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Kido-Cruz, Antonio

University Michoacana de San Nicolas de Hidalgo, Mexico

30 August 2016

Online at <https://mpra.ub.uni-muenchen.de/77654/>
MPRA Paper No. 77654, posted 20 Mar 2017 16:23 UTC

Tourism multipliers in the Mexican economy

Antonio Kido-Cruz

University Michoacana de San Nicolas de Hidalgo, Mexico

Abstract: *This paper presents an analysis of the multiplier impact generated by the tourism sector in Mexico in the year 2013. The importance of studying this sector, in particular, lies in its contribution to the National GDP of over 8% and in its promising development based on services' quality and the preferred destination of the developed countries. In addition, it is proposed to simulate the multiplier impact that will generate two current events, as they are, the construction of the new International Airport of Mexico and the increase of the investment in Fibers. The results were very punctual, a better distribution of the investment is generated, it is invested in the tourism sector, mainly in variables such as value added and remuneration.*

Keywords: Multiplier effect, production, employment, value added, tourism

JEL Classification: L83, M1, O1

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A previous version of this paper was published in:

Journal of Tourism, Heritage & Services Marketing, Volume 2, Issue 2, 2016, pp. 11-16, <http://doi.org/10.5281/zenodo.376342>

Biographical note: Antonio Kido-Cruz is professor at the Faculty of Accounting and Administrative Sciences, University Michoacana de San Nicolas de Hidalgo, Mexico, e-mail: akido@colpos.mx

1 INTRODUCTION

Dwyer et al. (2010) report that an economic impact analysis represents a measure in which tourist spending affects the various sectors of the economy, through an increase in inputs, income, and expenses. Production, income, and employment will be affected to the extent that the different productive sectors in a country are interrelated.

According to the information on the methodological criteria for the preparation of the National Account System of Mexico (SNCM) and the Tourism Satellite Account (CST) for the years 2007-2011, it is known that, in Mexico, the symmetric input-output matrices began in the 1950s, to date with the matrices corresponding to the years 1950, 1960, 1970, 1975, 1978, 1980, (these last three were updates of the Matrix of input-output of 1970), 2003, 2008 and 2012.

The base years for the calculation of the value of the productive transactions of the most recent matrices correspond to the year 2003 and 2008. For the base year change in 2008, the Input-Output Matrix of Mexico was compiled into two versions product by product and industry by industry. (INEGI, 2013).

The starting point of the input-output model in the economic analysis is the transformation of the Tableau Economique into an instrument that allows us to know the productive structure of the country and economic projection. The main assumptions of the model are: a) each sector produces a single good or service, under the same technique; that is, it is assumed that each input is provided by a single production sector, which implies that the same production technology is used, so that substitution between intermediate inputs is not possible, while each sector has a single primary production; ie there is no joint production (sectoral homogeneity hypothesis); b) there are no changes in the short term of the productive structure of each sector, so that the proportion of inputs required by each one will be fixed; c) in the short term, the inputs required by each sector in the production of a product vary in the same proportion as the sectoral production is modified, thus determining a function of production of fixed linear coefficient, which presents constant returns to scale (strict proportionality hypothesis); d) when the model is used to carry out price projections, it must be taken into account that the relative price ratio present in the year in which the matrix is elaborated (relative price invariance hypothesis) is maintained.

The model for the supply and use Charts (COU) and the IPM is the so-called open model in which both the Final Demand and the Gross Value Added (GVA) are separated from the intersectoral transactions of goods, so that these are presented separately from the inputs, if analyzed with respect to the final demands of all sectors is called the open model of Leontief that is a model of demand, on the other hand if it relates the production with the GVA, is called model of Gosh which is essentially a supply model (INEGI, 2013, p.2; Valeri, 2016).

2 METHODOLOGY

Although there are innumerable formal representations of the input-output model, in our case we will use the representation of Miller and Blair (2009). Considering a system of n linear equations, with n unknowns. It can be written using matrix notation. To solve these equations can use the operations with matrices. The solution for such a system is known as the inverse of Leontief (1986). The matrix representation can be written as:

$$Z \cdot i + f = x \quad (1)$$

Where i is the column vector with ones in each of its components. Note that the aggregation of productions by row is achieved by multiplying $Z \cdot i$. Column aggregation is achieved by doing a similar operation with the line vector $it = (1, 1, \dots, 1)$. By doing $it \cdot Z$ we obtain the aggregation of intermediate inputs.

