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Export and import composition as determinants of bilateral trade in goods: evidence from Russia

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ABSTRACT

Conventional theory and several empirical studies state that incomes and exchange rates are the key determinants of the trade balance. Here, we argue that export and import composition are also key explanatory variables because some goods are inelastic and/or with a high added value, directly and indirectly affecting income and price elasticities and trade balance. Thus, if exports and/or imports significantly consist of price inelastic products, then, a positive and a negative effect, respectively, should be expected on the trade balance. Using bilateral trade data and dynamic panel models, we found that the ratio of exports of crude petroleum and natural gas (price inelastic goods) to total exports is significantly and positively associated with the Russian trade balance in goods. For its part, Russian imports of high-tech goods (income elastic and price inelastic with a high added value) show a negative association. The goods balance of Russia also responded to changes in relative income, but there is only weak evidence of reactions to changes in the exchange rate. These findings partially explain the persistent surplus in the Russian trade balance and current account.

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KEYWORDS
Export composition; import composition; trade balance; crude petroleum and natural gas; high-tech goods

1. Introduction

Since the 1980s, several countries have been involved in four generations of external imbalances of global significance, including the United States (USA), East Asia, oil/commodities exporting countries and within the European Union/Eurozone (Belke & Schnabl, 2013; Brissimis, Hondroyiannis, Papazoglou, Tsaveas, & Vasardani, 2013; Carrasco & Hernandez-del-Valle, 2017; Carrasco & Serrano, 2015; Duarte & Schnabl, 2015; Gu, Zhou, & Beg, 2014; Navoi, 2017). By definition, the current account shows the income–expenditure relationship of a country, and the difference between national savings and investment. However, persistent current account deficits are unsustainable in the long-term since they are reflected in increasing external debt. In many countries, the trends over the last three decades show the unsustainability of growing imbalances which could lead to excessive indebtedness and a balance of payments crisis (Aristovnik, 2007, 2008; Carrasco & Serrano, 2015).

Russia was not exempt from the persistence of such imbalances. Since 1994, and excluding 1997, Russia has presented a positive balance in its current account (5.7% of GDP on average in the period 1994–2016). Note that this surplus is explained by

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the trade balance performance. Since 1994, Russian trade balance – exports of goods and services minus imports of goods and services – has been positive (8.9% of GDP on average in the period 1994–2016). On the contrary, many Central and Eastern European countries and former Soviet countries have been presenting deficits (Aristovnik, 2007, 2008). Russia clearly differs from these countries, and its case deserves a specific analysis.

As a major transition country, Russia is currently a key player participating in international trade. Several reasons explain its relevance. First, Russia, due to its size, has geographical borders with some of the leading regions in terms of trade, income and growth, such as the European Union and the dynamic economies of South Asia. Secondly, Russian exports of crude petroleum and natural gas accounted for around 27–47% of total exports of goods over the period 1996–2016. Note that exports of crude petroleum and natural gas are key inelastic inputs for the world productive system (Cooper, 2003; Krichene, 2002), which turns Russia into a geostrategic trade player of the world economy. Finally, starting in the 2000s, there has been a boom in the price of commodities and raw materials – including crude oil and natural gas – which has increased significantly the amount of exports of the Russian economy. However, like other commodities and raw materials, crude petroleum and natural gas prices are highly volatile which is reflected in the variability of the share of these goods in the total trade exports of Russia.

On the other hand, the main imported goods of the Russian economy are foodstuffs, chemicals and heavy engineering equipment (Obolenskii, 2016); the latter is characterised by belonging to high-tech industries. The link between import composition, especially capital imports, and economic growth for developing countries has been highlighted in the economic literature through the effects on investment composition and capital stock (Caselli & Wilson, 2004; Lee, 1995; Raveh & Reshef, 2016). If capital goods imports are relevant for effects of foreign trade on long-run growth, then, it can also be expected that imports of high-tech industries are significant determinants of the trade balance, especially in a major transition country such as the case of Russia.

Now, is the size and persistence of the Russian external surplus something to be worried about? A persistent deficit may be a problem because it can lead to excessive indebtedness and a balance of payment crisis (Aristovnik, 2007, 2008). On the other hand, a persistent surplus may be a problem because it indicates a lower investment in relation to national savings. However, a surplus could reflect precautionary savings in the case of countries exporting commodities and raw materials, which are characterised by high price volatility (Bems & de Carvalho Filho, 2011; Kilian, Rebucci, & Spatafora, 2009; Le & Chang, 2013), as in the case with Russia. This strategy allows hedging against fluctuations in commodity prices. Therefore, the management of the Russian external surplus is strategic for its future development, so it is necessary to know its determinants. Given this, the present research is motivated by the following questions: which are the key determinants of the Russian trade balance in goods? And particularly, which is the role played by export and import composition in determining the Russian trade balance?

To analyse the Russian external surplus determinants, the bilateral nature of trade sheds light on the role of the relative differences between trade partners. As stated in Khan and Hossain (2012), the determinants of the overall external balance differ from the determinants of the bilateral balance. Thus, we focus on the bilateral trade relationship of Russia with 54 trade partners[1] accounting for the 89% of Russian exports in 2016.

At a theoretical level, the key determinants of Russian trade balance surplus should be relative income to its major partners and the exchange rate (Bineau, 2016; Çelik & Kaya, 2010; Gu et al., 2014; Khan & Hossain, 2010, 2012). Nonetheless, these associations have not been tested before; thus, the estimation of the impact of these variables is the first contribution of this research. Secondly, this is the first study including export and import composition as explanatory variables. Recent studies for Eurozone countries (Wierts, Van Kerkhoff, & De Haan, 2014) and Russia (Tovar-García, 2018) stated that export composition is positively linked to export performance, specifically when exports consist of inelastic goods and/or with a high added value, for instance, high-tech products. Accordingly, this research extends the relevance of export and import composition in explaining trade balance. It is expected that Russian exports greatly consisting of petroleum and natural gas can also explain bilateral trade balance, because of the inelastic nature of this kind of product. For its part, imports of high-tech industries should negatively affect trade balance, because these goods are income elastic and price inelastic with a high added value. Moreover, Russian imports from Europe account for about 33–48% of total Russian goods imports. Since high-tech exports are significant determinants of Eurozone export performance (Wierts et al., 2014), the composition of imports – the share of high-tech imports – should also be a key explanatory variable of Russian trade balance.

