



Intersectoral employment in Mexico: A guide for an employment policy

El empleo intersectorial en México: una guía para una política de empleo

Rosalinda Arriaga Navarrete, Eduardo Ramírez Cedillo*,
Claudia Rocío González Pérez

Universidad Autónoma Metropolitana, México

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Abstract

The recent slowdown in the Mexican economy has widened the deficit employment gap and increased the need for more active government intervention, which allows for higher levels of employment. Given this environment, it is necessary to construct indicators that show the sectoral interrelationships of the economy that contribute to decision-making to develop employment policies. This article is carried out with an intersectoral approach, through the construction of employment coefficients, multipliers and elasticities, in order to identify the sectors with the greatest potential impact on employment that contributes to the direction of public employment policy. Estimates show that employment-product elasticity is higher in manufacturing industries, retail trade, construction, other services, agriculture, and transportation.

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Keywords: employment; public policies; input-output; interindustrial linkages

* Corresponding author.

E-mail address: ramceed@gmail.com (E. Ramírez Cedillo).

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Resumen

La reciente desaceleración de la economía mexicana ha ampliado la brecha deficitaria del empleo y a su vez ha incrementado la necesidad de una intervención gubernamental más activa que permita niveles más altos de empleo. Dado este entorno es necesario construir indicadores que muestren las interrelaciones sectoriales de la economía que contribuyan a la toma de decisiones para desarrollar políticas de empleo. Este artículo realiza estimaciones con un enfoque intersectorial, mediante la construcción de coeficientes, multiplicadores y elasticidades del empleo, con el propósito de identificar los sectores con mayor impacto potencial en el empleo que contribuyan a direccionar la política pública de empleo. Las estimaciones muestran que la elasticidad empleo-producto, es mayor en las industrias manufactureras, comercio al por menor, construcción, otros servicios, agricultura y transportes.

Código JEL: C67, E24, L80

Palabras clave: empleo; políticas públicas; insumo producto; eslab

Introduction

One of the most sensitive issues for different social disciplines is unemployment. In an economy whose predominant mode of production is capitalism, people need employment to earn an income to meet their needs. Therefore, involuntary unemployment is consolidated as a problem that must be addressed by public policy in its structural and cyclical nature.

Direct and indirect approaches are among the different policy options available to address unemployment. In the first case, the aim is to generate the conditions to expand employment opportunities, while in the second, it is to compensate for the loss of income caused by unemployment.

The recent slowdown in the Mexican economy in 2019 has accentuated the employment deficit gap, increasing the need to achieve higher employment levels. Given this environment, it is necessary to develop indicators that show those sectoral interrelations of the economy which contribute to decision-making to develop employment policies.

One way to do this is by estimating the direct and indirect employment requirement matrices for the different economic activities based on the Leontief input-output model. This model enables the integration of intermediate demand, which considers the linkages between economic sectors and their connection with final demand. Thus, it is possible to differentiate by economic activity the direct and indirect jobs attributable to intersectoral linkages. Likewise, direct and indirect employment coefficients and the estimation of employment-product elasticities can be constructed to assess the sectors with the greatest impact on total employment in the face of changes in the sector's demand, thereby directing public employment policy and government spending toward the economic activities that generate the greatest employment.

The article is organized as follows: in the second section, the forms of government intervention in the labor market are presented as a framework for analysis; in the third, a review of the literature concerning employment policy in Mexico and empirical work for estimating employment with an input-output approach is presented. In the fifth, the results of employment estimates based on intersectoral analysis of the Mexican economy are analyzed, with special emphasis on sectoral employment indicators, coefficients, multipliers, and elasticity, contributing to public policy design. The final section presents the conclusions.

Forms of government intervention in the labor market

Governments intervene in the labor market through policies designed to address the risks and consequences of unemployment by implementing active and passive policies. Active policies are aimed at strengthening the labor supply through job training, increasing the amount of labor demand through direct employment programs or subsidies for hiring labor, and improving the functioning of the labor market (employment services). As for passive policies, unemployment insurance is the best known (Velásquez 2005; Samaniego 2002).

To be effective, social policy programs must be based on a strategy that generates employment, an essential link between economic growth and social development (Stallings & Weller, 2010). In economic terms, the labor force is one of the main factors of production. Its importance increases because human capital is a key element for economic growth and productivity, and from the social point of view, employment is the main source of income for the vast majority of households. Therefore, generating productive employment for all is necessary for improving welfare (Weller, 2012; Stallings & Weller, 2001).

Employment policies are important due to what Weller (2012) calls special groups in the labor market, which have limited access to the labor market, for example, women, especially those of low educational level. Accordingly, the groups that present disadvantages and high vulnerability in the labor markets may be women, young people, seniors, and people with disabilities, and it is precisely because of the existence of these groups that the importance of employment policies arises, but also because of the need to deal with emergencies in periods of economic downturns and increases in unemployment.

