Economía, Sociedad y Territorio, vol. xxiii, núm. 73, 2023, 867-899.
DOI: http://dx.doi.org/10.22136/est20231940

Spatial impacts of insecurity and economic growth on FDI in Mexico, 1999-2019

Impactos espaciales de la inseguridad y el crecimiento económico sobre la IED en México, 1999-2019

Roldán Andrés-Rosales*
Leobardo de Jesús Almonte**
José Nabor Cruz Marcelo***

Abstract

Foreign Direct Investment in Mexico has been of relevance in determining economic growth in Mexican states. Despite being positive for the country, FDI has been limited by prevailing insecurity in different states, which had historically attracted this kind of investment. States in the northern border and in the center have usually attracted the greatest amount of FDI. Through SpVAR we quantified investment and insecurity spillovers in each state and its neighboring states, and we show that the push-in effect has been larger than the push-out effect in Mexico.

Keywords: *Foreign direct investment, SpVAR, insecurity, economic growth.*

Resumen

La Inversión Extranjera Directa (IED) en México ha contribuido a determinar el crecimiento económico en los estados. A pesar de que el flujo de estas inversiones ha sido positivo, la inseguridad ha limitado la entrada de inversiones en zonas que históricamente habían atraído IED. Los estados que han concentrado mayor inversión del exterior se localizan en la frontera norte y algunos en el centro del país. Mediante el SpVAR cuantificamos las derramas que la inversión e inseguridad han generado en los estados y sobre sus vecinos cercanos, mostramos que el efecto *push-in* ha sido más importante que el efecto *push-out*.

Palabras clave: Inversión Extranjera Directa, SpVAR, inseguridad, crecimiento económico.

* Department of Social Sciences of the Faculty of Higher Studies Cuautitlán-UNAM, e-mail: roldandres@unam.mx

** Faculty of Economics of the Autonomous University of Mexico State (UAEMéx), e-mail: ldejesusa@uaemex.mx

*** Executive Secretary of the National Council for the Evaluation of Social Development Policy (Coneval) correo-e: jnabor@unam.mx

Introduction

Since the opening of trade in Mexico in 1994, foreign direct investment (FDI) has played an important role in the economic growth and development of Mexican economy, reporting a constant and positive flow since then. However, rampant insecurity along with slow economic growth in Mexican states have had a negative effect on investment flow in some regions. Using available information from the Secretaría de Economía and the National Institute of Statistics and Geography (Inegi, by its acronym in Spanish), for all 32 Mexican states, we aim to answer the following questions: Has FDI decreased in the states that are considered insecure? In which states do total FDI, new investment and reinvestment have a constant and positive flow? Is past performance of neighboring states' investment, important in determining investment flow towards a given state?

Using the Spatial Vector Autoregressions technique (SpVAR) this work shows the effect of FDI, economic growth and insecurity on the 32 federal entities of Mexico. By analyzing the states that have received more FDI and states with the highest insecurity indicators, the work shows the causality between variables, and the impact of these variables among states.

There are discussions about the effects of spillovers from large transnational corporations or from FDI over Mexican states. Research from Gutiérrez-Portilla *et al.* (2016) consider that the only benefit they produce is less precarious jobs and higher wages than those from local businesses. In contrast with previous studies, this work shows that the effects of FDI, production growth and insecurity between states are far more important than the benefits within a state. Using the SpVAR methodology, the impacts received by an entity from its neighbors are quantified. Also, our study presents measurements of the benefits that a state produces within itself and on its neighbors when it receives FDI. Additionally, our findings show that the regions concentrating most investments are not the same as those with the highest insecurity indexes, which could be an indication of dispersion of investment to safer regions instead of concentration.

Using a spatial methodology, we show that the externalities generated by the variables considered in this work are greater than the impacts within a state. This implies the need to analyze whether the entity that receives FDI flows benefits its neighboring entities in a positive way by transferring part of its growth (i.e. push-out effect), or if the entity gets benefits from the increase of FDI of its neighbors (i.e. push-in effect) (Márquez *et al.*, 2010; 2014). This also implies the need to analyze the internal and external links that investment produces within the country. These links are not quantified, it could be thought as if there is no Granger causality between insecurity and FDI. This work shows that in fact, there is Granger

causality from the spatial perspective. Although, there is a weak causality between economic growth and FDI, this can be explained by the slow total economic growth of the country, which cannot attract enough foreign investment.

The main aim of our research is to show the tendencies of FDI and its relationship to states' economic growth and insecurity. The most important contribution lies in demonstrating that insecurity in neighboring states has a positive effect on the concentration of these investments in regions with the potential to attract them. It is also shown that states which fail to attract FDI are benefited when neighbors attract this investment and are affected when neighboring states have high levels of insecurity.

The hypothesis to be tested is that "security is fundamental to attract new investments, given that investors will invest in a certain state only if they feel secure about recovering their invested capital. Not only security in a particular state is important, but also the security offered by its neighbors; this is, it is not enough that security policies are applied in states that have the potential to attract FDI, a regional policy must be set in place, because the benefits will spill over the entire surrounding region".

The structure of the present work is as follows: the first section presents an introduction; the second section discusses some of the theoretical arguments about the advantages of FDI and empirical evidence from the literature; the third section is dedicated to the model specification and the data used with the spatial time series methodology; the fourth section shows the empirical evidence under different scenarios; finally, the fifth section contains the main conclusions of our work.

1. Theoretical discussion about FDI

Specialized literature (Banco Interamericano de Desarrollo (BID), 2018; Blonigen and Feenstra, 1997) differentiates two types of FDI BID: *a)* Horizontal FDI that consists in doubling the domestic activities on a foreign country in a way that some activities like assembly and production take place in both the headquarters' country, and the foreign countries. The objective of horizontal FDI is to have production be as close as possible to the final consumers and clients in order to reduce transportation costs. It is also called "seeking-market FDI"; *b)* Vertical FDI is characterized by activities that are dispersed geographically by different functions, in such a way that some activities, like research and development (R&D) are done in the country of origin, but others, such as assembly and production, take place in foreign countries. This type of FDI has the objective of minimizing production costs by doing different activities in

different countries where the costs are lower (productive fragmentation). It is known as "efficiency-seeking FDI" and it gives place to global value chains. Therefore, the intensive activities of R&D will take place in a country with a great amount of highly skilled workers, while the assembly and other activities of lower added value will take place in a country with abundance of lower skilled workers (BID, 2018).

There are other classifications of FDI in terms of the motivation of companies looking for locating their investment outside their country of origin. Among them are the following: *a*) Export platform FDI, is when a company seeks being close to its clients. Hence, the subsidiary is settled in a country from a region where it wants to supply its good or services, and from there it exports to different countries in that region (BID, 2018), *b)* Tariff jumping FDI is motivated by the wish of avoiding customs payments, and other commercial barriers (Blonigen and Feenstra, 1997, cited in BID, 2018). In this case, the companies settle their subsidiaries in countries where there are trade agreements that allow to avoid those barriers, or to reduce international commerce's costs. Finally, *c)* technology-driven FDI is motivated by the interest of learning from other companies. In this way, they benefit indirectly from the technological knowledge of other companies. Multinational companies look for locating in places where the knowledge ecosystems are advanced (BID, 2018).

In this context, it is evident that foreign direct investment (FDI) is an important source of funding for developing countries. According to Dussel Peters (2004), FDI is of great importance for the economic growth due to the technology and knowledge transfer. Ashby and Ramos (2013) mention that between 2004 and 2010, Mexico was the 16th recipient of international investment behind Australia and Singapore, and ahead of India. This flow of FDI was a result of the North American Free Trade Agreement (NAFTA, now USMCA) coming into effect (Dussel Peters, 2004; Torres-Preciado *et al.*, 2017). The NAFTA attracted international investors to establish in the north of Mexico due to the low labor costs, leading to attend North American market in a more competitive way. Other reasons that attracted FDI to Mexico was the privatization wave that the Mexican government did before and during the commercial liberalization. State-owned entities were passed on to private international investors.

There are several factors that influence the FDI flows. Daniele and Marani (2011) consider that the quality of the legal and institutional framework tends to influence the amount of FDI received by a country. Investment flows can also be influenced by the diversity of political and institutional systems (Globerman and Storer, 2009); meaning that the institutions are

important for these investments because of the following reasons: "first of all, according to studies about long term growth prospects, efficient institutions improve productivity prospects, and this attracts investors" (Daniele and Marani, 2011: 133). Secondly, a poor institutional framework means that there will be additional costs for multinationals increasing their total costs affecting their international competitiveness.

FDI is done by highly competitive multinational companies, they assimilate internal costs in a country, but when these costs are high or numerous it affects their investment decision making. According to Daniele and Marani (2011) some of the factors that attract FDI are: *1)* a great potential of domestic and foreign markets; *2)* high population density; *3)* presence of foreign capital (*signal effect*); *4)* good accessibility and infrastructure (since government investment is an important factor for attracting FDI); *5)* high skilled and specialized human capital as well as R&D expenditure; *6)* presence of economic clusters determined by a numerous amount of competitors, clients and suppliers of the same sector as the multinationals (Pelegrín and Bolancé, 2008) .

There are several factors that determine FDI flows to different regions. For instance, Lindsey Blanton and Blanton (2007) consider that the size of the market is the most common factor for attracting FDI. A country with a big market has a higher probability of attracting FDI, since it allows economies of scale in terms of production and distribution. In addition to the latter, Barry *et al*. (2003) mention that economists have long acknowledged the importance and benefits of clustered economies for the location of companies. The implications of clusters have been analyzed widely in the growing literature of the "new Economic Geography" (Krugman and Venables, 1996).

The advantages of the location refer to the peculiarities of a particular location that makes it more attractive to FDI. However, "far from promoting economic development of regional economies, they help to increase regional inequalities". These inequalities are exacerbated when some regions have insecurity problems and lack of FDI drivers. Here, "advantages of location refer to the peculiarities of a particular place that makes it more attractive for foreign investment" (Gutiérrez-Portilla *et al*., 2016: 71).

