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Internal and International Vertical Specialization of Brazilian states – An Input-Output analysis

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WTO, OECD with many others, suggest the trade in value-added would be a “better” measure than gross value to understand the impact of trade on employment, growth, production etc. We use in this work an Input-Output table for 2008, to calculate the value-added exported by Brazilian states. We distinguish the value-added exported directly by the state itself or indirectly via other states. Then, we define the extent of vertical specialization among Brazilian states by using value-added indirectly exported. We calculate equally the import content in states’ exports. If the share of import content in Brazilian exports is low, we show evidence that inter-state trade is quite high across some Brazilian states. Inter-state vertical specialization then operates at upstream stages of the value chain before the good be exported to foreign countries. However the value-added of a state; indirectly exported by another state is quite balanced by the value-added of its own exports which is imported from other states, then the export shares of each state in total Brazilian exports in value-added terms or in gross terms are close.

Vertical Specialization – Global supply-chain – Input-Output Analysis – Brazil – intra-national trade

L’OMC et l’OCDE notamment, suggèrent que le commerce en valeur ajoutée est une meilleure mesure des échanges que la valeur brute pour comprendre l’impact du commerce sur l’emploi, la croissance, la production etc. On utilise dans ce travail un tableau Input-Output pour l’année 2008 afin de calculer les valeurs ajoutées exportées par les États brésiliens. On distingue la valeur ajoutée exportée directement par un État de celle exportée indirectement via d’autres États. En utilisant la valeur ajoutée indirectement exportée, on définit l’ampleur de la spécialisation verticale entre les états brési-
1. Introduction

The goods exported by a country are rarely produced entirely within the country, which implies that the export values are made up partly of imported value-added. Indeed, the contribution of exports to growth and employment depends solely on the domestic value-added content.

The collapse of international trade from mid-2008 to mid-2009 was striking with a 38% fall in world exports and a massive 53% for China in just nine months. The “vertical specialization” process appears to play an important role in this surprisingly deeper and sudden recession (Liu [2011]) (Escaith, Lindenberg and Miroudot [2010]). The vertical specialization, “... occurs when a country uses imported intermediate parts to produce goods it later exports” (Hummels, Rapoport and Yi [1998]). It notably implies that the value-added of a component may be recorded several times in the trade statistics, i.e. each time it crosses the border for use in a new stage of the production process (Koopman, Wang and Wei [2012]). Recent studies confirm the trend to the deepening of vertical specialization. For example, the ratio of domestic value added to gross trade would have fallen by ten to fifteen percentage points, with two-thirds of this decline in the last two decades (Johnson and Noguera [2012]) what is confirmed by other studies (OECD [2011]).

For example, China is not specialized in exports of laptops, but after importing the technology and the components, is mainly specialized in the assembly of the final good, which is situated at the final stage of the industrial process (Koopman, Wang and Shang-Jin [2008]). Therefore, countries more specialized in the last stage of the production export more in terms of gross value and so seem more integrated into world markets. Vertical specialization also implies the domestic trade. It may occur before the exportation of the good with the fragmentation of the production process through a

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6. WTO statistics.

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supply chain across the regions inside the country (internal vertical specialization) and outside the country (re-exportation).

In reality, neither factor nor good markets are really “perfectly” integrated. Factors of production are not completely mobile, even within one country. A country’s regions may differ in terms of their specializations and production costs. So there could be a gain in producing tasks in different regions of a country. This is especially true for developing and emerging markets, such as Latin American countries, India and China, where regional differences are considerable. At our knowledge, this imbrication between domestic and international vertical specialization has never been studied, at least with the I-O methodology we use in the paper.

Domestic vertical specialization may be more or less accentuated depending on the inter-regional comparative advantages, but although depending on the country’s integration in the international supply chain. A region specialized at the final step of the production process will need to purchase intermediate goods originating either from the other regions of the country or from the rest of the world. Hence, a high share of import content in country’s gross exports can imply a low level of domestic vertical specialization. On the other hand, a high national value-added in country’s exports (low import content) can be due to a specialization in primary products which, by nature, need a short process or no process at all inside the country. In that case, we observe neither international, nor domestic integration in the global value chain.

Brazil is a specific case. Brazil’s rate of openness is low compared to other large emerging countries such as China. However, the domestic value-added content of Brazilian exports is probably higher (or the import content lower) since Brazilian specialization is mainly in tasks located at the early stages of the supply chain, such as raw materials, e.g. compared to China.

