The Impact of the Regional Trade Agreements on Inflow of Mexican Foreign Direct Investment: An Empirical Approach

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Abstract

This article aims to empirically evaluate, based on the annual time series from 1970 to 2018, the hypothesis that regional trade agreements (RTA) had a positive impact on the Mexican Foreign Direct Investment (FDI) inflow in this period. We use the North American Free Trade Agreement (NAFTA) to evaluate its impact in Mexico, which entered into force in 1994. In this context, our interest variable is the dummy d_1994, where from 1994 to 2018 it is equal to 1. We tested several empirical approaches based on ARDL models, robust least-squares methods as well as GMM methods. We also use Granger causality tests and impulse response tests based on the VAR system. All empirical models show that the estimated coefficient from the dummy variable, d_1994, is statistically significant and presents a positive sign. Moreover, the causality tests show that the variable d_1994 granger causes FDI as a proportion of GDP, and the impulse response tests validate the tested hypothesis as well.

Keywords: regional trade agreements, Mexican Foreign Direct Investment, North American Free Trade Agreement

1. Introduction

In the late 1980s and early 1990s, Mexico followed the trade liberalization trend and started opening its markets due to the need for capital inflows. During this process, Mexico embraced trade liberalization (Santos 2012) and the jurisdiction of international law through investment arbitration mechanisms (Puig 2007).

International economic law scholars have focused on the relationship between Bilateral International Treaty agreements (BITs) and the inflow of Foreign Direct Investment (FDI). Frenkel and Walter (2019) empirical study has showed that only BITs are not enough to positively impact FDI, unless the agreement is paired with strong protections under the international dispute settlement (ISDS) provisions. However, Meguerian-Faria (2021) goes even further by supporting that Regional Trade Agreements (RTAs) are the best instrument to foment FDI inflow in developing countries. RTAs have a stronger impact on domestic governance of such countries. Thus, they present the necessary incentives to capture investors' interest and their confidence.

This paper aims to assess the effect of regional trade agreements (RTAs) on Foreign Direct Investment (FDI) inflow into Mexico from 1970 to 2018. We empirically evaluate Mexico's FDI inflow to illustrate the theory introduced by Meguerian-Faria (2021). Instead of focusing on BITs Meguerian-Faria (2021) used RTAs – NAFTA, to identify how they impacted the domestic regulatory system of Mexico, and consequently the influx of FDI. In other words, we appraise the impact of regulatory changes implemented by Mexico after NAFTA and assess the impact of the agreement on FDI inflow in Mexico.

In this sense, the contribution of this article is to show that the effects of RTAs can be a good trade strategy to increase FDI inflow. In addition, this study can foster a discussion on the advantages and disadvantages of the two trading options, RTAs or BITs, instead of focusing basically on bilateral agreements. We appraise the impact of regulatory changes implemented by Mexico after NAFTA and assess the impact of the agreement on FDI inflow in Mexico. However, this comparative analysis is not the object of our discussion in the empirical models, but it is important in order to contextualize the debate.

Because NAFTA is the most important regional trade agreement signed by Mexico, we focus on the effects this agreement had on the national regulatory governance of the country, and how it impacted the inflow of foreign direct investments (FDI) in Mexico. Figure 1 below shows us the inflow of FDI in Mexico, in which we can see that after 1993/1994 the FDI inflow started to increase. The data is from the World Bank database on foreign direct investment inflow per country.

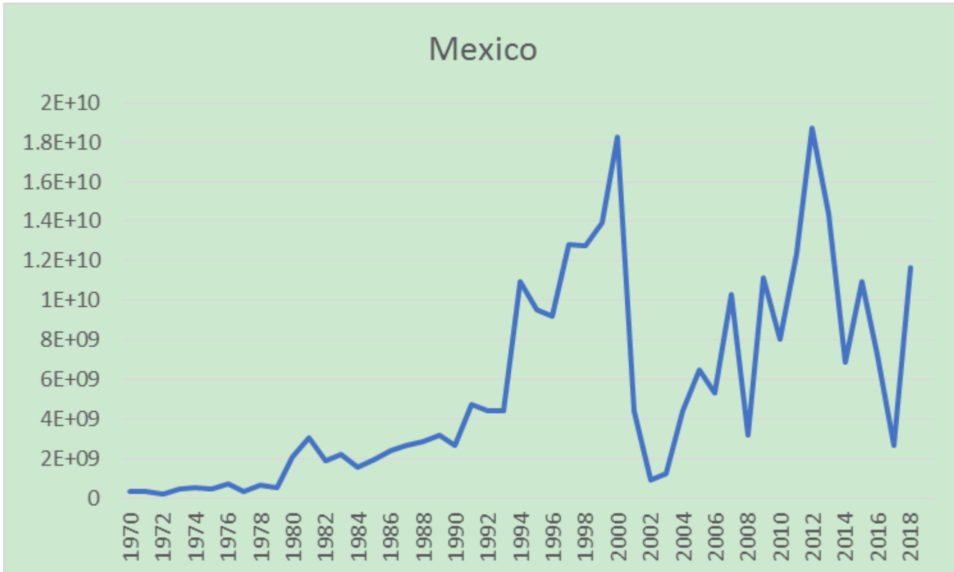

Figure 1. The evolution of the Mexican FDI inflow from 1970 to 2018

Almost twenty-five years after NAFTA came into being, much has changed in the international and domestic scenario of Mexico. Although generally successful, NAFTA has been renegotiated recently by its members. The new United States-Mexico-Canada Agreement (USMCA) was signed by the members on November 30th, 2018. The USMCA entered into force and replace NAFTA in July 1st, 2020. While discussing the risks and possible rewards of such renegotiation, Prof. Gantz (2018) emphasized that Mexico's commitment to open market and to the domestic reforms set up with NAFTA are still there.

Vast literature, especially in economics, has indicated the importance of law and legal institutions for economic growth. Cross (2001-2002), Ali, Fiess and MacDonald (2010) presented empirical and theoretical evidence of the positive effect of credible legal rules and institutions in economic growth and FDI inflow. Globerman and Shapiro (2002) identified governance infrastructure as an important determinant of FDI inflow and outflow. In this article, the authors define governance infrastructure as political, institutional and legal environment. Brunetti, Kisunko & Weder (1998) had developed an indicator of the "credibility of rules" and ran a regression model, using 73 countries; the results showed significant association between credibility and cross-country differences in economic growth and investment. The indicators of credibility in this model are predictability of rulemaking, subjective perception of political instability, security of persons and property, predictability of judicial enforcement, and corruption. A Buchanan, Le and Rishi (2012) study has shown a direct relationship between institutional quality and volatility of FDI. Furthermore, poor institutional quality increases volatility of FDI inflow and volatile inflow has negative influences on economic growth, as Lensink and Morrisey (2001) discovered.

In the early 1990s, Mexico adopted a policy of trade liberalization, especially with its neighbor, the United States (Santos 2012). With the exception of a few programs aiming to help small and medium size businesses as well as the export industry, Mexico dismantled most of its protectionist industrial policies (Santos 2012, Waldkirch 2010). Mexico's regulatory reform was crowned with the conclusion of NAFTA, which bound the country's commitment to the market liberalization policy and was even attached to future government leadership. The leadership in Mexico changes every six years with Presidential elections, and since NAFTA, all administrations prior to current President Lopez-Obrador, had maintained, and in recent years have even furthered, the necessary regulatory reforms. Although being elected on a protectionist platform, Obrador's administration has maintained the commitment through the renegotiations of NAFTA, which concluded with the creation of the USMCA that had already been ratified by Mexico. The effect of NAFTA has been an increase in the inward flow of FDI and a change in the investors' perceptions of the factors that are the determinants of FDI (Waldkirch 2003). One example of regulatory change is the reform of the secured transaction laws based on the UNCITRAL Model Law (Kozolchyk and Castaneda 2011, Kozolchyk 2006-07), and the changes in the Foreign Investment Law (1993) that relax the limitations imposed on most capital flows, government approval requirements and management control allowed to foreign investors. The Mexican's investment laws reforms started in 1989, but after NAFTA its apex in 1993 reforms. (Waldkirck 2010, pg. 710)

Levine (2001) also credited to NAFTA the improvements in the banking regulatory system. Although Mexico has promoted many legal reforms to support a more globalized growth, it has not fulfilled all the commitments under NAFTA, which may explain the initial timid impact of NAFTA.

Overall, it seems that the "take it or leave it" (Gillman 2009-10) approach adopted by the United States during the negotiations of NAFTA positively influenced Mexico, encouraging regulatory changes. In this paper, the author emphasized the US position when negotiating FTAs with Latin American countries as rigid and demanding of the commitment to regulatory changes. Nevertheless, like any other regional trade agreement, NAFTA has its shortcomings, which may explain the small drop in FDI inflow seen between 1995/1997. See graphic 1.