Hence, the advantages of a good location are due to the search of markets, resources, efficiency and strategic assets. According to Dunning (1993), this means that the search of a new market is to take advantage of economies of scale in each region. Meanwhile, the search of resources allows to access low-cost natural resources and that these contribute to improve international competitiveness. While the search for efficiency allows to promote and improve labor division and specialization of assets

of the multinational companies. Finally, the search of strategic assets allows to protect and keep the companies' advantages and to curb their competitors (Dunning, 1993).

Among the benefits that FDI produces, Guzmán Anaya (2013: 236) considers that "FDI has positive effects in host countries given that they produce spillovers in the local companies that contribute to increase their productivity. The transmission channels of the productivity spillover are the workers mobility, the competition effect, and the demonstration effect".

Appleyard and Field (2003) highlight five of the multiple benefits of FDI: *1.* Increase of competitiveness of the host country, since the arrival of new companies helps to reduce the pressure on prices, and to improve the efficiency in resource allocation promoting the competitiveness of local companies and promoting a learning process. When multinational companies begin to settle, it allows access to more competitive goods. *2.* Creation of human capital: Multinational companies introduce new management, marketing, and organizational practices, which demands training of personnel. Thus, multinational companies contribute to the creation of human capital in the host country, meaning that the productivity improves and provides better salaries than local companies. *3.* Incentives for exports: The multinationals produce more for the international markets than for the domestic one since they are more focused on exports. This allows the domestic companies that are looking to export their products to incorporate a learning system. *4.* Use of technology: FDI favors the arrival of modern technology, especially all that is related to new varieties of raw materials, high technology products, and new productive processes which cannot be obtained by means of financial investment or commerce of goods and services. Moreover, as the multinational companies establish relations with local companies through purchase of raw materials or other products, and flows of work force from company to company, they create positive externalities that contribute to the technical progress of the host country.

However, the ability to absorb the potential benefits of FDI is determined by the level of spillover that prevails between and within regions. Without these spillovers, the multinationals would function as a bubble, only benefitting their own workers. Nevertheless, a region with the above advantages to attract FDI that also has an insecurity problem as envisaged in Mexico, where kidnapping, homicide, armed robbery, etc. occur, the entry of this type of investment could be limited and regional inequalities could beincreased.

It is important to emphasize that investors may "mimic" the investment decisions of colleagues from other regions. DeCoster and Strange (1993) have pointed out that:

> even if these efficiency reasons are not prevalent, firms may find it rational to agglomerate spatially. If there is uncertainty about locations in which to invest, investors may exhibit a tendency to imitate each other's location decisions. In their specific model, this arises because investors locating in a good location provide a signal to other investors, and to banks which provide the funds for investments (DeCoster and Strange, 1993: 283).

The best way to analyze these statements is to confirm if it is the new investment or the reinvestment that has flowed to more entities.

Neighboring entities play a relevant role in FDI, because according to Ashby and Ramos (2013), crime organizations invest resources in activities that reduce the efficacy of State's deterrence against them using violence and threats (Fiorentini, 1995). Thus, the main effect of organized crime is to increase the costs of doing businesses (Hallward-Driemeier and Stewart, 2004; Daniele and Marani, 2011), not only by locating in insecure places, but also by locating in secure entities with insecure neighbors that where supply chains can be interrupted (Barnes and Oloruntoba, 2005; Czinkota *et al*., 2005; Globerman and Storer, 2009; Branzei and Abdelnour, 2010). Hence, it is important to analyze if the new investment received by Mexican entities than reinvestment. If in an entity reinvestment is growing more, it implies that the multinationals settled in there have learned to manage the insecurity climate and can reinvest their profits.

In general, the insecurity creates a climate of uncertainty and the possibility of expelling investment. For instance, the local demand may decrease due to emigration or relocation of businesses (Ashby and Ramos, 2013; Greenbaum *et al*., 2007). However, criminal activity may lead to emigration (Ashby and Ramos, 2013; Berry and Levitt, 1999), to decrease consumption per capita (Mejía and Restrepo, 2010) or to cause relocation or permanent closures of companies (Greenbaum *et al*., 2007). Small companies are more vulnerable to be target of organized crime through extorsion (Daniele and Marani, 2011).

Different regions have different intrinsic advantages to attract FDI, despite their variety they seem reduced by each region's problems. The flows of investment will be directed towards regions with more potential and factors that can attract them. Although multinationals do not care if the neighboring entities have the same potential or if at least, they offer less security for the entrance and exit of their final products, if a region does not have attractiveness to international investors and there are insecurity problems, the investment flow will be poor and scarce. Under these circumstances, as Gutiérrez-Portilla *et al*. (2016) remark, the FDI tends to increase the regional disparities instead of promoting regional harmony. Those inequalities will aggravate when regions have insecurity problems and lack of attractiveness to FDI.

2. Spatial distribution of insecurity and FDI

2.1. Data description

There are several studies that have analyzed FDI and its relationship with insecurity in Mexico. Most of them have related it with the homicide rates as a proxy variable of organized crime activity. Ashby and Ramos (2013) consider that individuals are less likely to report non-violent crimes, such as theft or other violent crimes like kidnapping or extorsion which can put the victims' lives in danger. Fajnzylber *et al.* (2002) state that most crimes are under-reported, and that the problem is more serious in countries with less reliable judicial systems (as it occurs in Mexico). For this reason, it is argued that homicides are less under-reported (Ashby and Ramos, 2013; Fajnzylber *et al.*, 2002). Hence, the reported homicide rate is the most used variable instead of theft or kidnapping, which does not imply that it is the most appropriate indicator but the less biased, and it has been used in studies like the one by Carbajal Suárez and Vergara González (2015).

We, too, used the homicide index as a proxy variable for insecurity. This variable was built as the number of homicides for every hundred thousand inhabitants for each one of the 32 states in Mexico. This is official information published by the Executive Secretariat of the National Security System (SESNSP by its acronym in Spanish)in 2021. Since Inegi does not publish quarterly data for the gross domestic product (GDP) of each state, we used the Quarterly Indicator of State Economic Activity (ITAEE by its acronym in Spanish) as a proxy for state GDP. The ITAEE represented economic growth for states in the country. Finally, the FDI variable was the FDI flows towards Mexico by state, whichis official information published by the Secretaría de Economía and it is classified as new investments and reinvestments made by international companies in different states of the country. All data is quarterly for the 32 states in Mexico during the period 1999:01-2019:04, in constant prices of 2019.

2.2. Exploratory analysis of FDI and insecurity

Of total FDI of 2019, Mexico City was the entity which attracted the highest percentage (23%), followed by Nuevo Leon (9.6%), State of Mexico (8.7%), Puebla (6%), Jalisco (4.6%), Coahuila and Chihuahua (4%), respectively. Meanwhile, the states with the highest homicide rate in the same year were Guanajuato (7.6%), Jalisco, the State of Mexico (6.9% each) and Chiapas (5.3%). Even though the State of Mexico and

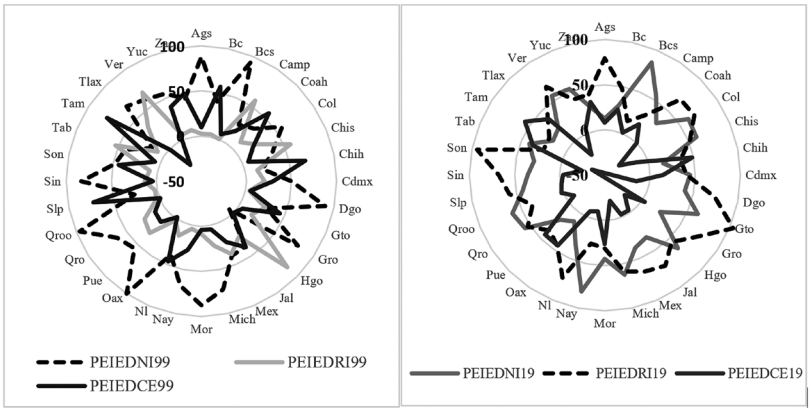
Jalisco are insecure states and received FDI flows, they did not have the highest percentages of attraction of FDI.

Graph 1 shows the spatial behavior of the FDI by components in 1999 and 2019. It shows that in 1999 (left hand side), the percentage of new investments (PEIEDNI) was higher in Morelos (Mor), Oaxaca (Oax), Quintana Roo (QRoo), Sinaloa (Sin), Aguascalientes (Ags), Baja California Sur (Bcs), and Durango (Dgo). While reinvestments (PEIEDRI) were higher in Hidalgo (Hgo), Chiapas (Chis), Campeche (Camp), and Veracruz (Ver).

The configuration of investments at state level changed in 2019, the highest FDI component was reinvestment, which implies that the already established companies were the ones keeping their investment in the same state, and that the flows of new investment were lower than in 1999, as it is the case of Guanajuato (Gto), Sonora (Son), Veracruz (Ver), and Aguascalientes (Ags). The fact that reinvestment has been greater than new investment means that somehow, multinational companies have learnt to manage the prevailing insecurity in states like Guanajuato.

However, this situation limits the entry of new investment given that it has shifted to less insecure entities such as Nayarit (Nay), Queretaro (Qro), Quintana Roo (QRoo), and Baja California Sur (Bcs), where the percentage of new investment is higher than in the aforementionedr states.