2. The recent performance of Russian external balance

A relevant fact about the Russian economy is the diversification of its trade partners. Since the breakdown of the USSR, Russia has been a relatively more open economy while changing the importance of its trade partners. In the past, its major partners were ex-Soviet and ex-Socialist countries (Djankov & Freund, 2002; Langhammer, 1991). This past is still a key determinant of Russia's major partners. Currently, around 12% of Russian international trade occurs with the Commonwealth of Independent States (CIS), mainly with Belarus, Kazakhstan and Ukraine. However, by economic bloc, the European Union is the most important partner of Russia (42.9% of international trade), mainly Netherlands, Germany, Italy, France and Poland. Other major partners are the dynamic South Asian countries (with an increasing share) and the USA (Federal'naya tamozhennaya sluzhba, 2017).

Figure 1 shows the share of Russian goods exports and imports to different regions (% of total goods exports and imports, respectively). In our sample, we include seven regions[2] consisting of 54 trade partners. European countries are the main destination of Russian exports (between 39.6% and 61.2% during the period 1996–2016) and imports (between 33% and 48.4%). Moreover, Asian countries have been gaining share in the past years (from 13% in 1998 to a peak of 25.9% in 2016 in exports and from 7.9% to 32.8% in imports). By contrast, non-EU post-Soviet countries have been losing relevance (from 17.6% in 1998 to 11.4% in 2016 in exports and from 29.7% in 2000 to 9.7% in 2016 in imports). Another relevant trade partner bloc is the USA and Canada with a share of between 2.0% and 7.3% in exports and between 4.7% and 9.9% in imports in the same period.

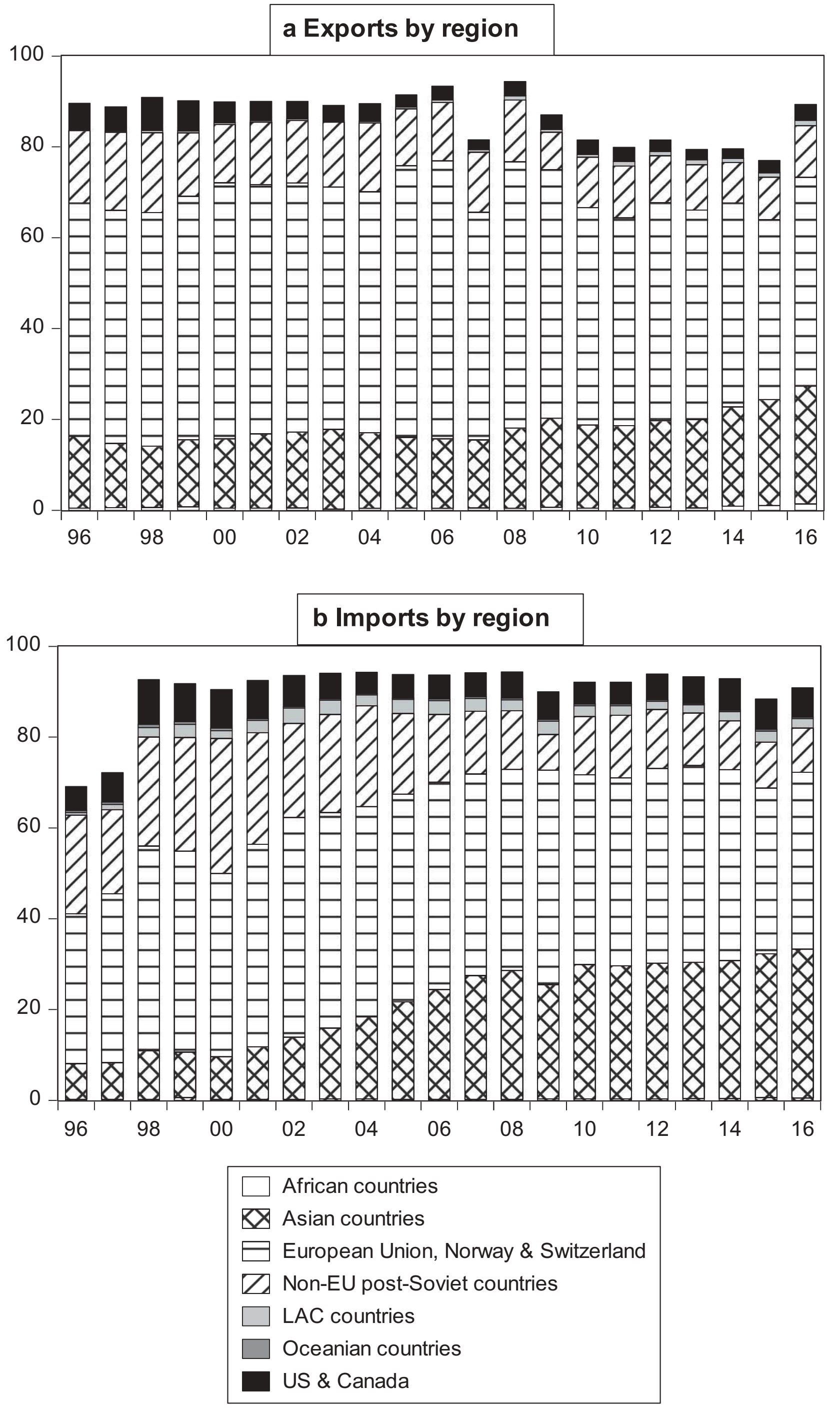

Figure 1. Share of exports and imports by region (% total goods exports and goods imports).
Source: STAN Bilateral Trade Database–Organisation for Economic Co-operation and Development.

