Análisis Económico, vol. XXXV, núm. 90, septiembre-diciembre de 2020, pp. 7-43, ISSN: 0185-3937, e- ISSN: 2448-6655

Interstate input-output model for Mexico, 2013[1]

Modelo interestatal de insumo-producto para México, 2013

(Received: 03/March/2020; accepted: 09/July/2020; published:04/September/2020)

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ABSTRACT

The aim of this paper is to describe in detail the process of estimation of the interregional input-output system for Mexico, for the year 2013. This is the first exercise of the type since no regional model has been built including all states of Mexico. With this paper, we make available not only the details of the methodological procedures adopted to generate the interregional system, but also the database itself to be used by other researchers and practitioners.
Keywords: interregional input-output, methodology, data, Mexico.
JEL Classification: C67; D57; R15.

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[1] This project was funded by Consejo Nacional de Ciencia y Tecnología in Mexico, under Project 266837 "Proyecto de implementación integral de la reforma energética: eficiencia energética, desarrollo de infraestructura e impacto social". We are very thankful for this support.
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[2] We thank Pedro Liedo and Mariana Menchero due to their excellent help as Research Assistants.

RESUMEN

El objetivo de este documento es describir en detalle el proceso de estimación del sistema interregional insumo-producto para México para el año 2013. Este es el primer ejercicio de este tipo ya que no se ha construido un modelo regional incluyendo todos los estados de México. Con este artículo, ponemos a disposición no sólo los detalles de los procedimientos metodológicos adoptados para generar el sistema interregional, sino también la propia base de datos que podrán utilizar otros investigadores y profesionistas.
Palabras clave: Insumo producto interregional; metodología; datos; México.
Clasificación JEL: C67; D57; R15.

INTRODUCTION

We have witnessed considerable advances in the estimation of regional and interregional extensions of input-output models since the pioneering incursions of Isard (1951) and Leontief et al. (1953). Despite those efforts, the scarcity of information associated with the high cost of obtaining interregional trade flows based on survey data remains as one of the main obstacles to the estimation of interregional input-output systems. This has made the so-called non-survey estimation methods of interregional systems gain popularity among academic researchers and practitioners (Round, 1983).

Round (1983) recalls that the use of the terms survey and non-survey methods suggests the existence of two exclusive and well-defined research techniques. However, interregional input-output systems are often constructed under hybrid approaches, combining various techniques according to the quantity and quality of primary data available. This paper describes the process of estimation of the interregional input-output systems for Mexico, for the year 2013, using the method known as Interregional Input-Output Adjustment System (IIOAS), based on Haddad et al. (2016a). The system is estimated under the very same methodological procedure and consider the 32 regions in Mexico whose economies are disaggregated in 37 sectors. There are recent efforts to estimate regional and interregional input-output systems for Mexico (e.g. Dávila, 2015; Assuad and Sánchez, 2016; Chiquiar et al., 2017).[3] However, to the best of our knowledge, this is the first interregional system that takes into account explicitly the economies of the 32 Mexican states.

The IIOAS is a hybrid method that combines data made available by official agencies, such as the Instituto Nacional de Estadística y Geografía (INEGI), with non-

[3] There is also a plethora of studies that estimated regional input-output models for different regions in Mexico. For different reviews, refer to Callicó et al. (2003); Dávila (2015); Assuad and Sánchez (2016).

survey techniques for the estimation of unavailable information. The main advantages of the IIOAS are its consistency with information from the National Accounts Statistics and the flexibility of its regionalization process, which can be applied to any country that: (i) publishes standard make and use tables; and (ii) provides a regional information system at the sectorial level. Such flexibility can be attested by recent applications for distinct interregional systems: interisland model for the Azores (Haddad et al., 2015), interregional models for Colombia (Haddad et al., 2016a), Egypt (Haddad et al., 2016b), Greece (Haddad et al., 2018), Lebanon (Haddad, 2014), Morocco (Haddad et al., 2017a), and Brazil (Haddad et al., 2017b).

The estimated systems are expected to be able to capture the existing specificities in the productive structure of each Mexican region and, in addition, contribute to the methodological debate on the estimation of interregional input-output systems under conditions of limited information (Hulu and Hewings, 1993; Riddington, Gibson and Anderson, 2006; Zhang, Shi and Zhao, 2015; Tobben and Kronenberg, 2015; Flegg et al., 2016). It also adds to a broader literature that deals with a large range of methods, extending from the earlier work of Jan Oosterhaven (1981), to Roy and Thill (2004) and the contributions of the entropy modelers starting with Alan Wilson (1970) and continuing with the cross entropy approaches of Esteban Fernandez-Vazquez et al. (2015).[4]

The paper is organized as follows: section 1 describes in detail the methodological procedure used in the construction of the interregional system for Mexico based on the IIOAS method. Section 2 presents the regionalization procedure. Section 3 presents an illustrative analysis using different indicators from the estimated databases, revealing some main structural features of the economy of Mexico. Final remarks follow.

I. Interregional Input-Output Matrix for Mexico

Initial Data Treatment

The estimation of the Interregional Input-Output Matrix for Mexico (IIOM-MX) is based on the Interregional Input-Output Adjustment System (IIOAS) method. The IIOAS method was developed to estimate interregional input-output systems under conditions of limited information. In the case of Mexico, we have used data from national and regional accounts provided by the Instituto Nacional de Estadística y Geografía (INEGI) for the years 2013 and 2014. The data consist mainly of the Supply

[4] It is not our intention to compare different approaches. By recognizing the strand of the literature in which our contribution lies, we leave that task to future work.

and Use Tables (SUT) at the national level, and regional data on sectoral GRP and macro regional aggregates.

The first step in data treatment was to build the national input-output matrix for Mexico from the SUT. We have organized the information available at INEGI[5], according to figures 1 and 2. The structure of the Make Table (o_pc_2) was then used to transform the new Use Table from a commodity by sector into a sector by sector system of information. The auxiliary matrix generated by the structure of the Make Table is often called the market share matrix. Finally, the national structure of 80 sectors was aggregated into 37 sectors to match the auxiliary data available at the regional level.

The next step was to disaggregate the national data into the 32 regions of Mexico. The details of such procedure are described in the next two subsections.

Figure 1
Schematic Structure of the IIOM-MX

		Absorption Matrix				
		1	2	3	4	5
		Producers	Investors	Household	Export	Government
	Size	J x Q	J x Q	Q	1	Q
Basic Flows	I x S	u_d_pb_2 u_m_pb_2	u_d_pb_2 u_m_pb_2	u_d_pb_2 u_m_pb_2	u_d_pb_2 u_m_pb_2	u_d_pb_2 u_m_pb_2
Margins	I x S x R	mc_d_2; mt_d_2 mc_m_2; mt_m_2	mc_d_2; mt_d_2 mc_m_2; mt_m_2	mc_d_2; mt_d_2 mc_m_2; mt_m_2	mc_d_2; mt_d_2 mc_m_2; mt_m_2	mc_d_2; mt_d_2 mc_m_2; mt_m_2
Taxes	I x S	in_d_2 in_m_2	in_d_2 in_m_2	in_d_2 in_m_2	in_d_2 in_m_2	in_d_2 in_m_2
Labor	1	mip_t_pb_ixi_2				
Capital	1	mip_t_pb_ixi_2				

[5] https://www.inegi.org.mx/temas/cou/

Other costs	1	mip_t_pb_ixi_2

Make	I
Q	o_pc_2

Note: J sectors; Q regions; I products; S sources (domestic and import); R margins.

<u>Source</u>: Instituto Nacional de Estadística y Geografía (INEGI)
Cuadros de Oferta y Utilización:
u_d_pb_2: Utilización de bienes y servicios a precios básicos | Economía total / Origen doméstico | Subsector SCIAN
u_m_pb_2: Utilización de bienes y servicios a precios básicos | Economía total / Origen importado | Subsector SCIAN
mc_d_2: Márgenes de comercio | Economía total / Origen doméstico | Subsector SCIAN
mt_d_2: Márgenes de transporte | Economía total / Origen doméstico | Subsector SCIAN
mc_m_2: Márgenes de comercio | Economía total / Origen importado | Subsector SCIAN
mt_m_2: Márgenes de transporte | Economía total / Origen importado | Subsector SCIAN
in_d_2: Impuestos netos de subsidios | Economía total / Origen doméstico | Subsector SCIAN
in_m_2: Impuestos netos de subsidios | Economía total / Origen importado | Subsector SCIAN
o_pc_2: Oferta de bienes y servicios a precios básicos | Economía total | Subsector SCIAN
Matriz de Insumo Producto:
mip_t_pb_ixi_2: Matriz simétrica de insumo producto. Industria por industria | Economía total / Origen doméstico e importado | Subsector SCIAN

Figure 2
Schematic Structure of the IIOM-MX

Millones de pesos (MXN) a precios de 2013

		Absorption Matrix				
		1	2	3	4	5
		Producers	Investors	Household	Export	Government
	Size	J x Q	J x Q	Q	1	Q
Basic Flows	I x S	10,668,007	3,285,202	8,340,140	4,325,247	1,986,054
Margins	I x S x R	1,322,563	359,426	1,932,084	590,630	0
Taxes	I x S	9,459	16,662	608,446	1	0
Labor	1	4,542,853				

Capital	1	11,012,348
Other costs	1	87,419

Make	I
Q	27,642,648

Note: J sectors; Q regions; I products; S sources (domestic and import); R margins.

Estimation of the Interregional Trade Matrices

In order to estimate the interregional system, it has been necessary to estimate the trade matrices among the 32 regions of Mexico. This procedure has been made by calculating three components: (i) the regional demand for domestic products; (ii) the regional demand for imported products; and (iii) the total supply of each region to the domestic and foreign markets, by sector.

We have assumed that regional demands for domestic and import products follow the national pattern for all users. In other words, economic agents share the same technology and preferences everywhere. However, it is important to note that we have estimated different trade matrices for each sector, which has allowed us to have different regional sourcing for intermediate inputs and final products.

The regional demand for domestic products is calculated, for each user, using the information provided in the matrix of demand-generating coefficients (DOMGEN). These coefficients are defined as the ratio of each element of the national use matrix to its respective column total.

For intermediate consumption, the ratio is defined as follows:

$$cic_{ij}^{dom} = \frac{z_{ij}^{dom}}{x_j}, \forall\ i, j = 1, \dots, 37 \qquad (1)$$

where cic_{ij}^{dom} is the national coefficient of intermediate consumption of domestic inputs; z_{ij}^{dom} is the intermediate consumption of domestic inputs by sector, and x_j is the total sectoral output. From equation (1), we can have a matrix of size *37* x *37* (*sector* x *sector*), $\mathbf{CIC^{dom}}$, with all the intermediate consumption ratios (cic_{ij}^{dom}).

Regarding the domestic absorption components (investment, household consumption, and government expenditure), we have used the ratio of each *i*-element to its respective column sum:

$$cinv_i^{dom} = \frac{inv_i^{dom}}{invt}, \forall\ i = 1, \dots, 37 \tag{2}$$

$$chou_i^{dom} = \frac{hou_i^{dom}}{hout}, \forall\ i = 1, \dots, 37 \tag{3}$$

$$cgov_i^{dom} = \frac{gov_i^{dom}}{govt}, \forall\ i = 1, \dots, 37 \tag{4}$$

where inv_i^{dom}, hou_i^{dom}, and gov_i^{dom} are the investment demand, household consumption, and government expenditure of each *i*-element in the national use matrix; and $invt$, $hout$, and $govt$ are the respective column sums, including tax. Thus, from equation (2) to (4), we may have vectors of size *37* x *1*, $\mathbf{cinv^{dom}}$, $\mathbf{chou^{dom}}$, and $\mathbf{cgov^{dom}}$, with all the investment demand, household consumption and government expenditure ratios, respectively.

The gross regional demand for domestic products is obtained by multiplying these coefficients – equations (1) to (4) – by (i) a matrix with the total sectoral output of each region in the main diagonal and zero elsewhere, $\mathbf{X^r}$; (ii) the total investment demand of each region, $invt^r$; (iii) the total household consumption of each region, $hout^r$; and (iv) the total government expenditure of each region, $govt^r$:

$$\mathbf{IC^{r,dom}} = \mathbf{CIC^{dom}} * \mathbf{X^r}, \forall\ r = 1, \dots, 32 \tag{5}$$

$$\mathbf{inv^{r,dom}} = \mathbf{cinv^{dom}} * invt^r, \forall\ r = 1, \dots, 32 \tag{6}$$

$$\mathbf{hou^{r,dom}} = \mathbf{chou^{dom}} * hout^r, \forall\ r = 1, \dots, 32 \tag{7}$$

$$\mathbf{gov^{r,dom}} = \mathbf{cgov^{dom}} * govt^r, \forall\ r = 1, \dots, 32 \tag{8}$$

where $\mathbf{IC^{r,dom}}$ is a matrix of intermediate consumption of domestic products; $\mathbf{inv^{r,dom}}$ is the consumption vector of capital goods produced domestically; $\mathbf{hou^{r,dom}}$ is the household consumption vector of domestic products; and $\mathbf{gov^{r,dom}}$ is the vector of government expenditure on domestic products; all for each region *r*.

Therefore, the (gross) total demand for domestic products in each region is given by

$$\mathrm{demdom}^{\mathrm{r}} = \sum_{j=1}^{37} \mathrm{IC}^{\mathrm{r,dom}} + \mathrm{inv}^{\mathrm{r,dom}} + \mathrm{hou}^{\mathrm{r,dom}} + \mathrm{gov}^{\mathrm{r,dom}}, \forall\, r = 1, \ldots, 32 \qquad (9)$$

Where $\mathbf{demdom^r}$ is the total demand vector for domestic products of size *37* x 1 for each region *r*.

