The new determinant creation theory: the case of Mexico

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Keywords
Foreign direct investment, determinants, public policy, theories.

Abstract

According to the literature related to the movement of foreign direct investment (FDI) worldwide, there are two main causes for these flows. The first one is related to the decision taken by companies to invest in certain markets according to their own international strategy and, the second corresponds to the government's policy designed to attract capital through the use of various factors such as infrastructure, skilled labor, cheap labor, industrial policy, natural resources, gross domestic product, the legal system, geographic location, cancellation fees, among others. Thus, countries attract capitals to certain types of industries using the attractiveness of their determinants.

Considering the above approach, if a government wants to attract capital, should it create new determinants to attract new investments flows or renew the most common used to? This paper is based on the application of the new determinant creation theory. To demonstrate it, Mexico was divided into three regions such as the north, center and south. Each region has certain number of states. The center of the country is the region that captured the largest amount of FDI inflows due to the use of some strategic determinants.

1. Introduction

In recent years, FDI has grown faster than trade flows and global production for various reasons such as political and economic changes in many developing countries. Those changes are characterized by the shift to democratic political systems as well as changes toward economic and legal systems oriented in the direction of trade liberalization in which Mexico played an important role since 1986 when signed as a GATT member. Many developing countries have made economic and structural arrangements in order to obtain some benefits and attract FDI. Because of such liberalization and changes, the FDI increased in developing countries in the 1990´s (Erdal and Tatoglu, 2002).

Since 1993, the FDI became an important source of private capitals outflows and inflows for Mexico as well as for many countries around the world. From that year, Mexico's public policy oriented to FDI flows uptake changed since a new foreign investment law was created. The new law expressed the need to encourage domestic and foreign productive investment within the country. Later on, in 2007 the PROMEXICO federal office was open for the purpose of attracting investment flows through different strategies like working together with the 32 states to make them attractive to foreign capitals.

The attractiveness of a state or a city depends on the number and kind of determinants they possess. Based on the 32 Mexico´s states reports, the most relevant determinants used to obtain FDI are infrastructure, skilled labor, low labor cost, security, tax-break, natural resources, gross domestic product, legal system, geographical location and industrial policy. Related to industrial policy, Deichmann *et al.* (2003) found that some factors determining the spatial decisions of multinational firms in a Middle East country depend on policy implications.

Considering the above, the government agenda should focus on making the country more attractive for FDI, especially in times of crisis when traditional determinants are put to the test and inspire proposals for new opportunities. Popovici (2012) notes that the idea of entering a new era of determinants of FDI is not new as there are several studies that highlight the key factors for attracting FDI. This emphasizes that the classical theories of FDI probably should be changed and others should be based on the emergence of new local capacities.

This research is divided as follows. In second part, a literature review is offered. Several papers were analyzed to describe the key factors for attracting FDI based on classical theories in order to compare them with the determinants used by Mexican government during 2000 to 2013. Section three includes the data and variables used to demonstrate the models proposed in section five. Descriptive statistics are presented in section four and finally, conclusions are discussed in section six.

2. Literature review

Most of the literature related to the attraction of FDI by countries is based on different theories such as localization economies and their determinants or related to trade and resource endowments. In that sense, the eclectic paradigm of Dunning (1988) argues that the path FDI takes is partly due to the specific advantages which one country has, based upon its regional geographic location and / or location in the world. These advantages arise from using resource endowments and / or assets held abroad by some countries in the world which are attractive to a company by combining them with its own resources.

That combination suggests that if a foreign company wants to use the resources of a country, it should establish a subsidiary by initiating a flow of FDI and then establish a start-up of an operating facility (Hill, 2008).

Likewise, the theory of international production suggests that the decision of a company to start manufacturing operations in other countries depends on certain attractions that the country of origin of the company has compared to the resources and benefits that it will obtain in locating a manufacturing subsidiary abroad (Morgan and Katsikeas, 1997). The theory of trade and resource endowment explains that FDI is directed toward countries with low wages and abundant natural resources that provide inherent differences of opportunity and initial favorable conditions for businesses.

There is a consensus as to the characteristics required for a host country to attract FDI which is that it depends on the motivations that foreign investors have in relation to their investment projects . According to Dunning (1983), the first reason is related to the market, whose main purpose is to serve local and regional markets from the FDI host country if the market grows and generate some return for the investor, the second relates to the investment made by a company in acquiring resources that are not available in the country of origin such as natural resources and low-cost inputs including labor. The latter corresponds to the level of efficiency achieved through the dispersion of value chain activities considering that the geographical proximity to the country of origin will minimize transportation costs. All this suggests that the direction in which FDI is aimed, is highly related to the comparative advantages (Kinoshita, 2003) of a given country. Then, one country that has, among other determinants, access to markets as well as cheap labor and abundant natural resources will attract large inflows of FDI.