The most recurrent passive policies consist of unemployment insurance that can take on different characteristics but focus on supporting the search for a new job; severance payments that attempt to discourage unjustified layoffs by increasing the associated cost for the employer or else generate resources to replace remunerations when the layoff occurs; individual unemployment savings accounts that accumulate monetary resources while the worker remains employed to provide benefits at the end of

the labor relation; in addition to pre-dismissal notices that allow workers to take precautions in the face of imminent dismissal (Velásquez, 2005). In Latin America, there have been different attempts to establish unemployment insurance programs and generate a compensatory source of income, as described by Velásquez (2010) and ECLAC (2004).

On the other hand, active employment policies are instruments aimed at the essential, although not the only, objective of tackling unemployment and are oriented toward different groups of workers, particularly those who are disadvantaged. Policies directly related to the labor market include those in the areas of training, protection, and gender equality, and those aimed at strengthening labor institutions (Weller, 2012).

Although training mechanisms cannot compensate for the weaknesses of the educational system, they can be useful in reducing some gaps. Examples include training programs for unemployed groups with specific employability problems (young people and women with low levels of education) or those engaged in low productivity and low-income activities (self-employed, micro-entrepreneurs).

Active employment policies can be classified into those intended for job creation and those directed at job training; in the first group, direct job creation programs and programs that generate incentives for hiring stand out (Velásquez, 2005; Samaniego, 2002). Job training programs, according to whom they target and the type of training they offer, are oriented toward three main types of training: training for unemployed populations or those at risk of being unemployed, training for the adult working population, and general apprenticeship programs and other job training programs for young people during the transition from school to work. In this way, vocational training programs have been developed for the most vulnerable groups of unemployed, such as young people and women with a low level of education or people engaged in low productivity and low-income activities.

Hiring incentives operate through temporarily granting subsidies on wages or social security contributions paid by the employer and assuming that the demand for labor will increase by reducing the wage cost of newly hired workers for a while. The subsidy amount is a fraction of the minimum wage or its equivalent.

In the case of hiring incentives, and following Velásquez (2005), it should be taken into account that this type of program is closely related to the economic cycle. If companies do not foresee an increase in demand for their production, they will be reluctant to hire, even with the subsidy. On the other hand, in the recovery phases, the subsidy may be redundant, thus partially financing new jobs that would have been created nonetheless. Nevertheless, when the stage of the cycle is at the beginning of the recovery, the subsidy can stimulate hiring decisions.

Direct job creation involves directly hiring workers through implementing public interest projects, although these are usually temporary and low-productivity jobs. Generally, the activation of these

programs is a counter-cyclical instrument and consists of services for the community, including cleaning, construction, and maintenance, among others, aimed at low-income people affected by crises or emergencies (Farné, 2016).

In the literature that explores the participation of the State in the labor market, Keynesian and post-Keynesian approaches stand out. Randall Wray (1997), one of the authors who has contributed the most to the "Employer of Last Resort" (ELR), points out that such a policy is capable of simultaneously achieving the objectives of full employment without inflation. He also insists that under certain conditions, it could even reduce inflationary pressures and economic fluctuations through an automatic stabilizer function where the important variables are the public deficit, private savings, and employment (public and private), which is directly related to production. Among other objectives, Wray (1997) mentions that the main instrument of this policy is the creation of an infinitely elastic demand for labor, where the minimum wage does not depend on the profit expectations of businesses.

The ELR, over time, has been supported by different authors, among which Minsky (1982, 1986), Forstater (1998), and Gordon (1997), who focus on the benefits and some of the characteristics of the programs, while Mitchell (1998), Mosler (1997-98), and Wray (1998) establish an analysis in post-Keynesian monetary theory that is closely linked to the approach described as functional finance by Lerner (1943), which has become known in recent years as the Modern Monetary Theory. Regarding public employment and its advantages, Wiseman et al. (1976) note the expansion of demand and its effect on jobs. Fullwiler (2007) demonstrates that the ELR program has stabilization properties as it maintains a reserve of workers to act as a buffer against changes in aggregate demand.

Different studies have highlighted the desirability of direct state intervention in the labor market. Antonopoulis et al. (2014) present the proposed implementation of the government "Job Guarantee (JG)" program with the direct creation of jobs to combat unemployment in Greece. The proposal is for the government to employ work projects in public infrastructure and information, environment, social services, and educational and cultural enrichment programs. Brodsky (2000), in turn, examines trends in public service employment programs in nine European countries, where such programs have become one of the main labor market tools for moving the permanently unemployed into employment and are highly beneficial in reducing social exclusion.

Lundholm and Wijkander (2008) also highlight the advantages of public participation in the labor market, comparing unemployment rates among OECD countries, mainly between the United States and Scandinavian countries. They state that a significant income distribution can generate distortions in the labor supply, mitigated by government employment and large public production. Scandinavian countries' high public employment rates provide relatively good jobs to less qualified employees, contributing to lower wage differentials than in the USA. According to the authors, the positive correlation

between equality and government employment shows that public production is the core of the welfare state. According to Lundqvist (2014), public employment in some European countries is important as the public sector provides necessary welfare services, and its quality depends on the decision of how many and whom to employ. It also accounts for a significant share of the aggregate labor demand, between 20% and 30%, depending on the country.

