EXPORT INCENTIVES AND GLOBAL VALUE CHAINS

Svetlana Ledyaeva

Aalto University School of Business (formerly Helsinki School of Economics), Department of Economics P.O. Box 21240 FI-00076 AALTO; email: Svetlana.Ledyaeva@aalto.fi

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Abstract: Nowadays global value chains (GVCs) play central role in trade flows. This paper argues that GVCs can play important role in transmission of national trade policy effects across borders. More specifically, this study examines how domestic export incentives can affect foreign countries` exporters in the presence of GVCs. Existing theoretical literature suggests that in addition to straightforward negative "competition for market share" effects, there can be positive effects, which propagate via backward and forward GVCs linkages (trade in inputs). To our knowledge, this paper is the first one that empirically tests these effects. In particular, using recent trade data for BRICs countries (Brazil, Russia, India and China) this study shows that in the GVCs world there can be both negative and positive effects of domestic export incentives for foreign export as theory predicts. According to our framework, positive effects propagate via GVCs linkages.

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1. INTRODUCTION

The production of most goods is increasingly organized along global value chains (GVCs), in which different stages of the production process are fragmented across countries. This worldwide phenomenon has attracted a lot of attention among policy makers, business leaders, trade economists and academic researchers alike. Consequently, a large academic literature has emerged to investigate how the possibility to fragment production processes across borders may affect the volume, pattern and consequences of international trade (see, e.g., Feenstra and Hanson 1996; Yi 2003; Grossman and Rossi-Hansberg 2008). However, GVCs are undeservingly rarely considered in theoretical and empirical analysis of trade policy (for relevant discussion see also Blanchard, Bown and Johnson 2016) though the question how should trade policy be designed in the presence of global production networks is considered to be of first-order importance (Manova 2015). In this paper, we take a step toward filling these voids by exploring effects of domestic export incentives on foreign countries` export in the presence of GVCs linkages.

The main issue in both policy and academic discussion of export incentives and particularly export subsidies in earlier years was whether they have significant negative impacts on foreign (rival) countries. Earlier strategic trade policy literature (Spencer and Brander 1983; Brander and Spenser 1985; To 1994) conclude that in the world of imperfect competition and without trade in intermediates (i.e. without GVCs), export subsidies can help domestic firms to capture market shares of foreign firms in international markets thereby pointing to negative effects of domestic export incentives on foreign export. In this study we refer to such effects as to negative “competition for market share” effects.

However, as Hoekman (2015) notes, once the shift towards GVCs production is considered and linkages within and across value chains must be taken into account, determining the net effects of government export policies becomes more complicated. In particular, domestic sectoral or firm-specific government policies in GVCs world can benefit GVC as a whole including foreign firms/plants, their workers and local communities (Hoekman 2015). This further raises concerns about the power of multinational corporations (MNCs) and their ability to lobby certain policy measures, whether in their base country or in foreign countries, which would benefit their activities worldwide via GVCs.

Several theoretical papers (Spencer and Jones 1991; Bernhofen 1997; Ishikawa and Spencer 1998; Sheldon, Pick, and McCorriston 2001; Lee and Wong 2005) attempted to shed light on these issues by studying external effects of export incentives in the presence of trade in intermediates/inputs (main attribute of GVCs). In general, these studies conclude that under certain theoretical assumptions and in the presence of trade in intermediates/inputs, domestic export incentives, particularly export subsidies, can lead to profit/rent-shifting to foreign producers-exporters within common value chains. In this paper, summarizing mentioned theoretical studies, we distinguish between two main types of such effects. First one, we name it positive forward linkages` effect, emerges as a result of domestic export incentive for intermediate-good producers. This incentive leads to the cost reduction of produced abroad exportable final/higher-tier intermediate goods, which use subsidized imported intermediate good in its production. Second one, we name it positive backward linkages` effect, emerges as a result of domestic export incentive for final-good/processed intermediate-good producers. In particular, this incentive stimulates demand increase for imported foreign intermediate goods, which are used in production of subsidized domestic final/higher-tier processed intermediate good.

We provide empirical test of the presence of the outlined effects in the BRICs[1] bloc`s trade in recent years (2009-2015). BRIC countries are very suitable for this project, particularly, due to their rather aggressive export promotion policies in recent years, which, according to classical view, should harm significantly commercial interests of each other. In particular, Evenett (2015) reports that BRICS (Evenett also includes South Africa into his analysis) countries` commercial interests have been hit over 2700 times by trade policy measures of other countries since the Global Crisis began and almost a third of the times a BRICS commercial interest is harmed, it is due to actions taken by another member of the club. He suggests that "a straightforward way for the BRICS to show greater solidarity would be to initiate a programme to unwind the 1196 measures that they have taken that harm each other's commercial interests" (Evenett 2015, p. 4). Evenett (2015) further reports that since the Global Crisis began three of the BRICS (Brazil, India, and China) have implemented

[1] The 'BRIC' is an acronym for the four largest and most dynamic emerging economies – Brazil, Russia, India and China. The four countries, Brazil, Russia, India and China (BRIC) held their first summit in 2009. At the end of 2010, South Africa was officially invited to join the group (henceforth called 'BRICS') and attended the third summit in 2011. I do not include South Africa in the analysis because its share in the BRICS export is very small – only 3% of the BRICS` cumulative export in 2010-2014 according to the data of International Trade Centre of WTO and UN (http://www.trademap.org/tradestat/Product_SelCountry_TS.aspx).

additional incentives to inflate exports. These incentives harm the interests of trading partners that compete in the same markets abroad, including BRICS members itself. In this paper, we suggest that due to rather high interdependence of BRIC countries via GVCs linkages there can be also significant positive effects of export incentives implemented in one BRIC country for exports of the other three BRIC countries. Indeed, according to our analysis of relevant data, BRIC countries demonstrate growing GVCs linkages between each other in recent years.

In our empirical analysis, we develop a framework to specifically estimate how export incentives implemented in one BRIC country affect exports of the other three BRIC countries via GVCs forward and backward linkages. We further distinguish between diagonal and off-diagonal linkages. This framework can have applications in studying other various effects` propagation via GVCs linkages.

More specifically, in gravity-type panel equations for export by six-digit industry estimated for each BRIC country in period 2009-2015, we control for weighted sums of export incentives over two-digit (or broader) industrial sectors implemented (and in force) in each of the other three BRIC countries with weights as ratios of sectoral value added which were constructed in such a way as to reflect forward or backward GVCs linkages between respective two BRIC countries for respective industrial sectors. We construct these ratios using bilateral data on origin of value added in gross exports (by exporting and source country - industrial sector) published by OECD-TiVA. Data on export incentives comes from Global Trade Alert (GTA) database of Centre for Economic Policy Research (CEPR).

Within this framework for the case of export incentives` effects` cross-border transmission via GVCs forward linkages we are able to estimate how export incentives implemented (and in force) in country X for intermediates, which are intensively used as inputs in exportable production in country Y, affect export of respective products of country Y. For the case of cross-border transmission via GVCs backward linkages we are able to estimate how export incentives implemented (and in force) in country X for processed goods (final or intermediate) affect export from country Y to country X, given that inputs produced in country Y are intensively used in the production of exposed processed goods in country X.

Due to high aggregation of the weighted sums of foreign export incentives (two-digit and broader ISIC sectors) versus high disaggregation of the dependent variable – export (six-digit HS industries), the relationship between them can be both positive and negative. This is because the resultant regression coefficients of the weighted sums of foreign export incentives reflect aggregation over average effects for exports in six-digit industries i within broader sectors s(i). For some six-digit industries i within broad sector s(i), effects can be positive due to GVCs linkages, for some – negative due to competition effects. Hence, average effects can be positive or negative. Overall, positive relationship would indicate the dominance of positive effects transmitting via GVCs linkages between respective two BRIC countries while negative relationship would point to the dominance of negative "competition for market share" effects of foreign export incentives.

Our empirical analysis provides rather convincing evidence that external effects of export incentives adjusted for GVCs linkages can be positive which confirms that GVCs can play important role in transmission of trade policy effects across borders. First, we find that Indian export incentives implemented for intermediate goods positively affect export of Brazil and China due to GVCs` forward linkages. In particular, our results imply that when India implements export incentives for intermediates, which are intensively used as inputs in exportable production in Brazil and China, positive effects emerge for competitiveness of respective Brazilian and Chinese export products in the world market via, e.g., cost reduction as theory predicts.

Second, strongest positive effects via GVCs backward linkages are coming from Russian export incentives implemented for final and processed intermediate goods for Brazilian and Chinese export to Russia and from Brazilian export incentives to Indian export to Brazil. These results suggest that when /Russia//Brazil/ implement export incentives for processed intermediates or final goods, /Brazil and China//India/ increase their export of inputs to /Russia//Brazil/, which are intensively used in /Russian//Brazilian/ exportable production of exposed goods.

However, we should notice that overall our findings show that classical negative effects still seem to dominate. This leads to the conclusion that GVCs linkages between BRICs are not strong enough to significantly dampen negative "competition for market shares" effects coming from each other's export incentives. Russian export seems to suffer most from negative effects of export incentives implemented in the

other three BRICs. On the one hand, this result points to weak GVCs linkages between Russia and other three BRICs, and, on the other hand, there must be very strong negative "competition for market share" effects coming to Russia from export incentives implemented in the other three BRIC countries.

This paper is linked with three literatures. First, it contributes to a strand of literature that theoretically found profit/rent-shifting effects from domestic export incentives to foreign producers in the presence of trade in intermediates/inputs (Spencer and Jones 1991; Bernhofen 1997; Ishikawa and Spencer 1998; Sheldon, Pick, and McCorriston 2001; Lee and Wong 2005). Despite the prominence of this theory, to our knowledge there is no single study, which would empirically examine these effects. In this paper, we take a step toward bridging this gap between theory and evidence.

Second, this study directly relates to recently emerging literature on trade policies in the age of global value chains (Balwin and Venables 2013; Gawande, Hoekman, Cui 2015; Blanchard, Bown and Johnson 2016). Third, though in recent years BRIC countries have become salient players in the world trade, only few trade research papers (see, e.g., Cakir and Kabundi (2013) and Iapadre and Tajoli (2014)) have attempted to analyze the BRICs in terms of their trade patterns, developing integration, and potential bloc-wide cohesiveness. This study attempts to enrich this scant literature.

The paper is organized as follows. Section 2 describes theoretical framework. Section 3 introduces our empirical case, in particular, it discusses recent data on BRICs export incentives and BRICs current involvement in GVCs including their interdependence via GVCs. Section 4 describes empirical strategy. Section 5 presents and discusses empirical results. Finally, section 6 offers conclusions.

2. THEORETICAL FRAMEWORK

Though the perfectly competitive model of international trade says that, in general, export subsidies reduce home country welfare, in the world of imperfect competition by subsidizing/promoting export countries might increase their domestic welfare if they win in competition for profitable international markets. In their seminal paper Spencer and Brander (1983) has shown that in imperfectly competitive international markets, a government, which has the objective of maximizing domestic welfare, may have an incentive to subsidize

research and development activities of domestic firms in industries in which they compete with foreign firms for international markets. In particular, they conclude that in the case of subsidy domestic welfare is improved by the capture of a greater share of the output of rent-earning industries, although the subsidy-ridden non-cooperative international equilibrium is jointly suboptimal. In a companion paper Brander and Spencer (1985) further present the analysis based on imperfect competition (in particular, they incorporate Cournot duopoly into a one-period "third market" model) to explain why export subsidies might be attractive policies from a domestic point of view. They found that governments` optimal policy is to subsidize exports because export subsidy improves the relative position of the domestic firm in non-cooperative rivalries with other firms, and allow it to expand its market share. To (1994) goes forward and examines export policy using a two-period model of oligopolistic competition with switching costs. He concludes: "When governments and firms are patient, consumers are impatient, and switching costs are significant, exporting countries will subsidize exports in the first period. A subsidy helps capture market share which is valuable to the government in terms of both second-period profits and second-period tax revenues" (To 1994, p. 100). All these studies come to a general conclusion that in markets with imperfect competition export incentives (subsidies, in particular) can benefit implemented countries and harm affected (rival) foreign countries if they help subsidized domestic firms to capture market shares of foreign firms in international markets. In other words domestic export promotion measures enhance domestic export (lead to the increase of domestic export shares in the world markets in affected industries) but negatively affect export of foreign rivals (i.e. the respective export shares of affected foreign countries fall). In the rest of the paper, we refer to the latter effect (i.e. negative effect of export incentive targeted at domestic good for foreign export of the same good) as to negative "competition for market share" effect.

In strategic trade policy models outlined above, only a final product is considered and only primary factors are used in the production process. However, in the real world most industries use in production not only primary factors but also intermediate inputs. Furthermore, the rising international trade in intermediate inputs reflects the increasing importance of GVCs when production processes span multiple countries, with each country specializing in particular stages of a good's production sequence (Costinot, Vogel, and Wang

2013). These facts have been recognized in academic literature and a number of papers have emerged analyzing various issues of interaction between trade in intermediate inputs and trade policies. In this study we focus on the literature which examines effects of domestic export incentives on foreign countries` export in the presence of trade in intermediates/GVCs. In order to make analysis more straightforward, we distinguish between external effects of export incentives targeted at either final or intermediate goods.

The seminal paper for the case of external effects of export incentives aiming at domestic final-good producers in the presence of intermediate trade is Ishikawa and Spencer (1998). Ishikawa and Spencer (1998), under assumption of Cournot competition, conclude that in vertically related industry an export subsidy aimed at shifting rents from foreign to domestic final-good producers may also shift rents to oligopolistic foreign suppliers of intermediate inputs. Bernhofen (1997), assuming that intermediate good is supplied by a foreign monopolist, similarly finds that export subsidy on domestic final-good producer can cause a vertical rent-shifting from domestic downstream producer to foreign upstream supplier. In the empirical context of this study these theoretical predictions imply that:

Proposition 1: *Domestic export incentive (e.g. subsidy) implemented in country A for final/higher-tier intermediate product X can induce foreign export of intermediate input I from country B to country A used in production of subsidized final/higher-tier intermediate product X in country A if foreign suppliers of intermediate input I are oligopolistic or monopolistic. In the rest of the paper, we refer to this effect as to* ***positive backward linkages` effect****.*

Theoretical literature on external effects of export incentives aiming at intermediate-good producers also allows us to make relevant conclusions. For example, in their influential paper Spencer and Jones (1991) study the market structure where, in the home country A, there is a vertically integrated firm controlling exports of both an intermediate and a final good. This firm competes in a foreign country B with a firm that produces the final good and has the option of either importing the intermediate good or producing it at higher cost. In the case of trade in intermediate and final goods, if in home country A profit margins are higher for trade in the

former, Spencer and Jones show that the optimal policy of country A government is a tax on exports of the final good in order to shift toward trade in the intermediate good. Such a policy results in that low-cost vertically integrated manufacturer in country A exports an intermediate product, lowering the costs of a foreign rival producer of final goods in country B thereby stimulating country B export of respective final goods. For the empirical context of our study, these conclusions imply that when a government establishes export incentives targeting at domestic intermediate-good producers, it might benefit foreign producers who import these intermediate inputs for their exportable production of final/higher-tier intermediate goods.

Similarly, Lee and Wong (2005) examine the use of export subsidy to encourage domestic production of an intermediate input or a final product in a model with international rivalry between firms in two countries. Lee and Wong paper is a simple extension of a well-known international duopoly model considered in the literature to study the use of export subsidies. They consider two countries, labeled home and foreign, and two industries in each country: one for a final good for consumption, and another for an intermediate input, which is used exclusively in the production of the final good. Trade between the two countries in the intermediate product is allowed, while outputs of the final good are sold in the rest of the world. Though Lee and Wong emphasize that they do not want to claim wide applicability of their results because of some simplifying assumptions they made, in the context of our study some of their conclusions are useful. In particular, according to their model, under certain theoretical assumptions, domestic subsidy for intermediate-input producer leads to the increase of output and profit of foreign producer of final good, which uses respective intermediate input in her production.

Sheldon, Pick, and McCorriston (2001) examine the interaction between export subsidies and profit-shifting in a vertical production system, where each stage of production downstream from agriculture may be characterized by imperfect competition. Their focus is on comparing the profit-shifting effect for the case where an export subsidy is targeted either at a foreign final processed good (i.e. foreign export subsidy for final-good producers) or at domestic unprocessed agricultural commodity (i.e. domestic export subsidy for unprocessed agricultural commodity producers), where the latter enters the production process for an intermediate good subsequently used in production of the final processed good. According to their model,

domestic export subsidy to the unprocessed agricultural commodity may have greater profit-shifting effects in the final goods` market than a downstream foreign export subsidy. In addition, both types of subsidy result in profits being shifted from the home to the foreign upstream processing firm.

Summarizing the above theoretical studies, we arrive at our second proposition:

Proposition 2: *Domestic export incentive (e.g. subsidy) implemented in country A for intermediate product I can positively affect country B`s export of final/higher-tier intermediate good X which uses intermediate product I imported from country A in its production. In the rest of the paper we refer to this effect as to* ***positive forward linkages` effect****.*

3. BRIC COUNTRIES AS A CASE STUDY OF EFFECTS OF DOMESTIC EXPORT INCENTIVES ON FOREIGN COUNTRIES` EXPORT

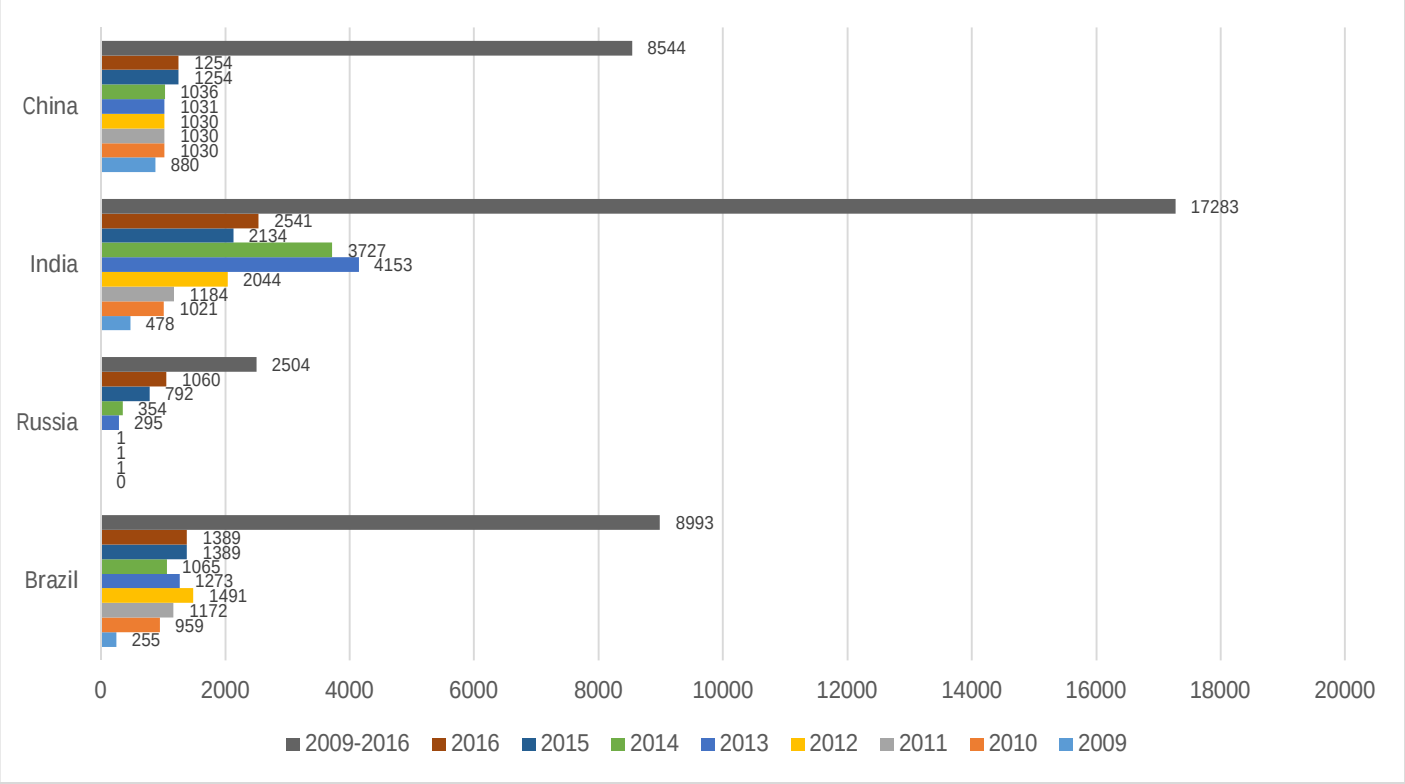
As was already noted in introduction, BRIC countries are very suitable for this project, firstly, due to their rather aggressive export promotion policies in recent years (see Evenett 2015) and, secondly, due to their rather high inclusion into the word` GVCs and also their high and growing interdependence via GVCs. Below we discuss these issues in more detail.