Berkoz (2009) argues that countries have traditional factors and environmental variables that are attractive to foreign companies. The traditional factors are market potential, labor costs, economic growth and government policies. The environmental variables correspond to political, economic, legal and infrastructural factors.

Kinoshita (2003) in turn, maintains that the most important determinants a country has to attract FDI are government institutions, natural resources and economies of agglomeration. Government institutions are one factor contributing to decisions by investors as to whether to invest

or not in a particular country because these institutions directly affect the operating conditions of enterprises. The investment cost for companies is not only economic but they also have to fight against entrenched practices in countries such as bribery and time lost in engaging in diverse and various negotiations resulting from the arrival of the company to a new market. Therefore, for the operating conditions of a company to appear reliable to the investor, there are two institutional variables to be considered: The legal system and the quality of the bureaucracy. As for the legal system, both its impartiality as well as popular perception of it is good determinants of the reliability of legal institutions in the country. Likewise, the variable related to the quality of the bureaucracy describes a non-political and professional bureaucracy which in turn facilitates the procedures for staff to be hired. With respect to agglomeration economies, investors seek those markets where there are benefits derived from the concentration of economic units which results in positive externalities (benefits and technological spill, use of skilled labor and concentrated in specific locations and links forward and backward with related industries) but also by investments made by other investors which can be seen as a positive sign of favorable investment conditions reducing uncertainty. As for the natural resources, Rasiah (2000) argues that developing economies with a resource-rich endowment obtains FDI.

Other studies describing the FDI determinants indicate that the infrastructure, good governance, taxes (Rasiah, 2000) and the labor market are conditions that governments must maintain (Bellak, et. al., 2010) but Lim (1983) found a negative relationship between investment incentives and FDI in 27 developing countries.

Groh and Wich (2009) describe the attractions to attract FDI in a country as labor costs, quality and the provision of quality infrastructure and legal systems. On the other hand, some authors consider that the provision of infrastructure should be a precondition for companies to establish subsidiaries in foreign markets as are a major emphasis on the provision of transport infrastructure as well as information and communication technologies (Botric and Skuflic, 2006, Goodspeed, et. al., 2009). Studies by Wei *et al*. (1999), Mariotti and Piscitello (1995), Broadman and Sun (1997) and He (2002) conclude that there is a positive relationship between infrastructure and FDI because the better the infrastructure is in a location the higher its desirability. Rasiah (2000), states out that FDI in developing countries is concentrated in economies endowed with good infrastructure.

In a recent research conducted by Botello and Davila (2013), concluded that public policy used in some states of Mexico to attract FDI, is based on the attractiveness of some determinants like skilled labor, cheap labor and infrastructure.

As opposed to what Botello and Davila (2013) concluded, Ondrich and Wasylenko (1993) and Rasiah (2000) found that there is no evidence that wages affect the location of new foreign plants, specially cheap labor but that it´s not the case for skilled labor. Flexible production forms have given rise to greater dispersal of organizational power as well as process innovation; local accumulation at peripheral sites has stimulated economic progress, albeit only in locations generating the requisite skills (Rasiah, 2000), suggesting that specialized FDI requires skilled labor. In the same way, Mendoza (2011) found that manufacturing companies established with foreign economic resources in Mexico demands skilled labor.

According to the research studies mentioned above, there are similarities in the description of the traditional determinants, which explain the attractiveness of a country with respect to foreign capital which suggests that the design of public policy in some countries and Mexico in particular, in relation to attracting financial resources from abroad, is very similar. In the case of Mexico, the statistics of attracting FDI for the period covering 2000 to 2013 show that relationship. In fact, the 32 Mexico´s states reports for 2000 to 2013 showed that the most common used determinants for attracting FDI are infrastructure, skilled labor, cheap labor, industrial policy, natural resources, gross domestic product, the legal system, geographic location, tax break and security. Berkoz (2009) found

almost the same determinants for the case of Turkey and suggests that a location analysis needs to be done in order to develop specific growth strategies to be applied by policy-makers in their plans to attract FDI to certain locations.