Review of the literature

In Mexico, as in other developing countries, an issue that may not be as relevant in developed countries (Ramírez, 2006) is to establish where efforts to generate jobs should be directed and whether the government should directly generate them or whether there should be a partnership with individuals in the search for full employment (Ramírez & Mendoza, 2016). The issue of productivity and seeking the greatest impact is of utmost relevance, as established by Jiménez (2005), while inequality in the labor market is studied by Torres (2005) and Cervantes (2011).

According to Jiménez (2005), in order to promote employment policies in Mexico, it is necessary to consider regional and local development, where training does not solve the problem of guaranteeing stable and adequate employment, and the development of public infrastructure is a factor to enhance the profitability of private investment and job creation.

For Cervantes (2011), promoting training programs that contribute to the beneficiaries' work experience is useful to increase employability, especially when they align with market needs and consider the sociodemographic characteristics of the beneficiaries and their work experience. Torres (2005) points out that the essential problem for developing labor markets and sustainable employment policies in Mexico is the inequality of opportunities due to the historical and structural conditions of the Mexican economy. He emphasizes that inequality poses problems regarding the design of employment generation policies, such as clarifying the sources of household income, the activities performed by its members, and access to labor market opportunities. He argues that employment alone does not guarantee the reduction of inequality, precariousness, and poverty. It is therefore necessary to have a coherent strategy focused on the world of work, emphasizing innovation and development policies as policies for creating quality jobs, as well as policies for forming social capital and not only social assistance policies. This strategy would strengthen the institutional link between the social and economic worlds in which public policies are the bridge.

Aguilar (2003) analyzes two examples of active employment programs in Mexico: the National Employment Service (SNE) and the Training Scholarship Program for the Unemployed (PROBECAT). The first seeks to improve the functioning of the labor market by bringing demand and job offers closer

together. The purpose of the second is to absorb the supply of workers, through retraining to increase their productivity and mobility, in a company or branch of activity. According to the author, both programs were insufficient and limited, given the magnitude of unemployment and the informal economy. From 1985 to 1997, the SNE included 0.8 of the labor supply of the active population and 2.8 of the workers with Social Security (IMSS). The applicants only represented 0.7 of the labor force, and only 3/4 of the latter figure obtained employment; moreover, only half of these 10 were under contract. For the same period, PROBECAT granted scholarships to the unemployed population, representing only 0.5% of the labor force supply and 1.6% of active workers with social security. Although programs may be adequate, other more general and consistent policies are needed to reduce unemployment and informal employment.

Public policy intervention should be channeled within the scope of that active intervention but with parameters that help to take the best measures where, as Bivens (2019) states, employment multipliers for policy design should be taken into consideration. These indicate the level of backward and forward linkages between industries; this linkage would express the direct employment supported by industry and the large amount of indirect employment supported by it. According to the author, employment multipliers measure how the creation or destruction of production or employment in a particular industry translates into major impacts on employment in an economy.

Among the works that analyze the link between the productive structure and employment are those by Durán and Castresana (2016), who study the direct and indirect employment associated with Ecuador's exports to the European Union, Pino and Fuentes (2017) for Chile in the period 2013-2017, Sánchez (2015), who identifies the economic activities with the greatest potential for generating direct and indirect employment for Costa Rica, and Arriaga and González (2019), who analyze the culture and tourism sector in Mexico based on its inter-industrial links and its capacity to generate employment.

Durán and Castresana (2016) show that economic sectors linked to primary products account for most of the employment associated with exports, the most prominent being agricultural, livestock, and fishery products, and oil and mining exports. The proportion of employment linked to exports in the manufacturing sector is 33%, with a higher intensity of indirect employment (3 direct jobs for each indirect job). Employment associated with exports to the European Union accounts for 29% of total employment in Ecuador linked to exports, highly concentrated in the agricultural and fishing sectors with a high intensity of direct employment and in the agro-industrial sectors with more indirect employment.

Arriaga and González (2019) analyze the tourism sector and the cultural sector in Mexico with an aggregate inter-industry approach that identifies the sectors that include the tourism and culture satellite industries and make them compatible with the 2008 input-output matrix. To this end, they estimate coefficients and employment multipliers to assess the potential economic impact of these activities by estimating the direct, indirect, and induced effects of tourism and cultural spending on the Mexican

economy. The results reveal that the cultural sector has higher inter-industrial demand and induced consumption demand linkages. Nevertheless, the economic value and direct coefficients in employment in the tourism sector determine that the final effect on employment is higher in the tourism sector. In the quantification that includes induced consumption, 4.22 jobs are created in the tourism sector versus 3.61 jobs in the culture sector, and the value of tourism GDP amounts to almost 8% of GDP versus 3% for culture, while the final effect on the number of jobs created from spending is higher for tourism.