3.1. Export incentives in the BRIC countries in recent years

In a recent Global Trade Alert (GTA) report of the Centre for Economic Policy Research (CEPR) authored by Evenett (2015), it has been shown that since the Global Crisis began three of the BRICS - Brazil, India, and China - have introduced a large number of additional incentives to inflate exports (i.e. export incentives). In this section, we briefly overview data on recent BRICs` export incentives according to GTA database. This database includes trade measures implemented from 2006 to present but does not necessarily contain all implemented measures. First, we report statistics on cumulative number of export incentives by industry (HS 2007 four-digit codes as reported in GTA database) and year of being in force. In particular, for each BRIC country we sum up number of export incentives, which are in force by affected industry in a certain year. E.g.

if in a country X in a year t two export incentives have been in force and the first one affects 10 HS four-digit industries while the second one – 5 industries, our indicator of export incentives in a year t for a country X equals to 15. In this way we are able to count not just for the number of implemented export incentives but also for their industrial coverage (some incentives concern only one HS four-digit industry, some – hundreds) and duration (some measures last only few months, some – five and even more years). If export incentive lasts only several months, i.e. less than one year, we count for it as 1/12*x where x is duration of the export incentive in months. E.g. for the above example if in a country X in a year t the first export incentive which affects 10 HS four-digit industries has been in force for six months, our indicator of export incentives in a year t for a country X equals to 10 (5 + 5 instead of 10 + 5 in original example). Results of the computations are reported on Figure 1.

Figure 1 Number of export incentives in force per industry (HS 2007 four-digit) and year

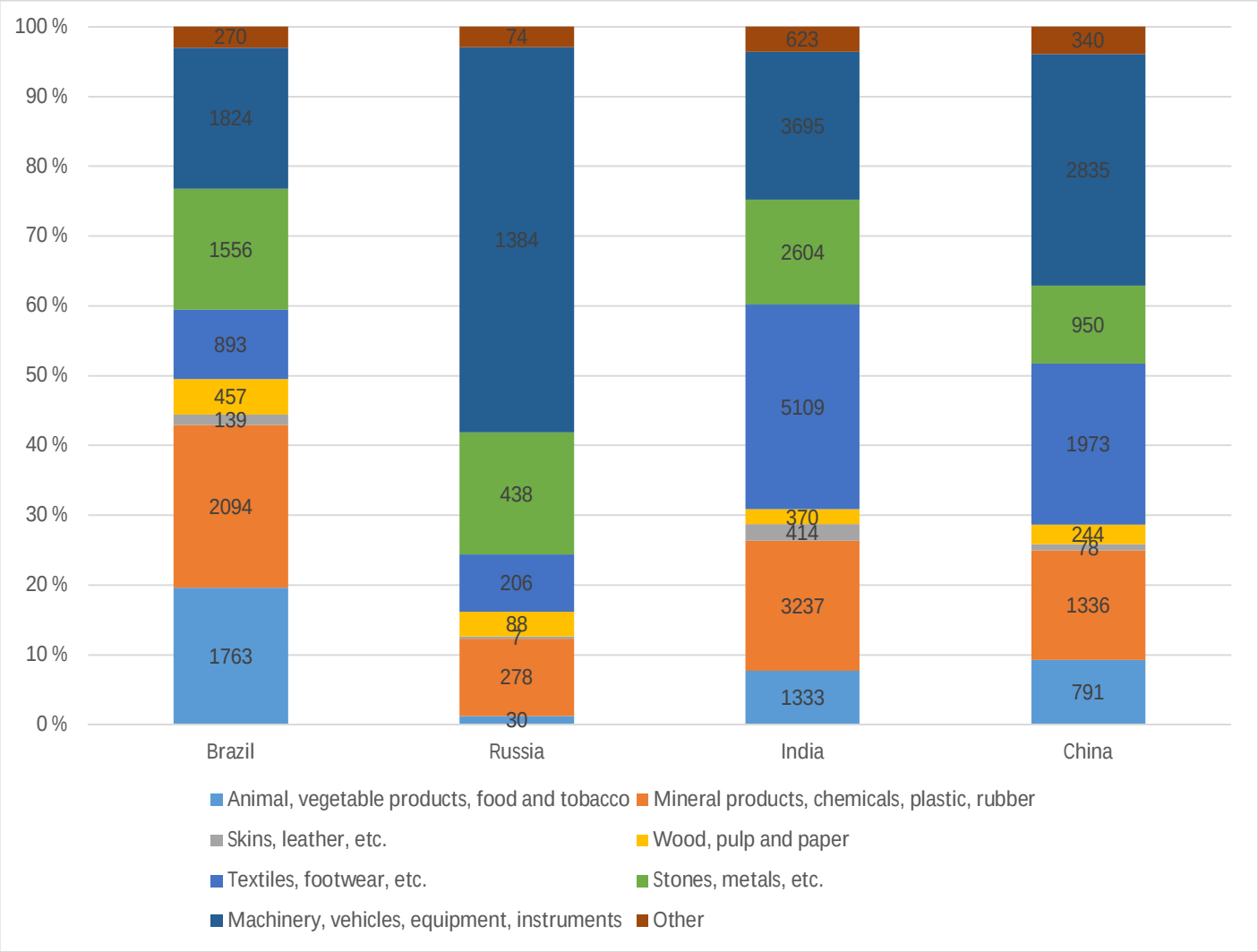


Source: Author`s calculations based on GTA data.

As we can see India is an obvious leader here. During the period of 2009-2016 Indian cumulative number of export incentives per industry-year was about 2 times higher than that of Brazil and China and 7 times higher

than that of Russia. We next report industrial structure of export incentives per industry-year as cumulative for the period of 2009-2016 on Figure 2.

Figure 2 Industrial structure of export incentives per industry-year as cumulative in 2009-2016



Note: Based on HS chapter classification: Animal, vegetable products, food and tobacco (chapters 1-24); Mineral products, chemicals, plastic, rubber (chapters 25-40); Skins, leather, etc. (chapters 41-43); Wood, pulp and paper (chapters 44-49); Textiles, footwear, etc. (chapters 50-67); Stones, metals, etc. (chapters 68-83); machinery, vehicles, equipment, instruments (chapters 84-92); Other (chapters 92-99).

Source: Author`s calculations based on GTA data.

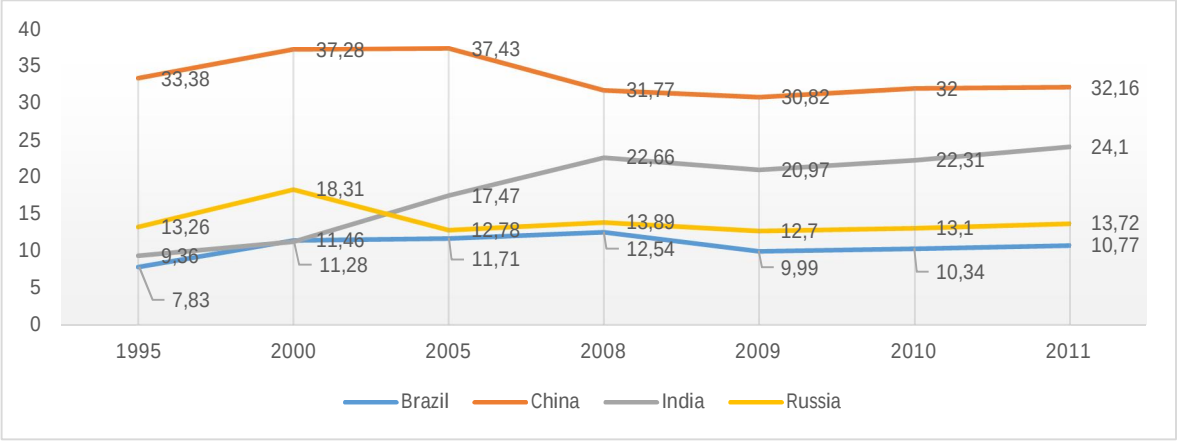
From the Figure 2 we can see that BRIC countries implemented most export incentives in machinery, vehicles, equipment, instruments` sector (especially its share is high for Russia - about 50%; for China it is about 30%; for Brazil and India – about 20%). India and China implement significant amounts of export incentives in agricultural and food industries – about 30 and 20% in total numbers of export incentives, respectively. Finally, BRICs stimulate export rather intensively in “Mineral products, chemicals, plastic and rubber sector” – over 20% of all export incentives in Brazil, about 20% in India, about 15% in China and about 10% in Russia.

After quantitative analysis of BRICs export incentives, we briefly turn to the qualitative side of the problem. According to Evenett (2015) and our assessments India stands out for the number of measures taken to boost exports through subsidized trade finance. Many of BRICs export incentives involve tax refunds or reductions for firms engaged in exporting. China mostly implements Value Added Tax (VAT) rebates and reductions: 17 out of 27 Chinese export incentives reported in GTA database concern VAT.

3.2. BRIC countries` participation in the world`s GVCs

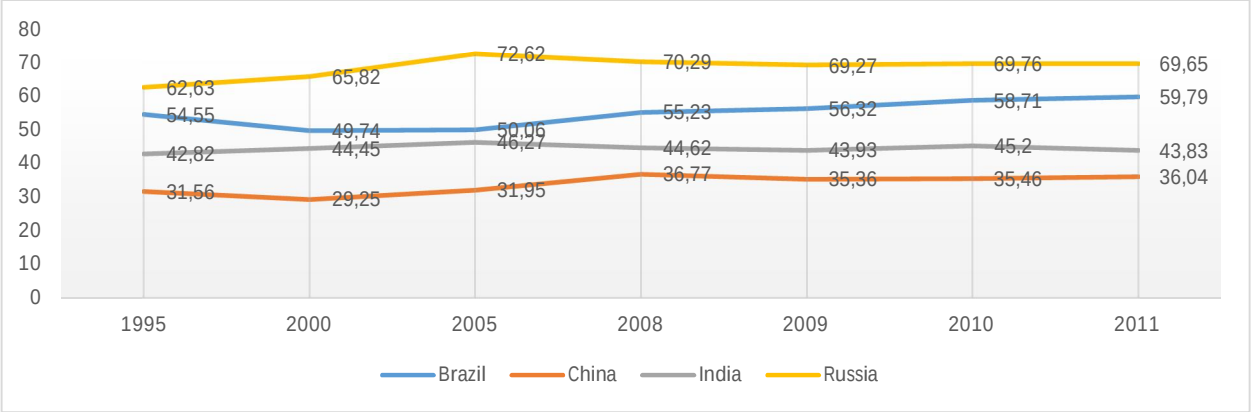
When it comes to measurement of GVCs participation, the most known approach is the Hummels, Ishii, and Yi (2001) indicator of "vertical specialization" and its refinement by Koopman, Powers, Wang, and Wei (2011). Value chain participation is defined in terms of the origin of the value added embodied in exports both looking backward and forward from a reference country: backward is represented by foreign value added embodied in exports, and forward is represented by domestic value added which is used as inputs to produce exports in the destination country (Kowalski, Gonzalez, Ragoussis, and Ugarte (2015)). On Figures 3 and 4 we present relevant indicators for BRIC countries which are readily available in OECD-TiVA database.

Figure 3 Foreign value added share of gross exports (backward GVCs participation index) in the BRICs, %



Note: According to OECD-TiVA definition backward GVC participation index captures the extent to which domestic firms use foreign intermediate value added for exporting activities in a given country.
Source: OECD-TiVA data.

Figure 4 Domestic value added in exports of intermediate products as a share of total gross foreign exports (forward GVCs participation index) in the BRICs, %

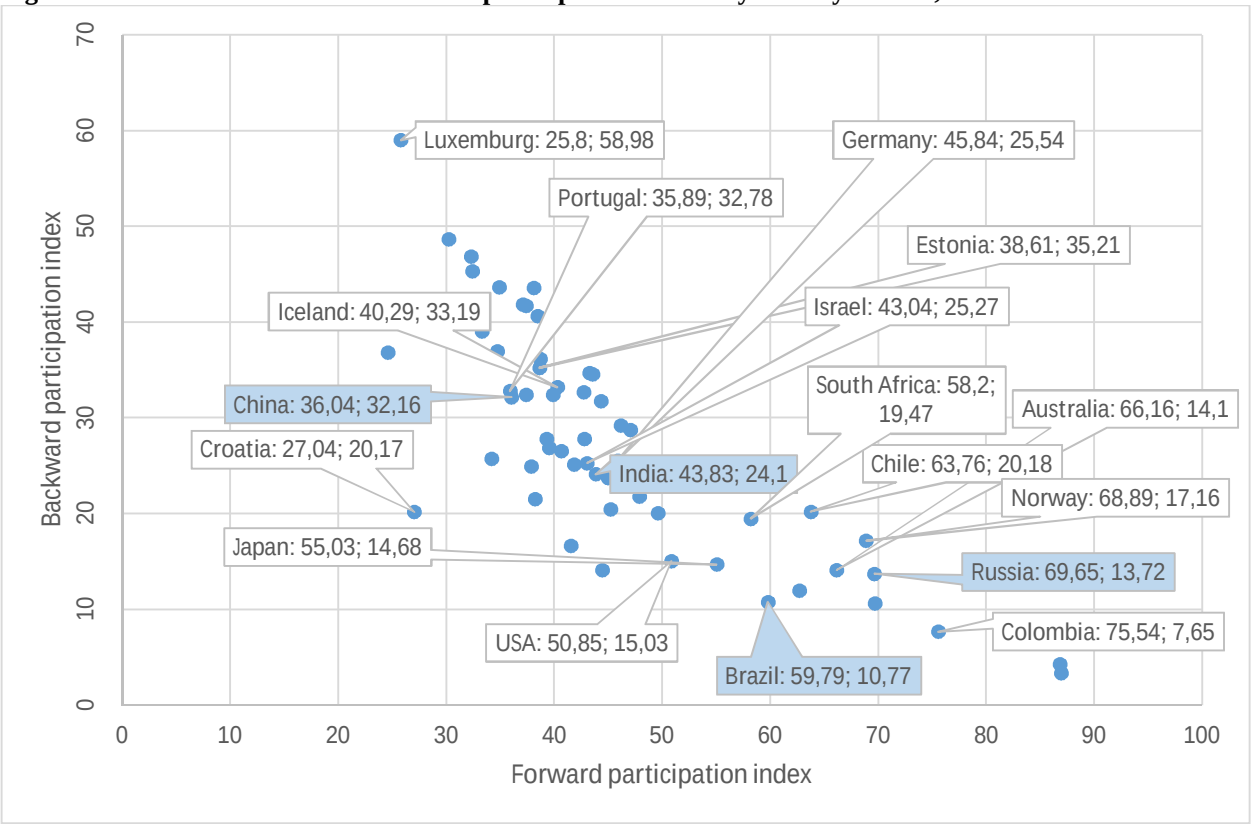


Note: According to OECD-TiVA definition forward GVC participation index captures the extent to which a given country's exports are used by firms in partner countries as inputs into their own exports.
Source: OECD-TiVA data.

As we can see from the Figures, only India`s backward participation index has increased dramatically in the period (from 9.36 to 24.1). Otherwise, both indices have been rather stable for the BRIC countries in 1995-2011. China has the highest participation in backward linkages of the world GVCs followed by India. Russia and Brazil, on the other hand, participate significantly more than India and China in forward linkages of the world GVCs. These are expectable trends, as, on the one hand, China and India are widely recognized as the world`s manufacturing hubs, and, on the other hand, Brazil and Russia are among the world`s largest suppliers of natural resources used as inputs in production of various goods and services worldwide.

On Figure 5 we depict backward against forward GVCs participation indices for all countries for which data is available in OECD-TiVA database for the year 2011 (last available data point).

Figure 5 Backward versus forward GVCs participation indices by country in 2011, %

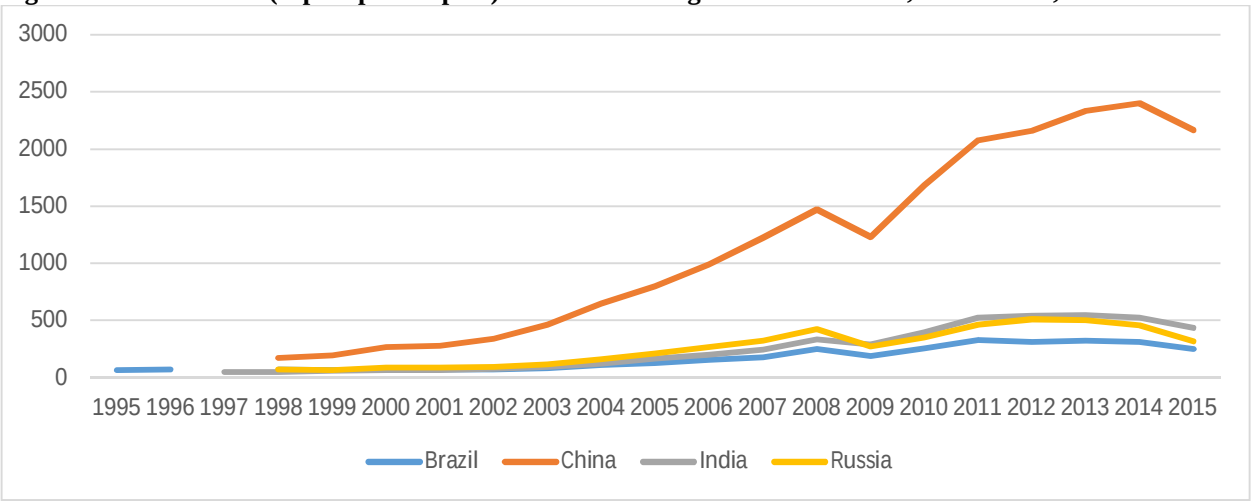


Source: OECD-TiVA data.

As can be seen from Figure 5, Brazil and Russia are in the cluster of resource abundant countries with high forward GVCs participation index and low backward GVCs participation index while China and India are in the cluster of countries with more advanced industrial structures with relatively equal indices ranging between 30 and 40%.

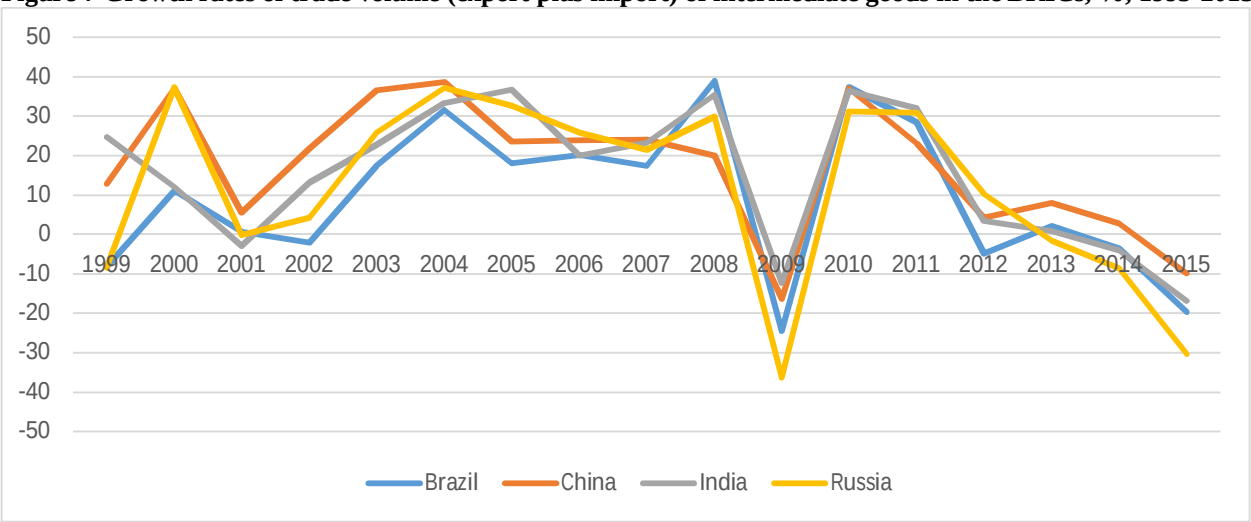
Trends in intermediate goods` trade are also indicative of GVCs formation because fragmented production processes require that parts, components, and partially manufactured subassemblies cross borders—sometimes more than once—before final goods are produced and shipped to final markets (Feenstra 1998; Arndt and Kierzkowski 2001; Sturgeon and Mevedovic 2011). On Figures 6 and 7 we present intermediate goods` trade volumes (export plus import) of the BRICs and their annual growth rates, respectively.

Figure 6 Trade volume (export plus import) of intermediate goods in the BRICs, billion USD, 1995-2015



Note: Intermediate goods have been identified according to Broad Economic Categories (BEC) classification.
Source: Author`s calculations based on UN COMTRADE data.