The procedure to estimate the demand for imported products is similar. Analogously, we have created a matrix of demand-generating coefficients for imported products (IMPGEN) defined to be the ratio of each element of the national matrix of imports over the respective column sum in the use matrix.

For intermediate consumption, the coefficient represents the share of imports in terms of national production as follows:

$$cic_{ij}^{imp} = \frac{z_{ij}^{imp}}{x_j}, \forall\, i, j = 1, \ldots, 37 \qquad (10)$$

Where cic_{ij}^{imp} is the intermediate consumption coefficient of imported inputs; z_{ij}^{imp} is the intermediate consumption of imported inputs, and x_j is the total sectoral output.

Analogously to domestic ratios, from equation (10) we can have a matrix of size *37* x *37* (*sector* x *sector*), $\mathbf{CIC^{imp}}$, with all the intermediate consumption ratios related to imported inputs.

Further, the coefficients for the final demand elements are given by

$$cinv_i^{imp} = \frac{inv_i^{imp}}{invt}, \forall\, r = 1, \ldots, 32 \qquad (11)$$

$$chou_i^{imp} = \frac{hou_i^{imp}}{hout}, \forall\, r = 1, \ldots, 32 \qquad (12)$$

$$cgov_i^{imp} = \frac{gov_i^{imp}}{govt}, \forall\, r = 1, \ldots, 32 \qquad (13)$$

Where inv_i^{imp}, hou_i^{imp}, and gov_i^{imp} are the investment demand, household consumption, and government expenditure of each *i*-element in the national imported matrix. Thus, $cinv_i^{imp}$, $chou_i^{imp}$, and $cgov_i^{imp}$ are the demand shares of imported products related to investment demand, household consumption, and government expenditure, respectively. From equation (11) to (13), we may have vectors of size *37* x *1*, $\mathbf{cinv^{imp}}$, $\mathbf{chou^{imp}}$, and $\mathbf{cgov^{imp}}$, with all the investment demand, household consumption and government expenditure ratios, respectively.

Therefore, the demands for imported products, by region, are defined as

$$\mathbf{IC^{r,imp}} = \mathbf{CIC^{imp}} * \mathbf{X^r}, \ \forall\ r = 1, \dots, 32 \qquad (14)$$

$$\mathbf{inv^{r,imp}} = \mathbf{cinv^{imp}} * invt^r, \ \forall\ r = 1, \dots, 32 \qquad (15)$$

$$\mathbf{hou^{r,imp}} = \mathbf{chou^{imp}} * hout^r, \ \forall\ r = 1, \dots, 32 \qquad (16)$$

$$\mathbf{gov^{r,imp}} = \mathbf{cgov^{imp}} * govt^r, \ \forall\ r = 1, \dots, 32 \qquad (17)$$

where $\mathbf{IC^{r,imp}}$ is a matrix with imports of intermediate inputs; $\mathbf{inv^{r,imp}}$ is the imports vector of capital goods; $\mathbf{hou^{r,imp}}$ is the vector of imports by household; and $\mathbf{gov^{r,imp}}$ is the vector of government expenditure on imports; all for each region *r*.
The total demand for imported products by region is given by

$$\mathrm{demimp}^r = \sum_{j=1}^{37} \mathrm{IC}^{r,imp} + \mathrm{inv}^{r,imp} + \mathrm{hou}^{r,imp} + \mathrm{gov}^{r,imp}, \ \forall\ r = 1, \dots, 32 \qquad (18)$$

In order to generate a matrix of regional demands for domestic products, we have placed all demand vectors for domestic products ($\mathbf{demdom^r}$, $\forall\ r$ = 1,..., 32) side by side, which has allowed us to have a matrix of size *37* x *32* (sector x region) – $\mathbf{DEMDOM}$, where each row represents the domestic demand for sector *i* by each region *r*. Similarly, we have made the same procedure with the demand vectors for imported products ($\mathbf{demimp^r}$, $\forall\ r$ = 1,..., 32), which has also allowed us to have a matrix of size *37* x *32* (sector x region) – $\mathbf{DEMIMP}$, where each row represents the sectoral imports by each region *r*.

The next step was to estimate the sectoral domestic supply ($\mathbf{supdom^r}$) in each region, which has been done by taking the difference between the sectoral total output ($\mathbf{x^r}$) and the sectoral exports ($\mathbf{exp^r}$) in each region.

$$\mathrm{supdom}^r = \mathrm{x}^r - \mathrm{exp}^r, \ \forall\ r = 1, \dots, 32 \qquad (19)$$

Similarly, placing all regional vectors side by side, we have created a matrix of size *37* x *32* (sector x region) – $\mathbf{SUPDOM}$, where each row represents the total regional domestic supply of sector *i*.

Thus, having the sectoral domestic demand and supply by region ($\mathbf{DEMDOM}$ and $\mathbf{SUPDOM}$), we have to ensure the equilibrium between them, in aggregate terms. We have thus adjusted the aggregate value of (gross) total domestic demand for each sector in order to have total domestic demand equivalent to total domestic supply.

The next step has been to construct, for each sector, matrices with regional trade shares ($\mathbf{SHIN^i}$). In other words, we have created matrices for each sector that represent the regional share on the total domestic trade. Considering *s* origin regions and *d* destination regions, we have estimated 37 matrices (one for each sector) of size *32* x *32* (origin x destination).

These shares have been estimated using equations, (20) and (21), based on previous work by Dixon and Rimmer (2004). Equation (20) has been used to calculate the initial ratio of the intra-regional trade (main diagonal of the trade matrix) while equation (21) has been used to estimate the interregional trade flows.

Thus, the intra-regional trade share is given by

$$shin^i_{s,d} = \mathrm{Min}\left\{\frac{supdom^i_s}{demdom^i_d}, 1\right\} * f, \ \forall\ i = 1, \ldots, 37;\ s, d = 1, \ldots, 32 \text{ and } s = d \tag{20}$$

Where $shin^i_{s,d}$ is the share of sector *i* in the national trade within each region. The intra-regional trade flow is defined to be the ratio of supply to demand of sector *i* within the region. If supply is greater than demand, we have assumed that all demand is met internally. However, based on Haddad et al. (2016a), we have multiplied the result by a factor (f) which gives us the extent of tradability of a given commodity. For non-tradable sectors, usually services, we have assumed that they are typically provided by the local economy. Thus, we have used initial f values close to unity 0.9 for non-tradable and 0.5 for tradable sectors.

Otherwise, the interregional trade is given by

$$shin^i_{s,d} = \left\{\frac{1}{imped_{s,d}} * \frac{supdom^i_s}{\sum_1^{32} supdom^i_k}\right\} * \left\{\frac{1-\mathrm{shin^i_{s,v}}}{\sum_{g=1, g\neq d}^{32}\left[\frac{1}{imped_{g,d}} * \frac{supdom^i_g}{\sum_{k=1}^{32} supdom^i_k}\right]}\right\}, \tag{21}$$

$\forall\ i = 1,\ldots, 37;\ s, d = 1, \ldots, 32;\ k = s;\ v = s;\ g = s$ and $s \neq d$

Where $shin^{i}_{s,d}$ is the share of trade flows of sector *i* with origin in region *s* and destination on region *d*; and $imped_{s,d}$ is given by the average travel time between two trading regions (see Annex 3).

From equations (20) and (21), we generate matrices of size *32* x *32* (region x region) for each sector – $\mathbf{SHIN^{i}}$, where the intra-regional trade shares are placed on the main diagonal and the interregional trade shares off-diagonal. Note that the column values add to one.

Using the $\mathbf{SHIN^{i}}$ matrices, we have estimated initial values for the trade matrices by multiplying each $\mathbf{SHIN^{i}}$ by its respective reference value in $\mathbf{DEMDOM}$:

$$\mathbf{TRADE^{i}} = \mathbf{SHIN^{i}} * \mathbf{DEMDOM^{*i}}, \forall i = 1, \dots, 37 \text{ and } s, d = 1, \dots, 32 \qquad (22)$$

Where $\mathbf{TRADE^{i}}$ is the trade matrix for sector *i* with origin in region *s* and destination in region *d*; and $\mathbf{DEMDOM^{*i}}$ is a diagonal matrix where values related to sector *i* from $\mathbf{DEMDOM}$ have been placed on the main diagonal and zero elsewhere.

This procedure ensures that the column sums of each $\mathbf{TRADE^{i}_{s,d}}$ matrix is equivalent to the demand of the respective region *d* for the products of region *s* (for each sector *i*). However, the row sum is not necessarily equivalent to the supply of each sector *i* from region *s* to region *d*. Thus, we have used a RAS procedure[6] to make sure that supply and demand balance out.

After the RAS procedure, we have included in each $\mathbf{TRADE^{i}_{s,d}}$ matrix the respective row from $\mathbf{DEMIMP}$. In other words, we added the Rest of the World as one of the origins. Thus, now *s* is equal to 33 since it represents the 32 Mexican regions plus the Rest of the World.

II. Regionalization Procedure

The 37 trade matrices estimated are consistent with the national supply and demand in each sector. The trade matrices, after the inclusion of the import row, $\mathbf{TRADE^{*i}_{s,d}}$, consider the sales of each Mexican region to the other Mexican regions and the purchases of each of them both from domestic and of the foreign supplying

[6] For more details of this method, see Miller and Blair (2009).

regions. However, from these matrices, we are not able to know if the sales were purchased by industries (intermediate consumption) or by final users in the other regions.

In order to deal with this issue, we have used a hypothesis proposed originally by Chenery (1956) and Moses (1955). We have applied the same regional proportion in the acquisition of inputs for all sectors and final products by all final users within a given region. In other words, we have used the same trade coefficient for all sectors or final users in the destination.

The regionalization procedure may be described by the following steps. The first step is given by the calculation of a new matrix for each sector with the trade shares, $\mathbf{SHIN\_N^i}$. This matrix is estimated based on the $\mathbf{TRADE^{*i}_{s,d}}$ matrices as follows:

$$\mathbf{SHIN\_N^i} = \mathbf{TRADE^{*i}_{s,d}} * [\mathbf{TRADE^{*i}}]^{-1}, \quad \forall\ i = 1, \dots, 37;\ s = 1, \dots, 33;\ \text{and } d = 1, \dots, 32 \tag{23}$$

Where $\mathbf{TRADE^{*i}}$ is a matrix diagonal whose $(\sum_{s=1}^{32} trade^{i}_{s,d})$ are placed on the main diagonal and zero elsewhere, being $trade^{i}_{s,d}$ each element of $\mathbf{TRADE^{*i}_{s,d}}$ matrix; *s* represents the 33 origin regions (32 regions of Mexico plus Rest of the World) and *d* represents the 32 destination regions (regions of Mexico).

Subsequently, we have used elements from the national use matrix to estimate the national coefficients (domestic plus imports) of intermediate consumption, investment demand, household consumption, and government expenditure.

For intermediate consumption, the matrix of coefficients is given by

$$\mathbf{CIC^N} = \mathbf{Z^{DOM+IMP}} * (\mathbf{ICT^{*N}})^{-1} \tag{24}$$

Where $\mathbf{Z^{DOM+IMP}}$ is the intermediate consumption matrix (domestic + imported); and $\mathbf{ICT^{*N}}$ is a diagonal matrix with the values from the vector of total intermediate consumption for each sector of destination *j* ($\mathbf{ict^N}$) in the main diagonal. This vector, $\mathbf{ict^N}$, is defined as

$$\mathbf{ict^N} = \mathbf{x^N} - \mathbf{va^N} \tag{25}$$

Where $\mathbf{x^N}$ is the vector with all national total sectoral output; and $\mathbf{va^N}$ is the vector with all national sectoral value-added.

For the final demand elements, we have taken each element of each vector over its respective total (including also indirect taxes). Thus, the investment demand, household consumption, and government expenditure coefficients are defined as follows:

$$cinv_i^N = \frac{inv_i^{DOM+IMP}}{invt^N}, \forall\ i = 1, \ldots, 37 \tag{26}$$

$$chou_i^N = \frac{hou_i^{DOM+IMP}}{hout^N}, \forall\ i = 1, \ldots, 37 \tag{27}$$

$$cgov_i^N = \frac{gov_i^{DOM+IMP}}{govt^N}, \forall\ i = 1, \ldots, 37 \tag{28}$$

Where $inv_i^{DOM+IMP}$, $hou_i^{DOM+IMP}$, and $gov_i^{DOM+IMP}$ represent each element in the investment demand, household consumption and government expenditure vectors, respectively (including domestic and imported sources); $invt^N$, $hout^N$, and $govt^N$ are the respective column sum, including also indirect taxes.

From equations (26) to (28), we can generate vectors with coefficients of investment demand ($\mathbf{cinv^N}$), household consumption ($\mathbf{chou^N}$), and government expenditure ($\mathbf{cgov^N}$).

The next step has been to estimate the regional coefficients. In order to obtain the intermediate consumption shares, $\mathbf{RICC}$, we have transformed the 37 $\mathbf{SHIN\_N}$ matrices into 33 $\mathbf{SHIN\_S}$ matrices of size *37* x *32*, which represent, for each origin, foreign region inclusive, the consumption share of each sector in each destination region. Thus, each $\mathbf{SHIN\_S}$ matrix represents one origin trade region, where rows show the sectors and columns the destination regions.

