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Regional Input-Output Matrices, an Application to Manufacturing Exports in Mexico*

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Abstract: Based on the national Input-Output Matrix (IOM) 2012 calculated by INEGI, we use Flegg's approach to estimate four regional Input-Output Matrices (RIOMs) using Banco de México's regionalization (Northern, North-Central, Central and Southern). The RIOMs are employed to evaluate the impact on regional gross output, value added and employment resulting from a 10,000 million dollar shock on Mexican manufacturing exports. The results show that the effects on the absolute values of gross output, value added and employment in the North are clearly larger than those estimated for the other regions. Another finding is that the total effects of the regional shocks tend to concentrate in the manufacturing sector, with the highest concentration observed in the North, and the lowest in the South. We also find that indirect effects of these shocks tend to be larger in regions far from the US border.
Keywords: Input-Output Model, Regional Analysis, Multiplier Effects, Exports
JEL Classification: R11, R12, R15

Resumen: A partir de la Matriz de Insumo-Producto nacional (MIP) 2012 de INEGI, se utiliza el enfoque de Flegg (2013) para estimar cuatro Matrices de Insumo-Producto regionales (MIPRs) bajo la regionalización del Banco de México (norte, centro-norte, centro y sur). Las MIPRs se emplean para evaluar el impacto sobre producción bruta, valor agregado y empleo a nivel regional de un choque de 10,000 millones de dólares en las exportaciones manufactureras mexicanas. Los resultados muestran que los efectos absolutos sobre producción bruta, valor agregado y empleo en el norte son mayores que los estimados para las otras regiones. El análisis también revela que los efectos totales de los choques regionales tienden a concentrarse en el sector manufacturero, con la mayor concentración observada en el norte y la más baja en el sur. Finalmente, se observa que los efectos indirectos de estos choques son mayores en las regiones más alejadas de la frontera con Estados Unidos
Palabras Clave: Modelo Insumo-Producto, Análisis Regional, Efectos Multiplicadores, Exportaciones

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I. Introduction

This paper estimates the direct and indirect effects that an exogenous shock to the manufacturing exporting sector can have on other sectors of economic activity at the regional level in Mexico. Positive shocks that originate in a particular manufacturing sector can have spill-over effects on other manufacturing sectors and on other activities -such as services or construction- via input-output linkages. To identify these effects, this paper extends traditional input-output matrix (IOM) analysis to the estimation of regional input-output matrices (RIOMs), which can be useful tools to characterize the regional heterogeneity in the organization of economic activity within a country. An IOM summarizes important information regarding the economy's productive structure that is useful to evaluate the aggregate impact on the entire economic system produced by exogenous shocks that initially originate within a particular activity. The estimation of IOMs at the regional level allows for a richer characterization of the aggregate effects of exogenous shocks as we may identify the differential spill-over effects that these shocks may have across regions within the same country.

Previous work has found that the regional impact of trade liberalization may be very heterogeneous. For example, Chiquiar (2005) and Cosar and Fajgelbaum (2016) study the regional impact of external economic integration and find that specialization patterns (i.e. sectoral composition) can lead to uneven effects of international trade. Similarly, Autor, Dorn and Hanson (2013) find differential effects of import competition from China in local labor markets in the U.S. In a related paper, Chiquiar et al. (2014) also find heterogenous effects of trade shocks –such as the enactment of NAFTA or the entry of China into the WTO- on Mexican labor markets. This paper focuses on a particular channel that can exacerbate or dampen the differential responses to an exogenous export shock at the regional level and that, therefore, can be relevant to explain heterogeneous regional effects of external shocks. In particular, even if the first order effect of an exogenous shock on exports for a particular region depends on its export orientation, regions in which sectors are more interconnected will benefit more from the same shock relative to those with weaker sectoral links. This implies that heterogeneous effects can arise not only from a region's export capability, but also from its underlying microeconomic structure in terms of how economic activity is organized. Indeed, Acemoglu et al. (2012) and Foerster et al. (2011) have emphasized the role of intersectoral linkages as an amplification mechanism that accounts for a substantial amount of aggregate fluctuations. Moreover, Caliendo et al. (2016) argue that intersectoral and interregional linkages are key in understanding the response of the aggregate economy to micro-level shocks.

Methodological advances, the availability of new and reliable data, and the development of more powerful and easy-to operate computational tools have made IOM analysis and its extension to RIOMs a tool that can be effectively implemented to further our understanding of the organization of economic activity and its consequences for aggregate outcomes. In this sense, this paper is related to the recent literature on value added trade, such as Koopman et al. (2010), Los et al. (2016), and Johnson and Noguera (2012, 2016), that uses IOM analysis to characterize the international fragmentation of production and the linkages across sectors and economies in order to trace value added along global production chains. This paper uses the methodology proposed by Alvarado et al. (2016) in order to estimate RIOMs for Mexico. In particular, the RIOMs are estimated for the regionalization of the Mexican economy used in the Reporte Sobre las Economias Regionales of Banco de Mexico, which divides Mexico into four economic regions: North, North-Center, Center, and South.[1]

The main result of this paper concerns the heterogeneous regional impact of a shock to manufacturing exports on gross output, value added, and employment. For instance, a positive shock to manufacturing exports will naturally benefit the Northern region more due to its export orientation relative to other regions in Mexico. However, the RIOM analysis allows us to uncover that there is substantial regional heterogeneity in the indirect effects that

[1] We recognize that it is not a possible to determine the optimal regionalization of a country. In fact, in the case of Mexico other researchers have already estimated RIOMs defining the regions differently to ours. See, for instance, Callicó et al. (2000) for the Western region (Colima, Jalisco, Michoacán y Nayarit); Ayala y Chapa (2007) for the North-East (Nuevo León, Coahuila y Tamaulipas); and Dávila (2015), who compiles estimations of RIOMs for seven regions obtained by different authors. There are also some estimations of RIOMs at the state level. Some examples are Fuentes (2005) for Baja California; Valdez (2004) for Tamaulipas; Dávila (2002) for Coahuila; and Chapa and Rangel (2010) and Rodríguez-Oreggia (1995) for Nuevo León.

arise from this external shock. In terms of the impact on gross output, it is found that the indirect effect is largest in the South, where it accounts for 29 percent of the total effect, while the indirect effect is smallest in the North, where it accounts for 16 percent of the total effect. This result in itself may be surprising, as the North is the most industrially developed and export oriented region in the country, while the South has a less developed industrial structure and is more closed off to international trade. It is also interesting to note that in terms of gross output, the indirect effects are concentrated in service sectors such as Transportation and Administrative and Support Services. For value added the patterns are roughly the same as those for gross output, with the notable exception that in this case indirect effects play a larger role in accounting for the total regional effect. In regards to employment, the most notable result is that both the Northern and Southern regions register the largest direct effects to a shock in manufacturing exports. This stands in contrast to the results for gross output and valued added where the South always registered the smallest direct effect.

The paper is organized as follows: Section II presents the basic theoretical framework to construct regional input-output matrices; Section III describes the estimation of RIOMs for the Mexican case.[2] Section IV uses the estimates of section III to estimate the impact of a shock to Mexican manufacturing on gross output, value added and employment; Section V concludes.

II. Methodology

II.1. Derivation of the National Input-Output Matrix (IOM)

The basic approaches to estimate a RIOM with indirect methods are invariably based on a National IOM. Once the latter has been obtained, its elements are transformed in accordance with the chosen methodology, as well as based on different criteria related to the distinctive features of the region for which a RIOM is constructed. However, the question remains as to how to obtain an IOM in the first place.

[2] Sections II and III rely heavily on a Banco de Mexico's paper in progress by Alvarado, Quiroga and Torre (2016).

The basic procedure starts by assuming that the economy has "n" sectors, where sector "i" distributes the value of its output x_i of one period among the (intermediate) sales to other productive sectors (z_{ij}) and the final demand (f_i)[3]:

$$x_i = z_{i1} + \cdots + z_{ij} + \cdots + z_{in} + f_i = \sum_{j=1}^{n} z_{ij} + f_i \tag{1}$$

Since there is a similar equation for each one of "n" sectors of the economy, we have that:

$$\begin{aligned} x_1 &= z_{11} + \cdots + z_{1j} + \cdots + z_{1n} + f_1 \\ &\vdots \\ x_i &= z_{i1} + \cdots + z_{ij} + \cdots + z_{in} + f_i \\ &\vdots \\ x_n &= z_{n1} + \cdots + z_{nj} + \cdots + z_{nn} + f_n \end{aligned} \tag{2}$$

Allowing:

$$\boldsymbol{x} = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}, \ \boldsymbol{Z} = \begin{bmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{bmatrix} \quad \text{and} \quad \boldsymbol{f} = \begin{bmatrix} f_1 \\ \vdots \\ f_n \end{bmatrix} \tag{3}$$

then (3) can be expressed in matrix notation as follows:

$$\boldsymbol{x} = \boldsymbol{Zi} + \boldsymbol{f} \tag{4}$$

where "$\boldsymbol{i}$" represents a column vector of 1's whose dimension is 1 by n.

In this representation, matrix "**Z**", integrated by z_{ij}, is the matrix of intermediate sales (Table 1). The reason for this denomination is that in this matrix, the elements of column "j" are purchases made by the productive sector "j" from each productive sector "i" (in other words, they are input purchases made by sector "j"); while the elements of line "i" are that

[3] Sections II.1 and II.2 are based on Miller and Blair (2009). In the discussion that follows, the variables are supposed to be measured in constant MXN. The approach can also be consulted in Leontief (1986).

sector's sales to each sector "j" (with the possibility that a fraction of these sales may be used by the same sector "i").

Table 1. Matrix of Intermediate Sales

		Buying Sector				
		1	...	j	...	n
Selling Sector	1	*Z11*	...	*Z1j*	...	*Z1n*
	.			.		.
	.			.		.
	.			.		.
	i	*Zi1*	...	*Zij*	...	*Zin*
	.	.		.		.
	.	.		.		.
	.	.		.		.
	n	*Zn1*	...	*Znj*	...	*Znn*

Source: Table 2.1, Miller and Blair (2009), p.13.

It should be stressed that the elements comprising an IOM are only a part of a complete set of production and revenue accounts of an economy. To see this, assume that an economy has only two productive sectors (1 and 2), where the vectors of demand for finished goods and services f_1 and f_2 are given by:

$$f_1 = c_1 + i_1 + g_1 + e_1 \tag{5}$$

$$f_2 = c_2 + i_2 + g_2 + e_2 \tag{6}$$

Here, c_i are consumers' purchases of good "i"; i_i are the businesses' purchases of good "i"; g_i are the purchases of good "i" made by the government (local, state and federal); and e_i are the exports of good "i" by the businesses established in the country. In all cases, the reference is for good "i", where i = 1 and 2. On summing up the corresponding components of f_1 and f_2, it is given that the total domestic demand for finished goods and services is given by "$C + I + G + E$", where:

$$\begin{aligned} C &= c_1 + c_2 \\ I &= i_1 + i_2 \\ G &= g_1 + g_2 \\ E &= e_1 + e_2 \end{aligned} \tag{7}$$

On the other hand, the payment industry for sectors 1 and 2 considers:

a) Employee compensations in sector 1 (l_1) and sector 2 (l_2), where $l_1 + l_2 = L$.

b) Interest, income, profits' payments, etc. in sectors 1 (n_1) and 2 (n_2), where $n_1 + n_2 = N$.

In turn, total imports by sector of economic activity are considered:

c) Imports from sector 1 (m_1) and from sector 2 (m_2); where $m_1 + m_2 = M$.

Based on the above, the input-output matrix (IOM) is constructed considering, besides the matrix of intermediate sales, the total domestic demand for finished goods and services (C + I + G + X). On the purchasing side, it considers the associated payments to generate the value added (L + N) as well as the value associated with imported goods used in domestic production (M).

Table 2. Input-Output Matrix and Value Added for an Economy

		Input Demand		Final Demand				Total Output
		1	2					
Processing Sectors	1	z_{11}	z_{12}	c_1	i_1	g_1	e_1	x_1
	2	z_{21}	z_{22}	c_2	i_2	g_2	e_2	x_2
Payment sectors	Value Added (v') Labor	l_1	l_2					
	Capital	n_1	n_2					
	Imports	m_1	m_2					
Total Outlays		x_1	x_2					X

Source: Table 2.2, Miller and Blair (2009), p.14.

According to Table 2, the vertical sum of the elements is defined as:

$$x_j = \left(z_{1j} + z_{2j}\right) + l_j + n_j + m_j \quad (8)$$

The same value "x_j" equals, in turn, the sum of the components in the line of total spending, that is, the sum of the demand for inputs and the demand for finished goods and services:

$$x_i = (z_{i1} + z_{i2}) + c_i + i_i + g_i + e_i \quad (9)$$

The above implies, in turn, that the value of total gross output– denominated "X"– is:

$$X = (x_1 + x_2) \tag{10}$$

Where $x_1 = z_{11} + z_{21} + l_1 + n_1 + m_{1} = z_{11} + z_{12} + c_1 + i_1 + g_1 + e_1$; and $x_2 = z_{12} + z_{22} + l_2 + n_2 + m_2 = z_{21} + z_{22} + c_2 + i_2 + g_2 + e_2$.

II.2. The Leontief Inverse Matrix

In the input-output approach, the fundamental assumption is that the flow of goods and services of sector "*i*" demanded by sector "*j*" (*zij*) in a given period depends exclusively on total production of "*j*" (*xj*), where this relation is expressed as follows:

$$a_{ij} = \frac{z_{ij}}{x_j} \tag{11}$$

Based on this definition, it is the case that:

$$z_{ij} = a_{ij}x_j \tag{12}$$

where a_{ij} is a coefficient that captures, for sector "*j*", <u>a fixed relation</u> between the level of production of "*j*" and the level of input "*i*" used to obtain the referred production. These coefficients are called the "fixed technical coefficients". It should be noted that these coefficients imply that all productive sectors have Leontief production functions and, therefore, in this framework all productive sectors have constant returns to scale.[4] Once we adopt the assumption of fixed coefficients and considering the relation established in equation (12), the equation system (2) can be rewritten as follows:

[4] It should be noted that the input-output approach is usually employed to analyze short run impacts, which is why the assumption of a fixed coefficients technology turns out to be adequate in the context of the analysis to be presented in section IV.

$$
\begin{aligned}
x_1 &= a_{11}x_1 + \cdots + a_{1i}x_i + \cdots + a_{1n}x_n + f_1 \\
&\vdots \\
x_i &= a_{i1}x_1 + \cdots + a_{ii}x_i + \cdots + a_{in}x_n + f_i \\
&\vdots \\
x_n &= a_{n1}x_1 + \cdots + a_{ni}x_i + \cdots + a_{nn}x_n + f_n
\end{aligned}
\tag{13}
$$

Rearranging:

$$
\begin{aligned}
x_1 - a_{11}x_1 - \cdots - a_{1i}x_i - \cdots - a_{1n}x_n &= f_1 \\
&\vdots \\
x_i - a_{i1}x_1 - \cdots - a_{ii}x_i - \cdots - a_{in}x_n &= f_i \\
&\vdots \\
x_n - a_{n1}x_1 - \cdots - a_{ni}x_i - \cdots - a_{nn}x_n &= f_n
\end{aligned}
\tag{14}
$$

Or:

$$
\begin{aligned}
(1 - a_{11})x_1 - \cdots - a_{1i}x_i - \cdots - a_{1n}x_n &= f_1 \\
&\vdots \\
-a_{i1}x_1 - \cdots + (1 - a_{ii})x_i - \cdots - a_{in}x_n &= f_i \\
&\vdots \\
-a_{n1}x_1 - \cdots - a_{ni}x_i - \cdots + (1 - a_{nn})x_n &= f_n
\end{aligned}
\tag{15}
$$

If we define:

I: Identity matrix *n* x *n*.

A: Matrix of fixed coefficients *n* x *n*.

x: Vector of gross output *n* x 1.

f: Vector of final demands *n* x 1.

Then (15) can be expressed as:

$$(\mathbf{I} - \mathbf{A})\mathbf{x} = \mathbf{f} \tag{16}$$

Finally, solving for **x**:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f}$$
$$\mathbf{x} = \mathbf{Lf} \tag{17}$$

where $\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$.

L is known as the "Leontief inverse matrix", or "matrix of total requirements." Note that the elements comprising matrix **L,** in the end, depend on a_{ij}. Hence, when the coefficients a_{ij} and the IOM are obtained, the derivation of **L** is trivial.

The importance of this matrix should not be overlooked, since it allows to identify the impact of exogenous shocks on gross output by means of the so-called multiplier effects, and in which we are interested for the purposes of impact analysis. These multiplier effects are classified into *direct* (the effect on the economic sector that receives the exogenous shock), and *indirect* (the effect generated by the affected sector on other sectors of the economy it interacts with); while their sum is known as *total multiplier*.[5]

The intuition behind these multipliers is that when a sector experiences, for example, a positive exogenous shock, it leads to greater productive activity in the same sector (a direct effect), as a result of which there is higher demand for intermediate inputs from other sectors of the economy involved in the productive process (an indirect effect), and so on. This process continues in a way that production in the economy grows more as compared to the initial impact. This generates greater value added, and more employment in the economy.[6]

Needless to say, the question that must be asked here is how to obtain, in practice, coefficients a_{ij} and, therefore, the IOM for the Mexican case. Fortunately, INEGI has been working on this subject and has already provided IOMs for the years 2003, 2008 and 2012. This implies that researchers need to use directly the most recent IOM to evaluate different shocks on the economy as a whole; or, rather, use it to obtain RIOMs to analyze shocks on

[5] In the literature on input-output matrices, "direct" and "indirect" multipliers are called "Type I Multipliers". When the "induced" impacts on the variables of interest are considered, the multipliers are called "Type II Multipliers". See Bess and Ambargis (2011).
[6] For the formal derivation of gross output, value added and employment multipliers, see Appendix 1.

the relevant variables in a particular region, which is what is of interest in this work. The generation of the RIOMs based on the IOM is presented in the following section.

II.3. Estimation of a RIOM

So far, we have described the methodology to obtain an IOM and the way to derive the Leontief inverse matrix based on the said IOM. However, the main goal of this paper is to construct RIOMs, which would allow us to analyze shocks on variables such as gross output, value added and employment at the regional level. In this respect, the literature on the subject indicates that the construction of a RIOM can be carried out using "direct methods", that is, methods that require statistical data obtained from surveys, just like a national IOM is constructed. Following this approach, some efforts were undertaken already in the 1950s (for example, Isard (1951) and Leontief (1953)). Clearly, this approach implied high monetary and time costs, derived from capturing and processing statistical data. Still, in the 70s alternative techniques to construct RIOMs started to be developed, reducing their costs and presenting results with a reasonable degree of reliability. In this sense, technological developments in the field of data processing have been fundamental for the progress in the RIOMs estimation techniques.

Alternatively, RIOMs can also be generated using "synthetic approaches", that is, using indirect and semi-direct methods (also known as hybrid methods), which help transform information available at the aggregate level to information at the regional level.[7] The essence of these methods lies in *adjusting* the elements of an IOM to obtain components of a RIOM. Thus, in all cases there is an IOM as a starting point.