Figure 7 Growth rates of trade volume (export plus import) of intermediate goods in the BRICs, %, 1995-2015



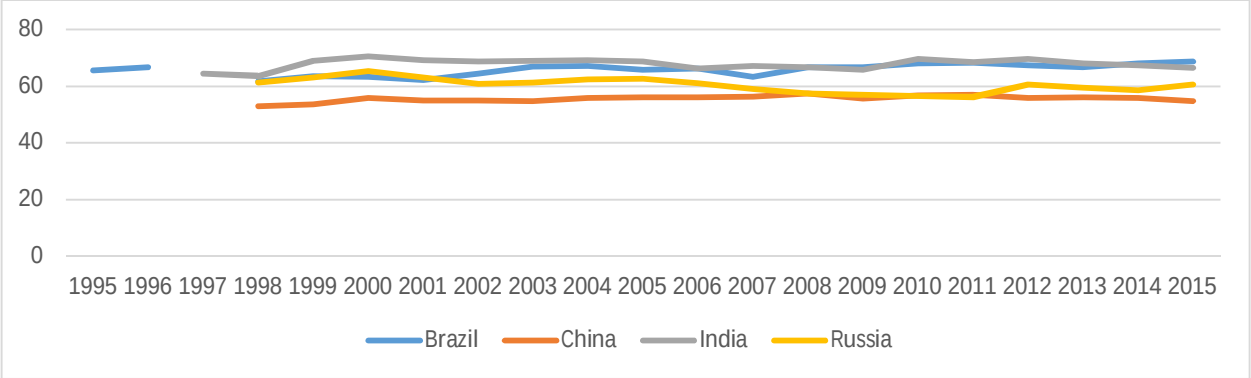
Note: 1) Intermediate goods have been identified according to BEC classification; 2) Growth rates have been computed as $\frac{Y_t - Y_{t-1}}{Y_{t-1}} \cdot 100\ \%$.

Source: Author`s calculations based on UN COMTRADE data.

As we can see from the Figures, though in recent decades BRICs` intermediate trade has been growing, the growth rates have been decreasing and have become even negative in 2014-2015 for all the BRICs.

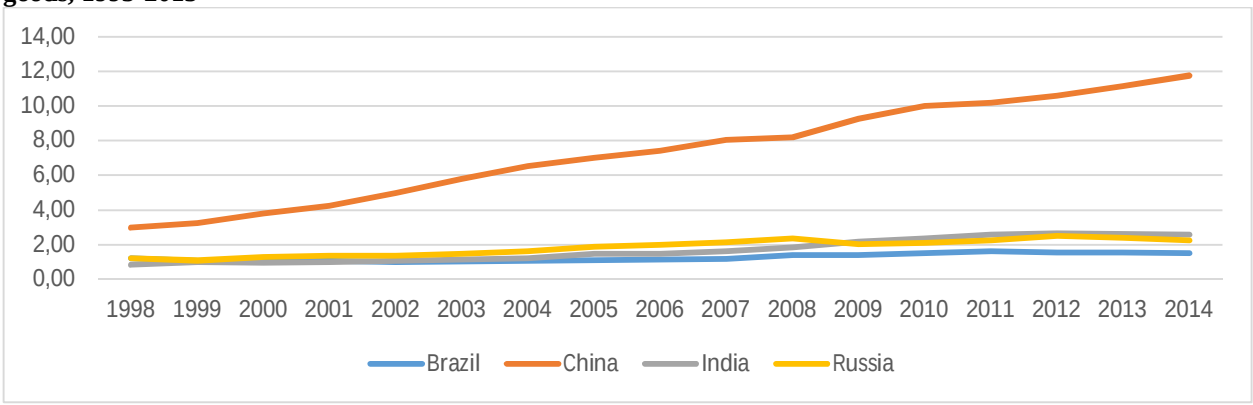
Figures 6 and 7 provide us with the picture of respective trade dynamics in absolute terms. Nevertheless, it is interesting to look at these trends relative to total trade of the BRICs and to world trade in intermediate goods. On Figures 8 and 9 we present these indicators.

Figure 8 Trade volume (export plus import) of intermediate goods as percentage of total trade volume of the BRICs, 1995-2015



Note: Intermediate goods have been identified according to BEC classification.
Source: Author`s calculations based on UN COMTRADE data.

Figure 9 BRICs trade volume (export plus import) of intermediate goods as percentage of world trade volume of intermediate goods, 1995-2015

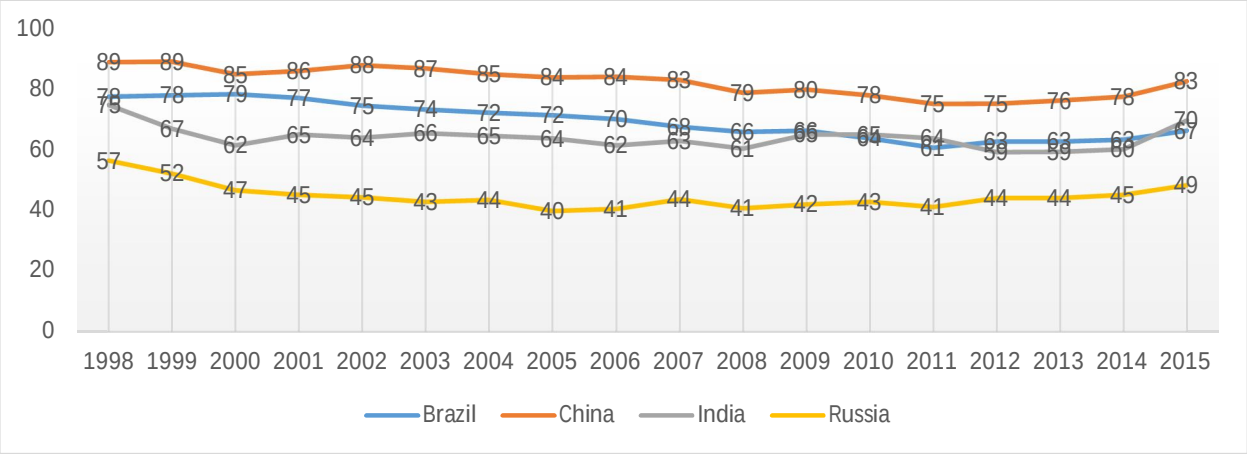


Note: Intermediate goods have been identified according to BEC classification.
Source: Author`s calculations based on UN COMTRADE data.

From Figure 8 we can conclude that BRICs` trade structure with respect to intermediate versus final goods have been rather stable in recent decades with highest share of intermediates in Brazilian and Indian trade and lowest – in Chinese trade. On the other hand, from Figure 9 we can further see that China`s role in the world trade of intermediate goods is rather significant with a strong growing tendency. Brazil, Russia and India do not seem to be even close to China on that score.

In Figure 10 we present shares of processed intermediates in total intermediate trade volumes of the BRICs.

Figure 10 Share of processed intermediates in total intermediate trade volume (export plus import) in the BRICs, %, 1998-2015



Note: Intermediate goods have been identified according to BEC classification.
Source: Author`s calculations based on UN COMTRADE data.

As we can see, China exhibits the highest share of processed intermediates in its intermediate trade among the BRICs and Russia – the lowest.

Finally, on Figures A1.1-A1.4 in Appendix 1, we present the structure of intermediate goods` exports of the BRICs according to Broad Economic Category (BEC) classification[2]. As we can see, Brazilian intermediate export has been rather diversified with dominance of processed and primary industrial supplies. Primary fuels and lubricants dominate in Russian intermediate export. Processed industrial supplies strongly dominate in Indian intermediate export. Finally, processed and primary industrial supplies prevail in Chinese intermediate export.

Overall, this brief descriptive analysis enables us to conclude that BRIC countries` participation in the world`s GVCs have been rather high and stable in recent years which is good in the context of this study. Furthermore, BRIC countries seem to have differential roles in the world`s GVCs with Brazil and Russia providing core inputs for global production and China and India serving as the world`s manufacturing hubs (China also stands out for specializing in more processed goods compared to other BRICs). This makes BRICs bloc a particularly interesting example for comparative analysis.

[2] The purpose of the classification is to analyze international trade statistics by large economic classes of commodities, distinguishing food, industrial supplies, capital equipment, consumer durables and consumer non-durables.

3.3. BRICs participation in each other`s global value chains

In recent years, BRIC countries` participation in each other's GVCs has been on rise. From Figures 11-14 we can see that between the years of 1995 and 2011 value added in export by the other three BRICs have increased for Brazil from 1.53 to 12.68%, for Russia from 2.67 to 12.32%, for India from 5.23 to 11.94% and for China from 4.65 to 7.08%. However, it should be noted that for Brazil, Russia and India most of this increase comes from China`s value added. On the other hand, China has the lowest share of BRICs value added in its export among the BRICs so it has also increased during the period by 1.5 times. We can also see that the shares of US, EU and Japan value added in BRIC countries` export either have decreased or have not changed in the period though they still remain high.

Figure 11

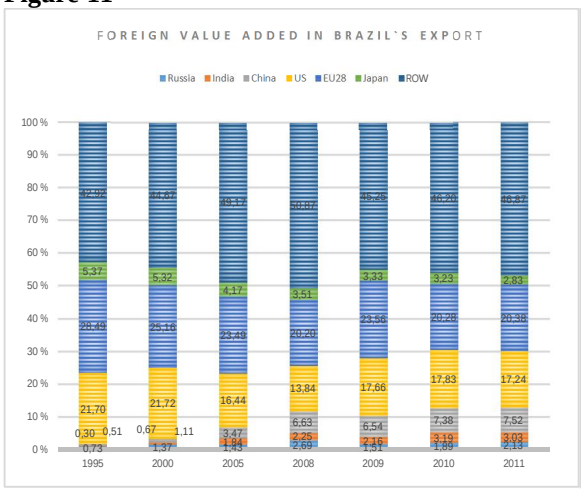


Figure 12

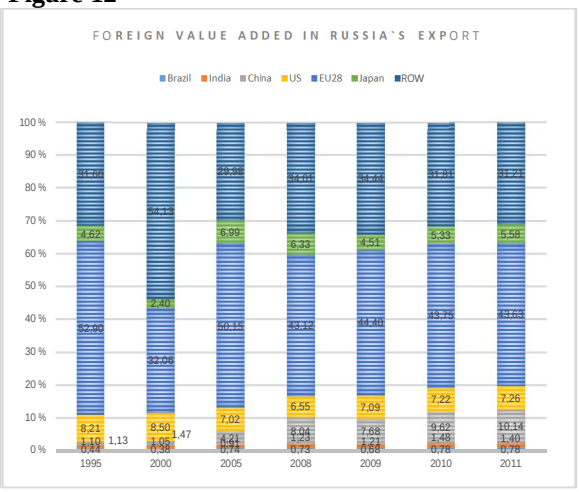


Figure 13

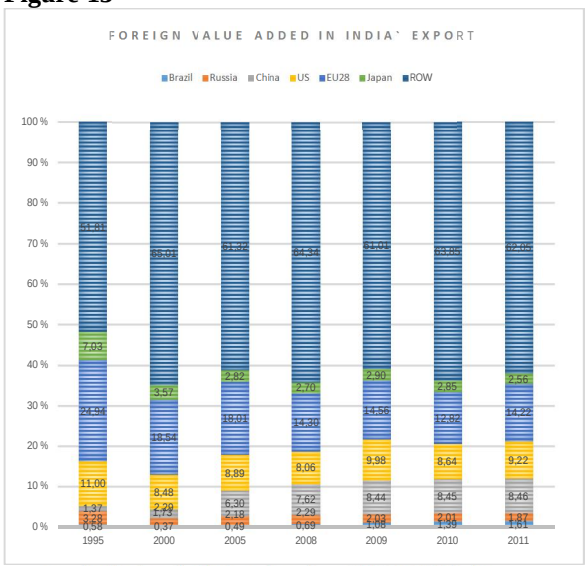
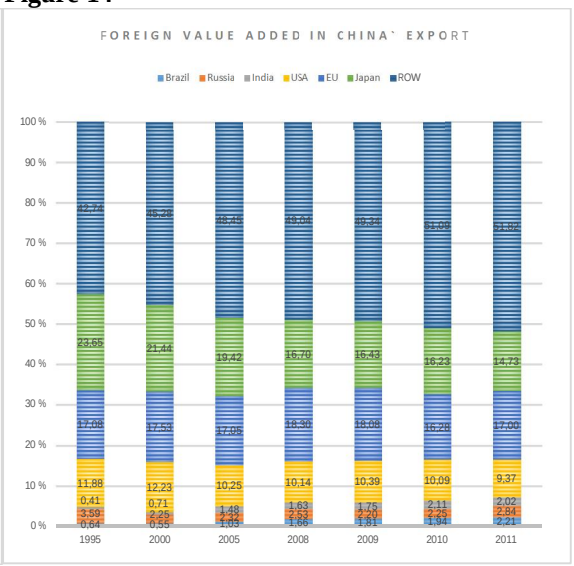


Figure 14



Source: Author`s calculations based on *OECD-TiVA data*.

Next, we look at inter-BRICs trade in intermediate goods presented on Figures 15-18.

Figure 15

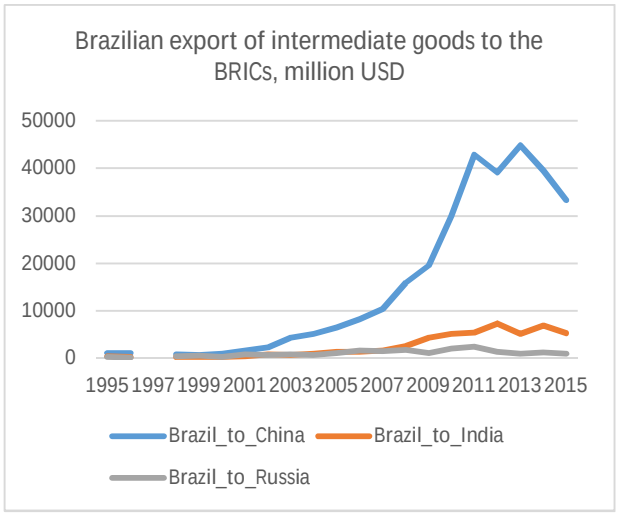


Figure 16

Figure 17

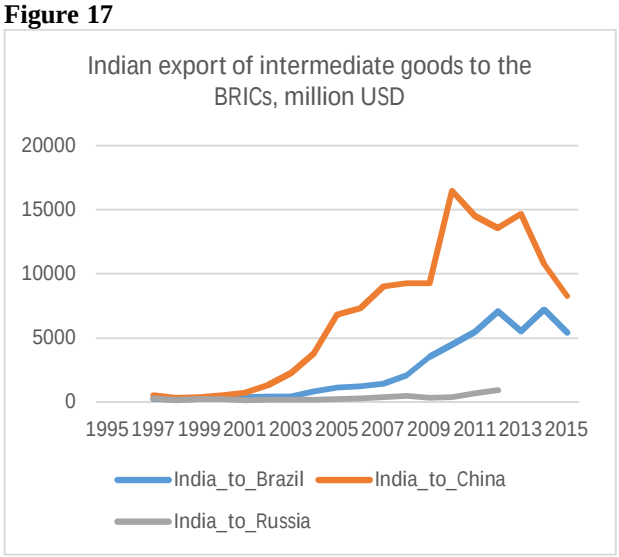
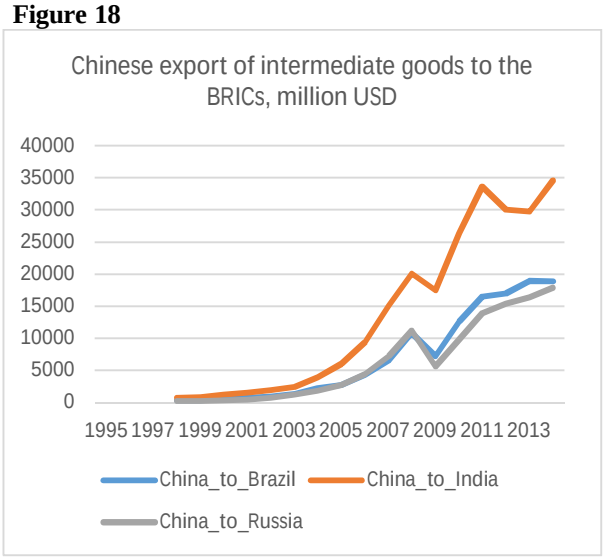


Figure 18



Note: Intermediate goods have been identified according to BEC classification.
Source: Author`s calculations based on UN COMTRADE data.

As we can see from the Figures, bilateral trade in intermediates between China, on the one hand, and Brazil, Russia and India, on the other hand, have been especially on rise in recent years.

Finally, on Figures A2.1-A2.12 in Appendix 2, we present the structure of intermediate goods` exports in inter-BRICs trade according to BEC. It appears that Brazil largely exports intermediates of food and fuel industries to other BRICs. Russian intermediate export to Brazil and India largely consists of processed industrial supplies though Russian intermediate export to China is mainly primary fuels. Processed industrial supplies dominate in Indian intermediate export in inter-BRICs trade. India also exports rather significant amounts of parts and accessories of capital goods (including transport equipment) to Brazil and Russia. China`s

main export categories in inter-BRICs intermediate trade are processed industrial supplies, parts and accessories of capital goods (including transport equipment).

On the whole, it can be concluded that at present BRICs interdependence via GVCs is rather high and, in general, has been growing in recent years. Individual roles of each BRIC country in common GVCs seem to have its own unique characteristics.

4. ESTIMATION STRATEGY

Export incentives` effects on foreign export via GVCs forward linkages (Proposition 2)

Empirical test of the impact of export policy (whether it is foreign or domestic) on export must control for other determinants of trade. We adopt a gravity approach to our data and augment it to include export policy measures. Specifically, for each country of interest (denoted by X, which is one of the BRIC countries) we estimate the following equation:

$$EX\_SH_{i,t,X} = a_0 + a_1 EX\_SH_{i,t-1,X} + a_2 WGDP\_SH_{t,X} + a_3 TF_{t,X} + a_4 EI_{i,t,X} + a_5 FLI\_OFFD_{s(i),t,BRIC1} + \\ + a_6 FLI\_D_{s(i),t,BRIC1} + a_7 FLI\_OFFD_{s(i),t,BRIC2} + a_8 FLI\_D_{s(i),t,BRIC2} + a_9 FLI\_OFFD_{s(i),t,BRIC3} + \\ a_{10} FLI\_D_{s(i),t,BRIC3} + \sum_t d_t YD + e_{it} + u_i$$

(1).

$EX\_SH_{i,t,X}$ / $EX\_SH_{i,t-1,X}$ is country X export share in the world export in an industry *i* (HS 2007, six-digit level) in a year t / t-1 (2008,…,2015). The data comes from UN COMTRADE. The use of export shares in world markets and not export flows as dependent variable is justified in the context of this study, first and utmost, because export incentives originally target at capturing market shares of foreign rivals in export markets. In our case, we are then able to test if domestic export incentives actually can help foreign exporters to capture additional market shares in the world markets conditional on the strength of their relevant GVCs linkages with the country implementing these incentives. However, for robustness checking purposes we also estimate a version of equation (1) with export flows as dependent variable (see equation (4) below).

$WGDP\_SH_{t,X}$ is the share of GDP of country X in the World GDP in a year t (2009-2015). The data comes from World Bank. $TF_{t,X}$ is Trade Freedom component of Index of Economic Freedom of Heritage foundation of country X in a year t (2009-2015). $EI_{i,t,X}$ is number of export incentives in industry i (HS 2007, four-digit level) which are in force in a year t (2009,…, 2015) in country X. If export incentive lasts only several months, i.e. less than one year, we count for it as 1/12*x where x is duration of the export incentive in months. Data comes from GTA database[3]. We expect that all control variables are positively related to the dependent variable as basic gravity and trade theories predict.

Last six variables in equation (1) are variables of interest in this study. $FLI\_OFFD_{s(i),t,BRIC1/2/3}$ and $FLI\_D_{s(i),t,BRIC1/2/3}$ are calculated as follows:

$$FLI\_OFFD_{s(i),t,BRIC1/2/3} = \sum_{s_n \neq s(i)} NFEI_{s_n \neq s(i),t,BRIC1/2/3} \cdot \frac{VA_{s_n \neq s(i),t,BRIC1/2/3} inEXP_{s(i),t,X}}{VA_{s_n \neq s(i),t,World} inEXP_{s(i),t,X}} \quad (2);$$

$$FLI\_D_{s(i),t,BRIC1/2/3} = NFEI_{s(i),t,BRIC1/2/3} \cdot \frac{VA_{s(i),t,BRIC1/2/3} inEXP_{s(i),t,X}}{VA_{s(i),t,World} inEXP_{s(i),t,X}} \quad (3),$$

where $s(i)$ is a broad industrial sector (ISIC (rev. 3) two-digit or broader sector as reported in Table 1 below) which includes industry i (HS 2007, six-digit level)[4]; $s_n \neq s(i)$ is a broad ISIC industrial sector which is not $s(i)$. *BRIC1/2/3* is one of the BRIC countries which is not X; t denotes year (2009,…,2015); *FLI* denotes forward linkages and *OFFD/D* – off-diagonal/diagonal elements of respective input-output tables used in calculations. *NFEI* denotes export incentives, which are in force in denoted sector, year and country and which

[3] This database includes trade measures implemented from 2006 but does not necessarily contain all implemented measures. Originally, GTA data is reported for four-digit HS 2007 industries. We should also note that while constructing export incentives` variables we consider only those export incentives, which, by GTA definition, are "implemented and almost certainly discriminate against foreign commercial interests" (in GTA classification they are marked by red color).

