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Economic growth, foreign direct investment and international trade: evidence on causality in the mexican economy

Resumo: Este artigo examina a causalidade no sentido de Granger e a sua direção entre as variáveis: Produto Interno Bruto (GDP), Exportações, Importações e Investimento Estrangeiro Direto (FDI) no México. O GDP se deteriora em dois setores: Setor industrial e Serviços. A metodologia desenvolvida por Liu, Burridge and Sinclair (2002) e os testes de câmbio estrutural para o vetor de cointegração, desenvolvidos por Quintos and Philips (1993) e Quintos (1997 e 1998) foram aplicados. A estimação mostra uma relação estável e causal do FDI sobre variáveis como o GDP industrial, Exportações e Importações. Porém, o setor de serviços tende a não ter um efeito direto sobre os investimentos. Embora o México tenha se beneficiado grandemente pelo FDI, tal benefício é ativado pelas Exportações e o GDP industrial, variáveis que têm uma forte ligação com a atividade econômica dos Estados Unidos e não com a evolução real da economia mexicana.

Palavras-chave: Produto interno bruto. Exportação. Importação. Economia mexicana.
Classificação JEL: C32, F17, F43.

Abstract: This paper examines both the existence of causality, in the Granger sense, and its direction between Gross Domestic Product (GDP), Exports, Imports and Foreign Direct Investment (FDI) in Mexico. GDP is broken down into two sectors: industrial and services. The cointegration methodology developed by Liu, Burridge and Sinclair (2002) and the tests of structural changes, for the vector of cointegration developed by Quintos and Philips (1993) and Quintos (1997 and 1998) were applied. The estimation shows a stable and causal relationship of FDI over variables such as the industrial GDP, Exports and Imports. However, the service sector tends to not have a direct effect over investments. Notwithstanding that Mexico greatly benefits from FDI, as such those benefits are triggered by Exports and the industrial GDP, variables that hold a stronger linkage with the economic activity of the United States and not with the actual evolution of the Mexican economy.

Keywords: International Trade. Economic Growth. Foreign Direct Investment. Causality. Cointegration.
JEL classification: C32, F17, F43.

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Introduction

In the decade of the 1980, Mexico implemented a series of economic reforms directed towards the commercial liberalization, privatization and deregulation of its financial markets. Nevertheless, Tornell et al. (2004) have recently shown that the performance of the Mexican economic growth was lower than expected in spite of the implementation of various commercial treaties, especially the North America Free Trade Agreement (NAFTA).

As an example, between 2005 and 2006, the Mexican economy increased its exports towards the United States in 9.2 and 11.5% respectively. Yet, the dynamism of the Mexican sales was inferior to the average of the imports observed in the American market (13.7 and 14.5% respectively) and also smaller than the average of most of its main business partners, a remarkable situation for the last six years period (Table 1).

Table 1 – Imports of the United States: main suppliers – Annual Variation

	2001	2002	2003	2004	2005	2006
Canada	-6.3	-3.3	7.2	14.2	12.5	8.8
China	2.3	22.4	21.7	29.1	23.8	31.7
Mexico	-3.4	2.5	2.6	12.9	9.2	11.5
Japan	-13.7	-4	-2.8	9.8	6.6	7.5
Germany	1	5.8	8.9	13.5	9.8	20.9
United Kingdom	-4.6	-1.5	4.7	8.8	10	17.6
Total average	-6.3	1.8	8.4	16.7	13.7	14.5
Annual growth of the United Status (%)	0.8	1.6	2.5	3.9	3.2	3.3

Elaborated on the basis of information of the Department of Commerce of the United States

It is also important to consider a significant decrease in the exports of computers, computers accessories and TV & radio transmitters, in which Chinese goods displaced Mexican Products´ sales (de la Cruz and Núñez, 2005). In fact, in the year 2005, Chinese exports in the mentioned headings soared over 52 billion dollars, whereas those of Mexico scored a mere 9.7 billion. The relevance of such difference resides in the fact that in the year 2000, Chinese exports of those products represented just 11 billion dollars, whereas those of Mexico surpassed the figure of 13 billion, an exponential growth for Chinese sales, at the time where Mexican sales remained stagnant.