A practical problem with indirect methods, however, is that in order to convert technical coefficients from the national to the regional level, there is a set of different alternatives, which depend on the application of the so-called Location Quotients (*LQ*). A *LQ* is an analytical statistic that measures a region's industrial specialization relative to the nation, which is computed as an industry's share of a regional total for some economic

[7] Hybrid models of matrices' regionalization, as implied by their name, are a combination of indirect methods that use data from surveys on productive activity and even expert opinions (see Lahr, 1993).

variable divided by the industry's share of the value for the same statistic at the national level. Among the *LQs* used to transform national quotients to regional quotients we find the simple location quotient (*SLQ*), the cross-industry quotient (*CLQ*), Round's semi-logarithmic location quotient (*RLQ*), the symmetric cross-industry location quotient (*SCILQ*), Flegg's location quotient (*FLQ*) and the augmented Flegg's location quotient (*AFLQ*) (Round, 1983; Flegg et al. 1995; Tohmo, 2004).

In view of the array of possible approaches to estimate *LQs*, one immediately wonders about the best alternative, if there is one. In light of this problem, different studies have focused on evaluating the performance of indirect methods based on *LQs* to construct RIOMs. The referred evaluations presented a comparison between the RIOMs estimated with "direct" methods against those obtained with "indirect" methods. The exercises were carried out with data from the U.S. and some European countries, since these have more available resources to construct the IOM with "direct" methods. Bonfiglio and Chelli (2008), for instance, performed Monte Carlo simulations and concluded that *FLQ* and *AFLQ* are better at reproducing the real values of RIOMs. Subsequently, Flegg and Tohmo (2013), performed a new evaluation of the existing methodologies by taking advantage of 20 regional matrices for Finland estimated using "direct" methods, and compared the technical coefficients obtained with different "indirect" methods with the "true" technical coefficients (i.e., those derived from the regional matrices, which in turn were obtained with "direct methods"). They concluded that the best performance was observed, again, using the Flegg method (*FLQ*). Therefore, the Flegg approach will be used in this paper to estimate the RIOM.[8]

[8] Since the publication of Flegg and Tohmo (2013), the estimation of MIPRs has essentially followed their approach. See Dávila (2015).

II.3.1. Derivation of Regional Technical Coefficients (a_{ij}^{R})

The Flegg method to estimate the RIOM considers, for the estimation of *LQs*, the relative size of the productive sectors, the dimension of the regional economy, and corrects for a bias associated with the procedures of sectorial aggregation.[9]

The method is based on the assumption that regional technical coefficients (a_{ij}^{R}) are, in principle, equal to the national ones (a_{ij}^{N}). Based on this assumption, consumption of intermediate goods of sector "*j*" in region "*R*" is given by:

$$Z_j^R = \sum_{i=1}^{n} a_{ij}^N * X_j^R \tag{18}$$

where:

Z_j^R = Regional intermediate consumption of sector *j*.

X_j^R = Regional gross output of sector *j*.

However, insofar as an input-output matrix with technical coefficients of the region "*R*" (that is, a RIOM) is required, national technical coefficients are adjusted using *LQs*, which claim to capture the degree of productive specialization of a region with respect to the nation. In particular, these coefficients identify whether the intermediate goods necessary to produce in sector "*j*" of region "*R*" are provided in the very region, or instead are obtained (imported) from other regions of the country. For example, if in the manufacturing sector of region *"R"* a location coefficient is equal to one (*LQ* = 1), this means that the region has a degree of specialization in this activity equal to that of the whole economy. On the other hand, a location coefficient greater than one (for instance, *LQ* = 1.1) would imply that region "*R*" is characterized by a greater productive concentration in manufacturing as compared to the national average.

---

[9] The augmented Flegg's location quotient (*AFLQ*) is different from *FLQ* in that the former considers the degree of specialization in the intersectorial trade of the region. Despite this, the results obtained with *AFLQ* to estimate a RIOM do not necessarily improve as compared to the performance obtained using *FLQ* (Dávila, 2015).

The relevant question for our exercise is, then, how to obtain regional technical coefficients based on the Flegg method. In our case, these coefficients (FLQ_{ij}) are calculated as follows:

1. Obtain the simple location quotient of economic sector "*i*" (SLQ_i), defined as the quotient of this sector's participation in regional GDP and the same ratio defined at the national level:

$$SLQ_i = \frac{GDP_i^R / GDP^R}{GDP_i^N / GDP^N} \tag{19}$$

2. Then, calculate the cross-industry location quotient of sector "*i*" with respect to sector "*j*" ($CILQ_{ij}$):

$$CILQ_{ij} = \frac{SLQ_i}{SLQ_j} \tag{20}$$

3. Next, obtain the adjustment factor "□", which is used to ponder the size of the regional economy with respect to the national economy. This factor is defined as follows:

$$\lambda = \left[Log_2(1 + \frac{GDP^R}{GDP^N})\right]^{\delta} \tag{21}$$

   where $0 < \lambda < 1$ and $\delta = 0.25$. It should be stressed that the value of the last parameter is the one more commonly used in the literature as, in line with Flegg and Tohmo (2013), it is the one that best approximates the estimated RIOMs to the real RIOMs.

4. Multiply cross-industry location quotients by "λ", to obtain the Flegg quotients (FLQ_{ij}):

$$FLQ_{ij} = CILQ_{ij} * \lambda \tag{22}$$

5. Finally, the regional technical coefficients that will be used as the basis to construct RIOMs are obtained in accordance with the following conditions:

$$a_{ij}^{R} = \begin{cases} a_{ij}^{N} & if \quad FLQ_{ij} \geq 1 \\ a_{ij}^{N} * FLQ_{ij} & if \quad FLQ_{ij} < 1 \end{cases} \qquad (23)$$

Notice that a regional coefficient of a given sector can be equal to its corresponding national coefficient when the degree of specialization and the relative size of the given sector at the regional level is equal to the national one. When this is not the case, the Flegg's correction comes into play to adjust national technical coefficients to the characteristics of the regional economy in question. When the estimation of all regional technical coefficients is ready, regional intermediate consumptions, and, therefore, RIOMs are ready to be constructed.

It should be stressed that the only economic series required for the estimation of Flegg's coefficients (FLQ_{ij}) is states´ GDP (which is the one used to calculate regional GDP) and national GDP per sector, which in Mexico is provided by INEGI. The following section describes in detail how the rest of the necessary components to construct a RIOM are obtained.

III. An Estimation of a RIOM for Mexico

To construct a RIOM and use it to evaluate the possible effects of different exogenous shocks on the economic activity of any given region, the following information is required:

1. Obtain an IOM at the national level, which will be used to estimate data at the regional level.

2. Construct a regional matrix of intermediate goods' consumption ($\mathbf{Z}^{\mathrm{R}}$) using regional technical coefficients (a_{ij}^{R}) based on what is presented in Section II.3.

3. Obtain, by sector and region, the components of final demand (F_j^R), that is, private consumption (C_j^R), investment (I_j^R), government spending (G_j^R), exports (EXP_j^R), value

added (V_j^R), and imports (M_j^R); as well as the components of the payment sectors, namely, taxes (T_j^R), wages (REM_j^R), and the payment of capital (EBO_j^R).

As regards the first point, INEGI provides estimations of the input-output matrices at the national level. In particular, as part of Mexico's National Accounts System, the Institute has published IOMs for the years 2003, 2008 and 2012. This paper uses the 2012 IOM, as it is the most recent one.[10] It should be noted that in deriving the RIOMs, a disaggregation level of 31 subsectors was used in accordance with the North American Industry Classification System (NAICS), which implies working with economic sectors; that is, a three-digit disaggregation level is used.[11] The reason to operate at this disaggregation level has to do with limitations regarding information availability by state, which is needed to construct some required variables at the regional level. On the other hand, it should be clarified that for some variables there is indeed information by state and economic sector, among them, Gross Domestic Product, obtained from Mexico's System of National Accounts; Wages, obtained from the National Survey of Occupation and Employment (ENOE, for its acronym in Spanish); and Exports, obtained from statistics of the external sector, released by INEGI. All these variables at the state level are the basis to obtain data at the regional level.

Having detailed the above, we now proceed to discuss how to construct the regional matrix of intermediate goods' consumption ($\mathbf{Z}^{\mathrm{R}}$), as well as the components of final demand and payment sectors, for which there is no disaggregated data.

[10] The national IOMs of 2003 and 2008 are based on representative surveys of productive activity as well as on economic censuses (a direct method). Meanwhile, the 2012 IOM was obtained after updating the 2008 IOM with the indirect RAS method (*Ratio Allocation System)*. It is noteworthy that the RAS method is a process of iterative adjustments in which the columns (purchases) and the lines (sales) of an IOM are forced to successively sum total values of the observed new levels of activity, taking as a reference point the structure of purchases and sales of an IOM derived based on the direct method (an original matrix). The process of iterative adjustment consists in multiplying each cell of the original matrix by a given proportion between the total of the new observed value and the total of the original value, a process that is repeated until the differences between the sum of columns and lines with respect to the corresponding observed values tend to zero. For an example of this approach, see Lynch (1986), Toh (1998) and Trinh and Viet-Pong (2013).

[11] Appendix 2 presents the 31 subsectors considered by the NAICS.

III.1. Construction of the Regional Matrix of Intermediate Goods' Consumption (Z^R)

The regional intermediate consumption of sector "j" that stems from sector "i" (Z_{ij}^R) is obtained based on the following definition:

$$Z_{ij}^R = a_{ij}^R * X_j^R \tag{24}$$

where X_j^R is the regional gross output of good "j" and a_{ij}^R is the regional technical coefficient.

Out of these two components, only a_{ij}^R is available, which compels us to estimate X_j^R. To do so, let us keep in mind that the regional gross output of sector "j" (X_j^R) is defined as:

$$X_j^R = V_j^R + ZT_j^R + M_j^R + T_j^R \tag{25}$$

where V_j^R is the regional gross value added; ZT_j^R is total regional demand for intermediate goods; M_j^R are regional imports; and T_j^R are payments of regional taxes.

Given that there is no information at the state level for M_j^R and T_j^R, they are estimated, in turn, as follows:

$$M_j^R = m_j^N X_j^R \tag{26}$$

$$T_j^R = t_j^N X_j^R \tag{27}$$

where it is assumed, on the one hand, that the national and regional average propensity to import are also equal ($m_j^N = m_j^R$); and, on the other hand, that the effective national and regional tax rates are equal ($t_j^N = t_j^R$). These two last assumptions are used, given that there is only information available on m_j^N and t_j^N.

Based on the above definitions, expression (25) becomes[12]:

$$X_j^R = V_j^R + \left(\sum_{i=1}^{n} a_{ij}^N X_j^R\right) + \left(m_j^N X_j^R\right) + \left(t_j^N X_j^R\right) \tag{28}$$

Finally, solving for X_j^R it is obtained that it equals:

$$X_j^R = V_j^R + \left(\sum_{i=1}^{n} a_{ij}^N X_j^R\right) + \left(m_j^R X_j^R\right) + \left(t_j^R X_j^R\right)$$

$$X_j^R\left(1 - \sum_{i=1}^{n} a_{ij}^N - m_j^R - t_j^R\right) = V_j^R$$

$$X_j^R = \frac{V_j^R}{\left(1 - \sum_{i=1}^{n} a_{ij}^N - m_j^R - t_j^R\right)} \tag{29}$$

Thus, the gross output of sector "*j*" in region "*R*" (X_j^R) can be estimated with the formula referred above, as it contains the numerator V_j^R, that is, the value of the regional GDP of economic sector "*j*", and for which there is information; and in the denominator there is a series of parameters that are regional technical coefficients (a_{ij}^R), the region's average propensity to import (m_j^R) and the regional effective tax rate (t_j^R), for which there are also estimates. When the components of regional gross output (X_j^R) and regional technical coefficients (a_{ij}^R) are available, it is possible to estimate the following for each sector "*j*":

$$Z_{ij}^R = a_{ij}^R * X_j^R \tag{30}$$

Meanwhile, each of these components indicates the consumption of each sector "*j*" of the different sectors that provide inputs, using which the region's intermediate consumption matrix is formed, one of the components of a RIOM. The sum of all elements yields *total intermediate consumption* of sector "*j*" of regional origin:

[12] Of all the above mentioned variables, there is information only on regional gross value added (V_j^R), as it is simply a sum of GDP by sector of the states conforming the region in question and that it is provided by INEGI. The remaining variables are estimated based on the detailed definitions, which are standard for this type of studies. See, for example, Ayala and Chapa (2013).

$$Z_j^R = \sum_{i=1}^{n} Z_{ij}^R \qquad (31)$$

As mentioned in Section II, the Flegg method assumes that the techniques of national and regional production are the same. Under this assumption, at the regional level each sector "*j*" would be consuming intermediate goods with a value of:

$$ZT_j^R = \sum_{i=1}^{n} a_{ij}^N * X_j^R \qquad (32)$$

Still, given that the Flegg method is applied to adjust regional production techniques, the difference between what the region is supposed to consume, if it maintains national production techniques, less what it, in fact, consumes given the adjusted production techniques that are obtained using the Flegg method, the total intermediate consumption of sector "*j*" stemming from the rest of the states (ZRE_j) equals:

$$ZRE_j = ZT_j^R - Z_j^R \qquad (33)$$

III.2. Estimation of the Components of Final Demand and the Sector of Payments

The RIOM is complemented by estimating, at the regional level, the components of final demand (C^R, I^R, G^R, EXP^R, M^R)[13], as well as the components of the payment industry: value added (V^R), taxes (T_j^R) and imports (M_j^R); along with the disaggregation of value added, that is taxes ($TSPNS_j^R$), wages (REM_j^R) and the payment of capital (EBO_j^R).

As regards the components of regional final demand, for the case of private consumption and the regional government spending (C^R and G^R, respectively), the national values of these variables are multiplied by the share of regional population in the national total; while regional investment (I^R), that equals the gross capital formation plus the change in inventories, is obtained from multiplying the value of national investment by the share of

[13] The sum of all the elements should be equal to the amount of final demand and that is why C^R, I^R, G^R and X^R are summed up. The difference between the final demand and the sum of the abovementioned elements is called "Exports to the rest of states". This last variable works as a way to absorb the error of using regional weights to obtain the components of final demand.

regional GDP in the national total.[14] For the case of EXP^R, state exports' data released by INEGI were used in order to obtain the corresponding regional values.

With respect to the components of the payment industry, M^R were calculated as the average ratio of output to imports at the national level and the regional gross output, while T_j^R, which corresponds to taxes on goods, is estimated by applying the tax rate of the goods at the national level (t_j^N) to the regional gross output (X_j^R). In turn, the item of regional wages (REM_j^R) is estimated multiplying the national figures by the share of regional wages in national wages (wage earners, self-employed, employers, and non-paid employees); while the tax on production ($TSPNS_j^R$) is obtained by multiplying the payroll tax (ISN) by the sectorial share of wages in the region. The capital payment (EBO_j^R) is obtained as the (residual) difference between V^R and the rest of abovementioned components. It should be noted that, insofar as the rest of components of V^R have errors in the measurement, the analysis of the capital payment can fail to generate reliable results.

Once the aforementioned operations are carried out, we obtain the necessary information to construct a RIOM for the Mexican economy, along with the estimates of the value added at the regional level.[15] Since there are four regions in the case of Mexico (Northern, North-Central, Central and Southern) according to the regionalization proposed in the "*Reporte sobre las Economías Regionales*" published by Banco de México (see Figure 1), it implies that there are four matrices, as illustrated in Table 2, one for each region.

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[14] In the case of private consumption, it is possible to make approximations using the Household Income and Expenditure Survey (ENIGH, for its acronym in Spanish). However, it is well known that the survey is not representative at the state level, given the sample and the different spending patterns across regions. With respect to Government spending, even though there is indeed information by state, there is no breakdown by sector of origin, reason why it would be impossible to make the estimates corresponding to the item of final demand. In view of the previously mentioned limitations, we proceed to estimate the final demand weighing private consumption and government spending by their participation in the population, while the variables of fixed capital gross formation and the change in inventories are weighed by the share of GDP.

[15] Appendix 3 presents all of the variables used for the estimation of RIOMs, including their respective definitions and sources.

Figure 1. Regionalization

Northern	North-Central	Central	Southern
Baja California (BC)	Aguascalientes (AGS)	Ciudad de México (CDMX)	Campeche (CAMP)
Chihuahua (CHIH)	Baja California Sur (BCS)	Estado de México (MEX)	Chiapas (CHIS)
Coahuila (COAH)	Colima (COL)	Guanajuato (GTO)	Guerrero (GRO)
Nuevo León (NL)	Durango (DGO)	Hidalgo (HGO)	Oaxaca (OAX)
Sonora (SON)	Jalisco (JAL)	Morelos (MOR)	Quintana Roo (QR)
Tamaulipas (TAMPS)	Michoacán (MICH)	Puebla (PUE)	Tabasco (TAB)
	Nayarit (NAY)	Querétaro (QRO)	Veracruz (VER)
	San Luis Potosí (SLP)	Tlaxcala (TLAX)	Yucatán (YUC)
	Sinaloa (SIN)		
	Zacatecas (ZAC)		

Source: Banco de México.

IV. Impact on Regional Economic Activity of a Shock to Mexican Manufacturing Exports

During the last decades the Mexican manufacturing sector has been the main pillar of Mexico’s external sector, accounting today for almost 90 percent of total exports. In 2015, however, the dynamism it had been showing during the previous six years (average annual growth rate of 8 percent) came to a halt. More precisely, if we compare the value of annualized manufacturing exports in the third quarter of 2016 (USD 333,801 million) against the same figure of 2015 (USD 342,848 million), we obtain a contraction of USD 9,048 million.

Considering the above, this section applies input-output analysis to determine how an exogenous shock to Mexican manufacturing exports of a magnitude similar to the one indicated in the previous paragraph affects variables such as gross output, value added, and employment at the regional level.

The Size of the Shock on the Manufacturing Sector and its Regional Distribution

The exercise will consider, for simplicity, a shock on total manufacturing exports of USD 10,000 million, which represents 3.5 percent of total manufacturing exports from Mexico to the US in 2015. The regional distribution of the shock, in dollar terms, will be derived by multiplying the share of each region's manufacturing exports in total manufacturing exports, by the previously mentioned USD 10,000 million shock. Since official data indicate that the shares of regional manufacturing exports in total manufacturing exports are 61.3, 22.5, 13.0, and 3.2 percent for the Northern, Central, North-Central and the Southern regions, the regional shocks in dollar terms will amount to USD 6,130 million; USD 2,245 million; USD 1,300 million and USD 320 million, respectively (Table 3a).[16]

With an estimate of the four regional shocks at hand, the next step consists in distributing them within each region across the 12 manufacturing subsectors considered for the calculation of the regional input-output matrices. In each region, the shock is distributed in terms of the share of the subsectors' exports in total manufacturing exports, and is shown in Table 3b. Thus, we have four regional distributions of external shocks since the shares of regional manufacturing exports in total manufacturing exports differ across regions. This table is quite revealing as it shows that the impacts in the Northern, North-Central and Central regions concentrate in Machinery, Computer, Electrical and Electronic Product, and Transportation Equipment Manufacturing (subsectors 333-336), with shares of 76.6, 75.0 and 71.5 percent, respectively. In the South, on the other hand, the main subsectors to absorb

[16] The data correspond to 2014 and were taken from INEGI.

the shock are Chemical (45.1 percent), Primary Metal (17.3 percent), and Food Manufacturing (13.8 percent).