Brazil’s poor performance in terms of openness does not obviously imply a low level of specialization along the domestic supply chain. Considering the high heterogeneity of Brazilian regions notably in terms of climate, location and factor endowment, there is room for large internal vertical specialization within Brazil. Yet although states’ trade statistics are available, they are given in gross value and we have no information on the shares of own domestic value-added and import content from other states in states’ exports.

The purpose of this paper is precisely to explore the contribution of each Brazilian state to Brazilian exports by using an Inter-state Input-Output matrix. Input-output analysis is crucial to measure the total import content of exports, either across the whole industry or in the entire country or region, because the national accounts are not merely sufficient to find the first order origin of the value-added. Section II describes the methodology founded on the input-output analysis, as a way of measuring trade in value-added terms and tracking interregional linkages from a value-added point of view. Section III explains the specific method used for the Brazilian Inter-State IO Table. Section IV provides a descriptive preliminary analysis of the results on the structure of inter-state vertical specialization for export products. Lastly, we present a conclusion on our results.
2. Methodology: Trade in value-added and interregional input-output tables

Conceptually, the gross value of each exported good includes the exporter’s value-added and the value-added of the imported inputs incorporated into the good by the foreign and domestic firms at earlier stages of the production chain. At first glance, for a traded good, the domestic content in exports or the value-added by an exporting entity is measured as the difference between the gross value of the exported good and the imported inputs used to produce it. However, some primary goods and/or components might be exported and re-imported for the transformation. Then, in order to find the origin of the inputs used and, by extension, the origin of the inputs used to produce these inputs and so on, we can decompose the value of a good \( P_a \) in the value-added \( V_i \) generated across countries or, more broadly, across different geographic entities \( i \) participating in the production chain: \( P_a = \sum_i V_i \). Where \( P_a \) is the gross value of product \( a \) and \( i \) is the origin of value-added.

However, it is tricky to measure the origins of value-added using national accounts, and International input-output (IO) tables are increasingly used as a way to measure the domestic value content of exports (Hummels and al. [2001]), (De Backer and Yamanao [2008]). IO tables, based on Leontief method [1986], use the mathematical equality between sales and purchases to analyze the impact of an increase in sales under certain assumptions (see, for example, Miller and Blair [2009]). They consist of a closed, endogenous part, which basically concerns the flows of inputs among the industrial sectors of the economy. The final demand in the economy is “exogenous” to IO table, since it is assumed to be independent of the industrial production linkages.\(^7\)

The interregional input-output (IRIO) tables, as a specific form of IO tables, can be used to estimate the value chains in traded goods by including the interdependencies among industrial sectors in different geographic entities. While IO tables concentrate on the industrial linkages inside a region and consider the sales to other regions as exports (final demand) without distinguishing if it is for final consumption or for transformation, in IRIO models, this distinction is made clear, with regional exports being distinguished between the goods sold to the other regions’ final consumption from those exported as intermediate goods.

A construction of International Input-Output table (IIO) has been funded by the European Commission (www.wiod.org) in which each country is considered as a region in line with IRIO models. The OECD has also national IO

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\(^7\) In some IO analysis, the household’s consumption, which is part of the final demand, can also be treated as being endogenous in the system.

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tables for some countries showing the import volume for each export sector (OECD [2011]). WTO databases on trade in value-added are now published and updated. However, for Brazil, this restriction has few consequences because the country has no significant processing zones devoted to exports.

In our analysis, we also use an IRIO (Inter-State IO table) table in which each Brazilian state is assumed as a region whose production is interdependent with other states and their exports to other countries are exogenous to the system. In this structure, for example, the exports of São Paulo state (SP) to France depends also on the intermediate goods imported (interregional trade) from Rio de Janeiro state (RJ). The Inter-state IO (IS-IO) table that we use for 2008 is constructed for 56 industries and 27 states.