According to Meguerian-Faria (2021), had Mexico implemented the necessary changes and reforms from day one, the country could be in a better economic position today. Yet, NAFTA is an example of RTA with binding effect on future government leadership, which positively impacts how investors see Mexico because of this strong commitment effect. As a result, Mexico has captured an expressive amount of greenfield investment projects.

This paper is organized as follows. In part 2, we discuss Mexico's motivations to conclude the NAFTA agreement, and how its commitment fitted into the Mexican economic policy at the time, and the importance of the USMCA, as a continuation of NAFTA, to Mexico's economic growth. In part 3, we present the methodological aspects. Then, we show the empirical results in part 4. In the conclusion, we emphasize the results from the adoption of the trade liberalization policy on Mexican FDI with our final considerations and recommendations.

2. Discussion: NAFTA and Mexico

Before starting the discussion, it is worth noting that although NAFTA has been renegotiated and a new agreement (USMCA) will replace the current NAFTA once it is ratified by all three members, the historical motivation of NAFTA is still valid and important as it is still the agreement in force. Once USMCA enters into force, there will be a transition period where NAFTA rules will still apply. In sectors such as the auto-industry, rules of origin, and dispute resolution (ISDS) these transition period will take about three years. Thus, NAFTA in many respects will control until 2024.

In light of the discussion presented in Meguerian-Faria (2021), it seems that NAFTA has presented the necessary incentives to investors, increasing the inflow of greenfield investment in Mexico's manufacturing industry from $3,431 million in 2005 to $21,463 million in 2008 (Fingar 2015). This article reports the level of Greenfield investment in Mexico. Greenfield investment is the investment of building up the business from the ground up, which assumes long term expectative and higher sunk cost. Even though NAFTA has been renegotiated and a new deal has been signed (the USMCA) we will continue to focus on NAFTA since we are evaluating the impact of it from its signature up to now. The impact of the new agreement and its significant lessening in investor protection may have an impact on future investment, but this is not the point of this paper, which concentrates on the results of NAFTA, from its establishment to now.

Mexico's motivations to conclude NAFTA were primarily economic in nature. Mexico wanted to expand employment and exports through the maquiladoras program or otherwise, stimulate job growth and transfer of technology, to mitigate the impact of the 1982 financial crisis through trade liberalization (Gantz 2009) and to increase inflow of FDI (Waldkirch 2003). Boosting productivity growth, therefore increasing the total factor productivity (TFP), promotes growth in GDP per worker, thus boosting economic growth (Levine 2001).

According to the Business Dictionary, TFP measures the efficiency of all inputs in a production process. TFP growth represents a part of the output not explained by the input used in production, usually from technological innovation or improvements. Also, Mexico had already initiated economic reform towards liberalization beginning in 1985, including but not limited to joining the GATT (Kandilov and Leblebicioglu). In this context, using data from 1984 to 1990, the authors wanted to evaluate the impact of the trade liberalization program launched in 1995. They found "that the decrease in input tariffs, as well as import license coverage, resulted in higher investment in Mexican manufacturing establishments." President Salinas understood the importance of the pressure from treaty obligations to promote necessary internal reforms. NAFTA was seen by Mexico's federal government as a security blanket that would not allow future governments to return to protectionist policies without breaching international obligations, truly embracing the open market philosophy (Waldkirch 2003).

At the time of NAFTA negotiations, the Uruguay Round was stalled and the political significance of this agreement for the three states was such that many items not yet implemented under WTO were incorporated into the agreement. NAFTA incorporated rules on foreign investment protections, trade in services, technical standards, sanitary and phytosanitary standards, intellectual property, government procurement and investor-state dispute settlement provisions, to cite a few (Gantz 2009). Because of its all-inclusive characteristic, NAFTA became the model FTA for all three members and influenced other countries' FTA-models as well.

Even though NAFTA has no provisions for harmonization of laws, with the exception of the disposition in NAFTA chapter 5 on harmonization of customs regulatory procedures, it has permitted the transplanting of U.S. laws into the Mexican legal system as Mexico introduced new laws and regulations implementing trade liberalization (Gillman, 2009-10). NAFTA has assured foreign investors of Mexico's commitment to reform. Chapter 5 of NAFTA establishes the steps to be followed by an importer to acquire a NAFTA Certificate of Origin, which requires a great deal of cooperation and coordination among the three members' customs services. (Gantz 2009 at 115).

The literature also credits the increase in FDI inflow into Mexico to NAFTA's binding effect, its duty-free treatment of most imports from Mexico into the United States and to Mexico's geographical proximity to the United States and Canada (Waldkirch 2003, Gillman 2009-10). It is estimated that FDI inflows in Mexico, in the second half of the 1990s, were about 60 percent higher than they would have been without NAFTA (Cuevas, Messmacher and Werner; Waldkirch 2003). In this study, the authors used a panel model to estimate total net inflows of FDI into a country considering indicators of macroeconomic stability and direct measure of globalization process. They concluded that FDI was 60 percent higher as a result of "NAFTA-induced exports". Waldkirch estimation has quite similar results, as it concluded that FDI in Mexico would be below 42 percent without NAFTA.

The major deregulation in the Mexican Foreign Investment Law has been the relaxation of Mexican rules restricting foreign ownership of enterprises in Mexico, which earlier limited the foreign capital participation and control to 49 percent. Today, however it is no longer applicable for investments of less than $150 million (Goldman, Tallaksen, McClintock and Wolkowitz 1994; Vargas 1994). Mexico's ranking on the "Ease of Doing Business" indicator from 2011-2015 period compared to the 2006-2010 period had improved on a steady pace from 43 to 38 (Khemani and Carrasco-Martin 2008). The "ease of doing business" is an indicator developed by the World Bank that ranks economies based on their regulatory environment.

The more stringent requirements imposed by NAFTA provisions on technical standards, sanitary and phytosanitary standards, intellectual property, and investor-state dispute settlement (ISDS) have increased the competitiveness of Mexican industry. In any event, it is undeniable that Mexico's commitment to open markets, was reflected in the unilateral reductions of applied tariffs to about 5-6%, as well as in the implementation of changes to its legal system.

Mexico suffered some setbacks during the first year of NAFTA. These lessened the positive effects expected from the agreement (Hufbauer, Cimino and Moran 2014; Cuevas *et al*). The uprising of southern states unhappy with alleged special attention offered to the Northern states, the assassination of presidential candidate Luis Colosio, the uprisings in Chiapas, and the peso crisis beginning in December 1994 scared some of the investors because of the political and economic repercussions of these issues (Hufbauer *et al* 2014; Cuevas *et al*).

Mexico's industry also lost some enterprises because of lower manufacturing costs in China, but the country was able to recover due to Mexico's strong commitment to trade liberalization and global competition through efficient industrialization. *Two ways to make a car*, The Economist, Mar. 2012, last visited on September 18, 2019. It is also important to remember here that cost of labor in China had increased and some businesses that had gone to China are returning to the NAFTA bloc. Still, Vietnam, and India are viable competitors for the labor-intensive industry that is moving from China.

NAFTA has positively impacted Mexico, especially because of the incorporation of alternative dispute resolution mechanisms, which demonstrated Mexico's commitment to a "pro-international law" policy (Wobeser 2012). Nonetheless, it is the domestic implementation of the necessary pro-trade environment through regulatory reforms which bolstered and solidified the effect and impact of the economic integration agreement (Monje-Naranjo). By comparing the increase in FDI in Mexico (under NAFTA) and Costa Rica (under the Caribbean Basin Initiative) Monje-Naranjo found that just an agreement is not enough to increase FDI. This was concluded because Costa Rica benefited most from CBI since it implemented the necessary regulatory reforms.

NAFTA chapter 11 regulates the disputes brought by investors before various international arbitration bodies, which tested the binding effect of dispute settlement provisions under NAFTA and the limitations imposed on the Mexican government by the obligations assumed under the agreement (Monje-Naranjo). Foreign investment and arbitration laws can be considered “global administrative law,” even though they are not uniform because of the powerful influence exerted by them within the governmental agencies (Robalino-Orellana 2007). Here we use such a comparison to facilitate the understanding of the impact of ISDS in curtailing domestic protectionist rules. However, we do not sign to the new line of study that recommends that international law, especially the WTO dispute settlement, be enforced under the full lenses of administrative law. These “laws” limit the agencies and judiciary powers to implement protectionist rules, offering the necessary protection to foreign investors (Robalino-Orellana 2007).

Furthermore, Mexico’s reforms in investment law, and secured transactions law, among other regulatory reforms, have opened the doors to greenfield investment, which is a long-term investment. Even without ISDS protections under USMCA, one can expect that Mexico should be able to retain most of the manufacturing industries already established there. Mexico will continue to be an important destination for U.S. manufacturing industries because of the costs of disinvestment and some other key factors, such as its proximity to the United States, low wage costs, and a 25-year history of friendly government policies should be enough to maintain Mexico as an important destination for U.S. manufacturing.

