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Patterns and determinants of agro-food trade of the BRIC countries: The role of institution

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Patterns and Determinants of Agro-Food Trade of the BRIC Countries: The Role of Institution

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Abstract

Agro-food trade between the BRIC countries has increased. Brazil and China contributed to
the rapid increase of agro-food trade. The Russian Federation experienced the stagnating and
the most volatile agro-food trade over time. The composition of agro-food trade for the BRIC
countries varies by the BEC agro-food trade categories and over time. The prevailing in the
composition of agro-food trade are BEC122 and BEC111 for Brazil and the Russian
Federation, and BEC122 and BEC112 for India and China. Brazil and India have
strengthened their market shares in agro-food trade between the BRIC countries, while the
Russian Federation has experienced the most severe deterioration. The number and the share
of trading partners that have traded every year vary between the BRIC countries and the BEC
agro-food trade categories over time. Agro-food trade between the BRIC countries is
positively associated with the GDP size and population size in importing countries, but
negatively associated with the GDP size and population size in exporting countries as well as
with distance. Mixed results are found for border effect, institutional quality and institutional
similarity depending on the BEC agro-food trade categories.

Keywords: agro-food trade, BRIC countries, adapted gravity model, institutions

JEL codes: F14, Q17, C23, O57

1 INTRODUCTION

During the last decades the world agro-food trade has been shaped by several factors and the most recently there has been an important role that have played by the world's leading emerging economies Brazil, the Russian Federation, India, and China (BRICs). These developments have implications for world agro-food trade, volatility of agro-food markets and developments.

The previous literature argues on rapid growth of exports from the BRIC countries, particularly from China (e.g. SCHOTT 2008). This has been achieved with export restructuring and specialization by the expansion of existing products (the intensive margin) and particularly with an expansion of the number of export varieties (the extensive margin). While traditional specialization tends to be into intensive margin, export-led growth across countries tends to combine both intensive margin and particularly extensive margin (FEENSTRA 1994, HUMMELS and KLENOW 2005). Determinants of product distribution across and within countries may be different (BRODA and WEINSTEIN 2006, SCHOTT 2008). Different factors explain specialization patterns between the intensive and extensive margin including trade liberalization (KEHOE and RUHL 2002). Although there is an increasing literature on the BRIC countries trade, but their agro-food trade pattern is less explored (except HAQ and MEILKE 2010).

In addition, the recent economic crisis shed light on the importance of institution explaining trade flows. Empirical papers find evidence supporting a hypothesis that institutions and institutional quality are an important determinant of sectoral export performances (e.g. BLANCHARD and KREMER 1997, BERKOWITZ et al. 2006, LEVCHENKO 2007, RANJAN and LEE 2007, NUNN 2007, MÉON and SEKKAT 2008).

We find differentials compositions and patterns in agro-food trade developments by the BRIC countries. We aim to explain the BRIC agro-food trade developments by the BEC agro-food trade categories by typical adapted gravity equation variables for the size of the economy and the size of population in exporting and importing countries, distance and having a common border as well as with our special focus on institutional quality and institutional similarity variables in order to comprehensively analyse and understand similarities and differences in determinants of agro-food trade developments by the BEC agro-food trade categories among the BRIC countries.

The rest of the paper is organized as follows. Nest two sections set out the methodology and describe the data. The followed section present and explain results, while the final section concludes.

2 DATA AND METHODOLOGY

We focus on the period 1998-2009, using export data from UN Comtrade database for agro-food products at the three-digit level classification of the Broad Economic Categories (BEC) classification Revision 3. The dataset includes the following main product groups: 111 – primary products (food and beverages) mainly for industry, 112 – primary products mainly for household consumption, 121 – processed products mainly for industry, and 122 – processed food and products intended for final consumption in households.

The BRIC Countries' and export destination countries' income is collected from the World Bank's World Development Indicator Database as well as the number of inhabitants (POP) in these countries, while the distance between partner countries is obtained from the CEPII database (MAYER and ZIGNAGO 2006).

The variables of particular interest are for the level of subjective institutional quality. Our data set includes institutional quality indices produced by the Fraser Institute for Institutions (GWARTNEY and LAWSON 2005). The institutional quality indices are obtained from the 'Economic Freedom of the World' (EFW) database. The EFW institutional quality indices are themselves based on several sub-indices designed to measure the degree of 'economic freedom' in the five areas: (1) government expenditures, taxes, and enterprises (government size); (2) legal structure and protection of property rights (legal system); (3) access to sound money: inflation rate, and possibility to own foreign currency bank accounts (sound money); (4) freedom to trade internationally: taxes on international trade, regulatory trade barriers, capital market controls, difference between official exchange rate and black market rate and similar (tariff); and (5) regulation of credit, labour, and business (regulation). Each of the economic freedom index ranges from 0 to 10 reflecting the distribution of the underlying data. Notionally, a low value is bad, and a higher value is good. Preliminary analysis shows that all aspects of institutional quality are interrelated, thus the indicators of institutional quality are highly positively correlated. For that reason, we treat them separately in the empirical analysis, including one dimension of the institutional quality in the equation at a time. Using too many institutional quality indicators simultaneously results in serious problems of multi-collinearity.

Estimating the adapted gravity trade model and assessing trade patterns on the basis of the empirical results have been subject to several econometric challenges. The most recent literature has addressed issues concerning the correct specification and interpretation of the gravity trade equation in empirical estimation. We concentrate on two methodological issues. First, several researches have argued that standard cross-sectional methods yield biased results because they do not control for heterogeneous trading relationships (e.g. FEENSTRA 2004, HELPMAN et al. 2008). Because of this, these researches introduced the fixed effects into the gravity trade equation. The fixed-effect trade models allow for unobserved or misspecified factors that simultaneously explain trade volume between two countries, such as the probability that the countries will be in the same regional integration regime (e.g. MATYAS 1997, EGGER 2002). Although the arguments underlying the use of the fixed effects as a solution to unobserved heterogeneity are roughly the same in the literature, there is little agreement about how to actually specify the fixed effects. Following CHENG and WALL (2005) we apply the fixed effect methods in which country-pair and period dummies are used to reflect the bilateral relationship between trading partners. Second issue is coming from log-linearising the gravity equation, given the heteroscedasticity nature of trade data. To avoid the heteroscedasticity and other estimation issues including, zero values, endogeneity and measurement error TENREYRO (2007) proposes the use Psuedo-Maximum-Likelihood (PML) estimator. To deal with heteroscedasticity we apply PML technique.