Let’s consider $a_{ij}^{rs}$ and $z_{ij}^{rs}$ being, respectively, the regional input-output coefficient and the monetary value of the flow of goods necessary as input from industry $i$ in origin state $r$ for the output of industry $j$ in state $s$, and $x_j^s$ being the total output of industry $j$ in region $s$. Then, the $a_{ij}^{rs}$ are calculated as follows,

$$a_{ij}^{rs} = \frac{z_{ij}^{rs}}{x_j^s} \tag{1}$$

In IS-IO table, technical coefficients ($a_{ij}^{rs}$) define the production structure across Brazilian states. Then, on the sales side (IS-IO table row), the total output of sector $i$ ($x_i^r$) in origin state $r$ is equal to its supply (sales of inputs) of intermediate goods to industries $j$ in destination state $s$ ($a_{ij}^{rs} x_j^s$; where $j = 1, \ldots, 56$ and $s = 1, \ldots, 27$) for production (output $x_j^s$) and of consumption goods for final demand in state $r$ ($f_i^r$): final consumption expenditure, government expenditure and exports (sales of consumption goods to other states or countries).

$$x_i^r = a_{i1}^{r1} x_1^r + \ldots + a_{ij}^{rs} x_j^s + \ldots + a_{i56}^{rs} x_{56}^s + f_i^r \tag{2}$$

Or equally,

$$x_i^r = \sum_{j=1}^{56} \sum_{s=1}^{27} a_{ij}^{rs} x_j^s + f_i^r \tag{2}$$

By writing the equation (2) for all industrial sectors $i$ and all states $r$, we get a system of $56 \times 27$ linear equations, which can be represented in matrix form:

$$x = Ax + f \tag{3}$$

$A$ is an $(56 \times 27) \times (56 \times 27)$ matrix of the interstate input-output coefficients representing interdependencies between Brazilian industries and states.
The final demand vector $f(56^{*}27^{*}1)$ is,

$$f = \begin{bmatrix} f^r \\ \vdots \\ f^s \end{bmatrix}$$

The output vector $x(56^{*}27^{*}1)$ is:

$$x = \begin{bmatrix} x^r \\ \vdots \\ x^s \end{bmatrix}$$

By rewriting the equation (3) with the Leontief inverse $(L = (I - A)^{-1})$, we can calculate the volume of gross output required to produce the additional final demand $\tilde{f}$:

$$\tilde{x} = (I - A)^{-1}\tilde{f} = L\tilde{f} \quad [4]$$

Where

$$I = \begin{bmatrix} I & 0 & 0 \\ 0 & \backslash & 0 \\ 0 & 0 & I \end{bmatrix}$$

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Or equally, we can approximate it by a von Neumann series as follows:

$$x = \bar{f} + Af\sqrt{x} + A^2 f\sqrt{x} + \ldots$$

Von Neumann series approximation shows that the gross output required to produce \( \bar{f} \) will be more than \( \frac{f\sqrt{x}}{H} \). Precisely, productive sectors in a state will produce \( \bar{f} \), the initial effect, with the inputs coming from the state itself but also from other sectors and states \( (Af) \). This first round effect is called the direct effect of the final demand on the economy. However, the sectors producing inputs \( (Af) \) also need inputs, calculated in the second round as \( A^2 \bar{f} \), and so on, called the indirect effect of demand \( \bar{f} \) on the economy.

On the purchase side (IS-I0 table column), the output of sector \( j \) in state \( s \) is equal to its purchases of inputs from other industries \( r \) in origin state \( \sum_{r=1}^{27} a_{ij} x_j^r + p_i^s \).

Equation (4) can be used to evaluate the impact of a change in final demand on total output and further measure, based on the equality from the purchase side (Equation 6), its impact on the payment sectors, which includes in part the value-added.

The next step is to calculate the value-added contributions of state \( s \) (value-added of \( s \) is an element of payment sectors \( p_i^s \) in equation (6) but also embodied in the inputs purchased from other states) and of state \( r \) (value-added embodied in the inputs purchased by state \( s \) from the industries of state \( r \)) in respond to the change in the exports (final demand, \( f \)) of state \( s \). On this point, we need the vector of value-added coefficients representing the share of value-added in the gross output of each industrial sector and in each state to measure the expected impact on value-added.

