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Export Promotion Policy in the Age of Global Value Chains

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Abstract

Nowadays global value chains play central role in trade flows. This paper further argues that global value chains can largely shape the outcomes of trade policies. More specifically, this study examines how domestic export promotion policies affect foreign countries' exports in the presence of global value chains. We argue that in addition to negative "competition for market share" effect proposed by strategic trade theory in the absence of trade in intermediates, there can be positive effects, which emerge due to backward and forward linkages inside global value chains via trade in intermediates. We build a framework which describes and summarizes these effects based on previous relevant studies separating them for final and intermediate goods' foreign exports depending on the type of good (final versus intermediate) targeted by domestic export incentive. We empirically test this framework for the BRICs bloc. In particular, we study how export incentives implemented in one BRIC country affect exports of the other three BRIC countries. Though our empirical evidence suggests that negative effects still prevail, we find rather strong evidence on positive effects as well. Positive effects are especially strong between China and India.

JEL Classification: F13, F14, O10

Keywords: export policy, export subsidy, export incentive, global value chains, intermediate goods, final goods, BRICs, Brazil, Russia, China, India

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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). In this paper we take a step toward filling these voids by exploring effects of domestic export promotion policies on foreign countries` export which emerge due to backward and forward linkages inside GVCs via trade in intermediates.

The main issue in both policy and academic discussion of export promotion policies and particularly export subsidies is whether they have significant negative impacts on foreign 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, export subsidies can help domestic firms to capture market shares of foreign firms in international markets thereby pointing to negative effect of domestic export incentives on foreign export. In this paper we refer to this effect as to negative “competition for market share” effect.

However, 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 become more complicated. In particular, 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). 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 this issue by studying export promotion policies` effects in the presence of trade in intermediates (the main attribute of GVCs production). In general, all these studies conclude that under certain theoretical assumptions, in the presence of trade in intermediates, export promotion policies, particularly export subsidies, can lead to profit/rent-shifting to foreign producers within common GVCs.

In this study, summarizing this literature, we distinguish between three types of positive effects of domestic export promotion measures on foreign countries` producers and in particular their export, which emerge due to backward and forward linkages inside GVCs via trade in intermediates (we also name them external effects of export incentives along with negative "competition for market share" effect). First one, we name it positive backward linkages` effect, emerges as a consequence of domestic export incentive for final-good/processed intermediate-good producers. This incentive stimulates demand increase for foreign intermediate good, which is imported to be used in production of subsidized domestic final/higher-tier processed intermediate good. Second one, we name it positive forward linkages` effect, emerges as a consequence of domestic export incentive for intermediate-good producers. This incentive leads to the cost reduction of produced abroad final/higher-tier intermediate good (which is exported to third countries), which uses subsidized imported intermediate good in its production. Finally, third one, we name it positive "spider" complementarity effect, emerges as a consequence of domestic export incentive for intermediate good used in the assembly of final/higher-tier intermediate good

abroad (which can be exported to third countries). Due to simultaneous action of positive backward and forward linkages` effects outlined above, this export incentive stimulates demand increase for complementary foreign intermediate good also used in the assembly of that final/higher-tier intermediate good.

We build a framework which describes and summarizes these effects separately for final and intermediate goods` foreign exports depending on the type of good (final versus intermediate) targeted by domestic export incentive. Our framework distinguishes between primary and processed intermediate goods and, at least partially, counts for spillover effects of domestic export incentives for other than targeted by incentive domestic goods and their subsequent effects on foreign producers and their export activities.

Next, we provide empirical test of the presence of the outlined effects in the BRICs[1] bloc`s trade in recent years (2009-2014) in accordance to our framework. BRIC countries are very suitable for this project, firstly, due to their rather aggressive export promotion policies in recent years (see, e.g., Evenett 2015) and, secondly, due to their rather high inclusion into the world`s GVCs and also their rather high interdependence via GVCs. In our empirical test we particularly study how export incentives implemented in one of the BRIC countries affect exports (more specifically, export shares in the world markets) of the other three BRIC countries. More concretely, we study effects of one of the BRIC countries` export incentives disaggregated at HS two-digit industries on the other three BRIC countries` export shares disaggregated at HS six-digit industries. This allows us to count for GVCs linkages inside two-digit HS industries. In order to

[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).

test our theoretical propositions more explicitly we further separate effects of BRICs export incentives on each other`s export of final, primary intermediate and processed intermediate goods. We also distinguish between external effects of export incentives targeted at final, primary intermediate and processed intermediate goods. Finally, we empirically separate positive backward linkages` effect, which only emerges in bilateral trade flows, from other external effects of export incentives.

Our empirical analysis utilizes a factor content of trade methodology developed by Romalis (2004). Romalis examines whether countries that are abundant in a factor of production capture larger U.S. import shares in industries relatively intensive in that factor. This paper takes the factor content specification and augments it with export policy measures to test how export policies inside and outside the country affect its export. The broad finding is that both domestic and foreign export policies are significant determinants of export. Data for the analysis mainly comes from Global Trade Alert, UN COMTRADE and UNCTAD.

Our empirical investigations provide rather strong evidence that external effects of export incentives can be negative or positive alike. Importantly, overall this evidence reflects each BRICs country`s role in the world`s and each other's GVCs. Our empirical results enable us to draw several broad conclusions. First, we find that on more aggregate levels negative effects of BRICs export incentives for each other's` exports still prevail which signifies that even in the world of GVCs export promotion policies are more harmful than beneficial for foreign countries. Second, we find that majority of positive external effects of export incentives within BRIC bloc emerge between China and India. Finally, our separate test for positive backward linkages` effects enables us to conclude that most positive backward linkages` effects within BRIC bloc emerge for the export of primary intermediates.

This paper draws from a strand of theoretical literature that found profit/rent-shifting effects from domestic export promotion policies to foreign producers in the presence of trade in intermediates (Spencer and Jones 1991; Bernhofen 1997; Ishikawa and Spencer 1998; Sheldon, Pick, and McCorriston 2001; Lee and Wong 2005). More specifically, this study contributes to this literature, firstly, by summarizing and clarifying the effects of domestic export promotion policies on foreign export, which emerge due to backward and forward linkages inside GVCs via trade in intermediates. Secondly, despite the prominence of the theory on the effects of domestic export promotion policies on foreign producers, to the best of 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.

This paper also 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). Finally, 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 presents theoretical framework of the study. Section 3 introduces our empirical case, in particular, it discusses BRICs recent export promotion policies and their current involvement in 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 final-good producers for foreign export of the same final 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 there have been a number of papers analyzing various issues of interaction between trade in intermediate inputs and trade policies. Given that in this study we focus on the effects of domestic export incentives on foreign countries` export (we refer to them as to external effects of export incentives), we mainly refer to the relevant studies within this broader literature. In order to make analysis more straightforward, we also distinguish between 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***.

Though theoretical literature on export promotion policies aiming at intermediate-good producers is somewhat less straightforward for the context of this study, it still 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 there can be circumstances when a government can be interested in establishing export promotion policy targeting at intermediate-good producers, which in turn will benefit producers in foreign countries who import these intermediate inputs for their production of final 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 can be 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 these 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****.*

The models discussed above assume production process of the 'snake' type, i.e. when the product moves through a vertical production process with value being added as a sequence of operations are performed. The operations form a continuum indexed $z \in [0, 1]$ where $z = 0$ is the most upstream and $z = 1$ is the most downstream, the output of which is the final good (Baldwin and Venables (2013)). However, Baldwin and Venables (2013) argue that most production processes are complex mixtures of the "snake" and "spider" chain types where "spider" is a production process where separate parts (intermediate goods) are assembled into the final good (or higher-tier intermediate good). Parts can be produced in different countries. The choices of location of part-makers and assembler are based on cost-minimization considerations.

Export incentive (e.g. subsidy) implemented in country A, which reduces production costs of one of the parts (intermediate good) used in "spider" production process/assembly of

final/higher-tier intermediate good in country B, should positively affect country`s B production/export of the final/higher-tier intermediate assembled good, in accordance to positive forward linkages` effect outlined above. It can be further suggested that in accordance to positive backward linkages` effect outlined above there can be positive effects from that export subsidy to foreign producers of other parts (intermediate goods) used in the assembly of the same final/higher-tier intermediate good due to the increased production/export of the latter. This logic brings us to the third proposition:

Proposition 3: *Assuming that production process of final/higher-tier intermediate good X is "spider" type and that the assembly of the good X in country A requires two intermediate goods Y and Z produced in country B and C, respectively, it can be suggested that domestic export incentive (e.g. subsidy) implemented in country B for intermediate product Y can positively affect export of intermediate good Z from country C to country A. In the rest of the paper we refer to this effect as to* ***positive "spider" complementarity effect***.

Finally, we should count for spillover effects of domestic export incentives for related domestic goods (not targeted by incentives directly) and their subsequent effects for foreign producers and their export activities, in particular. Firstly, export incentive targeted at domestic final/processed intermediate goods can positively affect export activities of domestic suppliers of intermediate inputs used in production of domestic subsidized final/processed intermediate goods. In particular, increased demand for their goods from local producers can enhance their productivity and export propensity. This proposition can be further supported by a recent study of Baldwin and Venables (2015) who develop 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. These positive spillovers for domestic upstream producers can lead to negative "competition for market share" effect for the export of foreign upstream producers of the same intermediates. We name this effect as ***indirect negative backward linkages` "competition for market share" effect***. On the other hand, the same export incentive can push domestic suppliers of intermediates to supply their goods to local subsidized producers instead of exporting them. This effect can be especially strong in case of vertical integration between domestic producers of final and intermediate goods. This can lead to positive "competition for market share" effect for the export of foreign upstream producers of the same intermediates. We name this effect as ***indirect positive backward linkages` "competition for market share" effect***.

Secondly, export incentives targeted at domestic primary/processed intermediate goods can negatively affect domestic producers of final/higher-tier processed intermediate goods who use domestic subsidized intermediates in their production. More specifically, this negative effect can arise if export incentive make it more profitable for domestic producers of subsidized intermediates to export them than to sell to local producers of higher-tier intermediate or final goods. This can lead to positive "competition for market share" effect for the export of foreign producers of the same final/higher-tier processed intermediate goods. We name this effect as ***indirect positive forward linkages` "competition for market share" effect***.

Thirdly, if two countries say A and B export two complementary final goods say X and Y, then export subsidy targeted at final good X/Y in country A/B can positively affect export of final good Y/X in country B/A. We name this effect as ***indirect positive "complementary final goods" effect***.

After building theoretical background of our framework, we move to its summary. This also requires outlining its basic assumptions. In particular, in this study, we distinguish between primary and processed intermediate goods and final goods. We further assume that primary intermediate good can be used in production of both processed intermediate or final good and processed intermediate good can be used in production of final or higher-tier processed intermediate good. We also assume that negative "competition for market share" effect can emerge between domestic and foreign producers of any type of goods (final good, primary or processed intermediate good) at horizontal level. That is domestic export subsidy targeted at domestic producers of either final or primary intermediate or processed intermediate good can help them to capture market shares in international markets of foreign producers of the same final or primary intermediate or processed intermediate good, respectively.

Based on theoretical propositions and assumptions made above, on Figure 1 we present theoretical framework, which serves as a base for our empirical analysis.

Figure 1 Theoretical framework: Summary of external effects of export incentives

Country B export of final goods	*Country B export of primary intermediate goods*	*Country B export of processed intermediate goods*
Export incentive aimed at final-good producers in country A		
***Negative* "competition for market share" effect** *Indirect positive "complementary final goods" effect*	***Positive* backward linkages` effect** (Proposition 1)  *Indirect negative backward linkages` "competition for market share" effect* *Indirect positive backward linkages` "competition for market share" effect*	***Positive* backward linkages` effect** (Proposition 1)  *Indirect negative backward linkages` "competition for market share" effect* *Indirect positive backward linkages` "competition for market share" effect*
Export incentive aimed at primary intermediate-good producers in country A		
***Positive* forward linkages` effect** (Proposition 2)  *Indirect positive forward linkages` "competition for market share" effect*	***Negative* "competition for market share" effect** ***Positive* "spider" complementarity effect** (Proposition 3)	***Positive* forward linkages` effect** (Proposition 2)  ***Positive* "spider" complementarity effect** (Proposition 3)  *Indirect positive forward linkages` "competition for market share" effect*
Export incentive aimed at processed intermediate-good producers in country A		
***Positive* forward linkages` effect** (Proposition 2)  *Indirect positive forward linkages` "competition for market share" effect*	***Positive* backward linkages` effect** (Proposition 1)  ***Positive* "spider" complementarity effect** (Proposition 3)  *Indirect negative backward linkages` "competition for market share" effect* *Indirect positive backward linkages` "competition for market share" effect*	***Negative* "competition for market share" effect** ***Positive* forward linkages` effect** (Proposition 2)  ***Positive* backward linkages` effect** (Proposition 1) ***Positive* "spider" complementarity effect** (Proposition 3) *Indirect negative backward linkages` "competition for market share" effect*  *Indirect positive backward linkages` "competition for market share" effect* *Indirect positive forward linkages` "competition for market share" effect*

Note: Direct effects are denoted by bold and italic while indirect effects – by italic.

3. BRIC COUNTRIES AS A CASE STUDY OF EFFECTS OF DOMESTIC EXPORT PROMOTION POLICIES 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, e.g., 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 promotion policies 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 recent BRICs` export promotion policies according to GTA database. This database includes trade measures implemented from 2006 to present but does not necessarily contain all implemented measures. In Table 1 we summarize basic statistics of export incentives which have been implemented in the BRIC countries in 2006-2014 according to GTA database.

Table 1 Summary statistics of export incentives implemented in BRIC countries in 2006-2014*

Country	Number of export incentives	Number of affected tariff lines (four-digit HS 2007) including repetitions**	Number of affected tariff lines (four-digit HS 2007) excluding repetitions**	Number of affected countries including repetitions**	Number of affected countries excluding repetitions**
Brazil	9	2980	854	1131	208
Russia	3	354	354	110	110
India	59	5311	1107	5242	212
China	15	1037	660	1181	194

Note: 1) *We consider only 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); export incentives for services are not included; 2) **Repetitions mean that certain industries/countries could be affected by several export incentives. Inclusion of repetitions is important because it helps to capture the magnitude of the effects of export incentives for industries and third countries, respectively.
Source: Author`s computations based on GTA data; data accessed on 20.06.2016.

As we can see, an obvious leader in export promotion policies among the BRICs in recent years has been India followed by Brazil and China. Russia represents an example of poor export promotion policy. In Table 2, we further present typological structure of BRICs export incentives.

Table 2 Typological structure of BRICs export incentives implemented in 2006-2014

Country	Number of export incentives	Financial incentives	Tax incentives	VAT (Value Added Tax) rebates	General measures*
Brazil	9	3	6	0	0
Russia	3	2	0	0	1
India	59	12	5	0	42
China	15	0	3	11	1

Note:*General measures may include financial and/or tax measures in a bundle with other promotion measures or it can be just a general framework measure.
Source: Author`s computations based on GTA data; data accessed on 20.06.2016.

From Table 2 we can conclude that Brazil and especially China rely more on tax export incentives while India and Russia – on financial export incentives (e.g. export subsidies). A large amount of Indian export incentives cannot be classified as purely financial or tax incentives, and, hence, we classify them as general measures.

In Table 3 we classify BRICs export incentives into targeted at final goods, primary or processed intermediate goods. It should be noted that we cannot make fully precise classification as data for export incentives is available at four-digit level of HS classification and Broad Economic Categories (BEC) classification classifies goods into final and primary/processed intermediate goods at six-digit level of HS classification. We consider an export incentive is targeted at final/primary intermediate/processed intermediate good if all six-digit subindustries within a respective four-digit industry are classified in BEC as final/primary intermediate/processed intermediate goods, respectively. Those four-digit industries which include six-digit industries of several types of goods are excluded from the analysis and classified as "undetermined" in Table 3.

Table 3 BRICs export incentives by type of targeted goods in 2006-2014; by number of affected tariff lines (four-digit HS 2007) including repetitions

Country	Final goods	Primary intermediates	Processed intermediates	Undetermined	Total
Brazil	759 (25%)*	114 (4%)	1554 (52%)	553 (19%)	2980
Russia	89 (25%)	2 (1%)	164 (46%)	99 (28%)	354
India	1820 (34%)	212 (4%)	2398 (45%)	881 (17%)	5311
China	311 (30%)	20 (2%)	461 (44%)	245 (24%)	1037

Note: 1) *****Percent to total in parentheses; 2) Type of the good is determined according to Broad Economic Categories (BEC) classification.
Source: Author`s computations based on GTA data; data accessed on 20.06.2016.

As we can see, BRIC countries have very similar structures of export incentives by targeted type of good. In particular, around half (44-52%) of affected tariff lines (including repetitions) are processed intermediates in all four BRICs, followed by final goods (25-34%). Shares of primary intermediates are very low (1-4%). This suggests that in our empirical analysis effects of the BRICs

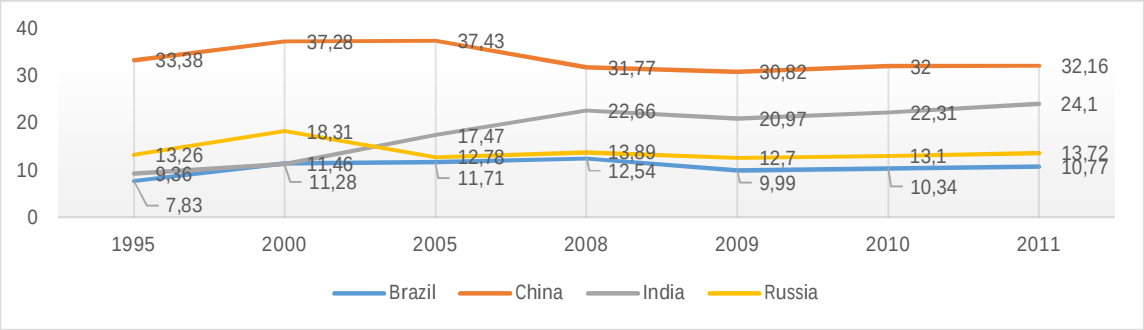
export incentives for each other's` exports will be dominated by those which emerge from incentives targeted at processed intermediates and final goods.

Finally, in Appendix 1 we present industrial breakdown of BRICs export incentives. For all BRICs the largest number of export incentives has been implemented in the two same two-digit HS 2007 industries – (84) Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof and (85) Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles. Two other industries in which all BRICs implemented significant number of export incentives are (73) Articles of iron and steel and (90) Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof. In general, it can be concluded that all BRIC countries make an emphasis on promotion of export of goods in machinery and equipment category.