According to the theory being tested here, the impact and general success of the USMCA (once it enters into force) greatly depend on Mexico’s implementation of the still- necessary reforms which should allow for some independence from its partners, the United States and Canada. Mexico has the potential to capture more investment from other countries and regions. According to data for the 1st quarter of 2019, from Statista.com, Mexico inflow of FDI from NAFTA members was rated 48%. Only 5% of that was from Canada. The data presented here is from the Statista.com site and refers to the 1st quarter of 2019, available at https://www.statista.com/statistics/709875/fdi-mexico-origin/, last visited on November 24, 2019. The second biggest investor in Mexico is Spain (13.8%), trailed by Belgium (6.9%) and the Netherlands (5.2%). Spain and Belgium are already investing at higher levels than Canada, but the NAFTA members are still responsible for almost 50% of all the FDI in Mexico.

3. Materials and Methods

Table 1 shows the variables used in the empirical models in the period from 1970 to 2018 based on annual time series data. The variables Openness and School are transformed in the first difference, in order to be stationary. Moreover, both variables are modified so as to be transformed into logarithmic values. They are denominated as L_d_Openness and L_d_School. The variable dependent, FDI_GDP, is also transformed into logarithmic value and it is denominated L_FDI_GDP. The remaining variables in Table 1 are in the form of percentage variation. All the data are obtained from the World Bank Indicators (WDI) site.

Table 1. Description of annual variables (1970 - 2018)

Variables	Indicator Name: description	Source
FDI_GDP	Foreign direct investment, net inflows (% of GDP): This series shows net inflows (new investment inflows minus disinvestment) in the reporting economy from foreign investors and is divided by GDP.	WDI
Openness	Imports of goods and services (% of GDP): Imports of goods and services represent the value of all goods and other market services received from the rest of the world.	WDI
School	School enrollment, secondary (gross), gender parity index (GPI): Gender parity index for gross enrollment ratio in secondary education is the ratio of girls to boys enrolled at secondary level in public and private schools.	WDI
Inflation_rate	Inflation, GDP deflator (annual %): Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole.	WDI
MEX_GDP%	GDP growth (annual %): Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.	WDI
World_GDP%	GDP growth (annual %): Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.	WDI

Note: WDI = World Development Indicators.

The dummy variable d_1994 shows the period in which Mexico started its participation in the Regional Trade Agreement (RTA) or NAFTA starting in 1994. Hence, in the period before 1994 the dummy variable is zero, i.e., d_1994 = 0, and otherwise d_1994 = 1. This is our main variable of interest, since we want to test the hypothesis that the RTA presents a positive effect on the inflow of Mexican foreign direct investments (FDI) since 1994, compared with the previous period.

Table 2 shows the descriptive statistics of each variable already modified in order to be used in the empirical models. We highlighted the inflation rate which reveals high rates. This means that the Mexican economy passed through a hyperinflationary process in some part of the period between 1970 and 2018. More specifically, from the mid-1970s until the early 1990s the rate of inflation was high.

Table 2. Descriptive statistics: Mexico data from 1970 to 2018

	L_FDI_GDP	L_d_Openness	L_d_School	Intlation_rate	Mexico_GDP%	World_GDP%
Mean	0.446603	0.030202	0.010928	24.02999	3.294403	3.097785
Median	0.548568	0.029444	0.008581	15.13704	3.475958	3.074418
Maximim	1.379391	0.384590	0.185272	142.8365	9.698170	6.505466
Minimum	-0.929738	-0.266618	-0.043912	1.529731	-6.291231	-1.678928
Std. Dev.	0.617870	0.108543	0.035255	28.64634	3.442433	1.417285
Skewness	-0.423956	0.321565	2.974493	2.255974	-0.584517	-0.560002
Kurtosis	2.144892	5.671624	14.61525	8.416371	3.774768	4.681471
Observations	48	48	48	48	48	48

Table 3 shows the correlation between the model variables. One can observe that the correlation between them is less than 0.40, which can be considered relatively low.

Table 3. Correlation: Mexico data from 1970 to 2018

	L_FDI_GDP	L_d_Openness	L_d_School	Intlation rate	Mexico_GDP%	World_GDP%
L_FDI_GDP	1	0.1167	-0.3709	-0.3881	-0.3773	-0.1704
L_d_Openness	0.1167	1	-0.0190	0.1339	-0.0147	0.3846
L_d_School	-0.3709	-0.0190	1	0.0549	0.1038	0.0953
Intlation rate	-0.3881	0.1339	0.0549	1	-0.2472	0.0469
Mexico_GDP%	-0.3773	-0.0147	0.1038	-0.2472	1	0.3874
World_GDP%	-0.1704	0.3846	0.0953	0.0469	0.3874	1

Given the definitions of the variables, one can specify the model to be tested as follows:

$$L\_FDI\_GDP=f(L\_d\_Openness, L\_d\_School, Inflation\ rate, Mexico\_GDP\%, World\_GDP\%, d\_1994) \quad (1)$$

In this context, we first use the Autoregressive Distributed Lag (ARDL) method for estimating the empirical models. ARDLs are standard least squares regressions that include lags of the dependent variable, besides explanatory variables as regressors (Greene, 2008). Although ARDLs models have been used in econometrics for decades, they have gained popularity in recent years as a method of examining cointegrating relationships between variables through the work of Pesaran and Shin (1998) and Pesaran, Shin and Smith (2001).

In other words, ARDLs models are linear time series models in which both the dependent and independent variables are related not only contemporaneously, but across historical (lagged) values as well. ARDLs models can assess both long-term and short-term effects. If all variables in the model are non-stationary and cointegrate in the same order, the long-term effect can be assessed. In addition, through an approach similar to the error correction mechanism, short-term effects can also be obtained.

However, if the empirical model of time series includes both stationary I (0) and non-stationary I(1) variables, that is, the variables do not cointegrate in the same order, then it is only possible to evaluate short-term effects. This is our case, as can be observed in Table 4. Thus, variables I(1) must be transformed into the first difference. Since all variables are stationary, then the ARDL method can be modeled, obtaining short-term effects. The unit root tests are presented in Table 4 in the next section. It can be observed that all variables used in the model are stationary.

The general time series regression model with multiple predictors takes into account k additional predictors, where q_1 lags of the first predictor are included, q_2 lags of the second predictor are included and so on, as can be noticed as follows:

$$Y_t = \beta o + \beta_1 * Y_{t-1} + \beta_2 * Y_{t-2} + \ldots\ldots + \beta_p * Y_{t-p} + \delta_{11} * X_{1t-1} + \delta_{12} * X_{1t-2} + \ldots + \delta_{1q1} * X_{1t-q1} + \ldots \delta_{k1} * X_{k1-1} + \delta_{k2} * X_{k2-2} + \ldots. + \delta_{kqk} * X_{kt-kq} + \varepsilon_t \quad (2)$$

Stock and Watson (2003) highlight four hypotheses for the ARDL models, which modify the OLS hypotheses. The first hypothesis shows that ε_t has a conditional average of zero, given all regressors and all lags of the model variables, so that

1. $E(\varepsilon_t \mid Y_{t-1}, Y_{t-2},\ldots, X_{1t-1}, X_{1t-2, \ldots,} X_{k1-1}, X_{k2-2}) = 0$,
2. The random variables ($Y_{t}, X_{1t}, \ldots, X_{kt}$) have a stationary distribution. Moreover ($Y_{t}, X_{1t}, \ldots, X_{kt}$) and ($Y_{t-j}, X_{1t-j}, \ldots\ldots, X_{kt-j}$) become independent as *j* becomes? big,
3. $X_{1t, \ldots,} X_{kt}$ *and* Y_t have four non-zero finite moments and finally,
4. there is no perfect multicollinearity.

Considering that the ARDL model has lagged variables, we use a Granger causality test (1969) in order to select the size of the lag in time series regression with multiple predictors and also obtain the optimal number of lags. In this context, we also use the F statistic as a form of determining the number of lags to be included so as to test the null hypothesis that the set of coefficients are equal to zero. If the hypothesis is not rejected, the estimated coefficients are not statistically significant. Moreover, the F statistics method can generate models that are too large in the sense that the true lag order is overestimated. Therefore, information criteria such as AIC and SIC should be used to avoid such problems. Notice that the choice of lags should offset the benefit of using additional information with the cost of estimating these same coefficients (Stock and Watson, 2003).

In the regression analysis, the use of the ordinary least squares (OLS) method would not be the best way to solve problems that contain extreme observations or outliers. Hence, we need a parameter estimation method which is robust where the value of the estimation is not very sensitive to small changes in the data. In this context, the robust least squares (RLS) method refers to a variety of regression methods which is *robust*, or less sensitive to outliers. Empirical results from RLS models are shown in subsection 4.1. There are some methods for RLS to determine a regression model: M-estimation (Huber, 1973), S-estimation (Rousseeuw and Yohai, 1984), and MM-estimation (Yohai 1987). These three methods differ in the following aspects:

i) M-estimation is an extension of the maximum likelihood method and, besides, it is also a robust estimation. This method approaches dependent variable outliers so that the value of the dependent variable is different principally from the regression model norm (large residuals).

ii) S-estimation is characterized by being a computationally intensive procedure, which takes into account outliers in the regressor variables (high leverages).

iii) MM-estimation is a conjunction of S-estimation and M-estimation. In other words, the procedure starts by performing S-estimation, and then uses the estimates obtained from S-estimation as the starting point for M-estimation. Since MM-estimation is a conjunction of the other two methods, it addresses outliers in both the dependent and independent variables.