Therefore, using Aguascalientes (the first region) as an example, the $\mathbf{SHIN\_S}$ for this region is composed of all the first rows of each of the 37 $\mathbf{SHIN\_N}$. For the second region, Baja California, the $\mathbf{SHIN\_S}$ includes all the second rows of each of the 37 $\mathbf{SHIN\_N}$, and so on. Further, in order to estimate **RICC**, each column of each $\mathbf{SHIN\_S}$ matrix is diagonalized and multiplied by $\mathbf{CIC^N}$:

$$\mathbf{RICC^{sd}} = \mathbf{SHIN\_S^*} * \mathbf{CIC^N} \tag{29}$$

Where $\mathbf{SHIN\_S^*}$ is a diagonal matrix whose non-zero elements come from the $\mathbf{SHIN\_S}$; *s* represents the 33 origin regions, and *d* represents the 32 destination regions.

From equation (29), we estimated, for each origin region, 32 destination matrices of size *37* x *37* (*sector* x *sector*). These matrices contain the shares of each sector in the intermediate consumption in each destination region.

Similarly, for each of the final demand components, we estimated, for each origin region, 33 vectors of size *37* x *1*, $\mathbf{shin\_s}$, which represents the shares of each destination region *d* in the acquisition of the output from each of the 37 sectors.

The final demand for capital goods (investment demand) for each region is given by

$$\mathbf{rcinv^{sd}} = \mathbf{SHIN\_S^{**}} * \mathbf{cinv^{N}}, \forall\, s = 1, \dots, 33; \text{ and } d = 1, \dots, 32 \qquad (30)$$

Where $\mathbf{SHIN\_S^{**}}$ is a diagonal matrix of the vector $\mathbf{shin\_s}$.

For household consumption:

$$\mathbf{rchou^{sd}} = \mathbf{SHIN\_S^{**}} * \mathbf{chou^{N}}, \forall\, s = 1, \dots, 33; \text{ and } d = 1, \dots, 32 \qquad (31)$$

and for government expenditure:

$$\mathbf{rcgov^{sd}} = \mathbf{SHIN\_S^{**}} * \mathbf{cgov^{N}}, \forall\, s = 1, \dots, 33; \text{ and } d = 1, \dots, 32 \qquad (32)$$

In order to obtain the regional share for the indirect tax paid by each user, we have calculated some coefficients from the national tax matrix. These coefficients are calculated for intermediate consumption, investment, household consumption, and government expenditure as follows.

The matrix with the national indirect tax coefficients related to intermediate consumption ($\mathbf{TCIC^{N}}$) is given by

$$\mathbf{TCIC^{N}} = \mathbf{TIC^{N}} * (\mathbf{ICT^{N}})^{-1} \qquad (33)$$

where $\mathbf{TIC^{N}}$ is a matrix of size *37* x *37* (*sector* x *sector*) with the indirect taxes related to intermediate consumption in the national tax matrix; and $\mathbf{ICT^{N}}$ is a diagonal matrix with the sectorial total intermediate consumption.

The vector with national indirect tax coefficients related to investment ($\mathbf{tcinv^{N}}$) is

$$\mathbf{tcinv^{N}} = \mathbf{tinv^{N}} * \left(invt^{N}\right)^{-1} \qquad (34)$$

Where $\mathbf{tinv^{N}}$ is the vector with tax related to investment, and $invt^{N}$ is the total demand for investment from the national use matrix.

The vector with national tax coefficients related to household consumption ($\mathbf{tchou^{N}}$) is given by

$$\mathbf{tchou}^{\mathbf{N}} = \mathbf{thou}^{\mathbf{N}} * \left(hout^{N} \right)^{-1} \quad (35)$$

Where $\mathbf{thou}^{\mathbf{N}}$ is the vector with tax related to household consumption, and $hout^{N}$ is the total demand for household from the national use matrix.

Finally, the vector with national tax related to government expenditure ($\mathbf{tcgov}^{\mathbf{N}}$) is

$$\mathbf{tcgov}^{\mathbf{N}} = \mathbf{tgov}^{\mathbf{N}} * \left(govt^{N} \right)^{-1} \quad (36)$$

Where $\mathbf{tgov}^{\mathbf{N}}$ is the vector with tax related to government consumption, and $govt^{N}$ is the total demand for government from the national use matrix.

The regional coefficients are obtained by multiplying each column of $\mathbf{SHIN\_S}$ by the national tax coefficient. Thus, the regional coefficient for indirect tax related to intermediate consumption is given by

$$\mathbf{RTCIC}^{\mathbf{sd}} = \mathbf{SHIN\_S}^{*} * \mathbf{TCIC}^{\mathbf{N}}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (37)$$

Which generates 1056 matrices of size *37* x *37* (*sector* x *sector*). These matrices represent the regional indirect tax coefficients for each pair of regions *s* x *d* (*origin* x *destination*).

For investment demand:

$$\mathbf{rtcinv}^{\mathbf{sd}} = \mathbf{SHIN\_S}^{*} * \mathbf{tcinv}^{\mathbf{N}}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (38)$$

which gives us 1056 vectors of size *37* x *1* that represents the proportion paid in tax related to the acquisition of products for investment in each pair of regions *s* x *d*.

Similarly, we have the regional coefficient for household consumption:

$$\mathbf{rtchou}^{\mathbf{sd}} = \mathbf{SHIN\_S}^{*} * \mathbf{tchou}^{\mathbf{N}}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (39)$$

And for government expenditure:

$$\mathbf{rtcgov}^{\mathbf{sd}} = \mathbf{SHIN\_S}^{*} * \mathbf{tcgov}^{\mathbf{N}}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (40)$$

In order to have all regional coefficients in monetary flows, we have multiplied the coefficients defined above by the regional values.

Intermediate consumption:

$$\mathbf{RIC}^{\mathbf{sd}} = \mathbf{RICC}^{\mathbf{sd}} * \mathbf{RICT}^{\mathbf{d}}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (41)$$

Where $\mathbf{RIC}^{\mathbf{sd}}$ is the regional intermediate consumption matrix for each pair of region (*s x d*), and $\mathbf{RICT}^{\mathbf{d}}$ is a matrix with the total regional intermediate consumption in the main diagonal and zero elsewhere.

Investment demand:

$$\mathbf{rinv^{sd}} = \mathbf{rcinv^{sd}} * rinvt^{d}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (42)$$

Where $\mathbf{rinv^{sd}}$ is the vector of demand for regional investment for each pair of region (*s x d*), and $rinvt^{d}$ is the total regional for investment.

Household consumption:

$$\mathbf{rhou^{sd}} = \mathbf{rchou^{sd}} * rhout^{d}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (43)$$

Where $\mathbf{rhou^{sd}}$ is the vector of regional household consumption for each pair of region (*s x d*), and $rhout^{d}$ is the total regional household consumption.

Government expenditure:

$$\mathbf{rgov^{sd}} = \mathbf{rcgov^{sd}} * rgovt^{d}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (44)$$

Where $\mathbf{rgov^{sd}}$ is the vector of regional government expenditures for each pair of regions (*s x d*), and $rgovt^{d}$ is the total regional government expenditures.

Given the estimates of sectoral foreign exports by region, ($\mathbf{exp^{r}}$), the values are allocated directly in the relevant column of the inter-regional system. We had access to foreign exports of manufacturing sectors by region.[7] For those sectors for which regionally disaggregated foreign exports were not available, we have assumed the same ratio of sectoral foreign exports to sectoral gross output to allocate foreign exports across regions.

Similar procedure has been used to transform indirect tax coefficients in monetary flows as follows:

For tax related to intermediate consumption:

$$\mathbf{RTIC^{sd}} = \mathbf{RTCIC^{sd}} * \mathbf{RICT^{d}}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (45)$$

Investment:

$$\mathbf{rtinv^{sd}} = \mathbf{rtcinv^{sd}} * rinvt^{d}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (46)$$

Household consumption:

$$\mathbf{rthou^{sd}} = \mathbf{rtchou^{sd}} * rhout^{d}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (47)$$

And government expenditure:

$$\mathbf{rtgov^{sd}} = \mathbf{rtcgov^{sd}} * rgovt^{d}, \forall\, s = 1, \ldots, 33; \text{ and } d = 1, \ldots, 32 \quad (48)$$

In order to have the completed inter-regional system, we need the regional value-added components (VA^{R}). In the interregional input-output system, the total

[7] https://datos.gob.mx/busca/dataset/exportaciones-por-entidad-federativa.

regional output (x^R) should be equivalent to the total demand of each region (DT^R). This balance checking can be done using the following identities.

Total regional output:

$$\mathbf{x}^{\mathrm{R}} = \sum_{i=1}^{37} \mathbf{RIC^{sd}} + \sum_{i=1}^{37} \mathbf{RTIC^{sd}} + \mathbf{rva^{sd}} \tag{49}$$

where $\mathbf{x^R}$ is the vector of sectorial regional total output; $\mathbf{RIC^{sd}}$ is the regional intermediate consumption matrix; $\mathbf{RTIC^{sd}}$ is the indirect tax matrix related to intermediate consumption, and $\mathbf{rva^{sd}}$ is the vector of regional value-added.

Total demand:

$$\mathbf{dt}^{\mathrm{R}} = \sum_{j=1}^{37} \mathbf{RIC^{sd}} + \mathbf{rinv^{sd}} + \mathbf{rhou^{sd}} + \mathbf{expr^{sd}} + \mathbf{rgov^{sd}} \tag{50}$$

Where $\mathbf{dt^R}$ is the total demand vector; $\mathbf{rinv^{sd}}$ is the demand for investment; $\mathbf{rhou^{sd}}$ is the household consumption; $\mathbf{expr^{sd}}$ is the export vector; and $\mathbf{rgov^{sd}}$ is the government expenditure.

Finally, an adjustment in Stocks ($\mathbf{stock^R}$) must be done to complete the interregional system:

$$\mathbf{stock^R} = \mathbf{x^{R'}} - \mathbf{dt^R} \tag{51}$$

III. Structural Analysis

Interregional Linkages

In this section, a brief comparative analysis of regional economic structures is carried out to illustrate some features of the system. Production linkages between sectors are considered through the analysis of the intermediate inputs portion of the interregional input-output database. Both the direct and indirect production linkage effects of the economy are captured by the adoption of different methods based on the evaluation of the Leontief inverse matrix.

The conventional input-output model is given by

$$\mathbf{x} = \mathbf{Ax} + \mathbf{f} \tag{52}$$

And

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f} = \mathbf{Bf} \tag{53}$$

Where **x** and **f** are respectively the vectors of gross output and final demand; **A** is a matrix with the input-output coefficients a_{ij} defined as the amount of product i required per unit of product j (in monetary terms) - $i, j = 1, \ldots, n$; and **B** is known as the Leontief inverse.

Let us consider systems equations (52) and (53) in an interregional context, with r different regions, so that:

$$\mathbf{x} = \begin{bmatrix} \mathbf{x}^1 \\ \vdots \\ \mathbf{x}^R \end{bmatrix}; \mathbf{A} = \begin{bmatrix} \mathbf{A}^{11} & \cdots & \mathbf{A}^{1R} \\ \vdots & \ddots & \vdots \\ \mathbf{A}^{R1} & \cdots & \mathbf{A}^{RR} \end{bmatrix}; \mathbf{f} = \begin{bmatrix} \mathbf{f}^1 \\ \vdots \\ \mathbf{f}^R \end{bmatrix}; \text{and } \mathbf{B} = \begin{bmatrix} \mathbf{B}^{11} & \cdots & \mathbf{B}^{1R} \\ \vdots & \ddots & \vdots \\ \mathbf{B}^{R1} & \cdots & \mathbf{B}^{RR} \end{bmatrix} \tag{54}$$

And

$$\begin{gathered} \mathbf{x}^1 = \mathbf{B}^{11}\mathbf{f}^1 + \cdots + \mathbf{B}^{1R}\mathbf{f}^R \\ \vdots \\ \mathbf{x}^R = \mathbf{B}^{R1}\mathbf{f}^1 + \cdots + \mathbf{B}^{RR}\mathbf{f}^R \end{gathered} \tag{55}$$

Furthermore, we may consider different components of **f**, which includes demands originating in the specific regions, *V*, and abroad, *e*. We obtain information of final demand from origin *s* in the IIOM-MX, allowing us to treat **V** as a matrix which provides the monetary values of final demand expenditures from the domestic regions in Mexico and from the foreign region.

$$\mathbf{V} = \begin{bmatrix} \mathbf{V}^{11} & \cdots & \mathbf{V}^{1R} \\ \vdots & \ddots & \vdots \\ \mathbf{V}^{R1} & \cdots & \mathbf{V}^{RR} \end{bmatrix}; \text{ and } \mathbf{e} = \begin{bmatrix} \mathbf{e}^1 \\ \vdots \\ \mathbf{e}^R \end{bmatrix} \tag{56}$$

Thus, we can re-write equation (55) as:

$$\begin{gathered} \mathbf{x^1} = \mathbf{B^{11}}(\mathbf{V^{11}} + \cdots + \mathbf{V^{R1}} + \mathbf{e^1}) + \cdots + \mathbf{B^{1R}}(\mathbf{V^{1R}} + \cdots + \mathbf{V^{RR}} + \mathbf{e^R}) \\ \vdots \\ \mathbf{x^R} = \mathbf{B^{R1}}(\mathbf{V^{11}} + \cdots + \mathbf{V^{R1}} + \mathbf{e^1}) + \cdots + \mathbf{B^{RR}}(\mathbf{V^{1R}} + \cdots + \mathbf{V^{RR}} + \mathbf{e^R}) \end{gathered} \tag{57}$$

From equation (57), we can then compute the contribution of final demand from different origins on regional output. It is clear from (57) that regional output depends, among others, on demand originating in the region and on the degree of interregional integration, also on demand from outside the region.