Figueroa (2012) assumes that tax facilities, proximity to markets, and cheap labor are insufficient factors to guarantee the cycle of capital, since what stands out is the outgoing transfer of the innovation activity itself, which suggests that the attraction of new FDI flows requires the creation of new determinants or the renewal of the most used. The advance of global knowledge has become itself as an attractive determinant to catch the attention of investors. In recent years, many countries around the world are worried about the way they are going to attract capitals. Should they create new determinants or renewal the ones that are always used? As for the case of Mexico, an FDI behavior from 2000 to 2013 is described in section 5.

3. Objectives, Variables, Hypotheses and Data

3.1 Objectives

The objective of this research is to make a comparison between the north, the center and the south of Mexico about the use of determinants to attract FDI from 2000 to 2013 based on the new determinant creation theory.

3.2 Variables

The dependent variable used in this research is:

3.2.1 fdi (amount of foreign direct investment). Foreign Direct Investment (FDI) has been selected as a dependent variable relative to the amount of Mexico´s foreign direct investment inflows from 2000 to 2013.

The independent variables in their different modalities that will be considered for the theoretical model are:

3.2.2 ifra (infrastructure). This variable explains if infrastructure was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico. Infrastructure is considered as paved roads (km) and airports (number).

3.2.3 qualab (qualified labor). This variable explains if skilled labor was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico. This variable was measured by the number of professionals that a State has.

3.2.4 wage (minimum wage). This variable explains if low cost labor was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico.

3.2.5 sec (security). This variable explains if security was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico. A few Mexican States offer through their annual reports security for international investors.

3.2.6 taxex (exemption from tax payment). This variable explains if exemption from tax payment was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico. Some Mexican States offer in their annual reports tax payment exemptions for international investors.

3.2.7 natures (natural resources). This variable explains if natural resources were used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico. Some Mexican States offer in their annual reports natural resources to be used by international firms.

3.2.8 gnp (gross national product). This variable explains if gross national product was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico. A few Mexican states offer as an argument to attract capital from abroad that they have well-developed industries.

3.2.9 legal (legal framework). This variable explains if a legal framework was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico.

3.2.10 geoloc (geographical location). This variable explains if geographical location was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico.

3.2.11 indpol (industrial policy). This variable explains if a foreign direct investment industrial policy was used as a determinant to attract foreign direct investment from 2000 to 2013 by the 32 states of Mexico.

3.2.12 impde (improvement of determinants). This variable was selected as a dependent variable to use it in the *probit* model in order to explain if the probability of improvement of the determinants used to attract foreign direct investment contributed to increase inflows from 2000 to 2013 by the 32 states of Mexico.

3.3 Hypotheses

For main model is:

H_1: The attraction of foreign direct investment depends on infrastructure development, on skilled labor, on low cost labor, on security, on tax exemption, on natural resources, on gross national product, on geographical location and industrial policy within Mexico from 2000 to 2013.

For main model with equation for efficiency:

H_2: The attraction of foreign direct investment depends on skilled labor, low cost labor, tax exemption, natural resources, gross national product, legal framework and industrial policy within Mexico from 2000 to 2013.

For main model of North zone:

H_3: The attraction of foreign direct investment depends on infrastructure development, on skilled labor, on low cost labor, on security, on tax exemption, on natural resources, on gross national product, on geographical location and industrial policy within Mexico from 2000 to 2013.

For North model with equation for efficiency:

H_4: The attraction of foreign direct investment depends on low cost labor, tax exemption and natural resources within Mexico from 2000 to 2013.

For main model of Centre Zone:

H_5: The attraction of foreign direct investment depends on infrastructure development, on skilled labor, on low cost labor, on tax exemption, on natural resources, on gross national product, on geographical location and industrial policy within Mexico from 2000 to 2013.

For Centre Zone model with equation for efficiency:

H_6: The attraction of foreign direct investment depends on infrastructure development, on skilled labor, on low cost labor and natural resources within Mexico from 2000 to 2013.

For main model of south zone:

H_7: The attraction of foreign direct investment depends on infrastructure development, on skilled labor, on low cost labor, on security, on tax exemption, on natural resources, on gross national product, on geographical location and industrial policy within Mexico from 2000 to 2013.

For South zone model with equation for efficiency:

H_8: The attraction of foreign direct investment depends on infrastructure development, on skilled labor, on low cost labor, on tax exemption, on geographical location and industrial policy within Mexico from 2000 to 2013.