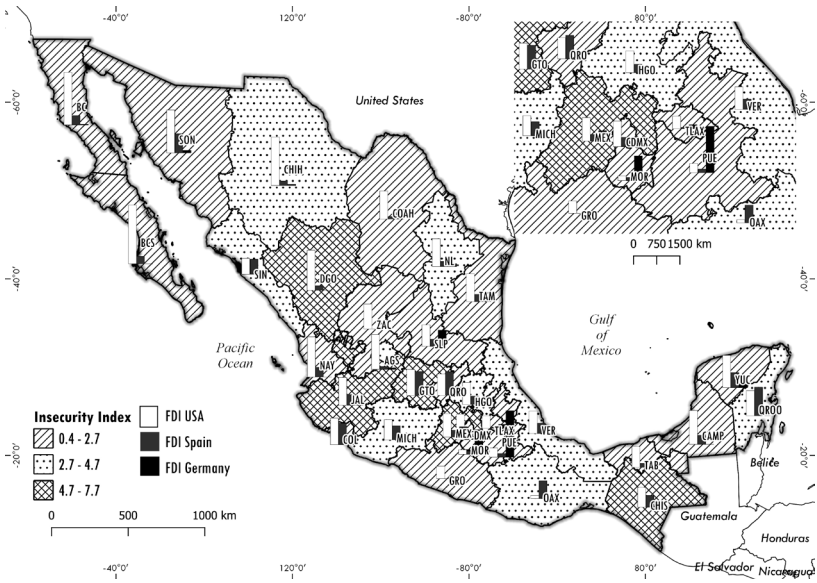
Graph 1
Spatial distribution of new FDI (PEIEDNI), reinvestment (PEIEDRI) and accounts (PEIEDCE) between companies in 1999 and 2019



Source: author's own elaboration based on data from Secretaría de Economía (2021).

Figure 1 illustrates the spatial distribution of insecurity by state, where the states shaded with squares have more insecurity, while the states shaded with diagonal stripes have lower insecurity, and the dotted entities have

Figure 1
Spatial distribution of insecurity and FDI from USA, Spain and Germany, 2019



Source: author's own elaboration based on data from Secretaría de Economía (2021), QGIS (2020).

a medium level of insecurity. The highest flows of FDI in 2019 came from the US with 37%, Spain with almost 12%, Germany 10%, Canada 9%, and Italy, Japan and Belgium 4% each.

The concentration of FDI from the three countries that invested more in Mexico in 2019 is distributed in the following states:

US region: Investment coming from the US in 2019 is illustrated in figure 1, where the white bar has the highest concentration in Mexico City (23%), Nuevo Leon (10%), State of Mexico and Chihuahua (7.5% each), Baja California and Tamaulipas (5% each).

Spain region: Investment coming from Spain, indicated in figure 1 with a gray bar, is concentrated in Mexico City (25%), Queretaro (10%), State of Mexico and Guanajuato (7% each), Jalisco and Nuevo Leon (6% each).

Germany region: Investment from Germany, indicated in figure 1 with a black bar, is concentrated in Mexico City and the State of Mexico (almost 13%), Morelos (almost 7%), and San Luis Potosi (6%).

Insecurity and its past behavior affect the flow of new investment in Mexican economy. Ashby and Ramos (2013) mention that some multinational companies have learned to manage insecurity, as it is shown above. Mostly they are companies based on natural resources like oil

extraction and mining since they are limited by the locations. That is also the case of agriculture, only that this has more flexibility (Ellison and Glaeser, 1999). Oetzel *et al.* (2007) emphasize that although the increase of delinquency discourages foreign investment, multinational companies (MNC) in primary sectors which characterized by high sunk costs and long-term investment horizons can participate in the risk management in a continuous way. Evidence suggests that multinational companies of globalized old extraction industries have accumulated an important experience in dealing with difficult regional conditions (Ashby and Ramos, 2013), including violent conflicts and delinquency (Bennett, 2002), like in Guanajuato, where reinvestment is more important than new investment.

3. Methodology and main results

The empirical evidence of this work is based on the approaches by Márquez *et al.* (2010; 2014); Lesage and Cashell (2015), and Torres-Preciado (2017), who have used spatial autoregressive vector models. The work of Márquez *et al.*, (2010; 2014) used this methodology to estimate the growth of Spanish economy, while the latter applied it to forecast the growth of manufacturing employment in Mexico. In this case, the focus is on the flow of FDI and insecurity of the 32 federal entities of Mexico. Andrés-Rosales *et al.* (2021) used the same methodology to analyze the relationship between economic growth and public spending in the states of Mexico. In this case, the focus is on the flow of FDI and insecurity of the 32 federal entities of Mexico. The importance of using this technique is that it allows to quantify positive effects of insecurity and growth over other states. The model specification is the following:

$$\mathrm{LFDIT_{it}} = \Gamma^1_{0\mathrm{i}} + \Gamma^1_{1\mathrm{i}}\mathrm{LFDIT_{i,t-1}} + \boldsymbol{\Gamma^1_{2\mathrm{i}}\mathbf{LFDIT}^*_{\mathbf{i,t-1}}} + \boldsymbol{\Gamma^1_{3\mathrm{i}}\mathbf{ITAE}^*_{\mathbf{i,t-1}}} + \boldsymbol{\Gamma^1_{4\mathrm{i}}\mathbf{INSEC}^*_{\mathbf{i,t-1}}} + \alpha^1_{1\mathrm{i}}\mathrm{INSEC_{i,t}} + \alpha^1_{2\mathrm{i}}ITAE_{\mathrm{i,t}} + \mathrm{e}^1_{\mathrm{it}} \quad (1)$$

$$\boldsymbol{\mathrm{LFDIT}^*_{\mathrm{i,t-1}}} = \Gamma^2_{0\mathrm{i}} + \boldsymbol{\Gamma^2_{1\mathrm{i}}\mathbf{LFDIT}_{\mathbf{i,t-1}}} + \Gamma^2_{2\mathrm{i}}\mathrm{LFDIT}^*_{\mathrm{i,t-1}} + \Gamma^2_{3\mathrm{i}}\mathrm{ITAE}^*_{\mathrm{i,t-1}} + \Gamma^2_{4\mathrm{i}}\mathrm{INSEC}^*_{\mathrm{i,t-1}} + \alpha^2_{1\mathrm{i}}\mathrm{INSEC_{i,t}} + \alpha^2_{2\mathrm{i}}ITAE_{\mathrm{i,t}} + \mathrm{e}^2_{\mathrm{it}} \quad (2)$$

$$\boldsymbol{\mathrm{ITAE}^*_{\mathrm{i,t-1}}} = \Gamma^3_{0\mathrm{i}} + \boldsymbol{\Gamma^3_{1\mathrm{i}}\mathbf{LFDIT}_{\mathbf{i,t-1}}} + \Gamma^3_{2\mathrm{i}}\mathrm{LFDIT}^*_{\mathrm{i,t-1}} + \Gamma^3_{3\mathrm{i}}\mathrm{ITAE}^*_{\mathrm{i,t-1}} + \Gamma^3_{4\mathrm{i}}\mathrm{INSEC}^*_{\mathrm{i,t-1}} + \alpha^3_{1\mathrm{i}}\mathrm{INSEC_{i,t}} + \alpha^3_{2\mathrm{i}}ITAE_{\mathrm{i,t}} + \mathrm{e}^3_{\mathrm{it}} \quad (3)$$

$$\boldsymbol{\mathrm{INSEC}^*_{\mathrm{i,t-1}}} = \Gamma^4_{0\mathrm{i}} + \boldsymbol{\Gamma^4_{1\mathrm{i}}\mathbf{LFDIT}_{\mathbf{i,t-1}}} + \Gamma^4_{2\mathrm{i}}\mathrm{LFDIT}^*_{\mathrm{i,t-1}} + \Gamma^4_{3\mathrm{i}}\mathrm{ITAE}^*_{\mathrm{i,t-1}} + \Gamma^4_{4\mathrm{i}}\mathrm{INSEC}^*_{\mathrm{i,t-1}} + \alpha^4_{1\mathrm{i}}\mathrm{INSEC_{i,t}} + \alpha^4_{2\mathrm{i}}ITAE_{\mathrm{i,t}} + \mathrm{e}^4_{\mathrm{it}} \quad (4)$$

Where the subindex *i* refers to the entity, *t* is time, and *LFDIT* refers to the logarithm of total foreign direct investment. *LFDIT** is the average of the logarithm of foreign direct investment of the neighboring entities; ITAE is the rate of growth of the entity's economic activity. *ITAE** is the average growth rate of the economic activity of the neighboring entities. *INSEC* is the logarithm of the insecurity index, while *INSEC** is the average of the logarithm of the insecurity index in the neighboring entities. While the Gammas are the parameters of the model.

It may be questionable that the analysis of the determinants of FDI flows is limited to the effect of the insecurity variable and to economic growth of states, especially because available literature offers several other explaining variables.[1] These two variables were chosen following the conventional structure of similar reviewed studies that mostly use them. Other variables were included because the SpVAR model became unstable. However, given the hypothesis to be tested and the contribution to be made to the literature, this work highlights the effect of neighborhood for each state, the flows of FDI and the effects on economic growth.

In the spatial framework, one can determine if the lag of the external variables adds valuable information about the determination of the local variables (Márquez *et al.*, 2014). According to Equation 1, if the previous values of $LFDI^{*}_{i,t}$, $ITAE^{*}_{i,t}$, $INSEC^{*}_{i,t}$ help to explain the future values of $LFDI_{i,t}$, the value of the parameters $\mathbf{\Gamma^{1}_{2i}}$, $\mathbf{\Gamma^{1}_{3i}}$, $\mathbf{\Gamma^{1}_{4i}}$ are statistically significant. Then it can be said that there is a push-in effect, which implies that neighbors of a particular entity affect that entity's behavior. If previous values of $LFDI_{i,t}$ explain the behavior of $LFDI^{*}_{i,t}$, $ITAE^{*}_{i,t}$, $INSEC^{*}_{i,t}$, the parameters $\mathbf{\Gamma^{2}_{1i}}$, $\mathbf{\Gamma^{3}_{1i}}$, $\mathbf{\Gamma^{4}_{1i}}$ will be statistically significant. Hence, it can be said that there is a push-out spillover, which means that a particular entity affects its neighbors in terms of total foreign direct investment.