In what follows, interdependence among sectors in different regions is considered through the analysis of the complete intermediate input portion of the interregional input-output table. The Leontief inverse matrix, based on the system (55), will be considered, and some summary interpretations of the structure of the economy derived from it will be provided. To illustrate the nature of interregional linkages in Mexico, we provide analysis of the structure of the Mexican economy derived from the Leontief inverse (multipliers) matrix, focusing on the database for 2013.

Multiplier Analysis

The column multipliers derived from **B** were computed (Miller and Blair, 2009). An output multiplier is defined for each sector *j*, in each region *r*, as the total value of production in all sectors and in all regions of the economy that is necessary to satisfy a euro's worth of final demand for sector *j*'s output.

Further, the multiplier effect can be decomposed into intraregional (internal multiplier) and interregional (external multiplier) effects[8], the former representing the impacts on the outputs of sectors within the region where the final demand change was generated, and the latter showing the impacts on the other regions of the system (interregional spillover effects).

Table 1 shows the intraregional and interregional shares for the average total output multipliers of the 32 regions of Mexico as well as the equivalent shares for the direct and indirect effects of a unit change in final demand in each sector in each region net of the initial injection (the total output multiplier effect net of the initial change). The entries are shown in percentage terms, providing insights into the degree of dependence of each region on the other regions.

Table 1
Regional Percentage Distribution of the Average Total and Net Output Multipliers: Mexico, 2013

		Total output multiplier		Net output multiplier	
		Intra-regional share	Interregional share	Intra-regional share	Interregio-nal share
R1	Aguascalientes	0.756	0.244	0.260	0.740
R2	Baja California	0.784	0.216	0.355	0.645
R3	Baja California Sur	0.774	0.226	0.358	0.642
R4	Campeche	0.708	0.292	0.164	0.836
R5	Coahuila de Zaragoza	0.767	0.233	0.306	0.694

[8] Departing from $\mathbf{B} = \begin{bmatrix} \mathbf{B}^{11} & \cdots & \mathbf{B}^{1R} \\ \vdots & \ddots & \vdots \\ \mathbf{B}^{R1} & \cdots & \mathbf{B}^{RR} \end{bmatrix}$, intraregional effects are associated with the block matrices in the main diagonal, and interregional effects with the off-diagonal block matrices. To obtain the net multiplier effects, we use $\mathbf{B} - \mathbf{I}$, instead of **B** (Miller and Blair, 2009).

R6	Colima	0.764	0.236	0.328	0.672
R7	Chiapas	0.810	0.190	0.426	0.574
R8	Chihuahua	0.766	0.234	0.302	0.698
R9	Ciudad de México	0.780	0.220	0.357	0.643
R10	Durango	0.775	0.225	0.353	0.647
R11	Guanajuato	0.801	0.199	0.400	0.600
R12	Guerrero	0.766	0.234	0.328	0.672
R13	Hidalgo	0.795	0.205	0.370	0.630
R14	Jalisco	0.812	0.188	0.437	0.563
R15	México	0.798	0.202	0.387	0.613
R16	Michoacán de Ocampo	0.784	0.216	0.377	0.623
R17	Morelos	0.786	0.214	0.342	0.658
R18	Nayarit	0.771	0.229	0.349	0.651
R19	Nuevo León	0.813	0.187	0.446	0.554
R20	Oaxaca	0.811	0.189	0.425	0.575
R21	Puebla	0.784	0.216	0.359	0.641
R22	Queretaro	0.793	0.207	0.376	0.624
R23	Quintana Roo	0.767	0.233	0.346	0.654
R24	San Luis Potosí	0.784	0.216	0.358	0.642
R25	Sinaloa	0.784	0.216	0.386	0.614
R26	Sonora	0.791	0.209	0.377	0.623
R27	Tabasco	0.758	0.242	0.276	0.724
R28	Tamaulipas	0.785	0.215	0.340	0.660
R29	Tlaxcala	0.777	0.223	0.317	0.683
R30	Veracruz de Ignacio de la Llave	0.799	0.201	0.406	0.594
R31	Yucatán	0.790	0.210	0.402	0.598
R32	Zacatecas	0.740	0.260	0.252	0.748

Source: Calculations by the authors.

Nuevo León, Jalisco, Chiapas, Oaxaca, Veracruz de Ignacio de la Llave, Yucatan and Guanajuato are the most self-sufficient regions; the average flow-on effects from a unit change in sectoral final demand are among the highest. The average net effect exceeds 40% for those regions. For some regions, such as Campeche, Zacatecas, Aguascalientes and Tabasco, the degree of regional self-sufficiency is lower, and the net intraregional flow-on effects, on the average, are below 25% of the total interregional effects.

Output Decomposition

In order to complement the multiplier analysis, the regional output decomposition is carried out in this section. We considered not only the multiplier structure but also the structure of final demand in the 32 domestic and the foreign regions.

Following equation (57), regional output (for each region) was decomposed, and the contributions of the components of final demand from different areas were calculated. The results are presented in table 2. As expected, the main contributions to the final demand of a region are given by itself, so the highest values in table are on the diagonal. In addition, the importance of Ciudad de México (R9), Nuevo León (R19) and México (R15) for the Mexican economy is verified, with the final demand originating in these regions generating the greatest contribution to the output of the other regions. The final demand for Ciudad de México (R9) contributes to 18.55% of the Mexican output, and, at the regional level, it contributes mainly to the regions México (R15), Hidalgo (R13), and Guerrero (R12). Final demand originating in Nuevo León (R19), contributes to 5.50% of total national output, and final demand originating in México (R15) contributes to 4.91% of final output. It is worth noting the importance of the rest of the world's demand for the Mexican production, with a contribution of 27.55%.

A more systematic approach to visualize the influence of final demand from different regions is to map the column original estimates that generated table 2. The results, illustrated in figure 3, provide an attempt to reveal the spatial patterns of income dependence upon specific sources of final demand. The 32 regions are grouped in five different categories in each map, so that darker colors represent higher values.

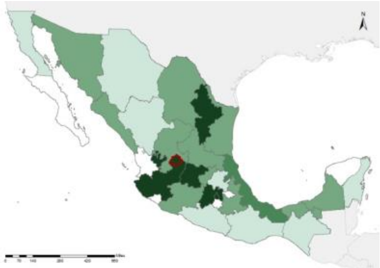
Table 2
Components of Decomposition of Regional Output Based on the Sources of Final Demand: México, 2013 (in %)

REGIONAL OUTPUT	ORIGIN OF FINAL DEMAND																																
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	ROW
R1	34.43	0.65	0.09	1.86	0.94	0.14	0.45	0.97	6.43	0.22	1.31	0.12	0.17	1.71	1.18	0.34	0.15	0.13	1.98	0.17	0.45	0.53	0.17	0.70	0.22	0.40	1.18	0.80	0.06	1.09	0.16	1.06	39.75
R2	0.17	39.09	0.22	3.57	0.96	0.06	0.67	1.12	3.43	0.12	0.31	0.06	0.07	0.48	0.58	0.12	0.08	0.06	1.26	0.09	0.32	0.17	0.14	0.18	0.21	1.12	1.65	0.42	0.03	0.93	0.13	0.33	41.84
R3	0.46	4.78	39.70	7.88	2.70	0.08	1.38	2.39	9.69	0.38	0.92	0.10	0.22	1.04	1.63	0.22	0.17	0.09	3.96	0.16	0.83	0.50	0.17	0.50	0.31	1.81	3.72	1.23	0.09	2.13	0.24	0.65	9.87
R4	0.45	1.04	0.18	18.52	1.25	0.18	0.84	1.11	8.28	0.26	1.01	0.24	0.25	1.46	1.93	0.43	0.30	0.16	2.42	0.26	0.84	0.58	0.40	0.53	0.45	0.87	2.47	0.70	0.12	1.74	0.48	0.43	49.83
R5	0.23	0.75	0.11	1.75	23.40	0.08	0.40	1.29	3.54	0.23	0.45	0.09	0.09	0.66	0.71	0.17	0.11	0.09	4.26	0.13	0.30	0.23	0.17	0.26	0.27	0.48	1.01	0.85	0.04	0.80	0.15	0.30	56.59
R6	0.77	1.46	0.10	4.30	1.70	44.73	0.85	1.82	10.76	0.24	1.32	0.14	0.24	3.29	1.96	0.45	0.24	0.19	2.93	0.19	0.79	0.67	0.20	0.65	0.30	1.07	2.49	1.06	0.10	1.73	0.26	0.73	12.29
R7	0.45	1.80	0.25	4.03	1.52	0.16	40.04	1.69	11.79	0.32	1.03	0.30	0.33	1.40	2.00	0.41	0.30	0.16	3.11	0.37	1.02	0.67	0.71	0.49	0.47	1.13	4.04	1.08	0.14	2.17	0.79	0.28	15.54
R8	0.23	1.10	0.10	1.97	1.33	0.07	0.43	31.77	3.68	0.22	0.45	0.08	0.09	0.65	0.70	0.16	0.10	0.08	2.18	0.12	0.31	0.23	0.15	0.24	0.25	0.80	1.09	0.60	0.04	0.82	0.15	0.33	49.45
R9	0.56	1.28	0.14	1.75	1.34	0.14	0.56	1.50	58.06	0.29	1.54	0.33	0.84	1.53	4.97	0.51	0.58	0.16	2.06	0.44	1.48	1.07	0.22	0.73	0.33	0.88	1.58	1.21	0.26	2.17	0.29	0.33	10.86
R10	0.71	1.86	0.23	3.44	3.10	0.15	0.76	3.33	9.65	34.10	1.28	0.18	0.26	1.85	1.91	0.38	0.26	0.21	5.54	0.24	0.79	0.64	0.31	0.73	0.68	1.27	2.06	1.59	0.10	1.70	0.30	0.99	19.40
R11	0.80	1.04	0.15	2.12	1.19	0.18	0.52	1.32	10.96	0.27	35.69	0.20	0.29	2.11	1.99	0.60	0.24	0.17	2.42	0.22	0.76	1.10	0.24	0.82	0.36	0.71	1.42	1.08	0.10	1.41	0.24	0.58	28.70
R12	0.56	1.49	0.09	4.22	1.78	0.09	0.83	1.85	20.99	0.21	1.17	35.14	0.40	1.46	2.97	0.30	0.69	0.10	3.19	0.26	1.34	0.84	0.21	0.57	0.20	0.96	2.89	1.15	0.16	2.26	0.33	0.42	10.90
R13	0.45	0.98	0.14	2.56	1.03	0.15	0.67	1.13	26.85	0.23	1.17	0.29	29.01	1.44	3.34	0.45	0.41	0.13	2.03	0.31	1.66	0.90	0.28	0.53	0.33	0.68	1.84	0.82	0.25	2.26	0.31	0.37	17.01
R14	0.87	1.32	0.17	2.45	1.45	0.29	0.56	1.62	10.38	0.31	1.81	0.18	0.29	35.19	2.06	0.80	0.25	0.29	2.92	0.23	0.77	0.84	0.26	0.78	0.44	0.89	1.60	1.32	0.10	1.50	0.26	0.59	27.21
R15	0.36	0.80	0.11	1.53	0.89	0.12	0.41	0.94	28.16	0.18	1.02	0.26	0.43	1.20	32.08	0.41	0.44	0.11	1.85	0.26	0.98	0.85	0.22	0.44	0.25	0.54	1.20	0.79	0.15	1.46	0.23	0.23	21.13
R16	0.83	1.42	0.14	2.69	1.71	0.19	0.55	1.78	14.69	0.26	2.02	0.20	0.37	3.53	2.75	33.48	0.32	0.21	3.36	0.25	0.92	1.16	0.25	0.72	0.33	0.95	1.85	1.32	0.13	1.70	0.29	0.47	19.13
R17	0.30	0.70	0.09	2.13	0.80	0.09	0.52	0.79	16.84	0.15	0.71	0.34	0.29	0.88	2.44	0.26	35.79	0.08	1.49	0.21	1.11	0.53	0.17	0.34	0.20	0.48	1.47	0.58	0.13	1.53	0.19	0.26	28.10
R18	0.78	1.66	0.13	3.74	2.41	0.17	0.75	2.28	12.43	0.49	1.61	0.14	0.30	3.10	2.13	0.47	0.22	42.66	4.18	0.18	0.84	0.87	0.19	0.70	0.44	1.31	2.17	1.42	0.10	1.72	0.22	0.61	9.54
R19	0.38	1.15	0.15	2.59	3.33	0.12	0.59	1.84	5.30	0.32	0.70	0.14	0.13	1.00	0.99	0.26	0.15	0.11	38.21	0.18	0.46	0.35	0.22	0.45	0.36	0.75	1.51	1.93	0.05	1.22	0.23	0.54	34.28
R20	0.49	1.50	0.18	5.49	1.66	0.14	1.30	1.59	15.94	0.27	1.11	0.28	0.38	1.35	2.39	0.39	0.36	0.13	3.09	34.82	1.76	0.77	0.38	0.52	0.38	0.97	3.56	1.06	0.19	3.07	0.44	0.44	13.59
R21	0.32	0.74	0.12	2.70	0.78	0.12	0.78	0.85	16.40	0.16	0.90	0.27	0.48	1.10	2.41	0.36	0.46	0.12	1.70	0.46	30.69	0.63	0.29	0.38	0.24	0.48	2.13	0.68	0.39	3.20	0.30	0.27	29.06
R22	0.53	0.77	0.12	2.25	1.00	0.14	0.58	1.01	13.30	0.21	1.77	0.20	0.33	1.51	2.44	0.49	0.27	0.13	1.95	0.24	0.82	31.28	0.22	0.72	0.28	0.54	1.54	0.89	0.11	1.59	0.24	0.44	32.10
R23	0.51	1.87	0.08	11.15	2.37	0.07	0.77	2.60	12.97	0.41	1.31	0.12	0.40	1.00	2.07	0.24	0.19	0.07	4.91	0.24	0.98	0.80	35.59	0.61	0.21	1.34	3.88	1.85	0.14	2.16	1.11	0.23	7.73
R24	0.83	0.84	0.13	2.36	1.36	0.16	0.58	1.21	9.17	0.27	1.59	0.17	0.23	1.74	1.71	0.41	0.22	0.15	3.14	0.22	0.64	0.88	0.23	31.63	0.30	0.54	1.52	1.34	0.08	1.44	0.22	0.84	33.83
R25	0.58	3.07	0.27	4.29	3.08	0.15	0.81	3.10	9.90	0.54	1.12	0.16	0.25	2.02	1.75	0.36	0.23	0.23	4.91	0.22	0.77	0.64	0.30	0.58	38.34	2.52	2.43	1.50	0.10	1.72	0.32	0.62	13.10
R26	0.26	2.48	0.27	3.66	1.09	0.14	0.79	1.69	5.20	0.23	0.60	0.14	0.13	1.06	1.07	0.28	0.16	0.16	1.98	0.20	0.48	0.30	0.30	0.28	0.66	29.26	1.93	0.63	0.06	1.43	0.27	0.38	42.45
R27	0.48	1.64	0.27	4.85	1.38	0.21	1.19	1.53	10.06	0.37	1.07	0.35	0.31	1.58	2.09	0.51	0.32	0.18	2.57	0.33	1.10	0.63	0.70	0.56	0.62	1.18	26.21	0.83	0.15	2.21	0.99	0.40	33.15
R28	0.44	1.25	0.16	2.78	2.08	0.14	0.59	1.59	6.83	0.31	0.82	0.17	0.16	1.18	1.23	0.32	0.16	0.13	5.06	0.16	0.57	0.44	0.23	0.61	0.40	0.82	1.55	29.12	0.07	1.28	0.26	0.56	38.52
R29	0.37	0.88	0.12	2.38	0.90	0.12	0.68	1.03	18.46	0.18	0.98	0.26	0.59	1.21	2.63	0.36	0.41	0.12	1.95	0.42	3.18	0.74	0.29	0.42	0.25	0.59	1.95	0.78	30.69	2.78	0.33	0.28	23.65
R30	0.44	1.35	0.19	2.80	1.20	0.15	0.78	1.40	13.97	0.27	1.07	0.32	0.43	1.45	2.39	0.43	0.37	0.15	2.48	0.40	1.65	0.71	0.43	0.51	0.41	0.88	2.36	1.00	0.22	39.29	0.48	0.32	19.73
R31	0.30	1.31	0.16	12.47	1.22	0.09	1.13	1.30	7.73	0.19	0.74	0.17	0.23	0.98	1.38	0.25	0.21	0.10	2.45	0.29	0.71	0.45	1.46	0.36	0.26	0.73	5.17	0.99	0.10	1.83	44.08	0.24	10.93
R32	1.32	1.00	0.12	2.54	1.74	0.14	0.60	1.62	8.78	0.38	1.45	0.16	0.23	1.79	1.72	0.38	0.24	0.14	3.86	0.19	0.73	0.72	0.22	1.03	0.29	0.66	1.55	1.16	0.09	1.52	0.23	36.23	27.17
TOTAL	0.92	2.49	0.40	3.35	2.53	0.37	1.30	2.54	18.55	0.65	2.54	0.62	0.80	3.63	4.91	1.08	0.74	0.38	5.50	0.78	2.00	1.41	0.70	1.23	1.04	1.88	2.58	2.06	0.32	3.58	0.85	0.71	27.55