Let’s represent the initial value-added contribution \( v_i^s \) where \( i = 1, \ldots, 56 \) and \( s = 1, \ldots, 27 \) for each industrial sector by the row vector \( v' \) (see Miller and Blair [2009, p. 243-271])

$$v' = [v_1^v, v_2^v, \ldots, v_{56}^v, v_1^v, v_2^v, \ldots, v_s^v]$$

The value-added coefficients \( v_i^s \) are then equal to the initial value-added contribution of each industrial sector divided by that sector’s gross output in the state \( (s = 1, \ldots, 27) \):

$$v'_v = v' x^{-1} = [v_1^v / x_1^v, v_2^v / x_2^v, \ldots, v_{56}^v / x_{56}^v, v_1^v / x_1^v, v_2^v / x_2^v, \ldots, v_s^v / x_s^v]$$

8. Technical coefficients \( (a_{ij}^r) \) have the following features:

$$\sum_{r=1}^{27} a_{ij}^r \neq x_j^r$$ and \( \sum_{i=1}^{56} \sum_{r=1}^{27} a_{ij}^r < 1 \)
Where $\tilde{x}$ is a diagonal matrix and $\tilde{x}^{-1} = \begin{bmatrix} 1/x_1 & \ldots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \ldots & 1/x_i \end{bmatrix}$

Then from the matrix algebra and by using the equation (8) for $v^\prime_c$, we can calculate a column vector $e$ whose elements measure the value-added generated in each sector and in each state given the changes in the final demand $f$:

$$\tilde{z} = v^\prime_c \tilde{x} = v^\prime_c Lf$$  \hspace{1cm} [9]$$

$\tilde{z}$ gives us the value added contribution of each state in response to a change in states’ exports. For the rest of the paper, we will refer to the value-added contribution of the state to whom the final demand (exports) is addressed as the “direct value-added in exports” and the value-added embodied in inputs purchased from other states for the production of export goods as “indirect value added in exports”.

For example, in line with equation (4), the output required from sector $i$ in region $r$ ($\tilde{x}^r_i$) to respond to the final demand of exports in region $s$ from sector $j$ ($f^s_j$) is equal to:

$$\tilde{x}^r_i = l^r_{ij}^s f^s_j$$

where $l^r_{ij}^s$ is the element of the interregional Leontief inverse matrix ($L$) concerning the purchases of sector $j$ in region $s$ from sector $i$ in region $r$.

And the indirect value-added contribution ($\tilde{z}^r_i$) of sector $i$ in region $r$ due to spillover impact of the demand of exports from industrial sector $j$ in region $s$ ($f^s_j$) can be calculated by equation (9):

$$\tilde{z}^r_i = (v^\prime_c)_{i}^r l^r_{ij}^s f^s_j$$

3. The construction of the Brazilian Inter-state input-output table

The Brazilian inter-state input-output system for 27 regions (26 states and the Federal District) for 2008 was estimated based on a combination of different sources of data and methodologies. We first detail the data available to estimate the Brazilian input-output table and then address the construction of the inter-state input-output system.

The most recent input-output system released by the Brazilian Statistical Office (IBGE) refers to 2005 (IBGE [2008]). However, using the information
available in the Brazilian System of National Accounts (IBGE [2010]) and the methodology presented by Guilhoto and Sesso Filho [2005] [2010], we can estimate an input-output system for 2008. The estimated national input-output system was then used as the basis to estimate the inter-state system for Brazil based on the methodology presented in Guilhoto et al. [2010].

The steps followed for the estimation of the inter-state system for Brazil can be summarized as follow:

- Using information from the IBGE surveys of Agriculture, Industry, Trade, Transport, Services, and Civil Construction, a first estimate is made of total output by 56 industries and 110 commodities for each of the Brazilian states;
- These initial estimates are then balanced to match the total output at the level of 17 industries presented in the Brazilian Regional Accounts (IBGE);
- These output estimates are also used to estimate the supply tables for each of the Brazilian states. The states’ supply tables are estimated in such a way as to be consistent with the national supply table;
- The tax, imports, and the input-output system’s final demand components are estimated for the 56 industries for each of the Brazilian states, which are also consistent with the value-added components in the national input-output table9;
- Using cross-industry location quotients for intermediate consumption and simple location quotients for final demand, a first estimation is made of flows of goods and services among the Brazilian states;
- Using the work done by Vasconcelos and Oliveira [2006], which estimates the flow of goods among Brazilian states for 1999, and taking into consideration the growth of the states from 1999 to 2008, a second estimation is made of flows of goods and services among the Brazilian states;
- The third and final estimation of flows of goods and services among the Brazilian states is made taking into consideration the following: a) the inter-state input-output system should be consistent with the national table; b) the change in inventories should be zero when they are zero in the national table; c) the change in inventories in each state, when related to the total output of the corresponding sector should be in a range no greater than 30% of this relation found in the national table;
- The third estimation produces a commodity by industry inter-state input-output system for Brazil. The supply tables for each of the states are then used to obtain the industry-by-industry inter-state system used in this work.