Table 3a. National Distribution of the Shock across Regions (%)

	Manufacturing Subsectors	Northern	North-Central	Central	Southern
311	Food Manufacturing	0.7	0.5	0.7	0.4
312	Beverage and Tobacco Product Manufacturing	0.5	0.7	0.0	0.1
313-314	Textile Mills and Textile Product Mills	0.2	0.0	0.2	0.0
315-316	Apparel Manufacturing, Leather and Allied Product Manufacturing	0.6	0.2	0.6	0.2
321	Wood Product Manufacturing	0.0	0.0	0.0	0.0
322-323	Paper Manufacturing	0.2	0.0	0.1	0.0
324-326	Oil and Chemical Manufacturing	3.3	1.2	2.7	1.4
327	Nonmetallic Mineral Product Manufacturing	0.6	0.1	0.4	0.0
331-332	Primary Metal Manufacturing	4.0	0.4	0.9	0.6
333-336	Machinery, Computer, Electrical and Electronic Product, and Transportation Equipment Manufacturing	47.0	9.8	16.1	0.2
337	Furniture and Related Product Manufacturing	0.6	0.0	0.0	0.0
339	Miscellaneous Manufacturing	3.8	0.1	0.8	0.2
	Total	**61.3**	**13.0**	**22.5**	**3.2**

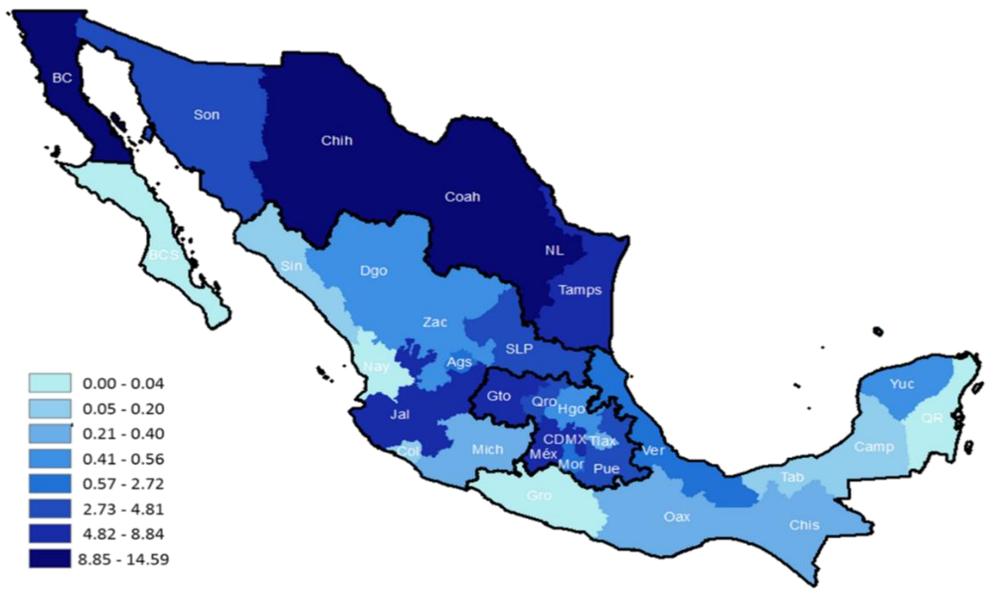
Table 3b. Relative Distribution of the Shock within Regions (%)

	Manufacturing Subsectors	Northern	North-Central	Central	Southern
311	Food Manufacturing	1.1	4.1	2.9	13.8
312	Beverage and Tobacco Product Manufacturing	0.7	5.5	0.2	4.0
313-314	Textile Mills and Textile Product Mills	0.2	0.2	0.9	0.5
315-316	Apparel Manufacturing, Leather and Allied Product Manufacturing	0.9	1.4	2.6	5.8
321	Wood Product Manufacturing	0.0	0.2	0.0	0.2
322-323	Paper Manufacturing	0.4	0.3	0.5	0.2
324-326	Oil and Chemical Manufacturing	5.4	9.0	12.0	45.1
327	Nonmetallic Mineral Product Manufacturing	0.9	0.4	1.6	0.6
331-332	Primary Metal Manufacturing	6.5	3.3	3.8	17.3
333-336	Machinery, Computer, Electrical and Electronic Product, and Transportation Equipment Manufacturing	76.6	75.0	71.5	6.4
337	Furniture and Related Product Manufacturing	0.9	0.2	0.1	0.1
339	Miscellaneous Manufacturing	6.1	0.4	3.7	6.0
	Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Banco de México estimates with data from INEGI.

Figure 2 provides the shares of state manufacturing exports in national manufacturing exports, reinforcing the view of why external shocks may affect regions differently. As it can be seen, the North is the region which concentrates the states with the largest shares of state manufacturing exports in national exports, and, hence, the most sensitive to external shocks. It is then followed by the Central, North-Central and Southern regions.

Figure 2. Share of State Manufacturing Exports in National Manufacturing Exports



Source: Own estimates using INEGI data.

Direct and Indirect Effects on Gross Output, Value Added and Employment

Following the methodology outlined in subsections II and III, we now proceed to estimate direct and indirect effects on regional gross output, value added and employment of the shocks mentioned above. It is important to mention at this point that we will work with input-output matrices in which the "manufacturing sector" is divided in the 12 subsectors already shown in Tables 3a and 3b. Thus, in our analysis, the direct multiplier for the whole manufacturing sector *within each region* will be derived by adding the direct effects obtained across the 12 regional manufacturing subsectors. Obviously, given the complementarities among manufacturing subsectors, "indirect effects" are also expected to emerge among them. Hence, the total indirect multiplier will be obtained by adding the indirect effects from the manufacturing subsectors, to the indirect effects stemming from subsectors other than manufacturing. Tables 4-6 present these results, with gross output and value added expressed in MXN 2012 million; and employment expressed in number of workers.[17]

One feature that immediately stands out in Tables 4-6 has to do with large differences of total effects across regions. In particular, notice that the impacts of the external shock on gross output, value added and employment in the North are, by far, the largest. This result, however, should not be considered a surprise as it was previously mentioned that this region concentrates 61.3 percent of total manufacturing exports, followed by the Central region with a distant 22.5 percent, the North-Central one with 13.0 percent, and, at last, the Southern region, with a meager 3.2 percent of total manufacturing exports. Since the differences mentioned above imply that absolute impacts are very heterogeneous across regions, comparisons of *absolute* direct and indirect effects are of little value. Hence, in what follows we will be referring, first, to relative measures of the direct and indirect effects within each region (obtained by dividing the direct and indirect effects by the regional total effect); and, second, to measures at the state level of the changes in the relevant variables (gross output, value added, and employment) which result from the shock, expressed as fractions of the 2012 absolute value of the corresponding variable.

Gross Output

Table 4 shows that the direct effects of the external shocks in manufacturing clearly dominate the indirect effects across all regions. The table also shows that the relative direct effect is significantly larger in the North (84 percent), followed by the North-Central region (80 percent), then by the Central region (79 percent), and at last the Southern region (71 percent). Now, when taking into account the indirect effects of the manufacturing subsectors, the total effect on manufacturing (i.e., direct plus indirect effects of the manufacturing subsectors) goes up to 94 percent of the total effect in the North; up to 88 percent in the central regions; and 79 percent in the South. Notice also that manufacturing is the sector with the largest indirect effect in all regions, except the South. Another interesting pattern that emerges from Table 4 associated with the indirect effects of sectors other than manufacturing

[17] Since the IOM refers to a 2012, the shocks were transformed from current dollars to 2012 pesos. This operation implied that the absolute shocks to gross output and value added are expressed in 2012 pesos.

is that they are concentrated in activities related with Commerce and Services (Administrative and Support Services; Professional, Scientific and Technical services; and Transportation). This supports the existence of a strong linkage between secondary and tertiary activities across Mexican regions.

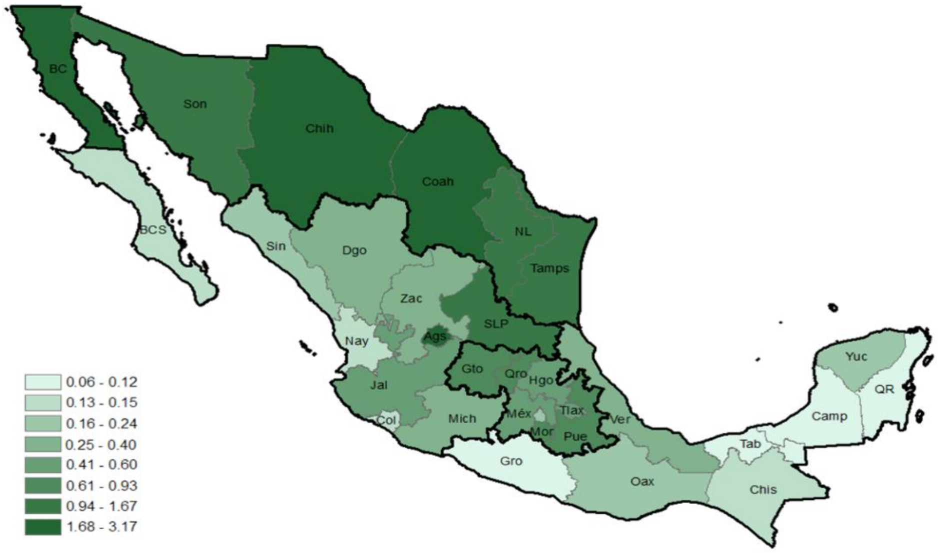
Figure 3 shows, in turn, the impacts of the export manufacturing shock on each state's gross output, as a fraction of their corresponding 2012 state gross output. The figure is useful to visualize the states that experience the largest changes in their gross output as a result of the external shock. As it can be readily seen, the pattern that emerges is one in which the largest effects are observed in the Northern states, followed by those of the Central, North-Central and Southern regions. This pattern makes sense as the Northern states are the ones more concentrated in export manufacturing activities; while those of the South show the lowest concentration in manufacturing exports sectors (see, for instance, Table 3a).

Table 4. Regional Impacts of a Shock on Mexican Manufacturing Exports:
Direct and Indirect Effects on Gross Output

Gross Output (Millons of pesos of 2012)*										
Northern	**Impact**	**Total**	**Direct Effect**	**Indirect Effect**	Manufacturing	Commerce	Non-oil Mining	Administrative and Support Services	Transportation	Others
	Absolute	121,630	101,829	19,801	11,643	2,391	1,316	890	886	2,674
	Relative	**100.0**	**83.7**	**16.3**	**9.6**	**2.0**	**1.1**	**0.7**	**0.7**	**2.2**
North Central		**Total**	**Direct Effect**	**Indirect Effect**	Manufacturing	Commerce	Transportation	Non-oil Mining	Agriculture	Others
	Absolute	27,137	21,668	5,469	2,297	1,253	337	307	306	969
	Relative	**100.0**	**79.8**	**20.2**	**8.5**	**4.6**	**1.2**	**1.1**	**1.1**	**3.6**
Central		**Total**	**Direct Effect**	**Indirect Effect**	Manufacturing	Commerce	Administrative and Support Services	Transportation	Professional, Scientific, and Technical Services	Others
	Absolute	47,007	37,363	9,644	4,195	2,088	852	703	503	1,303
	Relative	**100.0**	**79.5**	**20.5**	**8.9**	**4.4**	**1.8**	**1.5**	**1.1**	**2.8**
Southern		**Total**	**Direct Effect**	**Indirect Effect**	Oil and Gas Extraction	Manufacturing	Commerce	Agriculture	Administrative and Support Services	Others
	Absolute	7,441	5,281	2,160	773	594	228	194	71	301
	Relative	**100.0**	**71.0**	**29.0**	**10.4**	**8.0**	**3.1**	**2.6**	**0.9**	**4.0**

* Results are expressed in millions of pesos of 2012 since the IOM used to obtain regional coefficients corresponds to the mentioned year.
Note: The last six columns of each table present a breakdown of the indirect effect by affected sectors.
Source: Own estimates using data of INEGI.

Figure 3. Effect of a Shock on Manufacturing Exports on State's Gross Output
(As a % of State's Gross Output)

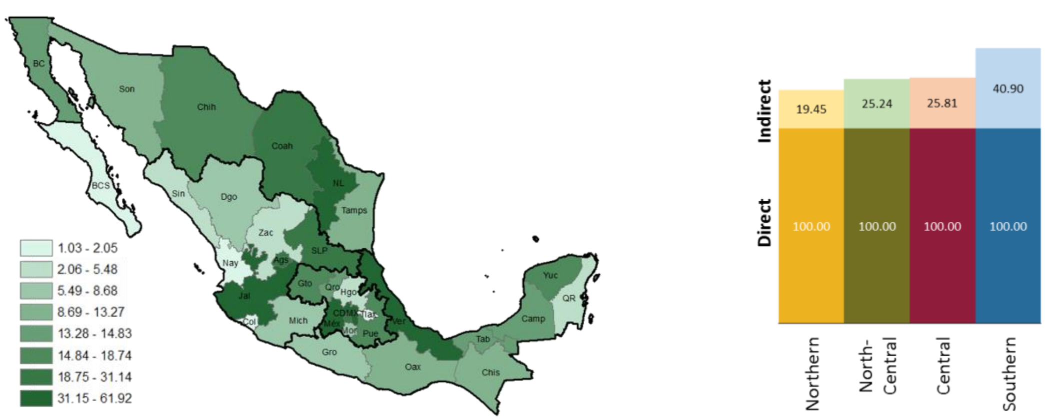


Source: Own estimates using INEGI data.

As a percentage of the initial regional shock, it is found that the indirect effect is the largest in the South, where it accounts for 41% of the shock, and the smallest in the North, where it accounts for 19% (Figure 4). This result in itself may be surprising, as the North is the most industrially developed and export oriented region in the country, while the South has a less developed industrial structure and a more inward oriented economy.

Figure 4. Impact on Gross Output as a percentage of Initial Regional Shock (%)

Total Impact **Direct and Indirect Impacts**



Source: Own estimates using INEGI data.

Value Added

In the case of value added, we find patterns roughly similar to those of gross output (Table 5). For instance, the direct effects are significantly larger than the indirect effects in the Northern, North-Central and Central regions. Another similar pattern is that the largest direct effect is again observed in the North (74 percent of the total impact), followed by those of the central regions (65 percent each), and then the South (52 percent). A different pattern is that the sum of the direct and indirect effects of the manufacturing sector at the regional level is smaller than the sum of the same effects for gross output; however, indirect effects in value added are larger relative to those of gross output. It is also worth mentioning that manufacturing, while being the sector registering the largest indirect effects for gross output, has been displaced by the commercial sector when speaking about value added in all regions but the Northern one. As it was the case for gross output, Commerce and Services (specifically, in the Administrative and Support Services and Transportation) appear among the sectors with the largest indirect effects across all regions, particularly in the central regions. In the case of South, Oil and Gas Extraction is the sector with the largest share in the indirect effect, which is to be expected given its relevance as an input provider for Chemical Manufacturing in that region.

The last row of each region's results presents the estimates of value added generated by the exogenous shock, as a fraction of regional GDP. These figures indicate that the North is, by far, the one experiencing the greatest increase in GDP (1.06 percent), followed by the North-Central region (0.32 percent), then the Central region (0.26 percent) and, at the end, the South (0.09 percent). Also, while it is true that the absolute change in value added is greater in the Central region than in the North-Central one, it is also true that the latter generates more value added relative to regional GDP.

Table 5. Regional Impacts of a Shock on Mexican Manufacturing Exports:
Direct and Indirect Effects on Value Added

Value Added (Millons of pesos of 2012)*										
		Total	**Direct Effect**	**Indirect Effect**	Manufacturing	Commerce	Non-oil Mining	Administrative and Support Services	Transportation	Others
Northern	Absolute	35,295	25,994	9,301	3,378	1,857	885	745	529	1,907
	Relative	**100.0**	**73.6**	**26.4**	**9.6**	**5.3**	**2.5**	**2.1**	**1.5**	**5.4**
	VA/GDP (%)	**1.06**	**0.78**	**0.28**	**0.10**	**0.06**	**0.03**	**0.02**	**0.02**	**0.06**
		Total	**Direct Effect**	**Indirect Effect**	Commerce	Manufacturing	Non-oil Mining	Transportation	Administrative and Support Services	Others
North Central	Absolute	8,624	5,629	2,994	973	701	206	201	199	713
	Relative	**100.0**	**65.3**	**34.7**	**11.3**	**8.1**	**2.4**	**2.3**	**2.3**	**8.3**
	VA/GDP (%)	**0.32**	**0.21**	**0.11**	**0.04**	**0.03**	**0.01**	**0.01**	**0.01**	**0.03**
		Total	**Direct Effect**	**Indirect Effect**	Commerce	Manufacturing	Administrative and Support Services	Transportation	Professional, Scientific, and Technical Services	Others
Central	Absolute	14,838	9,609	5,229	1,622	1,182	713	420	377	915
	Relative	**100.0**	**64.8**	**35.2**	**10.9**	**8.0**	**4.8**	**2.8**	**2.5**	**6.2**
	VA/GDP (%)	**0.26**	**0.17**	**0.09**	**0.03**	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**
		Total	**Direct Effect**	**Indirect Effect**	Oil and Gas Extraction	Commerce	Manufacturing	Agriculture	Administrative and Support Services	Others
Southern	Absolute	2,977	1,549	1,428	703	177	169	122	59	198
	Relative	**100.0**	**52.0**	**48.0**	**23.6**	**6.0**	**5.7**	**4.1**	**2.0**	**6.7**
	VA/GDP (%)	**0.09**	**0.05**	**0.04**	**0.02**	**0.01**	**0.01**	**0.00**	**0.00**	**0.01**

* Results are expressed in millions of pesos of 2012 since the IOM used to obtain regional coefficients corresponds to the mentioned year. Note: The last six columns of each table present a breakdown of the indirect effect by affected sectors. Source: Own estimates using data of INEGI.

Another interesting pattern is observed in Figure 5, which shows the effects of the increase in manufacturing exports on each state's value added, expressed as fractions of each state´s value added. In this case, notice that in 18 (out of the 32) Mexican states, the increase in their value added -as a fraction of their value added- resulting from the manufacturing exports' shock, is smaller than 0.14 percent (Baja California Sur, Campeche, Ciudad de México, Chiapas, Colima, Durango, Guerrero, Hidalgo, Michoacán, Nayarit, Oaxaca, Sinaloa, Quintana Roo, Tlaxcala, Tabasco, Veracruz, Yucatan, and Zacatecas). On the other hand, in four out of six states of the Northern region (Baja California, Chihuahua, Coahuila, and Nuevo León), those fractions fall in the interval 0.93-1.73 percent, while the other two (Sonora and Tamaulipas) range between 0.48-0.92 percent. Within this latter range, only two other states, both from the North-Central region, are included (Aguascalientes and San Luis Potosí). Therefore, Figure 5 is an alternative signal that the Northern states are the ones benefiting the most from the external shock in terms of value added.