3.2. BRIC countries` participation in the world`s global value chains

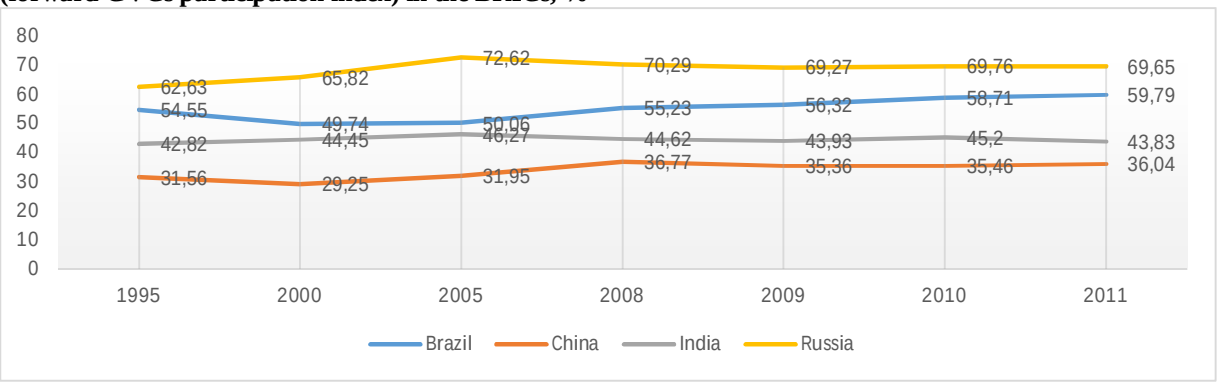
When it comes to measurement of GVCs participation, the most known approach is the Hummels, Ishii, and Yi (2001) indicator of "vertical specialization" and its refinement by Koopman, Powers, Wang, and Wei (2011). Value chain participation is defined in terms of the origin of the value added embodied 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 2 and 3 we present relevant indicators for BRIC countries which are readily available in OECD-TiVA database.

Figure 2 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 3 Domestic value added in exports of intermediate products as a share of total gross foreign exports (forward GVCs participation index) in the BRICs, %

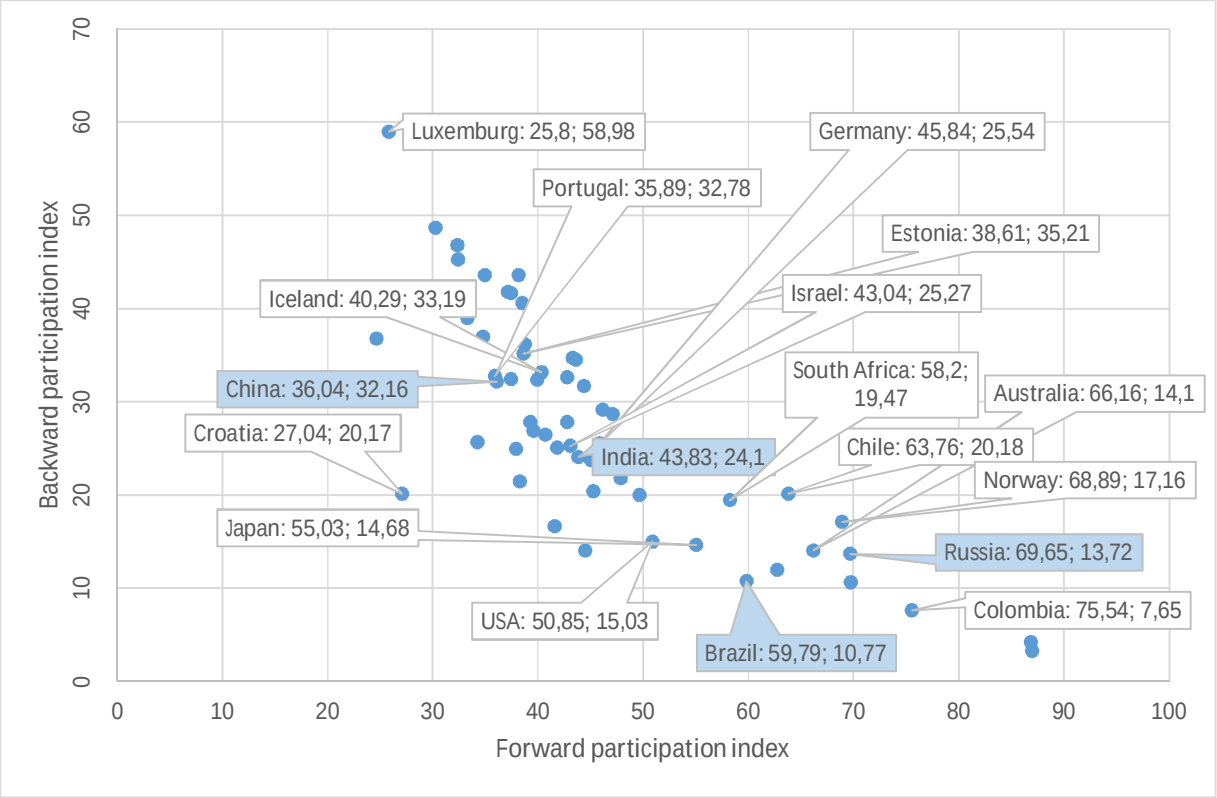


Note: According to OECD-TiVA definition forward GVC participation index captures the extent to which a given country's exports are used by firms in partner countries as inputs into their own exports.
Source: OECD-TiVA data.

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 4 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 4 Backward versus forward GVCs participation indices by country in 2011, %



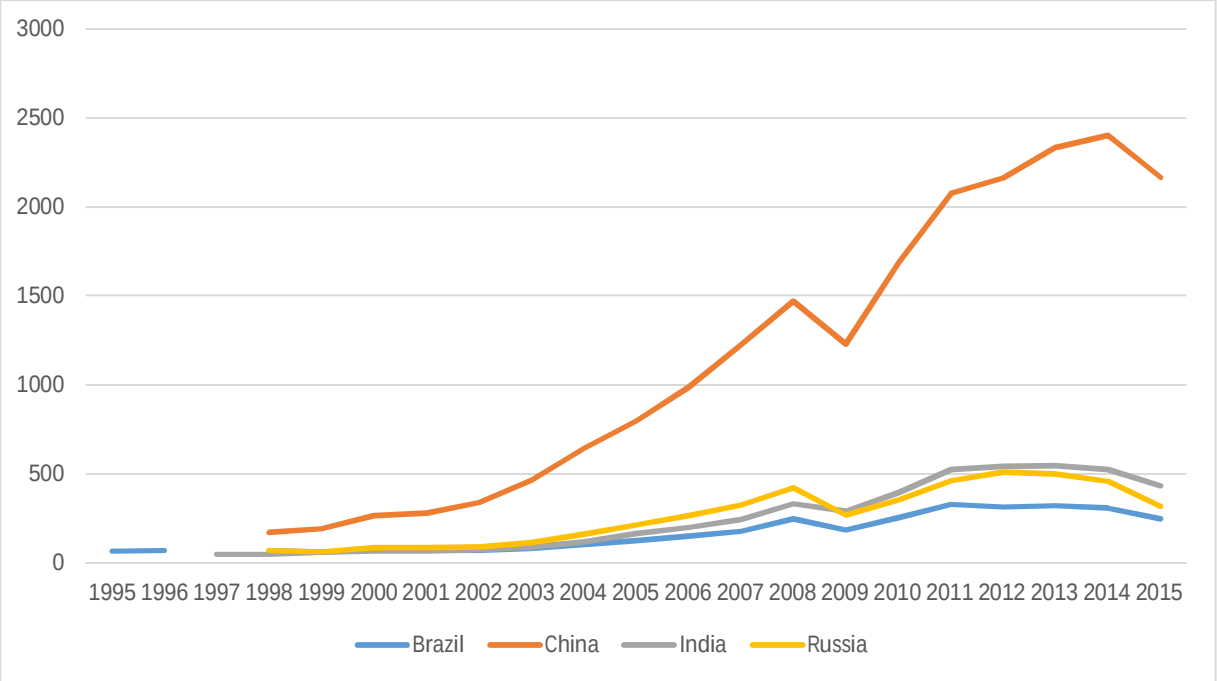
Source: OECD-TiVA data.

As can be seen from Figure 4, 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 structure 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

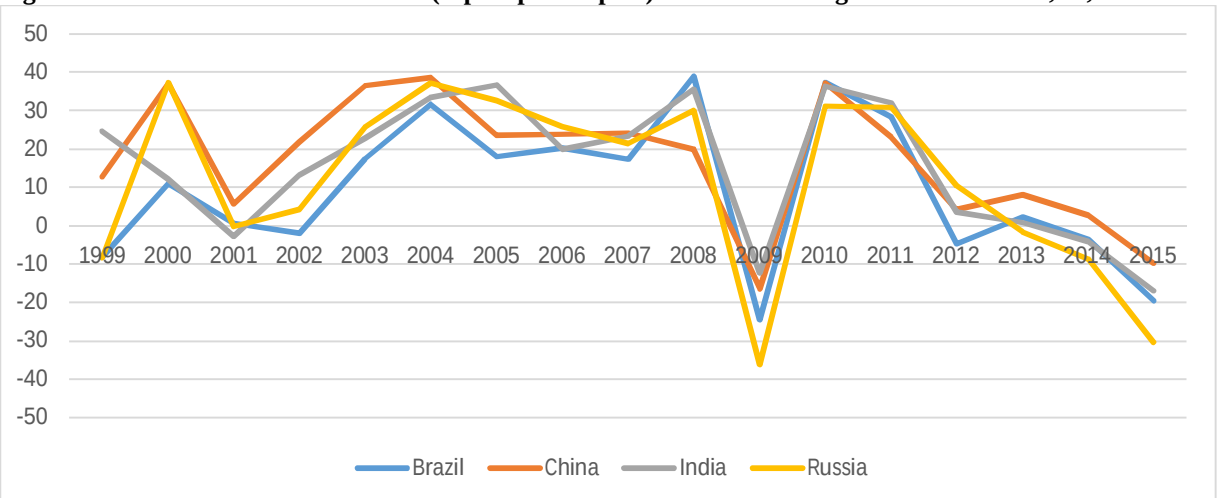
2011). On Figures 5 and 6 we present intermediate goods` trade volumes (export plus import) of the BRICs and their annual growth rates, respectively.

Figure 5 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 6 Growth rates of trade volume (export plus import) of intermediate goods in the BRICs, %, 1995-2015



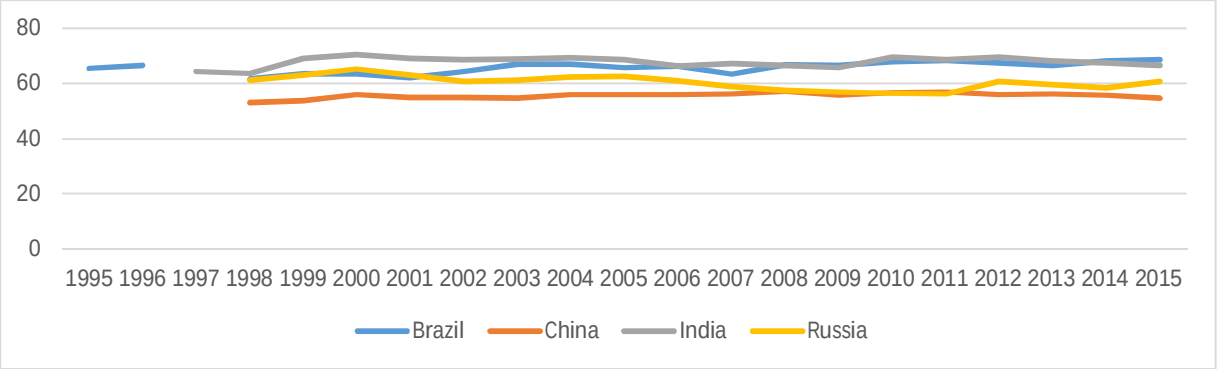
Note: 1) Intermediate goods have been identified according to BEC classification; 2) Growth rates have been computed as $\frac{Y_t - Y_{t-1}}{Y_{t-1}} \cdot 100\ \%$.

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 2015 for all the BRICs.

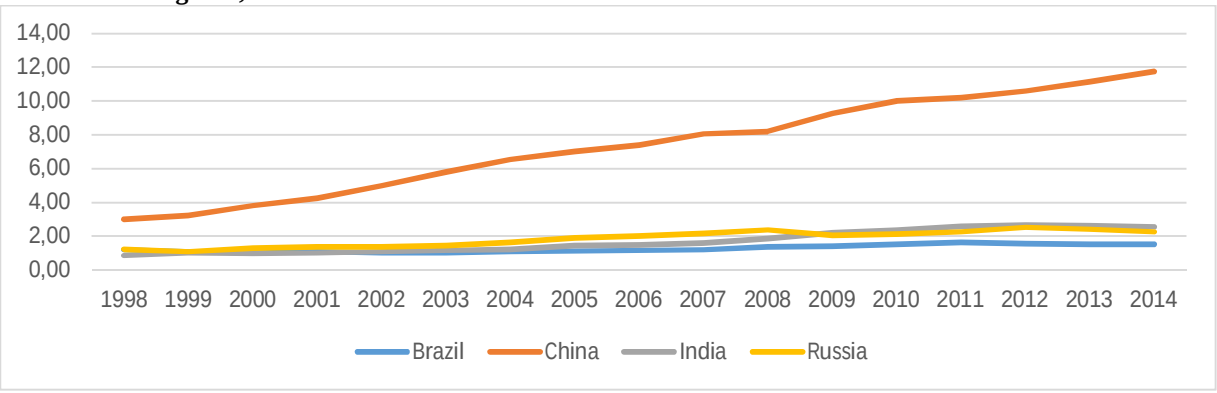
Figures 5 and 6 provide us with the picture of respective trade dynamics in absolute terms. Nevertheless, it is interesting to look at these trends relative to total trade of the BRICs and to world trade in intermediate goods. On Figures 7 and 8 we present these indicators.

Figure 7 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 8 BRICs trade volume (export plus import) of intermediate goods as percentage of world trade volume of intermediate goods, 1995-2015

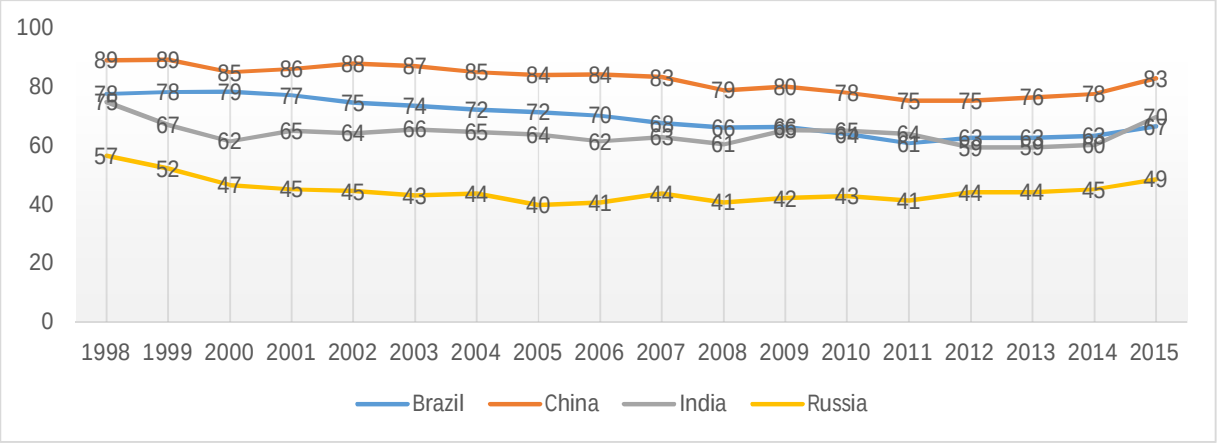


Note: Intermediate goods have been identified according to BEC classification.
Source: Author`s calculations based on UN COMTRADE data.

From Figure 7 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. From Figure 8 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 9 we present shares of processed intermediates in total intermediate trade volumes of the BRICs.

Figure 9 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 A2.1-A2.4 in Appendix 2, we present the structure of intermediate goods` exports of the BRICs according to 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

[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.

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. This makes BRICs bloc a particularly interesting example for comparative analysis.

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

In recent years, BRIC countries` participation in each other's GVCs have been on rise. From Figures 10-13 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 10

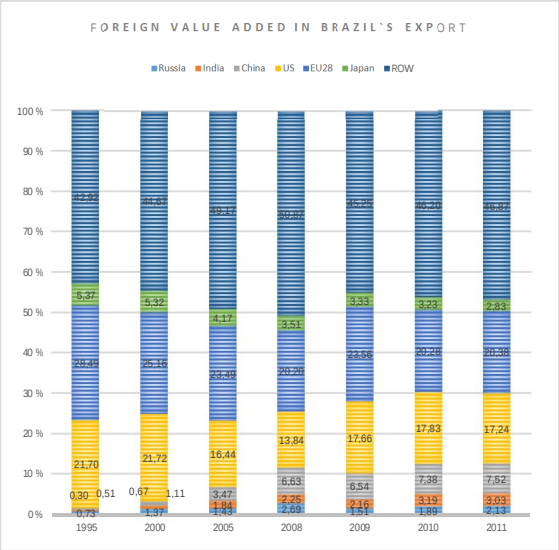


Figure 11

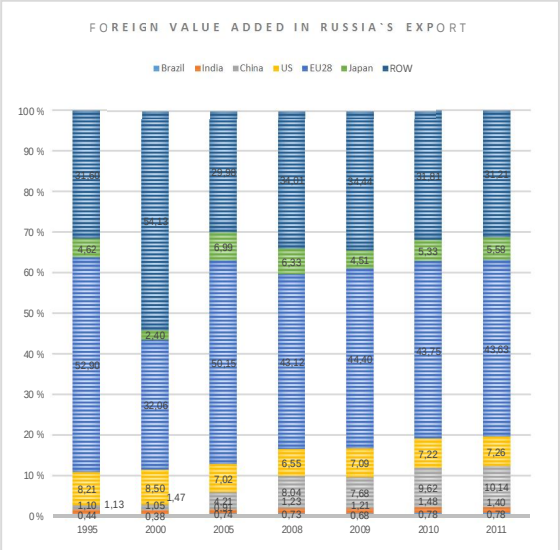


Figure 12

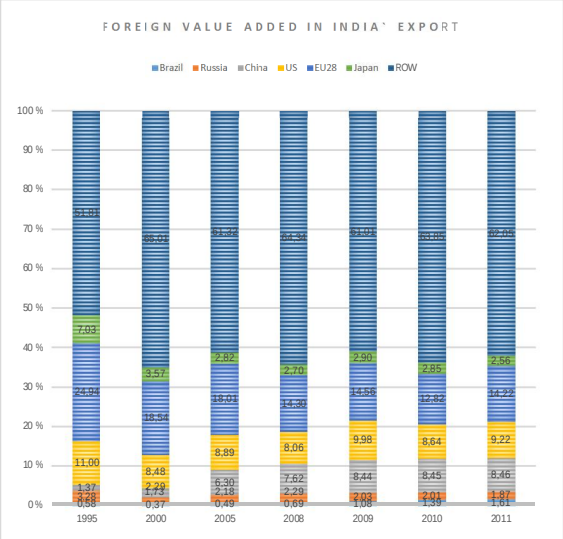
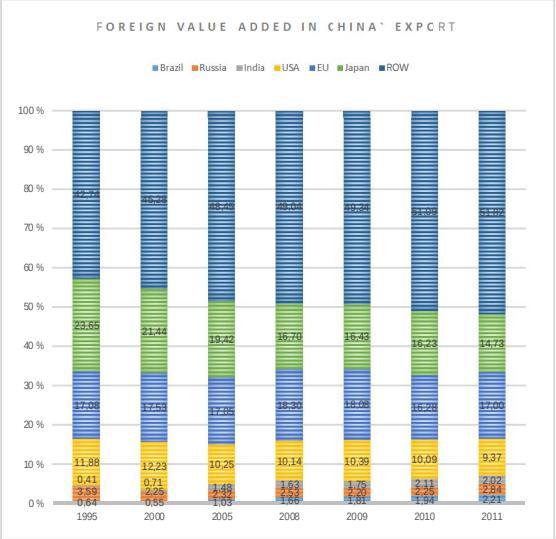


Figure 13



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

Next, we look at inter-BRICs trade in intermediate goods presented on Figures 14-17.