Pino and Fuentes (2017) establish the importance of input-output analysis for formulating public policies by evaluating employment linkages by the branch of activity. The authors perform a sensitivity analysis to identify the capacity of the sectors to generate direct and indirect jobs and the temporal dynamics of the multipliers to appreciate the structural variations in the capital-labor relation of the national economy. Sánchez (2015) estimates the levels of indirect employment for 77 activities that make up Costa Rica's input-output matrix in 2011 and determines that the services, commerce, and food crops sectors have the greatest impact on employment generation, with the food industry generating the most indirect jobs. Although the activities with the greatest potential to increase the economy's employment rate—as measured by the employment-output elasticity—are the service sector and commerce, this indicator is consistent with their direct and indirect employment results.

Given the importance of employment policy in Mexico, this paper presents the application of the input-output matrix to estimate the employment coefficients that enable the assessment of the sectors with the greatest impact on total employment. For the above, it is necessary to identify the functioning of intersectoral relations through the input-output model proposed by Leontief.

Input-output methodology

The input-output matrix (IOM) shows the intersectoral economic relations, the cost structure by economic activity, and the composition of the final spending of the macroeconomic sectors, families, companies, government, and the external sector. This information makes it possible to measure the impact on the production sectors of any change in the final demand for goods and services.

The intersectoral transactions of the input-output matrix is a double-entry table where the productive sectors are located in rows and columns. The sales made by the sectors for intermediate consumption and final demand are recorded in the rows. Goods and services destined for intermediate consumption are those that are used in the process of manufacturing other goods, and those that are recorded in final demand are no longer transformed. Final goods include household consumption, government spending, gross investment, and exports. The sum of both destinations (intermediate and final) of each sector's goods and services represents its gross production value.

The open Leontief model expresses the system of equations in matrix form as follows:

$$\mathbf{x} = \mathbf{A} \mathbf{x} + \mathbf{y} \tag{1}$$

Where:

x : gross value of production

A : matrix of technical coefficients

Ax : intermediate demand

y : final demand

The direct requirements matrix is called A since the elements of this matrix indicate the proportion in which an input is demanded to generate a unit of output. Then, from Leontief's model, the canonical expression pointed out by Schuschny (2005: 14) can be obtained:

$$\begin{aligned} \mathbf{x} &= \mathbf{A} \mathbf{x} + \mathbf{y} \\ \mathbf{x} &\equiv \begin{pmatrix} X_1 \\ \vdots \\ X_n \end{pmatrix} \\ \mathbf{A} &= \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & & \vdots \\ a_{n1} & \cdots & a_{nn} \end{pmatrix}; \\ \mathbf{Y} &= \begin{pmatrix} Y_1 \\ \vdots \\ Y_n \end{pmatrix} = \begin{pmatrix} I_1 + G_1 + Z_1 + E_1 \\ \vdots \\ I_n + G_n + Z_n + E_n \end{pmatrix} \\ \mathbf{x} &= (\mathbf{I} - \mathbf{A})^{-1} \cdot \mathbf{y} = \mathbf{B} \cdot \mathbf{y} \end{aligned}$$

where the matrix $B = (bij) = (I - A)^{-1}$ is the inverse Leontief or total requirements matrix (direct and indirect) and relates the production of each sector X_i to the final demand net of imports, a variable considered exogenous. Each element bij of the Leontief matrix represents the quantity of production that sector i must produce to satisfy *ceteris paribus* one unit of final demand net of imports from sector j -th. Moreover, since it is constant, it accounts for the change in the value of production of the i -th sector as a consequence of the change in the final demand net of imports of the j -th sector, i.e., $bij = \frac{\partial X_i}{\partial Y_j} \equiv \frac{dX_i}{dY_j}$

Matrix of direct and indirect requirements

$$\mathbf{B} = \begin{bmatrix} b_{11} & \cdots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{n1} & \cdots & b_{nn} \end{bmatrix}$$

Thus, the b_{ij} elements of the inverse matrix quantify the impact on the i -th industry of a change in the final net import demand of the j -th sector. These coefficients capture a single number of direct and indirect multiplicative effects since the product of each affected sector should impact not only itself but also the other sectors that use it as an input.

The input-output model is a macro-exercise of comparative statics since it does not consider any endogenous adjustment dynamics. In other words, the production function that the Leontief model considers is linear and assumes that the technical coefficients are constant during the analysis period. (Schuschny, 2005: 15)

Nonetheless, these restrictions do not invalidate the use of the model because the results show an x-ray of the productive relations of the year of analysis. The extrapolation of the results would have to consider some of these restrictions.

Since the matrix makes it possible to measure the direct and indirect impacts on production due to changes in final demand, it can be applied in designing public employment policies to reduce unemployment on a sound statistical basis.