Figure 2 shows the trend of key Russian macroeconomic indicators. First, note that after 1994, Russian trade openness has been higher than 46%, yet recently a decreasing trend has been observed (see Figure 2(a)). Particularly relevant, from 1993 and on, the Russian current account has been in a permanent and persistent surplus with a peak of 16.3% in 2000 and a decreasing trend since then (see Figure 2(b)). In this regard, the balance of goods and services is the major component of the Russian current account. Furthermore, for the case of Russia, the current account and the balance of goods and services have followed a parallel trend (with the only exception being in 1992). That is, in the available data sample, the balance of goods and services has also been in a persistent surplus.

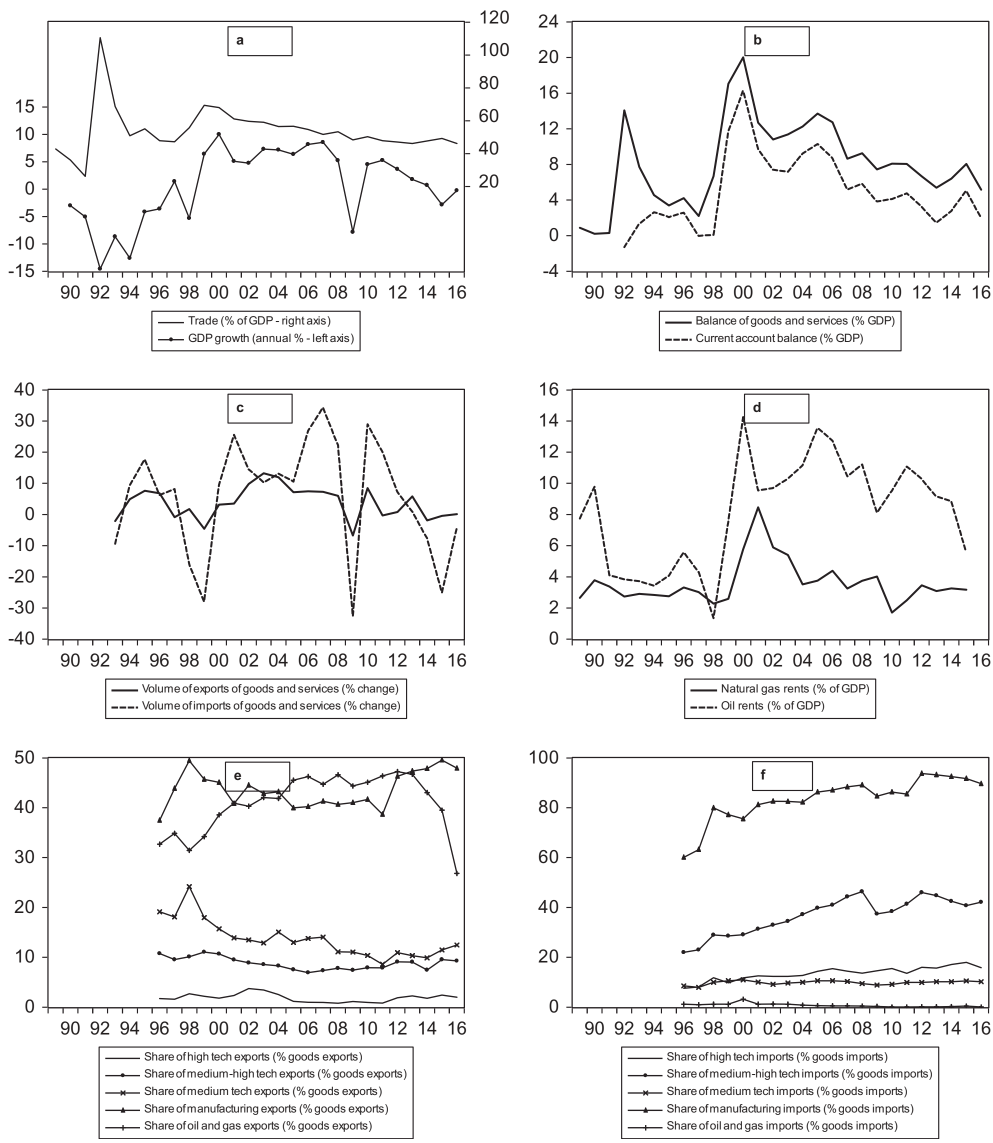

Figure 2. Selected variables of the Russian economy.
Source: World Development Indicators, OECD and International Monetary Fund.

In Russia, the share of crude petroleum and natural gas in the total exports of goods is significantly high (between 27% and 47% during the period 1996–2016) while the share of high-tech exports is relatively low (between 0.78% and 3.71% during the same period). Consequently, we could expect a higher influence of crude petroleum and natural gas exports on Russia's bilateral balance. Additionally, there is no clear pattern between total goods exports and the export composition by technological intensity (see Figure 3). On the contrary, the share of crude petroleum seems to play a relevant role in explaining export performance.

On the other hand, the relationship between import composition and total goods import is different (see Figure 4). For instance, if the sample is restricted to the 2000–2016 period, i.e. eliminating the years around the Russian crisis of the late 1990s, there is a positive relationship between high-tech and medium-high tech imports and import performance. This relationship is not clear when including medium tech and medium-low tech imports. Additionally, the share of oil and gas imports fluctuates around a minimum of 0.02% in 2016 and 3.1% in 2000, thus, the role of oil and gas imports could be expected as not relevant for determining the trade balance of the Russian economy.

It is important to note the significant differences regarding the share of oil and gas in exports and imports (Figure 2(e, f)). In the case of exports, oil and gas exports account for up to 47% of total goods exports.[3] By contrast, as we can expect, imports of oil and gas reach a maximum of 3.1% of total goods imports in the same period. Thus, while the share of oil and gas exports could be a potential determinant of trade balance through its effects on export performance (Tovar-García, 2018), the role of oil and gas imports is marginal.

In the case of goods imports, the major trade partner (by region) of the Russian economy is Europe. In this line, Wierts et al. (2014) highlight the role of export composition – namely the share of high-tech exports – as a key determinant of European countries' export performance. Therefore, we can expect import composition – the share of high-tech imports – to be a key explanatory variable of Russian import performance and, consequently, of Russian trade balance.