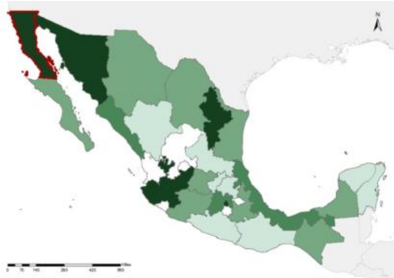
Source: Calculations by the authors.

Figure 3
Identification of Regions Relatively More Affected by a Specific Regional Demand, by Origin of Final Demand

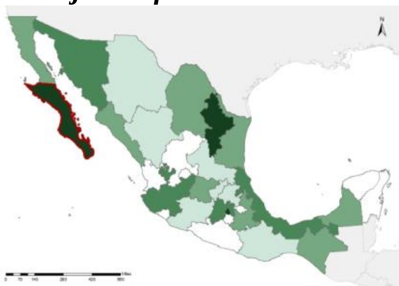
1 – Aguascalientes



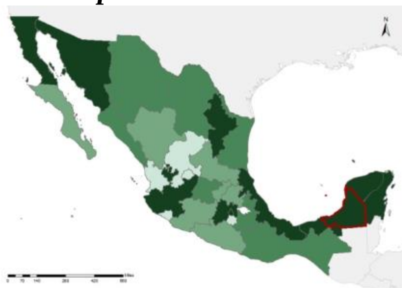
2 - Baja California



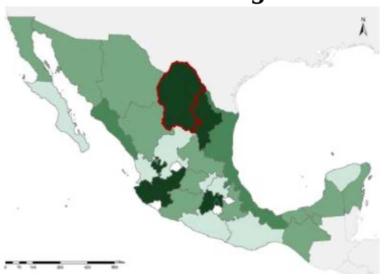
3 - Baja California Sur



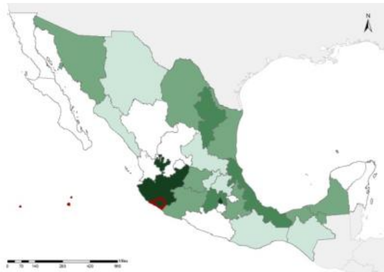
4 - Campeche



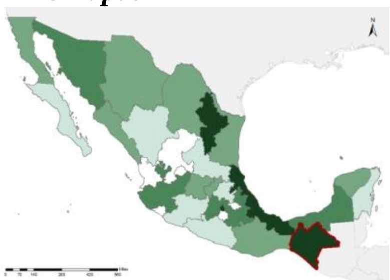
5 - Coahuila de Zaragoza



6 - Colima



7 – Chiapas



8 - Chihuahua

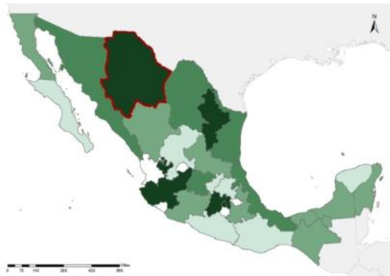
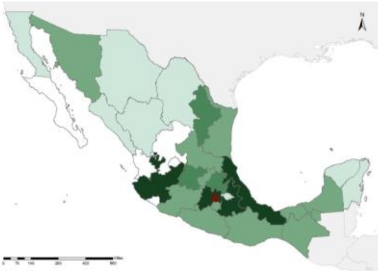
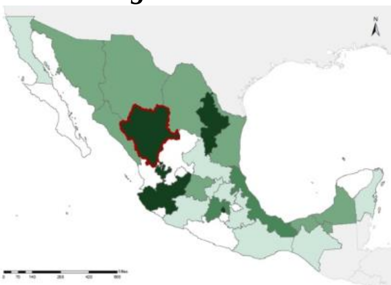


Figure 3
Identification of Regions Relatively More Affected by a Specific Regional Demand, by Origin of Final Demand (cont.)

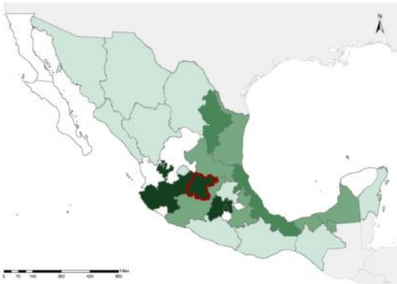
9 - Ciudad de México



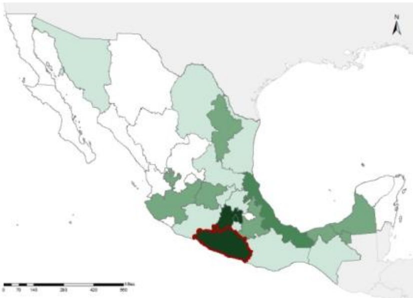
10 - Durango



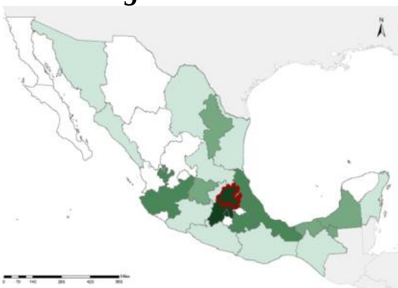
11 – Guanajuato



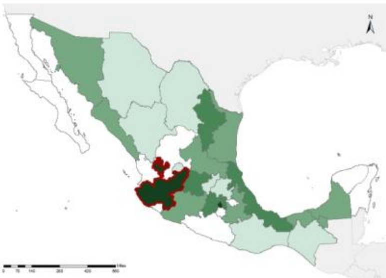
12 - Guerrero



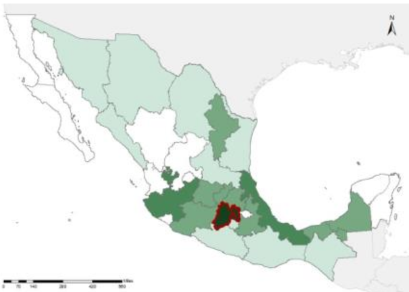
13 – Hidalgo



14 - Jalisco



15 – México



16 - Michoacán de Ocampo

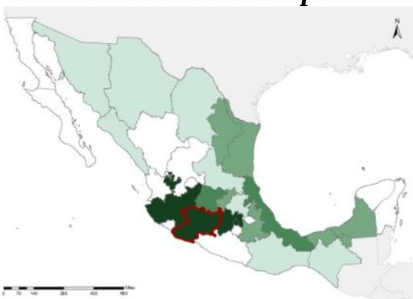
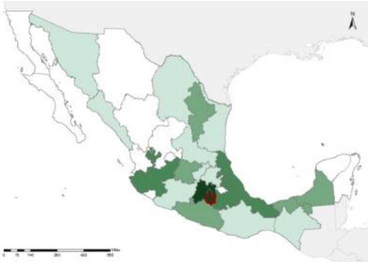
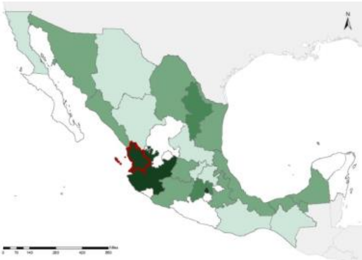


Figure 3
Identification of Regions Relatively More Affected by a Specific Regional Demand, by Origin of Final Demand (cont.)

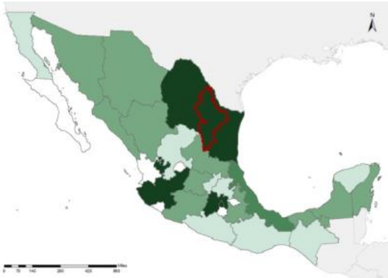
17 - Morelos



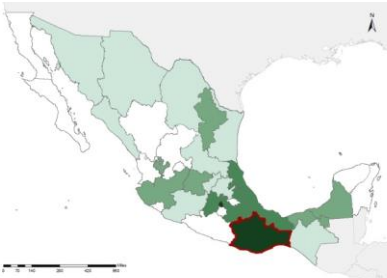
18 - Nayarit



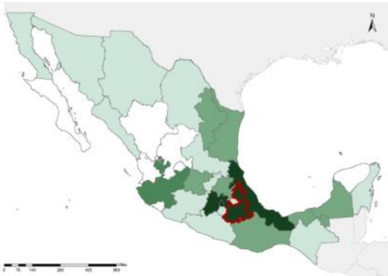
19 - Nuevo León



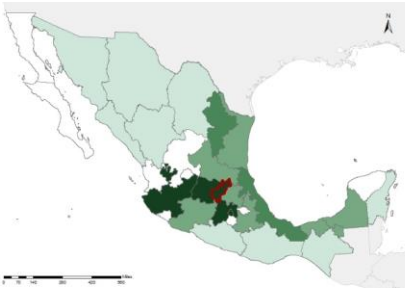
20 - Oaxaca



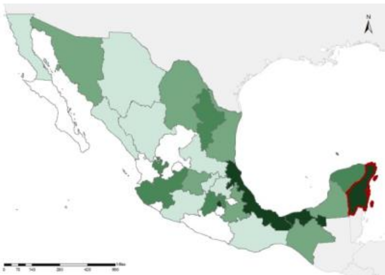
21 – Puebla



22 - Querétaro



23 - Quintana Roo



24 - San Luis Potosí

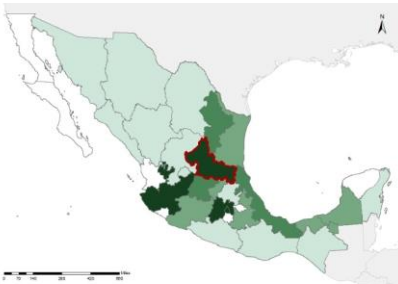
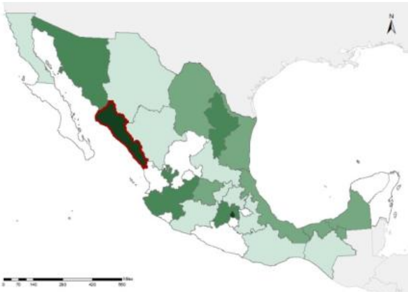
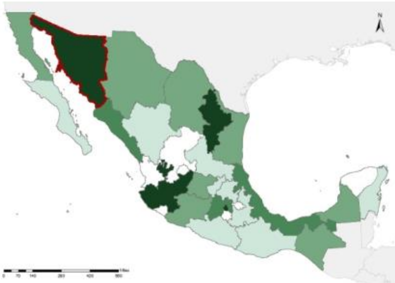


Figure 3
Identification of Regions Relatively More Affected by a Specific Regional Demand, by Origin of Final Demand (cont.)