The definition of the spatial weights matrix ($\boldsymbol{W}$) is of great importance for the spatial estimation (Quintana and Andrés-Rosales, 2014). According to these authors, $\boldsymbol{W}$ is a positive square matrix with dimension that depends on the sample size. It describes the interaction of spatial units between entities. By definition, $w_{ij} = 1$, if states *i* and *j* are neighbors and 0 otherwise. Although there are other types of vicinities that could be included which are not limited to contiguity. It is important to highlight that a normalized matrix is specified here in the same way that traditional spatial modeling literature does, which implies that the rows add to one, representing a spatial smoothing of the impacts of the neighboring regions

[1] Among the determinants of FDI found in the literature review are the size of the country, the political risk and other risk factors, external sector variables, macroeconomic indicators such as inflation and exchange rate stability (see Trevino *et al.,* 2002; Mogrovejo, 2005), as well as economic freedom indices (Bengoa y Sánchez Robles, 2003).

and where autocontiguity is not allowed or it is equal to zero (Anselin, 1988).

3.1. Spatial Granger Causality

The VAR model can be used to examine to which extent the variables in the system are determined by its past values, which is known as Granger causality (Granger, 1969). Enriched by the framework of spatial VAR (SpVAR), the spatial spreading and causality between variables and regions can be determined (Márquez *et al.*, 2014). These new considerations were named *Spatial Granger causality analysis* by Márquez *et al.* (2014); Kuethe and Pede (2011), and it is a new way to show the collateral spatial effects within the context of traditional VAR.

On the one hand, regarding causality generated by neighbors of an entity shown as Push-in effect in columns two to four of table 1, we found that the growth in production (ITAE) of the neighbors of Aguascalientes, Baja California, Guerrero, Jalisco, Nuevo Leon and Sonora, affects the FDI of these states. While the FDI of the neighbors of Baja California Norte, Baja California Sur, Mexico City, and Oaxaca affects the FDI of these listed states. On the other hand, the increase in insecurity of the neighbors of Baja California Norte, Chihuahua, Oaxaca, Puebla, Sonora and Tamaulipas affects the FDI of these entities.

The push-out effect implies that a particular state affects the economic growth (ITAE*), the FDI* and the insecurity (INSEC*) of its neighbors by modifying its FDI component. This effect is shown in columns five to seven of Table 1, where on one hand, if the foreign investment is modified in Aguascalientes, Colima, Morelos and Sonora, it affects the economic growth of their neighbors. On the other hand, the effect of FDI of Aguascalientes, Coahuila, Guanajuato, Puebla, and Tabasco affects the FDI of their neighboring entities. Finally, there is Granger causality between FDI with respect to insecurity of the neighbors of Baja California, Baja California Sur, Guanajuato, Puebla, Queretaro, San Luis Potosi, and Zacatecas. This implies that while there is a greater flow of foreign investment in these entities, the insecurity among their neighbors will increase or decrease.

Columns eight and nine of Table 1 show that the effect that changes in insecurity levels have on direct foreign investment within the states, were statistically significant for Baja California, Campeche, Hidalgo, Estado de Mexico, Sinaloa, Tlaxcala, and Zacatecas. On the other hand, changes in FDI of Baja California, Coahuila, State of Mexico, Morelos, Nayarit, Quintana Roo, Tamaulipas and Yucatan, affect the insecurity

Table 1
Spatial Granger Causality Tests

1999:01 to 2019:04	***Effects between entities***						***Within entity effect***	
	Push-in effect			***Push-out effect***				
Contiguity Matrix (1)	*ITAE* does not cause LFDI (2)*	*LFDI* does not cause LFDI (3)*	*INSEC* does not cause LFDI (4)*	*LFDI does not cause ITAE* (5)*	*LFDI does not cause LFDI* (6)*	*LFDI does not cause INSEC* (7)*	*INSEC does not cause LFDI (8)*	*LFDI does not cause INSEC (9)*
Aguascalientes	**2.80(0.02)**	0.76(0.57)	0.13(0.98)	**2.32(0.05)**	**3.51(0.00)**	1.34(0.25)	0.23(0.94)	0.38(0.85)
Baja California	**4.21(0.04)**	**3.52(0.06)**	**3.30(0.07)**	0.07 (0.78)	0.44(0.50)	**2.87(0.09)**	**18.91(0.00)**	**5.71(0.01)**
Baja California Sur	0.69(0.50)	**3.98(0.02)**	0.80(0.45)	1.72 (0.18)	1.55(0.21)	**4.39(0.01)**	1.25(0.29)	0.93(0.39)
Campeche	1.56(0.21)	0.24(0.78)	0.41(0.66)	1.44 (0.24)	0.84(0.43)	0.72(0.48)	**3.66(0.03)**	1.70(0.19)
Mexico City	0.45(0.77)	**2.58(0.04)**	0.88(0.47)	0.08(0.98)	0.25(0.90)	1.42(0.23)	0.33(0.85)	0.81(0.52)
Chihuahua	1.12(0.35)	0.77(0.57)	**2.32(0.05)**	0.31(0.90)	1.10(0.36)	1.44(0.21)	0.21(0.95)	0.19(0.96)
Chiapas	1.43(0.22)	1.15(0.34)	0.79(0.55)	0.33(0.89)	0.40(0.84)	0.08(0.99)	1.31(0.26)	0.54(0.74)
Coahuila	0.84(0.52)	0.96(0.44)	1.11(0.36)	0.36(0.87)	**5.49(0.00)**	1.34(0.25)	0.46(0.79)	**2.25(0.05)**
Colima	0.08(0.77)	0.22(0.63)	1.50(0.22)	**3.34(0.07)**	0.00(0.98)	0.01(0.91)	3.05(0.08)	1.04(0.31)
Durango	0.06(0.99)	1.57(0.18)	0.67(0.64)	0.90(0.48)	1.16(0.33)	1.64(0.16)	1.36(0.25)	0.81(0.54)
Guerrero	**2.92(0.01)**	1.41(0.23)	0.36(0.87)	1.18(0.32)	0.50(0.77)	1.05(0.39)	0.44(0.81)	1.91(0.10)

Table 1 (*continue*)

1999:01 to 2019:04	***Effects between entities***						***Within entity effect***	
	Push-in effect			***Push-out effect***				
Contiguity Matrix (1)	*ITAE* does not cause LFDI (2)*	*LFDI* does not cause LFDI (3)*	*INSEC* does not cause LFDI (4)*	*LFDI does not cause ITAE* (5)*	*LFDI does not cause LFDI* (6)*	*LFDI does not cause INSEC* (7)*	*INSEC does not cause LFDI (8)*	*LFDI does not cause INSEC (9)*
Guanajuato	0.97(0.43)	0.61(0.68)	**2.25(0.05)**	0.14(0.98)	**4.28(0.00)**	**2.94(0.01)**	1.53(0.19)	0.35(0.88)
Hidalgo	0.84(0.52)	1.17(0.33)	0.66(0.65)	1.44(0.22)	0.85(0.51)	1.52(0.19)	**3.26(0.01)**	0.51(0.76)
Jalisco	**2.48(0.04)**	1.76(0.13)	0.13(0.98)	0.60(0.69)	0.48(0.78)	0.52(0.75)	0.31(0.90)	0.72(0.60)
State of Mexico	0.45(0.50)	0.04(0.84)	**7.61(0.00)**	0.18(0.66)	1.63(0.20)	1.52(0.22)	**5.28(0.02)**	**3.16(0.07)**
Michoacan	3.44(0.06)	0.61(0.43)	0.03(0.84)	0.67(0.41)	2.30(0.13)	0.17(0.68)	0.02(0.88)	0.60(0.43)
Morelos	0.68(0.60)	1.25(0.29)	0.99(0.41)	**2.43(0.05)**	1.73(0.15)	0.69(0.59)	0.79(0.53)	**2.24(0.07)**
Nayarit	0.58(0.70)	1.57(0.17)	1.74(0.13)	0.44(0.81)	0.21(0.95)	1.53(0.19)	0.90(0.48)	**2.47(0.04)**
Nuevo Leon	**2.28(0.08)**	0.93(0.42)	1.28(0.28)	0.10(0.95)	1.38(0.25)	0.74(0.52)	0.40(0.74)	1.11(0.34)
Oaxaca	0.36(0.86)	**4.16(0.00)**	**2.60(0.03)**	1.21(0.31)	1.54(0.18)	0.52(0.75)	0.28(0.91)	1.08(0.37)
Puebla	0.67(0.64)	0.45(0.80)	**3.34(0.00)**	0.43(0.82)	**3.78(0.00)**	**2.50(0.03)**	1.97(0.09)	1.24(0.29)
Queretaro	0.24(0.86)	0.29(0.82)	1.59(0.19)	0.85(0.47)	1.84(0.14)	**2.73(0.05)**	0.73(0.53)	1.53(0.21)
Quintana Roo	0.56(0.72)	1.23(0.30)	0.88(0.49)	1.61(0.16)	0.23(0.94)	0.52(0.76)	0.34(0.88)	**2.33(0.05)**

Table 1 (*continue*)

1999:01 to 2019:04	***Effects between entities***						***Within entity effect***	
	Push-in effect			***Push-out effect***				
Contiguity Matrix (1)	*ITAE* does not cause LFDI (2)*	*LFDI* does not cause LFDI (3)*	*INSEC* does not cause LFDI (4)*	*LFDI does not cause ITAE* (5)*	*LFDI does not cause LFDI* (6)*	*LFDI does not cause INSEC* (7)*	*INSEC does not cause LFDI (8)*	*LFDI does not cause INSEC (9)*
Sinaloa	0.13(0.71)	1.55(0.21)	1.46(0.23)	0.40(0.52)	0.06(0.79)	0.00(0.97)	**2.97(0.08)**	0.66(0.41)
San Luis Potosi	1.97(0.09)	0.83(0.53)	1.74(0.13)	0.46(0.79)	0.15(0.97)	**2.06(0.08)**	0.37(0.86)	1.22(0.30)
Sonora	**3.66(0.05)**	1.13(0.29)	**4.29(0.04)**	**5.89(0.01)**	2.43(0.12)	0.20(0.65)	1.99(0.16)	2.66(0.10)
Tabasco	0.45(0.81)	1.07(0.38)	0.31(0.90)	0.85(0.51)	**3.09(0.01)**	0.35(0.87)	1.25(0.29)	0.60(0.69)
Tamaulipas	0.89(0.49)	1.24(0.29)	**2.79(0.02)**	1.09(0.37)	0.63(0.67)	1.92(0.10)	1.87(0.11)	**2.09(0.07)**
Tlaxcala	0.17(0.97)	1.72(0.14)	1.29(0.27)	0.93(0.46)	1.22(0.30)	0.70(0.62)	**3.98(0.00)**	1.14(0.34)
Veracruz	0.28(0.91)	1.29(0.27)	0.53(0.75)	0.35(0.87)	1.18(0.32)	1.04(0.39)	1.09(0.37)	0.59(0.70)
Yucatan	0.42(0.83)	0.28(0.92)	0.81(0.54)	1.16(0.33)	0.43(0.82)	1.30(0.27)	1.05(0.39)	**2.21(0.06)**
Zacatecas	0.82(0.53)	1.27(0.28)	1.59(0.17)	0.93(0.46)	1.69(0.14)	**1.98(0.09)**	**2.99(0.01)**	1.18(0.32)

Null hypothesis: A* does not Granger cause B. P-value shown in brackets. Variables FDI, NFDI and RFDI are in natural logarithmic scale. For transformation: Ln(x) = ln(x+0.0001) if x = 0, and ln(x) if x >0.