For Probit model of the three zones that represent the most efficient variables:

H_9: The probability of improving infrastructure, skilled labor, low cost labor, security, tax exemption and geographical location will attract more foreign direct investment flows.

For Probit model for south zone with the most efficient variables:
H_{10}: The probability of improving infrastructure, skilled labor and tax exemption will attract more foreign direct investment flows.

3.4 Data

Four hundred and sixteen yearly state reports were reviewed by the authors to build a database for this research. These reports were accumulated by the government of each state of Mexico. The determinants used to attract foreign direct investment by the 32 states during 2000 and 2013 were skilled labor, cheap labor, tax exemption, legal framework, security, natural resources, infrastructure, gross national product by state, industrial policy and geographical location which according to different authors, are the most common used around the world despite that it is not clear if the determinants are new or renewal for countries.

4. Descriptive statistics

North region is integrated by Baja California, Baja California Sur, Chihuahua, Coahuila, Durango, Nuevo Leon, San Luis Potosí, Sinaloa, Sonora, Tamaulipas and Zacatecas states. Table 4.1 show that Nuevo Leon did the maximum intake of FDI in 2010 with 5,379.70 US billion dollars and the minimum intake was made by Durango in 2005 with -21.

Table 4.1

State	Obs.	Mean	Std. Dev.	Min	Max
Baja California	14	904.88	250.83	542.20	1555.00
Baja California Sur	14	341.33	186.84	81.30	630.10
Chihuahua	14	1203.76	452.45	584.60	1920.60
Coahuila	14	333.29	353.79	121.60	1221.80
Durango	14	180.39	189.55	-21.00	574.50
Nuevo León	14	2260.60	1422.74	524.80	5379.70
San Luis Potosí	14	163.57	137.30	-13.90	509.40
Sinaloa	14	79.00	94.34	13.20	349.20
Sonora	14	305.34	308.25	37.80	1286.40
Tamaulipas	14	401.66	143.08	208.00	723.80
Zacatecas	14	265.73	447.60	0.10	1517.00
Total	154	585.41	792.04	-21.00	5379.70

In the center of the country there are 13 states: Aguascalientes, Colima, Distrito Federal, Estado de Mexico, Guanajuato, Hidalgo, Jalisco, Michoacan, Morelos, Nayarit, Puebla, Queretaro and Tlaxcala. Table 4.2 shows that Distrito Federal did the maximum intake 2001 with 22,062.50 US billion dollars and the minimum intake was made by Puebla in 2005 with -531.50.

Table 4.2

State	Obs.	Mean	Std. Dev.	Min	Max
Aguascalientes	14	233.94	194.47	8.00	665.90
Colima	14	17.87	19.91	-4.70	64.60
Distrito Federal	14	13465.21	4867.22	6540.50	22062.50
Estado de México	14	1244.10	762.91	545.20	3576.80
Guanajuato	14	256.66	224.61	-70.20	734.00
Hidalgo	14	5.60	30.26	-62.60	77.50
Jalisco	14	781.85	429.22	289.40	1866.00
Michoacan	14	132.19	422.74	-110.00	1590.30
Morelos	14	101.27	143.75	-56.30	453.30
Nayarit	14	88.39	46.18	19.90	180.30
Puebla	14	472.50	408.57	-531.50	1261.30
Querétaro	14	325.19	191.66	56.20	661.80
Tlaxcala	14	35.34	39.04	-17.20	136.50
Total	182	1320.01	3777.42	-531.50	22062.50

In Table 4.3, the maximum FDI intake corresponds to Quintana Roo which captured in 2007 the amount of 885.70 US billion dollars and the minimum intake of -147.40 was captured by Veracruz in 2011.

Table 4.3

State	Obs.	Mean	Std. Dev.	Min	Max
Campeche	14	2.61	62.71	-136.10	110.40
Chiapas	14	13.03	16.39	-11.20	41.80
Guerrero	14	31.01	45.17	-48.00	110.30
Oaxaca	14	20.56	25.72	-1.60	78.50
Quintana Roo	14	260.29	223.84	14.30	885.70
Tabasco	14	54.61	50.70	0.90	150.90
Veracruz	14	87.87	103.78	-147.40	272.10
Yucatán	14	39.05	33.26	5.50	132.90
Total	112	63.63	120.70	-147.40	885.70

A summary for the maximum and minimum FDI intake within Mexico is presented in Table 4.4.