9. Sources and information are: imports and exports by state: Ministry of Development, Industry and External Trade; tax collection in each state, government spending: Ministry of Finance and the State Secretaries of Finance, IBGE; payments to workers by industry and state: Ministry of Labor and IBGE Household Survey; household spending: Household and Household Consumption Patterns surveys; value-added generated at the level of 17 industries, by state: Brazilian Regional Accounts, IBGE; investment is based on the level of the Civil Construction in each state (IBGE).
4. Vertical specialization in Brazil

The diversified nature of Brazilian states’ characteristics, such as factor endowments, economic sizes, infrastructures, etc., may drive vertical specialization at national level. The exported goods are produced by a sequence of tasks in which one or more Brazilian states are involved. Hence, the value of gross exports from one state may partly include the value-added from other states, which inter-link the foreign trade with inter-state trade.

On this purpose, we calculate the value-added contribution of each state for states’ exports. They are computed by inversing the technical coefficient matrix from Inter-state Input-Output system for 2008. In our I-O system, the gross exports of each state \( s \) is driven by the demand exogenous to the inter-state production chain, hence is an element of final demand \( f^s \) addressed to state \( s \). In order to respond the final demand addressed \( f^s \), state \( s \) will produce the output \( x^s (x^s = L^r f^s) \) and the state \( r \) will participate to production process and produce \( x^r (x^r = L^s f^r) \) due to spillover impacts. Then, we appeal the value-added contribution \( \psi^s x^s \) of state \( s \) as “direct value-added contribution” of \( s \) to its exports and the spillover impact as “indirect value added contribution” of state \( r \) to the exports of \( s \) \( \psi^r x^r \).

In Graph 1, we show the percentage share of the gross export values of each state broken down by the value-added of the state itself (direct value-added contribution), the value-added originating in other states and

**Graph 1. Breakdown of Brazilian states’ gross exports (2008)**

Acre: AC; Alagoas: AL; Amazonas: AM; Amapa: AP; Bahia: BA; Ceara: CE; Distrito Federal: DF; Espirito Santo: ES; Goias: GO; Maranhao: MA; Minas Gerais: MG; Mato Grosso Do Sul: MS; Mato Grosso: MT; Para: PA; Paraiba: PB; Pernambuco: PE; Piaui: PI; Parana: PR; Rio De Janeiro: RJ; Rio Grande Do Norte: RN; Rondonia: RO; Roraima: RR; Rio Grande Do Sul: RS; Santa Catarina: SC; Sergipe: SE; Sao Paulo: SP; Tocantins: TO.

Source: 2008 Inter-State Input-Output Table calculated in association with J. Guilhoto (USP) based on the NEREUS database. Some elements are available on [http://guilhotojmg.wordpress.com/banco-de-dados/matrizes-nacionais-2/](http://guilhotojmg.wordpress.com/banco-de-dados/matrizes-nacionais-2/)

In Graph 1, we show the percentage share of the gross export values of each state broken down by the value-added of the state itself (direct value-added contribution), the value-added originating in other states and
re-exported (indirect value-added contribution), the gross imports from other countries\textsuperscript{10} and the tax collected in Brazil. For example for São Paulo (SP), the value-added produced by the state itself represents approximately 50\% of SP’s gross exports, while the value-added of 26 other states embodied in SP’s gross exports is about 20\%, as the content imported from the world.

In average, 54\% of states’ exports are produced by themselves while 24\% is the domestic import content re-exported. The foreign import content in states’ exports is around 12\% on average, which is in line with the OECD-WTO “Trade in Value Added” data (10.9\% in 2008)\textsuperscript{11}. However, percentages vary across states. Three small states (Roraima (RR), Acre (AC) and Tocantins (TO)) in the Northern region, which are relatively isolated from the rest of the country, have more than 70\% of their own value-added in their exports. Minas Gerais (MG), Pará (PA), Amapá (AP), Espírito Santo (ES), Piauí (PI) and Rio de Janeiro (RJ) also post a higher than average (more than 54\%) domestic value-added share in their gross exports. This result may be explained by the states’ large exports of natural resources, such as minerals for MG and iron ore for PA (Neto [2001]). In the case of Amazonas (AM), where the Manaus Free Trade Zone (MFTZ) is located, the domestic value-added share is the lowest of all the Brazilian states at 32\%. However, the value-added originating from other states (domestic import content) is around 31\%, which is higher than the foreign import content (26\%).