Previous studies included export composition to analyse export performance, productivity and economic growth. The major findings suggest positive effects of export composition and export diversification on economic growth (Aditya & Acharyya, 2013; Ghatak, Milner, & Utkulu, 1997), especially when transiting from primary exports to manufacturing exports (Fosu, 1990; Ghatak et al., 1997; Herzer, Nowak-Lehmann, & Siliverstovs, 2006).

The relevance of import composition (especially capital goods imports) for economic growth in developing countries has also been analysed in the empirical economic literature. The main findings indicate that import composition largely determines investment composition and capital stock (Caselli & Wilson, 2004; Raveh & Reshef, 2016).

Recently, and more relevant for this research, Wierts et al. (2014) and Tovar-García (2018) analysed the role of export composition in export performance and found a positive relationship between the share of high-tech exports and export performance in the European case, and between the share of oil and gas exports and export performance in the Russian case. Nevertheless, the role of export and import composition in determining the bilateral goods balance has not been tested in-depth. In this article, we add to this literature using and focusing on key characteristics of the Russian economy.

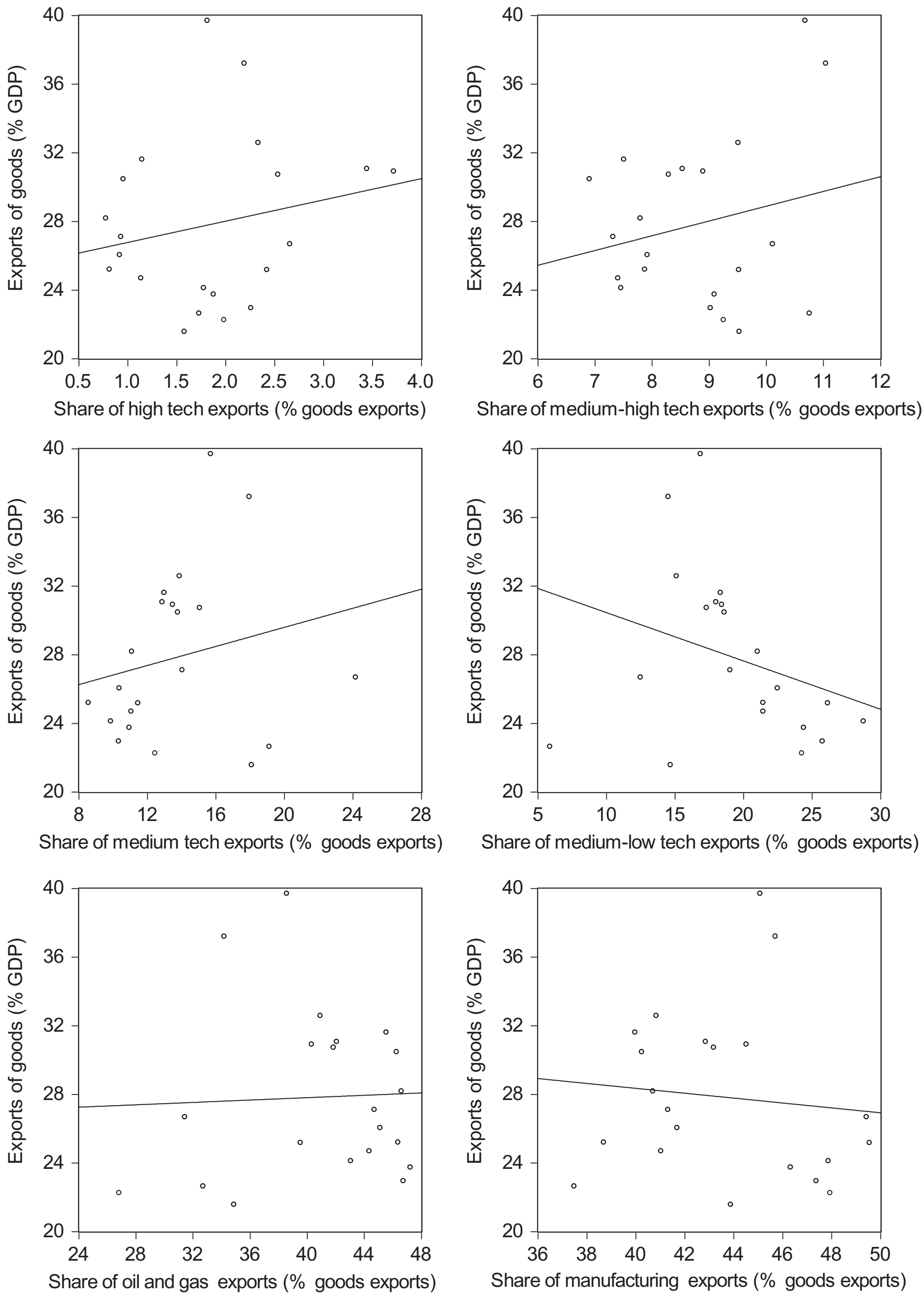

Figure 3. Exports of goods (% GDP) and export composition of Russia.
Source: STAN Bilateral Trade Database–Organisation for Economic Co-operation and Development.