Figure 14

Figure 15

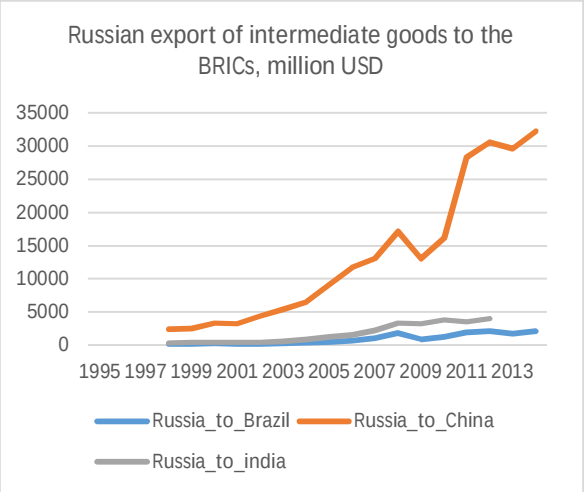
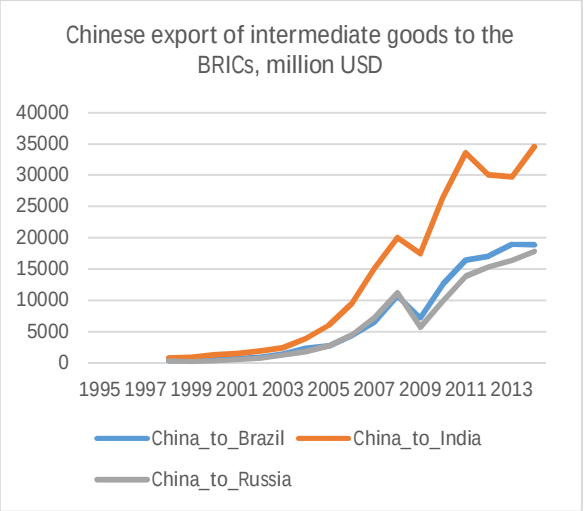


Figure 16

Figure 17



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 decades. Russia`s participation in inter-BRICs intermediate trade exhibits the lowest volumes in average. This might indicate that in our empirical analysis Russia can emerge as an outlier. However, for the purpose of comparative analysis, Russia`s inclusion can still provide us with interesting and useful insights.

Finally, on Figures A3.1-A3.12 in Appendix 3, 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. Furthermore, our descriptive analysis enables us to predict the relative importance of different external effects of export incentives outlined in this study. In particular, we can expect that positive backward linkages` effects can be stronger for Brazil and Russia, especially for export of primary intermediates, while positive forward linkages` and "spider" complementarity effects can be more important for China and India.

4. EMPIRICAL FRAMEWORK

4.1. Baseline framework

Empirical test of the impact of export policy on export must control for other determinants of trade. Romalis (2004) developed a simple empirical model that shows that endowments of skilled labor, unskilled labor and capital are important in explaining export patterns across countries and

industries. We adopt this model 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 first estimate the following baseline equation:

$$es_{it,X} = a_0 + a_1 si_i + a_2 ci_i + a_3 nci_i + a_4 er_{it,in\_X} + a_5 ei_{it,Brazil} + a_6 ei_{it,Russia} + a_7 ei_{it,India} + a_8 ei_{it,China} + \sum_t d_t YD + \sum_s f_s SD + \sum_{ts} j_{ts} YD' SD + e_{it} + u_i \quad (1),$$

where *i* and *t* indexes industries and time (year), respectively; s denotes broad industrial sectors. $es_{it,X}$ is the country X export share in the world export of an industry *i* (HS 2007, six-digit level) in a year t (2009,…,2014). The data comes from UN COMTRADE. The world export is represented by the sum of exports of the following countries: Australia, Austria, Brazil, Canada, China, France, Germany, India, Italy, Japan, Mexico, South Korea, Russia, United Kingdom and USA. The use of export shares in international markets and not export flows as dependent variable is important in the context of this study as export incentives originally target at capturing market shares of foreign rivals in export markets.

Variables si_i, ci_i and nci_i are measures of skill, capital and natural capital (natural resources) intensities for an industry i (converted from HS 1988/1992 to HS 2007, six-digit level). The data on factor intensities comes from UNCTAD database on revealed factor intensity indices: *Revealed Capital Intensity Index* (*RCI*), *Revealed Human Capital Intensity Index* (*RHCI*) and *Revealed Natural Resource Intensity Index* (*RNRI*). The detailed description of the indices can be found in Shirotori, Tumurchudur, and Cadot (2010). We briefly summarize the UNCTAD computation strategy of the factor intensity indices in Appendix 4. Skill and capital intensity

indices (si_i and ci_i) are taken for the year 2007 and natural capital/resources index (nci_i) – for the year 2000, last available data points in the UNCTAD database.

We further control for export taxes and restrictions in country X, er_{it,in_X}. It is the number of export taxes and restrictions implemented by country X in industry *i* (HS 2007, four-digit level) which are effective/in force in a year t (2009,…, 2014). Data comes from GTA database (details are below).

Next we add our variables of interest, industry-level measures of export incentives $ei_{it,Brazil}$, $ei_{it,Russia}$, $ei_{it,India}$ and $ei_{it,China}$, which denote the number of export incentives implemented in Brazil, Russia, India and China, respectively, in industry *i* which are effective/in force in a year t (2009,…,2014). These variables reflect internal and external effects of export incentives. Internal effects (i.e. effects of domestic export incentives for domestic export) correspond to country X export incentives' variable while the other three export incentives` variables reflect external effects of export incentives (i.e. effects of domestic export incentives for foreign exports or, putting this another way, effects of foreign export incentives for domestic export). For example, if X is Brazil, then coefficient a_5 reflects internal effects of Brazilian export incentives and a_6 - a_8 reflect external effects coming from other BRICs` (Russia, India and China, respectively) export incentives for Brazilian export. Industry i for internal effects is four-digit industry of HS 2007 but for external effects it is two-digit industry of HS 2007. That is we investigate external effects of export incentives within two-digit HS industries. In particular, we study how export incentives implemented in one BRIC country in some XX (two-digit) HS industry affect other BRIC countries` exports in XXNN.NN (six-digit) HS subindustries. In other words, while assessing external effects of export incentives, which, according to our theoretical

framework, are, at least partially, due to GVCs linkages, we count for GVCs linkages inside two-digit industries. Our empirical framework does not count for the effects coming from outside of the respective two-digit industries. Though theoretically these inter-industry effects should also exist due to inter-industry GVCs linkages well shown in international input-output tables, we argue that effects within narrower industries are in general stronger and our focus on them is justified.

We expect that internal effects of export incentives are always positive. External effects of export incentives can be negative or positive or zero. Positive/negative respective coefficient would imply that on aggregate level positive/negative external effects dominate. If the respective coefficient is zero, then, we can suggest that, on aggregate level, respective positive and negative external effects cancel each other.

We utilize Global Trade Alert (GTA) data to construct export incentives` and export taxes/restrictions` variables. As was already noted above 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). There are two other types of measures in GTA database, "amber" and "green" measures, which are less/or not discriminative measures. These measures can be, e.g., general export promotion strategy or reduction in export subsidy (the latter measure cannot be actually considered as export incentives as it is a reduction in export incentive). As in this study we are interested to see if generally discriminative export incentives can have positive effects on foreign exports due to GVCs` linkages, we do not consider "amber" and "green" measures in our empirical analysis. However, it is worth to mention that these measures are very

few and, hence, their inclusion most likely would not affect the results. While constructing export taxes/restrictions` variables we also consider only "red" measures. "Amber" and "green" measures mainly include adjustments to existing restrictions and are few.

Lastly, the model includes time (year) dummies (denoted by *YD*), dummies for broad industrial sectors (denoted by *SD;* 21 sections of HS 2007 classification) and full set of their interaction terms. e_{it} is an idiosyncratic error term, and u_i is unobserved industrial heterogeneity (an industry i specific effect). a_i, d_t, f_s and j_{ts} are parameters to be estimated.

Looking at Figure 1, we can notice that external effects of export incentives can be conveniently summed up by rows and columns. The "row" sums reflect resultant external effects of export incentives implemented in country A targeted at final or primary intermediate or processed intermediate goods for country B total export. To distinguish between external effects of export incentives by type of good targeted by incentive we estimate equation (1) separately for export incentives targeted at final, primary intermediate or processed intermediate goods. To construct separate measures of export incentives targeted at respective types of goods we sum up incentives targeted at four-digit final or primary intermediate or processed intermediate goods within two-digit HS industries. We must note that as we use correspondence between BEC and HS classification at six-digit industries to distinguish between final and primary/processed intermediate goods, for some four-digit industries we cannot determine the type of good exactly (when within this four-digit industry there are six-digit subindustries which represent different types of goods). These four-digit industries have been excluded from the analysis. We should also mention that variables which reflect internal effects of export incentives enter these estimations just as in baseline model, i.e. at four-digit industries and for all export incentives without separation by type of targeted good. Interpretation of the coefficients of external effects of export incentives

in these separate estimations is rather straightforward. For example, if we estimate equation (1) for Brazil (X is Brazil) and for export incentives targeted at final goods, then coefficients $a_6 / a_7 / a_8$ reflect external effects of Russian/Indian/Chinese export incentives targeted at final goods on Brazilian total export.

The "column" sums reflect resultant external effects of all export incentives implemented in country A for country B exports of different types of goods: final goods, primary or processed intermediates. To differentiate between these resultant effects we include into our baseline equation (1) two dummies for primary and processed intermediate goods (we again use correspondence table between six-digit HS 2007 and BEC classifications to distinguish between primary and processed intermediates and final goods), $DIG\_primary_i$ and $DIG\_processed_i$, and their interaction terms with the four variables, which reflect effects of export incentives:

$$es_{it,X} = a_0 + a_1 si_i + a_2 ci_i + a_3 nci_i + a_4 er_{it,in\_X} + a_5 ei_{it,Brazil} + a_6 ei_{it,Russia} + a_7 ei_{it,India} + a_8 ei_{it,China} + a_9 DIG\_primary_i + a_{10} DIG\_processed_i + a_{11} ei_{it,Brazil} \times DIG\_primary_i + a_{12} ei_{it,Brazil} \times DIG\_processed_i + a_{13} ei_{it,Russia} \times DIG\_primary_i + a_{14} ei_{it,Russia} \times DIG\_processed_i + a_{15} ei_{it,India} \times DIG\_primary_i + a_{16} ei_{it,India} \times DIG\_processed_i + a_{17} ei_{it,China} \times DIG\_primary_i + a_{18} ei_{it,China} \times DIG\_processed_i + \sum_t d_t YD + \sum_s f_s SD + \sum_{ts} j_{ts} YD \times SD + e_{it} + u_i \quad (2).$$

Here we are interested in the coefficients of variables which reflect external effects of export incentives and their interaction terms with dummies for intermediate goods. In particular, positive/negative coefficient of the variable, which reflects the number of export incentives implemented in country Y, one of the BRIC countries which is not X (one of the coefficients a_5 - a_8), would indicate that, in accordance to our theoretical framework outlined on Figure 1,

positive/negative external effects coming from country Y export incentives dominate for final goods` export of country X. Positive/negative sum of this coefficient and the coefficient of the interaction term between this variable and dummy for intermediate good (either primary or processed; one of the coefficients a_{11} - a_{18}) would imply that positive/negative external effects coming from country Y export incentives dominate for primary or processed intermediate goods` export of country X.

Finally, to evaluate "within cells" effects as outlined on Figure 1 we estimate equation (2) separately for export incentives targeted at final, primary intermediate or processed intermediate goods. For example, if we estimate equation (2) for Brazil (X is Brazil) and for export incentives targeted at final goods, coefficient $a_6/a_7/a_8$ will reflect external effects of Russian/Indian/Chinese export incentives targeted at final goods on Brazilian export of final goods; sum of coefficients $a_6/a_7/a_8$ and $a_{13}/a_{15}/a_{17}$ - effects of Russian/Indian/Chinese export incentives targeted at final goods on Brazilian export of primary intermediates and sum of coefficients $a_6/a_7/a_8$ and $a_{14}/a_{16}/a_{18}$ - effects of Russian/Indian/Chinese export incentives targeted at final goods on Brazilian export of processed intermediates.

4.2. Separate test for positive backward linkages` effect

As according to our theoretical framework positive backward linkages` effect emerges only for bilateral export, in particular, within our framework, export from country B to country A, we can separately test for the presence of this effect. More specifically, for separate test of our proposition (1) on positive backward linkages` effect we estimate slightly modified equation (2) for respective bilateral exports of the BRICs:

$$es_{it,XY} = a_0 + a_1 si_i + a_2 ci_i + a_3 nci_i + a_4 er_{it,in\_X} + a_5 it_{it,in\_Y} + a_6 ei_{it,Brazil} + a_7 ei_{it,Russia} + a_8 ei_{it,India} + a_9 ei_{it,China} + a_{10} DIG\_primary_i + a_{11} DIG\_processed_i + a_{12} ei_{it,Brazil} \times DIG\_primary_i + a_{13} ei_{it,Brazil} \times DIG\_processed_i + a_{14} ei_{it,Russia} \times DIG\_primary_i + a_{15} ei_{it,Russia} \times DIG\_processed_i + a_{16} ei_{it,India} \times DIG\_primary_i + a_{17} ei_{it,India} \times DIG\_processed_i + a_{18} ei_{it,China} \times DIG\_primary_i + a_{19} ei_{it,China} \times DIG\_processed_i + \sum_t d_t YD + \sum_s f_s SD + \sum_{ts} j_{ts} YD \times SD + e_{it} + u_i$$

(3),

where the dependent variable denoted by $es_{it,XY}$ is the share of country X`s export to country Y (both X and Y are BRICs countries) in the world export to country Y in an industry i (HS 2007, six-digit) in a year t (2009-2014). World export is determined in the same way as in baseline equations. Additionally to control variables from equations (1) and (2) we also control here for country Y import tariff (ad valorem tax rate, Most Favored Nation) in industry i (HS 2007, six-digit) in a year t, it_{it,in_Y}. Data comes from World Integrated Trade Solution database (WITS; Trade Analysis Information System (TRAINS) raw data).

We expect that in the presence of positive backward linkages` effects, positive external effects of export incentives implemented in country Y for country X`s export to country Y will crowd in intermediate goods. In particular, e.g. assuming that Y denotes Brazil and X – China, we expect $a_6 + a_{12}$ and/or $a_6 + a_{13}$ to be positive. This would imply that Brazilian export incentives stimulate Chinese export of primary and/or processed intermediates, respectively, to Brazil, where they are used in production of subsidized final/higher-tier intermediate goods. To concretize our results in accordance with our framework on Figure 1 (i.e. to get "within cells" results) we further estimate equation (3) separately for export incentives targeted at final and processed intermediate

goods. We should note that according to our framework export incentives targeted at primary intermediates do not lead to positive backward linkages` effects.

5. EMPIRICAL RESULTS

5.1. Baseline results

Baseline random effects panel data model`s estimates of equations (1) and (2) for each BRIC country for total number of export incentives are presented in Table 4. Descriptive statistics and correlation matrix of the dependent and explanatory variables are reported in Appendix 5. Though it can be seen that our variables, which reflect external effects of export incentives are rather highly correlated, we assume that until results look reasonable, we can accept them. Moreover, one of these variables always reflects internal effects of export incentives and is taken at four-digit industries` level, which removes multicollinearity problem at least partially as export incentives` variables taken at four-digit industries` level correlate significantly less with respective variables taken at two-digit industries` level (see Appendix 5).

Table 4 Baseline random effects panel data model estimation results

Variable/Model	Brazil		Russia		India		China	
	Eq. (1)	**Eq. (2)**	**Eq. (1)**	**Eq. (2)**	**Eq. (1)**	**Eq. (2)**	**Eq. (1)**	**Eq. (2)**
Constant	-0,21 (0.365)	-0,17 (0.364)	-0,235 (0.367)	-0,205 (0.367)	-0,269 (0.353)	-0,279 (0.352)	-0,839 (0.326)**	-0,872 (0.321)***
si_i	0,01 (0.026)	0,017 (0.026)	0,072 (0.026)***	0,077 (0.026)***	-0,241 (0.023)***	-0,239 (0.023)***	0,035 (0.023)	0,025 (0.023)
ci_i	-0,178 (0.026)***	-0,192 (0.026)***	-0,163 (0.026)***	-0,173 (0.026)***	-0,025 (0.024)	-0,027 (0.024)	-0,259 (0.023)***	-0,253 (0.023)***
nci_i	-0,003 (0.015)	-0,006 (0.015)	0,111 (0.015)***	0,109 (0.015)***	-0,027 (0.013)**	-0,029 (0.013)**	-0,073 (0.013)***	-0,061 (0.013)***
er_{it,in_X}			-0,005 (0.004)	-0,005 (0.004)	-0,006 (0.005)	-0,006 (0.005)	-0,002 (0.002)	-0,002 (0.002)
$ei_{it,Brazil}$	0,008 (0.005)*	-0,003 (0.007)	-0,002 (0.014)	-0,022 (0.016)	-0,003 (0.018)	-0,016 (0.021)	-0,003 (0.01)	0,008 (0.012)
$ei_{it,Russia}$	0,008 (0.008)	-0,004 (0.01)	0,015 (0.004)***	0,003 (0.007)	0,015 (0.01)	0,016 (0.011)	-0,022 (0.007)***	0,009 (0.009)
$ei_{it,India}$	-0,022 (0.011)**	-0,001 (0.014)	0,008 (0.011)	0,02 (0.012)	0,032 (0.007)***	0,034 (0.008)***	0,014 (0.01)	-0,035 (0.013)***
$ei_{it,China}$	0,042 (0.037)	0,1 (0.041)	-0,064 (0.039)*	0,001 (0.042)	0,214 (0.037)***	0,216 (0.041)***	0,067 (0.012)***	0,032 (0.017)*
DIG_primary		0,13 (0.186)		0,128 (0.185)		0,157 (0.167)		-0,674 (0.093)***
DIG_processed		0,144 (0.034)***		0,115 (0.034)***		0,062 (0.031)**		-0,274 (0.031)***
$DIG\_primary * ei_{it,Brazil}$		0,041 (0.019)**		0,029 (0.071)		0,089 (0.091)		-0,144 (0.053)***
$DIG\_processed * ei_{it,Brazil}$		0,017 (0.008)**		0,038 (0.016)**		0,024 (0.019)		-0,028 (0.012)**
$DIG\_primary * ei_{it,Russia}$		0,05 (0.054)		-0,061 (0.044)		-0,097 (0.071)		-0,111 (0.049)**
$DIG\_processed * ei_{it,Russia}$		0,015 (0.01)		0,017 (0.007)**		0,001 (0.008)		-0,045 (0.009)***
$DIG\_primary * ei_{it,India}$		0,008 (0.053)		-0,075 (0.051)		0,005 (0.028)		0,045 (0.05)
$DIG\_processed * ei_{it,India}$		-0,025 (0.013)**		-0,018 (0.011)*		-0,002 (0.008)		0,063 (0.013)***
$DIG\_primary * ei_{it,China}$		-0,081 (0.29)		0,102 (0.293)		0,054 (0.272)		0,115 (0.101)
$DIG\_processed * ei_{it,China}$		-0,092 (0.029)***		-0,105 (0.031)***		0,005 (0.031)		0,045 (0.022)**
R-squared (overall)	0.064	0.07	0.061	0.064	0.122	0.123	0.245	0.266
N. obs.	30 178	30 178	30 178	30 178	30 178	30 178	30 178	30 178

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses; 3) prior to estimation all variables have been standardized; 4) time, sectoral dummies and full set of their interaction terms are included in all models; 5) cells with coefficients which reflect internal effects of export incentives are marked by grey color.