In the next section we show unit root tests, several estimates based on ARDL models, Granger causality tests, Impulse response approaches via VAR (Hamilton 1994), as well as Robust Least Squares Methods and GMM models (Hamilton 1994). All of these methods are used in order to test our interest variable, i.e., a dummy variable that represents the Mexican regulatory system regarding RTAs, which affects the inflow of foreign direct investment.

4. Empirical Results

Table 4 shows unit root tests and shows that the variables used in the empirical models are stationary.

Table 4. Unit root tests (H0: time series has unit root)

	Augmented Dickey-Fuller test statistic (ADF)			Phillips-Perron test statistic (P.P.)		
Variables	Critical value: 5% level	t-Statistic	p-value	Critical value: 5% level	Adj. t-Stat	p-value
L_FDI_GDP	-3.506374	-3.585293	0.0418	-3.506374	-3.627011	0.0379
L_Openness	-3.506374	-2.849181	0.1878	-3.506374	-2.997642	0.1435
L_d_Openness	-2.925169	-6.574048	< 0.001	-2.925169	-6.696651	< 0.001
L_School	-3.506374	-2.209198	0.4738	-3.506374	-1.921871	0.6277
L_d_School	-1.949609	-2.473288	0.0147	-1.947975	-6.607694	< 0.001
Inflation_rate	-1.947816	-1.907750	0.0546	-1.947816	-1.907750	0.0546
Mexico_GDP%	-2.929734	-3.556506	0.0109	-1.947816	-4.549742	< 0.001
World_GDP%	-2.923780	-5.239367	0.0001	-2.923780	-5.034192	0.0001

Source: Prepared by the authors. Notes: L = Log values. Note: the unit root test of the inflation rate shows the critical value at 5% is -1.947816 and the t-Statistic value is -2.395626. Based on the null hypothesis of DF-GLS Test Equation on GLS Detrended Residuals, in which the variable has a unit root, the result is that the inflation rate variable does not have a unit root.

In order to estimate ARDL models, it is necessary to select the optimal number of lags based on the variables of the equation (1). Table 5 shows that 5 lags are selected according to FPE, AIC, SC and HQ criteria, while 3 lags are selected only by the LR criterion. Hence, we choose 5 lags to start the estimates from table 6.

Table 5. Var lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-269.1482	NA	0.000893	12.84410	13.13081	12.94983
1	-175.2374	152.8781	0.000114	10.75523	13.04888	11.60106
2	-131.5196	56.93480	0.000175	11.00091	15.30152	12.58684
3	-52.31690	77.36081*	7.32e-05	9.596135	15.90369	11.92217
4	38.31527	59.01630	3.78e-05	7.659755	15.97426	10.72589
5	231.7724	62.98604	1.14e-06*	0.940818*	11.26227*	4.747051*

Notes: (1) * indicates lag order selected by the criterion. (2) LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Now it is possible to estimate ARDL models with 5 lags. Table 6 shows four models, Models 1A and 1B use Akaike information criterion (AIC), while Models 2A and 2B use Schwarz information criterion (SIC). Furthermore, we estimate each model using two approaches in order to adjust the standard errors via White and Newey-West. We stress that although White standard errors correct for heteroscedasticity only, Newey West standard errors are robust to both Heteroscedasticity and Autocorrelation (HAC). We opt to estimate the empirical models considering both approaches in order to observe the consistency of the estimated coefficients. Since Table 6 is very long, we divide it into two tables, 6A and 6B.

Table 6A. Dependent Variable: L_FDI_GDP, Method ARDL, Annual time series 1970-2018

	Maximum 5 lags (AIC)		Maximum 5 lags (SIC)	
	Model 1A	Model 1B	Model 2A	Model 2B
	White	HAC: Newey-West	White	HAC: Newey-West
Variables	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)
L_FDI_GDP(-1)	0.478335 (0.428586)	0.478335 (0.485398)	0.478335 (0.428586)	0.478335 (0.485398)
L_FDI_GDP (-2)	-0.039750 (0.419325)	-0.039750 (0.504949)	-0.039750 (0.419325)	-0.039750 (0.504949)
L_FDI_GDP (-3)	0.612048 (0.467739)	0.612048 (0.315492)	0.612048 (0.467739)	0.612048 (0.315492)
L_FDI_GDP (-4)	0.847344 (0.821845)	0.847344 (0.686821)	0.847344 (0.821845)	0.847344 (0.686821)
L_d_Openness	1.046379 (1.454451)	1.046379 (1.660523)	1.046379 (1.454451)	1.046379 (1.660523)
L_d_Openness(-1)	6.819321* (2.409643)	6.819321* (1.920382)	6.819321* (2.409643)	6.819321* (1.920382)
L_d_Openness(-2)	-8.676747 (4.873233)	-8.676747 (4.671423)	-8.676747 (2.420940)	-8.676747 (4.671423)
L_d_Openness(-3)	3.009204 (2.198539)	3.009204 (2.684851)	3.009204 (2.198539)	3.009204 (2.684851)
L_d_Openness(-4)	1.876942 (2.420940)	1.876942 (2.882761)	1.876942 (2.420940)	1.876942 (2.882761)
L_d_Openness(-5)	-7.369268 (4.345126)	-7.369268 (4.140118)	-7.369268 (4.345126)	-7.369268 (4.140118)
L_d_School	8.713692 (11.22721)	8.713692 (9.161639)	8.713692 (11.22721)	8.713692 (9.161639)
L_d_School(-1)	-1.994132 (5.972948)	-1.994132 (5.227200)	-1.994132 (5.972948)	-1.994132 (5.227200)
L_d_School(-2)	2.638419 (3.908401)	2.638419 (4.515970)	2.638419 (3.908401)	2.638419 (4.515970)
L_d_School(-3)	4.523075 (5.973963)	4.523075 (7.871448)	4.523075 (5.973963)	4.523075 (7.871448)
L_d_School(-4)	-3.523295 (7.521354)	-3.523295 (6.033113)	-3.523295 (7.521354)	-3.523295 (6.033113)
L_d_School(-5)	-7.242108 (6.899481)	-7.242108 (4.805532)	-7.242108 (6.899481)	-7.242108 (4.805532)
Inflation_rate	-0.005507 (0.010089)	-0.005507 (0.012902)	-0.005507 (0.010089)	-0.005507 (0.012902)
Inflation_rate(-1)	0.006620 (0.013012)	0.006620 (0.017231)	0.006620 (0.017231)	0.006620 (0.017231)
Inflation_rate(-2)	-0.03445* (0.011232)	-0.03445* (0.011686)	-0.03445* (0.011686)	-0.03445* (0.011686)
Inflation_rate(-3)	0.058839 (0.021451)	0.058839 (0.023637)	0.058839 (0.021451)	0.058839 (0.023637)
Inflation_rate(-4)	-0.03110* (0.010033)	-0.03110* (0.010262)	-0.03110* (0.010033)	-0.03110* (0.010262)
Inflation_rate(-5)	0.013174 (0.005500)	0.013174 (0.006874)	0.013174 (0.005500)	0.013174 (0.006874)

Notes: (1) For all models, we use estimates with d.f. adjustment for standard errors & covariance; (2) p-value < 1% ***, 1%<p-value<5% **, 5%<p-value<10% *. In the last line R2 = Adjusted R2, SQR = Sum squared resid and P(F) = prob(F-statistic). (3) White = Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance. (4) HAC: Newey-West = HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000).

The empirical results from table 6 (Tables 6A and 6B) exhibit just three lag variables and a dummy variable that are marginally significant at 10% level: L_d_Openness(-1), Inflation_rate(-2), Inflation_rate(-4) and d_1994. Hence, most of the the current and lag variables aren't statistically significant. These results show that the empirical models are very poor. The Statistic F assumes the following null hypothesis (Ho): the set of estimated coefficients are equal to zero. In the last line of Table 6, one can confirm these results, since Ho is not rejected in all the models. Since Statistic F from Table 6B reproved the empirical models with 5 lags, we test the same empirical models with 4 lags.