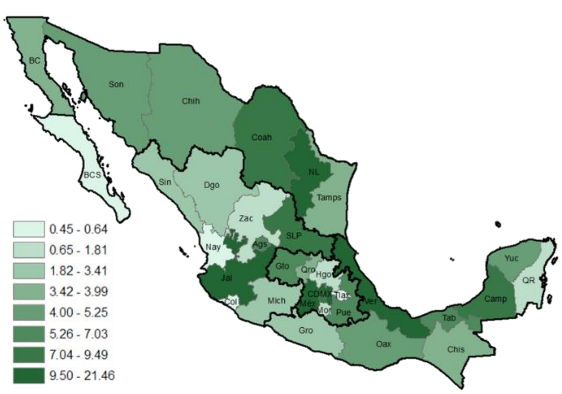
Figure 5. Effect of a Shock on Manufacturing Exports on State's Value Added
(As a % of State's Value Added)

Source: Own estimates using INEGI data.

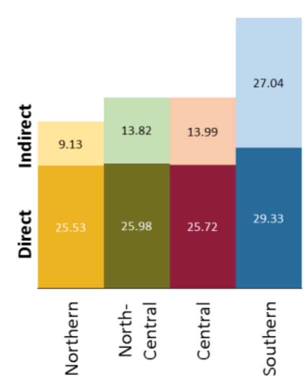
Figure 6 shows, in turn, a map of the total impact on the state's value added as a percentage of initial regional shock. In this case, the patterns are roughly the same as those for gross output, with Southern states displaying, on average, the largest direct (29%) and indirect (27%) impacts relative to the size of the initial regional shock, followed by the states located in Central regions, which show smaller relative direct (26%) and indirect impacts (14%), while Northern states display, on average, the lowest direct (26%) and indirect (9%) impacts with respect to the initial shock.

Figure 6. Impact on Value Added as a percentage of Initial Regional Shock (%)

Total Impact



Direct and Indirect Impacts



Source: Own estimates using INEGI data.

Employment

The last effects to be analyzed here are those related with employment. In this case, Table 6 shows that the impact of the manufacturing exports shock has the strongest direct effect in the Northern and Southern regions (73.8 percent and 59.9 percent, respectively), followed by those displayed in the Central and North Central regions (55.6 and 54.9 percent, respectively). Table 6 shows also, as in the case of gross output and value added, that the indirect effects concentrate, in addition to manufacturing, in Commerce and Services (Administrative and Support; Professional, Scientific, and Technical Services), which are recognized as labor intensive sectors.

Table 6. Regional Impacts of a Shock on Mexican Manufacturing Exports:
Direct and Indirect Effects on Employment

Employment (Number of workers)

Northern		Total	Direct Effect	Indirect Effect	Manufacturing	Commerce	Administrative and Support Services	Agriculture	Professional, Scientific, and Technical Services	Others
	Absolute	79,478	58,647	20,830	6,793	6,367	2,113	1,250	1,188	3,120
	Relative	**100.0**	**73.8**	**26.2**	**8.5**	**8.0**	**2.7**	**1.6**	**1.5**	**3.9**

North Central		Total	Direct Effect	Indirect Effect	Commerce	Manufacturing	Agriculture	Administrative and Support Services	Professional, Scientific, and Technical Services	Others
	Absolute	24,214	13,301	10,914	4,157	2,220	1,502	932	559	1,544
	Relative	**100.0**	**54.9**	**45.1**	**17.2**	**9.2**	**6.2**	**3.8**	**2.3**	**6.4**

Central		Total	Direct Effect	Indirect Effect	Commerce	Manufacturing	Administrative and Support Services	Agriculture	Professional, Scientific, and Technical Services	Others
	Absolute	37,762	21,011	16,751	6,477	3,869	1,512	1,344	1,010	2,538
	Relative	**100.0**	**55.6**	**44.4**	**17.2**	**10.2**	**4.0**	**3.6**	**2.7**	**6.7**

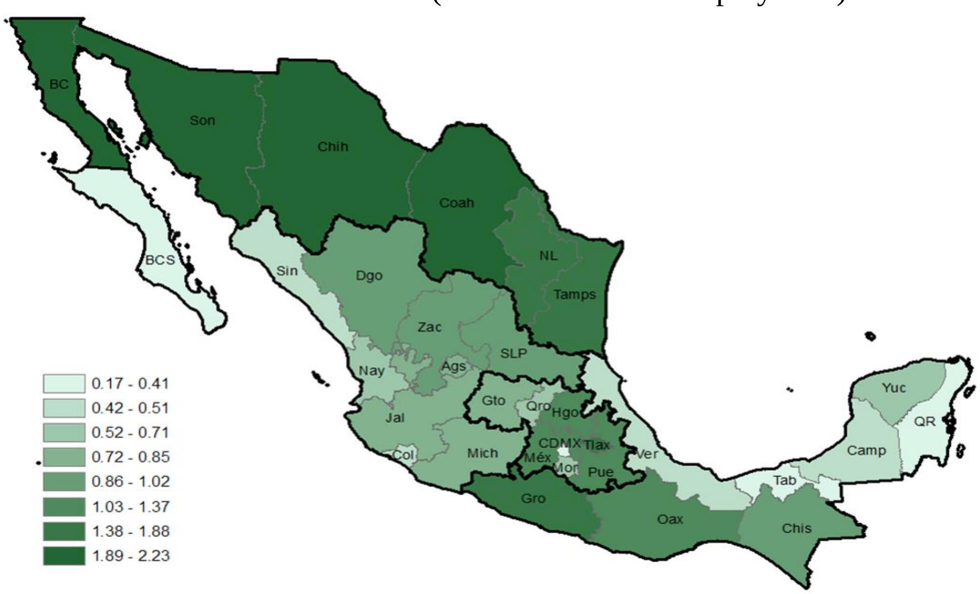
Southern		Total	Direct Effect	Indirect Effect	Agriculture	Commerce	Manufacturing	Administrative and Support Services	Non-oil Mining	Others
	Absolute	14,252	8,534	5,717	3,180	930	809	198	125	475
	Relative	**100.0**	**59.9**	**40.1**	**22.3**	**6.5**	**5.7**	**1.4**	**0.9**	**3.3**

Source: Own estimates using data of INEGI.

Figure 7 presents the changes in each state's employment arising from the external shock, expressed as fractions of each state´s total employment. In this case, the figure shows that the relative impacts are, again, larger in the Northern states, followed by those of the central regions. Notice also that in some Southern states (specifically, Oaxaca, Guerrero, and Chiapas) the effects are larger than those of most states. The impacts on the Northern states all range between 1.03 and 2.23 percent; in states of the Central region, the relative effects are estimated between 0.52 and 1.37 percent; while in most of the North-Central states, the estimated effects range between 0.17 and 1.02 percent. In the case of the South, the effects go from a low of 0.17 percent, up to 2.23 percent. On average, these figures indicate that the North is, by far, the region experiencing the greatest increase in employment (1.86 percent), followed by the North-Central (0.73 percent), the Southern (0.67 percent), and the Central (0.63 percent) regions.

The result that the largest relative effects are observed in the Northern states as well as in the Southern states of Oaxaca, Guerrero, and Chiapas, deserves a few words, particularly when it has been the case that the South has been the region reporting the lower direct effects in terms of gross output and value added. Regarding the results observed in the North, it can be argued that since its economy possesses a large manufacturing sector, then a strong external shock will affect significantly its economy, therefore propelling its employment levels. Some state economies of the South, on the opposite, are characterized by a relatively small manufacturing industry, but also by a small formal employment basis. Then, it is plausible that an exogenous impact on manufacturing could bring about a relatively large increase in (formal) employment, mostly as a result of a base effect.

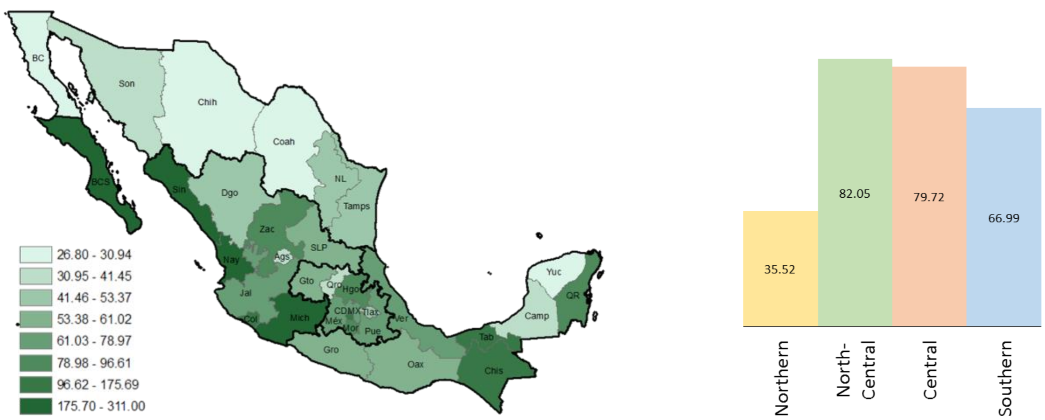
Figure 7. Effect of a Shock on Manufacturing Exports on State's Employment
(As a % of State's Employment)



Source: Own estimates using data of INEGI.

Figure 8 presents indirect effects in each state's employment arising from the shock on manufacturing exports, expressed as a fraction of each state's direct effect on employment. In this case, the figure shows that states located in the Central regional display, on average, the largest indirect effects on employment as a percentage of direct effects (80-82 %), followed by Southern states (67 %), and Northern states (35 %). Similar to gross output and value added, the RIOM analysis reveals substantial regional heterogeneity in the economic linkages across sectors in terms of employment, particularly between manufacturing and the rest of economic activities.

Figure 8. Indirect Effects as a percentage of Direct Effects on Employment (%)



Source: Own estimates using INEGI data.

V. Concluding Remarks

A RIOM is a tool that allows us to estimate the impact on a variety of indicators of economic activity at sectorial and regional levels. In this work we employed RIOMs to measure the effects on gross output (X^R), value added (VA^R) and employment (E^R) at the regional level generated by a USD 10,000 million shock on Mexican manufacturing exports.

The first interesting finding of the analysis is that the effect of the shock on the absolute values for the mentioned variables are, overall, larger in the North, followed by the central regions, and the South at last. The same pattern holds when analyzing the relative impact among regions. Nevertheless, it was seen that the relative indirect effects at the regional level tend to increase for every sector when value added and employment are compared to gross output results. This implies that when gross output increases in any of the regions, a greater impact given the multiplier effect is generated in value added and employment. The analysis also shows that the North is, by far, the region experiencing the greatest change in its value added relative to GDP, followed by the North-Central, the Central and the Southern regions.

Additionally, it was seen that within each region an important share of the indirect effects of the shock concentrates in manufacturing, suggesting possible complementarities inside the sector, particularly in the North; likewise, the results suggest a strong linkage between the manufacturing sector and tertiary activities, particularly Commerce and Services. This linkage is stronger in the central regions whose production is more oriented to the domestic market. In contrast, around half of the indirect impact of the shock on value added is concentrated in Oil and Gas Extraction in the South, which is explained by the importance of Chemical Manufacturing in the exports of that region as well as the demand of this sector for hydrocarbons.

The messages above are also implied in the patterns across states derived from the relative impacts of the external shock on the variables of interest (gross output, value added, and employment), with those relative impacts defined as the change in a state's given variable arising from the external shock, as a fraction of that state´s variable. In particular, it was seen that the Northern states are the ones reporting, overall, the largest relative effects, followed by those of the Central and North Central regions.

An interesting finding is that, once we normalize the impact, it turns out that multiplier effects tend to be larger in states not concentrated in the North. Particularly, the South –the most inward oriented and least industrially developed regional economy- displays the largest indirect effects on gross output and value added, while Central regions show the largest indirect effects on employment. Thus, the RIOM analysis allows us to uncover that there is substantial regional heterogeneity in indirect effects that arise from a shock on manufacturing exports.

Finally, it must be taken into account that despite the usefulness of the RIOMs for the regional economic analysis, this approach has its limitations. Among them: (i) Fixed technical coefficients are assumed, excluding possible technological changes and factors substitution possibilities, even though this could happen in the short term and more likely in the medium or long terms. Hence, the need to frequently update RIOMs. (ii) The rigidity of the model (implicit in the fixed technical coefficients assumption) prevents us from reflecting phenomena such as bottlenecks, increasing costs, etc. And, (iii) it is a very simple and restricted model that focuses only on the production side, and it doesn't explain why the relation between input and production follows a given pattern. As a result, the estimates provided here should be taken with caution, as they represent an initial effort to pinpoint the effects of an external shock across Mexican regional economies.

These limitations, however, open the road for future lines of work which could help refine the results presented in this paper. For instance, the methodology adopted here is not suited to pinpoint interregional effects. In other words, whenever a shock arises in any given region, the model does not allow us to identify how the sectorial reactions which take place in the region suffering the shock, permeate separately to the other regions.

Also, the model employed in this paper assumes that the prices of intermediate and final goods are constant, assumption which could be set aside in order to determine how overall prices may be affected by an exogenous shock.

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Appendix 1

Derivation of Multipliers of Gross Output, Value Added and Employment

The derivation of multipliers for Gross Output (GO), Value Added (VA) and Employment (E) as a result of an exogenous shock in sector "*j*" requires to keep in mind that GO equals:

$$\mathbf{GO} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f_j} = \mathbf{L}\mathbf{f_j}$$

Thus, an exogenous shock in sector *"j"* **($\Delta \mathbf{f_j}$)** implies that:

$$\Delta\mathbf{GO} = (\mathbf{I} - \mathbf{A})^{-1}\Delta\mathbf{f_j} = \mathbf{L}\Delta\mathbf{f_j}$$

Note that the exogenous shock in sector *"j"* **($\Delta \mathbf{f_j}$)** affects all sectors of the economy, and, therefore, the above expression refers to the change in the gross output of the economy as a whole (**ΔGO**), rather than the change observed in a specific subsector "*j*" of the referred economy (**$\Delta \mathbf{GO_j}$**). Likewise, this consideration applies to both the value added (**VA**) and employment (**E**). Considering this, in view of an exogenous shock on the final demand of sector "*j*", the following definitions are given:

1. **Gross Output Multiplier (GOM):** it is defined as the sum of elements by column of the Leontief inverse matrix (**L**) for a given sector "*j*".

   If $$\mathbf{L} = \begin{pmatrix} \boldsymbol{\gamma_{11}} & \cdots & \boldsymbol{\gamma_{1n}} \\ \vdots & \ddots & \vdots \\ \boldsymbol{\gamma_{n1}} & \cdots & \boldsymbol{\gamma_{nn}} \end{pmatrix}$$

   then, the Gross Output Multiplier (*gom*):

   $$gom = \sum_{i=1}^{n} \gamma_{ij}$$

   where γ_{ij} indicates precisely the additional output that is generated in each sector "*i*" in light of a shock on sector "*j*".

2. **Value Added Multiplier:** This multiplier captures the effects on value added in sectors "*i*" of the economy given an exogenous shock on sector "*j*" (that is, given a $\Delta\mathbf{f}_j$). It is obtained by summing up the elements of column "*j*" of the *n* x *n* value added matrix (VAM), which, in turn, is defined as $\mathbf{VAM} = \boldsymbol{\upsilon}_\mathbf{j}(\mathbf{I} - \mathbf{A})^{-1} = \boldsymbol{\upsilon}_\mathbf{j}\mathbf{L}$, where $\mathbf{L}$ is

Leontief inverse matrix and $\boldsymbol{\upsilon_j}$ is a matrix that contains in its principal diagonal the quotient of value added to gross output for each sector "*j*":

$$\boldsymbol{\upsilon_j} = \mathbf{I} * \left(\frac{\mathbf{VA_j}}{\mathbf{GO_j}}\right) = \begin{pmatrix} \boldsymbol{\upsilon_{1j}} & \cdots & \mathbf{0} \\ \vdots & \ddots & \vdots \\ \mathbf{0} & \cdots & \boldsymbol{\upsilon_{nj}} \end{pmatrix}$$

$$\mathbf{VAM} = \begin{pmatrix} \mathbf{vam_{11}} & \cdots & \mathbf{vam_{1n}} \\ \vdots & \ddots & \vdots \\ \mathbf{vam_{n1}} & \cdots & \mathbf{vam_{nn}} \end{pmatrix} = \begin{pmatrix} \boldsymbol{\upsilon_{1j}} & \cdots & \mathbf{0} \\ \vdots & \ddots & \vdots \\ \mathbf{0} & \cdots & \boldsymbol{\upsilon_{nj}} \end{pmatrix} \begin{pmatrix} \boldsymbol{\gamma_{11}} & \cdots & \boldsymbol{\gamma_{1n}} \\ \vdots & \ddots & \vdots \\ \boldsymbol{\gamma_{n1}} & \cdots & \boldsymbol{\gamma_{nn}} \end{pmatrix}$$

Thus, the value added multiplier (*vam*) is given by:

$$vam = \sum_{i=1}^{n} vam_{ij}$$

Intuitively, it is said that the multiplier effect on gross output (captured by **L**), is weighted by the participation of value added in the gross production of each sector ($\boldsymbol{\upsilon_j}$). That is, in view of increments in the gross output of sector "*j*", demand for goods in different sectors "*i*" goes up, as a result of which the value added is distributed among different sectors in which inputs are purchased.

3. **Employment Multiplier:** The employment multiplier (*em*) captures the increment in employment in sectors "*i*" of the economy, which arises as a result of an exogenous shock in sector "*j*" ($\Delta \mathbf{f}_j$). The effect is obtained by summing up the elements by column of the employment matrix (EM), defined as $\mathbf{EM} = \mathbf{e_j}(\mathbf{I} - \mathbf{A})^{-1} = \mathbf{e_j L}$, where $\mathbf{L}$ is Leontief inverse matrix and e_j is a matrix that contains in its main diagonal the number of employees[18] in sector "*j*" divided by the gross output of the said sector ($\mathbf{E_j}/\mathbf{GO_j}$):

$$\boldsymbol{e_j} = \boldsymbol{I} * \left(\frac{\boldsymbol{E_j}}{\boldsymbol{GO_j}}\right) = \begin{pmatrix} \boldsymbol{e_{1j}} & \cdots & \mathbf{0} \\ \vdots & \ddots & \vdots \\ \mathbf{0} & \cdots & \boldsymbol{e_{nj}} \end{pmatrix}$$

$$\mathbf{EM} = \begin{pmatrix} \mathbf{em_{11}} & \cdots & \mathbf{em_{1n}} \\ \vdots & \ddots & \vdots \\ \mathbf{em_{n1}} & \cdots & \mathbf{em_{nn}} \end{pmatrix} = \begin{pmatrix} \mathbf{e_{1j}} & \cdots & \mathbf{0} \\ \vdots & \ddots & \vdots \\ \mathbf{0} & \cdots & \mathbf{e_{nj}} \end{pmatrix} \begin{pmatrix} \boldsymbol{\gamma_{11}} & \cdots & \boldsymbol{\gamma_{1n}} \\ \vdots & \ddots & \vdots \\ \boldsymbol{\gamma_{n1}} & \cdots & \boldsymbol{\gamma_{nn}} \end{pmatrix}$$

[18] According to the ENOE, the number of occupied people includes: 1) wage earners, 2) self-employed, 3) employers, and 4) and non-paid employees. It should be mentioned that occupied people considers formal and informal employment.