First, as strategic trade theory predicts domestic export incentives implemented in the BRIC countries are positively associated with their domestic export shares of the affected product groups in the world market. Respective positive coefficients of equation (1) are statistically significant for

all the BRICs. Estimating equation (2) we find some interesting evidence on differences in internal effects of export incentives between final and intermediate goods. In particular, Brazilian domestic export incentives seem to be effective in promotion of domestic export of intermediate but not final goods. Russian export incentives are effective in promotion of processed intermediates but not primary intermediates and final goods. Indian export incentives do not seem to have strong differential effects for the domestic export of final versus intermediate goods. Finally, Chinese export incentives seem to be most effective in the export promotion of domestic processed intermediates but also effective in promotion of final goods and primary intermediates. BRICs` domestic export taxes/restrictions are negatively associated with domestic export (albeit none of the coefficients is statistically significant), which is also plausible. We should note that this variable is absent for Brazil as in GTA database we did not find any single export restriction/tax measure implemented by Brazil.

For external effects of export incentives, the evidence is mixed as expected. Estimating equation (1) we find that negative significant external effects are coming from Indian export incentives to Brazil`s export, from Russian export incentives to China`s export and from Chinese export incentives to Russia`s export. These results imply that on aggregate level domestic export incentives help India to win in competition with Brazil for export shares in international markets, Russia - in competition with China and China – in competition with Russia. On the other hand, Chinese export incentives appear to positively affect Indian export. This result implies that positive external effects of export incentives, which emerge due to GVCs linkages via trade in intermediates as this study proposes, seem to exist and can be even dominant on aggregate level.

When we decompose external effects of export incentives between final and intermediate goods in equation (2), we get rather informative results. First, we find that Indian and Chinese

export incentives discourage Brazilian export of processed intermediates. Similarly, we find that Chinese and Indian export incentives negatively affect Russian export of processed intermediates. Finally, there is quite strong evidence that Brazilian and Russian export incentives negatively affect Chinese export of both primary and processed intermediates. According to our theoretical framework, it can indicate the presence of negative "competition for market share" effects (both direct and indirect as specified in Figure 1). It is remarkable that strict majority of negative effects concern export of processed intermediates.

Second, we find that Brazilian export incentives positively affect Russian export of processed intermediates. We also find that positive effects of Chinese export incentives for Indian export seem to be strong for the export of all three types of goods. These results provide further support for the existence of positive external effects of export incentives, which emerge due to GVCs linkages.

Results for our controls - factor intensities` variables look rather realistic. In particular, we find that Brazil, Russia and China tend to export products with relatively lower physical capital intensity; for India this result is insignificant. For India industrial export shares are negatively associated with skilled labor (human capital) intensity while for Russia respective relationship is positive. Finally, natural capital (natural resources intensity) is positively associated with industrial export shares of Russia and negatively with those of India and China. In general, all these results reflect relative factor endowments of the BRICs that is in line with Romalis (2004) predictions. From Table 5 we can see that all the BRICs except Russia have physical capital stock per worker much below world average. However, for Russia it has decreased sharply between 1992 and 2007 and assuming that this tendency has continued in the subsequent years, the result of negative association between industries` physical capital intensities and Russia`s industrial

export shares in the world market does not look surprising. Second, human capital measured by average years of schooling is significantly below world average for India and only for Russia it is above average. Finally, only Russia has an obvious advantage in natural resources` endowments compared to the world average while China and India are rather resource scarce countries.

Table 5 Relative endowments in the BRICs: Relative to World average

	Physical capital stock per worker in 2000 USD		*Average years of schooling*		*Total natural capital per worker, 2000 USD*	
	1992	*2007*	*1992*	*2007*	*1994*	*2000*
Brazil	0,59	0,41	0,7	0,9	0,86	1,00
Russia	1,73	0,96	1,47	1,28	NA	2,44
India	0,13	0,18	0,52	0,54	0,54	0,35
China	0,12	0,35	0,89	0,95	0,24	0,27

Source: Author`s computations based on UNCTAD data.

Results for direct effects of the dummies for primary and processed intermediates also deserve to be discussed. Dummy for processed intermediates is positive and highly statistically significant for Brazil, Russia and India, which implies that conditional on all other variables included in the model, Brazil, Russia and India export more processed intermediates than final and primary intermediate goods. For China, both dummies are negative and highly statistically significant, which indicates that, conditional on the model, China exports more final goods than intermediates.

Next, to concretize our results in accordance to our theoretical framework outlined in Figure 1 we estimate equations (1) and (2) separately for export incentives targeted at final, primary and processed intermediate goods. Estimation results are presented in Tables 6-8.

Table 6 External effects of export incentives targeted at final goods: Random effects panel data model estimation results

Variable/Model	Brazil		Russia		India		China	
	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)
Constant	-0,262 (0.365)	-0,216 (0.364)	-0,2 (0.367)	-0,163 (0.366)	-0,415 (0.353)	-0,396 (0.353)	-0,835 (0.328)**	-0,868 (0.323)***
si_i	0,008 (0.026)	0,013 (0.026)	0,076 (0.026)***	0,078 (0.026)***	-0,253 (0.023)***	-0,25 (0.023)***	0,037 (0.023)	0,027 (0.023)
ci_i	-0,173 (0.026)***	-0,185 (0.026)***	-0,17 (0.026)***	-0,179 (0.026)***	0,0001 (0.023)	-0,003 (0.024)	-0,262 (0.023)***	-0,255 (0.023)***
nci_i	-0,003 (0.015)	-0,005 (0.015)	0,111 (0.015)***	0,11 (0.015)***	-0,029 (0.013)**	-0,029 (0.013)**	-0,073 (0.013)***	-0,062 (0.013)***
er_{it,in_X}			-0,005 (0.004)	-0,006 (0.004)	-0,006 (0.005)	-0,005 (0.005)	-0,002 (0.002)	-0,002 (0.002)
$ei_{it,Brazil}$	0,008 (0.005)*	-0,001 (0.007)	-0,039 (0.014)***	-0,042 (0.014)***	-0,04 (0.018)**	-0,044 (0.019)**	0,001 (0.01)	-0,01 (0.011)
$ei_{it,Russia}$	0,0003 (0.005)	-0,004 (0.005)	0,016 (0.004)***	0,001 (0.006)	0,011 (0.008)	0,009 (0.008)	-0,006 (0.004)	0,006 (0.005)
$ei_{it,India}$	0,003 (0.007)	0,008 (0.007)	-0,007 (0.008)	0,002 (0.008)	0,033 (0.007)***	0,033 (0.008)***	-0,016 (0.006)**	-0,029 (0.007)***
$ei_{it,China}$	-0,038 (0.029)	0,04 (0.034)	0,008 (0.031)	0,074 (0.036)**	0,046 (0.031)	0,075 (0.036)**	0,066 (0.012)***	0,029 (0.017)*
DIG_primary		0,423 (0.157)***		0,597 (0.158)***		-0,17 (0.149)		-0,612 (0.099)***
DIG_processed		0,159 (0.038)***		0,118 (0.037)***		0,066 (0.034)*		-0,284 (0.032)***
$DIG\_primary * ei_{it,Brazil}$		0,038 (0.019)**		0,145 (0.1)		0,199 (0.116)*		0,012 (0.078)
$DIG\_processed * ei_{it,Brazil}$		0,013 (0.008 /pv=0.104/		0,021 (0.019)		0,024 (0.023)		-0,043 (0.014)***
$DIG\_primary * ei_{it,Russia}$		0,4 (0.114)***		-0,057 (0.044)		-0,712 (0.185)***		-0,123 (0.103)
$DIG\_processed * ei_{it,Russia}$		0,006 (0.009)		0,021 (0.007)***		-0,002 (0.008)		-0,039 (0.008)***
$DIG\_primary * ei_{it,India}$		-0,028 (0.069)		-0,074 (0.084)		0,009 (0.027)		0,029 (0.065)
$DIG\_processed * ei_{it,India}$		-0,013 (0.017)		-0,035 (0.015)**		0,0003 (0.008)		0,088 (0.017)***
$DIG\_primary * ei_{it,China}$		0,274 (0.237)		0,746 (0.238)***		-0,332 (0.217)		0,115 (0.101)
$DIG\_processed * ei_{it,China}$		-0,078 (0.033)*		-0,115 (0.035)***		-0,021 (0.036)		0,048 (0.023)**
R-squared (overall)	0.064	0.068	0.062	0.068	0.118	0.118	0.242	0.264
N. obs.	30,178	30,178	30,178	30,178	30,178	30,178	30,178	30,178

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses; 3) prior to estimation all variables have been standardized; 4) time, sectoral dummies and full set of their interaction terms are included in all models; 5) cells with coefficients which reflect internal effects of export incentives are marked by grey color.

Table 7 External effects of export incentives targeted at primary intermediate goods: Random effects panel data model estimation results

Variable/Model	Brazil		Russia		India		China	
	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)
Constant	-0,238 (0.364)	-0,25 (0.363)	-0,191 (0.366)	-0,184 (0.367)	-0,412 (0.352)	-0,346 (0.352)	-0,845 (0.329)**	-0,874 (0.324)***
si_i	0,008 (0.026)	0,009 (0.026)	0,075 (0.026)***	0,081 (0.026)***	-0,248 (0.023)***	-0,247 (0.023)***	0,036 (0.023)	0,024 (0.023)
ci_i	-0,173 (0.026)***	-0,181 (0.026)***	-0,17 (0.026)***	-0,176 (0.026)***	-0,001 (0.023)	-0,004 (0.023)	-0,261 (0.024)***	-0,253 (0.023)***
nci_i	-0,003 (0.015)	-0,005 (0.015)	0,112 (0.015)***	0,11 (0.015)***	-0,03 (0.013)**	-0,03 (0.013)**	-0,072 (0.013)***	-0,061 (0.013)***
er_{it,in_X}			-0,005 (0.004)	-0,005 (0.004)	-0,005 (0.005)	-0,007 (0.005)	-0,002 (0.002)	-0,002 (0.002)
$ei_{it,Brazil}$	0,008 (0.005) /pv=0.103/	0,001 (0.006)	0,003 (0.008)	-0,004 (0.052)	-0,003 (0.011)	0,233 (0.062)***	-0,025 (0.006)***	-0,055 (0.04)
$ei_{it,Russia}$	0,001 (0.002)	0,103 (0.011)***	0,016 (0.004)***	0,009 (0.005) /pv=0.101/	-0,004 (0.003)	-0,123 (0.019)***	-0,005 (0.002)**	0,004 (0.01)
$ei_{it,India}$	-0,0003 (0.003)	-0,027 (0.014)*	-0,004 (0.004)	-0,001 (0.017)	0,033 (0.007)***	0,033 (0.007)***	-0,003 (0.003)	0,029 (0.013)**
$ei_{it,China}$	-0,007 (0.015)	-0,02 (0.03)	-0,005 (0.015)	0,024 (0.03)	0,059 (0.014)***	0,063 (0.026)**	0,067 (0.012)***	0,034 (0.017)*
DIG_primary		0,123 (0.068)*		0,103 (0.07)		-0,05 (0.065)		-0,563 (0.091)***
DIG_processed		0,138 (0.034)***		0,103 (0.036)***		-0,025 (0.034)		-0,261 (0.033)***
$DIG\_primary * ei_{it,Brazil}$		0,039 (0.018)**		0,006 (0.052)		-0,231 (0.063)***		0,046 (0.04)
$DIG\_processed * ei_{it,Brazil}$		0,007 (0.007)		0,008 (0.052)		-0,267 (0.063)***		0,021 (0.04)
$DIG\_primary * ei_{it,Russia}$		-0,106 (0.011)***		-0,07 (0.044) /pv=0.107/		0,123 (0.019)***		-0,007 (0.01)
$DIG\_processed * ei_{it,Russia}$		Omitted		0,009 (0.005)**		Omitted		Omitted
$DIG\_primary * ei_{it,India}$		0,027 (0.014)*		-0,006 (0.017)		0,001 (0.027)		-0,028 (0.013)**
$DIG\_processed * ei_{it,India}$		0,02 (0.014)		0,006 (0.018)		0,002 (0.007)		-0,043 (0.013)***
$DIG\_primary * ei_{it,China}$		0,02 (0.037)		-0,063 (0.037)*		-0,005 (0.033)		0,118 (0.101)
$DIG\_processed * ei_{it,China}$		-0,023 (0.041)		-0,014 (0.041)		-0,004 (0.037)		0,043 (0.022)*
R-squared (overall)	0.064	0.068	0.06	0.063	0.12	0.121	0.245	0.266
N. obs.	30 178	30 178	30 178	30 178	30 178	30 178	30 178	30 178

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses; 3) prior to estimation all variables have been standardized; 4) time, sectoral dummies and full set of their interaction terms are included in all models; 5) cells with coefficients which reflect internal effects of export incentives are marked by grey color.

Table 8 External effects of export incentives targeted at processed intermediate goods: Random effects panel data model estimation results

Variable/Model	Brazil		Russia		India		China	
	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)	Eq. (1)	Eq. (2)
Constant	-0,243 (0.365)	-0,189 (0.365)	-0,201 (0.366)	-0,194 (0.367)	-0,34 (0.352)	-0,385 (0.353)	-0,823 (0.329)**	-0,812 (0.322)**
si_i	0,007 (0.026)	0,011 (0.026)	0,074 (0.026)***	0,076 (0.025)***	-0,244 (0.023)***	-0,243 (0.023)***	0,037 (0.023)	0,025 (0.023)
ci_i	-0,172 (0.026)***	-0,18 (0.026)***	-0,165 (0.026)***	-0,171 (0.026)***	-0,018 (0.024)	-0,017 (0.024)	-0,261 (0.023)***	-0,254 (0.023)***
nci_i	-0,003 (0.015)	-0,006 (0.015)	0,11 (0.015)***	0,108 (0.015)***	-0,025 (0.013)*	-0,026 (0.013)*	-0,073 (0.013)***	-0,06 (0.013)***
er_{it,in_X}			-0,005 (0.004)	-0,005 (0.004)	-0,006 (0.005)	-0,006 (0.005)	-0,002 (0.002)	-0,002 (0.002)
$ei_{it,Brazil}$	0,008 (0.005)*	-0,0004 (0.007)	0,018 (0.012)	-0,029 (0.026)	0,014 (0.013)	-0,001 (0.033)	0,002 (0.009)	0,048 (0.019)**
$ei_{it,Russia}$	0,003 (0.004)	0,012 (0.011)	0,014 (0.004)***	0,007 (0.006)	0,007 (0.006)	-0,001 (0.011)	-0,001 (0.004)	-0,002 (0.01)
$ei_{it,India}$	-0,012 (0.005)**	-0,022 (0.017)	0,01 (0.006) /pv=0.103/	0,019 (0.014)	0,032 (0.007)***	0,035 (0.008)***	0,019 (0.005)***	0,027 (0.016) /pv=0.106/
$ei_{it,China}$	-0,002 (0.018)	0,081 (0.047)*	-0,043 (0.019)**	0,015 (0.049)	0,094 (0.018)***	0,058 (0.048)	0,065 (0.012)***	0,028 (0.017) /pv=0.101/
DIG_primary		0,036 (0.112)		0,031 (0.112)		0,1 (0.102)		-0,662 (0.091)***
DIG_processed		0,114 (0.036)***		0,105 (0.036)***		0,034 (0.034)		-0,3 (0.032)***
$DIG\_primary * ei_{it,Brazil}$		0,04 (0.018)**		0,006 (0.055)		0,004 (0.066)		-0,118 (0.041)***
$DIG\_processed * ei_{it,Brazil}$		0,014 (0.008)*		0,054 (0.026)**		0,017 (0.032)		-0,044 (0.019)**
$DIG\_primary * ei_{it,Russia}$		0,009 (0.021)		-0,063 (0.044)		-0,009 (0.025)		-0,016 (0.02)
$DIG\_processed * ei_{it,Russia}$		-0,009 (0.01)		0,011 (0.006)*		0,009 (0.01)		0,002 (0.01)
$DIG\_primary * ei_{it,India}$		0,016 (0.038)		-0,016 (0.035)		0,003 (0.028)		-0,024 (0.038)
$DIG\_processed * ei_{it,India}$		0,009 (0.017)		-0,015 (0.014)		-0,006 (0.008)		-0,007 (0.016)
$DIG\_primary * ei_{it,China}$		-0,19 (0.165)		-0,058 (0.17)		0,042 (0.162)		0,113 (0.101)
$DIG\_processed * ei_{it,China}$		-0,102 (0.046)**		-0,073 (0.048)		0,037 (0.047)		0,049 (0.022)**
R-squared (overall)	0.064	0.069	0.062	0.064	0.122	0.123	0.244	0.268
N. obs.	30 178	30 178	30 178	30 178	30 178	30 178	30 178	30 178

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses; 3) prior to estimation all variables have been standardized; 4) time, sectoral dummies and full set of their interaction terms are included in all models; 5) cells with coefficients which reflect internal effects of export incentives are marked by grey color.

First, we should mention that results for control variables (including direct effects of dummies for intermediates) and internal effects of export incentives do not differ much from the baseline results in table 4.

In what follows we discuss results for external effects of export incentives for each BRIC country. For Brazil, first, there is rather strong evidence that Russian export incentives targeted at final goods stimulate Brazilian export of primary intermediates (equation (2) for Brazil, Table 6). According to our framework, this can be due to positive backward linkages` effects and/or indirect positive backward linkages` "competition for market share" effects. We also find that Russian export incentives targeted at primary goods positively affect Brazilian export of final goods (equation (2) for Brazil, Table 7). This result reflects positive forward linkages` and/or indirect positive forward linkages` "competition for market share" effects. At last, we find that Chinese export incentives targeted at processed intermediates positively affect Brazilian export of final goods (positive forward linkages` and/or indirect positive forward linkages` "competition for market share" effects) and negatively – Brazilian export of processed intermediates (negative "competition for market share" and/or indirect negative backward linkages` "competition for market share" effects; equation (2) for Brazil, Table 8).