On the other hand, we have that the sum of columns with the values added can be written as:

$$it \cdot Z + v$$

The structural coefficient matrix is constructed using:

$$a_{ij} = Z_{ij}/x_j \quad (2)$$

This conforms to the matrix of structural coefficients:

$$a = \begin{bmatrix} a_{11} + & a_{12} + & \dots & a_{1n} \\ a_{21} + & a_{22} + & \dots & a_{2n} \\ a_{31} + & a_{32} + & \dots & a_{3n} \\ a_{n1} + & a_{n2} + & \dots & a_{nn} \end{bmatrix}$$

We can rewrite the system of n linear equations with n unknowns:

$$\begin{array}{cccccc} a_{11}X_1 & a_{12}X_2 & \dots & a_{1n}X_n & f_1 & = & X_1 \\ a_{21}X_1 & a_{22}X_2 & \dots & a_{2n}X_n & f_2 & = & X_2 \\ \vdots & \vdots & \ddots & \vdots & \vdots & = & \vdots \\ a_{n1}X_1 & a_{n2}X_2 & \dots & a_{nn}X_n & f_n & = & X_n \end{array} \quad (3)$$

We have that the unknowns are (X_1, X_2, \dots, X_n) is the total production vector, a vector $f = (f_1, f_2, \dots, f_n)$ is considered as a data of the problem, as well as the matrix of structural coefficients. This problem can be written as follows:

$$A \cdot x + f = x$$

Then we have that the solution of our system comes by multiplying the left-hand side by $(I - A)^{-1}$:

$$x = (I - A)^{-1} \cdot f \quad (4)$$

Now, assuming that the sector of final demand (households) is disturbed by some phenomenon $f \rightarrow f_0 + \delta f$:

$$f_0 + \delta f = \begin{bmatrix} f_1 + \delta f_1 \\ f_2 + \delta f_2 \\ \vdots \\ f_n + \delta f_n \end{bmatrix} = \begin{bmatrix} f_1 \\ f_2 \\ \vdots \\ f_n \end{bmatrix} + \begin{bmatrix} \delta f_1 \\ \delta f_2 \\ \vdots \\ \delta f_n \end{bmatrix}$$

In a compact way, we have to:

$$x = (I - A)^{-1}(f_0 + \delta f) = (I - A)^{-1}f_0 + (I - A)^{-1}\delta f = x_0 + (I - A)^{-1}\delta f$$

Which tells us that we can track changes in final total output due to a change in the final demand sector δf as:

$$\delta x = x - x_0 = (I - A)^{-1}\delta f \quad (5)$$

3 DATA

As a case of analysis, the comparison of the impact of the tourist activity in Mexico is presented using the results of the Tourism Input-Output Matrix of 2013. The main limitation of presenting the results for 2013 is to update the most recent matrix provided by INEGI for the year 2012. This update was based on the simple RAS method. Likewise, the direct coefficients of the different tourist sectors were obtained from the data of the value of the goods and services generated by the economic census that is only available for the year 2014 that present data for the year 2013. The process followed the procedure of Marquina (2006), which consists of the following stages: a) updating of the input-output matrix of the year 2012 to 2013 by the RAS simple method; B) aggregation of the updated matrix to 43 subsectors; C) estimation of the tourist input-product matrix taking into account the Tourism Satellite Account 2013 and the Economic Census of 2014. Table 1 shows the aggregation in 43 subsectors of the economy and the aggregation of 29 more representative subsectors corresponding to the tourism activities to form a tourist matrix of 72 by 72 subsectors of the economy.

4 MULTIPLIERS AND ECONOMIC SIMULATION

In the economic literature, two types of multipliers are distinguished. Type I models that do not consider the remuneration and private consumption sector within the analysis matrix (these multipliers are also referred to as simple or open economy multipliers) and the type II multipliers that if taken into account as a sector of the economy the remunerations and the private consumption. These multipliers are also known as total or closed economy multipliers (Miller and Blair, 2009).

The simplest notion of the type I multiplier of any variable implies to describe it as the total change in the variables of interest before a change in the final demand and considers the direct and indirect effects, as shown by the following relation (Hara, 2008):

A) Multiplier type I = (direct impact + indirect impact / direct impact).

The type II multiplier adds the impact or induced effect:

B) Multiplier type II = (direct impact + indirect impact + induced impact / direct impact).