Therefore, the multiplier of employment (*me*) is given by:

$$em = \sum_{i=1}^{n} em_{ij}$$

Intuitively, the multiplier effect on gross output (captured by **L**) is weighted by the share of employees in sector *"j"* (e_j). That is, given the increments in gross output of sector "*j*" ($\Delta \mathbf{f}_j$), demand for goods in different sectors "*i*" goes up, which, in turn, triggers greater production in these sectors, and, thus, higher demand for employment and working hours.

4. **Estimation of the Direct and Indirect Effects**

The multiplier effect on gross output, value added or employment is divided into the direct effect (the impact of an exogenous sectorial shock on itself) and the indirect effect (the impact of that sectorial shock on other sectors of the economy).

Formally, those multiplier effects are obtained from the elements of matrices ***L***, ***VAM*** and ***EM*** as follows:

- Direct multiplier of an exogenous shock in sector "j":

$$\gamma_{jj}, \ vam_{jj}, \ em_{jj}$$

- Indirect multiplier of an exogenous shock in sector "j" on sector "i", given i ≠ :

$$\gamma_{ij}, \ vam_{ij}, \ em_{ij}.$$

The total multiplier effect is obtained by adding the direct and indirect multipliers for each sector "j", as indicated above.

Appendix 2

Sectors of the North American Industry Classification System (NAICS)

No.	Sectors in accordance with the NAICS classification
1	Agriculture
2	Oil and gas extraction
3	Mining (except oil)
4	Electric power generation, transmission and distribution; and water and gas supply
5	Construction
6	Food manufacturing
7	Beverage and tobacco product manufacturing
8	Textile product mills, fabric finishings; textile mills, except apparel
9	Apparel manufacturing; leather and hide tanning and finishing; and leather and allied products manufacturing
10	Wood product manufacturing
11	Paper manufacturing
12	Chemical manufacturing
13	Nonmetallic mineral product manufacturing
14	Primary metal manufacturing
15	Machinery manufacturing; computer, communications, measuring instruments and other equipment manufacturing, electronic components manufacturing; electrical equipment, appliance, and component manufacturing; transportation equipment manufacturing
16	Furniture and related product manufacturing
17	Miscellaneous manufacturing
18	Trade
19	Transport, postal service and warehousing
20	Information
21	Finance
22	Real estate and rental and leasing
23	Professional, scientific and technical services
24	Management of companies and enterprise
25	Administrative and support services
26	Educational services
27	Healthcare and social assistance
28	Entertainment and recreation
29	Accommodation and food services
30	Other services
31	Public administration

Appendix 3

Variables Used for Input-Output Matrix

Variable:	Definition:	Sources used to estimate parameters and variables:
a_{ij}^N	National technical coefficients: input quantity "i" required to obtain a unit of final good "j" at the national level	National IOM (INEGI)
a_{ij}^R	Regional technical coefficients: input quantity "i" required to obtain a unit of final good "j" at the regional level	INEGI
x_j^R	Regional gross output by sector *j*	GDP (INEGI), national IOM (INEGI)
Z_{ij}^R	Regional intermediate demand	INEGI
Z_j^R	Regional intermediate consumption= $\sum Z_{ij}^R$	Regional IOM
ZRE_j^R	Regional intermediate consumption of other states	Residual
ZT_j^R	Total intermediate consumption = Regional intermediate consumption (Z)+ Regional intermediate consumption of other states (ZRE)	Regional IOM
m_j^N	(Total imports at the national level of sector "*j*") / (National Gross Output)	INEGI
M_j^R	Total regional imports by sector *j*	National IOM (INEGI)
t_j^N	(Taxes on goods and services net of subsidies at the national level) / (National Gross Output)	National IOM (INEGI)
T_j^R	Taxes on goods and services net of subsidies at the regional level of sector "j"	National IOM (INEGI)
V_j^R	Regional gross value added	GDP (INEGI)
REM_j^N	Total national wages of sector "*j*"	National IOM (INEGI)
α	Regional participation in national wages	INEGI
REM_j^R	Total regional wages by economic sector = α * REM_j^N	National IOM (INEGI)
β	$REM_j^R / \sum_{j=1}^{n} REM_j^R$	INEGI
ISN^R	Payroll tax collection at the regional level	INEGI
$TSPNS_j^R$	Taxes on production net of subsidies by sector *j* at the regional level: β*ISN^R	INEGI
EBO_j^R	Gross Operating Surplus = Vj^R- $REMj^R$- $TSPNSj^R$	Residual
F_i^R	Regional final demand	Regional IOM
γ	Share of regional population in national population ($Population^R$ / $Population^N$)	CONAPO
ϴ	Share of Regional GDP in National GDP: = (GDP^R / GDP^N)	INEGI
C_i^N	National private consumption for each sector *i*	National IOM (INEGI)
C_i^R	Regional private consumption for each sector *i* = (γ) (C_i^N)	INEGI
G_i^N	National public spending for each sector *i*	National IOM (INEGI)
G_i^R	Regional public spending for each sector *i* = (γ) (G_i^N)	INEGI
I_i^N	National gross fixed capital formation of sector "*i*"	INEGI
I_i^R	Regional gross fixed capital formation of sector: *i* = ϴ*Ii^N	INEGI
EXP_i^R	International exports by sector *i* at the regional level	INEGI
$EXPRE_i^R$	Net exports of the region to other states by sector *i:* F_i^R- (C_i^R+ G_i^R+ I^R+ VE_i^R+ EXP_i^R)	Residual

Appendix 4

Northern Region

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	10,949.29	0.00	0.00	3.39	77.73	56,054.92	1,287.60	1,122.45	51.57	1,655.67	2.87	846.27	0.04	1.50	6.35	0.55
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19,876.95	0.00	0.00	0.00	0.00
3	181.93	6.38	10,528.81	2,004.47	5,499.03	129.45	0.00	0.44	0.08	0.01	93.51	1,832.54	4,225.90	36,630.74	612.82	1.40
4	2,568.50	98.54	1,353.59	1,061.82	1,594.37	3,729.07	2,452.23	498.92	177.29	323.51	1,610.56	2,084.29	1,892.55	3,861.45	3,569.86	151.63
5	0.38	0.00	761.53	275.67	31,867.36	112.07	3.18	8.06	24.31	4.11	18.47	51.13	3.35	53.44	334.38	5.90
6	8,614.62	0.00	0.07	1.73	8.33	15,404.29	5,371.11	4.72	537.21	0.28	76.69	207.65	13.68	1.98	32.78	2.16
7	101.02	0.00	0.11	3.08	21.48	20.23	195.06	3.42	0.63	0.02	1.80	29.85	0.48	0.16	1.71	0.04
8	111.42	0.00	3.12	0.19	62.65	101.54	0.48	463.51	1,739.72	7.72	452.39	110.84	5.08	1.79	760.27	155.98
9	10.02	0.00	2.74	41.79	60.99	85.22	6.52	17.68	573.63	0.16	5.30	48.83	5.06	37.08	424.40	16.18
10	127.94	0.00	318.56	0.16	2,915.39	206.95	206.10	9.36	3.96	1,725.59	177.13	148.64	121.12	173.30	647.92	1,939.09
11	323.18	0.51	11.09	79.36	386.22	1,250.18	247.53	86.16	86.94	12.60	10,029.17	1,176.69	357.07	267.94	1,240.40	39.35
12	4,662.30	1,915.43	1,121.22	13,484.22	8,894.99	6,896.05	2,111.96	817.26	599.55	594.99	1,643.94	12,447.79	2,932.86	1,627.56	7,347.62	563.13
13	11.63	23.41	616.71	6.75	24,187.15	594.48	3,166.69	0.68	0.05	2.59	5.91	139.51	4,621.76	169.39	1,462.34	108.46
14	107.88	127.42	3,022.31	179.61	27,010.23	587.53	1,565.39	10.09	24.01	25.11	26.88	1,668.28	489.07	68,595.82	60,709.58	1,227.01
15	443.27	6.29	671.65	462.24	7,835.23	467.91	264.55	5.21	3.97	21.86	79.93	47.47	115.89	545.92	59,719.79	32.96
16	0.00	0.00	0.44	0.00	802.33	0.00	0.00	0.11	0.00	0.53	0.00	0.82	0.01	1.10	0.24	77.49
17	5.94	0.33	21.27	28.78	313.48	71.89	2.51	4.57	75.92	4.23	36.63	23.50	42.56	51.96	741.76	33.05
18	4,693.70	565.43	1,262.10	4,428.70	14,397.79	21,555.98	2,576.97	931.62	1,372.15	1,070.26	3,535.93	11,845.31	2,067.08	8,030.52	26,260.15	671.30
19	1,125.98	158.09	353.43	1,672.58	3,563.42	4,899.08	684.30	219.68	379.98	308.57	765.49	3,756.59	583.87	2,314.05	10,114.32	181.66
20	18.81	48.93	45.08	128.62	1,389.25	554.99	95.07	21.62	37.37	10.23	88.62	314.76	103.42	96.77	347.17	30.86
21	591.48	266.90	299.90	167.08	4,965.63	950.07	199.91	72.16	60.74	27.97	143.47	758.81	317.41	495.67	1,591.85	41.71
22	447.16	8.38	812.49	83.97	1,832.10	1,415.18	163.26	73.71	224.46	39.99	422.85	907.41	328.30	760.45	2,837.74	166.26
23	129.94	194.54	1,325.14	639.90	2,784.04	1,798.95	629.37	126.29	211.04	48.45	403.44	1,218.76	366.64	588.32	4,361.27	106.87
24	7.06	611.89	63.43	104.72	14.38	462.47	119.76	16.17	50.09	3.82	60.36	879.52	78.42	65.47	306.69	22.68
25	122.78	165.22	983.09	294.90	3,743.60	5,202.20	1,121.76	413.12	494.61	89.09	1,029.65	4,627.78	1,399.39	2,043.91	7,698.79	260.98
26	0.20	0.00	0.03	21.82	0.45	0.81	0.02	0.07	0.30	0.00	0.70	0.71	0.72	2.97	12.57	0.04
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	24.95	76.81	45.79	91.30	505.69	120.26	20.26	7.91	21.47	2.09	51.02	185.46	31.88	77.01	569.68	13.60
30	95.69	5.51	119.78	92.31	1,062.23	380.51	45.39	40.69	26.75	12.23	120.09	196.84	144.13	168.87	605.18	23.79
31	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zj^R	35,477.05	4,280.01	23,743.50	25,359.16	145,795.56	123,052.31	22,537.01	4,975.66	6,777.80	5,991.65	20,882.84	65,433.01	20,247.74	126,665.12	192,317.63	5,874.12
$ZREj^R$	17,469.36	0.00	18,394.99	34,683.67	41,594.76	24,768.31	12,068.96	835.52	995.44	4,456.72	9,636.68	88,403.17	11,057.89	65,054.70	175,478.51	4,339.28
ZTj^R	52,946.41	4,280.01	42,138.49	60,042.83	187,390.32	147,820.63	34,605.97	5,811.18	7,773.23	10,448.38	30,519.52	153,836.17	31,305.63	191,719.83	367,796.14	10,213.40
Mj^R	12,252.31	550.43	9,598.53	16,311.40	56,199.57	32,697.34	9,413.02	4,485.09	5,820.96	1,849.68	13,429.27	104,702.40	8,333.63	99,559.89	785,426.23	4,825.08
Tj^R	-798.07	-108.18	-920.33	-6,602.06	-2,179.66	290.75	-54.39	-59.06	-19.58	-144.04	-372.46	288.67	-1,370.50	-1,325.21	30.51	-100.92
Vj^R	108,721.31	47,480.85	104,091.23	81,557.58	302,870.97	107,799.60	32,391.63	5,688.27	9,756.88	8,676.67	20,511.83	79,669.02	40,207.96	130,486.53	356,899.99	10,882.46
REM	12,780.02	2,950.82	14,227.10	14,161.74	95,694.14	16,888.95	4,349.67	1,121.06	3,262.13	3,660.67	5,168.11	17,786.81	4,756.37	14,854.66	109,811.72	2,194.82
EBO	95,809.85	44,499.68	89,717.79	67,250.18	206,192.56	90,736.94	27,997.22	4,555.68	6,461.20	4,978.35	15,290.57	61,699.27	35,402.67	115,479.08	245,958.80	8,665.07
TSPNS	131.45	30.35	146.33	145.66	984.26	173.71	44.74	11.53	33.55	37.65	53.16	182.95	48.92	152.79	1,129.47	22.57
Xj^R	173,121.97	52,203.11	154,907.92	151,309.75	544,281.20	288,608.32	76,356.23	15,925.48	23,331.48	20,830.69	64,088.17	338,496.26	78,476.71	420,441.03	1,510,152.88	25,820.01

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	111.41	0.10	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	5.85	0.00	0.83	0.95	0.00
2	46.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	31.65	7.57	36.78	0.00	0.00	0.21	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	520.78	9,641.15	2,187.86	1,006.86	793.60	3,745.56	970.22	30.22	1,440.60	2,626.66	2,361.15	543.16	3,186.98	1,477.36	3,205.96
5	82.19	781.27	555.43	0.66	0.00	102.00	4.48	1.54	6.81	1,124.75	1,906.57	25.87	76.44	92.74	855.65
6	5.46	2,326.97	16.16	0.00	0.00	99.59	6.86	0.00	0.04	3.45	300.35	12.28	2,839.18	0.06	688.22
7	0.28	295.69	1.25	0.03	277.01	6.45	0.26	0.00	0.05	7.96	19.37	0.31	687.60	0.43	21.41
8	137.45	442.03	8.83	0.00	0.00	7.60	7.21	0.00	6.07	21.36	262.90	1.57	379.45	9.06	64.88
9	16.99	108.33	28.05	0.29	0.00	17.35	25.73	0.00	44.93	26.12	198.33	18.14	7.22	87.19	188.49
10	603.35	2,992.44	0.13	110.99	0.00	7.13	1.31	0.00	0.01	0.00	0.00	22.90	0.00	0.30	0.00
11	481.03	3,732.66	338.58	121.81	2,376.30	1,330.67	721.75	28.16	1,857.15	549.18	706.15	79.50	268.28	360.53	1,688.39
12	1,082.67	5,078.24	36,270.12	747.69	119.91	3,213.81	582.96	154.51	704.37	394.55	1,536.00	301.14	1,804.97	1,897.52	4,619.09
13	342.75	941.81	21.57	0.00	0.00	206.91	1.02	0.00	0.21	0.05	0.00	0.51	98.65	51.89	0.00
14	4,654.56	2,271.29	38.22	153.85	0.00	254.32	18.11	0.00	18.13	21.72	47.38	9.13	15.05	377.66	176.13
15	182.93	5,101.02	6,113.91	2,634.86	55.77	1,863.78	161.61	0.75	24.43	55.68	287.37	32.48	60.61	603.07	230.51
16	0.26	442.68	0.18	0.22	0.00	16.62	0.08	0.00	3.79	11.17	57.22	0.17	83.83	0.00	10.21
17	2,985.66	1,626.29	74.57	23.48	124.70	169.58	94.91	3.23	52.69	148.45	426.22	270.60	295.80	274.28	198.55
18	1,321.18	5,712.73	7,912.80	2,356.56	936.82	1,050.31	540.74	32.60	689.39	445.54	2,907.36	158.78	1,617.38	1,402.24	3,613.06
19	819.33	4,354.35	8,019.50	1,472.37	2,255.79	573.46	665.87	43.06	613.23	491.67	1,088.98	112.37	291.47	518.99	3,686.20
20	62.30	2,075.61	983.09	2,873.33	8,422.30	945.10	834.93	81.94	695.08	1,090.32	510.33	141.99	295.29	490.62	2,586.91
21	146.14	2,116.02	1,458.07	1,696.39	8,752.55	1,682.18	1,096.94	112.81	741.39	398.90	164.99	119.12	462.58	91.69	3,624.67
22	441.44	12,645.52	2,623.72	2,165.06	2,426.50	4,020.30	1,589.59	330.66	905.84	1,127.00	760.42	261.78	595.58	2,805.63	1,543.69
23	762.60	4,654.54	4,501.52	2,192.07	4,409.07	3,071.79	3,369.19	826.09	2,166.19	1,445.48	2,965.82	282.95	880.41	1,133.07	3,840.88
24	33.41	1,606.40	1,031.89	894.25	2,368.33	233.52	76.20	611.97	197.46	84.08	70.74	29.01	213.84	80.81	56.63
25	750.78	22,749.91	4,095.09	3,607.10	4,007.96	1,417.42	3,722.62	528.78	2,691.83	1,227.96	1,632.04	642.50	4,336.30	1,823.93	2,220.54
26	2.16	11.75	155.18	5.97	109.95	3.28	52.62	0.00	0.01	32.52	0.99	15.36	0.00	0.11	10.06
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.31	1.03	89.72	3.73	2.28	0.00	0.00	0.33	0.00	0.00	6.79	0.13	0.00	118.91
29	65.37	686.35	742.54	262.14	383.12	90.50	99.43	40.61	396.72	359.41	339.03	33.92	31.74	121.66	2,939.83
30	98.66	1,264.26	1,305.94	118.02	983.79	388.46	283.96	12.06	143.51	253.05	856.81	153.65	508.55	561.22	1,027.74
31	0.00	39.93	0.00	0.00	0.00	0.08	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Zj^R	15,789.15	93,707.22	78,521.99	22,533.73	38,807.21	24,520.27	14,928.69	2,839.00	13,400.25	11,947.05	19,412.39	3,275.98	19,038.14	14,263.01	37,216.61
$ZREj^R$	14,577.99	31,028.57	62,893.14	6,420.16	13,981.40	8,857.69	4,680.79	770.93	5,295.08	2,593.04	5,068.70	481.75	1,559.14	2,783.65	7,004.68
ZTj^R	30,367.15	124,735.79	141,415.13	28,953.89	52,788.61	33,377.95	19,609.47	3,609.93	18,695.34	14,540.08	24,481.09	3,757.73	20,597.28	17,046.66	44,221.29
Mj^R	31,260.66	21,542.15	35,890.43	13,068.73	6,705.54	3,243.91	1,815.62	90.96	2,141.75	1,641.89	5,303.41	411.22	2,468.41	4,868.31	5,770.03
Tj^R	-56.91	-1,045.80	-19,739.22	-303.56	-107.91	-1,362.29	-234.69	-56.83	-139.00	-178.39	-301.31	-59.34	-249.33	-357.39	-1,279.32
Vj^R	27,837.16	505,163.44	233,661.60	66,906.51	90,284.16	368,816.57	63,263.85	14,303.34	106,064.67	119,097.43	63,842.43	11,754.76	48,514.53	54,127.80	106,793.29
REM	8,656.09	87,283.56	62,729.47	14,481.92	25,313.68	5,560.28	17,645.91	3,454.11	78,014.15	103,902.36	52,236.25	3,299.68	13,398.84	24,644.35	93,042.43
EBO	19,092.04	416,982.13	170,286.93	52,275.63	64,710.12	363,199.10	45,436.44	10,813.71	27,248.11	14,126.38	11,068.91	8,421.15	34,977.87	29,229.97	12,793.88
TSPNS	89.03	897.76	645.20	148.95	260.36	57.19	181.50	35.53	802.41	1,068.69	537.28	33.94	137.81	253.48	956.99
Xj^R	89,408.06	650,395.59	391,227.95	108,625.56	149,670.41	404,076.14	84,454.26	17,947.40	126,762.76	135,101.01	93,325.62	15,864.37	71,330.89	75,685.38	155,505.29