Table 6B. Dependent Variable: L_FDI_GDP, Method ARDL, Annual time series 1970-2018

	Maximum 5 lags (AIC)		Maximum 5 lags (SIC)	
	Model 1A	Model 1B	Model 2A	Model 2B
	White	HAC: Newey-West	White	HAC: Newey-West
Variables	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)
Mex_GDP%	-0.142216 (0.134256)	-0.142216 (0.144915)	-0.142216 (0.134256)	-0.142216 (0.144915)
Mex_GDP%(-1)	0.324562 (0.239419)	0.324562 (0.161102)	0.324562 (0.239419)	0.324562 (0.161102)
Mex_GDP% (-2)	-0.161198 (0.135926)	-0.161198 (0.123308)	-0.161198 (0.135926)	-0.161198 (0.123308)
Mex_GDP% (-3)	0.171394 (0.115527)	0.171394 (0.123979)	0.171394 (0.115527)	0.171394 (0.123979)
Mex_GDP% (-4)	0.187004 (0.102926)	0.187004 (0.079535)	0.187004 (0.102926)	0.187004 (0.079535)
Mex_GDP% (-5)	-0.166038 (0.120206)	-0.166038 (0.100752)	-0.166038 0.120206)	-0.166038 (0.100752)
D_1994	1.981590* (0.711591)	1.981590* (0.695439)	1.981590* (0.711591)	1.981590* (0.695439)
D_1994(-1)	-5.777424 (3.533716)	-5.777424 (3.192466)	-5.777424 (3.533716)	-5.777424 (3.192466)
D_1994(-2)	5.790598 (5.279944)	5.790598 (4.585680)	5.790598 (5.279944)	5.790598 (4.585680)
D_1994(-3)	-0.603089 (3.432297)	-0.603089 (3.345680)	-0.603089 (3.432297)	-0.603089 (3.345680)
D_1994(-4)	-4.136720 (2.003481)	-4.136720 (2.171409)	-4.136720 (2.003481)	-4.136720 (2.171409)
D_1994(-5)	2.243329 (1.247932)	2.243329 (1.079814)	2.243329 (1.247932)	2.243329 (1.079814)
World_GDP%	0.317330 (0.252151)	0.317330 (0.239086)	0.317330 (0.252151)	0.317330 (0.239086)
World_GDP%(-1)	-0.842193 (0.549940)	-0.842193 (0.386555)	-0.842193 (0.549940)	-0.842193 (0.386555)
World_GDP%(-2)	0.544006 (0.322925)	0.544006 (0.231049)	0.544006 (0.322925)	0.544006 (0.231049)
World_GDP%(-3)	-0.178404 (0.159346)	-0.178404 (0.180922)	-0.178404 (0.159346)	-0.178404 (0.180922)
World_GDP%(-4)	-0.389956 (0.188197)	-0.389956 (0.154983)	-0.389956 (0.188197)	-0.389956 (0.154983)
World_GDP%(-5)	0.214524 (0.169525)	0.214524 (0.142735)	0.214524 (0.188197)	0.214524 (0.142735)
Constant	0.182303 (1.096822)	0.182303 (1.119709)	0.182303 (1.096822)	0.182303 (1.119709)
	R2=0.84, SQR = 0.09	R2=0.84, SQR = 0.09	R2=0.84, SQR = 0.09	R2=0.84, SQR = 0.09
Statistics	F_stat=6.58, (F)=0.14	F_stat= 6.58, P(F)=0.14	F_stat= 6.58, P(F)=0.14	F_stat= 6.58, P(F)=0.14

Notes: (1) For all models, we use estimates with d.f. adjustment for standard errors & covariance; (2) p-value < 1% ***, 1%<p-value<5% **, 5%<p-value<10% *. In the last line R2 = Adjusted R2, SQR = Sum squared resid and P(F) = prob(F-statistic). (3) White = Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance. (4) HAC: Newey-West = HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000).

Table 7 shows that FPE, AIC and HQ criteria choose 4 lags, LR criterion chooses 3 lags and, finally, SC criterion chooses 1 lag.

Table 7. Var lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-280.4647	NA	0.001115	13.06658	13.35043	13.17184
1	-182.9042	159.6444	0.000126	10.85928	13.13007*	11.70140
2	-137.7348	59.54151	0.000178	11.03340	15.29113	12.61237
3	-57.51770	80.21713*	7.05e-05	9.614441	15.85910	11.93026
4	33.24978	61.88691	3.36e-05*	7.715919*	15.94752	10.76859*

Notes: (1) * indicates lag order selected by the criterion. (2) LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

In this context, the Table 8 shows empirical models with 4 lags, Table 9 uses 3 lags and Table 10 exhibits models with only 1 lag. The models exhibited in Tables 8, 9 and 10 show that the null hypothesis of the statistics F is not accepted and consequently the models are validated.

Table 8. Dependent Variable: L_FDI_GDP, Method ARDL, Annual time series 1970-2018

	Maximum 4 lags (AIC)		Maximum 4 lags (SIC)	
	Model 3A	Model 3B	Model 4A	Model 4B
	White	HAC: Newey-West	White	HAC: Newey-West
Variabes	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)
L_FDI_GDP(-1)	0.275005* (0.155066)	0.275005** (0.124931)	0.233352** (0.109687)	0.233352** (0.097451)
L_FDI_GDP (-2)	0.280598 (0.280598)	0.280598* (0.168055)		
L_FDI_GDP (-3)	0.261950** (0.12766)	0.261950* (0.152846)		
L_FDI_GDP (-4)	-0.38086*** (0.11034)	-0.38086*** (0.096079)		
L_d_Openness	0.274639 (0.601858)	0.274639 (0.566631)	0.492993 (0.348392)	0.492993 (0.353350)
L_d_School	-2.21745** (0.89352)	-2.21745** (0.86989)	-3.36268** (1.25877)	-3.36268** (0.97879)
L_d_School(-1)	2.355690** (1.18000)	2.355690** (1.08987)		
L_d_School(-2)	1.090740 (0.999081)	1.090740 (0.877614)		
L_d_School(-3)	2.988230** (1.35512)	2.988230** (1.32397)		
Inflation_rate	-0.003724 (0.002280)	-0.003724 (0.002329)	-0.000199 (0.001775)	-0.000199 (0.002124)
Inflation_rate(-1)	0.003104 (0.002942)	0.003104 (0.002215)		
Inflation_rate(-2)	-0.003348 (0.003060)	-0.003348 (0.002726)		
Inflation_rate(-3)	0.00545*** (0.00179)	0.00545*** (0.00171)		
Mex_GDP%	-0.049611** (0.01834)	-0.049611** (0.01822)	-0.019490 (0.015837)	-0.019490 (0.016912)
Mex_GDP%(-1)	0.022547* (0.012542)	0.022547* (0.012542)		
Mex_GDP_% (-2)	0.022612 (0.191793)	0.022612 (0.015837)		
D_1994	0.64823*** (0.64823)	0.64823*** (0.15705)	0.73389*** (0.29155)	0.73389*** (0.15643)
World_GDP	0.044639 (0.046053)	0.044639 (0.035660)	-0.011274 (0.042582)	-0.011274 (0.043465
World_GDP%(-1)	0.046589 (0.032219)	0.046589* (0.027940)		
World_GDP%(-2)	-0.043400 (0.039702)	-0.043400 (0.047188)		
World_GDP%(-3)	0.026798 (0.036101)	0.026798 (0.045735)		
World_GDP%(-4)	-0.060097 (0.038225)	-0.060097 (0.039313)		
Constant	-0.194584 (0.280959)	-0.194584 (0.278590)	0.091921 (0.179347)	0.091921 (0.210387)
Statistics	R2=0.88, SQR=0.89 F_stat= 15.7, P(F)<0001	R2=0.88, SQR=0.89 F_stat= 15.7, P(F)<0001	R2=0.82, SQR=2.78 F_stat=31.16, (F)<0001	R2=0.82, SQR=2.78 F_stat=31.16, (F)<0001

Notes: (1) For all models, we use estimates with d.f. adjustment for standard errors & covariance; (2) p-value < 1% ***, 1%<p-value<5% **, 5%<p-value<10% *. (2) In the last line R2 = Adjusted R2, SQR = Sum squared resid and P(F) = prob(F-statistic). (3) White = Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance. (4) HAC: Newey-West = HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000).

Table 8 shows empirical models with 4 lags. The models are estimated considering the White and Newey-West statistic procedures. Furthermore, we use AIC criteria for models 3A and 3B and SIC criteria for models 4A and 4B. This same modus operandi is used in Tables 9 and 10.

The models 3A and 3B show that the estimated coefficients regarding lags effects from dependent variables are statistically significant at the 1%, 5% and 10% levels, except the coefficient from lag 2 in model 3A. The coefficients from lags 1, 2 and 3 present positive signs, while lag 4 shows a negative one. The empirical results also display, in rough terms, that lags 1, 2 and 3 reflect inertial effects, in which the FDI of the previous 3 years are reinforcing the increase of the dependent variable in current time. Moreover, note that the estimated coefficient from L_d_Openness variable is not statistically significant.

According to Models 3A and 3B, the proxy for the education variable, L_d_School, shows that the coefficient estimated for this current variable is statistically significant at the 5% level and presents a negative sign. However, the lags of estimated coefficients 1 and 3 from this same variable are statistically significant at the 5% level and the signs are positive. Considering the next control variable, only the estimated coefficient of the 4-year lagged inflation rate showed up statistically significant.