Traditional gravity trade theory points out that bilateral trade of exporter i and importer j countries in time t ($EXP_{ij,t}$) is positively associated with their national incomes and negatively associated with their geographical distance (e.g. ANDERSON and VAN WINCOOP 2004). We specify the following baseline adapted gravity trade model:

$$\ln EXP_{ijt}=\alpha_0 +\alpha_t+\alpha_i + \alpha_j +\alpha_1\ln GDP_{it} +\alpha_2\ln GDP_{jt}+\alpha_3\ln POP_{it}+\alpha_4 \ln POP_{jt}$$
$$+\alpha_5\ln DIST_{ij}+\alpha_6 BORDER_{ij}+ \eta_{ijt} \tag{1}$$

where GDP is gross domestic products for the economic country size, POP is population for the demographic country size and DIST is distance between the countries' capitals. Additional factors which may enhance or resist agro-food exports can also be included in the baseline adapted gravity trade model. Typically is included a dummy for having a common border ($BORDER_{ij}$), with value 1 when country i shares a common border with country j and 0 otherwise. According to the adapted gravity approach we expect positive sign for GDP_{jt} and POP_{jt} in importing countries and for $BORDER_{ij}$, but negative sign for GDP_{it} and POP_{it} in exporting countries and for $DIST_{ij}$ variables. We extend our baseline model specification with institutional quality explanatory variables:

$$\ln EXP_{ijt}=\alpha_0 ++\alpha_t+\alpha_i + \alpha_j +\alpha_1\ln GDP_{it} +\alpha_2\ln GDP_{jt}+\alpha_3\ln POP_{it}+\alpha_4 \ln POP_{jt}$$
$$+\alpha_5\ln DIST_{ij}+\alpha_6 BORDER_{ij}+ \alpha_7 \text{Institution}_j +\eta_{ijt} \tag{2}$$

where Institution describes various aspects of the institutional quality in importing countries.

3 THE BRIC COUNTRIES TRADE DEVELOPMENTS

Regional trading blocs and emerging economies play an important role in the world trade and the global economic system (FRANKEL 1997). We present a more detailed description of BRIC agro-food trade flows focusing on the difference among BRIC countries in terms of export growth, composition of exports and the role of new partners in export growth. Figure 1, which is in current US$ confirms that agro-food trade in the BRIC have increased due to the increasing patterns of agro-food trade development in Brazil and China, while India and the Russian Federation experience more stagnating agro-food trade developments.

Figure 1: The development of agro-food trade in the BRIC countries
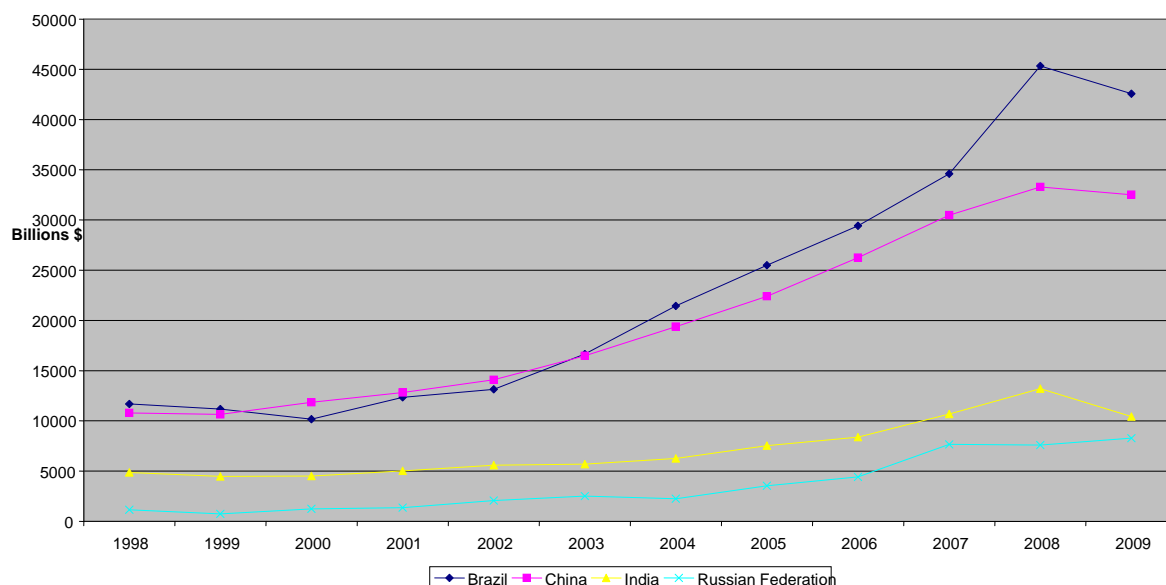
However, agro-food trade developments in the BRIC countries have been rather volatile. This is particularly the case for annual oscillations, which in Figure 2 are particularly seen for Russia. The most recent decline in agro-food trade is determined by the output decline.

Therefore, the economic recession has also caused the most recent deterioration in agro-food trade between the BRIC countries.

Figure 2: The growth of agro-food trade in the BRIC countries

Moreover, the composition of agro-food trade varies considerable between the BRIC countries, over time and by commodity groups. For Brazil, BEC112 is the least important in the composition of Brazilian agro-food trade (Figure 3). The most important is BEC122 followed by BEC111 and BEC121. In addition, there are clearly visible oscillations by individual years.