	Intermediate Demand	$C i^R$	$G i^R$	$I i^R$	$Exp i^R$	$ExpRE i^R$	Final Demand	Xi^R
1	72,179.36	29,242.02	0.00	9,208.37	0.00	62,492.22	100,942.61	173,121.97
2	19,923.31	0.00	0.00	100.12	5,324.67	26,855.01	32,279.80	52,203.11
3	61,823.82	0.00	0.00	85,348.42	35,541.76	-27,806.07	93,084.10	154,907.92
4	60,766.32	25,970.55	0.00	0.00	0.00	64,572.88	90,543.43	151,309.75
5	39,139.74	0.00	6.29	510,328.62	0.00	-5,193.45	505,141.46	544,281.20
6	36,575.93	223,062.81	0.00	-701.91	28,256.47	1,415.03	252,032.39	288,608.32
7	1,697.19	42,954.43	0.00	238.89	9,960.95	21,504.77	74,659.03	76,356.23
8	5,325.12	5,205.93	0.00	-120.70	6,267.33	-752.19	10,600.36	15,925.48
9	2,102.81	22,904.00	0.00	542.44	24,960.52	-27,178.29	21,228.67	23,331.48
10	12,459.79	1,001.79	0.00	74.24	759.78	6,535.09	8,370.90	20,830.69
11	30,234.52	6,742.48	394.84	345.61	13,010.46	13,360.26	33,853.65	64,088.17
12	126,168.42	94,982.79	0.00	2,768.27	109,437.70	5,139.09	212,327.84	338,496.26
13	36,782.87	9,909.64	0.00	491.39	18,055.54	13,237.27	41,693.84	78,476.71
14	173,431.76	9,249.58	0.00	12,982.70	191,079.10	33,697.88	247,009.27	420,441.03
15	88,132.92	69,243.13	0.00	101,731.29	1,630,630.35	-379,584.81	1,422,019.96	1,510,152.88
16	1,509.50	5,182.42	0.00	5,962.62	17,609.48	-4,443.99	24,310.52	25,820.01
17	8,227.38	7,231.63	0.00	529.49	117,814.29	-44,394.73	81,180.68	89,408.06
18	135,962.47	272,960.56	0.00	58,658.34	0.00	182,814.21	514,433.11	650,395.59
19	56,087.73	175,723.19	0.00	25,869.08	0.00	133,547.95	335,140.22	391,227.95
20	25,420.68	64,513.97	17.81	1,013.20	0.00	17,659.90	83,204.89	108,625.56
21	33,615.20	87,233.81	695.47	0.00	0.00	28,125.92	116,055.21	149,670.41
22	44,766.42	289,519.57	4.11	9,233.98	0.00	60,552.05	359,309.72	404,076.14
23	51,434.61	9,755.28	3,614.70	97.60	0.00	19,552.06	33,019.64	84,454.26
24	10,455.47	0.00	0.00	0.00	0.00	7,491.94	7,491.94	17,947.40
25	85,145.63	6,460.40	0.00	0.00	0.00	35,156.73	41,617.13	126,762.76
26	441.35	27,711.81	98,122.85	0.00	0.00	8,825.01	134,659.66	135,101.01
27	0.00	26,285.61	60,943.77	0.00	0.00	6,096.23	93,325.62	93,325.62
28	223.26	14,006.33	1,677.32	0.00	0.00	-42.54	15,641.11	15,864.37
29	8,437.56	69,075.03	0.00	0.00	0.00	-6,181.69	62,893.33	71,330.89
30	11,099.68	60,616.59	0.00	0.00	0.00	3,969.11	64,585.70	75,685.38
31	40.04	476.92	162,297.54	0.00	0.00	-7,309.20	155,465.25	155,505.29

North-Central

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	27,232.70	0.00	0.00	4.63	103.05	86,875.88	2,187.99	930.37	62.06	2,813.44	2.91	442.03	0.05	1.91	5.59	0.94
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,756.50	0.00	0.00	0.00	0.00
3	255.12	1.26	9,965.67	1,313.02	4,685.31	182.78	0.01	0.37	0.09	0.01	52.60	957.19	2,405.63	22,096.37	254.80	1.22
4	1,795.18	19.49	847.42	578.78	998.16	3,243.85	1,535.22	411.09	213.38	202.54	1,008.30	1,088.69	1,184.84	2,417.47	2,061.00	94.93
5	0.31	0.00	620.12	224.48	26,953.55	94.69	2.59	6.64	29.26	3.35	15.04	26.71	2.73	43.52	258.51	4.80
6	11,624.63	0.00	0.09	2.33	11.25	35,778.25	7,247.82	4.87	646.59	0.37	96.58	131.70	18.46	2.67	35.93	2.92
7	129.79	0.00	0.15	3.68	24.96	27.02	321.39	2.82	0.76	0.02	1.59	15.59	0.46	0.18	1.32	0.05
8	87.75	0.00	2.46	0.15	49.33	79.97	0.38	366.65	1,443.80	6.08	356.26	76.71	4.00	1.41	598.72	122.83
9	11.53	0.00	3.15	48.07	70.16	98.03	7.50	20.34	968.19	0.19	6.10	48.66	5.82	42.65	488.19	18.62
10	185.06	0.00	428.36	0.15	2,630.25	292.20	277.14	7.71	4.77	2,427.82	121.96	77.64	90.85	150.65	388.23	2,440.62
11	173.74	0.10	5.96	42.66	207.63	806.17	133.07	60.63	88.07	6.77	3,697.31	614.62	191.96	144.05	666.85	21.15
12	2,327.46	378.76	559.72	6,731.43	4,440.45	3,442.57	1,054.31	407.98	305.91	297.02	820.67	3,956.83	1,464.11	812.49	3,667.99	281.12
13	6.56	4.63	335.53	3.67	13,159.25	417.64	1,722.87	0.52	0.06	1.41	3.22	72.87	1,768.14	92.16	795.60	59.01
14	70.57	25.20	1,125.48	77.03	15,512.86	478.35	897.24	8.31	28.90	11.18	13.36	871.39	225.71	20,816.36	22,275.04	509.80
15	199.87	1.24	179.77	136.65	3,101.74	262.58	104.52	3.19	3.50	6.71	27.37	24.80	36.87	146.12	8,978.48	9.44
16	0.00	0.00	0.36	0.00	667.17	0.00	0.00	0.09	0.00	0.44	0.00	0.43	0.01	0.90	0.13	66.63
17	2.79	0.06	6.92	9.36	129.47	42.09	1.03	2.92	69.83	1.37	13.09	12.27	14.12	16.90	241.23	10.75
18	4,382.51	111.81	1,178.43	4,135.08	13,443.23	20,126.84	2,406.12	774.03	1,651.52	999.30	3,301.50	6,187.16	1,930.03	7,498.10	23,178.46	626.79
19	713.83	31.26	224.06	1,060.36	2,259.08	3,251.53	433.82	159.10	396.21	195.62	485.29	1,962.18	370.16	1,467.03	6,412.13	115.17
20	13.30	9.68	31.89	90.99	982.79	392.61	67.25	15.29	33.71	7.23	62.70	180.07	73.16	68.46	245.59	21.83
21	407.40	52.78	206.56	115.08	3,420.19	654.38	137.69	49.70	53.19	19.27	98.82	435.30	218.62	341.41	1,096.42	28.73
22	403.25	1.66	732.71	75.72	1,652.20	1,276.22	147.23	62.98	270.16	36.06	381.33	476.72	296.06	685.78	2,559.09	149.93
23	62.01	38.47	632.39	305.38	1,328.61	858.50	300.35	60.27	127.97	23.12	192.53	581.62	174.97	280.76	2,081.31	51.00
24	1.33	121.00	11.92	19.68	2.70	86.93	22.51	3.04	9.73	0.72	11.35	165.32	14.74	12.31	57.65	4.26
25	56.74	32.67	454.34	136.29	1,730.13	2,404.24	518.43	191.65	330.36	41.17	475.86	2,213.60	646.74	944.61	3,558.06	120.61
26	0.21	0.00	0.03	22.90	0.47	0.85	0.02	0.06	0.36	0.00	0.73	0.41	0.76	3.11	12.47	0.04
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	37.76	15.19	69.30	138.17	765.30	182.00	30.66	9.40	25.89	3.16	74.02	135.51	48.25	116.54	719.26	20.58
30	89.19	1.09	111.63	86.03	989.99	354.63	42.30	37.93	28.82	11.40	111.92	124.18	134.33	157.38	564.02	22.17
31	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zj^R	50,270.57	846.33	17,734.45	15,361.80	99,319.32	161,710.83	19,599.49	3,597.95	6,793.08	7,115.77	11,432.41	24,636.70	11,321.57	58,361.28	81,202.05	4,805.95
$ZREj^R$	43,867.35	0.00	22,150.25	23,969.14	60,342.03	46,998.29	26,919.02	1,190.32	2,562.76	7,584.59	5,735.05	55,716.58	6,499.43	16,340.22	21,802.64	3,976.46
ZTj^R	94,137.92	846.33	39,884.70	39,330.94	159,661.35	208,709.12	46,518.50	4,788.26	9,355.84	14,700.36	17,167.46	80,353.28	17,821.00	74,701.50	103,004.70	8,782.41
Mj^R	21,784.43	108.84	9,085.15	10,684.75	47,883.47	46,165.64	12,653.29	3,695.60	7,006.08	2,602.41	7,554.07	54,689.23	4,743.99	38,792.41	219,965.85	4,149.04
Tj^R	-1,418.96	-21.39	-871.10	-4,324.67	-1,857.13	410.51	-73.12	-48.66	-23.57	-202.65	-209.51	150.78	-780.17	-516.35	8.55	-86.78
Vj^R	193,304.86	9,388.92	98,523.88	53,424.14	258,053.81	152,203.12	43,541.92	4,686.99	11,743.35	12,207.65	11,538.06	41,613.54	22,888.73	50,842.63	99,953.13	9,357.74
REM	28,114.80	390.50	14,600.99	14,951.29	123,278.61	26,538.46	5,823.57	1,545.68	4,666.13	4,143.01	3,165.01	13,350.78	6,833.94	8,268.87	28,941.51	2,892.43
EBO	165,030.56	8,996.20	83,840.06	38,388.03	134,075.85	125,514.11	37,685.31	3,132.54	7,050.75	8,041.14	8,355.09	28,187.01	16,016.02	42,526.85	70,847.44	6,448.90
TSPNS	159.49	2.22	82.83	84.82	699.35	150.55	33.04	8.77	26.47	23.50	17.95	75.74	38.77	46.91	164.18	16.41
Xj^R	307,808.25	10,322.70	146,622.62	99,115.16	463,741.50	407,488.38	102,640.59	13,122.19	28,081.70	29,307.77	36,050.07	176,806.83	44,673.55	163,820.18	422,932.22	22,202.41

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	102.35	0.13	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	6.51	0.00	1.31	1.02	0.00
2	8.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	13.73	7.39	24.40	0.00	0.00	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	313.68	6,754.45	1,369.71	745.27	571.93	2,698.87	484.46	5.94	696.62	2,067.45	1,858.08	434.98	3,193.78	1,278.34	2,889.45
5	66.29	636.19	452.29	0.52	0.00	83.06	2.38	0.30	3.99	915.89	1,552.54	20.72	74.41	77.95	749.08
6	6.25	3,140.04	20.94	0.00	0.00	134.39	5.17	0.00	0.03	4.66	405.29	13.24	3,831.21	0.08	928.69
7	0.23	344.98	1.14	0.02	212.28	7.07	0.14	0.00	0.03	9.29	18.88	0.24	1,058.11	0.42	24.50
8	108.24	348.10	6.95	0.00	0.00	5.99	5.68	0.00	4.78	16.82	207.04	1.23	298.81	7.13	51.09
9	19.55	124.62	32.27	0.33	0.00	19.96	29.60	0.00	51.68	30.05	228.14	20.87	8.31	100.30	216.82
10	377.18	2,923.45	0.10	82.16	0.00	6.72	0.65	0.00	0.00	0.00	0.00	18.34	0.00	0.29	0.00
11	258.61	2,006.71	182.02	70.85	1,385.98	715.38	360.39	5.54	940.93	320.44	411.94	52.02	199.30	231.26	1,128.04
12	540.48	2,535.10	18,106.35	373.25	59.86	1,604.36	291.02	41.99	351.63	196.96	766.79	150.33	901.06	947.26	2,305.89
13	186.47	532.89	11.74	0.00	0.00	120.41	0.51	0.00	0.10	0.03	0.00	0.36	79.84	36.26	0.00
14	1,733.31	1,489.32	21.75	112.98	0.00	171.51	9.04	0.00	8.77	16.00	34.90	7.31	14.11	305.85	148.58
15	48.96	2,305.49	2,398.87	1,333.75	28.31	866.37	80.70	0.15	10.91	28.27	145.89	18.49	39.18	336.65	134.03
16	0.15	420.27	0.12	0.16	0.00	15.68	0.04	0.00	1.83	11.91	52.47	0.14	113.84	0.00	11.68
17	569.01	766.85	30.52	12.40	66.04	82.24	47.39	0.64	24.55	78.64	225.75	160.76	199.51	159.73	120.44
18	1,216.62	6,352.59	7,388.19	2,127.77	821.30	980.68	328.27	6.41	460.97	416.00	2,714.61	137.88	1,581.16	1,309.27	3,373.52
19	519.43	2,760.51	4,111.21	933.43	1,430.09	363.55	350.93	8.47	355.97	311.70	690.38	75.68	222.86	342.64	2,534.83
20	44.07	1,468.34	695.46	1,834.17	5,958.16	668.59	567.68	17.85	491.72	771.32	361.02	100.45	208.89	347.08	1,830.05
21	100.65	1,457.45	1,004.27	1,168.42	5,296.35	1,158.63	747.88	24.65	510.65	274.75	113.64	82.04	318.61	63.15	2,496.57
22	398.09	11,403.82	2,366.09	1,952.47	2,187.92	4,170.39	992.50	66.16	622.97	1,016.34	685.75	233.81	546.76	2,530.13	1,392.11
23	363.93	2,221.26	2,148.24	1,046.11	2,104.12	1,465.94	978.73	180.58	1,033.76	689.82	1,415.36	135.03	420.15	540.73	1,832.96
24	6.28	301.94	193.96	168.09	445.16	43.89	14.32	27.58	37.12	15.80	13.30	5.45	40.19	15.19	10.64
25	346.98	10,514.05	1,892.58	1,667.05	1,852.31	655.07	1,720.44	103.99	733.36	567.51	754.26	296.94	2,123.78	842.94	1,026.24
26	2.24	12.33	162.82	6.06	108.30	3.44	35.89	0.00	0.00	45.66	1.04	14.98	0.00	0.11	10.56
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.24	0.79	68.67	2.86	1.75	0.00	0.00	0.25	0.00	0.00	5.08	0.10	0.00	91.01
29	86.11	1,038.70	1,108.76	338.57	480.45	136.96	86.34	11.30	379.45	543.92	513.08	42.14	92.73	184.11	4,449.07
30	91.95	1,178.28	1,217.13	109.99	916.89	362.04	212.91	2.90	118.52	235.84	798.54	143.20	473.96	621.80	957.84
31	0.00	43.67	0.00	0.00	0.00	0.09	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Zj^R	7,529.61	63,089.15	44,948.66	14,152.50	23,928.29	16,543.24	7,353.10	504.45	6,840.58	8,585.11	13,975.18	2,171.72	16,041.99	10,279.72	28,713.69
$ZREj^R$	2,803.81	58,771.14	48,856.03	7,278.96	14,115.07	14,951.41	2,438.47	205.51	2,199.80	7,377.71	8,470.69	837.58	16,573.13	6,343.48	21,890.46
ZTj^R	10,333.42	121,860.29	93,804.69	21,431.46	38,043.36	31,494.65	9,791.57	709.96	9,040.38	15,962.82	22,445.87	3,009.30	32,615.12	16,623.20	50,604.15
Mj^R	10,637.46	21,045.55	23,807.15	9,673.38	4,832.51	3,060.87	906.59	17.89	1,035.67	1,802.55	4,862.52	329.31	3,908.64	4,747.37	6,602.87
Tj^R	-19.37	-1,021.69	-13,093.59	-224.69	-77.77	-1,285.43	-117.19	-11.18	-67.22	-195.84	-276.26	-47.52	-394.80	-348.51	-1,463.97
Vj^R	9,472.51	493,518.04	154,994.40	49,523.72	65,065.43	348,006.61	31,589.46	2,813.02	51,289.01	130,751.05	58,534.93	9,413.56	76,821.18	52,783.18	122,207.73
REM	2,793.96	102,787.45	53,003.18	12,844.56	23,881.93	8,667.12	19,997.21	2,345.89	62,970.44	132,791.40	60,422.43	4,354.10	16,060.87	24,361.23	143,121.18
EBO	6,662.70	390,147.48	101,690.54	36,606.30	41,048.02	339,290.32	11,478.80	453.82	-12,038.66	-2,793.68	-2,230.27	5,034.76	60,669.20	28,283.75	-21,725.37
TSPNS	15.85	583.11	300.68	72.87	135.48	49.17	113.44	13.31	357.23	753.32	342.77	24.70	91.11	138.20	811.92
Xj^R	30,424.02	635,402.19	259,512.66	80,403.87	107,863.53	381,276.70	42,170.43	3,529.69	61,297.85	148,320.57	85,567.05	12,704.65	112,950.14	73,805.23	177,950.78