For Russia, first, we find that negative effects coming from Chinese export incentives to Russian export found in Table 4 (equation (1) for Russia) mainly come from Chinese export incentives targeted at processed intermediates (equation (1) for Russia, Table 8). There is some evidence that these negative effects are strongest for Russian export of processed intermediates (equation (2) for Russia, Table 8), which indicates the presence of negative "competition for market share" and/or indirect negative backward linkages` "competition for market share" effects. Brazilian export incentives targeted at final goods negatively affect Russian export of final goods

(equation (2) for Russia, Table 6). This is evidence of negative “competition for market share” effects. We further find that Chinese export incentives targeted at final goods positively affect Russian export of final goods (equation (2) for Russia, Table 6), which, according to our framework, indicates the presence of indirect positive “complementary final goods” effects. There is also evidence of positive effects of Chinese export incentives targeted at final goods for Russian export of primary goods, which indicates the presence of positive backward linkages` and/or indirect positive backward linkages` “competition for market share” effects (equation (2) for Russia, Table 6). We also find that Indian export incentives targeted at final goods negatively affect Russian export of processed intermediates (equation (2) for Russia, Table 6). This result reflects indirect negative backward linkages` “competition for market share” effects according to our framework. Next, we find negative effects of Chinese export incentives targeted at primary intermediates for Russian export of primary intermediates (equation (2) for Russia, Table 7). This finding indicates the presence of negative “competition for market share” effects. Finally, we find positive effects coming from Brazilian export incentives targeted at processed intermediates to Russian export of processed intermediates (equation (2) for Russia, Table 8). This indicates the presence of positive forward and/or backward linkages` effects and/or “spider” complementarity effects and/or indirect positive forward and backward linkages` “competition for market share” effects.

For India we, first, find that Brazilian export incentives targeted at final goods negatively affect Indian export of final goods (equation (2) for India, Table 6) which indicates the presence of negative ”competition for market share” effects. At the same time, Brazilian export incentives targeted at final goods positively affect Indian export of primary intermediates (equation (2) for India, Table 6) which reflects positive backward linkages` effects and/or indirect positive

backward linkages` "competition for market share" effect. We further find that Chinese export incentives targeted at final goods positively affect Indian export of final goods (equation (2) for India, Table 6) which points to the presence of indirect "complementary final goods" positive effects. We also find that Russian export incentives targeted at final goods negatively affect Indian export of primary intermediates (equation (2) for India, Table 6). This indicates the presence of indirect negative backward linkages` "competition for market share" effects. Next, we find that Brazilian and Chinese export incentives targeted at primary intermediates positively affect Indian export of final goods (equation (2) for India, Table 7) which indicates the presence of positive forward linkages` and/or indirect positive forward linkages` "competition for market share" effects. We also find that Chinese export incentives targeted at primary intermediates positively affect Indian export of primary and processed intermediates (equation (2) for India, Table 7). This suggests the presence of a bundle of positive external effects of Chinese export incentives for Indian export. In contradiction to our theoretical framework, we find that Russian export incentives targeted at primary intermediates negatively affect Indian export of final goods (equation (2) for India, Table 7). According to our framework, this effect can be only positive. However, we aware that GVCs networks are more complex than in our simplified framework, which, for example, does not count for specificity of trade relations between different countries (e.g. trade agreements). Finally, we find that Chinese export incentives targeted at processed intermediates positively affect Indian export (equation (1) for India, Table 8). However, there is no strong evidence on their differential effects for Indian export of different types of goods (equation (2) for India, Table 8).

For China, first, we find that negative effects of Russian export incentives for Chinese export found in table 4 (equation (1) for China) mainly come from those targeted at primary intermediates (equation (1) for China, Table 7). However, their differential effects for Chinese

export of different types of goods are not clear (equation (2) for China, Table 7). There is also rather strong evidence that Indian export incentives targeted at final goods negatively affect Chinese export of final goods, which indicates the presence of negative "competition for market share" effects (equation (2) for China, Table 6). On the other hand, Indian export incentives targeted at final goods positively affect Chinese export of processed intermediates (equation (2) for China, Table 6) which points to the presence of positive backward linkages` and/or indirect positive backward linkages` "competition for market share" effects. However, Brazilian and Russian export incentives targeted at final goods negatively affect Chinese export of processed intermediates (equation (2) for China, Table 6), which indicates the presence of indirect negative backward linkages` "competition for market share" effects. We also find that Brazilian export incentives targeted at primary intermediates negatively affect Chinese export (equation (1) for China, Table 7) though differential effects for export by type of goods are not clear (equation (2) for China, Table 7). There is evidence that Indian export incentives targeted at primary intermediates positively affect Chinese export of final goods (which indicates the presence of positive forward linkages` effects and/or indirect positive forward linkages` "competition for market share" effects) but negatively - Chinese export of processed intermediates (equation (2) for China, Table 7). The latter result contradicts our theoretical framework, as the respective effect can be only positive. As for the case of negative effects of Russian export incentives targeted at primary intermediates for Indian export of final goods discussed above, we suggest that this finding can be due to some additional factors (e.g. bilateral trade agreements) for which we do not count in our simplified framework. We further find that Indian export incentives targeted at processed intermediates positively affect Chinese export of final goods and primary and processed intermediate goods (equation (2) for China, Table 8) which points to the presence of a bundle of

positive external effects. Finally, there is evidence that Brazilian export incentives targeted at processed intermediates positively affect Chinese export of final goods (which points to the presence of positive forward linkages` and indirect positive forward linkages` "competition for market share" effects) and negatively – Chinese export of primary intermediates (which indicates the presence of indirect negative backward linkages` "competition for market share" effect; equation (2) for China, Table 8).

5.2. Results of separate test for positive backward linkages` effect

To separately test for positive backward linkages` effect we first present random effects model`s estimation results of equation (3) for BRICs bilateral exports for total number of export incentives in Table 9.

Table 9 Backward linkages` effect`s test: Random effects panel data model estimation results

Variable/Model	Export from Brazil (X) to			Export from Russia (X) to			Export from India (X) to			Export from China (X) to		
	Russia (Y)	India (Y)	China (Y)	Brazil (Y)	India (Y)	China (Y)	Brazil (Y)	Russia (Y)	China (Y)	Brazil (Y)	Russia (Y)	India (Y)
Constant	-0,074 (0.346)	-0,107 (0.369)	-0,11 (0.366)	-0,247 (0.379)	-0,224 (0.379)	-0,07 (0.38)	-0,411 (0.371)	-0,285 (0.381)	0,223 (0.367)	-0,634 (0.327)*	-0,617 (0.349)*	-0,922 (0.342)***
si_i	0,006 (0.022)	-0,004 (0.024)	-0,021 (0.023)	0,059 (0.025)**	0,055 (0.024)**	0,047 (0.024)*	-0,202 (0.024)***	-0,121 (0.024)***	-0,185 (0.023)***	0,032 (0.022)	-0,002 (0.024)	-0,015 (0.023)
ci_i	-0,079 (0.023)***	-0,075 (0.025)***	-0,107 (0.024)***	-0,132 (0.026)***	-0,106 (0.024)***	-0,103 (0.025)***	-0,01 (0.024)	-0,016 (0.025)	-0,042 (0.024)*	-0,178 (0.023)***	-0,128 (0.024)***	-0,107 (0.024)***
nci_i	-0,022 (0.013)*	0,003 (0.014)	-0,0004 (0.013)	0,011 (0.014)	0,041 (0.014)***	0,067 (0.014)***	-0,018 (0.014)	-0,041 (0.014)***	-0,019 (0.013)	-0,053 (0.013)***	-0,042 (0.014)***	-0,057 (0.014)***
er_{it,in_X}				-0,002 (0.008)	0,013 (0.008)	-0,014 (0.007)**	0,008 (0.008)	0,008 (0.009)	-0,005 (0.007)	-0,004 (0.004)	0,006 (0.004)	-0,002 (0.004)
$it_{it,Y}$	0,006 (0.011)	0,006 (0.014)	-0,023 (0.013)*	-0,083 (0.019)***	-0,014 (0.014)	-0,053 (0.013)***	-0,054 (0.018)***	-0,05 (0.012)***	-0,029 (0.013)**	0,165 (0.016)***	0,047 (0.01)***	-0,017 (0.012)
$ei_{it,Brazil}$	-0,012 (0.013)	-0,013 (0.014)	0,004 (0.013)	-0,038 (0.027)	-0,059 (0.031)*	-0,048 (0.027)*	-0,03 (0.027)	0,016 (0.028)	-0,015 (0.026)	0,008 (0.019)	0,019 (0.02)	0,008 (0.02)
$ei_{it,Russia}$	0,011 (0.019)	-0,029 (0.021)	-0,03 (0.019)	0,002 (0.012)	0,021 (0.013)	0,008 (0.011)	0,026 (0.014)*	0,005 (0.015)	-0,003 (0.014)	0,001 (0.016)	-0,08 (0.017)***	-0,042 (0.017)**
$ei_{it,India}$	-0,023 (0.028)	0,007 (0.031)	0,038 (0.027)	-0,0005 (0.021)	0,03 (0.025)	0,003 (0.021)	0,054 (0.01)***	0,003 (0.011)	0,011 (0.009)	0,001 (0.023)	0,128 (0.026)***	0,038 (0.026)
$ei_{it,China}$	0,034 (0.036)	0,081 (0.038)**	0,065 (0.038)*	-0,058 (0.045)	-0,037 (0.045)	-0,001 (0.045)	0,156 (0.044)***	0,069 (0.046)	0,271 (0.043)***	0,016 (0.018)	0,023 (0.019)	0,04 (0.019)**
DIG_primary	0,284 (0.162)*	0,499 (0.168)***	0,559 (0.168)***	-0,22 (0.185)	-0,117 (0.169)	0,507 (0.176)***	0,08 (0.174)	0,534 (0.175)***	0,263 (0.167)	-0,519 (0.102)***	-0,439 (0.113)***	-0,554 (0.104)***
DIG_processed	0,033 (0.029)	0,089 (0.031)***	0,112 (0.031)***	0,029 (0.034)	0,068 (0.031)**	0,013 (0.033)	-0,02 (0.033)	0,085 (0.032)***	0,031 (0.032)	-0,123 (0.031)***	-0,144 (0.032)***	-0,057 (0.032)*
$DIG\_primary * ei_{it,Brazil}$	0,262 (0.037)***	0,03 (0.039)	0,114 (0.035)***	-0,079 (0.133)	-0,145 (0.137)	-0,225 (0.122)*	-0,252 (0.135)*	0,149 (0.15)	0,001 (0.117)	-0,022 (0.102)	0,051 (0.115)	-0,082 (0.098)
$DIG\_processed * ei_{it,Brazil}$	0,018 (0.015)	0,024 (0.017)	0,042 (0.015)***	0,018 (0.027)	0,031 (0.032)	-0,01 (0.028)	0,028 (0.025)	0,001 (0.026)	0,014 (0.024)	-0,023 (0.02)	0,01 (0.021)	-0,016 (0.021)
$DIG\_primary * ei_{it,Russia}$	-0,114 (0.138)	0,002 (0.122)	0,068 (0.116)	0,029 (0.083)	0,107 (0.105)	-0,027 (0.08)	0,138 (0.114)	-0,068 (0.126)	0,053 (0.09)	-0,019 (0.109)	-0,054 (0.122)	-0,018 (0.099)
$DIG\_processed * ei_{it,Russia}$	0,001 (0.02)	-0,004 (0.022)	0,023 (0.02)	0,009 (0.012)	0,003 (0.015)	-0,008 (0.012)	0,003 (0.011)	0,003 (0.011)	-0,006 (0.01)	-0,031 (0.017)*	0,027 (0.018)	0,024 (0.018)
$DIG\_primary * ei_{it,India}$	0,078 (0.129)	0,271 (0.127)**	0,401 (0.119)***	-0,015 (0.106)	0,179 (0.11)	0,396 (0.094)***	-0,052 (0.042)	-0,106 (0.043)**	-0,011 (0.036)	-0,161 (0.109)	-0,071 (0.114)	-0,187 (0.105)*
$DIG\_processed * ei_{it,India}$	-0,002 (0.025)	0,001 (0.028)	-0,039 (0.025)	-0,017 (0.019)	-0,014 (0.022)	0,016 (0.019)	-0,003 (0.011)	0,006 (0.012)	0,015 (0.01)	0,032 (0.023)	-0,044 (0.025)*	-0,05 (0.025)**
$DIG\_primary * ei_{it,China}$	-0,059 (0.257)	-0,015 (0.267)	0,05 (0.266)	-0,254 (0.306)	-0,217 (0.285)	0,656 (0.292)**	0,323 (0.295)	0,673 (0.3)**	0,214 (0.28)	0,001 (0.097)	0,236 (0.107)**	0,046 (0.102)
$DIG\_processed * ei_{it,China}$	-0,029 (0.026)	-0,073 (0.027)***	-0,06 (0.027)**	-0,051 (0.034)	-0,006 (0.035)	-0,008 (0.034)	0,031 (0.034)	-0,0002 (0.035)	0,025 (0.033)	0,061 (0.023)***	0,071 (0.024)***	0,057 (0.024)**
R-squared (overall)	0.043	0.032	0.05	0.022	0.022	0.037	0.097	0.047	0.092	0.241	0.141	0.172
N. obs.	27,350	26,462	28,363	27,381	26,462	28,363	27,381	27,350	28,363	27,381	27,350	26,462

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses; 3) prior to estimation all variables have been standardized; 4) time, sectoral dummies and full set of their interaction terms are included in all models; 5) cells with coefficients which reflect

internal effects of export incentives are marked by light grey color; 6) cells with coefficients used in calculations of ***backward linkages` effects*** are marked by dark grey color.

Inspecting respective sums of the coefficients of the variables reflecting external effects of export incentives and the coefficients of their interaction terms with dummies for intermediates, we find evidence on positive backward linkages` effects for several country-pairs. First, we find rather strong evidence that Indian export incentives stimulate Brazilian export of primary intermediates to India. Second, we find rather strong evidence that Chinese export incentives stimulate Russian export of primary intermediates to China. Finally, we find evidence that Chinese export incentives stimulate Indian export of primary and processed intermediates to China.

We should note that results for control variables (including direct effects of dummies for intermediates) are in general similar to those obtained in Table 4, 6, 7 and 8. Other significant results in Table 9 can be divided into two broad groups – those that concern internal effects of export incentives and those that concern other than positive backward linkages` external effects of BRICs export incentives in bilateral trade of the BRICs. As the core focus of this study is on more aggregate effects, we do not discuss them here.

Next, in order to concretize results according to our framework outlined in Figure 1 we estimate equation (3) separately for export incentives targeted at final and processed intermediate goods. Results are presented in Tables 10 and 11.

Table 10 Backward linkages` effect`s test for export incentives targeted at final goods: Random effects panel data model estimation results

Variable/Model	Export from Brazil (X) to			Export from Russia (X) to			Export from India (X) to			Export from China (X) to		
	Russia (Y)	India (Y)	China (Y)	Brazil (Y)	India (Y)	China (Y)	Brazil (Y)	Russia (Y)	China (Y)	Brazil (Y)	Russia (Y)	India (Y)
Constant	-0,116 (0.345)	-0,109 (0.369)	-0,125 (0.366)	-0,157 (0.379)	-0,182 (0.379)	-0,022 (0.379)	-0,505 (0.371)	-0,403 (0.38)	0,069 (0.369)	-0,646 (0.328)**	-0,674 (0.352)*	-0,958 (0.343)***
si_i	0,004 (0.022)	-0,008 (0.024)	-0,023 (0.023)	0,064 (0.025)**	0,056 (0.024)**	0,048 (0.024)**	-0,212 (0.024)***	-0,128 (0.024)***	-0,199 (0.023)***	0,033 (0.022)	-0,005 (0.024)	-0,018 (0.024)
ci_i	-0,075 (0.023)***	-0,07 (0.025)***	-0,104 (0.024)***	-0,143 (0.026)***	-0,107 (0.024)***	-0,108 (0.025)***	0,009 (0.024)	-0,005 (0.025)	-0,013 (0.024)	-0,178 (0.023)***	-0,123 (0.024)***	-0,099 (0.024)***
nci_i	-0,022 (0.013)*	0,004 (0.014)	0,001 (0.013)	0,013 (0.014)	0,043 (0.014)***	0,067 (0.014)***	-0,019 (0.014)	-0,039 (0.014)***	-0,021 (0.014)	-0,053 (0.013)***	-0,042 (0.014)***	-0,056 (0.014)***
er_{it,in_X}				-0,003 (0.008)	0,011 (0.008)	-0,018 (0.007)**	0,009 (0.008)	0,008 (0.009)	-0,005 (0.007)	-0,004 (0.004)	0,006 (0.004)	-0,002 (0.004)
$it_{it,Y}$	0,003 (0.01)	0,005 (0.014)	-0,025 (0.013)**	-0,081 (0.019)***	-0,015 (0.014)	-0,053 (0.013)***	-0,065 (0.019)***	-0,056 (0.012)***	-0,037 (0.013)***	0,171 (0.016)***	0,048 (0.01)***	-0,015 (0.013)
$ei_{it,Brazil}$	-0,012 (0.012)	-0,014 (0.014)	0,005 (0.013)	-0,025 (0.024)	-0,07 (0.027)***	-0,04 (0.023)*	-0,054 (0.025)**	0,022 (0.026)	-0,019 (0.023)	-0,026 (0.017)	0,001 (0.018)	-0,029 (0.018)
$ei_{it,Russia}$	-0,00003 (0.01)	-0,009 (0.011)	-0,014 (0.01)	0,007 (0.011)	0,027 (0.013)**	0,004 (0.011)	0,013 (0.01)	0,002 (0.011)	0,004 (0.01)	0,012 (0.008)	-0,02 (0.009)**	-0,015 (0.009)
$ei_{it,India}$	-0,002 (0.014)	-0,013 (0.017)	0,009 (0.013)	0,013 (0.014)	0,02 (0.017)	-0,002 (0.013)	0,053 (0.01)***	0,004 (0.011)	0,011 (0.009)	-0,009 (0.011)	0,046 (0.013)***	0,075 (0.014)***
$ei_{it,China}$	-0,026 (0.032)	0,078 (0.034)**	0,065 (0.033)*	0,031 (0.041)	0,013 (0.042)	0,036 (0.04)	0,058 (0.039)	-0,075 (0.039)*	0,067 (0.038)*	0,012 (0.018)	0,024 (0.019)	0,044 (0.019)**
DIG_primary	0,542 (0.142)***	1,036 (0.15)***	0,894 (0.147)***	-0,059 (0.165)	0,06 (0.153)	0,67 (0.155)***	-0,083 (0.167)	0,721 (0.16)***	0,075 (0.152)	-0,528 (0.117)***	-0,416 (0.122)***	-0,496 (0.117)***
DIG_processed	0,016 (0.033)	0,101 (0.036)***	0,132 (0.035)***	0,047 (0.037)	0,052 (0.034)	0,014 (0.036)	-0,03 (0.035)	0,049 (0.035)	0,04 (0.035)	-0,141 (0.033)***	-0,138 (0.035)***	-0,016 (0.034)
$DIG\_primary * ei_{it,Brazil}$	0,262 (0.037)***	0,019 (0.039)	0,104 (0.035)***	0,078 (0.153)	0,353 (0.167)	-0,005 (0.14)	0,063 (0.143)	0,347 (0.154)**	0,172 (0.13)	0,042 (0.128)	0,049 (0.14)	-0,099 (0.138)
$DIG\_processed * ei_{it,Brazil}$	0,019 (0.015)	0,023 (0.016)	0,037 (0.015)**	0,002 (0.032)	-0,011 (0.036)	0,001 (0.032)	0,02 (0.03)	-0,004 (0.031)	0,012 (0.028)	-0,041 (0.022)*	-0,026 (0.023)	-0,059 (0.023)***
$DIG\_primary * ei_{it,Russia}$	-0,263 (0.228)	2,019 (0.248)***	1,001 (0.233)***	0,026 (0.083)	0,096 (0.105)	-0,036 (0.08)	-0,44 (0.309)	1,902 (0.251)***	-0,08 (0.228)	0,058 (0.238)	-0,051 (0.197)	-0,101 (0.198)
$DIG\_processed * ei_{it,Russia}$	0,005 (0.017)	0,008 (0.019)	0,009 (0.018)	0,0002 (0.012)	-0,006 (0.013)	-0,007 (0.012)	-0,002 (0.011)	-0,005 (0.011)	-0,001 (0.01)	-0,019 (0.015)	0,014 (0.015)	-0,03 (0.015)**
$DIG\_primary * ei_{it,India}$	0,253 (0.149)*	-0,076 (0.153)	0,392 (0.144)***	-0,136 (0.163)	0,148 (0.177)	0,307 (0.15)**	-0,042 (0.041)	-0,156 (0.042)***	-0,006 (0.035)	-0,309 (0.132)**	-0,034 (0.136)	-0,057 (0.13)
$DIG\_processed * ei_{it,India}$	-0,015 (0.033)	-0,023 (0.035)	-0,032 (0.034)	0,007 (0.027)	0,013 (0.031)	0,018 (0.027)	-0,0005 (0.01)	0,009 (0.011)	0,014 (0.01)	0,034 (0.03)	-0,024 (0.032)	0,052 (0.031)*
$DIG\_primary * ei_{it,China}$	0,335 (0.214)	0,321 (0.226)	0,233 (0.22)	-0,069 (0.248)	-0,307 (0.228)	0,813 (0.232)***	0,029 (0.232)	0,086 (0.23)	-0,222 (0.219)	0,017 (0.098)	0,234 (0.109)**	0,036 (0.103)
$DIG\_processed * ei_{it,China}$	-0,015 (0.029)	-0,054 (0.031)*	-0,067 (0.031)**	-0,049 (0.039)	0,027 (0.04)	-0,033 (0.039)	0,023 (0.039)	0,008 (0.04)	-0,022 (0.038)	0,067 (0.023)***	0,078 (0.025)***	0,051 (0.024)**
R-squared (overall)	0.044	0.033	0.052	0.02	0.023	0.038	0.093	0.047	0.084	0.243	0.138	0.172
N. obs.	27,350	26,462	28,363	27,381	26,462	28,363	27,381	27,350	28,363	27,381	27,350	26,462