[4] Appropriate conversions from HS to ISIC and vice-versa have been made when needed.

do not concern final products (i.e. only export incentive for primary and processed intermediates are included). Data on export incentives comes from *Global Trade Alert* database. *VAinEXP* denotes value added (*VA*) of denoted country, industry and year in export (*EXP*) of denoted country, industry and year. Data on value added comes from *OECD-TiVA* database on origin of value added in gross export by exporting and source country-industrial sector (sectors are reported in Table 1)). Data is available up to 2011 and, hence, for the years of 2012-2015 we use data of 2011.

Table 1 ISIC rev. 3 broad sectors of value added OECD-TiVA data used in the study for construction of weights, which represent GVCs forward and backward linkages

ISIC rev. 3 sectors	*Description*
C01T05	Agriculture, hunting, forestry and fishing
C10T14	Mining and quarrying
C15T16	Food products, beverages and tobacco
C17T19	Textiles, textile products, leather and footwear
C20	Wood and products of wood and cork
C21T22	Pulp, paper, paper products, printing and publishing
C23	Coke, refined petroleum products and nuclear fuel
C24	Chemicals and chemical products
C25	Rubber and plastics products
C26	Other non-metallic mineral products
C27	Basic metals
C28	Fabricated metal products
C29	Machinery and equipment, nec
C30T33	Electrical and optical equipment
C34	Motor vehicles, trailers and semi-trailers
C35	Other transport equipment
C36T37	Manufacturing nec; recycling

Source: OECD-TiVA

The first indicator, $FLI\_OFFD_{s(i),t,BRIC1/2/3}$, reflects the weighted sum of export incentives for intermediates which are in force in country *BRIC1/2/3* in a year t in sectors $s_n^{1}\ s(i)$ with weights as ratios of value added of country *BRIC1/2/3* sectors $s_n^{1}\ s(i)$ in country X gross export of sector $s(i)$ to respective value added of the world in a year t (i.e. ratios have been computed for off-diagonal elements in respective bilateral input-output OECD/TiVA tables). The second indicator, $FLI\_D_{s(i),t,BRIC1/2/3}$, defines export incentives for intermediates which are in force in country *BRIC1/2/3* in a year t in sector $s(i)$ weighted by ratio of value added of country *BRIC1/2/3* sector $s(i)$ in country X gross export of sector $s(i)$ to respective value added of

the world in a year t (i.e. ratios have been computed for diagonal elements in respective bilateral input-output OECD-TiVA tables).

Since our weighted sums of export incentives` variables are computed for two-digit or broader sectors $S(i)$ while the dependent variable is represented at six-digit industries i, regression coefficients of the weighted sums of export incentives` variables reflect resultant effects over average effects for exports in industries i within broader $S(i)$ sectors. Individual effects for each industry i can be positive or negative. Positive effects emerge due to GVCs linkages and negative – due to competition for market shares in the world markets. Hence, the respective coefficients merely show which effects dominate – positive or negative.

In this study we further separate between off-diagonal and diagonal GVCs linkages and export incentives implemented in sectors $S_n \neq S(i)$ and $S(i)$, respectively, because export incentives implemented in foreign country in sector $S(i)$, besides positive effects transmitted via GVCs, can include direct negative "competition for market share" effects on export of country X in some industries i which belong to sector $S(i)$. Obviously, these effects cannot exist for export incentives implemented in sectors $S_n \neq S(i)$. Hence, negative effects are more likely to dominate for variables, which reflect export incentives` effects` transmission via diagonal GVCs linkages (however, we argue below that indirect negative competition effects can also exist in off-diagonal connections). As the aim of this study is particularly to find evidence on positive external effects of export incentives via GVCs linkages, we separate effects coming from off-diagonal and diagonal linkages for clearer evidence.

Finally, we control for time fixed effects, $\sum_t d_t YD$.

As was mentioned above for robustness checking purposes we also estimate the version of equation (1) for export flows:

$$LnEX_{i,t,X} = a_0 + a_1 LnEX_{i,t\text{-}1,X} + a_2 LnGDP_{t,X} + a_3 TF_{t,X} + a_4 EI_{i,t,X} + a_5 FLI\_OFFD_{s(i),t,BRIC1} +$$
$$+ a_6 FLI\_D_{s(i),t,BRIC1} + a_7 FLI\_OFFD_{s(i),t,BRIC2} + a_8 FLI\_D_{s(i),t,BRIC2} + a_9 FLI\_OFFD_{s(i),t,BRIC3} + \quad (4),$$
$$a_{10} FLI\_D_{s(i),t,BRIC3} + + \sum_t d_t YD + e_{it} + u_i$$

where $LnEX_{i,t,X}$ / $LnEX_{i,t\text{-}1,X}$ is natural logarithm of country X export in industry *i* (HS 2007, six-digit level) in a year t / t-1 (2008,…,2015). $LnGDP_{t,X}$ is natural logarithm of country X GDP in year t (2009,…,2015). Both variables are in US dollars and have been transformed into real values using US GDP deflator. Data for export flows comes from UN COMTRADE. Data for GDP and US GDP deflator comes from World Bank. The other variables have been defined above.

We suggest that if $FLI\_OFFD_{s(i),t,BRIC1/2/3}$ and $FLI\_D_{s(i),t,BRIC1/2/3}$ are positively related to $EX\_SH_{i,t,X}$ / $LnEX_{i,t,X}$, then we can conclude that export incentives for intermediates implemented (and in force) in one BRIC country, respectively, in sectors $s_n \neq s(i)$ and $s(i)$, overall positively affect export of the other BRIC (X) country via, respectively, off-diagonal and diagonal GVCs forward linkages.

If the respective relationship is negative for $FLI\_D_{s(i),t,BRIC1/2/3}$, we can straightforwardly conclude that direct negative "competition for market share" effects within sectors $s(i)$ dominate. If this relationship is negative for $FLI\_OFFD_{s(i),t,BRIC1/2/3}$, the interpretation is not that straightforward. In particular, this actually means that export incentives for intermediates implemented (and in force) in one BRIC country in sectors $s_n \neq s(i)$ on average negatively affect export of the other BRIC country in respective sectors $s(i)$ given that sectors $s_n \neq s(i)$ of the former country provide high value added for export of respective sectors $s(i)$ in the latter country. It can be suggested then that export incentives of the first country in sectors $s_n \neq s(i)$ also positively affect this country`s export in respective sectors $s(i)$ via spillovers which in turn cause significant negative "competition for market share" effects for export in respective sectors $s(i)$ of the second country.

Moreover, these indirect negative effects are stronger than possible positive effects, which propagate via off-diagonal forward GVCs linkages. Similar effects can also exist within sector $s(i)$ and, hence, this way of argumentation can be also used for explanation of negative relationship between $FLI\_D_{s(i),t,BRIC1/2/3}$ and $EX\_SH_{i,t,X}$ / $LnEX_{i,t,X}$ in addition to direct negative effects.

Export incentives` effects on foreign export via GVCs backward linkages (Proposition 1)

In order to test export incentives` effects on foreign export via GVCs backward linkages we estimate the following equation:

$$EX\_SH_{i,t,XtoY} = a_0 + a_1 EX\_SH_{i,t-1,XtoY} + a_2 WGDP\_SH_{t,X} + a_3 WGDP\_SH_{t,Y} + a_4 TF_{t,X} + a_5 TF_{t,Y} + a_6 EI_{i,t,X} + a_5 BLI\_OFFD_{s(i),t,YX} + a_6 BLI\_D_{s(i),t,YX} + \sum_t d_t YD + e_{it} + u_i \quad (5),$$

where $EX\_SH_{i,t,XtoY}$ is share of country X export to country Y in the world export to country Y in an industry *i* (HS 2007, six-digit level) in a year t / t-1 (2008,…,2015). X and Y denote two BRIC countries. The data comes from UN COMTRADE. $WGDP\_SH_{t,X}$ / $WGDP\_SH_{t,Y}$, $TF_{t,X}$ / $TF_{t,Y}$ and $EI_{i,t,X}$ were defined above.

Last two variables in equation (5) are variables of our interest. They are calculated as follows:

$$BLI\_OFFD_{s(i),t,YX} = \sum_{s_n \neq s(i)} NPIEI_{s_n \neq s(i),t,Y} \cdot \frac{VA_{s(i),t,X} inEXP_{s_n \neq s(i),t,Y}}{VA_{s(i),t,World} inEXP_{s_n \neq s(i),t,Y}} \quad (6);$$

$$BLI\_D_{s(i),t,YX} = NPIEI_{s(i),t,Y} \cdot \frac{VA_{s(i),t,X} inEXP_{s(i),t,Y}}{VA_{s(i),t,World} inEXP_{s(i),t,Y}} \quad (7),$$

where *BLI* denotes backward linkages. *NPIEI* denotes export incentives, which are in force in denoted sector, year and country and which do not concern primary intermediate products (i.e. only export incentives for processed intermediates and final goods are included). All other notations are as described above.

The first indicator, $BLI\_OFFD_{s(i),t,YX}$, defines the weighted sum of export incentives for final and processed intermediate goods which are in force in country *Y* in a year t in sectors $s_n \in s(i)$ with weights as ratios of value added of country *X* sector $s(i)$ in country Y gross export of sectors $s_n \in s(i)$ to respective value added of the world in a year t (i.e. ratios have been computed for off-diagonal elements in respective bilateral input-output *OECD_TiVA* tables). The second indicator, $BLI\_D_{s(i),t,YX}$, defines export incentives for final and processed intermediate goods which are in force in country *Y* in a year t in sector $s(i)$ weighted by ratio of value added of country *X* sector $s(i)$ in country Y gross export of sector $s(i)$ to respective value added of the world in a year t (i.e. ratios have been computed for diagonal elements in respective bilateral input-output *OECD_TiVA* tables).

For robustness checking purposes, we also estimate version of equation (5) for export flows:

$$LnEX_{i,t,XtoY} = a_0 + a_1 LnEX_{i,t-1,XtoY} + a_2 LnGDP_{t,X} + a_3 LnGDP_{t,Y} + a_4 TF_{t,X} + a_5 EI_{i,t,X} + a_6 BLI\_OFFD_{s(i),t,YX} + \\ + a_6 BLI\_D_{s(i),t,YX} + \sum_t d_t YD + e_{it} + u_i \quad (8),$$

where $LnEX_{i,t,XtoY}$ / $LnEX_{i,t-1,XtoY}$ is natural logarithm of country X export to country Y in an industry *i* (HS 2007, six-digit level) in a year t / t-1 (2008,…,2015). Export values have been transformed into real values using US GDP deflator of World Bank database. Other variables are as defined above.

We suggest that if $BLI\_OFFD_{s(i),t,YX}$ and $BLI\_D_{s(i),t,YX}$ are positively related to $EX\_SH_{i,t,XtoY}$ / $LnEX_{i,t,XtoY}$ then it can be concluded that export incentives for final and processed intermediate goods implemented (and in force) in country Y, respectively, in sectors $s_n \in s(i)$ and $s(i)$, on average positively affect export of country X to country Y via, respectively, off-diagonal and diagonal GVCs backward linkages.

If this relationship is negative for $BLI\_D_{s(i),t,YX}$ then we can suggest that negative competition effects dominate as increased local production in sector $s(i)$ in country Y due to export incentives means less import

and, hence, less export from country X to country Y in this sector (these effects can be also names as negative import substitution effects). Negative relationship between $BLI\_OFFD_{s(i),t,YX}$ and $EX\_SH_{i,t,XtoY}$ / $LnEX_{i,t,XtoY}$ would support theoretical predictions of Baldwin and Venables (2015) who developed a model in which the interaction of forward and backward linkages determines the range of goods and of parts that are produced in a developing economy. Based on this model they show that support for final goods producers can increase the range of parts produced, broadening the industrial base. In the context of our study this suggests that if export incentives for final and processed intermediate goods in country Y in sector $s(i)$ have positive spillover effects for other sectors $s_n \neq s(i)$ in country Y which produce inputs for sector $s(i)$, there can be less import in these sectors ($s_n \neq s(i)$) from country X.

5. EMPIRICAL RESULTS

Export incentives` effects on foreign export via GVCs forward linkages (Proposition 2)

We estimate equations (1) and (4) using panel version of Tobit model with random effects because of excessive number of zeros in our dependent variables. For robustness checking purposes we also report results for ordinary panel model with fixed effects. Results are reported in Tables 2 (for export shares) and 3 (for export flows). Desriptive statistics and correlation matrix are provided in Appendix 3.

Table 2 Export incentives` effects on foreign export via GVCs forward linkages: Dependent variable is export shares in world export by industry

	Brazil		Russia		India		China	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	-0,038 (0.035)	0,014 (0.033)	-0,076 (0.017)***	-0,078 (0.029)***	-0,068 (0.045)	0,241 (0.046)***	11,08 (1.505)***	11,032 (1.907)***
EX_SH(i,t-1,X)	0,942 (0.002)***	0,253 (0.005)***	0,938 (0.002)***	0,333 (0.005)***	0,919 (0.003)***	0,199 (0.007)***	0,974 (0.002)***	0,531 (0.005)***
WGDP_SH(t,X)	-4,931 (2.294)**	2,724 (2.464)	1,425 (1.242)	3,149 (2.081)	29,249 (4.286)***	30,979 (5.723)***	0,00000001 (0.000000001)***	0,00000002 (0.000000001)***
TF(t,X)	0,001 (0.001)	-0,0002 (0.001)	0,001 (0.0002)***	0,001 (0.0004)***	-0,0004 (0.001)	-0,004 (0.001)***	-0,158 (0.021)***	-0,156 (0.027)***
EI(i,t,X)	0,001 (0.0001)***	0,0002 (0.0002)	0,0004 (0.0002)*	-0,00003 (0.0002)	0,001 (0.0001)***	0,0002 (0.0002)	0,002 (0.0003)***	0,008 (0.001)***
FLI_OFFD_BR (s(i),t)			-0,0004 (0.0001)***	-0,0001 (0.0002)	0,001 (0.0003)**	0,0001 (0.001)	-0,001 (0.0002)***	-0,002 (0.0003)***
FLI_D_BR (s(i),t)			0,011 (0.004)***	0,0003 (0.006)	-0,004 (0.008)	0,016 (0.017)	-0,035 (0.006)***	-0,027 (0.009)***
FLI_OFFD_RU (s(i),t)	-0,0003 (0.0001)***	0,0002 (0.0001)***			-0,0004 (0.0003)	-0,001 (0.0003)**	0,0003 (0.0002)	0,0003 (0.0002)
FLI_D_RU (s(i),t)	-0,0001 (0.002)	-0,003 (0.002)*			0,002 (0.005)	0,009 (0.005)*	-0,011 (0.005)**	-0,008 (0.005)*
FLI_OFFD_IN (s(i),t)	0,0002 (0.0001)***	0,0001 (0.0001)**	-0,0002 (0.0001)*	-0,0004 (0.0002)**			0,001 (0.0002)***	0,001 (0.0003)***
FLI_D_IN (s(i),t)	0,001 (0.001)**	0,001 (0.001)	-0,001 (0.0004)***	-0,001 (0.001)			0,005 (0.001)***	0,003 (0.001)**
FLI_OFFD_CH (s(i),t)	0,0001 (0.00002)***	0,00002 (0.00004)	0,000004 (0.00002)	-0,00001 (0.00004)	-0,0001 (0.00003)***	-0,0004 (0.0001)***		
FLI_D_CH (s(i),t)	-0,001 (0.0003)***	-0,002 (0.001)***	-0,001 (0.0001)***	-0,001 (0.0003)**	0,002 (0.0004)***	-0,001 (0.002)		
Log likelihood	80122.048		75774.151		47132.509		45930.295	
Wald chi2 (Prob.)	186186.3 (0.0000)		190185.27 (0.0000)		84001.00 (0.0000)		Not reported	
N. of left-censored (zero) obs.	4,584		4,189		1,367		1,671	
N. obs.	31,776	31,776	31,776	31,776	27,224	27,224	31,776	31,776
R-sq. (overall)		0.918		0.869		0.676		0.914

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 3 Export incentives` effects on foreign export via GVCs forward linkages: Dependent variable is natural logarithm of export flows by industry

	Brazil		Russia		India		China	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	292,903 (267.873)	-606,62 (289.446)**	-3,941 (2.31)*	-65,562 (26.861)**	-10,538 (3.113)***	43,285 (73.069)	185,964 (179.936)	22,357 (210.646)
LnEX (i,t-1,X)	0,99 (0.003)***	0,119 (0.006)***	0,933 (0.003)***	0,243 (0.006)***	0,918 (0.003)***	0,171 (0.006)***	0,985 (0.002)***	0,322 (0.006)***
LnGDP(t,X)	-10,673 (9.801)	23,106 (10.526)**	Omitted	1,873 (0.894)**	Omitted	-0,67 (2.326)	2,539 (2.026)	1,332 (2.315)
TF(t,X)	0,095 (0.141)	-0,474 (0.133)***	0,056 (0.036)	0,317 (0.068)***	0,164 (0.046)***	-0,191 (0.115)*	-3,646 (3.349)	-0,707 (3.897)
EI(i,t,X)	0,168 (0.026)***	-0,035 (0.036)	0,02 (0.044)	-0,357 (0.039)***	0,072 (0.007)***	0,012 (0.012)	0,028 (0.01)***	-0,03 (0.048)
FLI_OFFD_BR (s(i),t)			-0,047 (0.019)**	-0,057 (0.034)*	0,015 (0.016)	-0,089 (0.055)	-0,016 (0.006)**	-0,029 (0.011)***
FLI_D_BR (s(i),t)			0,639 (0.749)	1,634 (1.221)	0,299 (0.437)	4,845 (0.946)***	-0,393 (0.176)**	-0,263 (0.289)
FLI_OFFD_RU (s(i),t)	-0,152 (0.025)***	-0,095 (0.021)***			0,022 (0.015)	-0,046 (0.014)***	-0,005 (0.008)	-0,006 (0.007)
FLI_D_RU (s(i),t)	0,681 (0.534)	0,58 (0.393)			-0,827 (0.291)***	0,636 (0.286)**	-0,098 (0.177)	-0,112 (0.161)
FLI_OFFD_IN (s(i),t)	0,074 (0.015)***	0,047 (0.017)***	0,004 (0.021)	-0,065 (0.034)*			0,021 (0.007)***	0,003 (0.01)
FLI_D_IN (s(i),t)	0,439 (0.133)***	0,432 (0.141)***	-0,188 (0.079)**	-0,458 (0.141)***			0,042 (0.031)	-0,034 (0.04)
FLI_OFFD_CH (s(i),t)	0,009 (0.004)**	-0,003 (0.009)	0,006 (0.004) /pv=0.107/	-0,001 (0.008)	0,008 (0.001)***	-0,002 (0.005)		
FLI_D_CH (s(i),t)	-0,211 (0.083)**	-0,126 (0.162)	-0,003 (0.029)	0,143 (0.061)**	0,018 (0.024)	0,019 (0.095)		
Log likelihood	-71147.599		-72887.661		-58786.195		-60839.619	
Wald chi2 (Prob.)	98428.45 (0.0000)		86442.38 (0.0000)		81763.73 (0.0000)		192500.55 (0.0000)	
N. of left-censored (zero) obs.	4,672		4,277		1,455		1,759	
N. obs.	31,864	31,864	31,864	31,864	27,312	27,312	31,864	31,864
R-sq. (overall)		0.763		0.662		0.694		0.876

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

First, we should note that interpretation of Tobit coefficients is not straightforward. In particular, Tobit regression coefficients are interpreted in a similar manner to OLS regression coefficients; however, the linear effect is on the uncensored latent variable, not the observed outcome. The expected export share changes by coefficient for each unit increase in the corresponding predictor. E.g. if we take the coefficient of $FLI\_OFFD_{s(i),t,CH}$ in the Tobit regression for Brazilian export shares (column 1, Table 2), we can say that if an industry i were to increase its $FLI\_OFFD_{s(i),t,CH}$ by one point, expected Brazilian export share in this industry would increase by 0.0001 points while holding all other variables in the model constant. Thus, the

higher $FLI\_OFFD_{s(i),t,CH}$, the higher the predicted export share. Or, in other words, the higher the number of export incentives implemented in China for intermediates in sectors s_n [1] $s(i)$ which are intensively used as value added/inputs in Brazilian exportable production in sector $s(i)$, the higher the predicted Brazilian export share in the world market in industry i.

For illustrative purposes, we summarize our results in Tables 4 and 5.

Table 4 Summary of results for off-diagonal forward linkages

Export incentives implemented in:	*Export of:*	*Impact*
Brazil	Russia	Strong negative
	India	Very weak positive
	China	Strong negative
Russia	Brazil	Weak negative
	India	Weak negative
	China	-
India	Brazil	Strong positive
	Russia	Strong negative
	China	Rather strong positive
China	Brazil	Weak positive
	Russia	Very weak positive
	India	Very weak negative

Note: Positive impacts are denoted by different shades of blue; negative – by different shades of orange. Darker shades correspond to stronger effects.