	Intermediate Demand	C_i^R	G_i^R	I_i^R	Exp_i^R	$ExpRE_i^R$	Final Demand	Xi^R
1	120,774.90	34,643.45	0.00	16,372.35	0.00	136,017.55	187,033.35	307,808.25
2	3,765.26	0.00	0.00	19.80	39,295.03	-32,757.39	6,557.44	10,322.70
3	42,217.22	0.00	0.00	80,783.53	0.00	23,621.87	104,405.40	146,622.62
4	43,063.35	30,767.68	0.00	0.00	0.00	25,284.13	56,051.81	99,115.16
5	32,921.91	0.00	7.45	434,813.04	19,232.64	-23,233.53	430,819.60	463,741.50
6	64,094.43	264,265.76	0.00	-991.04	14,887.17	65,232.05	343,393.95	407,488.38
7	2,207.11	50,888.74	0.00	321.13	1,245.21	47,978.41	100,433.49	102,640.59
8	4,258.36	6,167.54	0.00	-99.45	6,766.22	-3,970.47	8,863.83	13,122.19
9	2,719.71	27,134.70	0.00	652.88	750.77	-3,176.36	25,361.99	28,081.70
10	12,932.32	1,186.84	0.00	104.45	1,739.22	13,344.94	16,375.45	29,307.77
11	15,130.14	7,987.91	467.77	194.41	28,790.61	-16,520.77	20,919.92	36,050.07
12	60,121.14	112,527.50	0.00	1,445.95	2,500.30	211.94	116,685.69	176,806.83
13	19,411.74	11,740.09	0.00	279.73	25,427.32	-12,185.33	25,261.81	44,673.55
14	67,020.24	10,958.11	0.00	5,058.57	384,985.45	-304,202.19	96,799.94	163,820.18
15	20,998.85	82,033.34	0.00	28,490.78	852.69	290,556.55	401,933.37	422,932.22
16	1,364.44	6,139.69	0.00	5,127.20	1,515.60	8,055.48	20,837.97	22,202.41
17	3,118.70	8,567.42	0.00	180.18	0.00	18,557.72	27,305.32	30,424.02
18	121,146.14	323,380.36	0.00	57,306.10	0.00	133,569.58	514,256.04	635,402.19
19	34,548.49	208,181.83	0.00	17,159.70	0.00	-377.36	224,964.17	259,512.66
20	17,661.42	76,430.65	21.10	749.96	0.00	-14,459.26	62,742.46	80,403.87
21	22,153.27	103,347.17	823.94	0.00	0.00	-18,460.84	85,710.26	107,863.53
22	39,772.44	342,998.06	4.87	8,712.97	0.00	-10,211.64	341,504.26	381,276.70
23	23,675.99	11,557.23	4,282.39	48.73	0.00	2,606.08	18,494.44	42,170.43
24	1,884.09	0.00	0.00	0.00	0.00	1,645.60	1,645.60	3,529.69
25	38,953.01	7,653.73	0.00	0.00	0.00	14,691.11	22,344.84	61,297.85
26	445.84	32,830.59	116,247.57	0.00	0.00	-1,203.42	147,874.73	148,320.57
27	0.00	31,140.95	72,200.98	0.00	0.00	-17,774.88	85,567.05	85,567.05
28	170.76	16,593.51	1,987.14	0.00	0.00	-6,046.76	12,533.89	12,704.65
29	11,882.66	81,834.19	0.00	0.00	0.00	19,233.29	101,067.48	112,950.14
30	10,308.82	71,813.36	0.00	0.00	0.00	-8,316.94	63,496.42	73,805.23
31	43.79	565.01	192,276.26	0.00	0.00	-14,934.29	177,906.98	177,950.78

Central Region

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	5,318.62	0.00	0.00	3.31	75.74	54,622.22	1,254.69	1,093.76	71.92	1,613.35	2.80	845.25	0.04	1.46	6.19	0.54
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,390.63	0.00	0.00	0.00	0.00
3	44.68	1.25	204.63	322.73	1,185.60	39.57	0.00	0.15	0.04	0.00	17.44	630.17	732.13	5,802.79	97.08	0.22
4	2,217.35	19.28	360.37	445.67	1,383.07	4,494.74	2,127.23	656.20	335.72	228.92	1,397.11	2,826.60	1,641.73	3,113.79	3,096.74	131.53
5	0.39	0.00	271.49	372.24	29,724.22	157.02	4.29	12.33	53.50	3.90	24.95	80.60	4.52	57.71	451.51	7.96
6	12,645.36	0.00	0.03	3.44	19.31	57,869.95	14,030.15	12.80	1,674.10	0.37	207.82	562.72	37.08	3.03	88.83	5.54
7	104.40	0.00	0.04	4.32	32.64	31.96	230.36	5.90	1.56	0.02	2.73	53.06	0.73	0.17	2.59	0.06
8	178.48	0.00	1.72	0.41	158.38	363.43	1.38	3,591.42	8,440.17	11.32	2,030.94	452.40	19.09	2.99	2,362.52	436.07
9	23.11	0.00	2.18	130.86	222.01	439.14	26.77	126.19	9,919.85	0.35	34.28	286.97	27.38	89.17	1,898.73	65.14
10	83.51	0.00	88.02	0.10	1,769.00	168.11	125.06	8.30	5.06	341.44	107.48	135.85	73.49	105.15	393.15	1,176.61
11	289.49	0.10	3.42	96.52	546.04	3,001.42	394.57	233.92	339.82	10.33	19,581.33	3,293.98	740.66	250.28	2,155.59	61.52
12	7,700.12	374.84	637.55	30,237.81	23,186.70	23,977.93	6,207.06	2,841.66	2,130.67	899.21	5,716.07	75,112.62	10,197.69	2,803.10	23,542.32	1,623.30
13	10.04	4.58	176.67	7.62	31,764.69	1,238.91	4,688.91	1.54	0.18	1.97	9.54	327.11	6,240.19	146.98	2,360.09	157.52
14	80.24	24.94	511.37	87.59	17,638.32	543.89	1,020.18	10.19	34.92	12.71	15.19	1,737.61	256.64	10,793.09	25,705.23	579.65
15	382.67	1.23	118.51	355.24	9,373.10	805.83	320.75	9.78	10.74	11.75	84.01	91.99	113.14	291.74	33,913.23	28.96
16	0.00	0.00	0.11	0.00	876.95	0.00	0.00	0.18	0.00	0.36	0.00	1.42	0.01	0.86	0.26	52.07
17	5.13	0.06	4.37	23.33	375.01	130.53	3.21	9.05	216.57	2.31	40.58	48.01	43.80	32.34	748.14	33.33
18	5,548.96	110.65	513.71	7,108.86	26,865.13	47,707.97	5,421.37	2,061.86	4,336.17	1,157.83	7,825.76	26,807.79	4,574.89	9,900.19	58,119.30	1,385.18
19	1,155.60	30.94	124.88	2,330.73	5,772.20	10,012.99	1,249.75	489.94	1,220.11	289.79	1,494.45	8,638.64	1,139.88	2,476.59	19,745.95	325.42
20	24.90	9.58	20.55	231.23	2,903.23	1,641.94	224.00	72.75	160.34	12.39	298.23	1,059.19	321.47	133.61	891.76	71.32
21	785.31	52.23	137.09	301.20	10,405.62	2,818.51	472.31	246.92	264.27	33.99	490.98	2,567.18	989.34	686.27	4,100.20	96.66
22	543.71	1.64	340.13	138.63	3,515.98	3,183.11	353.25	165.78	700.91	44.49	951.10	2,040.99	738.42	964.21	6,382.82	352.84
23	172.62	38.07	606.09	1,154.22	5,837.39	5,339.93	1,487.85	457.05	970.48	58.90	1,460.09	4,125.61	1,143.46	815.01	11,239.99	247.79
24	11.53	119.74	35.66	232.18	37.07	1,687.32	347.97	91.87	304.33	5.70	276.25	3,659.42	300.59	111.48	971.51	64.63
25	143.41	32.33	395.34	467.69	6,901.39	13,577.12	2,331.61	1,219.83	2,102.69	95.23	3,028.83	14,089.40	3,837.22	2,489.52	17,445.34	532.05
26	0.26	0.00	0.01	39.35	0.94	1.89	0.04	0.15	0.89	0.00	1.63	1.66	1.68	4.11	29.26	0.09
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	42.19	15.03	26.66	209.63	1,165.18	277.10	46.69	18.23	49.47	3.23	117.56	427.32	73.45	135.80	1,312.63	31.34
30	139.73	1.08	60.21	183.01	2,447.99	1,198.02	117.94	128.12	97.36	16.35	378.10	619.75	453.79	257.13	1,714.30	60.63
31	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zj^R	37,651.79	837.57	4,640.84	44,487.91	184,182.95	235,330.65	42,487.41	13,565.88	33,441.83	4,856.19	45,595.24	154,913.94	33,702.54	41,468.57	218,775.27	7,527.97
$ZREj^R$	8,056.25	0.00	1,273.01	1,656.09	39,987.72	119,556.44	4,093.96	10,134.72	15,702.64	760.51	10,489.66	318,968.01	11,058.97	30,448.44	48,877.69	2,246.45
ZTj^R	45,708.04	837.57	5,913.86	46,144.00	224,170.67	354,887.08	46,581.38	23,700.60	49,144.47	5,616.70	56,084.90	473,881.96	44,761.51	71,917.01	267,652.97	9,774.42
Mj^R	10,577.28	107.72	1,347.09	12,535.61	67,230.23	78,499.64	12,670.39	18,292.22	36,801.64	994.33	24,678.61	322,528.69	11,915.61	37,346.42	571,571.14	4,617.69
Tj^R	-688.97	-21.17	-129.16	-5,073.80	-2,607.48	698.02	-73.21	-240.87	-123.82	-77.43	-684.46	889.23	-1,959.57	-497.11	22.21	-96.59
Vj^R	93,857.88	9,291.72	14,608.51	62,678.48	362,317.47	258,804.79	43,600.77	23,199.33	61,685.60	4,664.29	37,694.03	245,415.04	57,490.26	48,947.47	259,723.61	10,414.73
REM	15,284.64	239.12	3,233.71	9,624.60	179,343.15	29,681.90	7,243.84	8,000.39	16,908.64	1,478.09	8,658.90	43,964.72	8,448.25	11,142.71	44,087.75	3,079.04
EBO	78,391.05	9,049.75	11,336.25	52,939.15	180,836.55	228,769.09	36,270.58	15,103.57	44,575.42	3,168.58	28,931.92	200,926.26	48,941.31	37,671.94	215,110.33	7,298.98
TSPNS	182.19	2.85	38.55	114.72	2,137.76	353.81	86.35	95.36	201.55	17.62	103.21	524.06	100.70	132.82	525.52	36.70
Xj^R	149,454.24	10,215.84	21,740.30	116,284.28	651,110.89	692,889.53	102,779.32	64,951.28	147,507.89	11,197.89	117,773.08	1,042,714.91	112,207.80	157,713.80	1,098,969.92	24,710.25

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	108.56	0.09	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	5.70	0.00	0.85	0.93	0.00
2	10.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	5.01	1.86	7.86	0.00	0.00	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	451.76	9,359.10	1,897.90	1,094.67	865.18	3,739.61	1,058.34	40.52	1,381.67	2,864.70	2,574.59	664.30	4,425.36	1,771.30	4,003.67
5	110.98	1,054.94	750.00	0.89	0.00	137.73	6.05	2.40	9.20	1,518.75	2,574.45	36.78	123.38	129.26	1,242.13
6	14.81	6,305.89	43.78	0.00	0.00	269.88	18.58	0.00	0.11	9.35	813.92	33.28	6,873.01	0.16	1,865.02
7	0.43	449.26	1.89	0.04	420.88	9.80	0.40	0.00	0.07	12.10	29.43	0.49	1,251.35	0.68	35.05
8	450.31	1,604.31	32.56	0.00	0.00	27.27	33.18	0.00	27.95	72.58	1,027.44	7.22	1,002.33	37.86	263.31
9	80.16	566.09	148.95	2.06	0.00	89.61	183.61	0.00	315.81	127.78	1,115.90	129.48	27.47	524.80	1,101.36
10	366.10	1,957.77	0.08	81.33	0.00	4.79	0.96	0.00	0.01	0.00	0.00	18.87	0.00	0.24	0.00
11	881.34	7,576.21	698.28	273.36	5,347.62	2,668.80	1,625.16	77.94	3,852.26	1,132.42	1,589.40	200.70	547.64	892.28	4,352.37
12	3,657.38	17,657.31	126,113.13	2,599.75	416.95	11,174.60	2,026.98	537.24	2,449.13	1,371.87	5,340.77	1,047.07	4,916.17	6,597.77	16,060.82
13	553.17	1,580.78	34.82	0.00	0.00	357.18	1.92	0.00	0.35	0.10	0.00	1.08	201.38	107.57	0.00
14	1,970.80	1,693.38	24.74	128.46	0.00	195.01	15.17	0.00	13.35	18.20	39.68	8.58	16.05	347.76	168.94
15	150.26	7,075.23	7,361.80	4,093.09	86.88	2,658.78	251.89	1.44	33.48	86.76	447.71	56.76	120.25	1,033.12	411.31
16	0.28	552.42	0.19	0.30	0.00	21.33	0.11	0.00	4.67	15.65	80.21	0.27	149.64	0.00	16.38
17	2,194.91	2,378.22	94.67	38.46	204.80	255.06	155.96	6.53	76.13	243.89	700.11	498.55	603.82	495.38	373.53
18	2,924.05	14,315.02	17,512.70	5,215.57	2,073.38	2,324.56	1,196.77	72.93	1,525.76	986.08	6,434.61	351.41	3,301.58	3,103.45	7,996.47
19	1,599.56	8,500.89	15,636.21	2,874.48	4,403.92	1,119.56	1,299.96	97.91	1,197.19	959.88	2,126.00	233.05	594.98	1,055.15	7,805.94
20	168.71	6,227.13	2,996.90	13,452.49	28,341.91	2,801.76	2,809.62	275.74	2,339.01	3,061.91	1,648.60	477.81	644.78	1,651.00	8,678.53
21	396.86	6,365.79	4,457.04	5,805.18	41,786.36	5,000.55	3,753.84	386.05	2,537.09	1,123.30	534.46	407.63	1,012.84	313.77	12,193.39
22	992.92	28,443.09	5,901.45	4,869.79	5,457.83	10,404.96	3,575.40	743.74	2,037.48	2,534.93	1,710.39	588.82	1,215.75	6,310.59	3,472.16
23	2,072.16	14,010.72	13,768.26	7,933.26	15,956.76	9,136.69	17,020.89	2,989.70	7,839.62	4,072.80	9,612.87	1,024.00	1,928.81	3,928.45	12,928.17
24	111.59	5,943.36	3,879.24	4,491.61	12,063.90	853.72	410.26	6,171.32	982.80	291.19	281.81	146.67	575.82	344.37	234.30
25	1,793.66	60,209.78	11,012.53	10,610.64	11,789.81	3,706.80	10,950.43	1,591.61	9,718.40	3,042.08	4,650.97	1,889.97	8,851.74	5,365.26	6,531.92
26	5.03	27.34	361.18	13.89	255.91	7.64	122.47	0.00	0.02	90.12	2.30	35.75	0.00	0.25	23.41
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	1.05	3.52	341.83	14.23	7.62	0.00	0.00	1.24	0.00	0.00	40.52	0.31	0.00	448.77
29	150.62	1,581.44	1,710.91	604.02	882.76	208.52	229.09	93.58	914.09	828.14	781.17	78.17	86.21	280.31	6,773.79
30	294.64	3,980.52	4,111.76	371.58	3,097.47	1,223.06	894.04	37.98	451.83	783.69	2,697.66	483.78	1,224.57	2,711.12	3,235.83
31	0.00	127.13	0.00	0.00	0.00	0.25	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Zj^R	21,516.29	209,546.15	218,562.36	64,896.78	133,466.53	58,405.20	47,641.14	13,126.63	37,708.73	25,248.27	46,820.14	8,460.97	39,696.08	37,002.82	100,216.58
$ZREj^R$	5,618.25	35,030.31	26,026.99	21,422.14	26,574.53	8,106.86	15,231.87	5,670.66	11,012.34	4,733.61	11,237.18	4,222.38	2,349.40	10,546.36	24,514.33
ZTj^R	27,134.54	244,576.46	244,589.36	86,318.92	160,041.06	66,512.06	62,873.01	18,797.30	48,721.06	29,981.88	58,057.32	12,683.35	42,045.48	47,549.18	124,730.91
Mj^R	27,932.94	42,238.90	62,075.52	38,961.20	20,329.43	6,464.12	5,821.34	473.63	5,581.51	3,385.61	12,577.13	1,387.97	5,038.79	13,579.44	16,274.98
Tj^R	-50.85	-2,050.56	-34,140.63	-905.00	-327.15	-2,714.63	-752.48	-295.91	-362.25	-367.84	-714.57	-200.28	-508.95	-996.89	-3,608.45
Vj^R	24,873.88	990,502.29	404,137.37	199,465.34	273,717.65	734,938.74	202,840.17	74,478.97	276,410.28	245,580.85	151,403.40	39,675.51	99,033.32	150,981.62	301,221.97
REM	5,615.39	146,566.35	106,175.93	33,820.63	55,569.77	7,290.11	40,199.76	3,814.65	122,100.54	185,008.95	93,540.40	5,026.27	23,051.94	40,604.68	236,159.68
EBO	19,191.55	842,188.88	296,695.83	165,241.57	217,485.49	727,561.73	162,161.23	70,618.85	152,854.31	58,366.61	56,748.00	34,589.33	75,706.61	109,892.94	62,247.28
TSPNS	66.94	1,747.06	1,265.61	403.14	662.39	86.90	479.18	45.47	1,455.43	2,205.29	1,115.00	59.91	274.78	484.01	2,815.01
Xj^R	79,890.50	1,275,267.09	676,661.61	323,840.47	453,760.99	805,200.28	270,782.05	93,453.98	330,350.61	278,580.50	221,323.28	53,546.54	145,608.64	211,113.34	438,619.41

	Intermediate Demand	C_i^R	G_i^R	I_i^R	Exp_i^R	$ExpRE_i^R$	Final Demand	Xi^R
1	65,026.05	62,246.11	0.00	7,949.49	0.00	14,232.59	84,428.19	149,454.24
2	4,400.87	0.00	0.00	19.59	509.59	5,285.79	5,814.97	10,215.84
3	9,093.30	0.00	0.00	11,978.08	0.00	668.91	12,647.00	21,740.30
4	60,668.74	55,282.28	0.00	0.00	0.00	333.26	55,615.54	116,284.28
5	38,923.58	0.00	13.38	610,494.22	13,552.61	-11,872.90	612,187.31	651,110.89
6	103,408.33	474,823.32	0.00	-1,685.15	1,377.08	114,965.96	589,481.20	692,889.53
7	2,682.40	91,435.08	0.00	321.56	4,175.69	4,164.59	100,096.92	102,779.32
8	22,637.04	11,081.61	0.00	-492.27	18,934.63	12,790.26	42,314.23	64,951.28
9	17,705.20	48,754.66	0.00	3,429.48	13.43	77,605.11	129,802.68	147,507.89
10	7,010.50	2,132.47	0.00	39.91	4,612.79	-2,597.78	4,187.40	11,197.89
11	62,714.80	14,352.39	840.47	635.12	70,199.59	-30,969.29	55,058.29	117,773.08
12	419,155.58	202,185.40	0.00	8,527.47	5,019.84	407,826.63	623,559.33	1,042,714.91
13	49,974.89	21,094.18	0.00	702.60	20,548.64	19,887.49	62,232.91	112,207.80
14	63,691.84	19,689.14	0.00	4,870.01	321,723.56	-252,260.74	94,021.96	157,713.80
15	69,781.43	147,394.59	0.00	74,031.99	384.59	807,377.32	1,029,188.50	1,098,969.92
16	1,773.69	11,031.57	0.00	5,706.34	2,497.78	3,700.87	22,936.56	24,710.25
17	10,035.77	15,393.63	0.00	473.13	0.00	53,987.98	69,854.73	79,890.50
18	278,779.99	581,038.33	0.00	115,014.69	0.00	300,434.09	996,487.11	1,275,267.09
19	106,002.52	374,053.71	0.00	44,742.74	0.00	151,862.64	570,659.08	676,661.61
20	83,652.39	137,327.87	37.92	3,020.61	0.00	99,801.69	240,188.08	323,840.47
21	110,522.22	185,690.52	1,480.42	0.00	0.00	156,067.83	343,238.78	453,760.99
22	98,677.33	616,286.72	8.75	18,400.51	0.00	71,826.98	706,522.96	805,200.28
23	159,377.71	20,765.61	7,694.45	312.92	0.00	82,631.34	111,404.33	270,782.05
24	45,039.20	0.00	0.00	0.00	0.00	48,414.78	48,414.78	93,453.98
25	220,404.59	13,751.95	0.00	0.00	0.00	96,194.07	109,946.02	330,350.61
26	1,027.27	58,988.83	208,869.49	0.00	0.00	9,694.91	277,553.23	278,580.50
27	0.00	55,952.95	129,728.15	0.00	0.00	35,642.18	221,323.28	221,323.28
28	859.13	29,814.63	3,570.42	0.00	0.00	19,302.36	52,687.41	53,546.54
29	19,154.34	147,036.77	0.00	0.00	0.00	-20,582.47	126,454.30	145,608.64
30	33,473.06	129,031.68	0.00	0.00	0.00	48,608.60	177,640.28	211,113.34
31	127.49	1,015.19	345,475.15	0.00	0.00	92,001.59	438,491.93	438,619.41