Analysis of results: Intersectoral approach to employment

Following the proposed methodology, the analysis of employment through the input-output matrix at the level of the sectors of the Mexican economy for the year 2013 is undertaken¹. The analysis of results is proposed at two levels. First, the relations between the different sectors and the volume of jobs generated by the economy are presented; in this way, the employment of each sector records the jobs generated directly by the sector itself and those generated indirectly by the sector, driven by the demand of other sectors. In the second, the total employment coefficients (direct and indirect) and the employment multiplier are estimated, in order to determine which sectors have the potential to generate a greater number of jobs directly and indirectly, based on their demand, in addition to quantifying the response of the sectors to an increase in final demand and their contribution to total employment. With these estimators, it is possible to identify elements to direct public employment policy.

In order to estimate employment in the economy, it is necessary to obtain the direct employment coefficients for each economic activity and to construct the matrix of direct employment requirements, which only has values on the diagonal that correspond to direct employment in each economic sector. To construct the matrix of direct and indirect employment requirements, the diagonalized matrix of direct

¹It should be noted that INEGI's latest publication of the input-output matrices corresponds to 2018 and the economic information therein is from 2013.

employment and the matrix of direct and indirect coefficients obtained from the inverse matrix of Leontief are multiplied.

Employment coefficients

Direct employment coefficients measure the direct employment requirements of each sector (employment per monetary unit of output).

$$CL_j^d = \frac{L_j}{VBP_j}$$

L_j : Employed personnel of Sector j

GVP_j : Gross Value of Production of Sector j

CL^d : Measures how many direct jobs are generated in sector j, given an increase in sector j's final demand.

The Matrix of direct employment requirements, where the diagonal corresponds to CL^d by sector.

$$CL^d = \begin{bmatrix} CL_1^d & \dots & 0 \\ \vdots & CL_2^d & \vdots \\ 0 & \dots & CL_n^d \end{bmatrix}$$

The total employment coefficients for each sector of economic activity are obtained from the sum by column of the CL^T matrix of total employment requirements. For each sector j, the corresponding column of the CL^T matrix indicates the direct employment requirements to sector j and the indirect requirements to the other sectors per unit of j's GVP.

$$CL^T = CL^d B$$

$$\begin{bmatrix} CL_{11}^T & \dots & CL_{1n}^T \\ \vdots & \ddots & \vdots \\ CL_{n1}^T & \dots & CL_{nn}^T \end{bmatrix} = \begin{bmatrix} CL_1^d & \dots & 0 \\ \vdots & CL_1^d & \vdots \\ 0 & \dots & CL_n^d \end{bmatrix} \times \begin{bmatrix} b_{11} & \dots & b_{1n} \\ b_{21} & \ddots & b_{2n} \\ b_{n1} & \dots & b_{nn} \end{bmatrix}$$

This results in

$$CL_j^T = \sum_i CL_i^d b_{ij}$$

The indirect employment requirements (indirect coefficients) of employment to the same sector CL_j^i are calculated as the difference between the total requirements to that industry CL_j^T and the direct requirements (CL_j^d):

$$CL_j^i = CL_j^T - CL_j^d$$

With this indirect coefficient at the sectoral level, it is possible to estimate how many jobs are generated in the rest of the sectors of the economy in the face of increases in the final demand of subsector j. As the final demand of sector j increases, it generates an increase in the sector's gross output, leading to an increase in the demand for inputs needed for j's production. In this way, the increase in the demand for inputs generates an increase in the gross production of the sectors supplying those inputs chained to sector j, which leads to an increase in employment and value added (wages) in those sectors. (Lima & Castresana, 2016: 12)

Estimated direct and indirect employment generated in the Mexican economy

The relations between the sectors and the volume of jobs the economy generates are presented below. Thus, employment in each sector records the jobs generated directly by the sector and indirectly for the sector, driven by demand from other sectors.

In order to analyze the volume of employment by economic activity, the following are considered:

- a. Share of the sector in total direct and indirect employment
- b. Share of indirect employment compared to total employment in the economic sector

The above indicates the degree of linkage of the sector with the rest of the economic sectors, expressed in the number of indirect jobs generated in the sector driven by the demand of the rest. This differentiation is important because an economic activity can have a high level of total employment generation and be a sector with low inter-industrial linkages, which will be reflected in a proportion of indirect employment lower than the direct employment generated by the economic activity.

Thus, there are economic sectors with greater inter-industrial linkages, for which the sectoral demand of the rest of the sectors is very important and will therefore generate a greater volume of indirect employment than the direct employment generated by the activity. It is also possible that some sectors are significant in direct job creation, and their activity may be closely linked to the rest of the economic activities (Sanchez 2015:11).