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses; 3) prior to estimation all variables have been standardized; 4) time, sectoral dummies and full set of their interaction terms are included in all models; 5) cells with coefficients which reflect

internal effects of export incentives are marked by light grey color; 6) cells with coefficients used in calculations of ***backward linkages` effects*** are marked by dark grey color.

Table 11 Backward linkages` effect`s test for export incentives targeted at processed intermediates: Random effects panel data model estimation results

Variable/Model	Export from Brazil (X) to			Export from Russia (X) to			Export from India (X) to			Export from China (X) to		
	Russia (Y)	India (Y)	China (Y)	Brazil (Y)	India (Y)	China (Y)	Brazil (Y)	Russia (Y)	China (Y)	Brazil (Y)	Russia (Y)	India (Y)
Constant	-0,079 (0.347)	-0,104 (0.369)	-0,125 (0.367)	-0,26 (0.379)	-0,181 (0.38)	-0,064 (0.381)	-0,501 (0.371)	-0,298 (0.381)	0,108 (0.367)	-0,512 (0.326)	-0,594 (0.349)*	-0,843 (0.342)**
si_i	0,005 (0.022)	-0,008 (0.024)	-0,023 (0.023)	0,059 (0.025)**	0,057 (0.024)**	0,047 (0.024)*	-0,206 (0.024)***	-0,123 (0.024)***	-0,189 (0.023)***	0,033 (0.022)	0,001 (0.024)	-0,014 (0.023)
ci_i	-0,076 (0.023)***	-0,067 (0.025)***	-0,101 (0.024)***	-0,135 (0.025)***	-0,111 (0.024)***	-0,104 (0.025)***	-0,004 (0.024)	-0,011 (0.025)	-0,033 (0.024)	-0,18 (0.022)***	-0,132 (0.024)***	-0,109 (0.024)***
nci_i	-0,022 (0.013)*	0,003 (0.014)	-0,001 (0.014)	0,009 (0.014)	0,039 (0.014)***	0,066 (0.014)***	-0,015 (0.014)	-0,04 (0.014)***	-0,015 (0.013)	-0,052 (0.013)***	-0,041 (0.014)***	-0,056 (0.014)***
er_{it,in_X}				-0,001 (0.008)	0,014 (0.008)*	-0,013 (0.007)*	0,008 (0.008)	0,008 (0.009)	-0,005 (0.007)	-0,004 (0.004)	0,006 (0.004)	-0,001 (0.004)
$it_{it,Y}$	0,005 (0.01)	0,006 (0.014)	-0,023 (0.013)*	-0,092 (0.019)***	-0,015 (0.014)	-0,053 (0.013)***	-0,052 (0.018)***	-0,052 (0.012)***	-0,031 (0.013)***	0,17 (0.016)***	0,043 (0.01)***	-0,016 (0.012)
$ei_{it,Brazil}$	-0,012 (0.012)	-0,016 (0.014)	0,008 (0.012)	-0,073 (0.043)*	-0,016 (0.048)	-0,028 (0.043)	-0,036 (0.042)	-0,0003 (0.044)	-0,039 (0.04)	0,127 (0.032)***	0,073 (0.033)**	0,125 (0.033)***
$ei_{it,Russia}$	0,009 (0.022)	-0,009 (0.024)	0,008 (0.023)	0,009 (0.01)	0,02 (0.012)	0,005 (0.01)	0,004 (0.015)	0,024 (0.016)	-0,008 (0.014)	0,003 (0.019)	0,007 (0.02)	0,004 (0.019)
$ei_{it,India}$	-0,014 (0.034)	-0,0002 (0.037)	0,002 (0.035)	-0,02 (0.023)	0,01 (0.027)	-0,0001 (0.024)	0,056 (0.01)***	0,004 (0.011)	0,014 (0.01)	0,035 (0.03)	0,025 (0.031)	-0,022 (0.031)
$ei_{it,China}$	0,028 (0.042)	0,082 (0.045)*	0,043 (0.045)	-0,005 (0.053)	-0,02 (0.053)	-0,013 (0.053)	0,049 (0.052)	0,063 (0.053)	0,142 (0.051)***	0,004 (0.018)	0,013 (0.019)	0,034 (0.019)*
DIG_primary	0,142 (0.103)	0,398 (0.103)***	0,273 (0.103)***	-0,14 (0.118)	-0,058 (0.106)	0,295 (0.109)***	-0,018 (0.11)	0,255 (0.111)**	0,172 (0.102)*	-0,586 (0.094)***	-0,572 (0.104)***	-0,592 (0.097)***
DIG_processed	0,025 (0.031)	0,055 (0.033)*	0,082 (0.033)**	0,063 (0.036)*	0,079 (0.034)**	0,025 (0.035)	-0,025 (0.035)	0,06 (0.035)*	-0,005 (0.034)	-0,188 (0.033)***	-0,208 (0.035)***	-0,107 (0.034)***
$DIG\_primary * ei_{it,Brazil}$	0,26 (0.037)***	0,036 (0.039)	0,116 (0.035)***	0,075 (0.102)	-0,033 (0.102)	-0,195 (0.094)**	-0,185 (0.098)*	-0,103 (0.113)	-0,06 (0.085)	-0,129 (0.075)*	-0,091 (0.088)	-0,182 (0.072)**
$DIG\_processed * ei_{it,Brazil}$	0,017 (0.015)	0,025 (0.016)	0,034 (0.015)**	0,061 (0.042)	0,034 (0.048)	-0,008 (0.043)	0,04 (0.041)	0,006 (0.043)	0,044 (0.039)	-0,092 (0.032)***	-0,026 (0.034)	-0,095 (0.033)***
$DIG\_primary * ei_{it,Russia}$	-0,012 (0.057)	0,022 (0.049)	-0,048 (0.048)	0,024 (0.083)	0,102 (0.105)	-0,033 (0.08)	0,069 (0.038)*	-0,038 (0.046)	0,035 (0.031)	0,036 (0.045)	0,027 (0.05)	0,006 (0.04)
$DIG\_processed * ei_{it,Russia}$	-0,003 (0.021)	-0,009 (0.022)	-0,003 (0.022)	0,001 (0.01)	0,004 (0.012)	-0,005 (0.01)	0,016 (0.013)	0,005 (0.014)	0,0003 (0.013)	-0,008 (0.018)	-0,016 (0.018)	-0,008 (0.018)
$DIG\_primary * ei_{it,India}$	0,005 (0.104)	0,044 (0.094)	0,27 (0.093)***	-0,009 (0.074)	0,037 (0.074)	0,239 (0.066)***	-0,054 (0.042)	-0,09 (0.043)**	-0,012 (0.036)	-0,197 (0.094)**	-0,158 (0.098)	-0,122 (0.082)
$DIG\_processed * ei_{it,India}$	0,006 (0.034)	0,005 (0.036)	-0,005 (0.035)	-0,001 (0.024)	-0,018 (0.027)	0,015 (0.024)	-0,012 (0.011)	-0,0005 (0.012)	0,009 (0.01)	-0,02 (0.03)	-0,007 (0.031)	-0,006 (0.031)
$DIG\_primary * ei_{it,China}$	-0,284 (0.155)*	0,043 (0.155)	-0,218 (0.154)	-0,285 (0.19)	-0,145 (0.175)	0,434 (0.177)**	0,123 (0.186)	0,468 (0.192)**	0,174 (0.171)	0,002 (0.096)	0,25 (0.107)**	0,036 (0.101)
$DIG\_processed * ei_{it,China}$	-0,032 (0.041)	-0,091 (0.044)**	-0,056 (0.044)	-0,055 (0.051)	-0,024 (0.051)	0,007 (0.051)	0,038 (0.05)	-0,022 (0.052)	0,003 (0.05)	0,069 (0.023)***	0,079 (0.024)***	0,059 (0.024)**
R-squared (overall)	0.043	0.032	0.049	0.023	0.022	0.037	0.097	0.048	0.093	0.247	0.144	0.175

N. obs.	27,350	26,462	28,363	27,381	26,462	28,363	27,381	27,350	28,363	27,381	27,350	26,462

Note: 1) * if p-value < 0.10, ** if p-value < 0.05, *** if p-value < 0.01; 2) standard errors in parentheses; 3) prior to estimation all variables have been standardized; 4) time, sectoral dummies and full set of their interaction terms are included in all models; 5) cells with coefficients which reflect internal effects of export incentives are marked by light grey color; 6) cells with coefficients used in calculations of ***backward linkages` effects*** are marked by dark grey color.

For the first case of positive backward linkages` effects found in Table 9, i.e. that Indian export incentives stimulate Brazilian export of primary intermediates to India, there is some evidence (albeit not statistically significant) that these effects come from Indian export incentives targeted at processed intermediates. For the second case, i.e. that Chinese export incentives stimulate Russian export of primary intermediates to China, we find rather convincing evidence that these effects come from Chinese export incentives targeted at processed intermediates. Finally, for the third case, i.e. that Chinese export incentives stimulate Indian export of primary and processed intermediates to China, we find that most of these effects come from Chinese export incentives targeted at processed intermediates to Indian export of primary intermediates to China.

In addition, we find rather strong evidence that Russian export incentives targeted at final goods stimulate Indian export of primary intermediates to Russia. There is also evidence that Indian export incentives targeted at final goods stimulate Chinese export of intermediates to India (this effect seems to be stronger for Chinese export of processed than primary intermediates). Finally, there is evidence that Chinese export incentives targeted at final goods enhance Brazilian export of primary intermediates to China.

5.3. Results` discussion

For illustrative purposes, we summarize our results in Tables 12-15 below. Negative effects are marked by red color and positive – by blue color. We must note that we distinguish between positive and negative effects if they are rather obvious. Otherwise, respective cells are empty.

Table 12 External effects of all export incentives implemented in one BRIC country on total export of other three BRIC countries (results for equation (1) in Table 4)

	Brazilian total export	Russian total export	Indian total export	Chinese total export
Brazilian export incentives				
Russian export incentives				-
Indian export incentives	-			
Chinese export incentives		-	+	

Table 13 External effects of export incentives implemented in one BRIC country on total export of other three BRIC countries by type of good targeted by incentive (results for equation (1) in Tables 6-8)

	Brazilian total export	Russian total export	Indian total export	Chinese total export
Brazilian export incentives targeted at final goods		-	-	
Russian export incentives targeted at final goods				
Indian export incentives targeted at final goods				-
Chinese export incentives targeted at final goods				
Brazilian export incentives targeted at primary intermediates				-
Russian export incentives targeted at primary intermediates				-
Indian export incentives targeted at primary intermediates				
Chinese export incentives targeted at primary intermediates			+	
Brazilian export incentives targeted at processed intermediates				
Russian export incentives targeted at processed intermediates				
Indian export incentives targeted at processed intermediates	-			+
Chinese export incentives targeted at processed intermediates		-	+	

Table 14 External effects of all export incentives implemented in one BRIC country on export of different types of goods of other three BRIC countries (results for equation (2) in Table 4)

	Brazilian export of final goods	Russian export of final goods	Indian export of final goods	Chinese export of final goods	Brazilian export of primary intermediates	Russian export of primary intermediates	Indian export of primary intermediates	Chinese export of primary intermediates	Brazilian export of processed intermediates	Russian export of processed intermediates	Indian export of processed intermediates	Chinese export of processed intermediates
Brazilian export incentives								-		+		-
Russian export incentives								-				-
Indian export incentives				-					-			+
Chinese export incentives			+				+		-	-	+	

Table 15 External effects of export incentives implemented in one country on export of different types of goods of other three BRIC countries by type of good targeted by incentive (results for equation (2) in Tables 6-8)

	Brazilian export of final goods	Russian export of final goods	Indian export of final goods	Chinese export of final goods	Brazilian export of primary intermediates	Russian export of primary intermediates	Indian export of primary intermediates	Chinese export of primary intermediates	Brazilian export of processed intermediates	Russian export of processed intermediates	Indian export of processed intermediates	Chinese export of processed intermediates
Brazilian export incentives targeted at final goods		-	-				+			-		-
Russian export incentives targeted at final goods					+		-					-
Indian export incentives targeted at final goods				-						-		+
Chinese export incentives targeted at final goods		+	+			+			-	-	+	
Brazilian export incentives targeted at primary intermediates			+									
Russian export incentives targeted at primary intermediates	+		-									
Indian export incentives targeted at primary intermediates	-			+								-
Chinese export incentives targeted at primary intermediates			+			-	+				+	
Brazilian export incentives targeted at processed intermediates				+				-		+		
Russian export incentives targeted at processed intermediates												
Indian export incentives targeted at processed intermediates				+								+
Chinese export incentives targeted at processed intermediates	+								-			

First thing, which strikes the eye is that negative effects dominate on more aggregate levels (Tables 12-14). This suggests that even in the world of GVCs export incentives tend to be more harmful than beneficial for foreign countries` exports. Furthermore, all positive effects on aggregate levels in Tables 12-14 with exception of one (positive effects coming from Brazilian export incentives to Russian export of processed intermediates in Table 14) arise between China and India.

From Table 15 we can make several conclusions. First, main "receivers" of positive external effects of export incentives implemented in other three BRICs countries seem to be India and China while the main "giver" is China. Second, Russia and China seem to be hurt by export incentives implemented in other BRICs a bit more often than India and Brazil. Third, Brazilian, Indian and Chinese export incentives targeted at final goods are all harmful for Russian export of processed intermediates. According to our framework, this indicates that indirect negative backward linkages` "competition for market share" effects dominate here. In particular, our study suggests that in general "BIC" export incentives targeted at domestic final goods have positive spillover effects for processed intermediates in the same two-digit industries as targeted final goods, which in turn hurt Russian producers/exporters of the same intermediates. Forth, Brazil gets positive external effects only from Russian export incentives while all negative effects come from China and India. China gets most positive effects from Indian export incentives while negative effects come from Brazil, India and China. India gets most positive effects from China but also some positive effects come from Brazil while few negative effects come from Brazil and Russia but not from China. Finally, Russia seems to be rather equally affected by Brazilian, Indian and Chinese export incentives both on positive and negative sides.

In Table 16 we summarize positive backward linkages effects` results found in Tables 9-11.

Table 16 Summary of positive backward linkages` effects

	Brazilian export of primary intermediates	Russian export of primary intermediates	Indian export of primary intermediates	Chinese export of primary intermediates	Brazilian export of processed intermediates	Russian export of processed intermediates	Indian export of processed intermediates	Chinese export of processed intermediates
Brazilian export incentives								
Russian export incentives								
Indian export incentives								
Chinese export incentives								
Brazilian export incentives targeted at final goods								
Russian export incentives targeted at final goods								
Indian export incentives targeted at final goods								
Chinese export incentives targeted at final goods								
Brazilian export incentives targeted at processed intermediates								
Russian export incentives targeted at processed intermediates								
Indian export incentives targeted at processed intermediates								
Chinese export incentives targeted at processed intermediates								

As we can see from the summary table, positive backward linkages` effects mainly emerge for export of primary intermediates. However, for China-India trade they also emerge for processed intermediates.

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. It is reasonable to think that export promotion measures implemented in a country positively affect its export and negatively – its foreign rivals` export. This study argues that in

GVCs world effects of domestic export promotion policies 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 exports of the other three BRICs. 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 emerge due to backward and forward linkages inside GVCs via trade in intermediates.