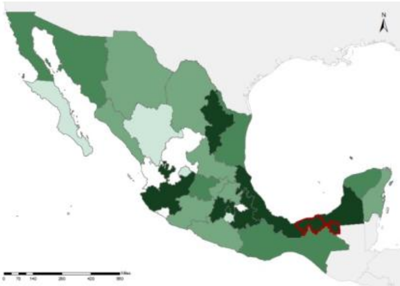
25 - Sinaloa



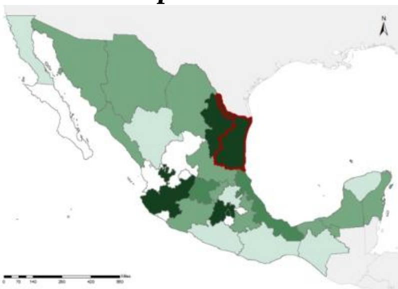
26 – Sonora



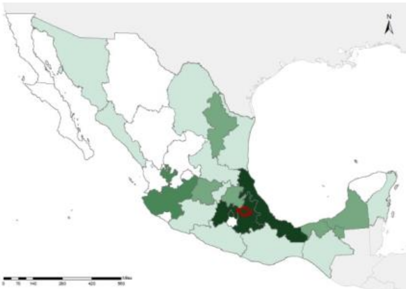
27 - Tabasco



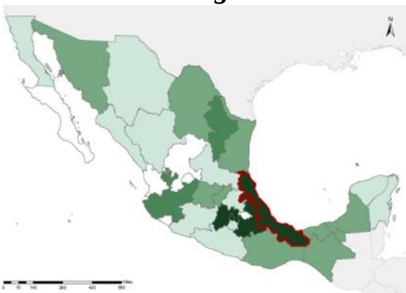
28 – Tamaulipas



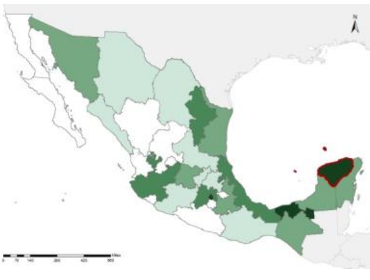
29 – Tlaxcala



30 - Veracruz de Ignacio de la Llave



31 - Yucatán



32 – Zacatecas

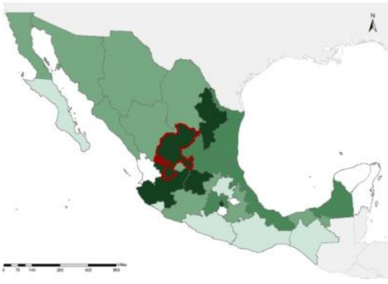
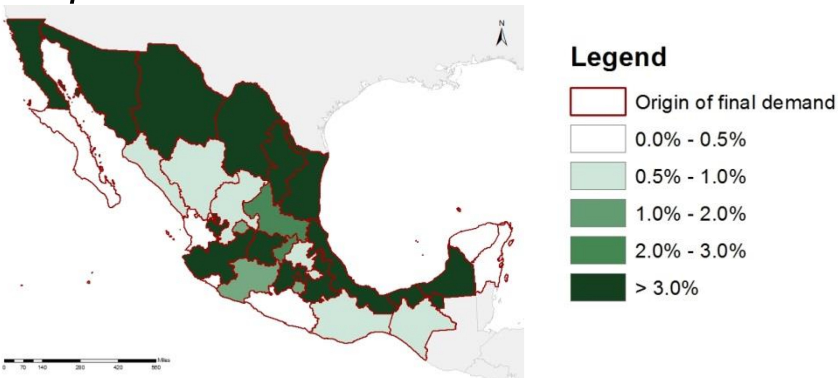


Figure 3
Identification of Regions Relatively More Affected by a Specific Regional Demand, by Origin of Final Demand (cont.)

Rest of the World



Source: Calculations by the authors.

FINAL REMARKS

The main aim of this paper was to describe the process of estimation of an interregional input-output system for México, for the year 2013. Further understanding of the structure of the Mexican regional economies, within an integrated system, is one of the main goals of a broader collaborative project underway at the University of São Paulo Regional and Urban Economics Lab (NEREUS) the Institute for Environmental Research Xabier Gorostiaga SJ (Universidad Iberoamericana Puebla) and the Instituto Tecnológico Autónomo de México (ITAM). With this paper, we make available not only the details of the methodological procedures adopted to generate the interregional system, but also the database itself to be used by other researchers and practitioners.[9]

One important caveat for this work is that there are no data available for a statistical validation of the results. Results can only be validated heuristically, which is the norm in this literature. The conclusions of the paper should be taken very cautiously when attempted to be generalized to other contexts. There is only methodological support for an internal validation of the conclusions for the case of the imposed structure on the database, i.e. the chosen gravity-equation parameters' values, the choice of the impedance function, etc. Unfortunately, given the lack of

[9] The database generated in this project is available as a supplementary file.

official statistics on interstate sectoral trade flows in México, there is no room for the statistical validation of the proposed method.

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ANNEX

Annex 1
List of Regions

Id	Regions
R1	Aguascalientes
R2	Baja California
R3	Baja California Sur
R4	Campeche
R5	Coahuila de Zaragoza
R6	Colima
R7	Chiapas
R8	Chihuahua
R9	Ciudad de México
R10	Durango
R11	Guanajuato
R12	Guerrero
R13	Hidalgo
R14	Jalisco
R15	México
R16	Michoacán de Ocampo
R17	Morelos
R18	Nayarit
R19	Nuevo León
R20	Oaxaca
R21	Puebla
R22	Querétaro
R23	Quintana Roo
R24	San Luis Potosí
R25	Sinaloa
R26	Sonora
R27	Tabasco
R28	Tamaulipas
R29	Tlaxcala

R30	Veracruz de Ignacio de la Llave
R31	Yucatán
R32	Zacatecas

Annex 2
List of Sectors

Id	Cod. SUT*	Sectors
S1	111	Agriculture
S2	112	Animal production
S3	113	Forestry and logging
S4	114	Fishing and aquaculture
S5	115	Agriculture, farming, forestry and fishing support service activities
S6	211	Extraction of crude petroleum and natural gas
S7	212-213	Mining and support service activities
S8	221	Electric power generation, transmission and distribution
S9	222	Water and gas supply by pipelines to the final consumer
S10	236-238	Construction
S11	311	Manufacture of food products
S12	312	Manufacture of beverages and tobacco products
S13	313-314	Manufacture of textiles
S14	315-316	Manufacture of wearing apparel
S15	321	Manufacture of wood and of products of wood and cork, except furniture
S16	322-323	Manufacture of paper and paper products; Printing and reproduction of recorded media
S17	324-326	Manufacture of coke and refined petroleum products; Manufacture of chemicals and chemical products; Manufacture of rubber and plastics products
S18	327	Manufacture of other non-metallic mineral products
S19	331-332	Manufacture of basic metals; Manufacture of fabricated metal products, except machinery and equipment

S20	333-336	Manufacture of machinery and equipment n.e.c.; Manufacture of computer, electronic and optical products; Manufacture of electrical equipment; Manufacture of motor vehicles, trailers and semi-trailers; Manufacture of other transport equipment
S21	337	Manufacture of furniture
S22	339	Other manufacturing
S23	431	Wholesale trade
S24	461	Retail trade
S25	481-493	Transportation and storage
S26	511-519	Information and communication
S27	521-524	Financial and insurance activities
S28	531-533	Real estate activities
S29	541	Professional, scientific and technical activities
S30	551	Activities of head offices; management consultancy activities
S31	561-562	Administrative and support service activities
S32	611	Education
S33	621-624	Human health and social work activities
S34	711-713	Arts, entertainment and recreation
S35	721-722	Accommodation and food service activities
S36	811-814	Other service activities
S37	931	Public administration and defense; compulsory social security; Activities of extraterritorial organizations and bodies

Note: *Instituto Nacional de Estadística y Geografía (INEGI) Cuadros de Oferta y Utilización – Supply and Use Tables (SUT).

Annex 3
Sectoral GRP Data

INEGI[10] publishes sectoral GRP information for 32 activity sectors in the 32 regions of Mexico for the year 2013. In order to obtain a more disaggregated sectoral structure, we disaggregate the Agriculture, forestry and fishing sector (11), and the Electric, water and gas supply sector (22) using regional shares from other databases. This disaggregation procedure takes into account the consistency with the sectoral information available at the Supply and Use Tables (SUT) at the national level.

Table A.3.1 shows the sectoral structure after the disaggregation of sector 11 into five economic sectors (111, 112, 113, 114, 115) and the disaggregation of sector 22 into two economic sectors (221, 222). This table also exhibits the variables used to calculate regional shares.

After calculating the regional shares for each SUT sector, the respective sectoral value- added estimates at the national level (from the national IO table) are distributed across the 32 Mexican regions. Next, the consistency of the regionalized data with GRP estimates is ensured using the bi-proportional adjustment method, RAS. For all the remaining 30 sectors, we use the regional shares provided by INEGI's sectoral GRP.

Table A.3.1
Data Sources Used to Calculate Regional Shares of Sectoral Output

Gross Regional Product		Supply and Use Tables		Variables used to calculate regional shares
Cod.	Sectors	Cod.	Sectors	
11	Agriculture, forestry and fishing	111	Agriculture	SIAP, Anuario Estadístico de la Producción Agrícola (Año base: 2013)
		112	Animal production	SIAP, Anuario Estadístico de la Producción Ganadera (Año base: 2013)
		113	Forestry and logging	SEMARNAT, Anuario Estadístico de la Producción Forestal (Año base: 2013)
		114	Fishing and aquaculture	SAGARPA, CONAPESCA, Anuario Estadístico de Acuacultura y Pesca (Año base: 2014)

[10] INEGI, PIB por Entidad Federativa (PIBE): https://www.inegi.org.mx/programas/pibent/2013/.

		115	Agriculture, farming, forestry and fishing support service activities	INEGI, PIB por Entidad Federativa, sector 11 (Año base: 2013)
22	Electricity, water and gas supply	221	Electric power generation, transmission and distribution	Programa de Desarrollo del Sistema Eléctrico Nacional – Generación 2013 (GWh)
		222	Water supply and gas supply by pipelines to the final consumer	INEGI, Censo Económico 2014 (año base: 2013), Valor agregado censal bruto (A131A)

Annex 4.A
Interregional Trade in Mexico, 2013 (in MXN billions)