Graph 2. Indirectly and directly exported value-added of states (\%)

Source: 2008 Inter-State Input Output Table calculated by J. Guilhoto at USP.

\textsuperscript{10} Notice that the importation of the state is not decomposed by its origin hence, it can include in part the value added originated from itself or other Brazilian states and re-imported as embodied in its imports from world (e.g. SP-France-SP or SP-France-AM).

\textsuperscript{11} On the import side one possible improvement is to decompose the imports’ value added into the one with origin in the Brazilian states and the one with origin abroad, but to do so we need to integrate the Brazilian interstate IO table into a World IO table, which is out of the scope of this work. However, giving the low content of the imports in the value added of the states, the overall conclusion should not change.
In Graph 2, we trace the picture from the point of the origin state $r$ – instead of the exporter state $s$ – of value-added and present the total value-added exported directly by the state itself and by other states indirectly. On average, 54% of states’ exported value-added is realized directly by themselves while 46% is exported indirectly, via other states. Graph 2 confirms that state inclusion in the national production chain of Brazilian exports is highly diverse and virtually non-existent in some states, e.g. Pará (PA). Other states with high mineral resources also export their output relatively directly (Minas Gerais (MG) and Pará (PA)). Rich and industrial states of the South and South-East appear to export their own value-added by themselves (Espírito Santo (ES), Rio Grande do Sul (RS), São Paulo (SP), Rio de Janeiro (RJ) and Santa Catarina (SC)). If Amazonas (AM) exports few directly, its value-added is in large part indirectly exported, which can be explained by the MFTZ special tax scheme to integrate the zone into the Brazilian domestic market.

**Graph 3.** States’ gross exports and value-added share in Brazilian total (%)

Source: 2008 Inter-State Input Output Table calculated by J. Guilhoto at USP.

In Graph 3 we present the share of states’ exports in Brazilian total gross exports and their value-added share – exported directly or indirectly – in Brazilian total exported value-added. It shows that the states’ exports shares (%) are very close. Rio de Janeiro (RJ)’s share in exported value-added seems to be relatively larger than it is in gross terms. São Paulo (SP), however, has a higher percentage of its exports in Brazilian total gross exports. However, these differences are very marginal, respectively 3% and 1.6%.

**5. Conclusion**

Our work discusses the implications of “vertical specialization” by extending the subject to an intra-national trade analysis. This is a new approach to
the existing literature which is mostly concentrated on the country level analysis and calculations. We use the Brazilian Inter-State Input-Output table for 2008, to calculate states’ value-added exported directly on its own and indirectly via other states. If the level of vertical specialization is relatively low concerning international trade, we show evidence that vertical specialization operates at upper stages of the domestic value chain. Except the states that export natural resources, Brazilian states’ exports are inter-linked by internal production chains, driven by the demand of rich southern and south-eastern states (São Paulo (SP), Santa Catarina (SC), etc.) and supplied by other states, frequently relatively poor (Rondônia (RO), Piauí (PI), etc.). In average, almost half of value-added exported by states are transformed and delivered abroad by other states. However, if the statistics in terms of value-added clarifies the nature of the contribution of each state to Brazilian exports, the share of each state in Brazilian exports in terms of added value is close to the one calculated in terms of gross exports.

The results presented in this paper, so far, are particular for the Brazilian case, and can be explained among other factors, by the richness of natural resources found in the Brazilian territory, and by the strategy of development adopted by Brazil in the 1950’s, *i.e.*, the Industrialization by Substitution of Imports (ISi). These two elements in a simple way could explain the relatively low openness of the Brazilian economy, the importance of the internal trade, and the exports based on natural resources.

However, the question is worthy also for other countries such as China, USA etc... European Union is also a heterogeneous market especially with its new Eastern members and intra-EU trade represents an important part of EU’s total trade. This high intra-EU trade can be also reflecting a vertical specialization across the EU members. In China special zones or export processing zones encourage imports of inputs. Hence, it seems unlikely that the Chinese exports push a vertical specialization in its domestic market though, the heterogeneity of China’s regions (Pei and allii [2010]). We need further work to highlight the domestic dimension of vertical specialization in the other countries.

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