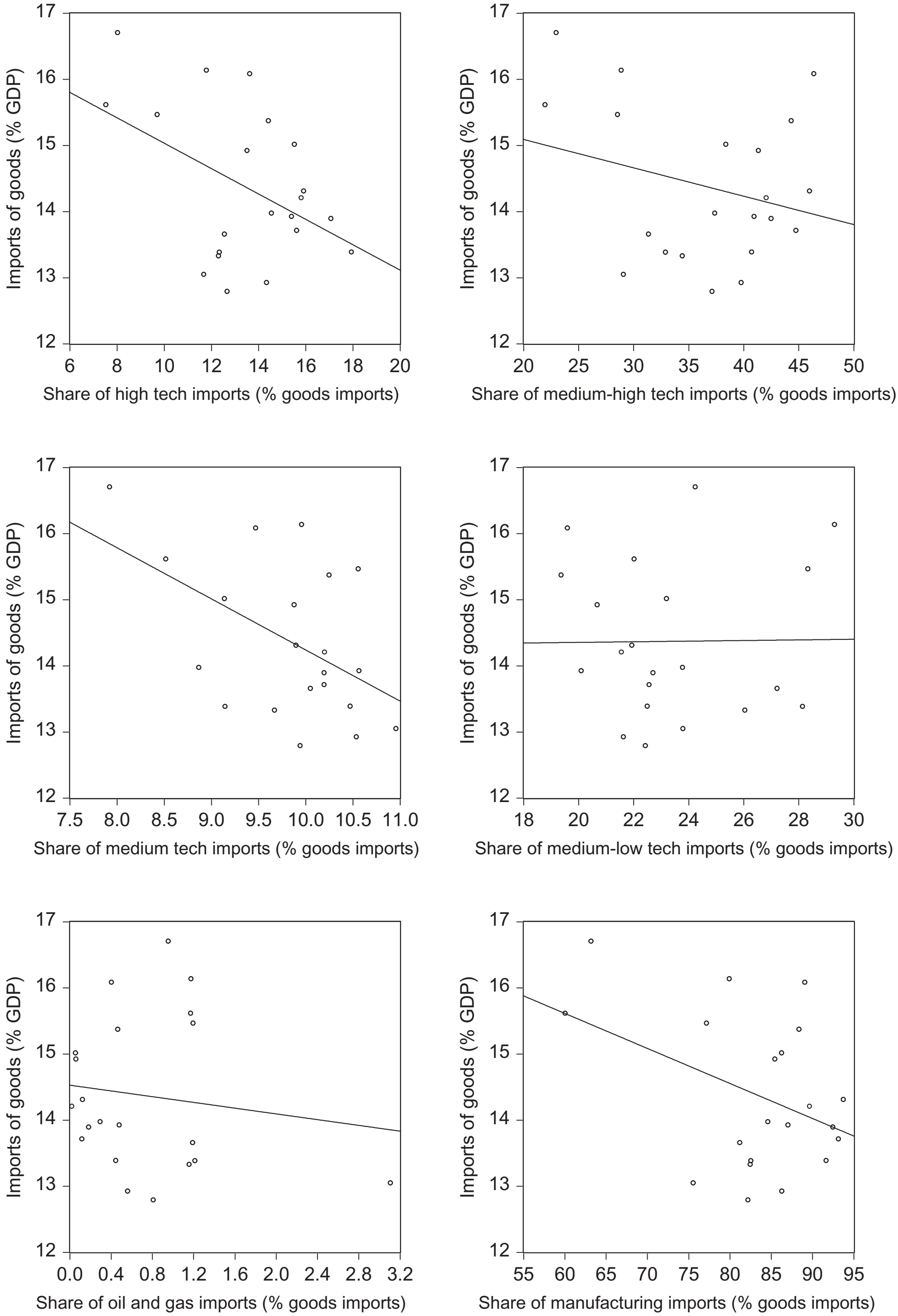

Figure 4. Imports of goods (% GDP) and import composition of Russia.

Source: STAN Bilateral Trade Database–Organisation for Economic Co-operation and Development.

3. Data and empirical specification

The core data were taken from the OECD, specifically the STAN Bilateral Trade Database by Industry and End-use category (BTDIxE) and from the World Bank, namely World Development Indicators (WDI). The dataset consists of annual observations on bilateral trade between Russia and 54 of its major partners, accounting for around 89% of Russian trade, over the period 1996–2016. However, we lost several observations in the regression analysis, where we included a maximum of 41 trade partners.

The dependent variable is bilateral trade balance (*TB*), measured as the ratio of total exports to total imports of goods. In this manner, we obtain a unit-free measure and positive numbers allowing a logarithmic transformation of the variable. These variables were drawn from BTDIxE and the size of the sample is mainly limited by the degree of data availability on this variable. On average, *TB* equals 12.46 (*SD* = 143.73). Figure 2 provides a general perception of the behaviour of the key dependent variable; it shows the trends in the trade balance and the current account of Russia with the world over the period 1989–2016.

Following the literature, there are two key explanatory variables: relative income and exchange rate (Bineau, 2016; Çelik & Kaya, 2010; Gu et al., 2014; Khan & Hossain, 2012). To estimate income elasticity, we use the ratio of a partner's real GDP per capita to Russian real GDP per capita (Y_P/Y_R). On average, this variable equals 2.69 (*SD* = 2.49). To estimate price elasticity, we use the real effective exchange rate index (*REER*), measured as the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.[4] We estimated a relative appreciation/depreciation (*RD*) using the ratio of the change in partner's *REER* ($REER_{Pt}/REER_{Pt-1}$) to the change in Russia's *REER* ($REER_{Rt}/REER_{Rt-1}$). On average, *RD* equals 1.008 (*SD* = 0.14). These variables were drawn from WDI.

Thus, using bilateral data, the baseline trade model[5] previously estimated in Turkey (Çelik & Kaya, 2010), Bangladesh (Khan & Hossain, 2012), China (Gu et al., 2014) and Cambodia (Bineau, 2016) is given by Equation (1):

$$lnTB_{Pt} = \beta_{0P} + \beta_1 lnY_P/Y_{R,\,t} + \beta_2 lnRD_{P,t} + e_P + v_{Pt} \tag{1}$$

In indicates a logarithmic transformation of the variables; in this manner the coefficients measure elasticities. Subscripts 'P', 'R' and *t* indicate partner country, Russia and time, respectively. The hypotheses claim that *TB* depends positively upon the level of Y_P/Y_R and *RD*. That is, countries with higher income, in comparison to Russia, should be able to import more products from Russia improving Russian trade balance in goods. In addition, the higher the *RD*, the cheaper the rouble, in relation to partner country, stimulating the demand of products from Russia and improving Russian trade balance.

We add export and import composition to this baseline model. Some export and import products are inelastic, for instance, petroleum, natural gas and high-tech goods (Cooper, 2003; Krichene, 2002; Wierts et al., 2014). If these inelastic products are a relevant proportion of total exports and/or imports, then, there are reasons to think that relative income and exchange rate will not, or will only weakly, affect trade balance. In this regard, in our sample, high-tech goods are only 2.4% of total Russian exports and 12.9% of total Russian imports. Thus, to test the relevance of export and import composition, in the Russian case, oil and natural gas are the most adequate set of export products and high-tech goods are the most adequate set of import products, due to the role of capital imports on economic growth in developing economies.