4.1 Comparative analysis of direct and indirect effects on changes in hotels and construction

Following the economic exposure, in this section we will simulate the effect of a change in the final demand on the different sectors of the economy under development under the same scenario, but with the units not standardized. The first refers to investment in newly created real estate investment trusts, particularly in hotels, known as FIBRA. The second impact is represented by the investment in the new airport in Mexico City. It is also important to emphasize that only type I multipliers will be obtained for the macroeconomic variables of employment, remuneration, value added and production value.

FIBRAS are Investment Trusts in Real Estate, which offer periodic payments and, at the same time, obtain gains from the capital gains of the respective properties. They are defined in article 187 and 188 of the LISR as: "trusts that are dedicated to the acquisition or construction of real estate that is destined to the lease or to the acquisition of the right to receive income from the lease of said assets, as well as to grant Financing for these purposes."

FIBRAS have become an option to invest and generate attractive returns. Fibra Uno, was the first fiber that traded on the Mexican Stock Exchange in 2011 with a portfolio of 13 properties; at the end of the third quarter of this year, the trust manages 440 properties. Three years later, the market has nine fibers specialized in hotels, malls, and industrial goods. In those that goes off 2014, the fibras with greater yield have been Danhos and Terra with 50.61 and 32.6% respectively (BANORTE-IXE, 2013). According to the same analysis of BANORTE-IXE, for the year 2014, the inventory of establishments in the country yields a total of 1,495 hotels with 210,141 rooms, of which 1,154 are hotels that are geared to serve business travelers in 40 selected markets from the country. Of those 1,154 hotels, 690 hotels are independent and 464 hotels are brand-name hotels. Mexico has 30 hotel groups, international and national, as well as more than 60 recognized brands. The most important group by a number of hotels is Hotel Group Intercontinental with a 25% market share, followed by Grupo Posadas (22%) and City Express (14%). The urban hotel industry in Mexico is characterized by a high participation of independent hotels (60%) throughout the country, except certain cities including Mexico and Monterrey that have a smaller participation. The foregoing represents an opportunity for the fidecomisos to grow selectively, taking into account that in other markets as in the United States it is estimated that branded hotels represent about 65% of the industry.

In addition to the above, the expectation of growth of the energy sector has driven the increase of placements of the certificates of capital (CKDs) and, to a lesser extent, the placements in the FIBRAS program. In the year 2015, they placed 5 CKDs for 5,989 million pesos, while only HD Fibra, which obtained only 1,500 million pesos, was released to the market. Even though this figure only represents an approximate impact of the investment in construction, acquisition, expansion and/or remodeling of hotels, it is the figure that will be used to simulate an impact on the final demand. In addition, the figure that will affect the construction of the new international airport of Mexico (NAICM) is based on the budget report for 2015, estimating a total of 12,500 million pesos (Secretary of the Treasury, 2015).

Tables 2, 3, 4 and 5 capture these multiplier effects. Recalling that the first shock applies to the hotel sector in an amount of 1,500 million pesos and the second shock applies to the construction sector for a total of 12.5 billion pesos, are presented below some results relevant to the analysis.

Table 2 shows the results of simulation of the direct and indirect effects that would have an increase of 1.5 billion in the subsector of hotels and an increase of 12.5 billion pesos in the construction sector, as an indicator of changes in the final demand. The first visible result is that the variation in the hotel subsector generates a multiplier of 1.10 against a multiplier of 1.23 of the construction sub-sector in the value added. However, it is important not to forget that the magnitude of the variation in the final demand is less in the hotel activity than in the construction activity. The value added, is affected in terms of the same subsector of construction in 0.31 billion pesos in value added. The economy, in general, reacts with an increase of 0.3833 billion pesos in value added, adding both direct and indirect impacts. Therefore, an investment of 12.5 million in the construction sector will bring to the economy a total of 1.23 billion pesos in value added.