Table 4.4

Zone	Mean	Std. Dev.	Min	Max
North	585.41	792.04	-21.00	5379.70
Centre	1320.01	3777.42	-531.50	22062.50
South	63.63	120.70	-147.40	885.70
Total	753.40	2501.16	-531.50	22062.50

As it was expected, the central zone has the highest values for FDI intake, in spite of the large territorial extension that the northern zone has. It can be assumed that the central zone used more determinants to attract FDI rather than the other two.

5. Methodology, Models and Results

5.1 Methodology

It is important to state out that the three zones proposed in this research have the same hypotheses, however to test them, were carried out several models of time series data, the results for these models indicate the nature of each of the variables used, and the relationship they have with the dependent variable and its statistical significance.

A comparison between the three regions was made with the results of the models and its hypothesis.

Once we have variables that will be employed in a probit model originally used by Bliss (1934) as well as applied to stochastic models by Steinbrecher and Shaw (2008) it was necessary to check and simulate the dependent variable (impde), which was developed as the probability that there is an improvement in the determinants that each one of the Mexican states raised in their public policies and in their development plans, related to foreign direct investment flows. The probit model tested the hypotheses and the main objective of this research.

It is important to note that the probit model was used to propose a new theory of attraction of foreign direct investment based on the creation of new determinants or renewal thereof as part of the public policy of the countries. The database developed for this study contains data on the determinants used by each of the states of Mexico for a period of thirteen years. During those years, there are states that do not use the ten determinants commonly used to attract foreign direct investment or there are states that decide to improve the determinants and previously used by the states. In any of these circumstances apply to the proposal of the new theory.

5.2 Models

The following equations are the proposal models to prove the hypotheses postulated earlier: Main model is:

$$fdi_t = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 wage_t + \beta_4 sec_t + \beta_5 taxex_t + \beta_6 natures_t + \beta_7 gnp_t + \beta_8 legal_t + \beta_9 geoloc_t + \beta_{10} indpol_t + u_t$$

For the main model we have the following equation for efficiency:

$$fdi_t = \beta_0 + \beta_1 qualab_t + \beta_2 wage_t + \beta_3 taxex_t + \beta_4 natures_t + \beta_5 gnp_t + \beta_6 legal_t + \beta_7 indpol_t + u_t$$

Main model for the North zone is:

$$fdi_t = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 wage_t + \beta_4 sec_t + \beta_5 taxex_t + \beta_6 natures_t + \beta_7 gnp_t + \beta_8 legal_t + \beta_9 geoloc_t + \beta_{10} indpol_t + u_t$$

For the North zone model we have the following equation for efficiency:

$$fdi_t = \beta_0 + \beta_1 wage_t + \beta_2 taxex_t + \beta_3 natures_t + u_t$$

Main model for the Centre zone is:

$$fdi_t = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 wage_t + \beta_4 sec_t + \beta_5 taxex_t + \beta_6 natures_t + \beta_7 gnp_t + \beta_8 legal_t + \beta_9 geoloc_t + \beta_{10} indpol_t + u_t$$

For the Centre zone model we have the following equation for efficiency:

$$fdi_t = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 wage_t + \beta_4 natures_t + u_t$$

Main model for the South zone is:

$$fdi_t = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 wage_t + \beta_4 sec_t + \beta_5 taxex_t + \beta_6 natures_t + \beta_7 gnp_t + \beta_8 legal_t + \beta_9 geoloc_t + \beta_{10} indpol_t + u_t$$

For the South zone model we have the following equation for efficiency:

$$fdi_t = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 wage_t + \beta_4 taxex_t + \beta_5 geoloc_t + \beta_6 indpol_t + u_t$$

The next probit model is for all the zones that represent the most efficient variables:

$$P(impde_t) = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 wage_t + \beta_4 sec_t + \beta_5 taxex_t + \beta_6 geoloc_t + u_t$$

Only for the South zone the probit model is as follows with the most efficient variables:

$$P(impde_t) = \beta_0 + \beta_1 ifra_t + \beta_2 qualab_t + \beta_3 taxex_t + u_t$$

5.3 Results

Due to the models that we present are handled through time series, we verified that the variables have a stationary stochastic process in the models proposed. As the variables presented a nonstationary process, the models are not useful to find reliable results by the method of ordinary least squares (OLS), in accordance with Engle and Granger (1987) that conducted a cointergration study. Then, we made a linear combination of two series, each of which is integrated of any kind of order, additionally checked and corrected the errors through the Granger causality (Granger, 1969 and Granger and Newbold, 1974) to verify that indeed the time series used are stationary, the following model show this test and in the Table A1 are the results of them:

$$fdi_t = \delta_0 + \alpha_1 fdi_{t-1} + \alpha_2 fdi_{t-2} + \alpha_3 fdi_{t-3} + \alpha_4 fdi_{t-4} + \gamma_1 ifra_{t-1} + \gamma_2 ifra_{t-2} + u_t$$