Source: author's own ellaboration based on data from Inegi (2021) and Secretaría de Economía (2021).

within these states. The latter is an indication that in the aforementioned states, some investments attract insecurity and vice versa.

3.2. Spatial Impulse response analysis

The SpVAR was estimated for each federal entity. To begin, the optimal number lags were identified, and the stability tests were applied. Results of characteristic roots indicate that the SpVAR satisfied the stability conditions.[2]

In the estimation of SpVAR models, the impulse-response function provides us with cyclic information about the behavior and interdependence between regions (Márquez *et al.*, 2014). With impulse-response functions one can quantify the impacts that a region has on its neighbors (push-out spillovers), and the impact that the neighbors have on a specific region (push-in spillovers).

Table 2 shows the quantification of the effects generated by gross domestic product growth at state level considering the contemporary effect. According to columns 2-4 of table 2, after a minor shock in neighbor states, Campeche generates and increase of 1.93%, 1.12% and 2.17% in total foreign direct investment (FDI*), new investment (NFDI*) and reinvestment (RFDI*), respectively. Chiapas is the state with the greatest increases when its neighbors modify the variables mentioned above (3.02%, 3.58% and 4.37%, respectively). Tabasco and Nuevo Leon are the most benefitted entities when new investment in their neighbors is modified, (4.37% and 4.07%, respectively), whereas reinvestment done by neighbors greatly benefits the reinvestment of Chiapas (4.37%), Guanajuato (4.32%), Oaxaca (4.42%) and Tabasco (4.64%).

Columns 5-10 in table 2 show that a small increasing shock of production (ITAE*) and insecurity (INSEC*) of the neighbors of an entity, does not have a significant effect in FDI, NFDI and RFDI of states, since the impact is less than or equal to 1.5%. The negative value observed for Yucatan (column 6) means that the economic growth of neighbors decreases new investments in the state. The latter is an indication that the economic growth and insecurity are not the most important components that affect the total investment, new investment, and reinvestment, except for a few entities like Coahuila (0.71%), Guanajuato (0.77%), Hidalgo (1.29%), where the insecurity of their neighbors positively affects the flow of total FDI towards them.

[2] Normality, autocorrelation and heteroskedasticity tests indicate that most states fulfill the correct specification tests, except for Chihuahua, Quintana Roo, Sonora y Yucatan. These states normality test indicates that residuals do not follow a normal distribution. For the autocorrelation test, Mexico City and Michoacan failed this assumption. Finally, the SPVAR for Coahuila, Nuevo Leon y Zacatecas presented heteroskedasticity problems. Due to space restrictions, we do not include results of corresponding tests.

Table 2
Generalized impulse-response by federal entity and their respective neighbors

1999:01 to 2019:04	***Effects between entities***																	
	Push-in spillovers									***Push-out spillovers***								
	From FDI, NFDI*, RFDI* to*			*From ITAE* to*			*From INSEC* to*			*From FDI, NFDI, RFDI to*			*From FDI, NFDI, RFDI to*			*From FDI, NFDI, RFDI to*		
Federal entity	*FDI (2)*	*NFDI (3)*	*RFDI (4)*	*FDI (5)*	*NFDI (6)*	*RFDI (7)*	*FDI (8)*	*NFDI (9)*	*RFDI (10)*	*FDI* (11)*	*NFDI* (12)*	*RFDI* (13)*	*ITAE* (14.a, 14.b, 14.c)*			*INSEC* (15.a, 15.b, 15.c)*		
Aguascalientes[1]	0.10	1.97***	2.39***	-1.29**	-0.71	0.66	-1.45**	-0.95	-0.41	0.06	1.55***	3.02***	-0.35**	-0.26	0.35	-0.01	-0.01	-0.01
Baja California[1]	0.09**	0.31	2.6***	-0.02	-0.11	-0.27	-0.03	-0.93	0.11	0.66**	0.21	2.73***	-0.13	-0.06	-0.18	0.00	-0.01	0.00
Baja California Sur[2]	0.13**	0.06	1.87***	-0.03	-0.19***	0.15	0.06	0.05	0.97**	0.10**	0.41	1.16***	-0.18	-0.9***	0.10	0.00	0.00	0.01
Campeche[2]	1.93***	1.12***	2.17***	-0.77	-0.88	-0.10	-0.57	-0.89	-0.11	0.85***	0.85***	2.29***	-0.20	-0.32	-0.05	0.00	-0.01	0.00
Mexico City[1]	0.13	1.57***	3.11***	-0.31	-0.06	-0.29	0.12	0.52	-0.37	0.13	1.55***	2.45***	-0.25	-0.04	-0.15	0.00	0.01	0.00
Chihuahua[1]	1.41***	3.07***	2.07***	0.09	-0.01	0.39	0.36	0.42	0.52	1.71***	1.97***	1.52***	0.08	0.00	0.18	0.01	0.00	0.01
Chiapas[2]	3.02***	3.58***	4.37***	-0.24	-0.44	-0.25	0.76	-0.06	-1.08**	2.21***	2.86***	3.31***	-0.06	-0.11	-0.07	0.01	0.00	-0.01
Coahuila[2]	0.98***	2.37***	0.83***	0.32	0.71	-0.32	0.71**	1.06**	-0.39	0.81***	2.12***	0.68***	0.14	0.22	-0.14	0.01	0.01	-0.01
Colima[1]	1.07	1.15**	0.88***	0.00	0.62	-0.05	1.13	1.16**	0.12	0.72	0.98**	1.1***	0.00	0.23	-0.04	0.01	0.01	0.00
Durango[1]	1.40***	2.70***	1.73	-0.16	-0.93	0.10	-0.25	0.77	-0.36	0.53***	1.52***	1.32***	-0.06	-0.26	0.04	0.00	0.01	0.00
Guerrero[1]	0.95	0.98**	3.15***	-0.49	-0.47	1.09***	-0.03	0.97**	-0.01	0.47	0.76**	2.21***	-0.16	-0.17	0.37***	0.00	0.01	0.00

Table 2 (*continue*)

1999:01 to 2019:04	***Effects between entities***																	
	Push-in spillovers									***Push-out spillovers***								
	From FDI, NFDI*, RFDI* to*			*From ITAE* to*			*From INSEC* to*			*From FDI, NFDI, RFDI to*			*From FDI, NFDI, RFDI to*			*From FDI, NFDI, RFDI to*		
Federal entity	*FDI (2)*	*NFDI (3)*	*RFDI (4)*	*FDI (5)*	*NFDI (6)*	*RFDI (7)*	*FDI (8)*	*NFDI (9)*	*RFDI (10)*	*FDI* (11)*	*NFDI* (12)*	*RFDI* (13)*	*ITAE* (14.a, 14.b, 14.c)*			*INSEC* (15.a, 15.b, 15.c)*		
Guanajuato[1]	0.64	2.42***	4.32***	-0.20	-0.51	-0.65	0.77**	0.68**	-0.08	0.38	2.52***	2.94***	-0.09	-0.23	-0.18	0.01	0.01	0.00
Hidalgo[3]	3.53***	3.29***	1.00***	-0.62	0.11	-0.18	1.29**	0.49	-0.32	1.03***	1.73***	0.83***	-0.18	0.03	-0.09	0.01	0.00	0.00
Jalisco[1]	0.12	2.46***	3.85***	-0.97	-0.75	-1.70***	-0.11	0.36	-0.15	0.05	1.36***	2.14***	-0.31	-0.25	-0.43***	0.00	0.00	0.00
State of Mexico[2]	0.40***	3.25***	2.02***	0.11	1.55***	-0.01	0.05	1.74***	-0.30	1.21***	2.25***	1.54***	0.24	0.55***	0.00	0.00	0.02	0.00
Michoacan[1]	1.06	2.63***	4.35***	0.10	0.15	-0.16	-0.63	-0.14	0.50	0.36	1.36***	2.96***	0.03	0.04	-0.05	-0.01	0.00	0.00
Morelos[2]	1.55***	2.17***	3.09***	-0.85	-0.05	-0.06	-0.16	1.13	-0.05	0.48***	1.19***	2.08***	-0.21	-0.01	-0.02	0.00	0.01	0.00
Nayarit[2]	-0.09	0.06	2.00***	0.00	-0.03	0.36	0.04	0.03	-0.32	-0.34	0.10	1.72***	-0.01	-0.02	0.17	0.00	0.00	0.00
Nuevo Leon[1]	1.81***	4.07***	0.39	-0.37	-0.18	0.17	0.34	1.34	-0.67	0.63***	2.15***	0.30	-0.13	-0.04	0.08	0.00	0.01	-0.01
Oaxaca[1]	0.75	2.74***	4.42***	0.56	-0.62	-0.16	0.92	0.50	0.61	0.39	1.63***	2.96***	0.16	-0.17	-0.04	0.01	0.00	0.00
Puebla[2]	-0.22	2.97***	3.38***	0.49	0.14	0.09	-0.30	0.18	0.03	-0.15	2.21***	2.8***	0.19	0.04	0.03	0.00	0.00	0.00
Queretaro[1]	0.09	1.13***	3.01***	-0.14	0.30	1.29***	0.07	0.26	-0.41	0.08	0.84***	1.87***	-0.09	0.10	0.43***	0.00	0.00	0.00
Quintana Roo[1]	-0.03	0.42	1.56***	-0.19	0.29	-0.14	0.16	0.18	-0.16	-0.04	0.57	1.53***	-0.13	0.19	-0.07	0.00	0.00	0.00
Sinaloa[1]	2.09***	3.43***	2.93***	-0.07	-0.50	-0.86	0.52	1.24***	-0.01	1.19***	2.29***	1.77***	-0.03	-0.16	-0.29	0.01	0.01	0.00