To measure export and import composition effects, we use the ratio of exports of petroleum and natural gas to total exports (*EC*) and the ratio of imports of high-tech goods to total imports (*MC*). On average, *EC* equals 0.33 (*SD* = 0.25) and *MC* equals 0.129 (*SD* = 0.13). This variable was drawn from BTDIxE.

Thus, the extended model is given by Equation (2), where we expect a positive association between *TB* and *EC* and a negative association between *TB* and *MC*.

$$lnTB_{Pt} = \beta_{0P} + \beta_1 lnY_P/Y_{R,\ t} + \beta_2 lnRD_{P,t} + \beta_3 lnEC_{P,t} + \beta_4 lnMC_{P,t} + \beta_5 X + e_P + v_{Pt} \quad (2)$$

where *X* represents control variables: yearly oil price, time dummy variables for crisis years and dummy variables by group of countries, for Commonwealth of Independent States (CIS), Central Eastern European countries (CEE) and Western European Countries (WEC).

As in previous empirical studies (Bineau, 2016; Çelik & Kaya, 2010; Gu et al., 2014; Khan & Hossain, 2012), we firstly tested stationarity. We used those tests not requiring strongly balanced data, Im–Pesaran–Shin (IPS) and Fisher-type, including combinations of constant and trend. The main results are reported in Table 1. The tests suggest that only the relative income (ln Y_P/Y_R) has unit root. These results differ from previous studies, where most of the variables had unit root, and as a result, panel cointegration analysis was required.

Therefore, in the Russian case, we can proceed with typical regression analysis using panel data. However, it is important to recognise that trade balance is a variable of autoregressive nature. That is, TB_{t-1} is a good predictor of TB_t. Given this, the econometric literature suggests the use of dynamic panel data models, namely the DIF GMM estimator (Arellano & Bond, 1991) and the SYS GMM estimator (Blundell & Bond, 1998). This has been already noted in the literature on the determinants of external imbalances, but the relevance of these methods is neglected because of specific concerns on the assumptions required by them. For example, there are no tests on autocorrelation in the case of Bangladesh (Khan & Hossain, 2012) and the validity of the internal instruments is rejected in the case of current accounts in emerging countries (Duarte & Schnabl, 2015).

Moreover, the dependent and independent variables may present highly autoregressive characteristics, biasing the DIF GMM estimator (Blundell, Bond, & Windmeijer, 2001; Bun & Windmeijer, 2010). Consequently, the SYS GMM in two steps is the main method used in this research. This method ensures efficiency and consistency once the internal instruments are validated and in the absence of autocorrelation of second order (Baltagi, 2005).

4. Results

Table 2 presents the main results of the regression analysis. The used method is SYS GMM in two steps, including a maximum of one lag of dependent and independent variables as instruments.[6] Note that the SYS GMM estimator provides short-run coefficients. To obtain long-run coefficients it is necessary to divide the short-run coefficient by 1 minus the coefficient of the lagged dependent variable.

Table 1. Panel unit root tests.

Variable	IPS	Fisher Dickey–Fuller	Fisher Phillips–Perron
ln *TB* constant	−4.75*	Inverse chi-squared 186.15* Inverse normal −3.66* Inverse logit −4.28* Modified inv. chi-squared 5.31*	Inverse chi-squared 184.68* Inverse normal −4.22* Inverse logit −4.57* Modified inv. chi-squared 5.21*
ln *TB* constant and trend	−5.48*	Inverse chi-squared 230.66* Inverse normal −5.50* Inverse logit −6.31* Modified inv. chi-squared 8.34*	Inverse chi-squared 164.48* Inverse normal −3.64* Inverse logit −3.69* Modified inv. chi-squared 3.84*
ln Y_P/Y_R constant	0.75	Inverse chi-squared 81.96 Inverse normal 0.86 Inverse logit 0.94 Modified inv. chi-squared −1.77	Inverse chi-squared 57.18 Inverse normal 3.47 Inverse logit 3.36 Modified inv. chi-squared −3.45
ln Y_P/Y_R constant and trend	7.06	Inverse chi-squared 43.55 Inverse normal 7.45 Inverse logit 7.50 Modified inv. chi-squared −4.38	Inverse chi-squared 25.75 Inverse normal 10.44 Inverse logit 10.85 Modified inv. chi-squared −5.59
ln *RD* constant	−14.41*	Inverse chi-squared 435.63* Inverse normal −15.82* Inverse logit −18.68* Modified inv. chi-squared 27.6*	Inverse chi-squared 401.98* Inverse normal −15.14* Inverse logit −17.24* Modified inv. chi-squared 24.9*
ln *RD* constant and trend	−9.74*	Inverse chi-squared 276.74* Inverse normal −10.71* Inverse logit −11.46* Modified inv. chi-squared 15.2*	Inverse chi-squared 256.56* Inverse normal −10.34* Inverse logit −10.68* Modified inv. chi-squared 13.6*
ln *EC* constant	−5.42*	Inverse chi-squared 163.43* Inverse normal −3.18* Inverse logit −4.34* Modified inv. chi-squared 5.9*	Inverse chi-squared 327.17* Inverse normal −7.24* Inverse logit −11.03* Modified inv. chi-squared 17.6*
ln *EC* constant and trend	−0.80	Inverse chi-squared 90.77 Inverse normal 0.28 Inverse logit −0.09 Modified inv. chi-squared 0.36	Inverse chi-squared 192.6* Inverse normal −3.27* Inverse logit −5.45* Modified inv. chi-squared 7.6*
ln *MC* constant	−5.48*	Inverse chi-squared 184.33* Inverse normal −4.22* Inverse logit −4.80* Modified inv. chi-squared 5.19*	Inverse chi-squared 225.83* Inverse normal −6.26* Inverse logit −6.61* Modified inv. chi-squared 8.01*
ln *MC* constant and trend	Insufficient number of time periods to compute	Inverse chi-squared 1.42* Inverse normal −2.07* Inverse logit −2.08* Modified inv. chi-squared 2.34*	Inverse chi-squared 191.52* Inverse normal −3.65* Inverse logit −3.85* Modified inv. chi-squared 5.68*

Ho: All panels contain unit roots.
* Indicates significance at 1% levels.