The significant downturn in the mentioned exports can also be extended to a larger share of products comprising the Mexican foreign trade with the United States (US), in particular those related to the manufacturing sector (de la Cruz and Núñez, 2005). In that sense, Chiquiar and Ramos-Francia (2005) also found that the performance of exports related to the manufacturing sector, an important recipient of Foreign Direct Investment (FDI) in Mexico, was strongly linked with the dynamics of the American economy,

According to Borensztein et al. (1998), FDI becomes an essential mechanism for obtaining the necessary technology required to induce economic growth in emerging economies. In the particular case of Mexico, Schiff and Wang (2003) estimated that this technology mostly stems from the United States and Canada, considered as Mexico's strategic business partners. Thus, if the Mexican manufacturing sector receives a substantial share of FDI (specially in the case of the exports oriented sector) and if this type of investment becomes a relevant source of technology for Mexico, any alteration in the patterns of both, FDI and international trade, has significant repercussions in the behavior of the Mexican industrial sector.

Under this analytical frame, the present study analyzes the causal relationships between the Exports (EXP), Imports (IMP), FDI and the economic growth of Mexico, as represented by its Gross Domestic Product (GDP). This last variable is broken down into the industrial and service sectors, with the purpose of determining the interactions that international trade and FDI have towards Mexican GDP.

For that matter, a Vector Error Correction Model (VECM) is considered as an appropriate mechanism to study, both the causality and direction, when the series are not stationary. The report is complemented with the analysis of stability in the cointegration

rank developed by Quintos (1993, 1997 and 1998), which allows us to infer if the number of long-run relationships found, remain constant throughout the sample. Moreover, under this approach it is necessary to establish the absence of structural change in the links found.

The document is divided into five sections: Section I deals with the introduction to this study; Section I considers a brief macroeconomic frame for the Mexican economy; Section II presents the Data and the Methodology used; Section III shows the results and last, Section IV summarizes the research findings

I A brief macroeconomic frame for the Mexican Economy

a) Financial Restriction: The origin of foreign resources requirement

The policies of economic structural change, implemented in the decade of the eighties by most Latin American countries, brought together a new stage for the economic dynamics of the region. In the case of Mexico, those economic changes derived from the need to overcome the exhaustion of the growth model previously applied.

However, Stiglitz (2003) analyzed an important economic fact, in the sense that this process was exacerbated by the increase of interest rates applied by the United States Federal Reserve in the beginnings of the decade of the 1980. In this way, Fernández (1997) and Hernández and Villagómez (2001) agree over the argument that with high levels of both interest rates and indebtedness, Mexico had to deal with a restricted access to international capital markets. Accordingly and as it happened in other Latin American economies, Mexico was urged to implement a deep economic adjustment program.

De la Cruz and Núñez (2006) described the strategy as a combination of policies directed towards the trade opening, the privatization of public companies and the deregulation of the financial system. As opposed of what was expected, the resulting investment in the country did not attain the required levels of efficiency and productivity, a reason why the economic growth was not enough to satisfy the necessities of the internal market, augmenting the deficit of current account, as estimated by Oks and Van Wijnbergen, (1993) and Núñez and Urzúa (1996).

In that sense, Santaella (2001) showed that the Mexican Federal Government had to assume the consequences of the resulting economic collapse, which negatively affected the viability of both, the fiscal policy and the financial capacity of the Government to impel economic growth by means of public expenditure.

As a direct result of the government's failure, the dynamics of investment and infrastructure development resided mostly in the efforts of the private sector. For Mexico, this economic process had a relevant impact in manufactures, mainly as a result of its strong relationship with the export oriented activities and because in the last 15 years, the manufacturing sector was the recipient of over 50 percent of the total FDI.

Nevertheless, Eichengreen (2003) found empirical evidence that does not allow us to generalize around the positive influence that the trade opening has over economic growth, for that matter it becomes relevant to apply empirical tests to analyze whether these variables exhibit some significant economic and statistical relationships.

b) FDI in Mexico.

