwealth of Independent States (CIS), Central Eastern European countries (CEE) and Western European countries (WEC), capturing all factors that are constant over time and particular between these groups of countries and Russia. The hypothesis state that \( E \) depends positively upon the level of \( Y_p \) and \( RER_p \). That is, higher income of partner countries and a relative depreciation of RUR should favor Russian exports.

The main variable of interest is \( EC \) and the hypothesis of primary interest states that increases in the share of crude petroleum and natural gas in exports increases bilateral total exports. In addition, we expect that \( EC \) affects income and price elasticities. Interaction terms are included in the model to verify impacts on these elasticities.

It is worth noticing the autoregressive nature of the variables under study, subsequently, the autoregressive characteristics of the model. Given this, the econometric literature and previous studies recommend the use of dynamic panel data models [6, 11]. Explicitly, the use of DIF GMM estimator [12] or SYS GMM estimator [13]. However, the use and importance of these methods has been underappreciated because of particular concerns on the assumptions required by them. Specifically, in the research developed by Wiers et al., (2014), analyzing Eurozone countries, the DIF GMM estimator did not pass the Sargan test to validate internal instruments.

In addition, note that the highly autoregressive characteristics of the variables under study may bias the DIF GMM estimator [14, 15]. Consequently, the SYS GMM method in two steps is a better option to estimate the coefficients in equation (1). To ensure efficiency and consistency the method requires valid internal instruments (verified by the Sargan test) and non-serial correlation of second order (verified by the Arellano-Bond test). To account for the potential problem of too many instruments in the SYS GMM estimator, it was allowed a maximum of 2 lags of dependent and independent variables as instruments [16].

**RESULTS**

Table shows the main results of the regression analysis. Note that the lagged dependent variable as regressor is statistically significant at the 1% level in all regressions, justifying the use of dynamic models. Moreover, the Sargan tests validate the internal instruments and serial correlation of second order is rejected in all regressions.

The estimated coefficients of the baseline model, given by equation (1), are reported in the column (1). The coefficient of partner’s income (\( Y_{Pt} \)) is positive and statistically significant at the 1% level, as the theory predicts. That is, Russia exports more products to partner countries with higher levels of income. On the contrary, the coefficient of bilateral real exchange rate (\( RER_{Pt} \)) is negative and statistically significant at the 1% level. That is, a larger bilateral depreciation of RUR implies that Russia exports less to the partner country. Moreover, the lagged partner’s income (\( Y_{Pt-1} \)) and the lagged real exchange rate (\( RER_{Pt-1} \)) present opposite signs, negative and positive, respectively. A similar situation was observed in [6].

Consequently, other two regression models were estimated to check robustness of results in the main specification. In column (2) the regressors do not include lagged variables and in column (3) the regressors include only lagged variables. Now, the evidence supports the statistical hypothesis on income elasticity (positive), but there are no robust results regarding price elasticity. In column (2) the coefficient of \( RER_p \) is negative and is not statistically significant, while in column (3) it is positive and statistically significant. Maybe, the depreciation has a positive impact on export performance only after some time, similar to a J-curve [17, 18].

The most important result for this research is the positive and statistically significant coefficient of export composition (\( EC_{Pt} \)) in the baseline regression (column 1). Therefore, a higher share of crude petroleum and natural gas in exports is positively linked to higher levels of bilateral total exports, as it was hypothesized. Note that in column (3) the coefficient of \( EC_{Pt-1} \) is negative,  

\[ 1 \text{ Note that this research is not focused on tests for J-curves and/or the determinants of bilateral trade balance.} \]
suggesting that the current composition matters for export performance.