In addition, was revised collinearity of the variables through a model of vector autoregressive (VAR), where it was found that indeed the variables presented a high collinearity and that has to be corrected for the variables are stationary, besides we use the Wald test (Wald, 1940) to prove if the model has an asymptotic chi-square distributions, the model was as follows and in the Table A2 are presented the results of them:

$$fdi_t = \delta_0 + \alpha_1 fdi_{t-1} + u_t$$

Once we have corrected the errors that could be present in the time series, and we are sure that the variables shown a Stationary Stochastic Process we proceeded to find the corresponding relations with each of the proposed variables as determinants for foreign direct investment flows that have been submitted in Mexico by 2000 to 2013.

The interaction of all independent variables in the Main model is shown with respect to the dependent variable in Table A3. It was expected that all the variables were significant but, the independent variables *ifra*, *sec, legal* and *geoloc* (corresponding to Infrastructure, Security, Legal system and Geographic Localization) were not.

Subsequently, the interaction of the dependent variable with each of the independent variables was done to confirm its significance, the models are shown before. The results (see tables A4 to A12) demonstrate that all the variables have a high significance more than 95%.

Once interactions were tested using linear regressions, a simulation using the *probit* model was done. The results showed that the probability of an improvement in the determinants increased flows of foreign direct investment. The presented results correspond to whole zones and we only use the most efficient variables to demonstrate the theory. When we tested the probit model for each zone, only the South zone had a good response for the most efficient variables shown in the model earlier.

6. Conclusions

The theories proposed by several authors to explain how countries attract FDI are diverse. Some are based on the use of different determinants as part of its public policy. In this sense, during the period 2000-2013, Mexico used ten determinants in common for each of the 32 states to attract foreign direct investment, however, the safety-related determinant not found to be significant as part of its public policy because it is now known that Mexico is facing serious security problems and cannot use that determinant in attracting foreign direct investment. There are positive relations between the rest of the determinants and the dependent variable which is coherent with the literature review.

Since the period studied is thirteen years, it was observed that some states of Mexico during that period decided to create or renew their determinants in order to attract more and new flows of foreign direct investment. In that sense, the purpose of this article was to test the new determinant creation theory proposed by Botello and Davila (2015) as part of the public policy of the 32 state governments and the probit model demonstrates that relationship.

If any government in the world is interested in attracting new or more foreign direct investment must create or renovate determinants used to attract investment flows. There are probably cities or provinces who want to attract resources for certain types of industry but they must create or renew the related determinants, such that the different types of industry prevailing in a country use different determinants and some of them they shall not be used to attract new resources and should focus on the development of new determinants.

The comparison that was made between the three regions demonstrated that the states located at the center of the country used more than five determinants to attract FDI. The use of more than five determinants is related to a good public policy design.

The probit model showed us that only in the South zone would be necessary to improve infrastructure, skilled labor and tax exemption to attract foreign direct investment (Table A12). On the other hand, the probit model applied for the other two zones did´t work out because they actually use the determinants to attract FDI and they don´t need to improve them to attract more FDI.

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Appendix

Table A1. Econometric results for the Vector Autorregresive (VAR) models, to prove collineality.