Column (1) presents the estimated coefficients of the conventional model given by Equation (1), adding control variables. Serial correlation of second order is rejected and the internal instruments are validated according to the Sargan test. It is worth noticing that the dynamic model is well justified because the lagged dependent variable as regressor is statistically significant at the 1% level. In general, all estimated regressions support the autoregressive nature of TB.

In column (1), the coefficient of relative income (ln Y_P/Y_R) is positive and statistically significant at the 1% level, it is a small coefficient indicating that bilateral trade balance is inelastic to income. Nevertheless, an increase in real income of partner countries improves Russia's trade balance in goods, as previous studies found in the case of Turkey (Çelik & Kaya, 2010), China (Gu et al., 2014) and Cambodia (Bineau, 2016). Yet, the evidence in China and Cambodia is somewhat mixed depending on partner country. On the contrary, in Bangladesh, using an Unrestricted Error Correction Model, relative

Table 2. Regression results dependent variable: ln *TB* (trade balance in goods).

		(1)	(2)	(3)	(4)	(5)	(6)
Lagged dependent (ln TB_{t-1})		0.85***	0.56***	0.49***	0.55***	0.77***	0.55***
Relative income (ln Y_P/Y_R)	+	0.61***	0.41**	0.47***			
Relative appreciation/depreciation (ln *RD*)	+	0.45***	0.26***	0.14*			
Export composition (ln *EC*)	+		0.02***	0.02***	−0.63***		0.09
Interaction 1 (ln *EC*×ln Y_P/Y_R)					0.52***		14.11**
Interaction 2 (ln *EC*×ln *RD*)					0.13		−14.17*
Import composition (ln *MC*)	-		0.07***			−1.11***	−0.57
Import composition (ln MC_{t-1})				−0.05***			
Interaction 1 (ln MC×lnY_P/Y_R)						0.54***	−13.82**
Interaction 2 (ln *MC*×ln *RD*)						0.67***	14.48*
CIS		2.58***	1.52**	0.60	1.17**	2.17***	0.57
CEE		−0.24	1.13***	1.41***	1.27***	0.68***	0.97***
WEC		0.72***	−0.27	−0.49	−0.24	0.29**	−0.32
Oil price		−0.001	−0.002***	−0.002***	−0.002**	−0.002***	−0.002***
Year 1998		−0.09***	−0.17***	−0.20***	−0.19***	−0.07***	−0.16***
Year 2009		−0.09***	−0.18***	−0.19***	−0.16***	−0.06	−0.26***
Year 2015		−0.11***	−0.04	−0.06	0.0002	−0.13***	−0.04
Year 2016		−0.17***	−0.19***	−0.31***	−0.20***	−0.20***	−0.20***
Constant		−0.84***	0.07	−0.11	−0.24	−0.32***	0.33
Observations		813	557	557	557	802	557
N×*T*		41×20	37×20	37×20	37×20	41×20	37×20
Sargan test (*p*-value)		34.28 (0.45)	29.36 (0.69)	28.55 (0.73)	30.43 (0.64)	32.92 (0.52)	26.59 (0.81)
First order serial correlation test (*p*-value)		−3.73 (0.00)	−3.88 (0.00)	−3.76 (0.00)	−3.93 (0.00)	−3.60 (0.00)	−4.01 (0.00)
Second order serial correlation test (*p*-value)		−0.21 (0.83)	0.03 (0.97)	−0.09 (0.92)	−0.03 (0.97)	−1.22 (0.21)	0.002 (0.99)
Long run coefficients							
Relative income (ln Y_P/Y_R)		4.07	0.91	0.92			
Relative appreciation/depreciation (ln *RD*)		3.00	0.59	0.27			
Export composition (ln *EC*)			0.05	0.04	−1.40		0.20
Import composition (ln *EC*)			0.16	−0.10		−4.83	−1.27

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels.

GDP per capita did not show significant impacts on trade balance in the short-term. However, the estimation using DIF GMM presented a positive and statically significant coefficient of relative GDP per capita (Khan & Hossain, 2012). Note that the cited study does not present tests on autocorrelation, so we should take the mentioned result with caution.

In column (1), the coefficient of relative appreciation/depreciation (ln *RD*) is positive and statistically significant at the 1% level, and it is also a small coefficient indicating that bilateral trade balance is inelastic to price variations. Nevertheless, a depreciation of the rouble improves Russia's trade balance in goods. In general, this result agrees with previous studies (Bineau, 2016; Çelik & Kaya, 2010; Gu et al., 2014; Khan & Hossain, 2012), which also showed some evidence for J-curves. That is, depreciation initially (short-term) leads to deterioration in the trade balance, and after some time (long-term), it improves the balance. Here, our focus is not on tests for J-curves, and we are not studying the determinants of bilateral trade balance for each partner country. Nonetheless, note that the coefficient of ln *RD* is positive in the short-run and in the long-run, subsequently, on average, there are no reasons to support J-curves in the Russian case.

In column (2) we estimated the model given by Equation (2), and the results support the findings in column (1), although income elasticity and price elasticity are even smaller. More important for this research: the coefficient of export composition is positive, statistically significant and a small figure. Nevertheless, this result is supporting our working hypothesis, that is, the share of crude petroleum and natural gas in exports positively impact the bilateral trade balance, even controlling by oil price. On the other hand, the estimation for import composition is not supporting our hypothesis; its coefficient is positive and statistically significant (also a small figure). That is, high-tech import products positively impact Russian trade balance, but we expected a negative association because this kind of import product should increase total Russian imports.

Because of the unexpected result about import composition, we developed two strategies to check the robustness of these results. First, we changed the lag structure of the model, entering independent variables with one lag and/or combinations of lagged and current variables. With these modifications (not all reported), the results indicate a negative and significant coefficient for import composition (for instance, see column 3), but the results for the coefficient of export composition are mixed, suggesting that current export composition is what affects trade balance.