	DESTINATION																																	TOTAL
ORIGIN	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	ROW	
R1	159	2	0	6	4	1	2	4	20	1	7	1	1	10	6	2	1	1	8	1	2	3	1	4	1	2	4	3	0	4	1	5	91	355
R2	2	456	3	29	11	1	6	12	27	2	3	1	1	7	7	1	1	1	13	1	3	2	2	2	3	16	14	4	0	9	2	3	256	899
R3	1	8	84	11	5	0	2	4	13	1	2	0	0	2	3	0	0	0	7	0	1	1	0	1	1	4	5	2	0	3	0	1	8	170
R4	1	5	0	164	8	0	15	4	45	1	26	0	13	23	47	3	6	1	32	13	6	11	1	6	1	4	44	41	2	42	2	1	347	915
R5	5	13	2	20	478	1	5	28	39	5	9	2	2	15	15	4	2	1	93	3	7	5	3	6	5	12	12	17	1	13	3	5	448	1279
R6	1	2	0	5	3	73	1	2	12	0	2	0	0	6	3	1	0	0	4	0	1	1	0	1	0	2	3	1	0	2	0	1	8	139
R7	2	8	1	16	7	1	233	7	39	2	5	2	2	7	11	2	1	1	13	2	5	3	3	2	2	6	20	5	1	13	4	1	33	462
R8	3	13	1	18	21	1	5	416	32	5	6	1	1	11	11	3	2	1	29	2	5	3	2	4	4	14	11	8	1	10	2	4	330	979
R9	22	46	6	59	58	6	21	59	2566	12	68	18	44	69	256	25	28	7	73	21	72	49	8	34	15	41	60	51	13	92	10	14	166	4088
R10	2	5	1	8	12	0	2	11	20	148	4	1	1	7	7	2	1	1	18	1	2	2	1	3	3	5	5	5	0	5	1	3	31	317
R11	11	12	2	18	17	2	5	16	99	4	556	3	4	32	28	9	3	2	28	3	10	16	3	12	5	10	13	13	1	16	3	7	187	1151
R12	2	4	0	11	6	0	2	6	58	1	4	138	1	5	11	1	3	0	10	1	5	3	1	2	1	3	8	3	1	7	1	1	19	318
R13	2	4	1	7	5	1	2	5	101	1	6	2	179	7	18	2	2	1	8	1	9	5	1	3	1	3	6	4	2	10	1	1	33	435
R14	18	22	3	36	30	6	9	28	145	7	38	4	6	897	44	18	5	6	50	4	15	17	5	17	10	19	24	23	2	27	5	11	306	1855
R15	9	17	3	26	24	3	8	22	659	5	27	8	13	34	1052	12	13	3	43	7	31	25	5	13	6	15	23	19	5	35	5	5	300	2475
R16	5	8	1	10	12	1	2	10	63	2	14	1	3	30	21	246	2	1	18	2	6	8	1	5	2	7	8	7	1	10	2	2	51	562
R17	1	2	0	5	3	0	1	3	51	1	3	2	1	4	11	1	157	0	5	1	5	2	1	1	1	2	4	2	1	5	1	1	62	338
R18	1	2	0	4	4	0	1	3	15	1	2	0	0	6	3	1	0	78	6	0	1	1	0	1	1	2	3	2	0	2	0	1	7	154
R19	11	29	4	44	118	3	11	52	89	9	20	4	4	30	27	7	4	3	1148	5	13	10	5	15	10	25	28	64	2	27	6	12	388	2226
R20	2	6	1	18	7	1	5	6	51	1	5	1	2	6	11	2	2	1	12	189	8	3	2	2	2	5	12	4	1	13	2	2	27	409
R21	4	7	1	21	9	1	7	9	149	2	11	3	8	14	36	4	7	1	17	6	428	8	3	5	2	6	18	7	7	36	3	2	164	1006
R22	4	5	1	11	8	1	3	7	74	2	16	2	3	13	22	4	2	1	13	2	7	289	1	7	2	4	8	6	1	10	2	3	119	651
R23	1	6	0	33	8	0	2	8	35	1	4	0	1	3	6	1	1	0	14	1	3	2	144	2	1	5	12	6	0	6	3	1	10	320
R24	7	5	1	10	11	1	3	8	46	2	13	1	2	16	14	3	2	1	22	2	5	8	1	272	2	4	7	10	1	9	1	6	113	611
R25	3	14	1	17	18	1	3	15	36	4	5	1	1	13	9	2	1	1	23	1	4	3	1	3	241	15	10	7	1	8	2	3	34	500
R26	3	33	3	33	19	2	8	23	42	3	8	2	2	17	16	5	3	2	27	3	7	4	3	4	9	458	18	7	1	18	4	4	244	1035
R27	3	13	2	33	11	1	18	11	56	3	18	3	9	18	34	5	4	1	25	9	10	8	6	6	5	11	303	23	2	40	9	2	177	878
R28	5	13	2	23	26	2	5	18	51	4	11	2	3	15	16	4	2	1	66	2	6	6	2	9	5	11	13	404	1	14	3	6	230	980
R29	1	1	0	3	2	0	1	2	26	0	2	0	1	2	6	1	1	0	3	1	9	2	0	1	0	1	2	1	69	5	1	0	20	164
R30	6	17	3	30	18	2	11	18	149	4	18	6	10	24	44	7	6	2	33	8	31	11	6	8	6	15	31	17	5	706	7	4	142	1404
R31	1	4	0	35	4	0	3	4	18	1	2	1	1	4	5	1	1	0	7	1	2	1	5	1	1	3	15	3	0	6	186	1	22	341
R32	4	2	0	5	6	0	1	4	16	1	5	0	1	6	5	2	1	0	12	0	2	2	0	4	1	2	3	3	0	5	1	100	33	228
ROW	96	215	16	139	369	15	73	269	603	37	229	26	70	330	450	60	66	15	492	51	233	146	26	133	48	247	153	226	29	230	38	37	0	5167
TOTAL	398	1000	143	907	1341	128	477	1092	5445	274	1148	235	391	1678	2256	439	328	133	2372	343	955	661	245	590	394	979	902	999	150	1440	311	250	4407	32809

Annex 4.B
Interregional Trade in Mexico: Purchases Shares, 2013

	DESTINATION																																	
ORIGIN	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	ROW	TOTAL
R1	0.399	0.002	0.002	0.007	0.003	0.005	0.003	0.004	0.004	0.004	0.006	0.002	0.002	0.006	0.003	0.004	0.002	0.004	0.003	0.002	0.002	0.004	0.003	0.007	0.003	0.002	0.004	0.003	0.002	0.003	0.002	0.018	0.021	0.011
R2	0.005	0.456	0.021	0.031	0.008	0.005	0.012	0.011	0.005	0.006	0.003	0.003	0.002	0.004	0.003	0.003	0.003	0.005	0.005	0.003	0.004	0.003	0.007	0.004	0.007	0.017	0.015	0.004	0.002	0.006	0.005	0.012	0.058	0.027
R3	0.002	0.008	0.587	0.012	0.004	0.001	0.004	0.004	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.004	0.006	0.002	0.001	0.002	0.001	0.004	0.002	0.005
R4	0.003	0.005	0.001	0.181	0.006	0.002	0.032	0.004	0.008	0.004	0.023	0.001	0.034	0.014	0.021	0.007	0.017	0.006	0.014	0.037	0.006	0.016	0.005	0.010	0.002	0.004	0.049	0.041	0.013	0.029	0.008	0.003	0.079	0.028
R5	0.012	0.013	0.014	0.022	0.357	0.011	0.011	0.025	0.007	0.019	0.008	0.008	0.005	0.009	0.007	0.008	0.007	0.011	0.039	0.007	0.007	0.007	0.011	0.011	0.013	0.013	0.014	0.017	0.005	0.009	0.009	0.018	0.102	0.039
R6	0.003	0.002	0.001	0.005	0.002	0.570	0.002	0.002	0.002	0.001	0.002	0.001	0.001	0.004	0.001	0.002	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.002	0.001	0.002	0.003	0.001	0.001	0.002	0.001	0.004	0.002	0.004
R7	0.005	0.008	0.008	0.018	0.006	0.006	0.487	0.007	0.007	0.006	0.004	0.007	0.005	0.004	0.005	0.005	0.005	0.005	0.006	0.007	0.005	0.005	0.013	0.004	0.006	0.006	0.022	0.005	0.005	0.009	0.013	0.005	0.008	0.014
R8	0.008	0.013	0.009	0.020	0.015	0.008	0.010	0.381	0.006	0.018	0.006	0.005	0.004	0.006	0.005	0.006	0.005	0.008	0.012	0.005	0.005	0.005	0.008	0.007	0.009	0.014	0.012	0.008	0.004	0.007	0.007	0.015	0.075	0.030
R9	0.057	0.046	0.039	0.065	0.043	0.044	0.045	0.054	0.471	0.045	0.059	0.075	0.113	0.041	0.113	0.056	0.085	0.049	0.031	0.063	0.076	0.074	0.034	0.058	0.037	0.042	0.066	0.051	0.087	0.064	0.033	0.057	0.038	0.125
R10	0.006	0.005	0.005	0.009	0.009	0.003	0.004	0.010	0.004	0.540	0.004	0.002	0.002	0.004	0.003	0.004	0.003	0.005	0.008	0.002	0.003	0.003	0.003	0.005	0.007	0.005	0.005	0.005	0.003	0.004	0.003	0.012	0.007	0.010
R11	0.028	0.012	0.012	0.020	0.013	0.018	0.010	0.015	0.018	0.015	0.484	0.012	0.011	0.019	0.012	0.021	0.009	0.015	0.012	0.008	0.011	0.025	0.011	0.021	0.012	0.010	0.015	0.013	0.010	0.011	0.010	0.029	0.042	0.035
R12	0.005	0.004	0.001	0.012	0.005	0.002	0.005	0.005	0.011	0.003	0.003	0.586	0.004	0.003	0.005	0.002	0.008	0.002	0.004	0.003	0.005	0.004	0.002	0.003	0.001	0.003	0.009	0.003	0.004	0.005	0.003	0.005	0.004	0.010
R13	0.005	0.004	0.004	0.008	0.004	0.005	0.005	0.004	0.019	0.004	0.005	0.007	0.459	0.004	0.008	0.005	0.006	0.004	0.003	0.004	0.010	0.007	0.004	0.005	0.004	0.004	0.007	0.004	0.011	0.007	0.004	0.006	0.008	0.013
R14	0.045	0.022	0.021	0.039	0.022	0.048	0.019	0.026	0.027	0.026	0.033	0.016	0.015	0.534	0.020	0.042	0.014	0.047	0.021	0.013	0.015	0.025	0.019	0.029	0.024	0.020	0.027	0.023	0.014	0.019	0.015	0.044	0.070	0.057
R15	0.022	0.017	0.018	0.029	0.018	0.022	0.017	0.020	0.121	0.017	0.024	0.033	0.034	0.020	0.467	0.026	0.040	0.019	0.018	0.020	0.032	0.038	0.020	0.021	0.016	0.015	0.025	0.019	0.031	0.024	0.017	0.021	0.068	0.075
R16	0.014	0.008	0.005	0.011	0.009	0.008	0.005	0.009	0.012	0.007	0.012	0.005	0.007	0.018	0.009	0.560	0.006	0.009	0.008	0.005	0.006	0.012	0.005	0.009	0.005	0.007	0.009	0.007	0.007	0.007	0.006	0.010	0.012	0.017
R17	0.003	0.002	0.003	0.006	0.002	0.003	0.003	0.002	0.009	0.002	0.002	0.008	0.004	0.002	0.005	0.002	0.478	0.002	0.002	0.003	0.005	0.003	0.002	0.002	0.002	0.002	0.004	0.002	0.004	0.004	0.002	0.003	0.014	0.010
R18	0.003	0.002	0.001	0.005	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.001	0.001	0.004	0.001	0.002	0.001	0.587	0.003	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.003	0.002	0.001	0.002	0.001	0.003	0.002	0.005
R19	0.027	0.029	0.029	0.049	0.088	0.023	0.023	0.048	0.016	0.035	0.017	0.017	0.010	0.018	0.012	0.017	0.013	0.020	0.484	0.015	0.014	0.015	0.022	0.025	0.025	0.025	0.031	0.064	0.010	0.019	0.018	0.049	0.088	0.068
R20	0.005	0.006	0.006	0.019	0.005	0.005	0.009	0.006	0.009	0.005	0.004	0.006	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.552	0.008	0.005	0.006	0.004	0.004	0.005	0.014	0.004	0.007	0.009	0.006	0.007	0.006	0.012
R21	0.009	0.007	0.007	0.023	0.007	0.009	0.015	0.008	0.027	0.007	0.010	0.014	0.020	0.008	0.016	0.009	0.020	0.008	0.007	0.017	0.448	0.012	0.011	0.008	0.006	0.006	0.020	0.007	0.045	0.025	0.011	0.009	0.037	0.031
R22	0.010	0.005	0.005	0.012	0.006	0.007	0.007	0.006	0.014	0.006	0.014	0.007	0.008	0.008	0.010	0.009	0.007	0.007	0.005	0.005	0.007	0.437	0.006	0.011	0.005	0.004	0.009	0.006	0.007	0.007	0.005	0.012	0.027	0.020
R23	0.004	0.006	0.002	0.036	0.006	0.001	0.005	0.007	0.006	0.005	0.003	0.002	0.003	0.002	0.003	0.002	0.002	0.001	0.006	0.002	0.003	0.004	0.589	0.003	0.002	0.005	0.013	0.006	0.003	0.004	0.011	0.002	0.002	0.010
R24	0.018	0.005	0.006	0.011	0.008	0.008	0.006	0.008	0.008	0.008	0.012	0.006	0.005	0.009	0.006	0.008	0.006	0.007	0.009	0.005	0.006	0.012	0.006	0.460	0.005	0.005	0.008	0.010	0.005	0.006	0.005	0.024	0.026	0.019
R25	0.007	0.014	0.008	0.018	0.013	0.005	0.007	0.014	0.007	0.013	0.005	0.003	0.003	0.008	0.004	0.004	0.003	0.009	0.010	0.003	0.004	0.005	0.006	0.005	0.611	0.015	0.011	0.007	0.004	0.006	0.006	0.011	0.008	0.015
R26	0.009	0.033	0.022	0.037	0.014	0.012	0.017	0.022	0.008	0.012	0.007	0.008	0.005	0.010	0.007	0.011	0.008	0.013	0.011	0.008	0.008	0.006	0.014	0.008	0.023	0.468	0.020	0.007	0.007	0.012	0.012	0.015	0.055	0.032
R27	0.006	0.013	0.014	0.037	0.008	0.012	0.037	0.010	0.010	0.011	0.015	0.013	0.023	0.011	0.015	0.010	0.013	0.010	0.011	0.026	0.010	0.012	0.024	0.010	0.012	0.011	0.336	0.023	0.014	0.028	0.029	0.009	0.040	0.027
R28	0.012	0.013	0.013	0.025	0.020	0.013	0.011	0.016	0.009	0.015	0.010	0.010	0.006	0.009	0.007	0.009	0.006	0.010	0.028	0.006	0.007	0.008	0.009	0.015	0.012	0.011	0.015	0.405	0.006	0.010	0.008	0.024	0.052	0.030
R29	0.002	0.001	0.001	0.003	0.001	0.001	0.002	0.002	0.005	0.001	0.002	0.002	0.004	0.001	0.003	0.001	0.003	0.001	0.001	0.002	0.009	0.002	0.002	0.001	0.001	0.001	0.003	0.001	0.459	0.003	0.002	0.002	0.004	0.005
R30	0.015	0.017	0.019	0.033	0.013	0.017	0.022	0.017	0.027	0.016	0.015	0.024	0.024	0.014	0.020	0.016	0.020	0.014	0.014	0.023	0.032	0.017	0.024	0.014	0.016	0.015	0.034	0.017	0.032	0.490	0.022	0.017	0.032	0.043
R31	0.002	0.004	0.003	0.039	0.003	0.002	0.007	0.004	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.022	0.002	0.002	0.003	0.017	0.003	0.002	0.004	0.600	0.003	0.005	0.010
R32	0.010	0.002	0.002	0.005	0.005	0.002	0.003	0.003	0.003	0.004	0.004	0.002	0.002	0.004	0.002	0.004	0.002	0.002	0.005	0.001	0.002	0.003	0.002	0.007	0.002	0.002	0.004	0.003	0.003	0.003	0.002	0.399	0.008	0.007
ROW	0.241	0.215	0.112	0.153	0.275	0.119	0.153	0.246	0.111	0.137	0.199	0.111	0.179	0.197	0.199	0.136	0.200	0.110	0.208	0.148	0.244	0.221	0.106	0.225	0.123	0.253	0.169	0.227	0.191	0.160	0.123	0.147	0.000	0.157
TOTAL	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Annex 4.C
Interregional Trade in Mexico: Sales Shares, 2013