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APPENDICES

Appendix 1 *Industrial breakdown of BRICs export incentives based on Global Trade Alert (GTA) data*

Table A1.1 Industrial structure (two-digit HS 2007) of export incentives implemented in Brazil in 2009-2014 (by number of affected tariff lines (four-digit HS as reported in GTA database) including repetitions): top 10 industries

	Industry	Number of affected tariff lines including repetitions	% from total
1	**(84) Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof**	281	9,43
2	**(85) Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles**	182	6,11
3	(29) Organic chemicals	134	4,50
4	(39) Plastics and articles thereof	118	3,96
5	(28) Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	108	3,62
6	(72) Iron and steel	94	3,15
7	**(73) Articles of iron and steel**	80	2,68
8	**(90) Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and**	79	2,65
9	(38) Miscellaneous chemical products	78	2,62
10	(48) Paper and paperboard; articles of paper pulp, of paper or of paperboard.	76	2,55
	Total in top 10	**1230**	**41,28**

Table A1.2 Industrial structure (two-digit HS 2007) of export incentives implemented in Russia in 2009-2014 (by number of affected tariff lines (four-digit HS as reported in GTA database) including repetitions): top 10 industries

	Industry	Number of affected tariff lines including repetitions	% from total
1	**(84) Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.**	86	24,29
2	**(85) Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.**	42	11,86
3	**(90) Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof.**	27	7,63
4	(72) Iron and steel.	26	7,34
5	**(73) Articles of iron and steel.**	25	7,06
6	(39) Plastics and articles thereof.	20	5,65
7	(87) Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.	15	4,24
8	(40) Rubber and articles thereof.	10	2,82
9	(76) Aluminium and articles thereof.	9	2,54
10	(69) Ceramic products.	8	2,26
	Total in top 10	**268**	**75.7**

Table A1.3 Industrial structure (two-digit HS 2007) of export incentives implemented in India in 2009-2014 (by number of affected tariff lines (four-digit HS as reported in GTA database) including repetitions): top 10 industries

	Industry	Number of affected tariff lines including repetitions	% from total
1	**(84) Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof**	571	10,75
2	**(85) Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles**	363	6,83
3	(61) Articles of apparel and clothing accessories, knitted or crocheted (Textile section)	263	4,95
4	(62) Articles of apparel and clothing accessories, not knitted or crocheted (Textile section)	260	4,90
5	(28) Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	216	4,07
6	(29) Organic chemicals	203	3,82
7	**(73) Articles of iron or steel**	179	3,37
8	**(90) Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof**	160	3,01
9	(72) Iron and steel	125	2,35
10	(52) Cotton	113	2,13
	Total in top 10	**2453**	46,19

Table A1.4 Industrial structure (two-digit HS 2007) of export incentives implemented in China in 2009-2014 (by number of affected tariff lines (four-digit HS as reported in GTA database) including repetitions): top 10 industries

	Industry	Number of affected tariff lines including repetitions	% from total
1	**(84) Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof**	155	14,95
2	**(85) Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles**	100	9,64
3	(29) Organic chemicals	65	6,27
4	**(90) Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof**	54	5,21
5	(39) Plastics and articles thereof.	36	3,47
6	(70) Glass and glassware.	29	2,80
7	(87) Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.	27	2,60
8	**(73) Articles of iron or steel**	21	2,03
9	(52) Cotton.	20	1,93
10	(44) Wood and articles of wood; wood charcoal.	19	1,83
	Total in top 10	**526**	**50,72**

Note: Industries, which are in top 10 for all BRICs are marked by bold.
Source: Author`s computations based on GTA data; data accessed on 20.06.2016.

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

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

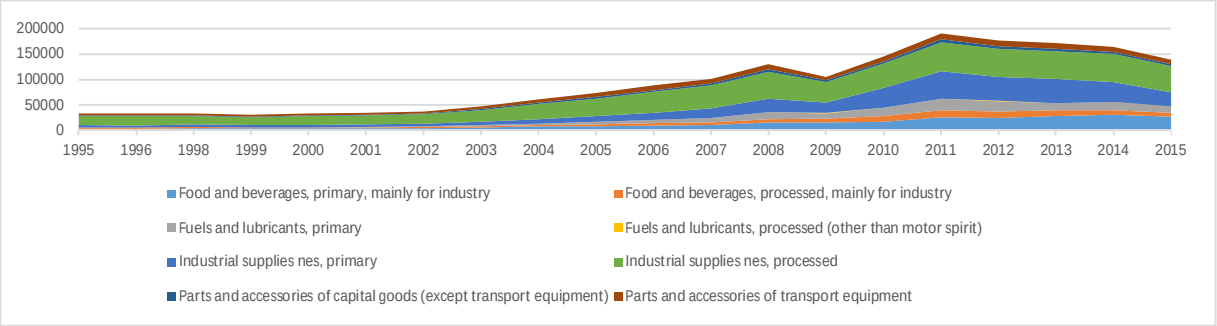


Figure A2.2. Russian export of intermediate goods: BEC structure, million USD

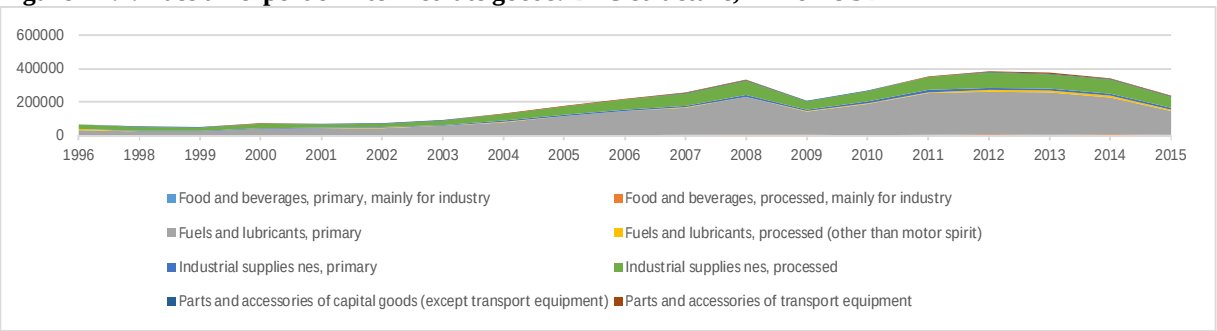


Figure A2.3. Indian export of intermediate goods: BEC structure, million USD

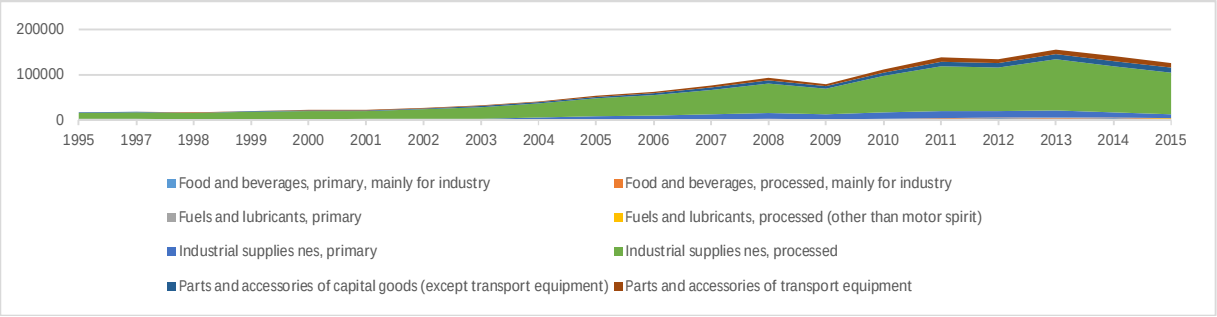
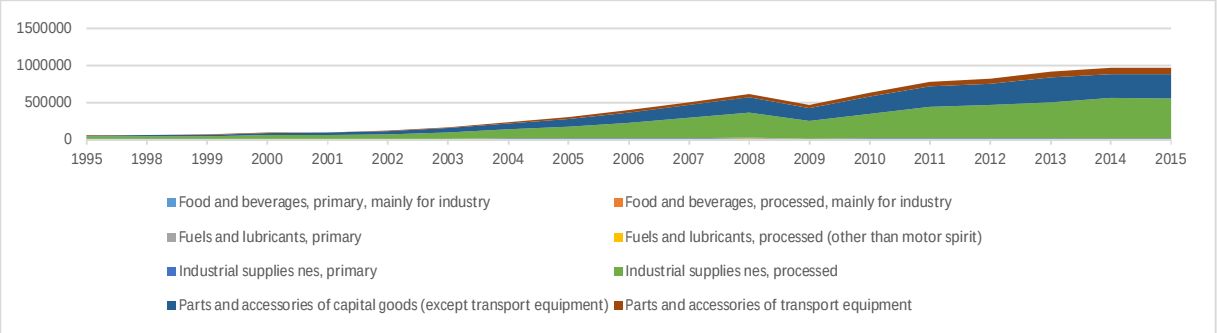


Figure A2.4. Chinese export of intermediate goods: BEC structure, million USD



Source: UN COMTRADE

Appendix 3 *BEC structure of intermediate goods` export in inter-BRICs trade in 1995-2015*

Figure A3.1 Brazilian export of intermediate goods to Russia: BEC structure, million USD

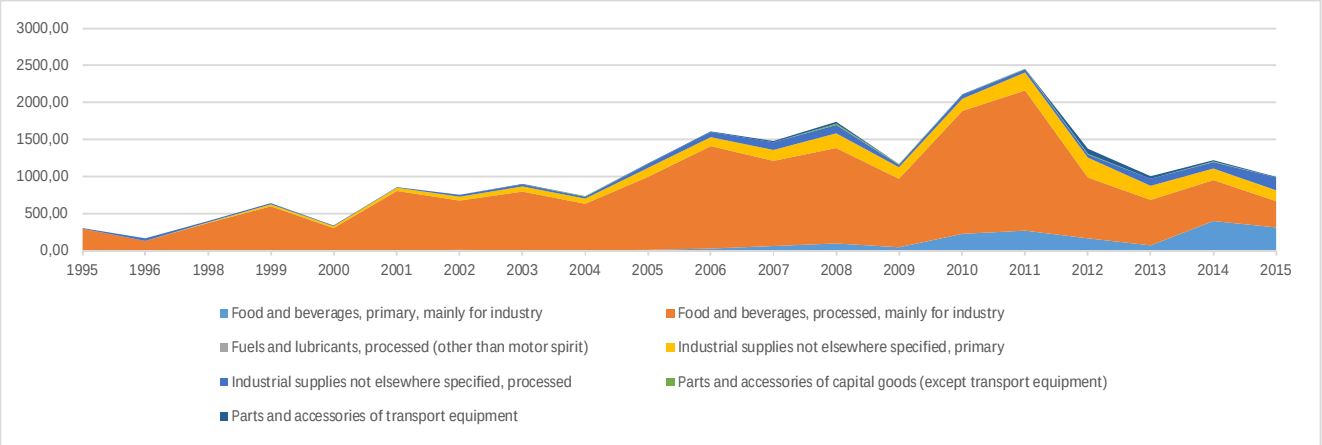
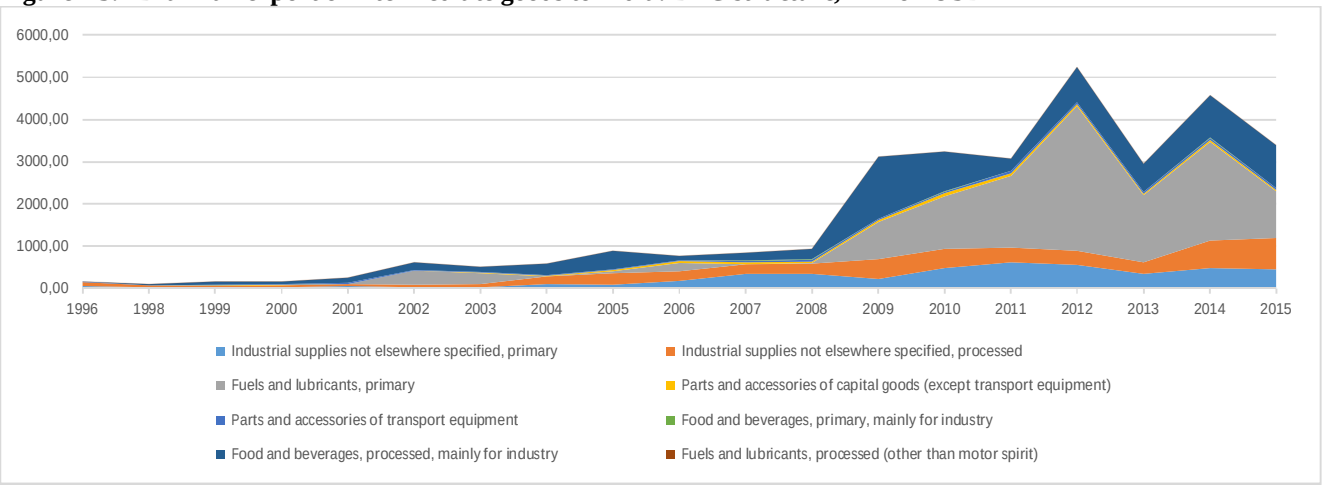


Figure A3.2 Brazilian export of intermediate goods to India: BEC structure, million USD



Source: UN COMTRADE

Figure A3.3 Brazilian export of intermediate goods to China: BEC structure, million USD

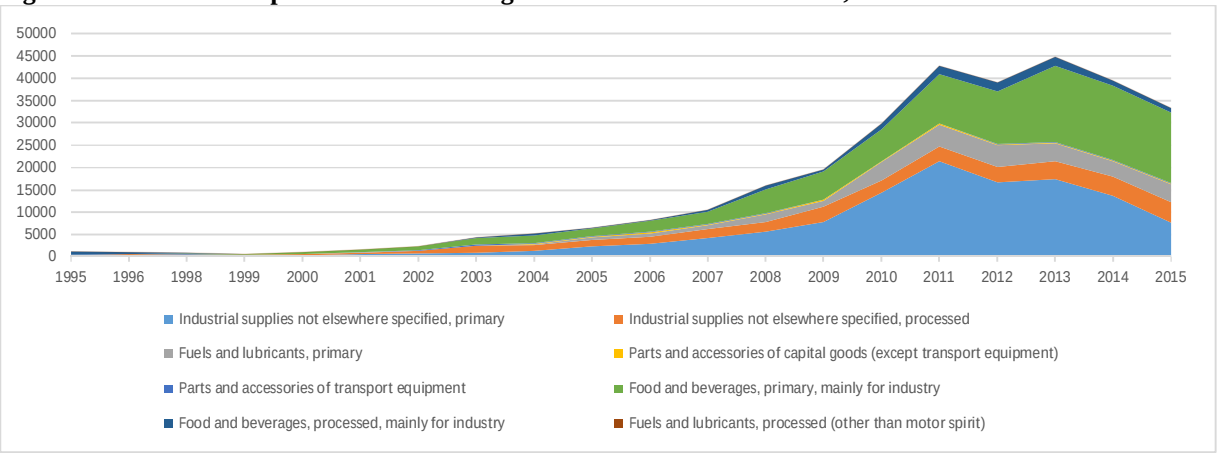


Figure A3.4 Russian export of intermediate goods to Brazil: BEC structure, million USD

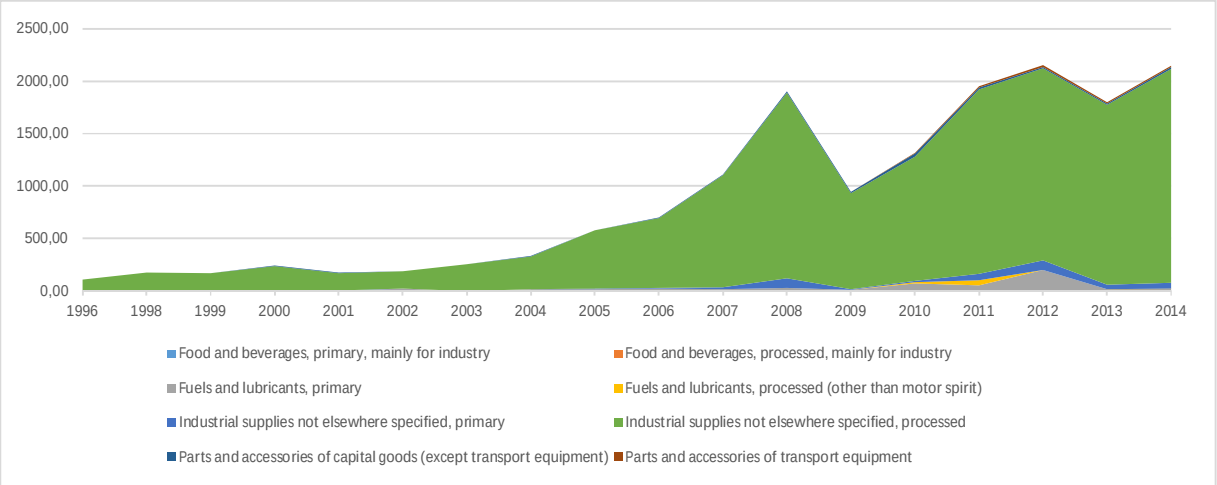


Figure A3.5 Russian export of intermediate goods to India: BEC structure, million USD

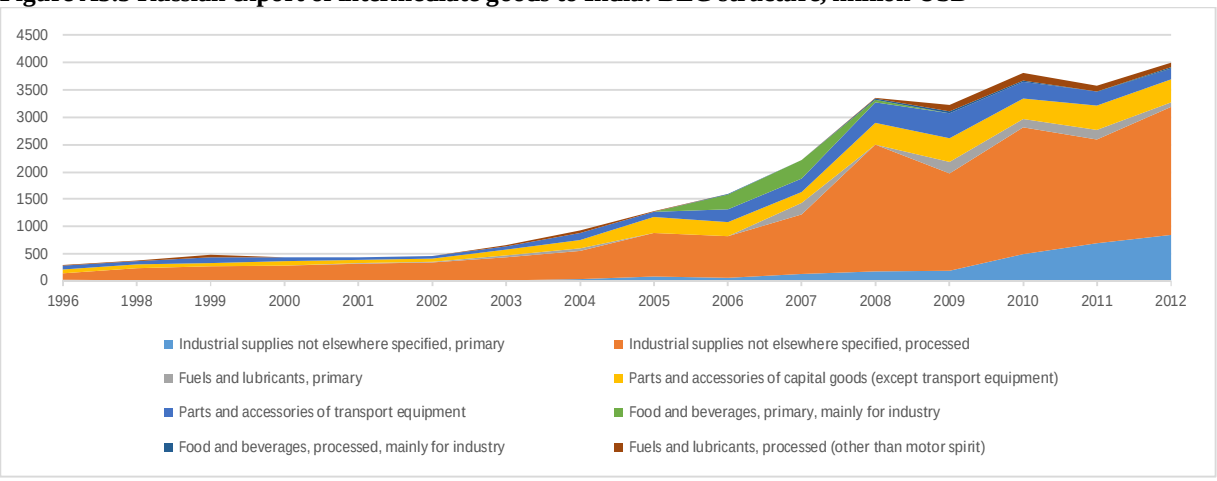


Figure A3.6 Russian export of intermediate goods to China: BEC structure, million USD

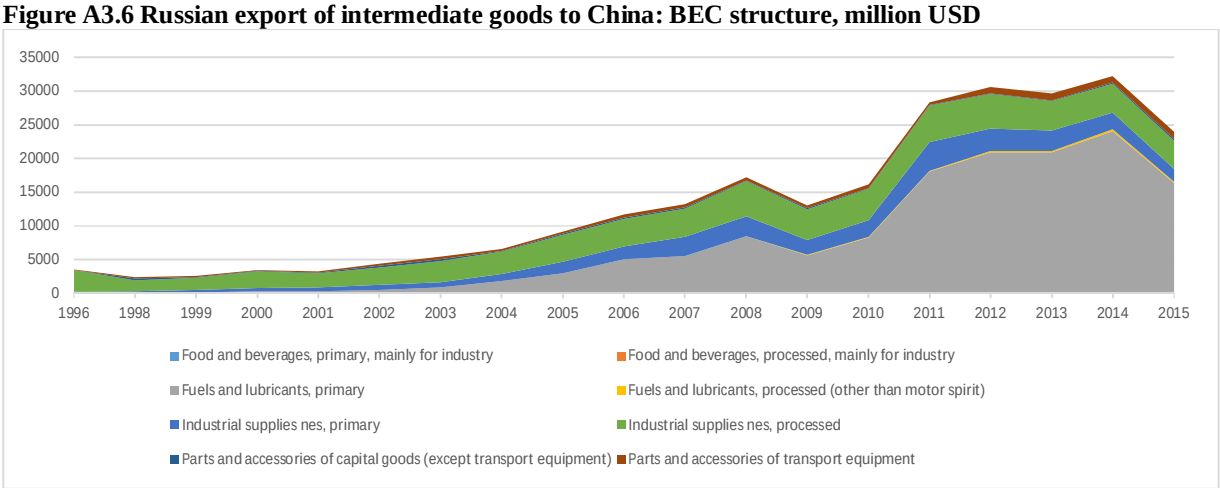


Figure A3.7 Indian export of intermediate goods to Brazil: BEC structure, million USD