The second strategy consisted of the inclusion of interaction terms, which also allow us to observe changes in income and price elasticities. These results are reported in columns (4)–(6). In column (4), in addition to control variables, we are entering export composition and its interaction terms with relative income and exchange rate (excluding relative income and exchange rate to avoid multicollinearity concerns). Now, export composition presents a negative coefficient, but the interaction term with relative income is positive and statistically significant. This suggests that the effect of export composition on trade balance occurs through indirect impacts on income elasticity. In column (5), we run a similar regression entering import composition and its interaction terms. The coefficient of import composition is negative and statistically significant and its interaction terms are positive and statistically significant in both cases, suggesting that import composition is also affecting trade balance through impacts on income and price elasticities. Finally, to confirm the effects of export and import composition, in column (6) we included both variables and their interaction terms. The results indicate that these variables are indirectly influencing trade balance, through changes in income and price elasticities. However, the interaction terms with exchange rate do not always present statistical significance, suggesting a weak effect from price elasticity. In sum, in the case of export composition, income elasticity is increased by exports consisting of higher shares of crude petroleum and natural gas, and price elasticity is decreased, and *vice versa* in the case of imports consisting of higher shares of high-tech products.

Concerning the control variables, note that bilateral trade balance is higher in the case of countries from the Commonwealth of Independent States and Central Eastern Europe. The coefficients of oil price and crisis years are negative and statistically significant in most of the regressions. Particularly, the years 2015 and 2016 are accompanied by international sanctions and bilateral trade restrictions between Russian and several western countries, explaining the negative link.

As additional robustness checks, we replicated the regression analysis using a standard approach with fixed and random effects, a fixed effects corrected model as proposed by Bruno (2005), and the DIF GMM estimator. Although these methods are biased because of endogeneity and lack of instrumental variables, their results (not reported) support the used dynamic models.

5. Conclusion

Like previous studies (Bineau, 2016; Çelik & Kaya, 2010; Gu et al., 2014; Khan & Hossain, 2012), we found that relative income of partner countries and exchange rates are associated with bilateral trade balance, and subsequently explain external imbalances. This research contributes to this literature claiming and showing empirical evidence of significant effects of export and import composition on the goods balance. In the particular case of Russia, petroleum and gas are highly relevant export products, and their demand is price inelastic (Cooper, 2003; Krichene, 2002). Accordingly, our results indicate that this kind of export composition is positively related to trade balance. For its part, high-tech products are also price inelastic, and the share of these goods in Russian imports is relatively high, which is negatively associated with the bilateral trade balance of Russia. However, the findings suggest that export and import composition mainly influence the trade balance through indirect effects on income and price elasticities.

Hence, the role of export and import composition in trade balance has several policy implications. Note that Russia has been showing a persistent surplus in both the trade account and the current account; it seems that this surplus is desirable, until now, since Russian surplus could reflect precautionary savings (Bems & de Carvalho Filho, 2011; Kilian et al., 2009; Le & Chang, 2013) hedging against fluctuations in crude petroleum and natural gas prices. Therefore, the management of the external surplus is of strategic importance for the future development of the Russian economy. However, if policy makers decide to adjust this situation they should take into account the composition of exports and imports, and subsequently Russia's production structure. This implies many challenges, because the supply of petroleum and gas is also highly inelastic, and because it is also highly complicated to complete the transition to produce high-tech goods domestically. Consequently, policies impacting income or price elasticities (particularly, exchange rates) are unlikely to generate the needed outcomes.

Note that our results are in line with previous studies suggesting that export composition can also favour export performance. Particularly, the evidence suggests that exports consisting of high technology products are positively associated with bilateral total exports in the case of Eurozone countries (Wierts et al., 2014). Therefore, future research should also analyse the impact of other kinds of export composition on export performance, for instance, oil and gas in the Russian case (Tovar-García, 2018).

Notes

1. List of trade partners: Argentina, Australia, Austria, Belarus, Belgium, Brazil, Bulgaria, Canada, China, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Kazakhstan, Korea, Kyrgyzstan, Latvia, Lithuania, Mexico, Moldova, Mongolia, Netherlands, New Zealand, Norway, Pakistan, Poland, Portugal, Romania, Saudi Arabia, Singapore, Slovak Republic, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, Ukraine, United States and Venezuela.
2. Trade blocs: Latin American and Caribbean (Argentina, Brazil, Mexico, Venezuela); Oceania (Australia, New Zealand); European Union plus Norway and Switzerland (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden, United Kingdom, Norway, Switzerland); USA and Canada; Asia (China, India, Indonesia, Iran, Israel, Japan, Korea, Mongolia, Pakistan, Saudi Arabia, Singapore, Turkey, Thailand); non-EU post-Soviet states (Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Ukraine); Africa (Egypt, South Africa).
3. In the years leading to the global financial crisis, profits of natural gas and crude petroleum increased significantly, i.e. there was a positive increment in the difference between the value of natural gas/crude oil production at world prices and total costs of production. Consequently, in the years before the global financial crisis, the prices of natural gas and crude petroleum were significantly high such as to increase the share of these export products in the total goods exports. However, since 2014, the price of crude petroleum and natural gas has been falling which has been reflected in a decrease in the share of these products in total exports.
4. Previous studies used the real exchange rate between the currency of the country of interest and the currency of the partner country. Actually, most of the international transactions take place in dollars, euros, British pounds or yens. Consequently, we think that the measure used here is a better approach of the appreciation or depreciation of the rouble. In addition, we replicated our regressions using bilateral real exchange rates and the results (not reported) are qualitatively the same.
5. Note that geographical distance has been included in previous studies on the bilateral balance (Khan & Hossain, 2012). However, we did not include these indicators due to data limitations and because distance seems to be irrelevant in the case of Russia, the largest country of the world sharing borders with many of its major partners.
6. In this manner, we keep the number of instruments low, accounting for the potential problem of too many instruments (Roodman, 2009).

Disclosure statement

No potential conflict of interest was reported by the authors.

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