Table 2 (*continue*)

1999:01 to 2019:04	***Effects between entities***																	
	Push-in spillovers									***Push-out spillovers***								
	From FDI, NFDI*, RFDI* to*			*From ITAE* to*			*From INSEC* to*			*From FDI, NFDI, RFDI to*			*From FDI, NFDI, RFDI to*			*From FDI, NFDI, RFDI to*		
Federal entity	*FDI (2)*	*NFDI (3)*	*RFDI (4)*	*FDI (5)*	*NFDI (6)*	*RFDI (7)*	*FDI (8)*	*NFDI (9)*	*RFDI (10)*	*FDI* (11)*	*NFDI* (12)*	*RFDI* (13)*	*ITAE* (14.a, 14.b, 14.c)*			*INSEC* (15.a, 15.b, 15.c)*		
San Luis Potosi[2]	0.96**	2.92***	2.59***	0.51	0.82	1.72***	-0.61	-0.45	-1.42***	0.56**	2.00***	1.23***	0.19	0.25	0.44***	-0.01	0.00	-0.01
Sonora[2]	0.39	2.45***	3.12***	0.16	0.28	1.11	0.54	-0.03	-0.45	0.15	1.5***	1.68***	0.07	0.11	0.45	0.00	0.00	0.00
Tabasco[1]	3.07***	4.37***	4.64***	-0.33	-0.48	-0.78	-0.89	-0.57	-0.33	1.89***	3.41***	3.40***	-0.09	-0.15	-0.24	-0.01	-0.01	0.00
Tamaulipas[1]	0.21***	2.83***	2.70***	-0.02	-0.79	0.73	0.15**	2.41***	-0.24	0.88***	1.86***	1.85***	-0.04	-0.21	0.28	0.01	0.02	0.00
Tlaxcala[1]	1.85***	2.93***	3.74***	0.57	0.68	0.52	0.06	0.49	0.27	1.12***	2.58***	2.76***	0.25	0.28	0.21	0.00	0.00	0.00
Veracruz[1]	3.13***	4.18***	1.1***	-0.66	-0.35	1.63***	0.63	-0.08	-0.44	1.58***	2.68***	0.74***	-0.19	-0.09	0.53***	0.01	0.00	0.00
Yucatan[1]	0.25	1.44***	2.67***	0.41	**-5.00****	-0.30	-0.03	0.31	0.46	0.25	0.80***	1.69***	-0.07	-0.23	-0.14	0.00	0.00	0.00
Zacatecas[1]	0.10	2.52***	3.46***	0.74	0.03	0.67	0.30	0.86	-0.19	0.03	1.17***	1.98***	0.13	0.01	0.22	0.00	0.01	0.00

** 10% statistical significance, *** 5% statistical significance.

Numbers following the name of the entity in column one indicate: 1 for 1-lag test; 2 indicates a 2-lag test, and 3 indicates a 3-lag test.

Source: author's own ellaboration based on data from Inegi (2021) and Secretaría de Economía (2021).

It is worth noting that, contrary to other studies, the SpVAR methodology used here allows to capture the bidirectional relationship between the considered variables, instead of limiting the real explanation of the independent variable due to the unidirectional relationship modeled, for instance, by fixed effect panel data and dynamic panel data methodologies, such as that used Ramos and Ashby (2017), who analyze the effect of violent crimes on FDI in Mexican states, and who show that the lag of the variable is important to explain future FDI performance. In the same manner, Madrazo (2009) applied a panel data methodology to study the effect of violent crime on FDI; both studies found a negative relationship of violent crimes with FDI, but they do not provide any evidence on how a region's neighbors might affect the regional FDI.

Columns two to four of table 3 show a minor disturbance in FDI, NFDI and RFDI, which positively affects these variables in time. The impact of these variables in time is more important than the impact in other variables like growth or insecurity (these impacts are not included due to a lack of space). The effects of insecurity and economic growth of entities shown in column 5 of table 3 (columns 5-10), have a small effect on the different components of investment. Some entities have a negative impact, like Colima, Puebla, Tabasco and Zacatecas (-2.16%, -1.39%, -1.95%, and -1.30%, respectively). Negative effects indicate that the past insecurity has negatively influenced investment in these states.

Table 3
Generalized impulse-response within federal entities

1999:01 to 2019:04	*Effects within entities*								
	From FDI, NFDI and RFDI to			*From INSEC to*			*From ITAE to*		
Federal entity (1)	*FDI* (2)	*NFDI* (3)	*RFDI* (4)	*FDI* (5)	*NFDI* (6)	*RFDI* (7)	*FDI* (8)	*NFDI* (9)	*RFDI* (10)
Aguascalientes[1]	7.08***	5.55***	3.88***	1.08	0.59	0.47	-0.21	-0.19	0.60
Baja California[1]	0.49***	5.17***	4.48***	0.02	0.20	0.37	0.06	-0.21	0.63
Baja California Sur[2]	0.69***	0.71***	5.21***	0.07	-0.00	-0.23	-0.01	-0.03	0.57
Campeche[1]	6.94***	4.98***	3.74***	-0.60	-1.11 ***	0.04	-0.04	-0.94 **	-0.66
Mexico City[3]	3.32***	4.04***	5.28***	-0.25	0.13	-1.94 ***	-0.41	-0.20	-0.28
Chihuahua[1]	2.7***	6.68***	4.86***	0.12	0.11	-0.02	0.12	0.69	0.56
Chiapas[1]	5.36***	6.05***	5.30***	1.03**	1.03	-0.23	-0.31	0.36	0.85
Coahuila[2]	3.83***	5.16***	3.63***	0.65	1.00**	-0.02	0.23	0.08	-0.40
Colima[1]	6.23***	5.74***	3.11***	-2.16 ***	-0.51	0.37	-0.02	0.93	-0.22
Durango[2]	5.86***	6.45***	4.85***	-0.41	-0.67	0.21	0.65	1.63***	0.37
Guerrero[1]	5.50***	5.10***	4.65***	0.03	-0.09	0.10	-0.46	0.25	0.82
Guanajuato[2]	4.04***	3.47***	6.11***	0.71	0.73**	-0.65	-0.13	0.04	0.23
Hidalgo[1]	6.30***	7.38***	3.58***	0.79	1.22	-0.44	-0.25	-0.49	0.25

Table 3 (*continue*)

1999:01 to 2019:04	*Effects within entities*								
	From FDI, NFDI and RFDI to			*From INSEC to*			*From ITAE to*		
Federal entity (1)	*FDI* (2)	*NFDI* (3)	*RFDI* (4)	*FDI* (5)	*NFDI* (6)	*RFDI* (7)	*FDI* (8)	*NFDI* (9)	*RFDI* (10)
Jalisco[1]	5.38***	5.39***	6.90***	-0.08	-0.01	0.79	-0.75	-0.23	-1.27 **
State of Mexico[2]	0.83***	4.92***	5.03***	-0.14	0.70	-0.92 **	-0.00	1.08***	-0.49
Michoacan[1]	6.22***	5.70***	5.46***	-0.08	-0.30	0.81	-0.32	-0.70	-0.41
Morelos[2]	6.78***	6.40***	4.82***	0.50	0.87	0.22	-0.59	-0.45	0.05
Nayarit[1]	0.84***	2.30***	3.36***	-0.00	0.14	-0.85 ***	0.03	0.04	-0.59
Nuevo Leon[2]	6.01***	7.91***	4.49***	0.68	-0.96	0.08	0.20	-0.35	0.18
Oaxaca[1]	6.12***	6.59***	6.44***	-0.41	-0.17	1.69***	0.42	-1.03	-0.41
Puebla[1]	4.67***	5.49***	4.61***	-1.39 ***	0.34	-0.50	-0.02	0.64	0.58
Queretaro[2]	2.99***	4.98***	5.00***	-0.08	1.11***	-0.26	0.82***	1.12***	1.97***
Quintana Roo[2]	2.91***	2.92***	3.87***	-0.03	0.01	-0.19	-0.07	-0.38	-0.30
Sinaloa[2]	4.58***	5.64***	5.70***	0.12	1.32***	-0.73	0.55	-0.44	-0.22
San Luis Potosi[1]	4.51***	5.75***	6.03***	0.14	0.57	1.76***	0.76	1.43***	1.56***
Sonora[2]	6.11***	7.4***	6.97***	0.92	0.72	0.98	-0.34	0.92	1.13
Tabasco[1]	6.46***	5.80***	6.13***	-1.95 ***	-0.61	-0.86	-0.21	-0.77	0.23

Table 3 (*continue*)

1999:01 to 2019:04	*Effects within entities*								
	From FDI, NFDI and RFDI to			*From INSEC to*			*From ITAE to*		
Federal entity (1)	*FDI* (2)	*NFDI* (3)	*RFDI* (4)	*FDI* (5)	*NFDI* (6)	*RFDI* (7)	*FDI* (8)	*NFDI* (9)	*RFDI* (10)
Tamaulipas[1]	0.76***	7.31***	5.09***	-0.01	-0.82	0.09	-0.08	-0.85	-0.33
Tlaxcala[2]	4.64***	5.03***	5.08***	0.11	0.05	0.83	-0.08	0.73	-0.83
Veracruz[1]	5.16***	6.17***	4.75***	0.48	-0.16	0.06	-0.06	0.20	0.57
Yucatan[1]	3.74***	5.32***	5.60***	0.01	-0.05	-0.45	0.11	1.11**	-0.57
Zacatecas[1]	6.77***	6.06***	5.49***	-1.39 **	-0.84	-0.44	0.77	-0.78	0.23

** Indicates 10% statistical significance, *** indicates 5% statistical significance.
Numbers following the name of the entity in column 1 indicate: 1 for 1-lag test; 2 indicates a 2-lag test, and 3 indicates a 3-lag test.
Source: author's based on data from Inegi (2021) and Secretaría de Economía (2021).