	Coef.	Std. Err.	z	P> | z |	[95% Conf.	Interval]
fdi						
L1	0.4306679	0.0461224	9.34	0.000	0.3402697	0.5210661
L2	0.3804776	0.0461891	8.24	0.000	0.2899486	0.4710067
ifra						
L1	-975.7836	577.5145	-1.69	0.091	-2107.691	156.1241
L2	1123.365	574.9412	1.95	0.051	-3.499405	2250.229
qualab						
L1	1366.324	498.5146	2.74	0.006	389.2537	2343.395
L2	-1268.267	495.873	-2.56	0.011	-2240.16	-296.3732
wage						
L1	1407.241	480.625	2.93	0.003	465.2329	2349.248
L2	-1220.12	481.8106	-2.53	0.011	-2164.452	-275.7891
sec						
L1	-385.2097	388.8907	-0.99	0.322	-1147.421	377.0021
L2	137.0567	390.072	0.35	0.725	-627.4703	901.5837
taxex						
L1	-167.8146	372.4278	-0.45	0.652	-897.7597	562.1306
L2	179.5967	375.0052	0.48	0.632	-555.4	914.5934
natures						
L1	-1259.199	375.3069	-3.36	0.001	-1994.787	-523.6109
L2	977.642	376.3549	2.6	0.009	240	1715.284
gnp						
L1	53.92237	477.2691	0.11	0.910	-881.5079	989.3526
L2	-21.31266	477.5679	-0.04	0.964	-957.3586	914.7032
legal						
L1	640.9021	416.9201	1.54	0.124	-176.2463	1458.05
L2	-717.5595	411.4749	-1.74	0.081	-1524.036	88.91654
geoloc						
L1	-472.3277	533.0303	-0.89	0.376	-1517.048	572.3926
L2	518.8095	532.957	0.97	0.330	-525.7671	1563.386
indpol						
L1	-1115.89	515.1683	-2.17	0.030	-2125.601	-106.1786
L2	1198.99	513.3238	2.34	0.020	192.8936	2205.086
_cons	62.0544	258.102	0.24	0.810	-443.8162	567.9251

Table A2. Econometric results for find the Granger causality Wald tests.

Equation	Excluded	chi2	df	Prob > chi2
fdi	ifra	3.845	2	0.146
fdi	qualab	7.5706	2	0.023
fdi	wage	8.8491	2	0.012
fdi	sec	2.4035	2	0.301
fdi	taxex	0.23293	2	0.890
fdi	natures	11.594	2	0.003
fdi	gnp	0.03053	2	0.985
fdi	legal	3.0496	2	0.218
fdi	geoloc	0.94766	2	0.623
fdi	indpol	5.5766	2	0.062
fdi	ALL	43.089	22	0.005

Table A3. Econometric results to prove the Main model.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	-244.0008	330.7772	-0.74	0.461	-894.1126	406.111
qualab	1256.584	321.9045	3.9	0.000	623.9108	1889.258
wage	1189.834	251.0359	4.74	0.000	696.4464	1683.222
sec	-10.27588	249.7737	-0.04	0.967	-501.1829	480.6311
taxex	842.5535	243.0423	3.47	0.001	364.8764	1320.231
natures	-1628.048	222.9378	-7.3	0.000	-2066.212	-1189.885
gnp	675.6926	292.9066	2.31	0.022	100.0119	1251.373
legal	695.4954	282.6456	2.46	0.014	139.9816	1251.009
geoloc	-104.7476	317.7382	-0.33	0.742	-729.2326	519.7373
indpol	-783.9201	384.4638	-2.04	0.042	-1539.548	-28.29201
_cons	384.1425	354.4729	1.08	0.279	-312.5411	1080.826

Table A4. Econometric results for the efficiency for the Main model.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
qualab	1134.319	282.7677	4.01	0.000	578.5757	1690.062
wage	1149.151	244.139	4.71	0.000	669.3278	1628.975
taxex	871.8325	234.1914	3.72	0.000	411.5597	1332.105
natures	-1626.604	220.7432	-7.37	0.000	-2060.446	-1192.762
gnp	654.3342	284.8688	2.3	0.022	94.46154	1214.207
legal	697.6063	280.3351	2.49	0.013	146.644	1248.569
indpol	-855.4545	368.4702	-2.32	0.021	-1579.635	-131.2742
_cons	239.1149	269.1615	0.89	0.375	-289.8871	768.1169

Table A5. Econometric results to prove the Main model for the North zone.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	-427.6572	776.5477	-0.55	0.584	-1979.464	1124.15
qualab	-96.48356	630.4007	-0.15	0.879	-1356.239	1163.272
wage	-989.692	357.9943	-2.76	0.007	-1705.087	-274.2974
sec	-341.8069	303.7626	-1.13	0.265	-948.828	265.2142
taxex	357.6946	351.6871	1.02	0.313	-345.0961	1060.485
natures	-628.4817	261.8958	-2.4	0.019	-1151.839	-105.1247
gnp	-287.328	517.9242	-0.55	0.581	-1322.317	747.6609
legal	-448.4763	520.0115	-0.86	0.392	-1487.636	590.6838
geoloc	784.6992	517.3892	1.52	0.134	-249.2206	1818.619
indpol	(omitted because of collinearity)					
_cons	2081.318	757.9992	2.75	0.008	566.5774	3596.059