Southern Region

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	11,249.92	0.00	0.00	3.42	78.32	56,481.88	772.97	467.80	29.32	732.90	0.68	874.03	0.02
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	182,563.89	0.00
3	30.76	5.32	191.91	222.21	816.31	27.24	0.00	0.10	0.03	0.00	12.01	433.89	504.09
4	1,790.87	338.61	280.69	456.99	995.76	3,236.07	965.19	206.70	100.81	93.89	251.44	2,035.05	678.30
5	0.39	0.00	211.46	284.75	34,409.70	109.39	1.67	3.34	13.82	1.60	3.86	61.66	1.61
6	8,390.01	0.00	0.03	1.68	8.12	14,786.56	4,013.05	2.45	305.47	0.15	22.73	202.24	9.31
7	38.81	0.00	0.03	1.18	8.25	8.08	29.13	1.42	0.36	0.01	0.37	13.42	0.18
8	46.06	0.00	1.29	0.08	25.90	41.98	0.20	80.16	757.91	3.19	146.30	45.82	2.10
9	5.68	0.00	1.55	23.71	34.61	48.35	3.70	10.03	186.87	0.09	2.47	27.71	2.87
10	30.28	0.00	68.56	0.03	641.39	60.95	45.34	3.01	1.83	88.79	28.70	49.26	26.65
11	42.69	0.32	1.47	10.48	51.01	198.07	32.69	14.90	21.64	1.66	177.07	209.75	47.16
12	8,887.05	9,404.96	496.58	24,627.41	16,955.19	10,346.51	1,775.41	476.96	340.92	368.82	548.15	45,769.88	2,245.05
13	3.40	33.71	137.61	1.90	6,812.74	216.22	891.95	0.27	0.03	0.73	0.99	57.09	375.99
14	32.77	190.72	398.30	35.77	7,202.67	222.10	416.59	4.16	13.65	5.19	3.56	709.56	104.80
15	9.83	0.69	8.84	6.72	152.52	12.91	5.14	0.16	0.17	0.33	1.35	1.47	1.81
16	0.00	0.00	0.06	0.00	111.13	0.00	0.00	0.02	0.00	0.07	0.00	0.18	0.00
17	1.03	0.28	2.54	3.44	47.60	15.47	0.38	1.07	25.67	0.51	4.81	5.69	5.19
18	3,392.96	1,470.87	400.12	3,201.39	10,407.80	15,582.27	1,550.68	389.19	780.23	474.89	843.95	8,755.90	1,132.64
19	735.25	427.92	97.27	1,092.17	2,326.87	3,349.10	357.47	91.01	216.06	118.86	158.61	2,889.41	277.74
20	9.38	78.45	16.01	64.18	693.20	276.93	47.44	10.11	21.25	5.08	23.69	157.06	51.61
21	285.33	412.56	106.78	80.60	2,395.39	458.31	96.43	33.85	34.54	13.49	38.46	366.05	153.12
22	383.16	25.13	264.92	71.95	1,569.89	1,212.64	101.04	31.67	127.63	18.25	103.80	777.54	185.01
23	69.14	331.51	472.07	340.51	1,481.46	957.27	334.91	59.28	120.00	24.16	108.20	648.54	195.10
24	0.25	56.41	2.24	3.71	0.51	16.36	4.24	0.57	1.83	0.13	2.14	31.12	2.77
25	63.29	310.19	307.92	152.01	1,929.63	2,681.46	578.21	171.16	281.25	39.06	242.81	2,468.84	721.31
26	0.21	0.00	0.01	23.47	0.48	0.87	0.01	0.03	0.17	0.00	0.19	0.77	0.44
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	49.35	394.13	20.77	170.74	1,031.40	184.75	17.44	4.73	12.23	1.32	17.42	378.26	24.99
30	94.88	15.90	46.90	91.53	1,053.21	377.28	33.74	21.00	15.21	6.70	35.40	195.17	97.54
31	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zj^R	35,642.74	13,497.68	3,535.94	30,972.04	91,241.07	110,909.04	12,075.03	2,085.15	3,408.91	1,999.88	2,779.15	249,729.22	6,847.42
$ZREj^R$	17,824.56	78,639.97	1,070.29	6,610.28	102,751.18	33,374.78	1,248.66	322.43	1,011.11	303.83	1,260.86	44,152.12	1,989.80
ZTj^R	53,467.30	92,137.65	4,606.23	37,582.32	193,992.25	144,283.83	13,323.69	2,407.58	4,420.02	2,303.71	4,040.00	293,881.33	8,837.22
Mj^R	12,372.85	11,849.42	1,049.23	10,209.72	58,179.53	31,915.02	3,624.12	1,858.18	3,309.91	407.83	1,777.69	200,018.51	2,352.49
Tj^R	-805.92	-2,328.85	-100.60	-4,132.39	-2,256.45	283.79	-20.94	-24.47	-11.14	-31.76	-49.30	551.46	-386.88
Vj^R	109,790.91	1,022,141.12	11,378.38	51,048.95	313,541.38	105,220.36	12,471.15	2,356.66	5,547.96	1,913.07	2,715.24	152,195.92	11,350.25
REM	25,587.35	19,992.05	14,455.29	9,991.15	115,247.17	15,021.14	3,843.64	1,296.53	3,276.68	661.37	1,911.53	22,468.25	4,408.72
EBO	83,990.80	1,001,982.84	-3,197.11	40,974.71	197,335.92	90,074.31	8,595.55	1,049.35	2,244.03	1,246.20	787.81	129,540.84	6,904.87
TSPNS	212.76	166.24	120.20	83.08	958.29	124.90	31.96	10.78	27.25	5.50	15.89	186.83	36.66
Xj^R	174,825.14	1,123,799.34	16,933.24	94,708.59	563,456.71	281,702.99	29,398.02	6,597.95	13,266.75	4,592.85	8,483.63	646,647.22	22,153.08

	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1	0.85	0.26	0.16	36.04	0.10	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	5.90
2	0.00	0.00	0.00	73.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	3,995.36	12.00	0.15	3.45	1.28	5.41	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00
4	1,438.41	97.07	29.34	110.46	6,738.24	1,366.43	503.51	383.67	2,692.39	517.42	1.07	744.19	2,062.49	1,853.62
5	26.66	12.18	1.53	23.34	677.29	501.03	0.35	0.00	101.91	2.55	0.05	4.26	1,161.81	1,926.34
6	1.40	1.69	0.79	2.20	2,266.30	15.73	0.00	0.00	96.99	5.52	0.00	0.04	3.36	292.52
7	0.06	0.06	0.01	0.08	113.59	0.48	0.01	106.42	2.48	0.10	0.00	0.02	3.06	7.44
8	0.74	42.82	62.51	56.82	182.73	3.65	0.00	0.00	3.14	2.98	0.00	2.51	8.83	108.68
9	21.04	34.42	9.18	9.64	61.47	15.92	0.16	0.00	9.85	14.60	0.00	25.49	14.82	112.52
10	38.13	18.29	389.39	132.74	709.83	0.03	29.49	0.00	1.74	0.35	0.00	0.00	0.00	0.00
11	35.39	39.07	5.20	63.54	493.02	44.72	17.41	340.52	175.76	103.48	1.00	245.30	78.73	101.21
12	1,294.88	426.72	232.71	490.45	7,021.70	52,184.15	637.18	98.52	5,121.55	528.04	7.57	702.90	722.57	2,475.28
13	47.71	42.79	22.58	78.22	275.88	6.08	0.00	0.00	62.34	0.33	0.00	0.06	0.02	0.00
14	3,560.32	1,049.12	168.34	627.41	691.50	10.10	52.46	0.00	79.63	6.19	0.00	5.45	7.43	16.20
15	7.19	17.22	0.46	2.41	113.36	117.96	65.58	1.39	42.60	4.04	0.02	0.54	1.39	7.17
16	0.15	0.01	1.65	0.04	70.00	0.02	0.04	0.00	2.70	0.01	0.00	0.59	1.98	10.16
17	6.21	15.57	3.95	61.01	281.92	11.22	4.56	24.28	30.23	18.49	0.11	9.02	28.91	82.99
18	4,573.36	1,091.67	198.57	428.41	3,020.94	5,719.96	1,437.53	550.96	759.24	350.61	1.16	492.45	322.07	2,101.66
19	1,144.05	365.02	46.65	230.64	2,843.34	3,460.43	779.72	1,151.72	374.46	374.80	1.53	380.27	321.06	711.09
20	48.29	16.16	10.22	22.62	1,035.69	490.54	723.98	4,202.55	471.58	416.61	3.22	346.83	544.04	254.64
21	239.11	74.32	13.86	53.22	1,020.75	703.36	818.33	2,061.16	811.47	529.16	4.44	357.64	192.43	79.59
22	445.42	121.33	50.58	147.22	10,835.66	2,248.21	1,358.35	1,467.74	2,987.23	1,060.03	11.93	665.51	965.71	651.59
23	313.06	203.73	35.52	277.87	2,476.81	2,395.38	1,166.46	2,346.19	1,634.59	965.45	32.56	1,152.69	769.18	1,578.20
24	2.32	10.85	0.80	1.18	56.84	36.51	31.64	83.79	8.26	2.70	0.78	6.99	2.97	2.50
25	1,053.53	316.21	76.27	240.53	11,726.37	2,110.80	1,859.27	2,065.89	730.60	1,918.81	18.75	723.75	632.95	841.23
26	1.90	0.59	0.01	0.79	12.64	166.92	4.09	72.65	3.53	38.33	0.00	0.01	38.08	1.06
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.22	0.71	62.46	2.60	1.59	0.00	0.00	0.23	0.00	0.00
29	62.73	33.88	5.75	30.32	971.71	1,093.88	228.74	322.30	147.67	92.21	2.04	405.36	673.96	559.41
30	118.78	31.07	8.69	39.51	1,253.53	1,294.86	88.92	714.61	385.16	227.40	0.52	126.61	250.91	849.54
31	0.00	0.00	0.00	0.00	41.15	0.00	0.00	0.00	0.08	0.00	0.00	0.01	0.00	0.00
Zj^R	18,477.03	4,074.11	1,374.91	3,244.06	54,993.86	74,004.51	9,870.23	15,996.97	16,738.84	7,180.24	86.75	6,398.71	8,808.75	14,630.56
$ZREj^R$	14,744.83	777.26	26.30	394.63	35,373.26	18,541.40	4,609.00	9,524.07	11,925.03	3,277.50	41.25	3,258.99	6,866.17	8,587.80
ZTj^R	33,221.86	4,851.37	1,401.21	3,638.69	90,367.12	92,545.90	14,479.24	25,521.04	28,663.88	10,457.75	128.00	9,657.70	15,674.92	23,218.37
Mj^R	17,252.07	10,360.07	661.97	3,745.75	15,606.60	23,487.67	6,535.40	3,241.84	2,785.76	968.27	3.23	1,106.39	1,770.04	5,029.86
Tj^R	-229.64	0.40	-13.85	-6.82	-757.65	-12,917.88	-151.81	-52.17	-1,169.89	-125.16	-2.02	-71.81	-192.31	-285.77
Vj^R	22,611.15	4,707.65	1,493.00	3,335.54	365,974.89	152,914.50	33,458.55	43,648.54	316,727.40	33,738.67	507.17	54,791.23	128,392.88	60,549.46
REM	4,652.21	1,684.33	1,720.77	2,365.85	76,735.84	62,228.96	7,122.98	16,629.86	4,704.39	14,091.68	2,129.03	39,361.56	139,507.51	47,689.92
EBO	17,920.25	3,009.31	-242.08	950.01	288,600.98	90,168.10	26,276.34	26,880.40	311,983.89	19,529.81	-1,639.56	15,102.37	-12,274.65	12,463.00
TSPNS	38.68	14.01	14.31	19.67	638.07	517.44	59.23	138.28	39.12	117.17	17.70	327.30	1,160.02	396.55
Xj^R	72,855.44	19,919.50	3,542.33	10,713.17	471,190.96	256,030.20	54,321.37	72,359.25	347,007.14	45,039.53	636.39	65,483.51	145,645.54	88,511.91

	28	29	30	31	Intermediate Demand	Ci^R	Gi^R	Ii^R	$Expi^R$	$ExpREi^R$	Final Demand	Xi^R
1	0.00	0.88	0.96	0.00	70,736.42	37,801.90	0.00	9,298.97	610,876.56	-553,888.71	104,088.72	174,825.14
2	0.00	0.00	0.00	0.00	182,637.80	0.00	0.00	2,155.39	10,786.95	928,219.20	941,161.54	1,123,799.34
3	0.00	0.00	0.00	0.00	6,261.57	0.00	0.00	9,329.58	0.00	1,342.09	10,671.66	16,933.24
4	378.96	3,186.11	1,275.28	2,882.51	37,691.54	33,572.78	0.00	0.00	0.00	23,444.27	57,017.05	94,708.59
5	18.05	94.39	92.16	883.67	40,630.82	0.00	8.12	528,307.95	15,444.87	-20,935.06	522,825.88	563,456.71
6	11.54	2,765.15	0.06	670.28	33,875.37	288,358.95	0.00	-685.12	2,477.20	-42,323.41	247,827.63	281,702.99
7	0.12	316.40	0.17	8.86	660.62	55,528.28	0.00	91.98	611.63	-27,494.48	28,737.40	29,398.02
8	0.65	156.86	3.74	26.82	1,814.47	6,729.83	0.00	-50.01	7,099.50	-8,995.85	4,783.48	6,597.95
9	10.29	4.10	49.47	106.94	847.57	29,608.58	0.00	308.44	174.82	-17,672.66	12,419.18	13,266.75
10	6.84	0.00	0.09	0.00	2,371.70	1,295.04	0.00	16.37	291.16	618.58	2,221.15	4,592.85
11	12.78	48.96	56.82	277.14	2,948.94	8,716.17	510.42	45.75	48,871.58	-52,609.22	5,534.69	8,483.63
12	318.28	3,440.55	2,913.74	7,077.23	207,936.92	122,786.66	0.00	5,288.37	654.84	309,980.42	438,710.30	646,647.22
13	0.19	41.34	18.77	0.00	9,128.94	12,810.44	0.00	138.71	17,554.99	-17,480.01	13,024.14	22,153.08
14	3.50	6.55	142.01	68.99	15,835.04	11,957.17	0.00	2,249.69	9,255.97	33,557.58	57,020.40	72,855.44
15	0.91	1.93	16.55	6.59	609.25	89,512.35	0.00	1,341.87	254.84	-71,798.82	19,310.25	19,919.50
16	0.03	18.96	0.00	2.08	219.91	6,699.44	0.00	818.03	7,138.32	-11,333.38	3,322.42	3,542.33
17	59.10	73.35	58.72	44.28	927.61	9,348.51	0.00	63.45	0.00	373.60	9,785.56	10,713.17
18	114.78	1,224.14	1,013.64	2,611.79	74,395.84	352,863.05	0.00	42,496.10	0.00	1,435.97	396,795.12	471,190.96
19	77.95	229.54	352.92	2,610.89	27,593.82	227,161.83	0.00	16,929.43	0.00	-15,654.89	228,436.37	256,030.20
20	70.85	147.34	244.81	1,290.81	11,795.19	83,398.85	23.03	506.68	0.00	-41,402.37	42,526.19	54,321.37
21	57.46	223.14	44.23	1,748.52	13,507.09	112,769.36	899.06	0.00	0.00	-54,816.26	58,852.16	72,359.25
22	203.70	519.52	2,404.08	1,322.75	32,339.19	374,269.31	5.31	7,929.84	0.00	-67,536.51	314,667.95	347,007.14
23	150.56	468.49	602.94	2,043.84	23,755.68	12,610.90	4,672.82	52.05	0.00	3,948.07	21,283.84	45,039.53
24	1.03	7.57	2.86	2.00	383.86	0.00	0.00	0.00	0.00	252.53	252.53	636.39
25	331.17	2,368.66	940.14	1,144.57	39,046.63	8,351.52	0.00	0.00	0.00	18,085.36	26,436.89	65,483.51
26	13.05	0.00	0.11	10.82	391.24	35,823.76	126,845.89	0.00	0.00	-17,415.36	145,254.29	145,645.54
27	0.00	0.00	0.00	0.00	0.00	33,980.08	78,783.56	0.00	0.00	-24,251.73	88,511.91	88,511.91
28	3.33	0.09	0.00	82.78	154.03	18,106.34	2,168.31	0.00	0.00	-9,360.26	10,914.39	11,068.42
29	36.71	130.14	191.28	4,612.04	11,907.65	89,295.04	0.00	0.00	0.00	44,603.36	133,898.40	145,806.06
30	143.58	504.23	558.35	1,019.02	9,699.75	78,360.60	0.00	0.00	0.00	-12,851.87	65,508.73	75,208.48
31	0.00	0.00	0.00	0.00	41.26	616.52	209,806.15	0.00	0.00	-49,866.54	160,556.13	160,597.39
Zj^R	2,025.41	15,978.39	10,983.90	30,555.23								
$ZREj^R$	596.32	26,124.09	5,955.35	15,114.11								
ZTj^R	2,621.73	42,102.48	16,939.25	45,669.34								
Mj^R	286.90	5,045.62	4,837.63	5,958.97								
Tj^R	-41.40	-509.64	-355.14	-1,321.21								
Vj^R	8,201.19	99,167.59	53,786.73	110,290.29								
REM	2,749.47	16,761.67	22,325.06	145,748.48								
EBO	5,428.85	82,266.54	31,276.04	-36,670.10								
TSPNS	22.86	139.38	185.64	1,211.91								
Xj^R	11,068.42	145,806.06	75,208.48	160,597.39								