Table 1: Aggregation of the updated matrix to 43 subsectors

| Table 1. Aggregation of the updated matrix to 43 subsectors | | |
|-------------------------------------------------------------|-------------------------------------------------------------------------------|---------------|
| Sector | CODESOA | CODESOA ADDED |
| 1 | Agriculture, cattle raising, forestry, hunt and fishing, | 111 |
| 2 | extraction of oil and gas | 112 |
| 3 | Metal Ore Mining, except Oil and Gas | 113 |
| 4 | Services related to mining | 114 |
| 5 | Electric Power Generation, Transmission and Distribution | 211 |
| 6 | Natural Gas Distribution and water distribution | 212 |
| 7 | Edification | 213 |
| 8 | Specialized works for construction | 221 |
| 9 | Industrial Building Construction | 222 |
| 10 | Food Manufacturing | 236 |
| 11 | Beverage and Tobacco Product Manufacturing | 237 |
| 12 | Textile manufacturing inputs and finished textiles, manufacture of product | 238 |
| 13 | Manufacture of wood | 311 |
| 14 | Manufacture of paper | 312 |
| 15 | Printing industry and related industries | 313 |
| 16 | Petroleum and Coal Products Manufacturing | 314 |
| 17 | Chemical Manufacturing, Plastics and Rubber Products Manufacturing, ↓ | 315 |
| 18 | Primary Metal Manufacturing | 316 |
| 19 | Fabricated Metal Product Manufacturing | 321 |
| 20 | Manufacture of machinery and equipment | 322 |
| 21 | Computer, Communications Equipment and Electronic Product Manufac | 323 |
| 22 | Manufacture of accessories, electrical appliances and equipment electrici | 324 |
| 23 | Transportation Equipment Manufacturing | 325 |
| 24 | Furniture and Related Product Manufacturing | 326 |
| 25 | All Other manufacturing | 327 |
| 26 | Retail Trade | 331 |
| 27 | Air, rail and water Transportation, Pipeline, Tourist transport, Truck Transp | 332 |
| 28 | Postal services, package delivery, storage, | 333 |
| 29 | Central banking | 334 |
| 30 | Institutions of non-stock exchange credit and financial intermediation, | 335 |
| 31 | Stock exchange activities, exchange rate and financial investment | 336 |
| 32 | Bond companies, insurance and pensions | 337 |
| 33 | Real estate, rental of personal property | 339 |
| 34 | Trademarks, patents and franchises | 431 |
| 35 | Professional, scientific and technical services, Management of companies | 481 |
| 36 | Waste management and remediation services | 482 |
| 37 | educational Services | 483 |
| 38 | Health Care and Social Assistance | 484 |
| 39 | Arts, Entertainment and Recreation, Museums, historic sites, zoos and sim | 485 |
| 40 | Accommodation Preparation services food and beverage, Repair and main | 486 |
| 41 | Repair and maintenance | 487 |
| 42 | Personal services | 488 |
| 43 | Associations and organizations | 491 |
| 44 | crafts | 492 |
| 45 | beachwear and swimwear | 493 |
| 46 | baggage | 511 |
| 47 | Hotel | 512 |
| 48 | Others accommodation services | 515 |
| 49 | airline industry | 517 |
| 50 | Bus | 518 |
| 51 | All Other transport services | 519 |
| 52 | travel agency | 521 |
| 53 | Foods, beverages and tobacco | 522 |
| 54 | Clothes and shoes | 523 |
| 55 | Newspapers, magazines and books | 524 |
| 56 | Pharmaceuticals and personal care products | 531 |
| 57 | Photography Studios, Portrait | 532 |
| 58 | Others transport services | 533 |
| 59 | Restaurant and bars | 541 |
| 60 | commerce | 551 |
| 61 | transport | 561 |
| 62 | movie theater, shows and others | 562 |
| 63 | toiletries and personal hygiene | 611 |
| 64 | Photo service | 621 |
| 65 | rental cars | 622 |
| 66 | Financial and insurance | 623 |
| 67 | Others goods and service N.C.O.P. | 624 |
| 68 | Others tourist market industries | 711 |
| 69 | Tourist management and promotion | 712 |
| 70 | teaching service | 713 |
| 71 | recreation service | 721 |
| 72 | Others services | 722 |
| 73 | | 811 |
| 74 | | 812 |
| 75 | | 813 |

Finally, we developed probable scenarios of changes in final demand in 2015 and assuming that a potential increase of 12.5 billion in the construction sub-sector and 1.5 billion in the hotel sub-sector could be estimated, the direct effects and indirect in the Mexican economy. The results of these simulations indicate that in the case of the macroeconomic variables of remuneration and employed personnel there is a greater direct and indirect effect on the economy when investing in hotels, while in value added and construction there is the greater impact when investing in the construction sector.

But on average with the sum of remunerations, personnel employed, production and value added there is a greater impact when the investment is in the Hotel sector with an average growth of 1.26 billion pesos, while investment in construction generates 1.24 billion of pesos. In addition, it must be considered that the investment in hotels is smaller on a scale of 3 to 1.

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