Figure 3: The composition of Brazilian agro-food trade
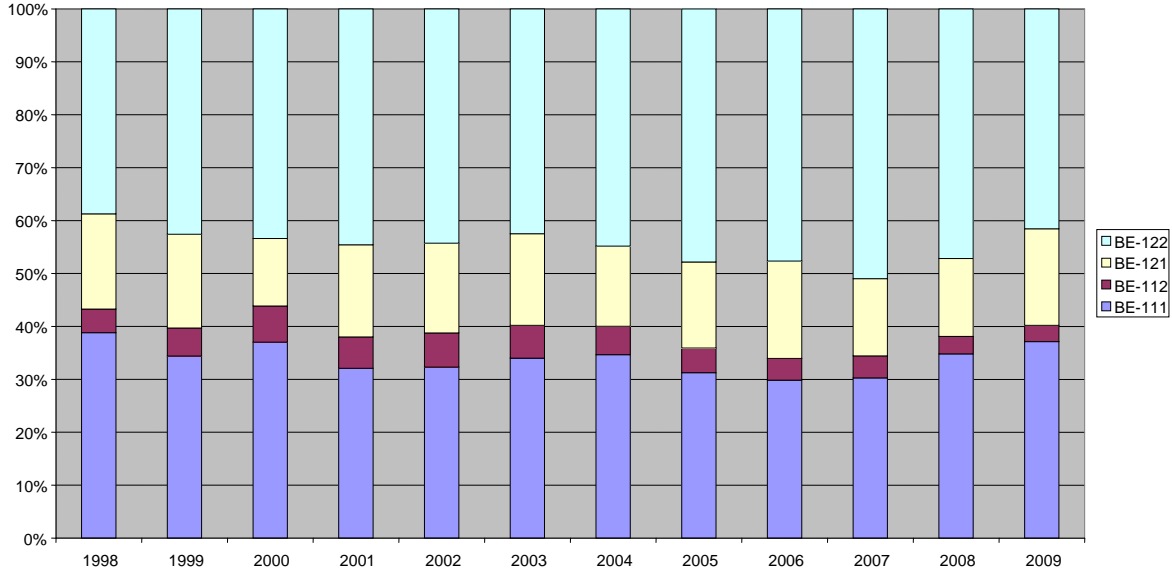
For China BEC122 is far the most important in the composition of agro-food trade followed by BEC112. BEC111 takes a lower percentage, while BEC121 is less important (Figure 4).

Figure 4: The composition of Chinese agro-food trade
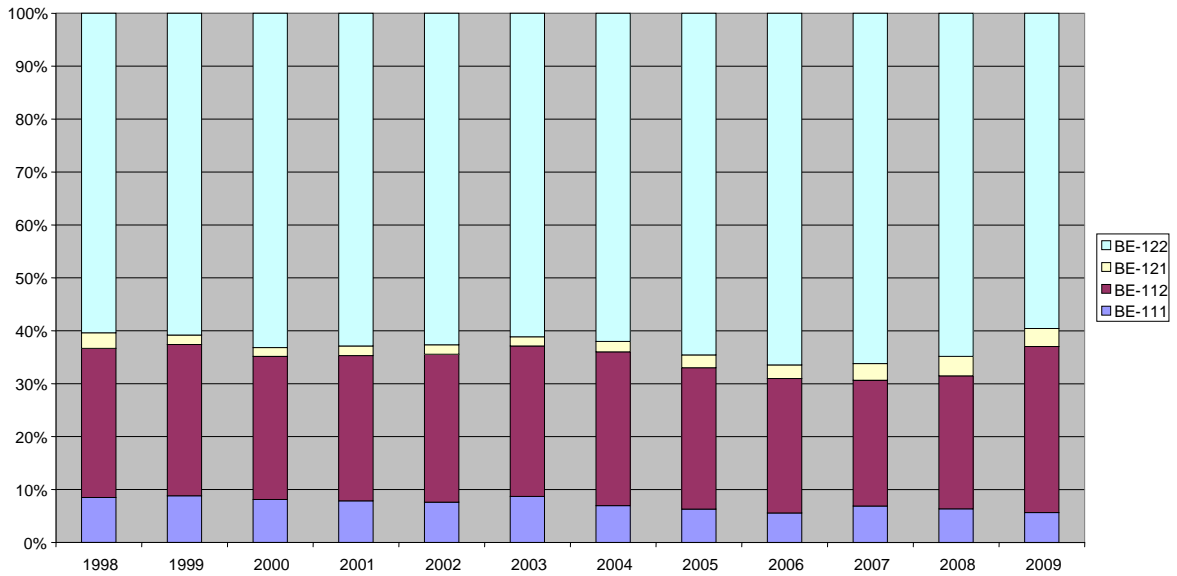
The composition of Indian agro-food trade is rather volatile over time (Figure 5). BEC112 and BEC122 are the most important in the composition of agro-food trade. BEC121 has the lowest percentage and thus importance.

Figure 5: The composition of Indian agro-food trade
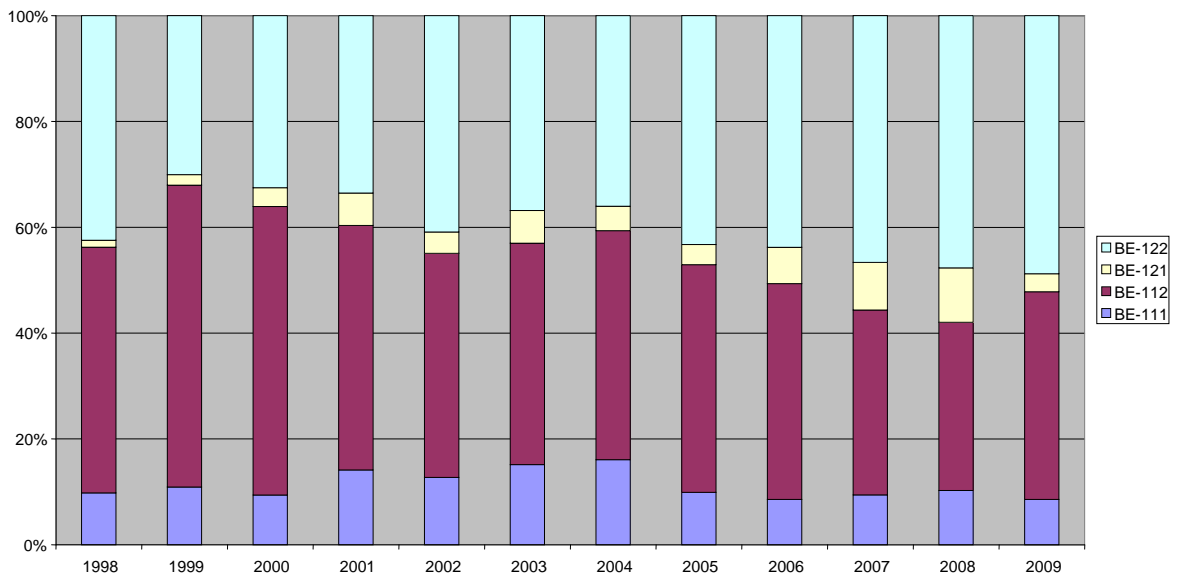
Russia has experienced not only the instabilities in patterns of agro-food trade developments, but also in its composition (Figure 6). In a spite of these instabilities, BEC111 and BEC122 have explored the greatest share in agro-food trade composition, but vary considerably by years over time.