Table 5 Summary of results for diagonal forward linkages

Export incentives implemented in:	*Export of:*	*Impact*
Brazil	Russia	Very weak positive
	India	Very weak positive
	China	Rather strong negative
Russia	Brazil	Very weak negative
	India	-
	China	Weak negative
India	Brazil	Rather strong positive
	Russia	Rather strong negative
	China	Weak positive
China	Brazil	Rather strong negative
	Russia	-
	India	Very weak positive

Note: Positive impacts are denoted by different shades of blue; negative – by different shades of orange. Darker shades correspond to stronger effects.

As we can see the evidence on which effects dominate – positive or negative - is inconclusive though we can notice that strong and rather strong negative effects are found more often than strong and rather strong positive effects (6 against 3 times). In general, this indicates that on average GVCs linkages between BRICs are not strong enough to significantly suppress negative "competition for market shares" effects coming from each

other's export incentives. We can see that Russian export seems to suffer most from negative effects of export incentives for intermediates implemented in the other three BRICs. It gets most negative effects from Indian export incentives for intermediates. This evidence enables us to conclude that, on the one hand, Russian GVCs linkages with the other three BRICs can be rather weak, and, on the other hand, negative "competition for market share" effects between Russia and the other three BRICs must be strong.

Largest positive effects come from Indian export incentives for intermediates to Brazilian export via both off-diagonal and diagonal GVCs forward linkages. In addition, Chinese export benefits rather significantly from Indian export incentives for intermediates via off-diagonal GVCs forward linkages. These results indicate that GVCs forward linkages between India, on the one hand, and Brazil and China, on the other hand, are rather strong which makes possible the situation when Brazil and China get more positive effects than negative from export incentives for intermediates implemented in India. In particular, according to our framework, when Indian intermediates become more accessible/cheaper due to domestic export incentives, Brazilian and Chinese exportable production, where these Indian intermediates are used intensively, becomes more competitive in the world markets.

Export incentives` effects on foreign export via GVCs backward linkages (Proposition 1)

In Tables 6-13 we provide estimation results for equations (5) and (8). Here we also report panel version of Tobit model with random effects and ordinary panel model with fixed effects. We should mention that we delete all observations for those industries for which we have only zeros or/and not available data for all years in the studied period 2008-2015 as estimation algorithms do not converge then due to too large numbers of zero observations.

Table 6 Export incentives` effects on foreign export via GVCs backward linkages: Export to Brazil, dependent variable is bilateral export shares in world export by industry

X to Brazil:	Russia to Brazil		India to Brazil		China to Brazil	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	-0,797 (4.981)	-12,076 (11.317)	3,418 (0.976)***	0,291 (0.67)	-0,033 (0.026)	1,512 (1.238)
EX_SH(i,t-1,XtoY(BR))	0,412 (0.051)***	-0,119 (0.032)***	-0,032 (0.006)***	-0,015 (0.005)***	0,539 (0.012)***	0,221 (0.007)***
WGDP_SH(t,X)		-1479,475 (1276.791)	-33,182 (50.034)	22,673 (34.471)	0,000000004 (0.000000001)***	0,00000002 (0.000000005)***
WGDP_SH(t,BR)	27,479 (38.759)	1811,628 (1565.406)	-37,093 (21.88)*	3,899 (15.104)	8,534 (5.533)	64,165 (16.512)***
TF(t,X)	-0,001 (0.016)	0,082 (0.075)	-0,006 (0.002)***	-0,002 (0.001)*	Omitted	-0,066 (0.023)***
TF(t,BR)	0,009 (0.053)	0,055 (0.057)	-0,04 (0.011)***	-0,003 (0.008)	Omitted	0,04 (0.011)***
EI(i,t,X)	0,009 (0.013)	-0,008 (0.012)	0,008 (0.001)***	0,002 (0.001)***	0,014 (0.002)***	0,011 (0.005)**
FLI_ND_X_BR (s(i),t)	0,004 (0.001)***	0,005 (0.003)*	0,0001 (0.001)	0,0003 (0.0005)	0,001 (0.0001)***	0,0005 (0.0001)***
FLI_D_X_BR (s(i),t)	-0,097 (0.034)***	-0,126 (0.068)*	0,048 (0.017)***	0,028 (0.015)*	-0,021 (0.004)***	-0,022 (0.005)***
Log likelihood	-431.09143		2662.6051		2738.4713	
Wald chi2 (Prob.)	81.75 (0.0000)		165.44 (0.0000)		Not reported	
N. of left-censored (zero) obs.	1,210		6,851		3,799	
N. obs.	1,959	1,959	17,949	17,949	24,711	24,711
R-sq. (overall)		0.018		0.025		0.641

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 7 Export incentives` effects on foreign export via GVCs backward linkages: Export to Brazil, dependent variable is natural logarithm of bilateral export flows by industry

X to Brazil:	Russia to Brazil		India to Brazil		China to Brazil	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	-147,553 (184.169)	-176,045 (285.941)	158,17 (59.593)***	1,682 (74.755)	-21,616 (43.911)	-169,913 (31.285)***
LnEX (i,t-1,XtoY (BR))	0,844 (0.057)***	0,03 (0.015)*	0,699 (0.038)***	0,025 (0.008)***	0,903 (0.005)***	0,134 (0.007)***
LnGDP(t,X)	3,205 (2.008)	-13,58 (18.008)		0,814 (1.496)	-0,189 (0.652)	3,525 (0.739)***
LnGDP(t,BR)		19,604 (25.633)	-3,391 (0.963)***	0,634 (0.495)	1,102 (0.412)***	1,741 (0.385)***
TF(t,X)	-0,079 (0.428)	0,114 (0.264)	0,44 (0.087)***	-0,199 (0.054)***		-0,284 (0.418)
TF(t,BR)	0,829 (1.572)	-0,029 (0.689)	-1,328 (0.594)**	-0,327 (0.364)	-0,052 (0.233)	0,658 (0.214)***
EI(i,t,X)	-0,153 (0.381)	-0,147 (0.153)	0,284 (0.033)***	0,022 (0.033)	0,178 (0.027)***	-0,079 (0.103)
FLI_ND_X_BR (s(i),t)	0,18 (0.049)***	-0,095 (0.04)**	-0,02 (0.018)	-0,083 (0.032)**	0,0001 (0.001)	0,003 (0.002)
FLI_D_X_BR (s(i),t)	-0,144 (1.127)	3,679 (0.889)***	1,476 (0.559)***	0,763 (0.972)	0,063 (0.053)	-0,404 (0.101)***
Log likelihood	-8629.1928		-37961.815		-62612.688	
Wald chi2 (Prob.)	379.55 (0.0000)		574.34 (0.0000)		35873.84 (0.0000)	
N. of left-censored (zero) obs.	3,333		6,495		4,190	
N. obs.	5,201	5,201	16,506	16,506	25,158	25,158
R-sq. (overall)		0.033		0.042		0.468

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 8 Export incentives` effects on foreign export via GVCs backward linkages: Export to Russia, dependent variable is bilateral export shares in world export by industry

X to Russia:	Brazil to Russia		India to Russia		China to Russia	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	-0,354 (0.892)	-1,502 (1.05)	-0,451 (0.24)*	-0,066 (0.154)	-0,117 (0.013)***	21,561 (2.898)***
EX_SH(i,t-1,XtoY(RU))	0,666 (0.016)***	0,3 (0.01)***	0,588 (0.015)***	0,134 (0.009)***	0,554 (0.015)***	0,229 (0.006)***
WGDP_SH(t,X)	6,974 (6.303)	196,818 (146.208)	142,267 (58.798)**	15,66 (36.632)	0,00000001 (0.000000001)***	0,00000001 (0.000000001)***
WGDP_SH(t,RU)		-162,137 (119.221)	45,923 (19.132)**	6,982 (12.079)	30,493 (3.878)***	38,896 (5.53)***
TF(t,X)	0,003 (0.01)	0,008 (0.005)	-0,003 (0.001)***	-0,0002 (0.001)		-0,315 (0.043)***
TF(t,RU)	0,001 (0.003)	0,01 (0.007)	0,0004 (0.0005)	0,0004 (0.0004)		0,012 (0.002)***
EI(i,t,X)	0,005 (0.002)***	-0,002 (0.001)*	0,002 (0.001)***	-0,0002 (0.001)	0,014 (0.002)***	0,003 (0.005)
FLI_ND_X_RU (s(i),t)	0,004 (0.001)***	0,003 (0.0003)***	0,001 (0.0005)**	0,0003 (0.0003)	0,0002 (0.00004)***	0,0001 (0.00003)***
FLI_D_X_RU (s(i),t)	-0,085 (0.083)	-0,073 (0.045) /pv=0.103/	0,012 (0.037)	0,029 (0.024)	-0,003 (0.003)	0,004 (0.003)
Log likelihood	3228.2584		3361.5314		6926.494	
Wald chi2 (Prob.)	1865.41 (0.0000)		1690.83 (0.0000)		Not reported	
N. of left-censored (zero) obs.	5,142		7,144		3,744	
N. obs.	9,017	9,017	15,901	15,901	26,386	26,386
R-sq. (overall)		0.66		0.507		0.664

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 9 Export incentives` effects on foreign export via GVCs backward linkages: Export to Russia, dependent variable is natural logarithm of bilateral export flows by industry

X to Russia:	Brazil to Russia		India to Russia		China to Russia	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	-325,25 (466.842)	169,115 (235.751)	-81,108 (30.862)***	-322,751 (38.204)***	-2509,803 (267.842)***	109,111 (40.909)***
LnEX (i,t-1,XtoY (RU))	0,923 (0.036)***	0,11 (0.011)***	0,865 (0.037)***	0,036 (0.009)***	0,906 (0.004)***	0,097 (0.006)***
LnGDP(t,X)	27,324 (41.983)	-11,315 (21.043)		10,068 (1.204)***	4,637 (0.5)***	2,412 (0.173)***
LnGDP(t,RU)	-16,766 (29.513)	7,995 (14.778)		1,645 (0.306)***		1,191 (0.183)***
TF(t,X)	0,068 (1.117)	-0,876 (0.572)	0,775 (0.323)**	-0,055 (0.032)*	35,639 (3.845)***	-2,969 (0.696)***
TF(t,RU)	0,172 (0.434)	-0,114 (0.219)	0,376 (0.135)***	0,02 (0.018)	-2,504 (0.278)***	0,123 (0.03)***
EI(i,t,X)	1,006 (0.208)***	-0,03 (0.137)	0,267 (0.032)***	-0,005 (0.038)	0,189 (0.022)***	0,184 (0.103)*
FLI_ND_X_RU (s(i),t)	0,141 (0.068)**	-0,021 (0.035)	0,013 (0.03)	0,015 (0.02)	-0,001 (0.001)*	-0,003 (0.001)***
FLI_D_X_RU (s(i),t)	-7,463 (10.136)	1,455 (4.937)	0,000000001 (0.000000002)	0,000000002 (0.000000001)	0,198 (0.064)***	0,046 (0.055)
Log likelihood	-16315.893		-35101.387		-68927.242	
Wald chi2 (Prob.)	783.23 (0.0000)		956.93 (0.0000)		46131.10 (0.0000)	
N. of left-censored (zero) obs.	5,148		7,225		4,152	
N. obs.	9,024	9,024	15,993	15,993	28,171	28,171
R-sq. (overall)		0.278		0.0823		0.433

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 10 Export incentives` effects on foreign export via GVCs backward linkages: Export to India, dependent variable is bilateral export shares in world export by industry

X to India:	Brazil to India		Russia to India		China to India	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	-0,06 (0.611)	0,735 (0.376)*	-2,632 (2.039)	0,884 (1.331)	-0,228 (0.107)**	-55,647 (26.572)**
EX_SH(i,t-1,XtoY(IN))	0,508 (0.015)***	0,186 (0.009)***	0,375 (0.013)***	0,101 (0.009)***	0,651 (0.015)***	0,255 (0.007)***
WGDP_SH(t,X)	2,302 (13.896)	-16,084 (8.208)*	362,77 (284.916)	-121,386 (186.083)	-0,00000001 (0.00000001)*	-0,0000002 (0.0000001)**
WGDP_SH(t,IN)	-0,361 (31.599)	-40,735 (18.594)**	1154,983 (905.914)	-393,83 (591.858)	92,93 (33.562)***	1479,187 (673.249)**
TF(t,X)	0,0002 (0.007)	-0,008 (0.004)*	0,004 (0.004)	-0,001 (0.002)		0,734 (0.351)**
TF(t,IN)	0,0002 (0.001)	0,0004 (0.001)	-0,038 (0.03)	0,013 (0.02)	0,002 (0.002)	0,023 (0.01)**
EI(i,t,X)	0,003 (0.002)*	-0,003 (0.001)**	-0,002 (0.002)	-0,001 (0.001)	0,02 (0.002)***	0,016 (0.006)***
FLI_ND_X_IN (s(i),t)	0,00005 (0.0001)	-0,0002 (0.0001)***	-0,0001 (0.0001)*	-0,0002 (0.0001)***	0,00005 (0.00002)***	0,0001 (0.00002)***
FLI_D_X_IN (s(i),t)	-0,069 (0.012)***	-0,031 (0.008)***	0,004 (0.002)	0,0004 (0.002)	0,005 (0.001)***	0,001 (0.001)
Log likelihood	6000.0509		5314.6147		2277.5976	
Wald chi2 (Prob.)	1209.26 (0.0000)		834.69 (0.0000)		Not reported	
N. of left-censored (zero) obs.	6,049		5,654		3,045	
N. obs.	12,650	12,650	13,951	13,951	24,764	24,764
R-sq. (overall)		0.551		0.319		0.631

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 11 Export incentives` effects on foreign export via GVCs backward linkages: Export to India, dependent variable is natural logarithm of bilateral export flows by industry

X to India:	Brazil to India		Russia to India		China to India	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	-195,275 (75.907)**	-155,418 (222.149)	11,825 (12.02)	366,006 (133.599)***	119,751 (28.624)***	-300,839 (112.386)***
LnEX (i,t-1,XtoY (IN))	0,637 (0.028)***	0,07 (0.009)***	0,683 (0.032)***	0,072 (0.009)***	0,888 (0.004)***	0,144 (0.006)***
LnGDP(t,X)	3,254 (0.988)***	1,23 (1.1018)	-0,563 (0.487)	-1,139 (0.552)**	-4,457 (1.067)***	-5,799 (2.778)**
LnGDP(t,IN)		3,574 (6.728)		-12,554 (4.487)***		13,261 (4.974)***
TF(t,X)	1,349 (0.773)*	0,358 (0.435)	0,029 (0.06)	0,043 (0.017)**		1,54 (0.787)**
TF(t,IN)	0,122 (0.104)	0,002 (0.153)	0,028 (0.031)	0,373 (0.104)***	0,224 (0.051)***	-0,013 (0.018)
EI(i,t,X)	0,885 (0.18)***	0,004 (0.119)	0,206 (0.144)	-0,31 (0.086)***	0,219 (0.022)***	0,168 (0.093)*
FLI_ND_X_IN (s(i),t)	0,006 (0.013)	-0,001 (0.009)	-0,008 (0.005)*	-0,02 (0.004)***	-0,001 (0.0002)***	0,0001 (0.0003)
FLI_D_X_IN (s(i),t)	-7,209 (1.278)***	-5,513 (0.825)***	0,141 (0.159)	0,154 (0.125)	0,03 (0.009)***	-0,01 (0.013)
Log likelihood	-26294.715		-31158.069		-65668.813	
Wald chi2 (Prob.)	655.98 (0.0000)		602.66 (0.0000)		43250.11 (0.0000)	
N. of left-censored (zero) obs.	6,061		5,698		3,443	
N. obs.	12,663	12,663	14,000	14,000	26,677	26,677
R-sq. (overall)		0.197		0.184		0.579

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 12 Export incentives` effects on foreign export via GVCs backward linkages: Export to China, dependent variable is bilateral export shares in world export by industry

X to China:	Brazil to China		Russia to China		India to China	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	1,603 (0.606)***	0,337 (0.357)	1,754 (2.46)	1,056 (1.396)	0,006 (0.077)	0,112 (0.23)
EX_SH(i,t-1,XtoY(CH))	0,562 (0.015)***	0,168 (0.009)***	0,564 (0.012)***	0,247 (0.008)***	0,573 (0.012)***	0,11 (0.008)***
WGDP_SH(t,X)	-0,472 (8.512)	-11,691 (5.187)**	-4,231 (4.597)	-0,676 (2.625)	25,573 (10.186)**	-1,497 (8.346)
WGDP_SH(t,CH)	-0,000000001 (0.000000002)	-0,000000003 (0.000000002)**	-0,000000001 (0.000000001)	-0,000000001 (0.000000001)	-0,0000000002 (0.000000001)	0,000000001 (0.000000001)*
TF(t,X)	-0,008 (0.006)	-0,01 (0.003)***	0,002 (0.001)	0,001 (0.001)	-0,002 (0.001)	-0,0003 (0.001)
TF(t,CH)	-0,014 (0.011)	0,007 (0.007)	-0,027 (0.036)	-0,015 (0.02)	Omitted	-0,001 (0.003)
EI(i,t,X)	0,004 (0.001)***	0,0001 (0.001)	-0,001 (0.002)	0,0004 (0.001)	0,003 (0.0004)***	-0,0003 (0.0005)
FLI_ND_X_CH (s(i),t)	0,0002 (0.0002)	-0,0004 (0.0002)**	0,00004 (0.0001)	0,0002 (0.0002)	0,0001 (0.0003)	0,0003 (0.0004)
FLI_D_X_CH (s(i),t)	0,005 (0.005)	0,001 (0.006)	0,001 (0.003)	0,003 (0.005)	-0,018 (0.005)***	0,011 (0.01)
Log likelihood	7838.2057		4878.5537		10071.454	
Wald chi2 (Prob.)	Not reported		Not reported		Not reported	
N. of left-censored (zero) obs.	7,351		7,533		5,950	
N. obs.	15,225	15,225	14,701	14,701	18,985	18,985
R-sq. (overall)		0.533		0.478		0.509

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

Table 13 Export incentives` effects on foreign export via GVCs backward linkages: Export to China, dependent variable is natural logarithm of bilateral export flows by industry

X to China:	Brazil to China		Russia to China		India to China	
	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE	Tobit with RE	Ordinary panel with FE
Constant	156,717 (96.277)	109,278 (56.553)*	-55,342 (181.646)	-16,119 (80.477)	131,07 (50.4)***	107,464 (165.29)
LnEX (i,t-1,XtoY (CH))	0,986 (0.012)***	0,071 (0.009)***	1,042 (0.014)***	0,093 (0.009)***	0,542 (0.023)***	0,012 (0.007)*
LnGDP(t,X)	2,764 (1.186)**	-0,331 (0.683)	-1,644 (0.744)**	-1,9 (0.342)***		-7,371 (8.71)
LnGDP(t,CH)	2,558 (2.275)	-1,166 (1.341)	-0,024 (0.74)	1,968 (0.35)***	-3,31 (1.256)***	3,364 (2.922)
TF(t,X)	0,345 (0.646)	-0,74 (0.391)*	0,047 (0.131)	0,057 (0.058)	-0,474 (0.201)**	0,147 (0.202)
TF(t,CH)	-4,725 (1.321)***	-0,123 (0.69)	1,33 (3.09)	0,177 (1.354)		-0,033 (0.321)
EI(i,t,X)	1,089 (0.128)***	0,035 (0.106)	-0,092 (0.159)	-0,781 (0.085)***	0,226 (0.03)***	0,03 (0.029)
FLI_ND_X_CH (s(i),t)	0,016 (0.013)	0,067 (0.034)**	0,008 (0.009)	-0,079 (0.022)***	-0,035 (0.024)	0,063 (0.06)
FLI_D_X_CH (s(i),t)	-3,165 (0.48)***	0,048 (0.966)	-0,838 (0.272)***	-0,895 (0.563) /pv=0.111/	1,026 (0.332)***	-0,299 (0.739)
Log likelihood	-33053.322		-31755.913		-49525.872	
Wald chi2 (Prob.)	7535.63 (0.0000)		6013.47 (0.0000)		727.34 (0.0000)	
N. of left-censored (zero) obs.	7,695		8,618		6,861	
N. obs.	15,904	15,904	16,226	16,226	20,532	20,532
R-sq. (overall)		0.201		0.09		0.043

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses.

For illustrative purposes we summarize results in Tables 14 and 15.

Table 14 Summary of results for off-diagonal backward linkages

Export incentives implemented in:	*Export of:*	*Impact*
Brazil	Russia to Brazil	Weak positive
	India to Brazil	Very weak negative
	China to Brazil	Weak positive
Russia	Brazil to Russia	Rather strong positive
	India to Russia	Very weak positive
	China to Russia	-
India	Brazil to India	Very weak negative
	Russia to India	Strong negative
	China to India	Very weak positive
China	Brazil to China	-
	Russia to China	Weak negative
	India to China	-

Note: Positive impacts are denoted by different shades of blue; negative – by different shades of orange. Darker shades correspond to stronger effects.