In column (4) the baseline model is estimated adding interaction terms to verify impacts of export composition on income and price elasticities. The results are similar to those reported in column (1), yet with key differences. Now, the coefficient of $EC_{p}$ is negative and statistically significant (against the working hypothesis) and the interaction terms ($lnY_{p} \times lnEC$ and $lnRER \times lnEC$) have positive and statistically significant coefficients. Therefore, export composition essentially affects export performance due to impact on income and price elasticities. This result is particularly robust in the case of income elasticity. Again, in the case of price elasticity, the results are mixed, suggesting that the lagged $RER_{p-1}$ is positively linked to export performance and the current $RER_{p}$ is negatively linked (columns 5 and 6).

It is worth noticing that the control variables present positive and statistically significant coefficients in all regressions. As it was expected, the dummies by groups of countries indicate that CIS, CEE and WEC countries have higher levels of bilateral exports with Russia than the countries in the reference group (which includes smaller countries). Moreover, the coefficient of oil price is positive and statistically significant in all regressions at the 1% level. Therefore, the recent fall in oil prices is not strong enough to negatively affect real bilateral exports.

As additional tests of robustness the regression analysis was replicated using growth rates of the variables under study and using other methods, such as

| Table. Regression results, dependent variable ln E (bilateral real total exports) |
|---------------------------------|------------|------------|------------|------------|------------|------------|
| Lagged Dependent (ln $E_{t-1}$) | 0.42***    | 0.37***    | 0.51***    | 0.36***    | 0.35***    | 0.31***    |
| Partner’s income (ln $Y_p$)     | + 2.83***  | 0.39***    | 2.59***    | 0.42***    | 2.08***    | 0.44***    |
| Lagged partner’s income (ln $Y_{p-1}$) | -2.46***  | 0.42***    | -0.22***   | -0.42***   | -0.04***   | 0.02*      |
| Real exchange rate (ln RER)     | + -0.21*** | -0.02      | -0.27***   | -0.04**    | 0.02***    | 0.02**     |
| Lagged real exchange rate (ln RER$_{t-1}$) | 0.18***   | 0.02***    | 0.17***    | 0.02***    | 0.02***    | 0.02***    |
| Export composition (ln EC)      | + 0.03***  | 0.03***    | -0.95***   | -0.57***   | -0.01**    | -0.01***   |
| Lagged export composition (ln EC$_{t-1}$) | 0.01***   | -0.01**    | 0.01***    | 0.00***    | 0.001***   | 0.001***   |
| Interaction 1 (ln $Y_p \times ln EC$) | 0.003**    | -0.004**   | 0.004**    | 0.004**    | 0.004**    |
| Interaction 2 (ln RER $\times$ ln EC) | 0.109***  | 0.54*      | 0.53***    | 0.19***    | 0.65**     | 0.83***    |
| CIS                              | 1.24***    | 1.13***    | 1.66***    | 1.37***    | 0.96***    | 1.53***    |
| CEE                              | 0.79***    | 0.77***    | 0.64***    | 0.87***    | 0.84***    | 0.95***    |
| WEC                              | 0.01***    | 0.01***    | 0.01***    | 0.01***    | 0.01***    |
| Oil price                        | -2.22***   | -1.93***   | -5.08***   | -4.99***   | -2.46***   | -2.53***   |
| Observations                     | 587        | 659        | 649        | 587        | 659        | 587        |
| N × T                            | 46 × 20    | 48 × 20    | 48 × 20    | 46 × 20    | 48 × 20    | 46 × 20    |
| Sargan test                      | 41.52      | 45.79      | 45.21      | 39.08      | 43.06      | 41.85      |
| (p-value)                        | (0.85)     | (0.01)     | (0.01)     | (0.01)     | (0.01)     |
| First order serial               | -4.06      | -3.98      | -4.41      | -3.89      | -3.90      | -3.98      |
| correlation test                 | (0.00)     | (0.00)     | (0.00)     | (0.00)     | (0.00)     |
| (p-value)                        | 0.10       | 0.66       | 1.17       | -0.05      | 0.46       | 0.94       |
| Second order serial              | (0.91)     | (0.50)     | (0.24)     | (0.95)     | (0.64)     | (0.34)     |
| correlation test                 | (0.00)     | (0.00)     | (0.00)     | (0.00)     | (0.00)     |
| (p-value)                        | Partner’s income (ln $Y_p$) | + 0.64  | 0.62  | 0.86  | 0.80  | 0.66  | 0.64  |
| Real exchange rate (ln RER)      | + -0.05   | -0.03   | 0.04   | -0.08   | -0.06   | 0.03   |
| Export composition (ln EC)       | + 0.06    | 0.05    | -0.02  | -1.45   | -0.88   | -0.01  |