Estimates of total direct and indirect employment show that the largest share is in the Retail Trade (17%), Manufacturing (14%), Agriculture, Animal Husbandry, and Forestry (13%), Other Services (10%), Construction (10%), and Business Support Services (8%) sectors, which in volume account for 72% of total employment in the economy. Direct employment represents 70% of total employment, with the following economic sectors accounting for 66% of direct employment: Retail Trade (21%), Manufacturing (15%), Construction (13%), Other Services except governmental activities (11%), Agriculture, Animal Husbandry, and Forestry (7%). (Table 1, Figure 1)

The following economic sectors each contribute about 5% of employment: Temporary Accommodation and Food and Beverage Preparation Services, Government and Legislative Activities, Transportation, and Educational Services

Table 1
 Direct and Indirect Employment for the Mexican Economy

No.	Economic Sectors	Total direct+indirect employment (%)	Direct Employment (%)	Indirect Employment (%)
7	46 Retail Trade	16.9	21.4	6.6
5	31-33 Manufacturing Industries	14.4	14.9	13.1
1	11 Agriculture, animal husbandry, forestry, fishing and hunting	12.8	7.3	25.3
19	81 Other services except for governmental activities	9.9	10.6	8.2
4	23 Construction	9.7	12.6	3.1
14	56 Business support services and waste and residue management and remediation services.	8.2	0.8	24.9
18	72 Temporary lodging and food and beverage preparation services.	4.5	5.4	2.4
20	93 Legislative, governmental, law enforcement, international, and extraterritorial organization activities	4.5	6.4	0.02
15	61 Educational services	4.4	6.3	0.11
8	48-49 Transportation, post. and warehousing	4.3	4.8	3.2
	Participation (10 sectors)	89.6	90.5	86.9
	Total Jobs and Participation (20 economic sectors)	57 465 990 100%	39 909 077 69%	17 556 913 31%

Source: created by the authors, based on information from INEGI (2018)

Indirect jobs represent 30% of total jobs generated due to the intermediate demand produced between economic activities by intersectoral linkages. The sectors generating indirect jobs due to the demand of the sectors linked to their economic activity are Agriculture, Animal Husbandry and Farming, Forestry (25%), Business Support Services (25%), Manufacturing Industries (13%), Other Services (8%), and Retail Trade (7%), which together account for 78% of the total indirect jobs in the economy. (Table 1)

Additionally, a sector's linkage level can be observed through the volume of indirect employment as a proportion of total employment in each economic activity. The data show that the sectors that stand out the most in this proportion are Business Support Services (93%), Professional, Scientific, and Technical Services (84%), Agriculture, Animal Husbandry and Farming, and Forestry (60%), Wholesale Trade (60%), and the Manufacturing Sector (28%). (Figure 1)

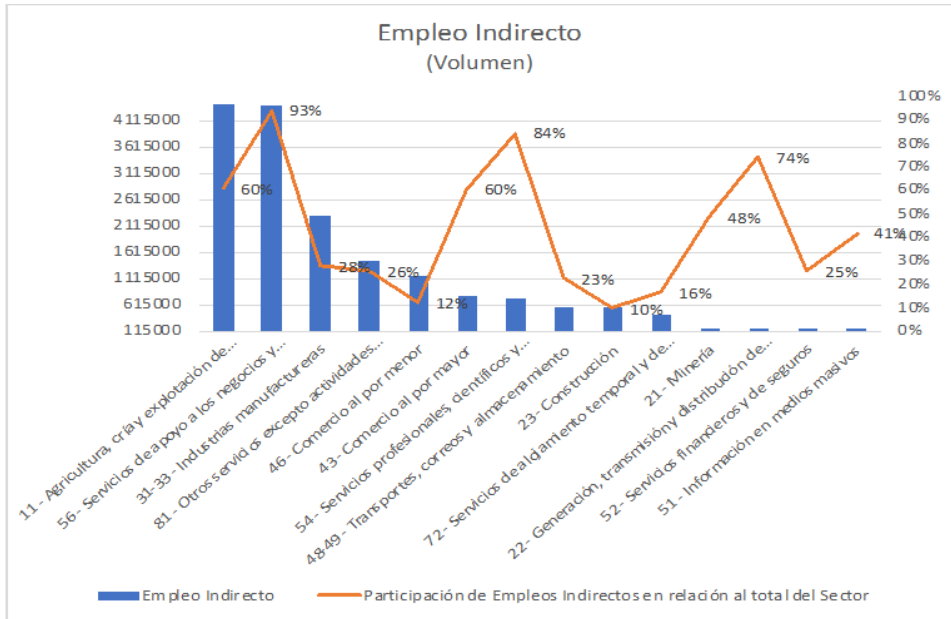


Figure 1. Share of indirect employment relative to total employment in the sub-sector
 Source: created by the authors, based on information from INEGI (2018)

Estimation of employment coefficients, multipliers, and employment-output elasticity

This section refers to the potential capacity of each sector to generate jobs directly and indirectly for the rest of the economy, considering the intersectoral linkages and the sector's demand.

Employment coefficients

Based on models and statistics, a set of indicators can be estimated for the economic sectors to help guide public employment policy. These indicators are the direct and indirect employment coefficients, obtained from the sum of the columns of the matrix of direct and indirect employment requirements and the employment multipliers. In addition, calculating employment-output elasticities makes it possible to identify the economic activities with the greatest impact on total employment in the face of changes in the sector's demand.