Table 15 Summary of results for diagonal backward linkages

Export incentives implemented in:	*Export of:*	*Impact*
Brazil	Russia to Brazil	Very weak negative
	India to Brazil	Rather strong positive
	China to Brazil	Rather strong negative
Russia	Brazil to Russia	-
	India to Russia	-
	China to Russia	Rather strong positive
India	Brazil to India	Strong negative
	Russia to India	-
	China to India	Weak positive
China	Brazil to China	Very weak negative
	Russia to China	Weak negative
	India to China	-

Note: Positive impacts are denoted by different shades of blue; negative – by different shades of orange. Darker shades correspond to stronger effects.

As we can see strongest positive effects via GVCs backward linkages are coming from Russian export incentives for final and processed intermediate goods to Brazilian (via off-diagonal linkages) and Chinese (via diagonal linkages) export to Russia and from Brazilian export incentives to Indian export to Brazil (via diagonal linkages). According to our framework, these results indicate that when Russia/Brazil implement export incentives for final and processed intermediates, this stimulates export from /Brazil and China to Russia// India to Brazil/ of inputs, which are intensively used in Russian/Brazilian exportable production of exposed goods.

Strongest negative effects are coming from Brazilian export incentives to Chinese export to Brazil and from Indian export incentives to Russian and Brazilian exports to India. This indicates that there are rather strong negative import-substitution effects coming from Brazilian/Indian export incentives for processed

intermediate and final goods to export of /China to Brazil//Russia and Brazil to India/. On average Brazil and Russia tend to get more negative effects and China and India – more positive. This indicates that Chinese and Indian inputs are more likely to be used in exportable production in the other BRICs (Brazil and Russia, in particular) than Brazilian and Russian.

6. CONCLUSIONS

Whereas much attention has been devoted to the effects of export incentives on domestic export, we argue in this paper for the need to investigate effects of domestic export incentives on foreign exports. To our knowledge, though theory is rather established in this respect, this study is the first one to empirically test external effects of export incentives.

It is reasonable to think that export incentives implemented in a country positively affect its export and negatively – its foreign rivals` export. However, this study argues that in the GVCs world effects of domestic export incentives on foreign exports can be negative or positive alike. For empirical test of this proposition, we explicitly study the effects of export incentives implemented in one of the BRIC countries on the exports of the other three BRICs. We further weight export incentives by value added ratios, which reflect forward and backward GVCs linkages between respective pairs of countries. Empirical results reveal that while BRICs export incentives positively affect domestic exports, their external effects for each other's` export can be both positive and negative. According to our study, positive effects propagate via GVCs backward and forward linkages.

REFERENCES

Arndt, S.W. and Kierzkowski, H. eds., 2001. *Fragmentation: New production patterns in the world economy*. OUP Oxford.

Baldwin, R. and Venables, A.J., 2015. Trade policy and industrialisation when backward and forward linkages matter. *Research in Economics*, *69*(2), pp.123-131.

Bernhofen, D.M., 1997. Strategic trade policy in a vertically related industry. *Review of International Economics*, *5*(3), pp.429-433.

Blanchard, E.J., Bown, C.P. and Johnson, R.C., 2016. *Global supply chains and trade policy* (No. w21883). National Bureau of Economic Research.

Brander, J.A. and Spencer, B.J., 1985. Export subsidies and international market share rivalry. *Journal of International Economics*, *18*(1), pp.83-100.

Çakır, M.Y. and Kabundi, A., 2013. Trade shocks from BRIC to South Africa: A global VAR analysis. *Economic Modelling*, *32*, pp.190-202.

Costinot, A., Vogel, J. and Wang, S., 2013. An elementary theory of global supply chains. *The Review of Economic Studies*, *80*(1), pp.109-144.

Evenett, S.J., 2015. BRICS Trade Strategy: Time for a Rethink. CEPR Press.

Feenstra, R.C., 1998. Integration of trade and disintegration of production in the global economy. *The Journal of Economic Perspectives*, *12*(4), pp.31-50.

Feenstra, R.C. and Hanson, G.H., 1996. Globalization, outsourcing, and wage inequality. *The American Economic Review*, *86*(2), p.240.

Gawande, K., Hoekman, B. and Cui, Y., 2015. Global Supply Chains and Trade Policy Responses to the 2008 Crisis. *The World Bank Economic Review*, *29*(1), pp.102-128.

Grossman, G.M. and Rossi-Hansberg, E., 2008. Trading tasks: A simple theory of offshoring. *The American Economic Review*, *98*(5), pp.1978-1997.

Hoekman, B.M., 2015. Subsidies and spillovers in a value chain world: new rules required? World Economic Forum, The E15 Initiative.

Hummels, David, Jun Ishii, and Kei-Mu Yi. "The nature and growth of vertical specialization in world trade." *Journal of International Economics* 54.1 (2001): 75-96.

Iapadre, P.L. and Tajoli, L., 2014. Emerging countries and trade regionalization. A network analysis. *Journal of Policy Modeling*, *36*, pp.S89-S110.

Ishikawa, J. and Spencer, B.J., 1999. Rent-shifting export subsidies with an imported intermediate product. *Journal of International Economics*, *48*(2), pp.199-232.

Koopman, R., Powers, W. and Wang, Z., *and Wei, SJ (2011). Give credit where credit is due: Tracing value added in global value chains*. NBER Working Papers Series 16426.

Kowalski, P., Gonzalez, J.L., Ragoussis, A. and Ugarte, C., 2015. Participation of Developing Countries in Global Value Chains. *OECD Trade Policy Papers*, No. 179, OECD Publishing, Paris.

Lee, J. and Wong, K.Y., 2005. Vertical integration and strategic trade policies. *The North American Journal of Economics and Finance*, *16*(1), pp.93-117.

Manova, Kalina. "Global value chains and multinational activity with financial frictions." *The Age of Global Value Chains* (2015): 187.

Sheldon, I.M., Pick, D.H. and McCorriston, S., 2001. Export subsidies and profit-shifting in vertical markets. *Journal of Agricultural and Resource Economics*, pp.125-141.

Spencer, B.J. and Brander, J.A., 1983. International r & d rivalry and industrial strategy. *The Review of Economic Studies*, *50*(4), pp.707-722.

Spencer, B.J. and Jones, R.W., 1991. Vertical foreclosure and international trade policy. *The Review of Economic Studies*, *58*(1), pp.153-170.

Sturgeon, T.J. and Memedović, O., 2011. *Mapping global value chains: Intermediate goods trade and structural change in the world economy*. United Nations Industrial Development Organization.

To, T., 1994. Export subsidies and oligopoly with switching costs. *Journal of International Economics*, *37*(1), pp.97-110.

Yi, K.M., 2003. Can vertical specialization explain the growth of world trade?. *Journal of Political Economy*, *111*(1), pp.52-102.

APPENDICES

Appendix 1 *BEC structure of intermediate goods` export of the BRICs in 1995-2015*

Figure A1.1. Brazilian export of intermediate goods: BEC structure, million USD

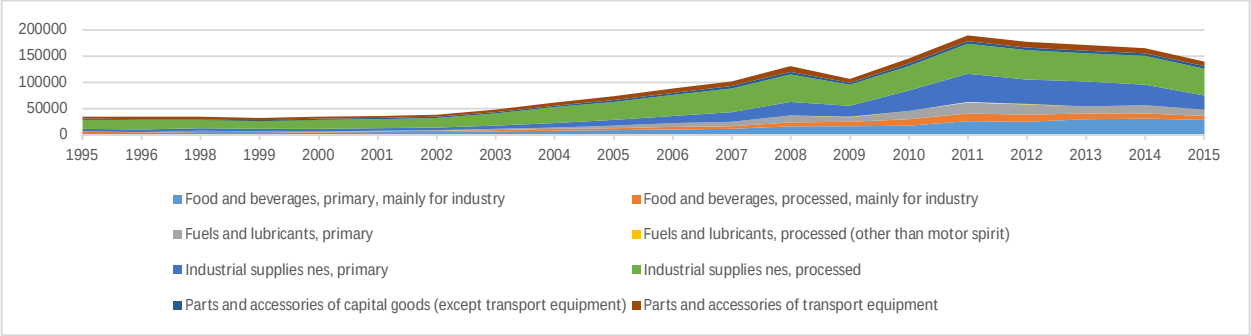


Figure A1.2. Russian export of intermediate goods: BEC structure, million USD

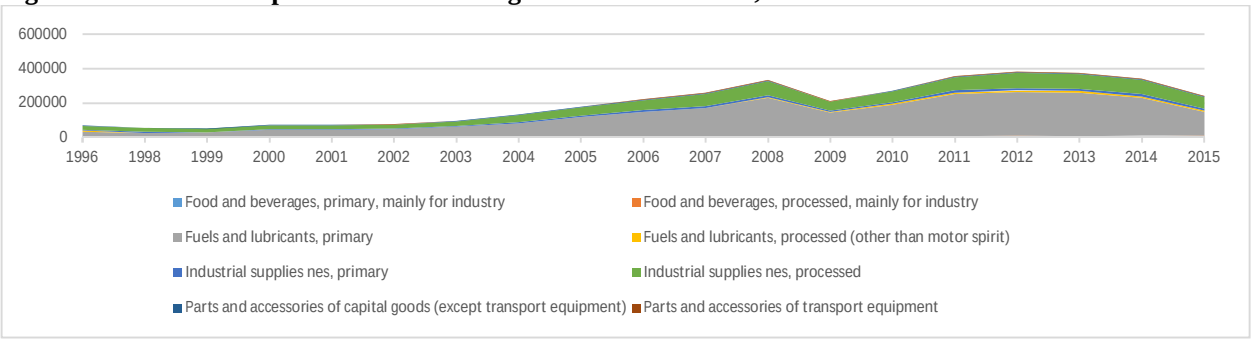


Figure A1.3. Indian export of intermediate goods: BEC structure, million USD

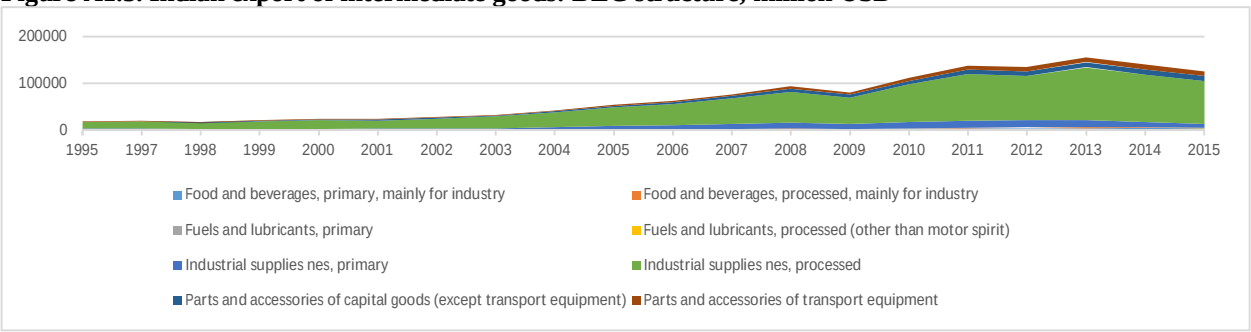
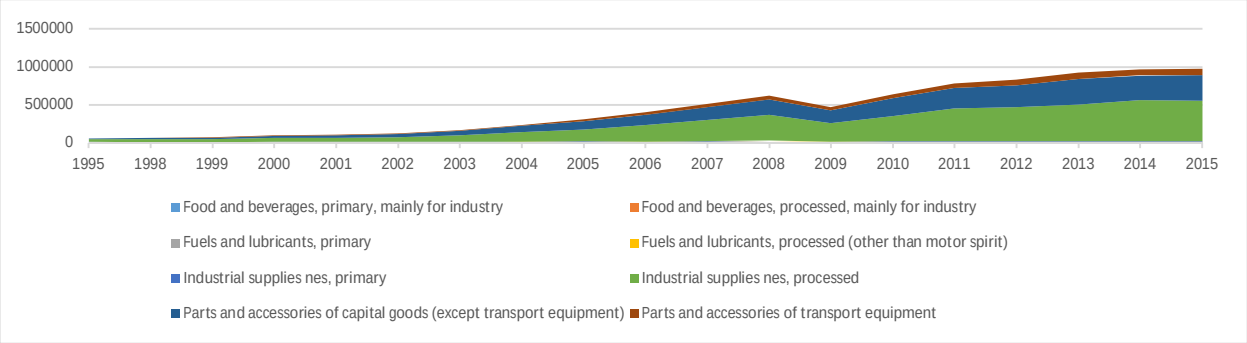


Figure A1.4. Chinese export of intermediate goods: BEC structure, million USD



Source: UN COMTRADE

Appendix 2 *BEC structure of intermediate goods` export in inter-BRICs trade in 1995-2015*

Figure A2.1 Brazilian export of intermediate goods to Russia: BEC structure, million USD

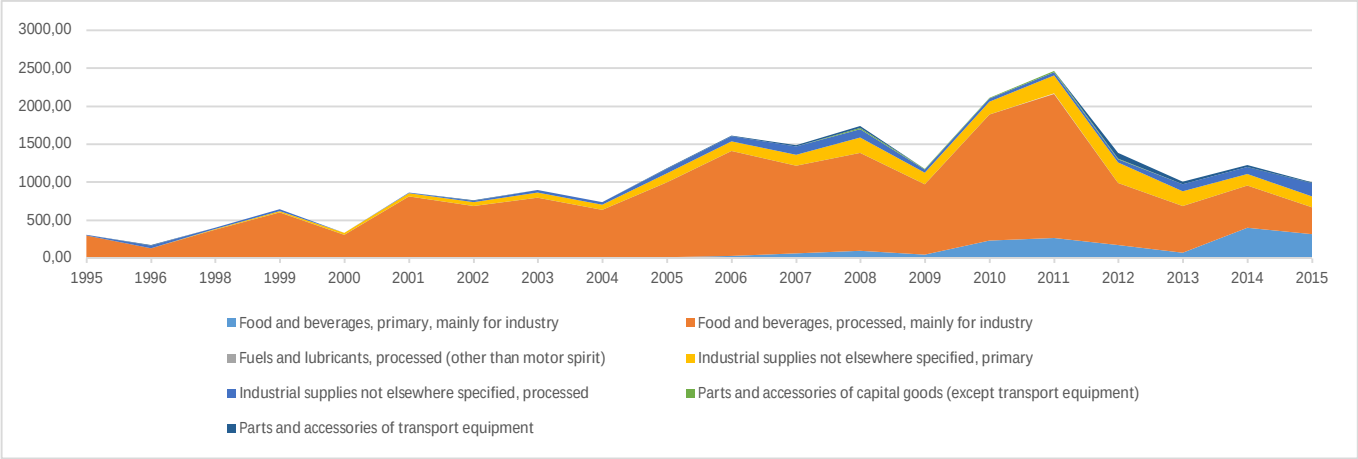


Figure A2.2 Brazilian export of intermediate goods to India: BEC structure, million USD

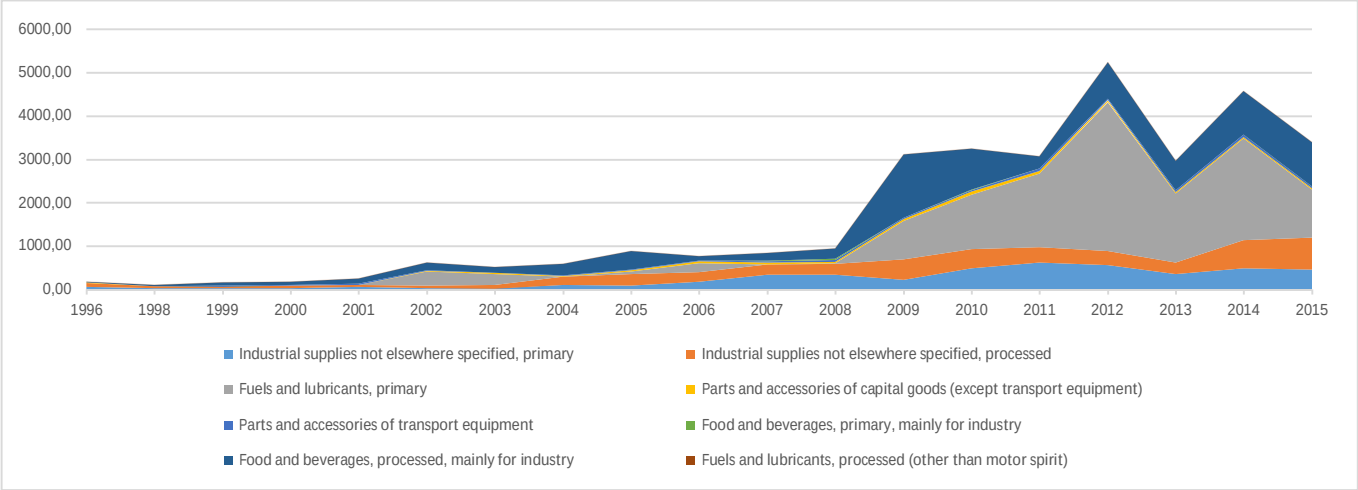


Figure A2.3 Brazilian export of intermediate goods to China: BEC structure, million USD

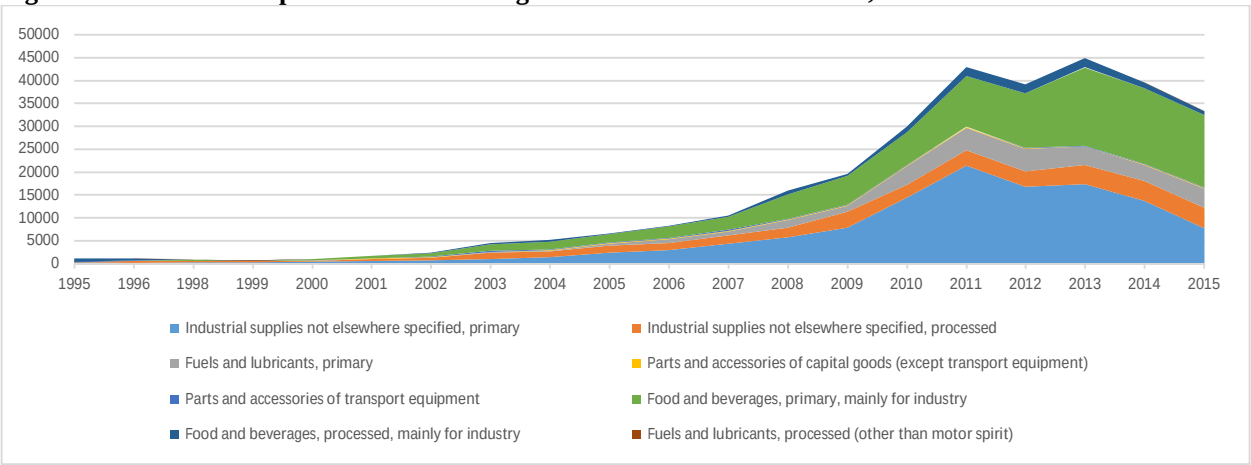


Figure A2.4 Russian export of intermediate goods to Brazil: BEC structure, million USD

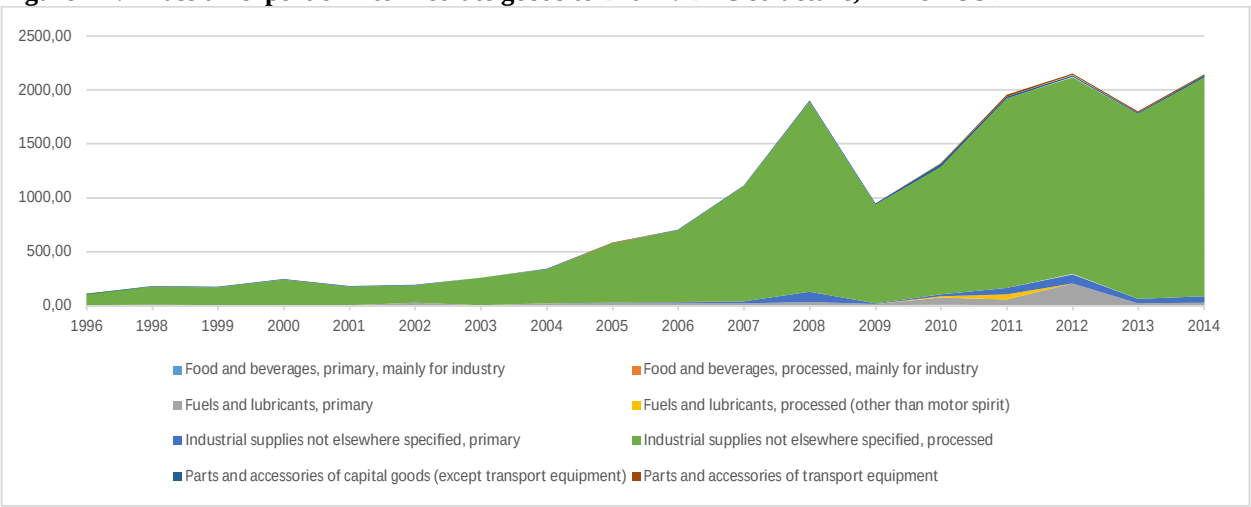


Figure A2.5 Russian export of intermediate goods to India: BEC structure, million USD