Conclusions

Foreign Direct Investment (FDI) had a differentiated effect on federal entities in Mexico. This work has shown, through the spatial VAR technique, that reinvestments in the neighbor states largely determine reinvestment in a particular state, generating spillovers throughout the different states in the country. Additionally, performance of new investments is determined by past performance of new investments within the state; this is, if a state received new FDI in the past, its likelihood of seeing more new investment increases, as it was found for Hidalgo, Nuevo León, Sonora and Tamaulipas.

Stylized facts showed that neither economic growth nor insecurity are major determinants of new investments or reinvestments, but these are explained by other factors. In other words, both insecurity and economic growth have failed to be relevant variables to explain FDI.

We have also shown that FDI generates benefits both within the state and to its neighbors, and that total foreign direct investment, reinvestment and new investment are mostly explained by their own lags, but also by past performance of these investments in neighboring entities.

It is worth noting that the states' own lags throughout time are larger than neighbors' lags or the effect that a state has over its neighbors. Regarding the effect of variables themselves in time, which have an influence on future investment within entities, we found a 5.3% for new investment, 4.8% for reinvestment and 4.3% for total investment. This implies that past performance is more important for new investments within states than it is for neighboring states.

Average push-out spillovers of states towards their neighbors are larger in reinvestments (2%) than in new investments (1.6%) or total foreign direct investments (0.6%). However, push-in spillovers are much larger than push-out spillovers; for instance, when reinvestment of a neighbor changes, the spillover in the state is of 2.7%, higher than 0.7%, which is the spillover of a state on its neighbors. These results match those of Márquez *et al.*, (2014; 2010) and Andrés-Rosales *et al.* (2021) in their effects. On the other hand, when new investment of a neighbor changes, the push-in spillover is 2.3%, also 0.7% higher than a state's push-out spillover on neighbors. Finally, the effect of an increase in total FDI in a state is 1% over its neighbors total FDI. What we can conclude is that reinvestment has had a larger effect among states than new investment. These results are hardly comparable with other studies because the SpVAR has been scarcely used for FDI research, but they are somewhat comparable with other research topics that have used the same technique.

With our research, we have shown that both economic growth and insecurity have not largely affected total FDI flows, as also found by Ashby and Ramos (2013) in the sense that companies have learnt to cope with insecurity and are still investing in different states. However, contrary to these authors, we only found a Granger causality in some entities for the Mexican economy. When quantifying these effects in percentage terms and determining the effect of insecurity on FDI, we did not find them significant, and in those entities where the impact was positive, this was less than 2.4% as observed for Tamaulipas, or 1.7% for the State of Mexico. In the rest of the entities, we found no evidence of what the authors found, and this is what is special about spatial analysis, that it cannot be generalized to the whole country, which is what macroeconomic studies do, while spatial analysis quantifies in a more punctual way the behavior of the problem in question.

Madrazo (2009) considers a hypothetical scenario: if Mexico had a zero-homicide rate for every 100 thousand inhabitants during the period 1998-2006, it would have received around 94 extra dollars per capita in FDI each year or around 9,396,720 extra dollars in FDI each year for any city with a population of over 100,000. Nevertheless, we have shown in this study that this amount would be off the mark, given that if a city keeps its insecurity under control, but its neighbors do not, this will have a negative influence over FDI flows to the city. We agree with Ramos and Ashby (2013) in that it is likely that foreign investors have heterogeneous capabilities to evaluate and cope with the high levels of organized crime in host states, which influences the likelihood of investing in them. This may explain the positive effects of insecurity on FDI in some states, but this is not the rule for every entity.

Finally, it is noteworthy that the present research could be analyzed at sectoral and municipal levels, which ould improve the study, since the state level continues to be an aggregate level and treating economic sectors altogether repeats the error of macroeconomic analysis. This will be done in future studies to understand the nature and performance of investment in the country in a better way, and to be able to recommend public policies that address these issues.

Acknowledgments

This work was supported by UNAM-PAPIIT IN303821.

References

Andrés-Rosales, Roldán; Quintana-Romero, Luis; De Jesús-Almonte, Leobardo and Del Río-Rama, María de la Cruz (2021), "Spatial spillovers of economic growth and public spending in Mexico: Evidence from a SpVAR model, 1999-2019", *Economic Analysis and Policy*, vol. 71, Queensland, Economic Society of Australia, pp. 660-673, doi: https://doi.org/10.1016/j.eap.2021.07.004

Anselin, Luc (1988), *Spatial econometrics methods and models*, California, Kluwer Academic Publishers.

Appleyard, Dennis and Field, Alfred (2003), *Economía Internacional*, Ciudad de Mexico, McGraw Hill.

Ashby, Nathan and Ramos, Miguel (2013), "Foreign direct investment and industry response to organized crime: the mexican case", *European Journal of Political Economy,* vol. 30, Amsterdam, Elsevier, pp. 80-91.

Barnes, Paul and Oloruntoba, Richard (2005), "Assurance of security in maritime supply chains: conceptual issues of vulnerability and crisis management", *Journal of International Management*, 11 (4), Amsterdam, Elsevier, pp. 519-540, doi: https://doi.org/10.1016/j.intman.2005.09.008

Barry, Frank; Görg, Holger and Strobl, Eric (2003), "Foreign direct investment, agglomerations, and demonstration effects: an empirical investigation", *Review of World Economics,* 139 (4), Switzerland, Springer, pp. 583-600, doi: https://doi.org/10.1007/BF02653105

Bengoa, Marta y and Sanchez-Robles, Blanca (2003), "Foreign direct investment, economic freedom and growth: new evidence from Latin America", *European Journal of Political Economy*, 19 (3), Amsterdam, Elsevier, pp. 529-545, doi: https://doi.org/10.1016/S0176-2680(03)00011-9

Bennett, Juliette (2002), "Multinational corporations, social responsibility and conflict", *Journal of International Affairs,* 55 (2), New York, Columbia University, pp. 396-410.

Berry, Julie and Levitt, Steven (1999), "Crime, urban flight, and the consequences for cities", *The Review of Economics and Statistics,* 81 (2), Cambridge, Harvard Kennedy School, pp. 159-169, doi: https://doi.org/10.1162/003465399558030

BID (Banco Interamericano de Desarrollo) (2018), *Inversión extranjera como motor del desarrollo para América Latina y el Caribe*, Washington D. C., Banco Interamericano de Desarrollo, <https://tinyurl.com/mr3vwx2v>, October 1st, 2018.

Blonigen, Bruce and Feenstra, Robert, (1997), "Protectionist threats and foreign direct investment", in Robert C. Feenstra (ed.), *The Effects of U.S. Trade Protection and Promotion Policies*, Chicago, University of Chicago Press, pp. 55-80.

Branzei, Oana and Abdelnour, Samer (2010), "Another day, another dollar: enterprise resilience under terrorism in developing countries", *Journal of International Business Studies*, 41 (5), London, Palgrave Macmillan, pp. 804-825, doi: https://doi.org/10.1057/jibs.2010.6

Carbajal Suárez, Yolanda and Vergara González, Reyna (2015), "Inversión extranjera directa e inseguridad en México", *Economía Actual,* 8 (2), Toluca, Universidad Autónoma del Estado de México, pp. 23-29.

Czinkota, Michael; Knight, Gary; Liesch, Peter and Steen, John (2005), "Positioning terrorism in management and marketing: research propositions", *Journal of International Management*, 11 (4), Sydney, Elsevier, pp. 581-604, doi: https://doi.org/10.1016/j.intman.2005.09.011

Daniele, Vittorio and Marani, Ugo (2011), "Organized crime, the quality of local institutions and FDI in Italy: a panel data analysis", *European Journal of Political Economy,* 27 (1), London, Thomson Scientific, pp. 132-142, doi: https://doi.org/10.1016/j.ejpoleco.2010.04.003

DeCoster, Gregory and Strange, William (1993), "Spurious agglomeration", *Journal of Urban Economics,* 33 (3), Ontario Canada, University of Toronto, pp. 273-304, doi: https://doi.org/10.1006/juec.1993.1017

Dunning, John (1993), *Multinational enterprises and the global Economy*, New York, Addison Wesley.

Dussel Peters, Enrique (2004), *La inversión extranjera directa en México: desempeño y potencial. Una perspectiva macro, meso, micro y territorial*, Ciudad de México, Siglo XXI editores.

Ellison, Glenn and Glaeser, Edward L. (1999), "The geographic concentration of industry: does natural advantage explain agglomeration?", *The American Economic Review,* 89 (2), Washington D. C., American Economic Association, pp. 311-316.

Fajnzylber, Pablo; Lederman, Daniel and Loayza, Norman (2002), "Inequality and violent crime", *Journal of Law and Economics*, 45 (1), Illinois, University of Chicago Press, pp. 1-40, doi: https://doi.org/10.1086/338347

Fiorentini, Gianluca and Peltzman Sam (1996), "Oligopolistic competition in illegal markets", in: Gianluca Fiorentini (ed.), *The Economics of Organised Crime*, Cambridge, Cambridge University Press, pp. 274-291.

Globerman, Steven and Storer, Paul (2009), "The Effects of 9/11 on Canadian-U.S. trade: an update through 2008", Washington D. C., The Brookings Institution, <https://goo.su/1YZ4k>, June 9th, 2023.