The employment coefficient represents the number of jobs per million pesos of spending associated with final demand in the economic sector. The following sectors have the highest direct and indirect employment coefficients, with the highest incidence recorded for sectors with high direct employment. Thus, it is possible to observe that the greatest generation of total jobs (direct and indirect) is attributed to a group of sectors where the source of job creation is the sector itself. Such is the case of Other services, except governmental activities (12.61), Agriculture, animal husbandry, and forestry (10.36), Business support services (7.32), Retail trade (5.94) and Temporary accommodation and food and beverage preparation services (5.87). On the other hand, there are sectors with significant total employment coefficients, where employment generation is also attributable to indirect coefficients due to their greater intersectoral linkages. In other words, these are sectors that demand inputs from the different economic sectors, thus generating indirect employment for the economic activities linked to the sector, as is the case of the Manufacturing industry (2.14), Agriculture, animal husbandry and farming, and forestry (10.36), Leisure, cultural, and sports services (4.30), Transportation, post, and storage (2.47), and Financial and insurance services (1.69). (Table 2)

Employment multiplier

Multipliers indicate how many jobs are generated in the rest of the sectors of the economy (indirect employment) when the demand for inputs from sector j increases. The increase in the demand for inputs produces an increase in the gross production of the activities supplying those inputs (chained to sector j), which leads to an increase in employment. The successive effects following the spending generate the multiplier effect of sectoral employment.

The analysis of multipliers contributes to the study of economic impact. It shows how an increase in final demand generates greater production than the initial increase. Each increase in production is associated with increased employment, which will depend on the direct employment coefficients.

Employment multipliers are obtained by dividing the total employment coefficients (direct and indirect) by the direct employment coefficients for each economic subsector:

$$mL = \frac{CL_j^T}{CL_j^d}$$

Only sectors with total employment coefficients greater than 2 jobs per million pesos of investment are considered to analyze these multipliers. The sectors with high multipliers are Manufacturing Industries (2.5), Transportation, post, and storage (1.68), Professional and technical services (1.43), Construction (1.34), Health services (1.33), and Leisure, cultural, and recreational services (1.36). An interpretation can be, for example, that if manufacturing industries generate 0.86 direct jobs per million pesos of investment and their employment multiplier is 2.50, then the employment impact will be 2.14 total jobs in the economy. Certainly, some sectors such as Corporate, Mining, Mass Media Information, and Financial Services have the highest sectoral multipliers in the economy and, thus, a higher linkage. Nevertheless, they have very small direct employment coefficients, so the total employment coefficient is less than 2. Therefore, it is recognized that there are economic sectors with high indirect coefficients and high employment multipliers; nevertheless, since their direct employment base is too small, they were not selected among the economic activities that generate the most jobs per million pesos of final demand spending. For this paper, the measurements obtained from the input-output analysis seek to identify sectors that contribute to job creation and provide elements to guide public policy. (Table 2).

Table 2
 Coefficients and Employment Multiplier

No.	Economic Sectors	Direct Employment Coefficients	Indirect Employment Coefficients	Direct and Indirect Employment Coefficients	Employment Multiplier
19	81 - Other services except for governmental activities	12.04	0.57	12.61	1.05
1	11 - Agriculture, animal husbandry and farming, forestry, fishing, and hunting	9.07	1.29	10.36	1.14
14	56 - Business support services and waste and residue management and remediation services	6.92	0.40	7.32	1.06
7	46 - Retail trade	5.42	0.53	5.94	1.10
18	72 - Temporary accommodation and food and beverage preparation services	4.91	0.96	5.87	1.19
17	71 - Cultural and sporting entertainment and other recreational services	3.16	1.14	4.30	1.36
15	61 - Educational services	3.40	0.27	3.67	1.08
4	23 - Construction	2.65	0.91	3.57	1.34
20	93 - Legislative, governmental, law enforcement, international and extraterritorial organization activities	2.71	0.76	3.47	1.28
16	62 - Health and social assistance services	2.50	0.82	3.32	1.33
12	54 - Professional, scientific, and technical services	2.04	0.87	2.91	1.43
8	48-49 - Transportation, post, and warehousing	1.47	1.00	2.47	1.68
5	31-33 - Manufacturing industries	0.86	1.28	2.14	2.50
10	52 - Financial and insurance services	0.54	1.15	1.69	3.14
9	51 - Information in mass media	0.52	0.90	1.42	2.73
3	22 - Generation, transmission and distribution of electric power, water supply, and piped gas supply to the final consumer	0.49	0.92	1.41	2.87
6	43 - Wholesale trade	0.83	0.48	1.31	1.58
13	55 - Corporate	0.23	0.79	1.02	4.37
2	21 - Mining	0.25	0.47	0.71	2.89
11	53 - Real estate services and rental of movable and intangible assets	0.31	0.17	0.48	1.54

Source: created by the authors, based on information from INEGI (2018)

Employment-product elasticity

One of the important determinants in the study of the economic impact on employment is the spending on final demand by sector, which refers to its economic weight. So far, the employment coefficients and their impact on employment in the face of the variation of one million pesos (monetary unit of the matrix) have been considered. For this purpose, the economic weighting of the sector and its impact on employment is considered by estimating the employment-output elasticity, which shows the effect on total employment generation of increases in the demand of the different economic activities. (Sánchez, 2015:17). This is an indicator that combines the coefficients of employment and the economic weight of the sector in final demand in this way:

Elasticity of sector j

$$E_j^e = \left[\sum_{i=1}^n \left(\frac{L_i}{x_i} \right) b_{ij} \right] \frac{y_j}{L}$$

Where L_i and x_i is the employment and output of product i consumed by sector j; b_{ij} is the ij-th coefficient of the direct and indirect employment requirements matrix and y_j is the final demand of sector j. (Sánchez, 2015:17)

It should be noted that the 1% increase for each sector considers its capacity to meet sustainable final demand increases due to the economic weight of the sector. The largest percentage increase in national employment in the face of 1% increases in final demand would be registered in the following sectors with their respective contributions to total employment: Manufacturing 149 155 (0.25%), Retail Trade 93 617 (0.16%), Construction 67 382 (0.12%), Other Services except for governmental activities 44 243 (0.08%), Agriculture, animal husbandry, and forestry 33 229 (0.06%), Legislative and governmental activities 32 937 (0.06%), Transportation, post, and warehousing 32 458 (0.06%), Educational services 27 725 (0.05%), Temporary accommodation and food and beverage preparation services 25 858 (0.04%). See Table 3.

Table 3
 Employment-output elasticity and employment effect

No.	Economic Sectors	Final Demand 2013 (Millions of Mexican pesos)	1% increase in Final Demand	Increase in total employment	Employment-Output Elasticity
5	31-33 - Manufacturing industries	6961829	69618	149155	0.259553388
7	46 - Retail trade	1575215	15752	93617	0.162907687
4	23 - Construction	1889500	18895	67382	0.117255538
19	81 - Other services except for governmental activities	350751	3508	44243	0.076989887
1	11 - Agriculture, animal husbandry and farming, forestry, fishing, and hunting	320776	3208	33229	0.057823440
20	93 - Legislative, governmental, law enforcement, international, and extraterritorial organization activities	950501	9505	32937	0.057316282
8	48-49 - Transportation, mail, and warehousing	1312862	13129	32458	0.056482094
15	61 - Educational services	743098	7431	27275	0.047463365
18	72 - Temporary accommodation and food and beverage preparation services	440416	4404	25858	0.044997157
16	62 - Health and social assistance services	577908	5779	19173	0.033363323
10	52 - Financial and insurance services	654872	6549	11075	0.019271917
6	43 - Wholesale trade	640890	6409	8402	0.014620254
11	53 - Real estate services and rental of movable and intangible assets	1709838	17098	8207	0.014282218
2	21 - Mining	757006	7570	5407	0.009408183
17	71 - Cultural and sporting entertainment and other recreational services	107033	1070	4605	0.008013201
9	51 - Information in mass media	322945	3229	4570	0.007952549
14	56 - Business support services and waste and residue management and remediation services	44783	448	3276	0.005701447
12	54 - Professional, scientific and technical services	70585	706	2055	0.003575530
3	22 - Generation, transmission and distribution of electric power, water supply, and piped gas supply to the final consumer	119903	1199	1693	0.002946911
13	55 - Corporate	251	3	3	0.000004454
	Total	19550963	195510	574619	1.00

Source: created by the authors, based on information from INEGI (2018)

Conclusions

The sectoral structure of the Mexican economy made it possible to identify the linkages of the different economic activities to estimate indicators that could contribute to orienting public employment policy by identifying the sectors that drive direct and indirect employment. To this end, the programs that have integrated public employment policy focused on training, skills training, or strengthening work experience have sought to increase the employment rate. One of the most important implications of this article is that it identifies the three factors that have the greatest impact on the employment rate: the economic weight of the sector and the direct and indirect employment coefficients.

Accordingly, the employment rate can be raised if the government encourages and supports sectors with high direct employment coefficients strongly linked to the rest of the production sectors with high indirect employment coefficients. This article focuses on the major direct employment generators, such as the service sectors (other services, business support and temporary accommodation, and food and beverage preparation), the agricultural and animal husbandry sectors, and the commercial sector, with special emphasis on indirect employment-generating sectors with high employment multipliers, such as manufacturing industries, transportation, services (professional and technical services, health services, leisure, cultural, and recreational services), and construction. Moreover, the latter have additional advantages over the economy because their spending, having high sectoral linkages, is associated with multiplier effects in production and value-added (wages) that have not been considered in this paper. Finally, in terms of employment-output elasticity, the sector with the highest contribution to national employment in the face of 1% increases in the sector's final demand are manufacturing industries, retail trade, construction, other services except governmental activities, agriculture, animal husbandry and logging, legislative and governmental activities, transportation, post and warehouse keeping, educational services, temporary accommodation services, and food and beverage preparation. In order to establish a specific employment policy, it may be necessary to disaggregate the sectors to be more precise in the policy design corresponding to each sector.

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