Figure 6: The composition of Russian agro-food trade
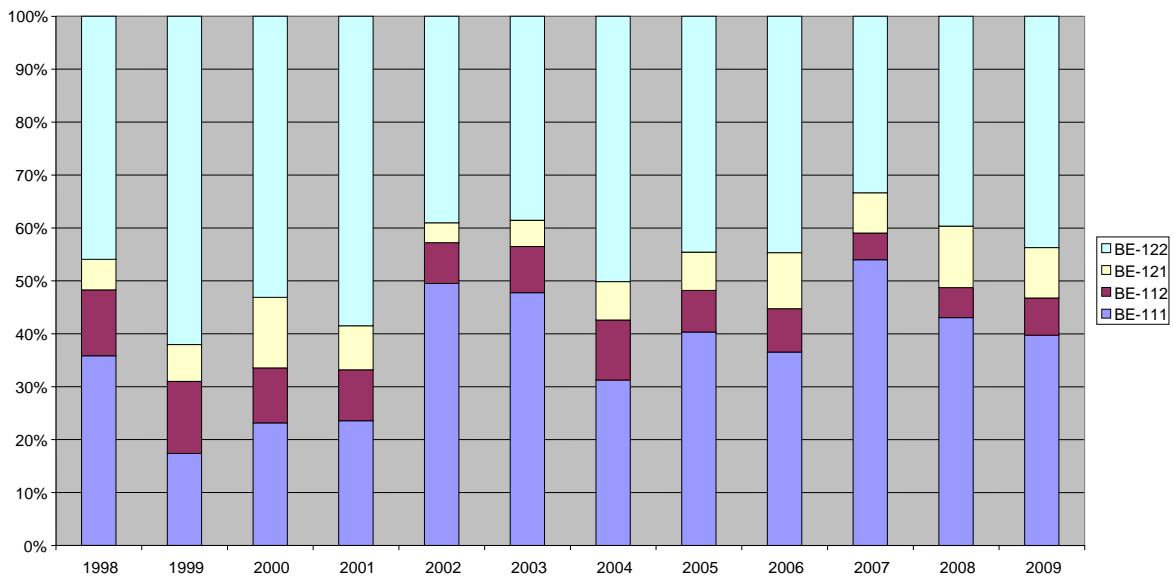
The share in the number of the trading partners, which conduct the trade with the BRIC countries every year, indicates the intensity of agro-food trade relations between the BRIC countries. As can be seen from Figure 7 this varies by the BRIC countries and by the agro-food commodity groups. Among countries, the share is greater than 70% for Brazil, China and India in 1998, but declined over the analysed period as can be seen for the year 2009. This deterioration in the intensity of trade relations might suggest also trade diversion with a shift of agro-food trade towards non BRIC countries. Among the agro-food commodity categories the share of the intensity of the partners' relations is the highest for BEC112 and BEC122.

Figure 7: The share of the trading partners with trading every year
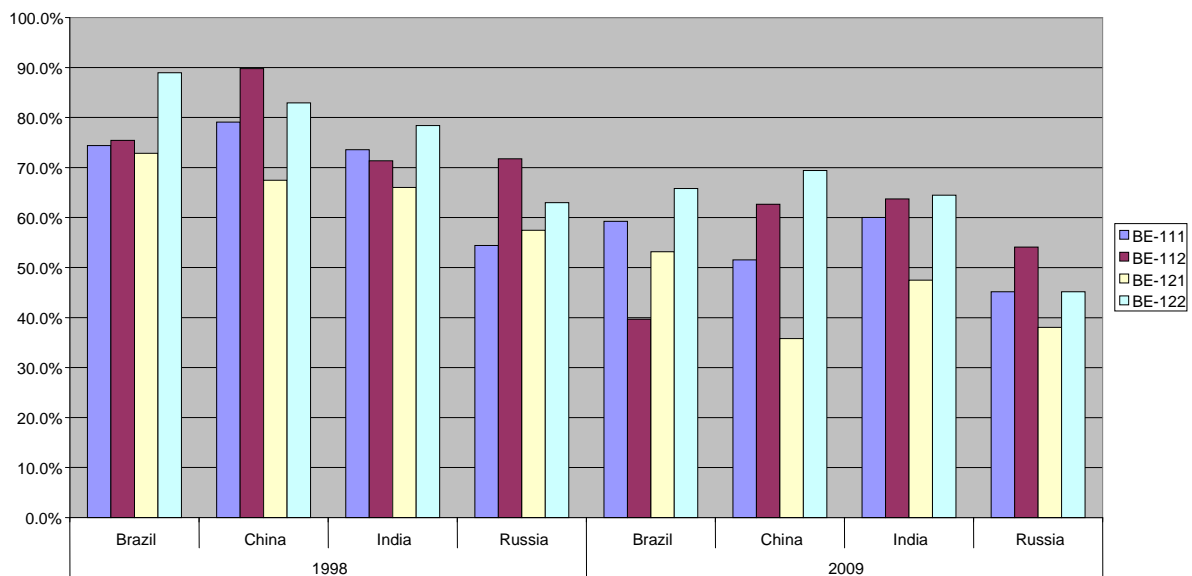
Figure 8 compares the share of the BRIC countries in their total agro-food trade by agro-food commodity groups between the years 1998 and 2009. There are differentials in performance

between the BRIC countries. Except for BEC112, Brazil and India increased their trading market share. China deteriorated its share for BEC121. Russia explores a great volatility: rapid drop for BEC111 and BEC121, but keeping similar share for BEC112 and experienced an increase for BEC122.