Granger, Clive W. J. (1969), "Investigating causal relations by econometric models and cross-spectral methods", *Econometrica*, 37 (3), Cleveland, Econometric Society, pp. 424-438.

Greenbaum, Robert; Dugan, Laura and LaFree, Gary (2007), "The impact of terrorism on Italian employment and business activity", *Urban Studies,* 44 (5-6), Glasgow, University of Glasgow, pp. 1093-1108, doi: http://dx.doi.org/10.1080/00420980701255999

Gutiérrez-Portilla Paula; Maza, Adolfo; Villaverde, José and Hierro, María (2016), "Foreign direct investment in the SSpanish regions: what are the influencing factors?", *Journal or Regional Research,* issue 35, Alcalá, Asociación Española de Ciencia Regional, pp. 67-82.

Guzmán Anaya, Leo (2013), "Inter-industry productivity spillovers from Japanese and US FDI in Mexico's manufacturing sector", *Technol-*

ogy and Investment, 4 (4), Wuhan, Scientific Research Publishing Inc., pp. 236-243, doi: http://dx.doi.org/10.4236/ti.2013.44028

Hallward-Driemeier, Mary and Stewart, David (2004), "How do investment climate conditions vary across countries, regions and types of firms? (English)", Washington D. C., World Development Report background papers/ World Bank Group, <https://tinyurl.com/yez35pzy>, April 16th, 2021.

Inegi, (Instituto Nacional de Estadística y Geografía) (2021), "Banco de Información Económica", Aguascalientes, Inegi, <https://acortar.link/1eptO7>, March 12th, 2021.

Krugman, Paul and Venables, Anthony J. (1996), "Integration, Specialization, and Adjustment", *European Economic Review,* 40 (3), Amsterdam, Elsevier, pp. 959-967, doi: https://doi.org/10.1016/0014-2921(95)00104-2

Kuethe, Todd and Pede, Valerien (2011), "Regional housing price cycles: a spatio-temporal analysis using US state-level data", *Regional studies*, 45 (5), London, Taylor & Francis, pp. 563-574, doi: https://doi.org/10.1080/00343400903497897

Lesage, James P. and Cashell, Bryce (2015), "A comparison of vector autorregresive forecasting performance: spatial versus non-spatial Bayesian priors", *The Annals of Regional Science,* 54 (2), Heidelberg, Western Regional Science Association International-Springer, pp. 533-560, doi: https://dx.doi.org/10.1007/s00168-015-0665-1

Lindsey Blanton, Shannon and Blanton, Robert G. (2007), "What attracts foreign investors? An examination of Human Rights and Foreign Direct Investment", *Journal of Politics,* 69 (1), Chicago, The University of Chicago Press Journals, pp. 143-155, doi: https://doi.org/10.1111/j.1468-2508.2007.00500.x

Madrazo, R. Federico (2009), "The effects of violent crime on FDI: the case of Mexico 1998-2006", Masters thesis, Georgetown University, Washington, D. C., <https://goo.su/crRkiN>, August 12th, 2022.

Márquez, Miguel A.; Ramajo, Julián and Hewings, Geoffrey (2010), "A spatio-temporal econometric model of regional growth in

Spain", *Journal of Geographical Systems*, 12 (2), Heidelberg, Springer, pp. 207-226, doi: https://doi.org/10.1007/s10109-010-0119-3

Márquez, Miguel A.; Ramajo, Julián and Hewings, Geoffrey (2014), "Regional growth and spatial spillovers: Evidence from an SpVAR for the Spanish regions", *Papers in Regional Science*, 94 (5), Azores, Wiley-Blackwell, pp. S1-S18, doi: https://doi.org/10.1111/pirs.12102

Mejía, Daniel and Restrepo, Pascual (2010), "Crime and conspicuous consumption", Working paper CEDE No. 2010-32, Bogotá, Universidad de los Andes, doi: http://dx.doi.org/10.2139/ssrn.1720919

Mogrovejo, Jesús (2005), "Factores determinantes de la inversión extranjera directa en algunos países de Latinoamérica", *Estudios Económicos de Desarrollo Internacional (AEEADE)*, vols. 5-2, Santiago de Compostella, Euro-American Association of Economic Development Studies, pp. 63-90.

Oetzel, Jennifer; Getz, Kathleen and Ledk, Stephen (2007), "The role of multinational enterprises in responding to violent conflict: a conceptual model and framework for research", *American Business Law Journal,* 44 (2), Florida, John Wiley & Sons, pp. 331-358, doi: https://doi.org/10.1111/j.1744-1714.2007.00039.x

Pelegrín, Angels and Bolancé, Catalina (2008), "Regional foreign direct investment in manufacturing. Do agglomeration economic matter?", *Regional Studies*, 42 (4), London, Taylor & Francis, pp. 505-522, doi: https://doi.org/10.1080/00343400701543157

QGIS (Quantum Geographical Information System) (2020), "QGIS", version 3.14., San Francisco, QGIS Development Team.

Quintana, Luis and Andrés-Rosales, Roldán (2014), *Técnicas modernas de análisis regional*, Ciudad de México, Plaza y Valdés.

Ramos, Miguel and Ashby, Nathan Ramos (2017), "The halo effect: violent crime and foreign direct investment", *Multinational Business Review,* 25 (4), Branford, Emerald Publishing, pp. 287-306, doi: http://dx.doi.org/10.1108/MBR-04-2017-0020

Ramos, Miguel and Ashby, Nathan (2013), "Heterogeneous firm responses to organized crime: evidence from FDI in Mexico", *Journal of International Management,* 19 (2), Philadelphia, Elsevier, pp. 176-194, doi: https://doi.org/10.1016/j.intman.2013.01.002

Secretaría de Economía (2021), "Inversión Extranjera Directa", Aguascalientes, Secretaría de Economía, <https://tinyurl.com/2p8kfdmn>, March 12th, 2021.

SESNSP (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública) (2021), "Incidencia delictiva del fuero federal", Ciudad de México, Gobierno de México, <https://goo.su/UID0U>, March 10th, 2021.

Torres-Preciado, Víctor Hugo, Polanco-Gaytán, Mayrén and Tinoco-Zermeño, Miguel Á. (2017), "Crime and regional economic growth in Mexico: a spatial perspective", *Papers in Regional Science,* 96 (3), Azores, Wiley-Blackwell, pp. 477-494, doi: https://doi.org/10.1111/pirs.12205

Trevino, Len. J.; Daniels, John and Arbeláez, Harvey (2002), "Market reform and FDI in Latin America: an empirical investigation", *Transnational Corporations*, 11 (1), New York, United Nations Publications, pp. 44-47.

Received: July 14th, 2021.
Forwarded: July 14th, 2022.
Accepted: October 28th, 2022.

Roldán Andrés-Rosales. PhD in Economics from the Universidad Nacional Autónoma de México (UNAM). He is currently professor and researcher in the Department of Social Sciences of the Faculty of Higher Studies Cuautitlán-UNAM, in the State of Mexico. Supervisor and lecturer at the postgraduate course in economics at UNAM. He is a member of the National System of Researchers, level I. His current lines of research are regional economic development and social, cooperative and solidarity economy. His recent publications include, co-authored: "Modeling oil price uncertainty effects on economic growth in Mexico: a sector-level analysis", *Environmental Science and Pollution Research*, 29 (49), Cham, Springer Nature, pp. 73987-74002 (2022); "Análisis espacial de la desigualdad salarial y la precariedad laboral en el sector turístico mexicano", *Contaduría y Administración,* 68 (2), e392, Ciudad de México,

Universidad Nacional Autónoma de México, pp. 271-295 (2023) and "National tourism and its role in the post-covid economic recovery of the Mexican regions", *El Periplo Sustentable*, Toluca, Universidad Autónoma del Estado de México (In press).

Leobardo de Jesús Almonte. PhD in Economics from the Universidad Nacional Autónoma de México. Currently, a professor-researcher at the Faculty of Economics of the Universidad Autónoma del Estado de México (UAEMex). He is a member of the National System of Researchers, level I. His lines of research are employment and economic growth and regional and sectoral economy. His recent publications include; as author: *Lento crecimiento y empleo manufacturero en México. Un análisis de endogeneidad territorial*, Toluca, Eón editores-Universidad Autónoma del Estado de México (2019); co-authored: "Valor agregado en las exportaciones manufactureras del TLCAN, 2005, 2010 y 2015. Un análisis por subsector", *Análisis Económico*, 37 (95), Ciudad de México, Universidad Autónoma Metropolitana unidad Azcapotzalco/División de Ciencias Sociales y Humanidades, pp. 69-88 (2022); and "Productividad manufacturera y crecimiento económico en las entidades federativas de México: un análisis de efectos espaciales, 1998-2018", *Regiones y Desarrollo Sustentable*, 21 (41), Tlaxcala, El Colegio de Tlaxcala, pp. 338-368 (2021).

José Nabor Cruz Marcelo. PhD in Economics from the Universidad Nacional Autónoma de México (UNAM). In 2012, his doctoral thesis on Income Distribution and the Development Model in Mexico, was awarded the Annual Maestro "Jesús Silva Herzog" Economic Research Prize, awarded by the Economic Research Institute (IIEc), UNAM, where he later carried out postdoctoral studies. He is currently a permanent full-time researcher level A and professor in the Economics Postgraduate Program at UNAM. He served as director of the Economics Postgraduate Program and belongs to the National System of Researchers, level I. His publications include; as author: "Income distribution and poverty as obstacles to the recovery crisis in the European Union", *Revista de Relaciones Internacionales, Estrategia y Seguridad*, 10 (1), Bogota, Universidad Militar Nueva Granada, pp. 135-158 (2015); co-authored: "Análisis del impacto reciente de las remesas en el sector de la construcción en Colombia", *Revista internacional de estudios migratorios*, 5 (1), Almería, Centro de Estudios de las Migraciones y las Relaciones Interculturales (CEMyRI), pp. 1-30 (2015).