The estimated coefficients from Mex_GDP% and Mex_GDP%(-1), which present negative and positive signs respectively, are statistically significant at 1% and 5% levels respectively, based on models 3A and 3B.

Finally, we stress our interest variable, d_1994, which shows the estimated coefficient statistically significant at the 1% level with a positive sign. This means that the NAFTA agreement generates a positive effect on the inflow of foreign direct investment as proportion of GDP in the Mexican economy. Note that the variable relative to World_GDP% is not statistically significant in current time as well as in the previous years.

As for Models 4A and 4b, when compared to Models 3A and 3B, we can highlight the importance of using more than one criterion for selecting lags (AIC and SIC), since the number of lags obtained is sensitive to the criterion used. In this case, we use two of the most used criteria in the literature.

Models 4A and 4B, based on SIC criteria, show the same model but with few lagged variables. In this context, we highlighted just the variables statistically significant at the 1% and 5% levels. The estimated coefficients from L_FDI_GDP(-1), L_d_School and d_1994 show positive, negative and positive signs respectively. Finally, it is worth noting that all estimated models have Adjusted R2 indicator higher than 0.80. Moreover, the F statistics validate all of them.

Table 9 reveals that four empirical models take into account 3 lags. There are similarities among some variables from Tables 8 and 9, such as L_d_School and the dummy variable, d_1994. However, most of them show differences. Only the estimated coefficient from lagged dependent variable related to Models 5A and 5B, L_FDI_GDP(-1), is statistically significant, while models 6A and 6B present two L_FDI_GDP lags statistically significant. In addition, all of the estimated coefficients reveal positive signs.

Table 9. Dependent Variable: L_FDI_GDP, Method ARDL, Annual time series 1970-2018

	Maximum 3 lags (AIC)		Maximum 3 lags (SIC)	
	Model 5A	Model 5B	Model 6A	Model 6B
	White	HAC: Newey-West	White	HAC: Newey-West
	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)
L_FDI_GDP(-1)	0.385160*** (0.14004)	0.385160*** (0.12331)	0.224643* (0.132859)	0.224643* (0.119378)
L_FDI_GDP (-2)			0.237048** (0.099039)	0.237048** (0.078691)
L_d_Openness	-0.212144 (0.386613)	-0.212144 (0.329320)	0.655817* (0.375932)	0.655817** (0.287926)
L_d_School	-3.117224*** (1.09607)	-3.117224*** (0.92925)	-3.246054*** (1.06273)	-3.246054*** (0.82813)
L_d_School(-1)	1.537735* (0.826290)	1.537735* (0.838112)		
Inflation_rate	-0.004605*** (0.00128)	-0.004605*** (0.00112)	0.000316 (0.00169)	0.000316 (0.00229)
Inflation_rate(-1)	0.007406** (0.002765)	0.007406** (0.002315)		
Inflation_rate(-2)	-0.005287** (0.002216)	-0.005287** (0.002115)		
Inflation_rate(-3)	0.005520*** (0.001855)	0.005520*** (0.001853)		
Mex_GDP%	-0.037955*** (0.013040)	-0.037955** (0.014063)	-0.022928 (0.014006)	-0.022928 (0.016024)
Mex_GDP%(-1)	0.039226*** (0.011084)	0.039226*** (0.011748)	0.027466*** (0.010074)	0.027466** (0.011215)

D_1994	0.719541*** (0.166368)	0.719541*** (0.011748)	0.561706*** (0.196763)	0.561706*** (0.154154)
World_GDP%	0.060794* (0.034448)	0.060794* (0.030900)	0.000965 (0.042655)	0.000965 (0.039597)
Constant	-0.321406* (0.168772)	-0.321406* (0.191165)	-0.043369 (0.199604)	-0.043369 (0.227787)
Statistics	R2=0.85, SQR=1.69 F_stat=22.4, P(F)<0001	R2=0.85, SQR=1.69 F_stat=22.4, P(F)<0001	R2=0.83, SQR=2.34 F_stat=26.5, (F)<0001	R2=0.83, SQR=2.34 F_stat=26.5, (F)<0001

Notes: (1) For all models, we use estimates with d.f. adjustment for standard errors & covariance; (2) p-value < 1% ***, 1%<p-value<5% **, 5%<p-value<10% *. (2) In the last line R2 = Adjusted R2, SQR = Sum squared resid and P(F) = prob(F-statistic). (3) White = Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance. (4) HAC: Newey-West = HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000).

Notice that, based on models 6A and 6B, the estimated coefficients from L_d_openness are statistically significant with positive signs. Additionally, the current and lagged variables related to inflation rate from Models 5A and 5B are statistically significant, while the signs are alternated among negative and positive.

As for the Mex_GDP% variable, the empirical results from Tables 8 (Models 3A and 3B) and 9 (Models 5A and 5B) are similar. However, only the models 6A and 6B from Table 9 present the estimated coefficients statistically significant from Mex_GDP%(-1) with positive signs. Besides, the models 5A and 5B display that the estimated coefficient from World_GDP% variable is statistically significant with a positive sign.

Lastly, the ARDL models with 1 lag based on Table 10 show that only the estimated coefficients regarding L_d_Openness, Inflation _rate and World_GDP% variables are not statistically significant. The rest of them are statistically significant, but the most important issue is that the main variable, d_1994, keeps its estimated coefficients statistically significant with positive signs, regardless of control variables, according to all the estimated empirical models.

Table 10. Dependent Variable: L_FDI_GDP, Method ARDL, Annual time series 1970-2018

	Model 7: maximum 1 lag (AIC)		Model 8 : maximum 1 lag (SIC)	
	White	HAC: Newey-West	White	HAC: Newey-West
	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)	Coefficient (Std.Error)
L_FDI_GDP(-1)	0.298217** (0.14004)	0.298217*** (0.093829)	0.298217*** (0.116485)	0.298217*** (0.093829)
L_d_Openness	0.176773 (0.413659)	0.176773 (0.333975)	0.176773 (0.413659)	0.176773 (0.333975)
L_d_School	-3.324478*** (1.02225)	-3.324478*** (0.74730)	-3.324478*** (1.02225)	-3.324478*** (0.747306)
Inflation_rate	-0.001922 (0.001262)	-0.001922 (0.001403)	-0.001922 (0.001262)	-0.001922 (0.001403)
Inflation_rate(-1)	0.004711*** (0.001658)	0.004711*** (0.001407)	0.004711*** (0.001658)	0.004711*** (0.001407)
Mex_GDP%	-0.025510* (0.01385)	-0.025510* (0.014965)	-0.025510* (0.01385)	-0.025510* (0.014965)
Mex_GDP%(-1)	0.030429*** (0.009805)	0.030429*** (0.009642)	0.030429*** (0.009805)	0.030429*** (0.009642)
D_1994	0.807575*** (0.152463)	0.807575*** (0.139451)	0.807575*** (0.152463)	0.807575*** (0.139451)
World_GDP%	0.010243 (0.039139)	0.010243 (0.040864)	0.010243 (0.039139)	0.010243 (0.040864)
Constant	-0.186036 (0.197008)	-0.186036 (0.228955)	-0.186036 (0.197008)	-0.186036 (0.228955)
Statistics	R2=0.84, SQR=2.33 F_stat=28.2, P(F)<0001	R2=0.84, SQR=2.33 F_stat=28.2, P(F)<0001	R2=0.84, SQR=2.33 F_stat=28.2, (F)<0001	R2=0.84, SQR=2.33 F_stat=28.2, (F)<0001

Notes: (1) For all models, we use estimates with d.f. adjustment for standard errors & covariance; (2) p-value < 1% ***, 1%<p-value<5% **, 5%<p-value<10% *. (2) In the last line R2 = Adjusted R2, SQR = Sum squared resid and P(F) = prob(F-statistic). (3) White = Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance. (4) HAC: Newey-West = HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000).

Table 11 shows that the dummy variable, d_1994, Granger cause L_FDI_GDP considering 4, 3, 2 and 1 lags. Additionally, causality tests are shown in the appendices based on Table 11A, taking into account all the variables presented in the empirical models.

Table 11. Pairwise Granger Causality Tests: 1970-2018

Lags	Null Hypothesis	Obs	F_Statistic	Prob.
5	D_1994 does not Granger Cause L_FDI_GDP	44	1.71065	0.1596
	L_FDI_GDP does not Granger Cause D_1994		0.82596	0.5403
Lags	Null Hypothesis	Obs	F_Statistic	Prob.
4	D_1994 does not Granger Cause L_FDI_GDP	45	2.58602	0.0532
	L_FDI_GDP does not Granger Cause D_1994		1.09002	0.3761
Lags	Null Hypothesis	Obs	F_Statistic	Prob.
3	D_1994 does not Granger Cause L_FDI_GDP	46	3.20736	0.0334
	L_FDI_GDP does not Granger Cause D_1994		1.40438	0.2560
Lags	Null Hypothesis	Obs	F_Statistic	Prob.
2	D_1994 does not Granger Cause L_FDI_GDP	47	4.58171	0.0159
	L_FDI_GDP does not Granger Cause D_1994		0.56269	0.5739
Lags	Null Hypothesis	Obs	F_Statistic	Prob.
1	D_1994 does not Granger Cause L_FDI_GDP	48	15.8795	0.0002
	L_FDI_GDP does not Granger Cause D_1994		0.00411	0.9492

4.1 Empirical Evidence Based on Robust Least Squares Methods and GMM

Table 12 displays three Robust Least Squares models: Model 9 with M-estimation, Model 10 with S-estimation, and Model 11 with MM-Estimation. Our interest variable d_1994 is statistically significant at the 1% level for all models and once more shows a positive sign, as expected.