Figure 8: The share of the BRIC partners in total agro-food trade with trading every year
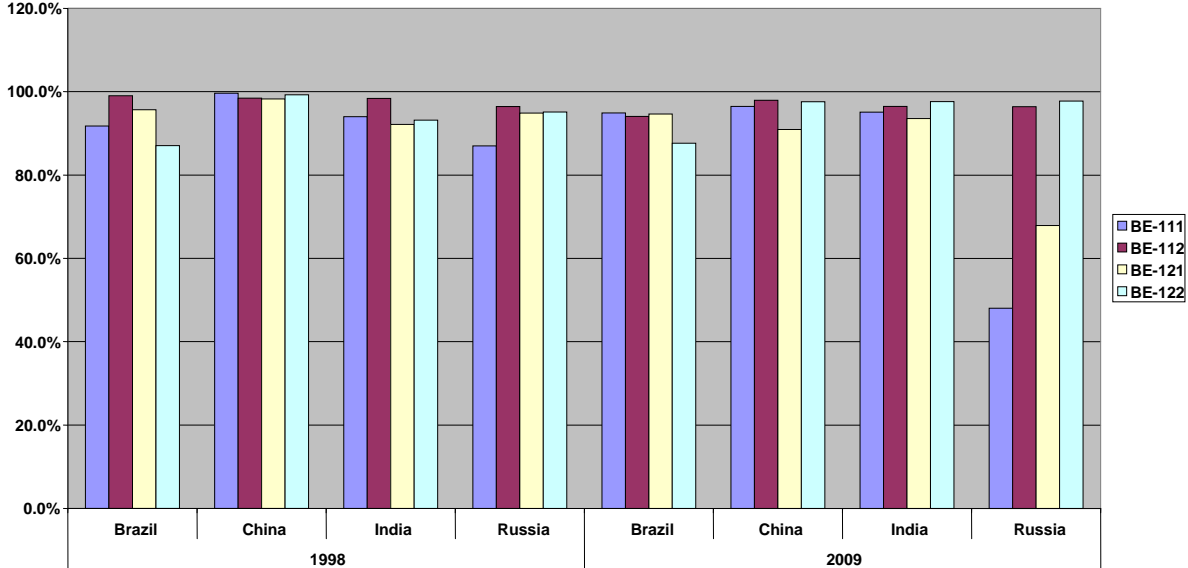
Finally, we also present the role of intensive and extensive margin in export growth in terms of new trading partners. Between 1998 and 2009 the number of trading partners has increased by the BRIC countries and by the agro-food commodity groups (Figure 9).

Figure 9: Number of trading partners
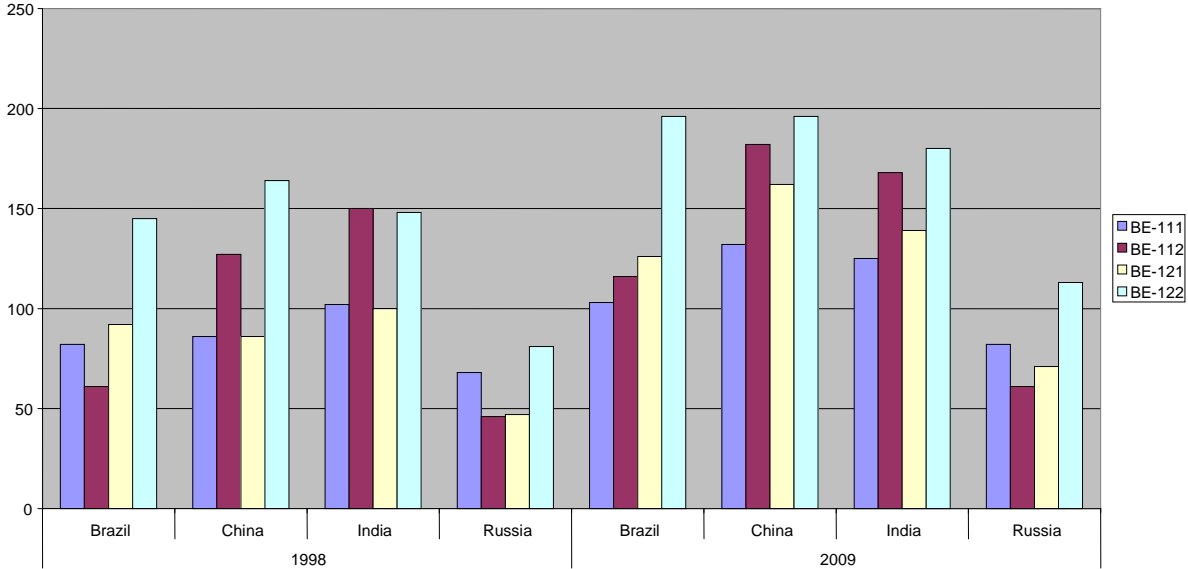
To sum up these descriptive structures and patterns in developments, there are two interesting remarkable results. First, the number of stable partners declined to the end of period. Second,

the share of stable partners in total trade exceeded 90 per cent for majority of observations, except Russia in some cases. These results imply that the source of agro-food trade growth between the BRIC countries is the increase of exports on stable partners' markets.