Table A6. Econometric results to prove the North zone model and its efficiency.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
wage	-454.5493	222.7434	-2.04	0.045	-898.9103	-10.18831
taxex	431.3133	200.2818	2.15	0.035	31.76205	830.8645
natures	-784.6987	238.695	-3.29	0.002	-1260.882	-308.5153
_cons	1291.753	212.5607	6.08	0.000	867.706	1715.8

Table A7. Econometric results to prove the Main model for the Centre zone.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	-8591.304	1698.898	-5.06	0.000	-11955.88	-5226.726
qualab	7016.785	1410.907	4.97	0.000	4222.557	9811.013
wage	4190.124	1109.61	3.78	0.000	1992.599	6387.649
sec	-1128.155	655.9011	-1.72	0.088	-2427.133	170.8224
taxex	1253.865	842.257	1.49	0.139	-414.181	2921.911
natures	-3971.377	612.9727	-6.48	0.000	-5185.338	-2757.417
gnp	9.265904	824.4177	0.01	0.991	-1623.45	1641.982
legal	866.1459	1079.211	0.8	0.424	-1271.176	3003.468
geoloc	5240.747	2129.923	2.46	0.015	1022.545	9458.949
indpol	1699.542	1053.058	1.61	0.109	-385.9831	3785.068
_cons	-2925.182	1891.326	-1.55	0.125	-6670.855	820.4905

Table A8. Econometric results to prove the Centre zone model and its efficiency.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	-7149.045	1163.955	-6.14	0.000	-9453.023	-4845.067
qualab	7837.189	857.5113	9.14	0.000	6139.798	9534.58
wage	5583.035	662.41	8.43	0.000	4271.835	6894.235
natures	-3505.574	579.6309	-6.05	0.000	-4652.917	-2358.23
_cons	1585.566	748.5047	2.12	0.036	103.9465	3067.185

Table A9. Econometric results to prove the Main model for the South zone.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	-69.35637	33.84929	-2.05	0.045	-136.9988	-1.713963
qualab	-256.2685	74.30185	-3.45	0.001	-404.7489	-107.7882
wage	-74.45251	41.27105	-1.8	0.076	-156.9261	8.021095
sec	73.91393	63.45999	1.16	0.249	-52.90073	200.7286
taxex	-110.0664	70.69522	-1.56	0.125	-251.3395	31.20674
natures	-1.441328	50.47261	-0.03	0.977	-102.3028	99.42014
gnp	-12.81507	47.39622	-0.27	0.788	-107.5289	81.89872
legal	7.815492	48.86373	0.16	0.873	-89.83088	105.4619
geoloc	-255.7259	85.9169	-2.98	0.004	-427.4171	-84.03466
indpol	107.0278	62.54835	1.71	0.092	-17.96513	232.0207
_cons	338.8366	76.16697	4.45	0.000	186.629	491.0441

Table A10. Econometric results to prove the South zone model and its efficiency.

fdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	-82.59838	29.28889	-2.82	0.006	-141.0592	-24.13752
qualab	-225.9771	64.53583	-3.5	0.001	-354.7912	-97.16305
wage	-67.80997	28.24511	-2.4	0.019	-124.1875	-11.43248
taxex	-64.66266	32.81391	-1.97	0.053	-130.1595	0.8341753
geoloc	-200.0316	62.85906	-3.18	0.002	-325.4988	-74.56438
indpol	101.7571	37.13935	2.74	0.008	27.62663	175.8875
_cons	293.3092	60.34388	4.86	0.000	172.8623	413.7561

Table A11. Econometric results for the probit model for all the zones.

impde	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	0.9505503	0.2740667	3.47	0.001	0.4133894	1.487711
qualab	1.103166	0.2708506	4.07	0.000	0.5723088	1.634024
wage	1.197051	0.2522312	4.75	0.000	0.7026872	1.691415
sec	2.594698	0.5823021	4.46	0.000	1.453407	3.73599
taxex	2.380362	0.4712555	5.05	0.000	1.456718	3.304005
geoloc	1.675795	0.4969372	3.37	0.001	0.7018156	2.649774
_cons	-3.524616	0.5662015	-6.23	0.000	-4.634351	-2.414882

Table A12. Econometric results for the probit model for the South zone.

impde	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ifra	2.020183	0.4690625	4.31	0.000	1.100838	2.939529
qualab	-1.900055	0.5742888	-3.31	0.001	-3.025641	-0.7744698
taxex	1.765698	0.4905429	3.6	0.000	0.8042513	2.727144
_cons	-1.549091	0.3821762	-4.05	0.000	-2.298143	-0.8000396