Regarding the control variables, only the estimated coefficient from the variable L_d_school is statistically significant at the 1% level, considering the three models. The estimated coefficient is still negative, but the expected sign should be positive. Still considering Model 10, the estimated coefficient from the variable L_d_openness is marginally significant at the 10% level and shows a positive impact on the dependent variable, as expected.

Mexican economic growth presents a negative estimated coefficient which is statistically significant at the 1% level, based on Model 10 as well. We stress that if the variable Mexico_GDP% increases, the variable L_FDI_GDP will decrease given FDI, because the economic growth affects the denominator of the ratio FDI/GDP. In this context, this is the expected result. Besides this, the estimated coefficient of the constant term is statistically significant at the 5% level, also according to Model 10. Finally, the rest of the estimated coefficients from Table 12 is not statistically significant.

Table 12. Dependent Variable: L_FDI_GDP. Method: Robust Least Squares (1970-2018)

	Model 9: M-estimation		Model 10: S-estimation		Model 11: MM-estimation	
Variables	Coefficient	(Std.Error)	Coefficient	(Std.Error)	Coefficient	(Std.Error)
L_d_Openness	0.376654	(0.413659)	0.753183*	(0.411284)	0.357411	(0.417209)
L_d_School	-3.780063***	(1.17343)	-5.002434***	(1.15538)	-3.705493***	(1.172033)
Inflation_rate	0.000145	(0.001991)	-0.001907	(0.00196)	0.000292	(0.001989)
Mexico_GDP%	-0.023520	(0.015181)	-0.025510***	(0.014947)	-0.023257	(0.015162)

D_1994	0.984689***	(0.113372)	0.949706***	(0.111628)	0.990247***	(0.113236)
World_GDP%	-0.045252	(0.034369)	-0.034372	(0.033840)	-0.038561	(0.034328)
Constant	0.192309	(0.149990)	0.358661**	(0.147683)	0.159759	(0.149810)
Statistics						
Adjusted R-squared	0.66		0.67		0.68	
SQR	3.08		3.96		3.04	

Notes: p-value < 1% ***, 1%<p-value<5% **, 5%<p-value<10% *. SQR = Sum squared resid.

Table 13 displays Model 12 based on the M-estimation method, in which we use the same variables from Table 12 and two additional interactive variables. The first is the interactive variable inflation_rate*d_1994, which shows the effect of the inflation rate on L_FDI_GDP from 1994 until 2018. Notice that both estimated coefficients from inflation_rate related to tables 12 and 13 are not statistically significant. However, in table 14, the interactive variable is marginally significant at the 10% level and shows a negative sign, as expected. In this context, the higher the inflation rate is, the worse the economic fundamentals are, and consequently the incentive for an influx of FDI tends to reduce.

Table 13. Dependent Variable: L_FDI_GDP. Method: Robust Least Squares (1970-2018)

Model 12 - Method: M-estimation				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_d_Openness	0.818083	0.380070	2.152455	0.0314
L_d_School	-3.755600	1.030656	-3.643893	0.0003
Inflation_rate	-0.000524	0.001809	-0.289883	0.7719
Inflation_rate*d_1994	-0.010150	0.006297	-1.611832	0.1070
Mexico_GDP%	-0.023909	0.013944	-1.714604	0.0864
D_1994	0.512809	0.216303	2.370786	0.0178
World_GDP%	-0.119311	0.036174	-3.298228	0.0010
World_GDP%*d_1994	0.158280	0.055792	2.837000	0.0046
Constant	0.488017	0.162587	3.001570	0.0027
Statistics				
Statistics: Adjusted R-squared=0.63, Adjust Rw-squared=0.91, Rn-squared statistic=264.5, Prob(Rn-squared stat.) = <0.00001.				
Note: The methods S-estimation and MM-estimation cannot be estimated because the maximum number of singular subsamples was reached.				

The estimated coefficient of the proxy for the foreign income ratio, World_GDP%, is not statistically significant in Table 12, but with the insertion of the second interactive variable in Table 13, World_GDP%*d_1994, the estimated coefficient of World_GDP% (-0.119311) becomes significant at the 1% level and shows a negative sign. On the other hand, the second interactive variable shows a positive sign, and its estimated coefficient (0.158280) is also statistically significant at the 1% level. Taking into account both variables, from 1994 to 2018, the net effect of the foreign income rate on L_FDI_GDP is positive, as expected. In this sense, the higher the external income of all the world is, the greater the possibility of other countries doing direct investments in Mexico becomes.

The estimated coefficients of L_d_openness and d_1994 are statistically significant at the 5% level and they present positive signs. These results present empirical evidence that the Foreign Direct Investment also increased in Mexico due to higher economic openness as well as with the implementation of RTAs since 1994. The estimated coefficients from L_School and Mexico_GDP% continue with negative signs and, moreover they are statistically significant at the 1% and 10% levels respectively.

Finally, considering the possibility of endogeneity problems, we opt to estimate a GMM model in order to correct this kind of situation using instrumentals variables. Firstly, based on the empirical results from table 14, all the estimated coefficients are statistically significant at the 1% level.

Table 14. Dependent Variable: L_FDI_GDP. GMM Method (1970-2018)

	Model 13 - Method: Generalized Method of Moments (GMM)			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_d_Openness	0.243956	0.014281	17.08269	<0.00001
L_d_School	1.627067	0.211430	7.695525	<0.00001
Inflation_rate	-0.004226	4.80E-05	-87.95141	<0.00001
Mexico_GDP%	-0.030016	0.002229	-13.46817	<0.00001
D_1994	0.659992	0.004931	133.8373	<0.00001
World_GDP%	0.030573	0.003033	10.08035	<0.00001
Constant	0.306155	0.005210	58.76479	<0.00001

Statistics	Adjusted_R2=0,81	SQR = 1.37	J-statistic = 10.3	Prob(J-stat) = 0.99
Instruments: L_FDI_GDP(-1to-5), L_d_Openness(-2to-5), L_D_SCHOOL(-1to-5), INFLATION_RATE(-1to-5), Mexico_GDP%(-1to-5), D_1994(-1to-5), World_GDP%(-1to-11)				

Note: SQR = Sum squared resid, Prob(J-stat) = Prob(J-statistic).

Secondly, all of them display the expected signs. In this sense, we highlighted that the impact of L_d_school on L_FDI_GDP is positive as expected, and the estimated coefficient value from L_d_School variable is 1.627. This means that an increase of 1% in L_d_school, raises the L_FDI_GDP dependent variable in 1,67%. Besides, the J statistics show that the instruments are validated, since the null hypothesis (Ho), which states that the instruments are valid, is not rejected with a p-valeu of 0.99.

At last, we also test the same model from Table 14 in order to insert a new dummy variable, d_1991_1993, in Table 15, which is equal to 1 referring to the years 1991, 1992, and 1993, the other years being equal to zero. The idea is to test to see if there was an increase in the FDI inflow in Mexico, which began in the NAFTA negotiation period that started around 1991 and ended in 1993. In other words, we test the hypothesis that the expectation of the NAFTA agreement being approved contributed to the increase of the FDI inflow during the period mentioned.

Table 15. Dependent Variable: L_FDI_GDP. GMM Method (1970-2018)

	Model 13 - Method: Generalized Method of Moments (GMM)			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_d_Openness	0.224605	0.020863	10.76546	<0.0001
L_d_School	2.399846	0.446946	5.369435	<0.0001
Inflation_rate	-0.004114	0.000116	-35.35369	<0.0001
Mexico_GDP%	-0.035214	0.003311	-10.63495	<0.0001
D_1994	0.692164	0.014668	47.18888	<0.0001
World_GDP%	0.042199	0.005375	7.851175	<0.0001
D_1991_1993	0.088184	0.033591	2.625225	0.0135

Constant	0.248909	0.017667	14.08912	<0.0001
Statistics	Adjusted_R2=0,79	SQR = 1.35	J-statistic = 9.57	Prob(J-stat) = 0.99
Instruments: L_FDI_GDP(-1to-5), L_d_Openness(-2to-5), L_D_SCHOOL(-1to-5), INFLATION_RATE(-1to-5), Mexico_GDP%(-1to-5), D_1994(-1to-5), World_GDP%(-1to-11)				

Note: SQR = Sum squared resid, Prob(J-stat) = Prob(J-statistic).