4 ECONOMETRIC ADAPTED GRAVITY MODEL

4.1 The baseline model

As can be seen from Table 1 on baseline econometric model estimations, the GDP size in exporting countries is associated with decreases in agro-food trade in each of the agro-food BEC categories while the GDP size in importing countries is associated with increases in agro-food trade in each of the BEC agro-food categories. Therefore, the increase in the GDP size in importing countries is a crucial determinant for agro-food export increases between the BRIC countries. The absolute size of the coefficient of elasticity is higher for the BEC112 and BEC 122 agro-food categories. Moreover, the population size and its expansion seem to be even more important determinant for agro-food trade between the BRIC countries. The sings of the coefficients of elasticity pertaining to the size of population vis-à-vis the GDP size are the same, but the absolute size of the coefficients of elasticity pertaining to the population size are much higher than those in the case of the GDP size. This can be explained by the rapid population growth in some of the BRIC countries such as China and India. This population growth has determinant the expansion of agro-food trade between the BRIC countries. Consistently with the theoretical expectation, agro-food trade is negatively associated with distance. The importance of distance for agro-food trade varies by the BEC agro-food categories. The coefficient of elasticity is the lowest for BEC11 and the highest for BEC122. Finally, while the regression coefficients for the border variable are significant, the sings of the regression coefficients are mixed: of a positive sign for BEC112 and BEC122, but of a negative sign for BEC111 and BEC121.

Table 1: Baseline PML estimations

	BEC111	BEC112	BEC121	BEC122
lnGDP exporter	-0.022***	-0.177***	-0.052***	-0.122***
lnGDP importer	0.421***	0.666***	0.126***	0.689***
lnPopulation exporter	-0.474***	-6.255***	-5.372***	-0.523***
lnPopulation importer	0.846***	0.839***	0.648***	0.626***
lndistance	-0.451***	-0.803***	-0.752***	-1.118***
border	-0.871***	1.431***	-0.852***	1.091***
year effect	yes	yes	yes	yes
exporter fixed effect	yes	yes	yes	yes
importer fixed effect	yes	yes	yes	yes
N	2796	3429	2499	4834
Pseudo R^2	0.9131	0.9228	0.8937	0.9051

4.2 The role of institutional quality

Trade in different agro-food categories are likely to require different institutions and their quality. We separately test the impact of the five different institutions on agro-food trade: government size, legal system, sound money, regulation, and tariff. The effect of the institutions is included by the explanatory variable institutional quality in importing countries.

Table 2 presents the estimated regressions for the BEC111 agro-food category with the included explanatory variable for institutional quality. The coefficients of elasticity pertaining to the GDP size of exporting and importing countries are significant, but in the case of the GDP size of exporting countries are of mixed signs. In the case of the regulation and tariff, respectively, the sign for the GDP size of exporting countries has become of a positive sign thus has encouraged agro-food export. The coefficients of elasticity pertaining to the population size of exporting countries are consistently negative and consistently positive for the population size of importing countries. Distance and having a common border are negatively associated with agro-food trade. The institutional quality of importing countries is positively associated with agro-food trade. There are only differentials in the size of the regression coefficients, which is the lowest in the case of government size and the highest for tariff. Therefore, better institutional quality with the relatively smaller government size and relatively lower tariffs encourages agro-food trade between the BRIC countries. This finding support the international aims to make governmental institutions more effective with institutional and policy measures, which are supporting freer and less distorting international agro-food trade.

Table 2: PML models for BEC111 with institutional quality

	government size	legal system	sound money	regulation	tariff
lnGDP exporter	-0.006***	-0.029***	-0.048***	0.066***	0.004***
lnGDP importer	0.421***	0.357***	0.374***	0.405***	0.411***
lnPopulation exporter	-0.397***	-0.048***	-0.407***	-2.080***	-0.307***
lnPopulation importer	0.846***	0.835***	0.840***	0.838***	0.842***
lndistance	-0.450***	-0.440***	-0.443***	-0.444***	-0.449***
border	-0.870***	-0.869***	-0.870***	-0.887***	-0.870***
institutional quality importer	0.025***	0.178***	0.172***	0.133***	0.211***
year effect	yes	yes	yes	yes	yes
exporter fixed effect	yes	yes	yes	yes	yes
importer fixed effect	yes	yes	yes	yes	yes
N	2724	2724	2724	2304	2017
Pseudo R^2	0.9132	0.9157	0.9151	0.9124	0.9142

Table 3: PML models for BEC112 with institutional quality

	government size	legal system	sound money	regulation	tariff
lnGDP exporter	-0.181***	-0.178***	-0.188***	-0.221***	-0.185***
lnGDP importer	0.667***	0.666***	0.676***	0.653***	0.669***
lnPopulation exporter	-6.522***	-6.389***	-6.715***	-5.152***	-6.377***
lnPopulation importer	0.838***	0.837***	0.841***	0.809***	0.836***
lndistance	-0.763***	-0.764***	-0.764***	-0.734***	-0.764***
border	1.506***	1.505***	1.528***	1.575***	1.513***
institutional quality importer	0.043***	0.007***	-0.054***	-0.015***	0.137***
year effect	Yes	yes	yes	yes	yes
exporter fixed effect	Yes	yes	yes	yes	yes
importer fixed effect	Yes	yes	yes	yes	yes
N	3210	3210	3210	2692	3210
Pseudo R^2	0.9218	0.9217	0.9220	0.9059	0.9221

Table 3 presents the estimated regressions for the BEC112 agro-food category with the included institutional quality variable. The coefficients of elasticity pertaining to the GDP size and the population size in exporting and importing countries, distance and having a common

border are of the same signs and significant. However, except for similar absolute sizes of the coefficients of elasticity pertaining to the population size in importing countries, the absolute size of all other coefficients of elasticity is higher for the BEC112 agro-food category. This stronger relative trade reaction for the BEC112 agro-food category suggests greater dynamics in the BRIC markets for the BEC112 agro-food products in association with the increasing economic size (income elasticity) and the increasing population size in exporting countries, importance of distance proximity and having a common border. Therefore, the substantial reduction of the BEC112 agro-food category export is found due to the joint effect of the increasing domestic population and income sizes. In addition, the BEC112 agro-food category export seems to be biased to the neighbouring countries trade. Unlike for the BEC111, for the BEC112 are mixed results pertaining to institutional quality of importing countries. The regression coefficient is of a positive sign for government size, legal system and tariff, but of a negative sign for sound money and regulation. These findings imply that international trade in this agro-food category requires different institutions with better institutional quality: the relatively smaller government size, better functioning of the legal system and relatively lower tariffs that encourage agro-food trade between the BRIC countries. On the other hand sound money and better regulation discourage the BEC112 agro-food trade.