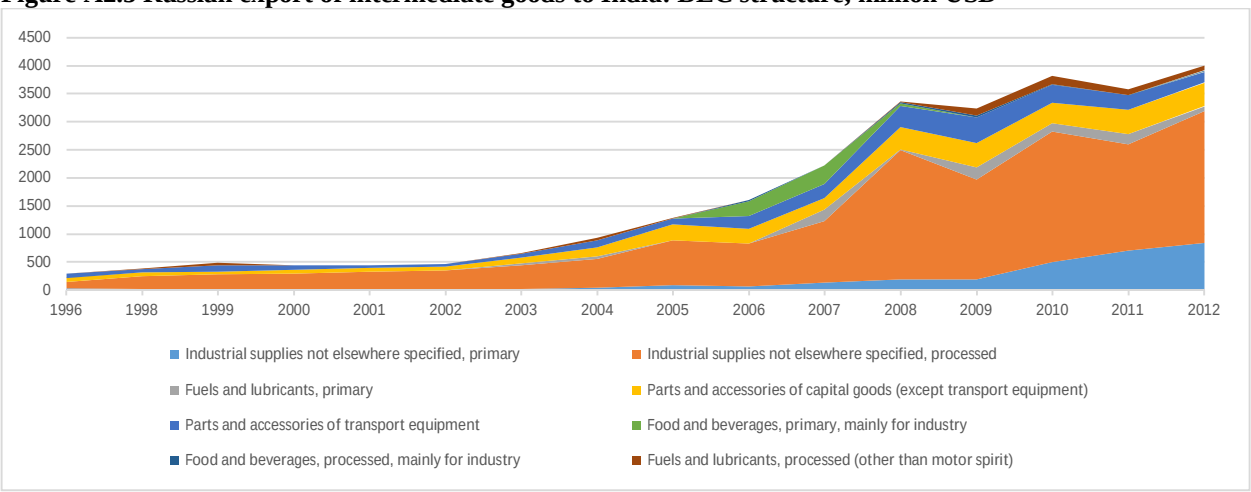


Figure A2.6 Russian export of intermediate goods to China: BEC structure, million USD

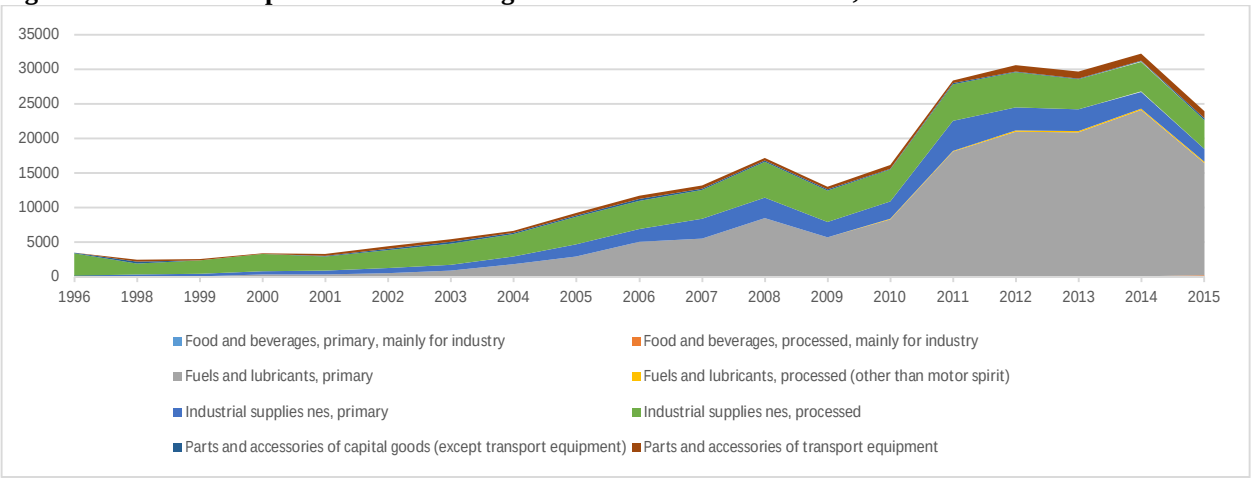


Figure A2.7 Indian export of intermediate goods to Brazil: BEC structure, million USD

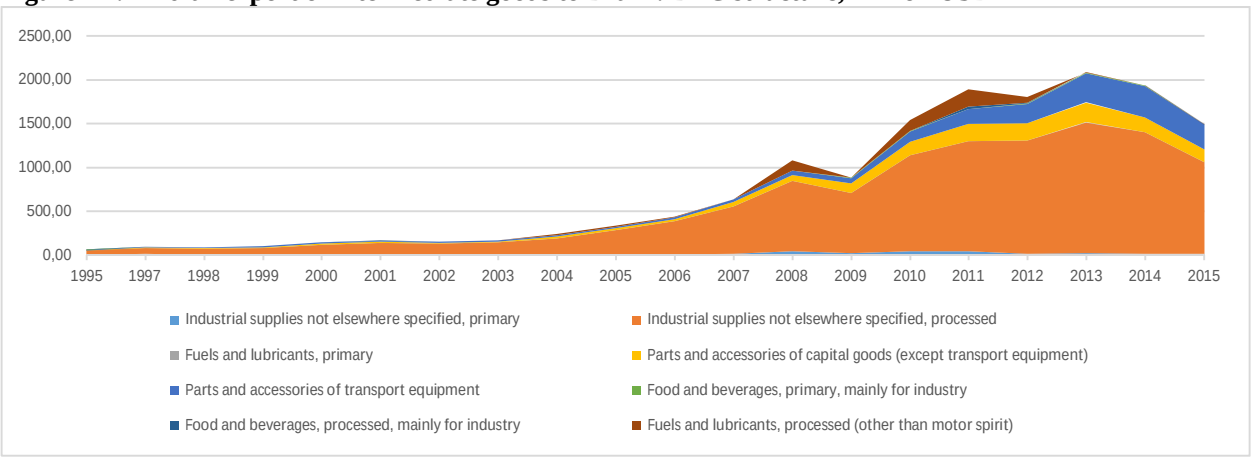


Figure A2.8 Indian export of intermediate goods to Russia: BEC structure, million USD

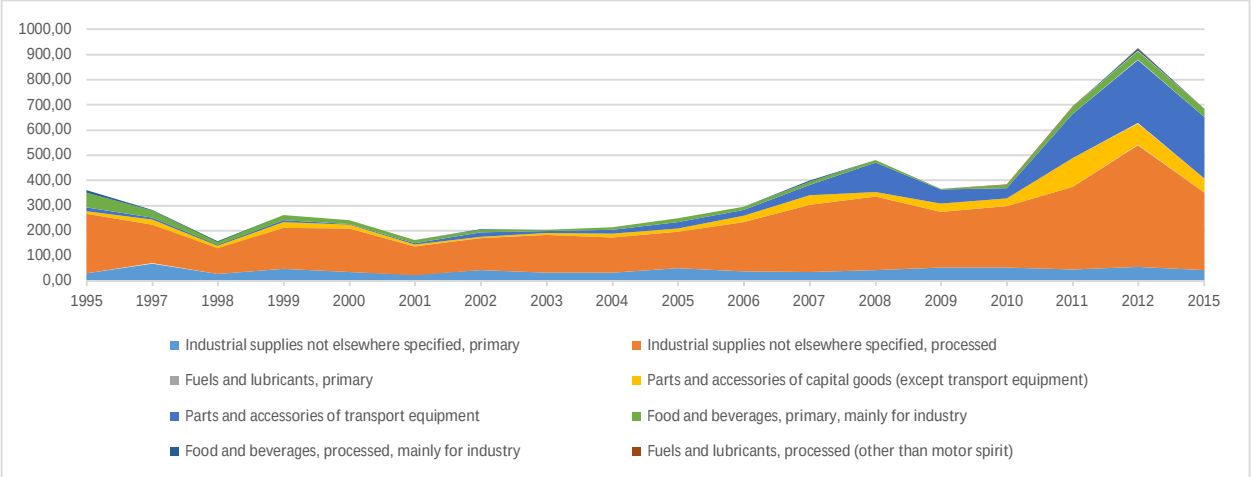


Figure A2.9 Indian export of intermediate goods to China: BEC structure, million USD

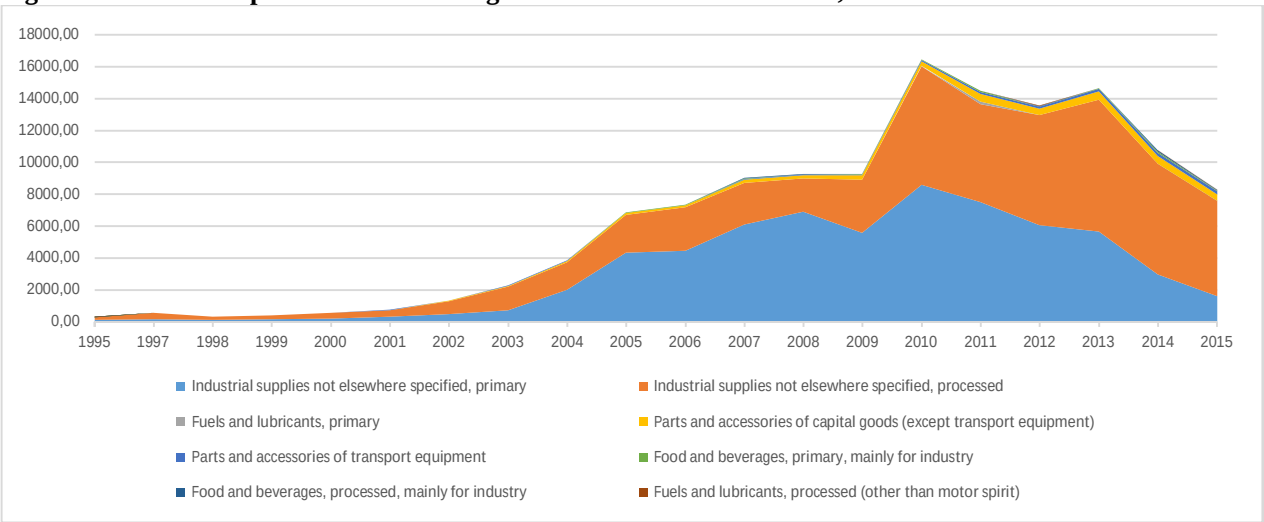


Figure A2.10 Chinese export of intermediate goods to Brazil: BEC structure, million USD

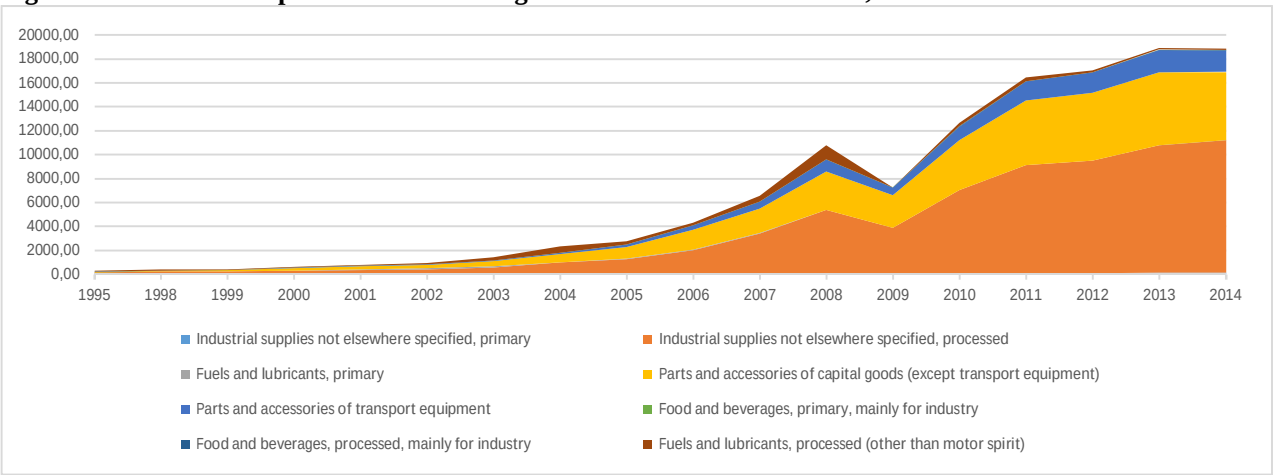


Figure A2.11 Chinese export of intermediate goods to Russia: BEC structure, million USD

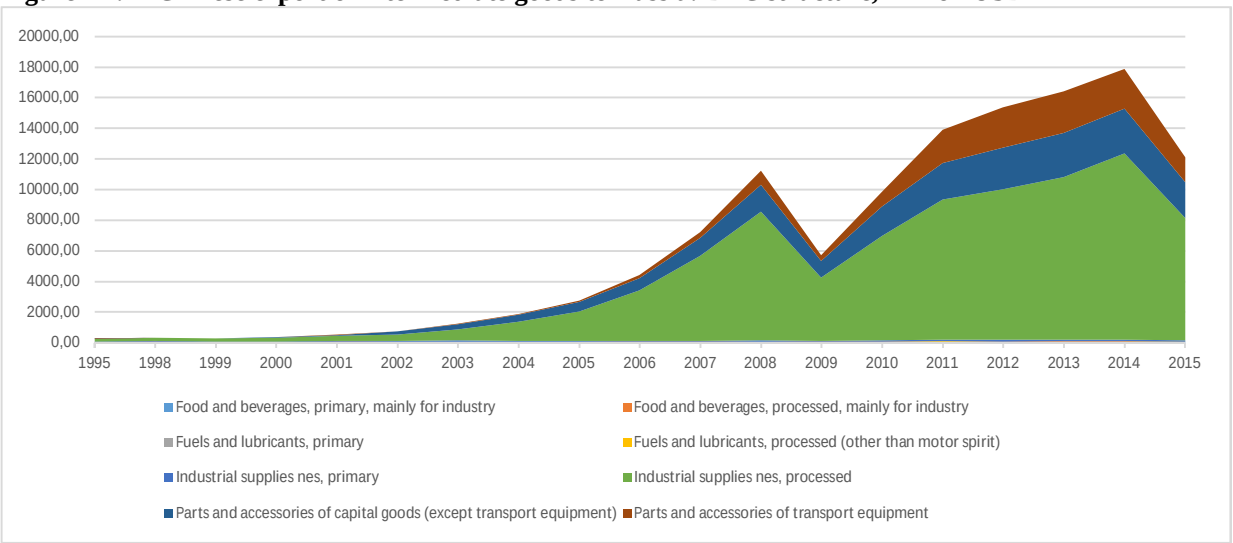
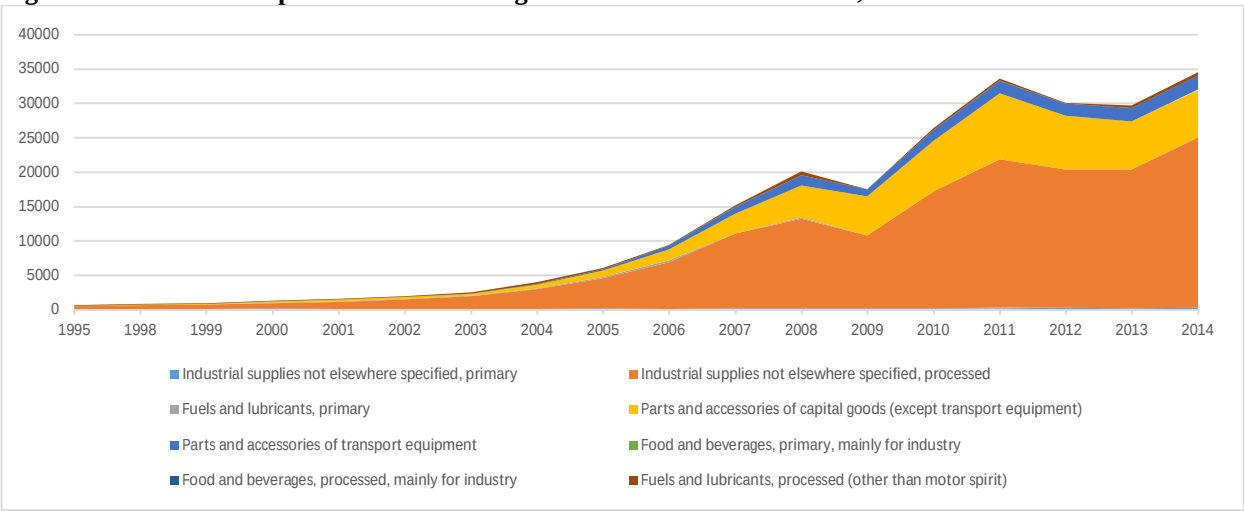


Figure A2.12 Chinese export of intermediate goods to India: BEC structure, million USD



Source: UN COMTRADE

Appendix 3

Table 3.1. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
EX_SH(i,t,BR)	40 319	0,0	0,0	0,0	0,9
EX_SH(i,t,RU)	40 319	0,0	0,0	0,0	0,7
EX_SH(i,t,IN)	35 268	0,0	0,1	0,0	1,0
EX_SH(i,t,CH)	40 319	0,1	0,2	0,0	1,0
LnEX (i,t,BR)	40 408	11,5	5,6	0,0	24,2
LnEX (i,t,RU)	40 408	11,4	5,5	0,0	25,9
LnEX (i,t,IN)	35 357	13,8	4,3	0,0	24,5
LnEX (i,t,CH)	40 408	16,3	4,8	0,0	37,0
WGDP_SH(t,BR)	40 408	0,0	0,0	0,0	0,0
WGDP_SH(t,RU)	40 408	0,0	0,0	0,0	0,0
WGDP_SH(t,IN)	40 408	0,0	0,0	0,0	0,0
WGDP_SH(t,CH)	40 408	0,0	0,0	0,0	0,0
LnGDP(t,BR)	40 408	28,4	0,2	28,1	28,6
LnGDP(t,RU)	40 408	28,2	0,2	27,8	28,4
LnGDP(t,IN)	40 408	28,1	0,1	27,9	28,3
LnGDP(t,CH)	40 408	29,6	0,3	29,2	29,9
TF(t,BR)	40 408	69,9	0,7	69,1	72,0
TF(t,RU)	40 408	71,0	3,7	68,2	77,4
TF(t,IN)	40 408	61,5	6,2	51,0	67,9
TF(t,CH)	40 408	71,6	0,6	70,2	72,2

EI(i,t,BR)	35 357	1,1	0,8	0,0	3,0
EI(i,t,RU)	35 357	0,2	0,5	0,0	2,3
EI(i,t,IN)	35 357	2,2	2,3	0,0	14,3
EI(i,t,CH)	35 357	1,1	1,0	0,0	6,0
FLI_OFFD_BR_RU (s(i),t)	32 363	1,3	2,0	0,0	10,1
FLI_D_BR_RU (s(i),t)	32 363	0,0	0,0	0,0	0,2
FLI_OFFD_BR_IN (s(i),t)	31 864	8,2	5,4	0,5	21,8
FLI_D_BR_IN (s(i),t)	31 864	0,1	0,3	0,0	1,2
FLI_OFFD_BR_CH (s(i),t)	31 864	24,8	8,0	12,4	58,2
FLI_D_BR_CH (s(i),t)	31 864	0,3	0,3	0,0	1,1
FLI_OFFD_RU_BR (s(i),t)	31 864	3,2	2,0	0,5	11,0
FLI_D_RU_BR (s(i),t)	31 864	0,0	0,0	0,0	0,2
FLI_OFFD_RU_IN (s(i),t)	31 864	11,4	6,5	0,5	26,0
FLI_D_RU_IN (s(i),t)	31 864	0,2	0,4	0,0	1,7
FLI_OFFD_RU_CH (s(i),t)	31 864	52,8	13,2	25,0	92,3
FLI_D_RU_CH (s(i),t)	31 864	0,8	1,2	0,0	5,0
FLI_OFFD_IN_BR (s(i),t)	31 864	2,8	1,4	0,5	22,1
FLI_D_IN_BR (s(i),t)	31 864	0,0	0,0	0,0	0,2
FLI_OFFD_IN_RU (s(i),t)	32 363	2,7	3,8	0,0	28,6
FLI_D_IN_RU (s(i),t)	32 363	0,0	0,1	0,0	0,6
FLI_OFFD_IN_CH (s(i),t)	31 864	45,1	14,7	19,8	89,6
FLI_D_IN_CH (s(i),t)	31 864	0,7	0,7	0,0	2,4
FLI_OFFD_CH_BR (s(i),t)	31 864	5,1	3,1	0,6	19,8
FLI_D_CH_BR (s(i),t)	31 864	0,1	0,1	0,0	0,4
FLI_OFFD_CH_RU (s(i),t)	32 363	2,3	3,5	0,0	28,6
FLI_D_CH_RU (s(i),t)	32 363	0,0	0,1	0,0	0,4
FLI_OFFD_CH_IN (s(i),t)	31 864	6,7	4,5	0,4	20,9
FLI_D_CH_IN (s(i),t)	31 864	0,3	0,5	0,0	2,2