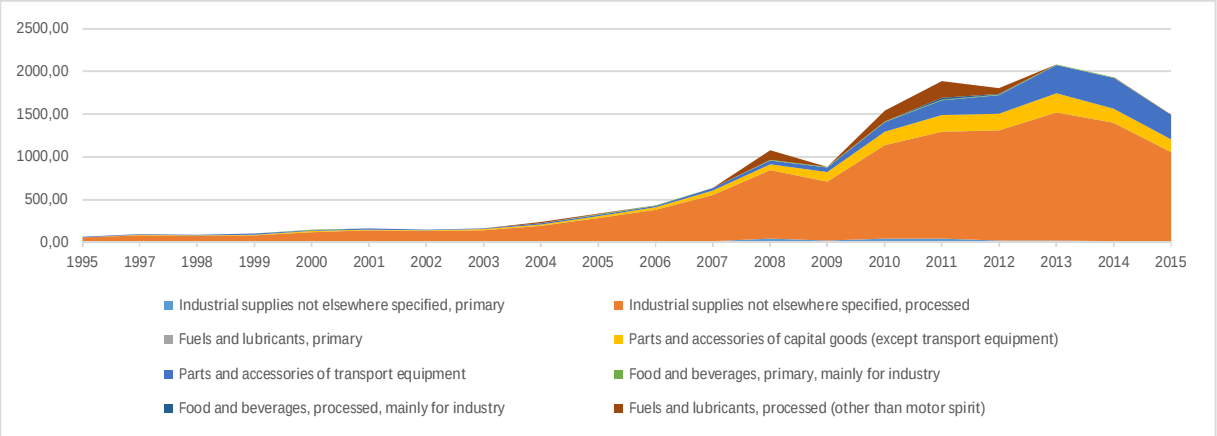


Figure A3.8 Indian export of intermediate goods to Russia: BEC structure, million USD

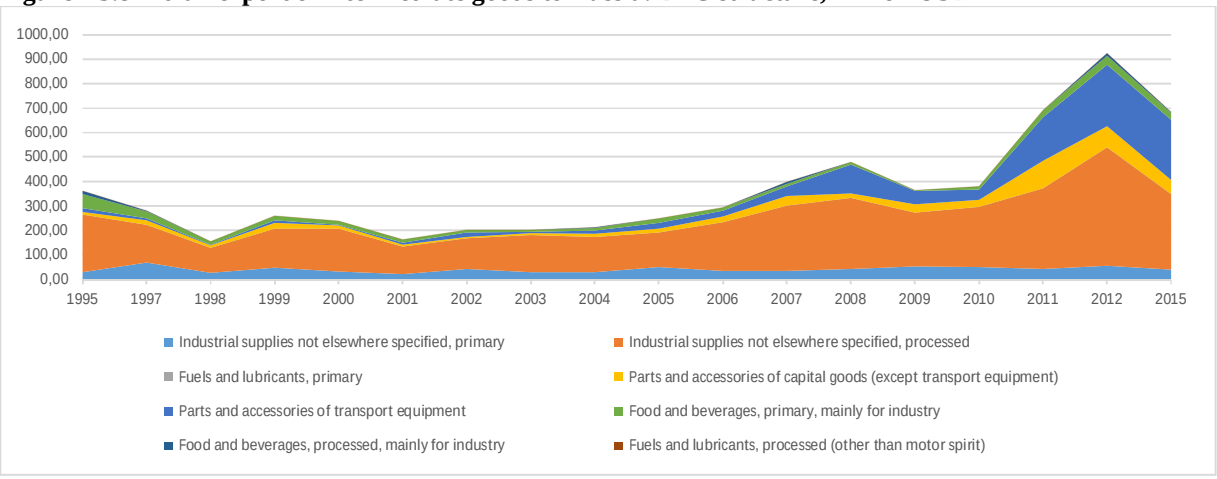


Figure A3.9 Indian export of intermediate goods to China: BEC structure, million USD

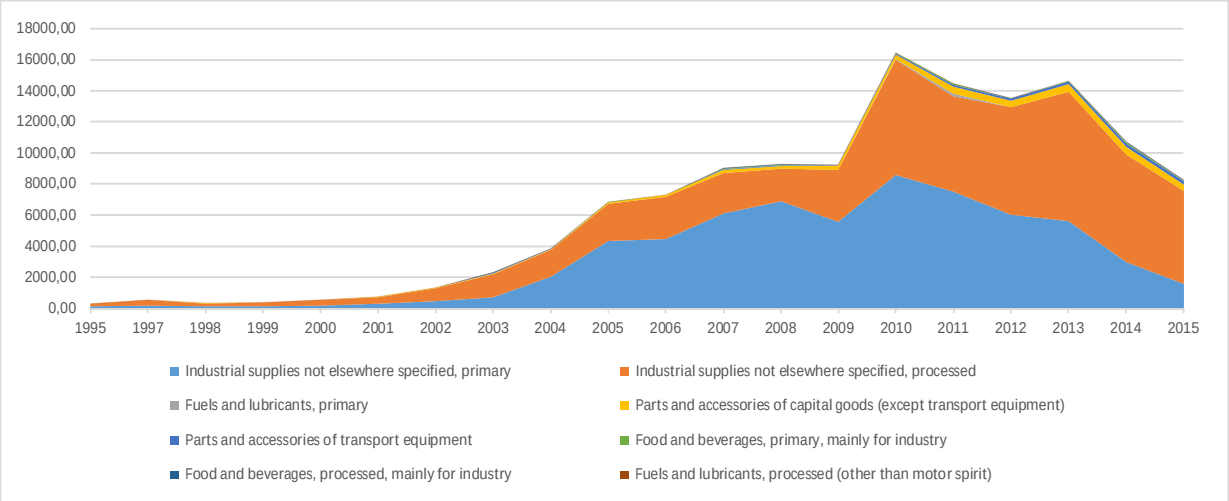


Figure A3.10 Chinese export of intermediate goods to Brazil: BEC structure, million USD

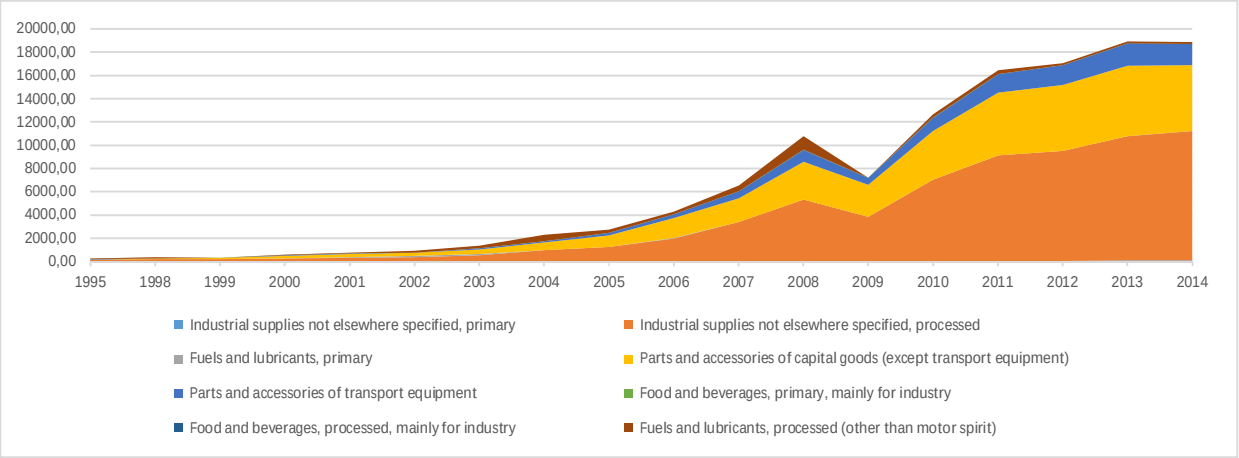


Figure A3.11 Chinese export of intermediate goods to Russia: BEC structure, million USD

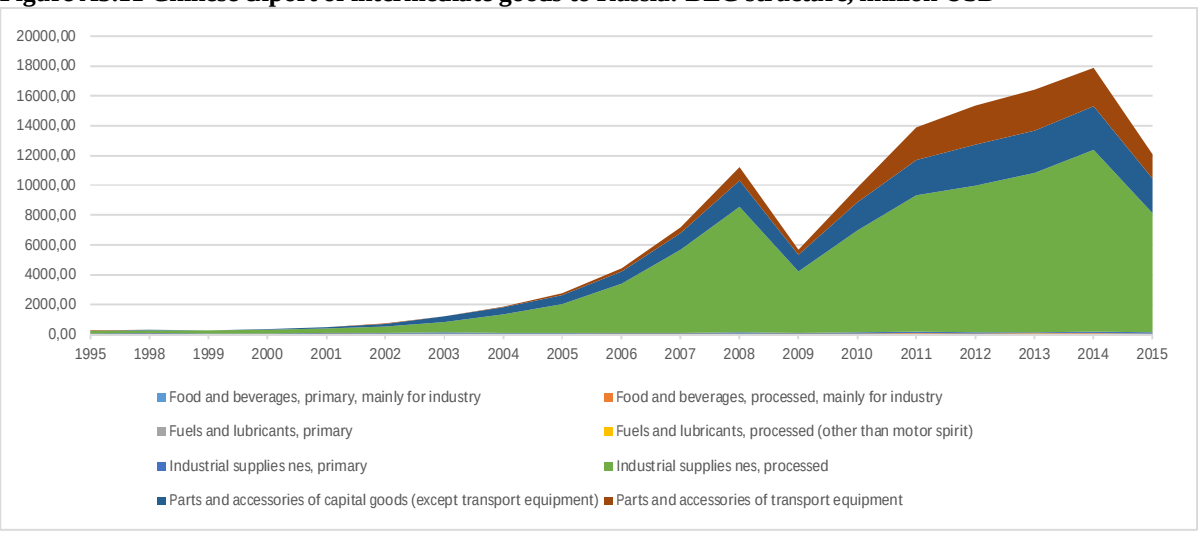
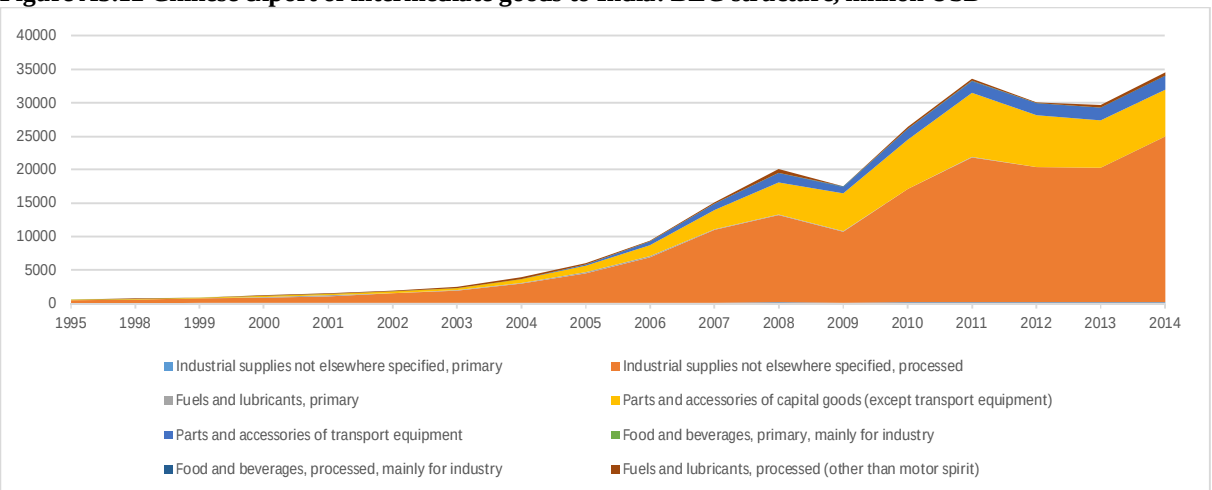


Figure A3.12 Chinese export of intermediate goods to India: BEC structure, million USD



Source: UN COMTRADE

Appendix 4 *UNCTAD computation strategy of the factor intensity indices*

The revealed factor intensity indices for each traded good were calculated as a weighted average of factor abundance of 94 countries exporting that good, with a variant of *Balassa's Revealed Comparative Advantage (RCA) indices* as weights.

The *Revealed Capital Intensity Index*, *RCI* of good *i* is calculated as:

$$RCI_i = ci_i = \sum_c v_i^c \frac{K^c}{L^c} \quad \text{(A1)},$$

where K^c is country`s *c* capital stock, $L^c$ is its labor force, and $v_i^c$ is a variant of Balassa`s RCA for country *c* in good *i*. For *RCI*`s computation, capital stock estimates have been reconstructed from investment flows by adding up, recursively, current investment to the previous period's capital stock, appropriately depreciated. In particular, Easterly and Levine (2001) capital stock estimates have been replicated using the updated version 6.2 of the Penn World Table which provides aggregate investment figures for 159 countries.

The *Revealed Human Capital Intensity Index*, *RHCI*, of a good *i* is given by:

$$RHCI_i = si_i = \sum_c v_i^c h^c \quad \text{(A2)},$$

where h^c is the average years of schooling achieved by the average person. The *RHCI* is based on Barro and Lee (2001) estimates of educational attainment rates for 105 countries at five-year intervals from 1960 to 2004 for different levels of education for overall populations aged over 15 and over 25, respectively. Both si_i and ki_i are for HS 4-digit industry.

The *Revealed Natural Resource Intensity Index*, *RNRI*, of a good *i* is calculated as:

$$RNRI_i = \sum_c v_i^c nr^c \quad \text{(A3)},$$

where nr^c is natural resource capital per person. To measure the natural resource endowment in a country, UNCTAD researchers used two alternative data sources. First indicator is arable land taken from the World Bank's World Development Indicators (WDI). Second indicator is taken from the database on natural resource capital from the World Bank's volumes "Expanding the Measure of Wealth" (1997) and "Where is the Wealth of Nations?" (2006). The database covers only two years (1994 and 2000) and provides with the most complete measure of natural resource endowments to date. Natural resource capital in the database consists of non-renewable resources (subsoil assets, including oil, natural gas, coal, and mineral resources), cropland, pastureland, forested areas (including areas used for timber extraction and non-timber forest products), and protected areas. In this study we use the *RNRI* computed using natural resource capital database (i.e. second alternative).

Appendix 5 Descriptive statistics and correlation matrix of variables in baseline estimations

Table 5.1. Descriptive statistics

Variable	N. obs.	Mean	Std. Dev.	Min	Max
Dependent variables					
es (it,Brazil)	30 184	0,00	1,00	-0,25	14,61
es (it,Russia)	30 184	0,00	1,00	-0,26	15,44
es (it, India)	30 184	0,00	1,00	-0,39	7,91
es (it, China)	30 184	0,00	1,00	-0,93	3,02
Explanatory variables					
si (it)	30 300	0,00	1,00	-4,08	2,47
ci (it)	30 300	0,00	1,00	-2,05	2,80
nci (it)	30 294	0,00	1,00	-1,60	9,84
er (it, Russia)	30 300	0,00	1,00	-0,12	20,07
er (it, India)	30 300	0,00	1,00	-0,07	43,79
er (it, China)	30 300	0,00	1,00	-0,11	13,50
ei (it, Brazil), two-digit	30 300	0,00	1,00	-0,93	2,99
ei (it, Russia), two-digit	30 300	0,00	1,00	-0,30	4,85
ei (it, India), two-digit	30 300	0,00	1,00	-0,66	4,12
ei (it, China), two-digit	30 300	0,00	1,00	-0,74	2,58

Note: Descriptive statistics is reported for standardized variables.

Table 5.2. Correlation matrix

	es (it,br)	es (it,ru)	es (it, in)	es (it, ch)	si (it)	ci (it)	nci (it)	er (it, ru)	er (it, in)	er (it, ch)	ei (it, br)	ei (it, ru)	ei (it, in)	ei (it, ch)
es (it,br)	1,00													
es (it,ru)	0,02	1,00												
es (it, in)	-0,01	-0,03	1,00											
es (it, ch)	-0,12	-0,12	-0,07	1,00										
si (it)	-0,11	0,01	-0,30	-0,27	1,00									
ci (it)	-0,15	-0,04	-0,25	-0,29	**0,85**	1,00								
nci (it)	-0,02	0,12	-0,14	-0,23	0,40	0,34	1,00							
er (it, ru)	0,02	0,10	0,00	-0,08	-0,04	-0,04	0,06	1,00						
er (it, in)	0,14	0,02	0,00	-0,03	-0,07	-0,07	-0,01	-0,01	1,00					
er (it, ch)	0,02	0,10	0,00	0,00	0,03	0,01	0,02	0,00	-0,01	1,00				
ei (it, br)	-0,05	-0,03	-0,09	-0,07	0,30	0,36	0,05	-0,03	-0,03	-0,01	1,00			
ei (it, ru)	-0,03	-0,02	-0,06	-0,02	0,14	0,17	0,02	-0,02	-0,02	-0,02	**0,58**	1,00		
ei (it, in)	-0,07	-0,04	-0,03	0,08	0,12	0,16	-0,04	-0,04	-0,03	-0,02	**0,74**	**0,86**	1,00	
ei (it, ch)	-0,07	-0,08	-0,09	-0,03	0,28	0,35	0,01	-0,05	-0,05	-0,06	**0,89**	0,49	**0,64**	1,00

Note: 1) *br* denotes *Brazil*; *ru* denotes *Russia*; *in* denotes *India*; *ch* denotes *China*; 2) correlation coefficients higher than 0.5 are denoted by bold.

Table 5.3. Correlation matrix of export incentives` variable disaggregated at two- and four-digit levels

	ei (it, Brazil), four-digit	ei (it, Russia), four-digit	ei (it, India), four-digit	ei (it, China), four-digit	ei (it, Brazil), two-digit	ei (it, Russia), two-digit	ei (it, India), two-digit	ei (it, China), two-digit
ei (it, Brazil), four-digit	1,00							
ei (it, Russia), four-digit	0,20	1,00						
ei (it, India), four-digit	0,24	0,40	1,00					
ei (it, China), four-digit	0,18	0,18	0,21	1,00				
ei (it, Brazil), two-digit	0,29	0,35	0,12	0,35	1,00			
ei (it, Russia), two-digit	0,15	**0,75**	0,33	0,19	**0,58**	1,00		
ei (it, India), two-digit	0,21	**0,61**	**0,53**	0,28	**0,74**	**0,86**	1,00	
ei (it, China), two-digit	0,15	0,27	0,08	0,46	**0,89**	**0,49**	**0,64**	1,00

Note: Correlation coefficients higher than 0.5 are denoted by bold.