Notes: The SYS GMM estimator provides short-run coefficients. To obtain long-run coefficients it is necessary to divide the short-run coefficient (plus the lagged independent coefficient) by 1 minus the coefficient of the lagged dependent variable.

(*) [**] and {***} indicate statistical significance at the (10%) [5%] and (1%) levels.
the DIF GMM estimator, fixed effects, random effects and the fixed effects corrected model as proposed in [19]. These results (not reported) are similar to those presented in Table, supporting the main findings.

* * *

This research employed dynamic panel data models to estimate the effects on bilateral exports caused by its composition for the Russian case, where the share of crude petroleum and natural gas in total exports is high. These are inelastic export products, and the author’s findings point to a positive link between their share in exports and volume of bilateral trade. However, the indirect effects conditioning income and price elasticities are more relevant than the direct effects. These conclusions agree with the case of the Eurozone countries where high technology products are strategic in export composition [6]. Here the key difference is a suggestion: we should not focus only on high-tech or top range products. The clue in export composition to affect export performance is a high share of inelastic exports products (and/or high added value goods as in the Eurozone case).

Therefore, in addition to partner’s income and bilateral real exchange rate, export composition is a significant variable in explaining export performance. Moreover, this provides an additional explanation of the persistent Russian surplus in both the trade account and the current account. Subsequently, this also partially explains persistent external imbalances in other countries, for example, in the USA, China, and several European countries [1, 3, 5, 6, 20].

From a policy perspective, the findings indicate that persistent external imbalances may be explained by export composition, at least in part. Therefore, a price competitiveness strategy based on the depreciation of the domestic currency, a typical short-term policy to adjust external imbalances, may not be successful if the export composition is not taken into account. In the Russian case, the persistent trade and current account surplus is likely to be seen by the policy makers as a desirable outcome. However, the surplus implies that the rest of the world is in debt with Russia, they do not pay interests, and the Russian production satisfies the external demand in addition to the domestic demand, which is ultimately likely to create inflation. To reverse this situation, when it is considered necessary, a price competitiveness strategy may be adopted, but policy makers should take into account the particular characteristics of the nation’s export composition.

REFERENCES


**РОССИЯ: КАК ДОЛЯ СЫРОЙ НЕФТИ И ПРИРОДНОГО ГАЗА В ЭКСПОРТЕ ВЛИЯЕТ НА ЕГО ОБЪЕМ?**

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Эмпирически доказано, что значительная доля в экспорте высокотехнологичных товаров с высокой добавленной стоимостью, спрос на которые неэластичен, положительно влияет на его объем. Иначе говоря, для объяснения динамики экспорта важен учет его структуры. Автор проверяет связь между объемом экспорта России и долей в нем сырой нефти и природного газа. Эти товары являются ключевыми в российском экспорте, причем спрос на них неэластичен. С помощью регрессионных моделей автором установлено, что применительно к РФ более высокая доля сырой нефти и природного газа в экспорте положительно коррелирует с его объемом в рамках двусторонней торговли. Однако такая зависимость является главным образом результатом косвенных последствий структуры российского экспорта, а именно его неэластичности по цене и по уровню доходов в странах-контрагентах. Данный вывод помогает лучше понять природу хронического профицита внешнеторгового баланса и счета текущих операций платежного баланса РФ, а также сформулировать рекомендации по управлению этими диспропорциями.

Ключевые слова: структура экспорта, объем экспорта, внешний дисбаланс, нефть, природный газ, Россия.

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