Table 3.2a Correlation matrix

	EX_SH(i,t,BR)	EX_SH(i,t,RU)	EX_SH(i,t,IN)	EX_SH(i,t,CH)	LnEX (i,t,BR)	LnEX (i,t,RU)	LnEX (i,t,IN)	LnEX (i,t,CH)	WGDP_SH(t,BR)	WGDP_SH(t,RU)
EX_SH(i,t,BR)	1,00									
EX_SH(i,t,RU)	0,04	1,00								
EX_SH(i,t,IN)	-0,01	-0,03	1,00							
EX_SH(i,t,CH)	-0,09	-0,09	-0,03	1,00						
LnEX (i,t,BR)	0,27	0,03	-0,08	-0,01	1,00					
LnEX (i,t,RU)	0,05	0,28	-0,11	-0,02	0,52	1,00				
LnEX (i,t,IN)	0,02	-0,03	0,28	0,09	0,49	0,39	1,00			
LnEX (i,t,CH)	-0,02	-0,02	-0,05	0,44	0,47	0,45	0,52	1,00		
WGDP_SH(t,BR)	0,00	-0,02	-0,02	-0,06	0,01	-0,08	0,00	-0,01	1,00	
WGDP_SH(t,RU)	-0,01	0,00	0,00	-0,03	0,01	0,02	0,02	0,00	0,80	1,00
WGDP_SH(t,IN)	0,00	0,01	0,02	0,07	-0,01	0,03	0,01	0,02	-0,43	-0,55
WGDP_SH(t,CH)	0,00	0,02	0,04	0,09	-0,01	0,14	0,03	0,03	-0,56	-0,15
LnGDP(t,BR)	-0,01	-0,01	0,00	-0,03	0,01	-0,01	0,02	0,01	0,90	0,92
LnGDP(t,RU)	-0,01	0,00	0,01	-0,01	0,01	0,04	0,03	0,01	0,72	0,97
LnGDP(t,IN)	0,00	0,01	0,03	0,07	0,00	0,09	0,03	0,04	-0,02	0,18
LnGDP(t,CH)	0,00	0,02	0,04	0,08	0,00	0,14	0,04	0,04	-0,29	0,15
TF(t,BR)	0,01	0,00	-0,02	-0,04	0,00	-0,02	-0,03	-0,03	-0,34	-0,35
TF(t,RU)	0,00	0,02	0,03	0,06	-0,01	0,13	0,02	0,03	-0,47	-0,05
TF(t,IN)	0,00	0,00	0,02	0,04	0,00	0,03	0,02	0,03	0,30	0,30
TF(t,CH)	0,00	0,00	0,00	0,02	-0,01	0,01	0,00	0,01	0,16	0,05
EI(i,t,BR)	0,08	-0,01	0,00	-0,03	0,23	0,18	0,11	0,09	0,04	0,19
EI(i,t,RU)	-0,02	0,01	-0,02	0,04	0,12	0,18	0,12	0,15	-0,47	-0,31
EI(i,t,IN)	-0,07	-0,06	0,13	0,25	0,03	0,06	0,22	0,20	-0,04	0,23
EI(i,t,CH)	-0,08	-0,10	0,02	0,16	0,11	0,09	0,19	0,25	-0,05	-0,04
FLI_OFFD_BR_RU (s(i),t)	0,01	0,03	0,05	0,05	-0,06	0,07	-0,02	-0,04	-0,74	-0,49
FLI_D_BR_RU (s(i),t)	-0,01	0,05	0,02	-0,01	0,00	0,04	0,02	-0,02	-0,38	-0,27
FLI_OFFD_BR_IN (s(i),t)	-0,02	0,00	0,02	0,07	0,02	0,16	0,07	0,08	0,00	0,44
FLI_D_BR_IN (s(i),t)	-0,03	0,03	0,07	0,02	-0,05	-0,05	0,02	-0,03	0,02	0,16
FLI_OFFD_BR_CH (s(i),t)	-0,05	-0,01	-0,03	0,09	0,08	0,16	0,12	0,18	-0,18	-0,03
FLI_D_BR_CH (s(i),t)	-0,09	-0,07	0,07	0,20	-0,03	-0,03	0,12	0,17	-0,06	-0,02
FLI_OFFD_RU_BR (s(i),t)	0,07	-0,01	-0,02	-0,09	-0,06	0,00	-0,13	-0,16	0,10	0,24
FLI_D_RU_BR (s(i),t)	0,09	0,06	0,01	-0,15	-0,09	-0,03	-0,14	-0,24	0,04	0,11

FLI_OFFD_RU_IN (s(i),t)	0,00	0,01	-0,01	0,00	0,03	0,18	0,03	0,04	0,00	0,47
FLI_D_RU_IN (s(i),t)	-0,03	0,03	0,08	0,04	-0,06	-0,05	0,03	-0,03	0,02	0,17
FLI_OFFD_RU_CH (s(i),t)	0,02	0,02	-0,10	-0,09	0,09	0,20	0,01	0,03	-0,32	-0,21
FLI_D_RU_CH (s(i),t)	-0,07	-0,08	0,16	0,31	-0,09	-0,14	0,10	0,13	-0,06	-0,05
FLI_OFFD_IN_BR (s(i),t)	0,00	0,09	-0,01	-0,03	0,09	0,16	0,08	0,06	0,13	0,28
FLI_D_IN_BR (s(i),t)	0,02	0,14	0,00	-0,12	0,01	0,06	0,01	-0,09	0,04	0,07
FLI_OFFD_IN_RU (s(i),t)	0,00	0,05	0,03	0,05	0,00	0,12	0,02	0,01	-0,74	-0,48
FLI_D_IN_RU (s(i),t)	0,00	0,08	-0,01	-0,03	0,04	0,11	0,04	0,01	-0,37	-0,25
FLI_OFFD_IN_CH (s(i),t)	-0,02	0,04	-0,10	-0,03	0,17	0,25	0,12	0,16	-0,18	-0,06
FLI_D_IN_CH (s(i),t)	-0,06	0,01	0,06	0,07	-0,04	-0,05	0,08	0,06	-0,04	-0,04
FLI_OFFD_CH_BR (s(i),t)	0,06	0,02	0,03	-0,03	-0,09	-0,03	-0,13	-0,16	0,10	0,26
FLI_D_CH_BR (s(i),t)	0,05	0,07	0,07	-0,09	-0,12	-0,09	-0,11	-0,21	0,02	0,13
FLI_OFFD_CH_RU (s(i),t)	0,00	0,04	0,04	0,07	-0,01	0,09	0,00	0,01	-0,70	-0,45
FLI_D_CH_RU (s(i),t)	0,00	0,07	0,00	-0,02	0,02	0,08	0,02	-0,01	-0,45	-0,31
FLI_OFFD_CH_IN (s(i),t)	0,00	0,01	-0,01	0,05	0,03	0,16	0,02	0,06	-0,04	0,41
FLI_D_CH_IN (s(i),t)	-0,03	0,03	0,09	0,05	-0,06	-0,05	0,03	-0,02	0,02	0,18

Table 3.2b Correlation matrix

	WGDP_SH(t,IN)	WGDP_SH(t,CH)	LnGDP(t,BR)	LnGDP(t,RU)	LnGDP(t,IN)	LnGDP(t,CH)	TF(t,BR)	TF(t,RU)	TF(t,IN)	TF(t,CH)
WGDP_SH(t,IN)	1,00									
WGDP_SH(t,CH)	0,59	1,00								
LnGDP(t,BR)	-0,29	-0,15	1,00							
LnGDP(t,RU)	-0,38	0,07	0,93	1,00						
LnGDP(t,IN)	0,67	0,79	0,35	0,40	1,00					
LnGDP(t,CH)	0,47	0,95	0,16	0,36	0,89	1,00				
TF(t,BR)	-0,56	-0,47	-0,60	-0,52	-0,89	-0,63	1,00			
TF(t,RU)	0,27	0,79	-0,12	0,11	0,52	0,76	-0,26	1,00		
TF(t,IN)	0,62	0,45	0,54	0,45	0,87	0,59	-0,96	0,25	1,00	
TF(t,CH)	0,47	0,19	0,24	0,13	0,46	0,24	-0,61	0,38	0,73	1,00
EI(i,t,BR)	0,22	0,35	0,21	0,27	0,44	0,41	-0,40	0,19	0,39	0,17
EI(i,t,RU)	0,41	0,52	-0,30	-0,20	0,34	0,43	-0,14	0,45	0,14	0,12
EI(i,t,IN)	0,02	0,38	0,18	0,32	0,34	0,45	-0,27	0,49	0,23	0,21
EI(i,t,CH)	0,10	0,09	-0,03	-0,02	0,08	0,08	-0,07	0,05	0,06	0,04
FLI_OFFD_BR_RU (s(i),t)	0,64	0,84	-0,47	-0,31	0,54	0,69	-0,22	0,73	0,22	0,19
FLI_D_BR_RU (s(i),t)	0,33	0,40	-0,25	-0,18	0,25	0,32	-0,10	0,33	0,10	0,08
FLI_OFFD_BR_IN (s(i),t)	0,04	0,63	0,37	0,59	0,61	0,76	-0,47	0,72	0,44	0,30
FLI_D_BR_IN (s(i),t)	0,01	0,19	0,14	0,21	0,20	0,24	-0,17	0,21	0,15	0,09
FLI_OFFD_BR_CH (s(i),t)	0,38	0,50	0,02	0,08	0,50	0,50	-0,35	0,31	0,35	0,14
FLI_D_BR_CH (s(i),t)	0,13	0,17	0,00	0,02	0,16	0,16	-0,13	0,10	0,12	0,05
FLI_OFFD_RU_BR (s(i),t)	0,22	0,33	0,27	0,31	0,46	0,41	-0,42	0,17	0,44	0,21
FLI_D_RU_BR (s(i),t)	0,10	0,15	0,12	0,14	0,21	0,19	-0,19	0,08	0,20	0,10
FLI_OFFD_RU_IN (s(i),t)	0,03	0,65	0,39	0,61	0,63	0,78	-0,48	0,77	0,45	0,34
FLI_D_RU_IN (s(i),t)	0,01	0,21	0,15	0,22	0,21	0,25	-0,19	0,23	0,16	0,10
FLI_OFFD_RU_CH (s(i),t)	0,59	0,60	-0,12	-0,07	0,57	0,55	-0,40	0,36	0,43	0,23
FLI_D_RU_CH (s(i),t)	0,14	0,13	-0,02	-0,01	0,14	0,12	-0,13	0,08	0,11	0,07
FLI_OFFD_IN_BR (s(i),t)	0,27	0,38	0,33	0,37	0,54	0,47	-0,51	0,18	0,54	0,27
FLI_D_IN_BR (s(i),t)	0,09	0,10	0,09	0,09	0,15	0,12	-0,16	0,04	0,16	0,10
FLI_OFFD_IN_RU (s(i),t)	0,64	0,85	-0,46	-0,30	0,55	0,70	-0,23	0,75	0,23	0,20
FLI_D_IN_RU (s(i),t)	0,33	0,42	-0,24	-0,16	0,27	0,34	-0,11	0,36	0,11	0,10
FLI_OFFD_IN_CH (s(i),t)	0,40	0,46	0,00	0,04	0,47	0,46	-0,34	0,29	0,36	0,17
FLI_D_IN_CH (s(i),t)	0,13	0,09	-0,01	-0,02	0,11	0,08	-0,12	0,05	0,10	0,08

FLI_OFFD_CH_BR (s(i),t)	0,21	0,35	0,28	0,33	0,48	0,44	-0,44	0,18	0,44	0,19
FLI_D_CH_BR (s(i),t)	0,15	0,24	0,15	0,19	0,30	0,29	-0,27	0,13	0,26	0,11
FLI_OFFD_CH_RU (s(i),t)	0,60	0,80	-0,43	-0,28	0,51	0,66	-0,21	0,70	0,21	0,19
FLI_D_CH_RU (s(i),t)	0,39	0,49	-0,29	-0,21	0,31	0,39	-0,12	0,41	0,13	0,10
FLI_OFFD_CH_IN (s(i),t)	0,05	0,64	0,33	0,55	0,60	0,75	-0,45	0,76	0,42	0,32
FLI_D_CH_IN (s(i),t)	0,01	0,23	0,16	0,24	0,23	0,28	-0,20	0,25	0,17	0,11

Table 3.2c Correlation matrix

	EI(i,t,BR)	EI(i,t,RU)	EI(i,t,IN)	EI(i,t,CH)	FLI_OFFD_BR_RU (s(i),t)	FLI_D_BR_RU (s(i),t)	FLI_OFFD_BR_IN (s(i),t)	FLI_D_BR_IN (s(i),t)	FLI_OFFD_BR_CH (s(i),t)	FLI_D_BR_CH (s(i),t)
EI(i,t,BR)	1,00									
EI(i,t,RU)	0,21	1,00								
EI(i,t,IN)	0,21	0,22	1,00							
EI(i,t,CH)	0,17	0,24	0,23	1,00						
FLI_OFFD_BR_RU (s(i),t)	0,18	0,38	0,20	0,01	1,00					
FLI_D_BR_RU (s(i),t)	0,15	0,23	0,05	0,04	0,46	1,00				
FLI_OFFD_BR_IN (s(i),t)	0,24	0,28	0,57	0,06	0,33	-0,02	1,00			
FLI_D_BR_IN (s(i),t)	0,14	-0,06	0,23	0,03	0,16	0,46	-0,04	1,00		
FLI_OFFD_BR_CH (s(i),t)	0,20	0,50	0,25	0,25	0,29	0,08	0,43	-0,15	1,00	
FLI_D_BR_CH (s(i),t)	0,04	0,14	0,37	0,31	0,09	0,16	0,12	0,30	0,57	1,00
FLI_OFFD_RU_BR (s(i),t)	0,37	0,00	0,01	-0,06	0,18	-0,06	0,26	-0,12	0,11	-0,18
FLI_D_RU_BR (s(i),t)	0,24	-0,12	-0,06	-0,17	0,13	0,10	0,04	0,06	-0,13	-0,20
FLI_OFFD_RU_IN (s(i),t)	0,30	0,28	0,48	0,04	0,35	0,08	0,94	0,11	0,32	0,00
FLI_D_RU_IN (s(i),t)	0,14	-0,07	0,26	0,02	0,17	0,46	-0,01	1,00	-0,15	0,31
FLI_OFFD_RU_CH (s(i),t)	0,31	0,54	-0,08	0,08	0,49	0,20	0,27	-0,23	0,62	-0,15
FLI_D_RU_CH (s(i),t)	-0,03	-0,01	0,49	0,18	0,11	-0,02	0,12	0,17	0,14	0,63
FLI_OFFD_IN_BR (s(i),t)	0,32	0,21	0,09	0,03	0,13	0,14	0,34	0,06	0,34	-0,04
FLI_D_IN_BR (s(i),t)	0,15	0,00	-0,05	-0,10	0,07	0,43	-0,08	0,46	-0,04	0,03
FLI_OFFD_IN_RU (s(i),t)	0,20	0,51	0,23	0,05	0,91	0,62	0,35	0,22	0,35	0,11
FLI_D_IN_RU (s(i),t)	0,10	0,42	0,08	0,01	0,40	0,66	0,14	0,16	0,26	0,04
FLI_OFFD_IN_CH (s(i),t)	0,25	0,55	0,02	0,19	0,25	0,23	0,28	-0,10	0,64	0,01
FLI_D_IN_CH (s(i),t)	0,07	0,03	0,17	0,18	0,10	0,51	-0,17	0,74	0,13	0,69
FLI_OFFD_CH_BR (s(i),t)	0,35	-0,12	0,06	-0,14	0,24	0,00	0,23	0,08	-0,03	-0,15

FLI_D_CH_BR (s(i),t)	0,26	-0,17	0,03	-0,18	0,23	0,37	-0,05	0,57	-0,24	0,01
FLI_OFFD_CH_RU (s(i),t)	0,19	0,38	0,20	0,03	0,88	0,60	0,29	0,28	0,26	0,11
FLI_D_CH_RU (s(i),t)	0,16	0,36	0,06	0,03	0,52	0,93	0,07	0,36	0,18	0,10
FLI_OFFD_CH_IN (s(i),t)	0,26	0,26	0,50	0,04	0,36	0,07	0,89	0,12	0,36	0,11
FLI_D_CH_IN (s(i),t)	0,14	-0,06	0,31	0,02	0,18	0,46	0,03	0,98	-0,13	0,34

Table 3.2d Correlation matrix

	FLI_OFFD_RU_BR (s(i),t)	FLI_D_RU_BR (s(i),t)	FLI_OFFD_RU_IN (s(i),t)	FLI_D_RU_IN (s(i),t)	FLI_OFFD_RU_CH (s(i),t)	FLI_D_RU_CH (s(i),t)	FLI_OFFD_IN_BR (s(i),t)	FLI_D_IN_BR (s(i),t)	FLI_OFFD_IN_RU (s(i),t)	FLI_D_IN_RU (s(i),t)
FLI_OFFD_RU_BR (s(i),t)	1,00									
FLI_D_RU_BR (s(i),t)	0,78	1,00								
FLI_OFFD_RU_IN (s(i),t)	0,33	0,11	1,00							
FLI_D_RU_IN (s(i),t)	-0,12	0,07	0,12	1,00						
FLI_OFFD_RU_CH (s(i),t)	0,36	0,07	0,34	-0,25	1,00					
FLI_D_RU_CH (s(i),t)	-0,16	-0,11	-0,10	0,21	-0,41	1,00				
FLI_OFFD_IN_BR (s(i),t)	0,26	0,14	0,34	0,06	0,48	-0,11	1,00			
FLI_D_IN_BR (s(i),t)	0,01	0,48	0,00	0,48	0,02	-0,08	0,33	1,00		
FLI_OFFD_IN_RU (s(i),t)	0,11	0,11	0,37	0,23	0,52	0,07	0,27	0,21	1,00	
FLI_D_IN_RU (s(i),t)	-0,06	0,16	0,16	0,17	0,37	-0,06	0,29	0,50	0,64	1,00
FLI_OFFD_IN_CH (s(i),t)	0,08	-0,07	0,32	-0,11	0,83	-0,30	0,60	0,23	0,40	0,50
FLI_D_IN_CH (s(i),t)	-0,26	-0,05	-0,12	0,74	-0,22	0,35	0,02	0,48	0,19	0,24
FLI_OFFD_CH_BR (s(i),t)	0,86	0,68	0,28	0,09	0,15	-0,01	0,32	0,02	0,16	-0,12
FLI_D_CH_BR (s(i),t)	0,44	0,64	0,07	0,58	-0,12	0,08	0,07	0,52	0,22	0,13
FLI_OFFD_CH_RU (s(i),t)	0,11	0,06	0,33	0,27	0,43	0,07	0,19	0,11	0,92	0,38
FLI_D_CH_RU (s(i),t)	-0,05	0,12	0,14	0,36	0,33	-0,06	0,20	0,47	0,72	0,84
FLI_OFFD_CH_IN (s(i),t)	0,33	0,07	0,93	0,13	0,27	-0,02	0,29	-0,08	0,39	0,08
FLI_D_CH_IN (s(i),t)	-0,12	0,09	0,14	0,99	-0,26	0,27	0,07	0,50	0,25	0,22

Table 3.2e Correlation matrix

	FLI_OFFD_IN_CH (s(i),t)	FLI_D_IN_CH (s(i),t)	FLI_OFFD_CH_BR (s(i),t)	FLI_D_CH_BR (s(i),t)	FLI_OFFD_CH_RU (s(i),t)	FLI_D_CH_RU (s(i),t)	FLI_OFFD_CH_IN (s(i),t)	FLI_D_CH_IN (s(i),t)
FLI_OFFD_IN_CH (s(i),t)	1,00							
FLI_D_IN_CH (s(i),t)	0,00	1,00						
FLI_OFFD_CH_BR (s(i),t)	-0,12	-0,13	1,00					
FLI_D_CH_BR (s(i),t)	-0,23	0,39	0,62	1,00				
FLI_OFFD_CH_RU (s(i),t)	0,26	0,20	0,25	0,25	1,00			
FLI_D_CH_RU (s(i),t)	0,37	0,41	-0,02	0,30	0,63	1,00		
FLI_OFFD_CH_IN (s(i),t)	0,23	-0,07	0,37	0,11	0,42	0,13	1,00	
FLI_D_CH_IN (s(i),t)	-0,11	0,74	0,08	0,58	0,28	0,37	0,15	1,00