Table 4: PML models for BEC121 with institutional quality

	government size	legal system	sound money	regulation	tariff
lnGDP exporter	-0.053***	-0.054***	-0.029***	-0.000***	-0.051***
lnGDP importer	0.127***	0.119***	0.193***	0.131***	0.128***
lnPopulation exporter	-5.258***	-5.208***	-4.675***	-6.104***	-5.248***
lnPopulation importer	0.646***	0.645***	0.668***	0.626***	0.647***
lndistance	-0.750***	-0.752***	-0.732***	-0.707***	-0.750***
border	-0.850***	-0.854***	-0.831***	-0.861***	-0.851***
institutional quality importer	-0.078***	0.020***	-0.087***	-0.002***	0.021***
year effect	yes	yes	yes	yes	yes
exporter fixed effect	yes	yes	yes	yes	yes
importer fixed effect	yes	yes	yes	yes	yes
N	2396	2396	2396	2026	2396
Pseudo R^2	0.8934	0.8928	0.8946	0.8924	0.8928

Table 4 presents the estimated regressions for the BEC121 agro-food category with the included institutional quality variable. The baseline model variables remain significant and of the same signs. The regression coefficients are in general of a slightly higher absolute size than in the case of the BEC111 (Table 2) and a slightly of a lower absolute size than in the case of the BEC 112 (Table 3). It is confirmed the importance of the economic size and demographic population size factors as well as lower trade costs with neighbouring countries.

The regression coefficients for the baseline explanatory variable model specification are also the same for the BEC122 agro-food product category (Table 5). By the absolute size, the income size elasticity is higher, while for the population size is modest. Distance and border effects are in a favour of trade with the neighbouring countries. The impact of institutional quality on the BEC122 trade is again significant, but of mixed directions: of a positive sign for sound money and regulation, and of a negative sign for government size, legal system and tariff.

Table 5: PML models for BEC122 with institutional quality

	government size	legal system	sound money	regulation	tariff
lnGDP exporter	-0.117***	-0.127***	-0.121***	-0.130***	-0.107***
lnGDP importer	0.688***	0.693***	0.688***	0.698***	0.685***
lnPopulation exporter	-0.611***	-0.736***	-0.613***	0.488***	-0.579***
lnPopulation importer	0.625***	0.627***	0.625***	0.624***	0.624***
lndistance	-1.118***	-1.116***	-1.118***	-1.097***	-1.119***
border	1.088***	1.094***	1.088***	1.121***	1.084***
institutional quality importer	-0.016***	-0.089***	0.005***	0.004***	-0.109***
year effect	Yes	yes	yes	yes	yes
exporter fixed effect	Yes	yes	yes	yes	yes
importer fixed effect	Yes	yes	yes	yes	yes
N	4630	4630	4630	3998	4630
Pseudo R^2	0.9030	0.9034	0.9030	0.8940	0.9033

4.3 The role of institutional similarity

Now, we investigate the role of the institutional similarity in agro-food exports. We may argue that the bilateral familiarity, and thus the institutional similarity of trading partners with similar norms of behaviours and institutions both formal and informal in doing international agro-food trade businesses, increases compatibility and trust, and reduces adjustment costs and insecurity in agro-food exports. In other words the institutional similarity is an additional factor affecting relative transaction costs as an explanatory factor in bilateral agro-food trade.

We apply the following approach to identify the institutional similarity still based on the absolute difference between partner countries' institutional quality. To provide the same fraction of subsample of similar countries for each type of institution we divide countries into percentiles (quartiles) regarding to absolute institutional quality difference between partners. We define strict threshold for the institutional similarity, namely we classify only the first quartiles of absolute difference of institutional quality as similar countries.

The effect of the institutional similarity on agro-food exports appears to depend on how inclusive is the set of 'similar' countries in the analysed sample. Tables 6 to 10 present the econometric model results with institutional similarity as the additional explanatory variable. The institutional similarity is defined as a dummy for the first percentile of absolute difference between the BRIC partner countries' institutional quality. The regression coefficients for the baseline explanatory model variables, except of a sign switch for the coefficient of elasticity pertaining to the GDP size of exporting countries for the BEC11 agro-food category, remain similar. Institutional quality in importing countries consistently positively determines only the BEC111 agro-food trade. The mixed results pertaining to the institutional quality of importing countries variable remain for the BEC112, BEC121 and BEC122 agro-food categories. In these cases the results as already explained previously are mixed: significant, but of mixed signs. These results reinforce findings that international trade in agro-food products require specific institutions, which have different effects on different agro-food products international trade. There is no any single institutional quality variable, which is found to be favourable for each of the analysed BEC agro-food trade categories. Therefore, different institutional quality determines agro-food trade differently. This implies that successful agro-food trade requires different institutions for trade in different agro-food products.