ORIGIN	DESTINATION R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	ROW	TOTAL
R1	0.446	0.007	0.001	0.017	0.012	0.002	0.004	0.011	0.057	0.003	0.019	0.002	0.002	0.028	0.017	0.005	0.002	0.002	0.022	0.002	0.006	0.008	0.002	0.011	0.003	0.005	0.011	0.009	0.001	0.012	0.002	0.013	0.255	1.000
R2	0.002	0.508	0.003	0.032	0.012	0.001	0.006	0.014	0.030	0.002	0.004	0.001	0.001	0.007	0.008	0.002	0.001	0.001	0.014	0.001	0.004	0.002	0.002	0.002	0.003	0.018	0.015	0.005	0.000	0.010	0.002	0.003	0.285	1.000
R3	0.004	0.047	0.494	0.064	0.029	0.001	0.011	0.023	0.077	0.004	0.009	0.001	0.002	0.012	0.016	0.003	0.002	0.001	0.039	0.002	0.008	0.005	0.002	0.005	0.003	0.021	0.031	0.012	0.001	0.020	0.003	0.006	0.046	1.000
R4	0.001	0.006	0.000	0.179	0.008	0.000	0.017	0.005	0.049	0.001	0.028	0.000	0.014	0.025	0.051	0.003	0.006	0.001	0.035	0.014	0.006	0.012	0.001	0.007	0.001	0.004	0.049	0.044	0.002	0.046	0.003	0.001	0.379	1.000
R5	0.004	0.010	0.002	0.016	0.374	0.001	0.004	0.022	0.030	0.004	0.007	0.001	0.001	0.012	0.012	0.003	0.002	0.001	0.073	0.002	0.005	0.004	0.002	0.005	0.004	0.010	0.010	0.013	0.001	0.010	0.002	0.004	0.350	1.000
R6	0.008	0.013	0.001	0.034	0.019	0.526	0.007	0.017	0.084	0.003	0.015	0.001	0.003	0.045	0.023	0.006	0.003	0.002	0.029	0.002	0.008	0.007	0.002	0.008	0.003	0.012	0.021	0.010	0.001	0.016	0.002	0.007	0.061	1.000
R7	0.004	0.017	0.003	0.035	0.016	0.002	0.503	0.015	0.085	0.004	0.011	0.004	0.004	0.015	0.024	0.004	0.003	0.001	0.029	0.005	0.011	0.007	0.007	0.005	0.005	0.014	0.043	0.012	0.002	0.028	0.009	0.003	0.072	1.000
R8	0.003	0.014	0.001	0.019	0.021	0.001	0.005	0.425	0.033	0.005	0.006	0.001	0.001	0.011	0.011	0.003	0.002	0.001	0.030	0.002	0.005	0.003	0.002	0.004	0.004	0.014	0.011	0.008	0.001	0.011	0.002	0.004	0.337	1.000
R9	0.005	0.011	0.001	0.014	0.014	0.001	0.005	0.014	0.628	0.003	0.017	0.004	0.011	0.017	0.063	0.006	0.007	0.002	0.018	0.005	0.018	0.012	0.002	0.008	0.004	0.010	0.015	0.012	0.003	0.023	0.002	0.003	0.041	1.000
R10	0.007	0.017	0.002	0.025	0.037	0.001	0.006	0.034	0.064	0.466	0.014	0.002	0.003	0.023	0.022	0.005	0.003	0.002	0.057	0.003	0.008	0.007	0.003	0.009	0.008	0.015	0.016	0.014	0.001	0.016	0.003	0.010	0.097	1.000
R11	0.010	0.010	0.002	0.016	0.015	0.002	0.004	0.014	0.086	0.003	0.483	0.002	0.004	0.028	0.024	0.008	0.003	0.002	0.024	0.002	0.009	0.014	0.002	0.011	0.004	0.009	0.012	0.012	0.001	0.014	0.003	0.006	0.163	1.000
R12	0.006	0.013	0.001	0.034	0.020	0.001	0.007	0.018	0.182	0.002	0.012	0.433	0.005	0.016	0.035	0.003	0.009	0.001	0.031	0.003	0.015	0.009	0.002	0.006	0.002	0.010	0.025	0.011	0.002	0.022	0.003	0.004	0.058	1.000
R13	0.004	0.009	0.001	0.017	0.011	0.001	0.005	0.011	0.233	0.003	0.014	0.004	0.413	0.016	0.043	0.005	0.005	0.001	0.019	0.003	0.021	0.011	0.002	0.006	0.003	0.008	0.013	0.008	0.004	0.022	0.003	0.003	0.077	1.000
R14	0.010	0.012	0.002	0.019	0.016	0.003	0.005	0.015	0.078	0.004	0.020	0.002	0.003	0.483	0.024	0.010	0.002	0.003	0.027	0.002	0.008	0.009	0.002	0.009	0.005	0.010	0.013	0.012	0.001	0.015	0.003	0.006	0.165	1.000
R15	0.004	0.007	0.001	0.011	0.010	0.001	0.003	0.009	0.266	0.002	0.011	0.003	0.005	0.014	0.425	0.005	0.005	0.001	0.017	0.003	0.012	0.010	0.002	0.005	0.002	0.006	0.009	0.008	0.002	0.014	0.002	0.002	0.121	1.000
R16	0.010	0.013	0.001	0.018	0.021	0.002	0.004	0.018	0.113	0.004	0.025	0.002	0.005	0.052	0.037	0.437	0.004	0.002	0.033	0.003	0.011	0.014	0.002	0.009	0.003	0.012	0.014	0.013	0.002	0.017	0.003	0.004	0.091	1.000
R17	0.003	0.007	0.001	0.015	0.008	0.001	0.004	0.008	0.151	0.002	0.008	0.005	0.004	0.011	0.031	0.003	0.464	0.001	0.014	0.003	0.014	0.006	0.002	0.004	0.002	0.006	0.012	0.006	0.002	0.016	0.002	0.002	0.182	1.000
R18	0.008	0.015	0.001	0.029	0.026	0.002	0.006	0.021	0.098	0.006	0.016	0.001	0.003	0.039	0.022	0.005	0.002	0.510	0.039	0.002	0.008	0.009	0.002	0.007	0.005	0.015	0.017	0.013	0.001	0.016	0.002	0.005	0.048	1.000
R19	0.005	0.013	0.002	0.020	0.053	0.001	0.005	0.023	0.040	0.004	0.009	0.002	0.002	0.013	0.012	0.003	0.002	0.001	0.516	0.002	0.006	0.005	0.002	0.007	0.004	0.011	0.013	0.029	0.001	0.012	0.002	0.006	0.174	1.000
R20	0.004	0.014	0.002	0.043	0.018	0.001	0.011	0.015	0.126	0.003	0.011	0.004	0.005	0.014	0.026	0.004	0.004	0.001	0.029	0.462	0.019	0.008	0.004	0.006	0.004	0.012	0.030	0.011	0.003	0.032	0.004	0.004	0.066	1.000
R21	0.004	0.007	0.001	0.021	0.009	0.001	0.007	0.009	0.149	0.002	0.011	0.003	0.008	0.014	0.036	0.004	0.007	0.001	0.017	0.006	0.425	0.008	0.003	0.005	0.002	0.006	0.018	0.007	0.007	0.036	0.003	0.002	0.163	1.000
R22	0.006	0.007	0.001	0.017	0.012	0.001	0.005	0.010	0.114	0.002	0.024	0.002	0.005	0.020	0.034	0.006	0.003	0.001	0.020	0.003	0.011	0.444	0.002	0.010	0.003	0.007	0.012	0.010	0.002	0.016	0.002	0.005	0.183	1.000
R23	0.005	0.017	0.001	0.102	0.024	0.001	0.007	0.024	0.110	0.004	0.012	0.001	0.004	0.009	0.018	0.002	0.002	0.001	0.045	0.002	0.009	0.007	0.451	0.006	0.002	0.014	0.036	0.017	0.001	0.020	0.011	0.002	0.033	1.000
R24	0.012	0.009	0.001	0.017	0.018	0.002	0.005	0.014	0.075	0.004	0.022	0.002	0.003	0.026	0.024	0.006	0.003	0.002	0.036	0.003	0.009	0.013	0.002	0.445	0.003	0.007	0.012	0.016	0.001	0.015	0.002	0.010	0.184	1.000
R25	0.006	0.028	0.002	0.033	0.036	0.001	0.007	0.030	0.071	0.007	0.011	0.001	0.003	0.025	0.018	0.004	0.002	0.002	0.047	0.002	0.008	0.006	0.003	0.006	0.482	0.030	0.020	0.013	0.001	0.017	0.004	0.006	0.068	1.000
R26	0.003	0.032	0.003	0.032	0.018	0.002	0.008	0.023	0.041	0.003	0.008	0.002	0.002	0.016	0.016	0.005	0.002	0.002	0.026	0.003	0.007	0.004	0.003	0.004	0.009	0.442	0.018	0.007	0.001	0.017	0.004	0.004	0.235	1.000
R27	0.003	0.014	0.002	0.038	0.012	0.002	0.020	0.012	0.064	0.003	0.020	0.004	0.010	0.021	0.039	0.005	0.005	0.001	0.029	0.010	0.011	0.009	0.007	0.007	0.005	0.013	0.345	0.026	0.002	0.045	0.010	0.003	0.201	1.000
R28	0.005	0.013	0.002	0.023	0.027	0.002	0.005	0.018	0.052	0.004	0.011	0.002	0.003	0.015	0.016	0.004	0.002	0.001	0.067	0.002	0.006	0.006	0.002	0.009	0.005	0.011	0.014	0.413	0.001	0.014	0.003	0.006	0.235	1.000
R29	0.004	0.008	0.001	0.016	0.010	0.001	0.005	0.011	0.158	0.002	0.011	0.003	0.009	0.014	0.035	0.004	0.005	0.001	0.019	0.005	0.055	0.009	0.003	0.005	0.002	0.007	0.015	0.008	0.419	0.029	0.003	0.002	0.120	1.000
R30	0.004	0.012	0.002	0.021	0.013	0.002	0.008	0.013	0.106	0.003	0.013	0.004	0.007	0.017	0.032	0.005	0.005	0.001	0.023	0.006	0.022	0.008	0.004	0.006	0.004	0.011	0.022	0.012	0.003	0.502	0.005	0.003	0.101	1.000
R31	0.003	0.011	0.001	0.103	0.013	0.001	0.010	0.011	0.052	0.002	0.007	0.002	0.002	0.011	0.014	0.002	0.002	0.001	0.021	0.003	0.007	0.004	0.016	0.004	0.003	0.008	0.045	0.009	0.001	0.017	0.547	0.002	0.066	1.000
R32	0.018	0.009	0.001	0.022	0.027	0.001	0.006	0.016	0.069	0.005	0.020	0.002	0.003	0.026	0.024	0.008	0.003	0.001	0.051	0.002	0.009	0.010	0.002	0.018	0.003	0.008	0.014	0.012	0.002	0.021	0.003	0.437	0.147	1.000
ROW	0.019	0.042	0.003	0.027	0.071	0.003	0.014	0.052	0.117	0.007	0.044	0.005	0.014	0.064	0.087	0.012	0.013	0.003	0.095	0.010	0.045	0.028	0.005	0.026	0.009	0.048	0.030	0.044	0.006	0.045	0.007	0.007	0.000	1.000
TOTAL	0.012	0.030	0.004	0.028	0.041	0.004	0.015	0.033	0.166	0.008	0.035	0.007	0.012	0.051	0.069	0.013	0.010	0.004	0.072	0.010	0.029	0.020	0.007	0.018	0.012	0.030	0.027	0.030	0.005	0.044	0.009	0.008	0.134	1.000