The empirical evidence from Table 15 is similar to that of Table 14, except by the new variable d_1991_1993. This new dummy variable shows that the estimated coefficient of d_1991_1993 is statistically significant at the 5% level with a positive value (0.088184).

Figures 1 and 2 show the impulse response process based on the VAR system for 24 years, which reveals the response of L_FDI_GDP to the dummy variable d_1994. One can observe the positive impact of the implementation of RTAs since 1994 on foreign direct investment as a proportion of GDP in Mexico. The difference between both figures is that the second one presents accumulated responses. Both results show the positive effect of RTAs on L_FDI_GDP.

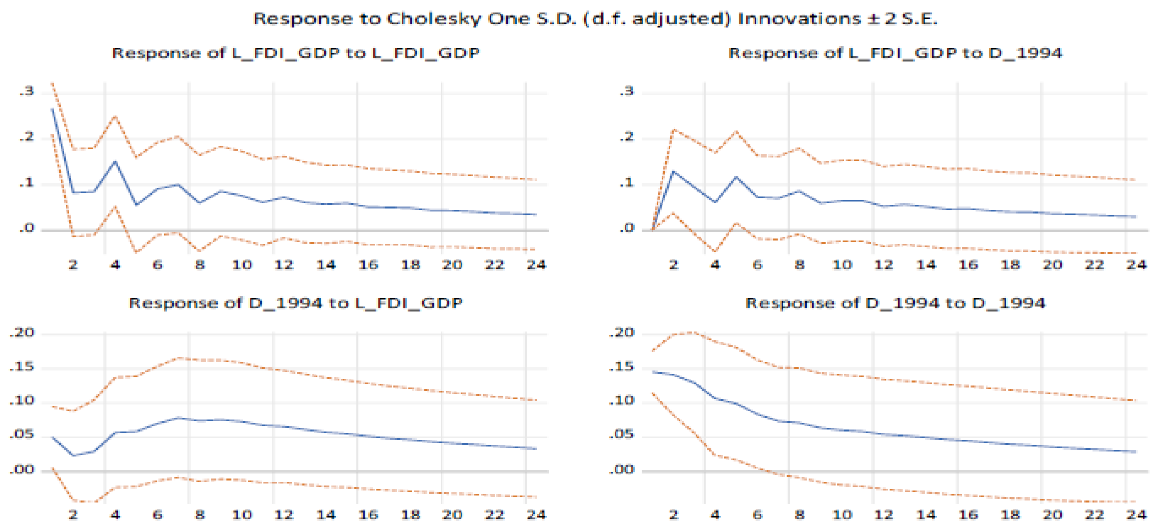

Figure 1. Impulse response (24 periods)

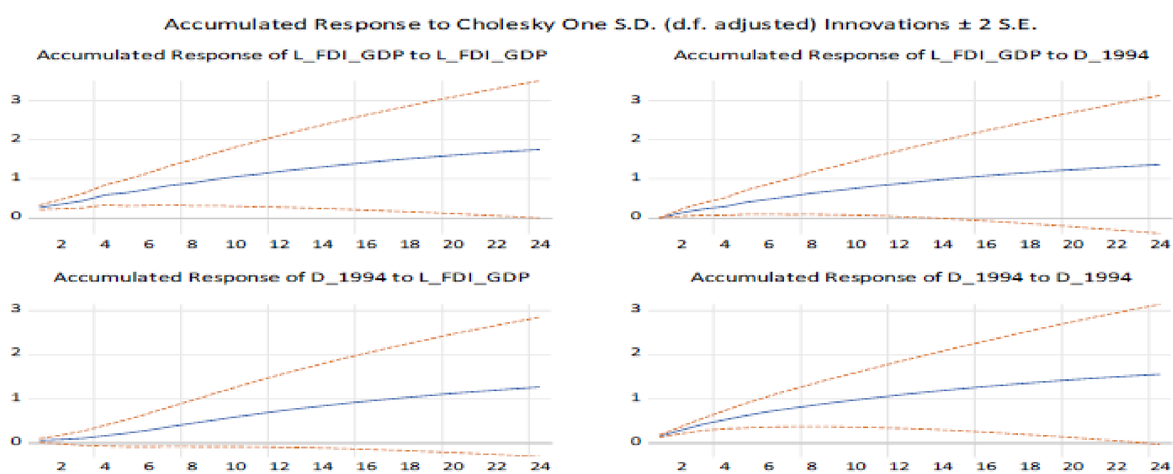

Figure 2. Impulse response Tests: Accumulated responses (24 periods)

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Appendix

Table A. Pairwise Granger Causality Tests (4 lags): 1970-2018

Null Hypothesis:	Obs	F-Statistic	Prob.
L_IMPORTS_GDP does not Granger Cause L_FDI_GDP	45	1.06257	0.3891
L_FDI_GDP does not Granger Cause L_IMPORTS_GDP		1.59609	0.1965
L_D_SCHOOL does not Granger Cause L_FDI_GDP	44	0.49246	0.7412
L_FDI_GDP does not Granger Cause L_D_SCHOOL		1.69902	0.1723
INFLATION_RATE does not Granger Cause L_FDI_GDP	45	0.39077	0.8138
L_FDI_GDP does not Granger Cause INFLATION_RATE		1.46764	0.2323
MEXICO_GDP_GROWTH does not Granger Cause L_FDI_GDP	45	0.70014	0.5970
L_FDI_GDP does not Granger Cause MEXICO_GDP_GROWTH		1.62544	0.1890
D_1994 does not Granger Cause L_FDI_GDP	45	2.58602	0.0532
L_FDI_GDP does not Granger Cause D_1994		1.09002	0.3761
WORLD_GDP_GROWTH does not Granger Cause L_FDI_GDP	45	1.90269	0.1312
L_FDI_GDP does not Granger Cause WORLD_GDP_GROWTH		1.31949	0.2813
L_D_SCHOOL does not Granger Cause L_IMPORTS_GDP	44	1.37622	0.2621
L_IMPORTS_GDP does not Granger Cause L_D_SCHOOL		2.24630	0.0839
INFLATION_RATE does not Granger Cause L_IMPORTS_GDP	45	1.42859	0.2444

L_IMPORTS_GDP does not Granger Cause INFLATION_RATE		2.12324	0.0980
MEXICO_GDP_GROWTH does not Granger Cause L_IMPORTS_GDP	45	4.58513	0.0043
L_IMPORTS_GDP does not Granger Cause MEXICO_GDP_GROWTH		2.67046	0.0476
D_1994 does not Granger Cause L_IMPORTS_GDP	45	1.92898	0.1267
L_IMPORTS_GDP does not Granger Cause D_1994		3.50621	0.0162
WORLD_GDP_GROWTH does not Granger Cause L_IMPORTS_GDP	45	0.74990	0.5646
L_IMPORTS_GDP does not Granger Cause WORLD_GDP_GROWTH		1.33583	0.2755

Table B. Pairwise Granger Causality Tests (4 Lags): 1970-2018

Null Hypothesis:	Obs	F-Statistic	Prob.
INFLATION_RATE does not Granger Cause L_D_SCHOOL	44	0.47258	0.7555
L_D_SCHOOL does not Granger Cause INFLATION_RATE		0.13655	0.9677
MEXICO_GDP_GROWTH does not Granger Cause L_D_SCHOOL	44	1.02178	0.4096
L_D_SCHOOL does not Granger Cause MEXICO_GDP_GROWTH		2.58799	0.0536
D_1994 does not Granger Cause L_D_SCHOOL	44	1.02669	0.4072
L_D_SCHOOL does not Granger Cause D_1994		0.74667	0.5669
WORLD_GDP_GROWTH does not Granger Cause L_D_SCHOOL	44	2.30834	0.0773
L_D_SCHOOL does not Granger Cause WORLD_GDP_GROWTH		0.20123	0.9360
MEXICO_GDP_GROWTH does not Granger Cause INFLATION_RATE	45	0.66383	0.6212
INFLATION_RATE does not Granger Cause MEXICO_GDP_GROWTH		0.07941	0.9882
D_1994 does not Granger Cause INFLATION_RATE	45	1.70331	0.1707
INFLATION_RATE does not Granger Cause D_1994		0.38867	0.8153
WORLD_GDP_GROWTH does not Granger Cause INFLATION_RATE	45	0.34399	0.8464
INFLATION_RATE does not Granger Cause WORLD_GDP_GROWTH		0.82897	0.5156
D_1994 does not Granger Cause MEXICO_GDP_GROWTH	45	4.65345	0.0039
MEXICO_GDP_GROWTH does not Granger Cause D_1994		0.11286	0.9772
WORLD_GDP_GROWTH does not Granger Cause MEXICO_GDP_GROWTH	45	0.35329	0.8400
MEXICO_GDP_GROWTH does not Granger Cause WORLD_GDP_GROWTH		1.08503	0.3785
WORLD_GDP_GROWTH does not Granger Cause D_1994	45	0.99261	0.4241
D_1994 does not Granger Cause WORLD_GDP_GROWTH		0.11885	0.9749