Table 6: PML models for BEC111 with institutional quality and institutional similarity

	government size	legal system	sound money	regulation	tariff
lnGDP exporterr	-0.007***	-0.028***	-0.049***	0.065***	-0.005***
lnGDP importer	0.421***	0.356***	0.374***	0.405***	0.402***
lnPopulation exporter	-0.395***	-0.067***	-0.457***	-2.054***	-0.331***
lnPopulation importer	0.846***	0.834***	0.840***	0.838***	0.840***
lndistance	-0.450***	-0.440***	-0.443***	-0.444***	-0.447***
border	-0.870***	-0.869***	-0.870***	-0.887***	-0.870***
institutional quality importer	0.025***	0.177***	0.174***	0.133***	0.198***
institutional similarity	-0.013***	-0.024***	0.023***	0.016***	-0.091***
year effect	yes	yes	yes	yes	yes
exporter fixed effect	yes	yes	yes	yes	yes
importer fixed effect	yes	yes	yes	yes	yes
N	2724	2724	2724	2304	2724
Pseudo R2	0.9132	0.9157	0.9151	0.9124	0.9146

Table 7: PML models for BEC112 with institutional quality and institutional similarity

	government size	legal system	sound money	regulation	tariff
lnGDP exporter	-0.183***	-0.175***	-0.187***	-0.225***	-0.185***
lnGDP importer	0.667***	0.666***	0.675***	0.651***	0.669***
lnPopulation exporter	-6.551***	-6.439***	-6.736***	-5.083***	-6.381***
lnPopulation importer	0.838***	0.837***	0.840***	0.808***	0.836***
lndistance	-0.763***	-0.763***	-0.764***	-0.733***	-0.764***
border	1.506***	1.506***	1.525***	1.569***	1.513***
institutional quality importer	0.043***	0.007***	-0.051***	-0.012***	0.138***
institutional similarity	-0.030***	-0.057***	0.050***	0.085***	0.009***
year effect	yes	yes	yes	yes	yes
exporter fixed effect	yes	yes	yes	yes	yes
importer fixed effect	yes	yes	yes	yes	yes
N	3210	3210	3210	2692	3210
Pseudo R^2	0.9218	0.9218	0.9221	0.9062	0.9221

Table 8: PML models for BEC121 with institutional quality and institutional similarity

	government size	legal system	sound money	regulation	tariff
lnGDP exporter	-0.055***	-0.054***	-0.028***	0.000***	-0.068***
lnGDP importer	0.126***	0.119***	0.193***	0.131***	0.125***
lnPopulation exporter	-5.296***	-5.195***	-4.700***	-6.075***	-5.188***
lnPopulation importer	0.646***	0.644***	0.668***	0.626***	0.645***
lndistance	-0.750***	-0.752***	-0.732***	-0.707***	-0.750***
border	-0.850***	-0.854***	-0.831***	-0.861***	-0.851***
institutional quality importer	-0.080***	0.020***	-0.083***	0.002***	-0.004***
institutional similarity	-0.064***	0.016***	0.045***	0.030***	-0.246***
year effect	yes	yes	yes	yes	yes
exporter fixed effect	yes	yes	yes	yes	yes
importer fixed effect	yes	yes	yes	yes	yes
N	2396	2396	2396	2026	2396
Pseudo R^2	0.8936	0.8928	0.8947	0.8924	0.8956

Table 9: PML models for BEC122 with institutional quality and institutional similarity

	government size	legal system	sound money	regulation	tariff
lnGDP exporter	-0.116***	-0.127***	-0.116***	-0.131***	-0.106***
lnGDP importer	0.688***	0.692***	0.687***	0.698***	0.684***
lnPopulation exporter	-0.639***	-0.687***	-0.646***	0.490***	-0.620***
lnPopulation importer	0.625***	0.627***	0.625***	0.624***	0.624***
lndistance	-1.118***	-1.116***	-1.118***	-1.097***	-1.119***
border	1.088***	1.093***	1.087***	1.121***	1.083***
institutional quality importer	-0.013***	-0.085***	0.002***	0.006***	-0.113***
institutional similarity	0.032***	0.054***	-0.041***	0.016***	-0.056***
year effect	yes	yes	yes	yes	yes
exporter fixed effect	yes	yes	yes	yes	yes
importer fixed effect	yes	yes	yes	yes	yes
N	4630	4630	4630	3998	4630
Pseudo R^2	0.9030	0.9035	0.9031	0.8941	0.9034

Finally, the regression coefficients pertaining to the institutional similarity variable are mixed by different institutional quality variables and between the BEC agro-food trade categories. For the BEC111 agro-food trade category, the regression coefficients are of a positive sign pertaining to sound money and regulation, but of a negative sign pertaining to government size, legal system and tariff. For BEC112, they are of a positive sign pertaining to sound money, regulation and tariff, but of a negative sign pertaining to government size and legal system. For BEC121, they are of a positive sign pertaining to legal system, sound money and regulation, but of a negative sign for government size and tariff. For BEC 122, they are of a positive sign pertaining to government size, legal system and regulation, but of a negative sign for sound money and tariff. Similarly as for institutional quality, also in the case of institutional similarity there is no found any common institutional similarity variable for different the BEC agro-food categories in trade between the BRIC countries.

5 CONCLUSIONS

The emerging BRIC marketing economies are due to a large population number such as China and India as well as due to increasing size of economies one of the challenging issues for international trade. In this paper we have focused on agro-food trade between the BRIC countries, namely Brazil, the Russian Federation, India and China. Their bilateral trade has increased over time. This has been the results, which have been achieved particularly by Brazil and China, which have contributed to the rapid increase of agro-food trade. On the other hand the Russian Federation has experienced the stagnating and the most volatile agro-food trade over time.

The composition of agro-food trade for the BRIC countries varies largely between the countries, the BEC agro-food trade categories and over time. The prevailing in the composition of agro-food trade for Brazil and the Russian Federation are BEC122 and BEC111 agro-food categories, and for India and China BEC122 and BEC112 agro-food trade categories. This specialization patterns can be results of natural factor endowments as well as developed food processing and emerging international agro-food marketing activities.

Brazil and India have strengthened their agro-food competitiveness by gaining market shares in agro-food trade between the BRIC countries, while the Russian Federation has experienced the most severe deterioration. The number and the share of trading partners that have traded every year vary between the BRIC countries and the BEC agro-food categories over time.

Agro-food trade between the BRIC countries is positively associated with the GDP size and population size in importing countries as well as with institutional quality in the case of BEC111 agro-food trade category, but negatively associated with the GDP size and population size in exporting countries as well as with distance. Mixed results are found for border effect, institutional quality and institutional similarity depending on the BEC agro-food trade categories.

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