Behrman (1995) posed that the investment flows directed towards Latin America were forced by the trade opening processes implemented in the previous years. It has been shown that as part of these processes, the FDI has favored the economic growth of its recipients (Balasubramanyam, et al. (1996); De Mello, (1997, 1999), De Soysa and O'neal, (1999); Saltz, (1999); Ramírez, (2000, 2002, 2006), Honglin, (2001); de la Cruz and Núñez (2006)). In previous works, Dunning (1981, 1988 and 2002) and De Mello (1997) have described the economic foundation of these relationships, that are sustained both by the greater accumulation of capital (physical and human), and by the increasing access that the host economy has in terms of "not-marketable intangible assets" as business, administrative and logistics improvements. In addition, the access to

FDI allows the host country to benefit from the new technological developments made in other countries, something that according to Borensztein et al. (1998) favors its economic growth. In addition, Lipsey (2001) argues in favor of the positive economic influence of FDI, by posing that it's fluctuation is lower than any other kind of financial flows.

In the case of Mexico, the free trade agreements have strengthened the country's access to international markets. In this sense, Cuevas, et al. (2005) have estimated that the NAFTA raised Mexico's receptions of FDI and at the same time improved the scenarios that would have been provoked without the trade agreement. Their results are consistent with the economic benefits that Ramírez, (2000 and 2002) and Schiff et al. (2003) have postulated, regarding the possibility of the host country to induce a greater economic growth and a corresponding increase of productivity. In addition, Aroca and Maloney (2005) have found enough empirical evidence to understand the negative relationship between FDI flows and migration, implying that an increase in such investment attenuates the migratory flows to the US. Recently, Jordaan, (2005) has emphasized that the positive effects of foreign trade show a higher impact in those sectors and economic regions related to manufacturing and assembling, although Robertson (2005) affirmed that such incidence has not necessarily favored an increase in wages.

Despite the previous fact, in terms of economic growth, it is plausible that flows of FDI exhibit solid links with the export-oriented sector of the Mexican industrial production (de la Cruz and Núñez, 2005 and Dussel et al. 2003). The existence of a relevant economic interaction between foreign trade, industrial production and FDI derives from increasing imports of intermediate and capital goods required by the Mexican industrial production, particularly in the case of inbound plants (maquiladoras), (de la Cruz and Núñez 2006). Additionally, Chiquiar and Ramos-Francia, (2005) have emphasized that these interactions are associated with the evolution of the economic cycle of the United States, a country receiving more than 80% of the Mexican exports and originating the greatest amount of FDI, from the total arriving into Mexico (Table 2).[1]

Table 2 – Foreign Direct Investment in Mexico

	1994	1995	2000	2001	2002	2003	2004	2005	2006
TOTAL	15,052	9,696	17,776	27,487	19,342	15,345	22,301	19,643	18,938
New investment	9,752	7,008	8,107	20,577	11,389	5,998	13,351	9,842	7,538
Reinvestment	2,367	1,572	3,850	3,855	2,440	2,070	2,333	3,463	3,625
Accounts between companies	2,039	-250	2,837	883	3,469	5,316	4,142	3,516	4,752
Imports of in bond plants	895	1,366	2,983	2,172	2,044	1,961	2,475	2,822	3,022
FDI in manufacturing (%)	58.2	58.1	55.8	21.1	44.7	43.6	57.0	58.1	61.3
United States FDI in Mexico	4,966.5	5,514.8	12,694.4	21,389.2	12,975.4	9,629.4	8,192.2	10,147.2	9,327.7

Source: Bank of Mexico, millions of dollars.

Theoretically, Balassa (1978) and Feder (1982) attributed the prior result to the idea that the process of commercial and financial opening had a positive effect on the economic growth. However, the development and application of new time series methodologies have led several studies in which estimated causalities and interrelations provide a less powerful effect to the one originally thought (Ram, (1987) and Love, (1994)).

Authors such as Cuadros (2000) and Fuji, Candaudap and Gaona (2005) showed that exports do not have a long-run causal relationship towards Mexico's economic growth. These results are explained by the fact that the imported component is too high and diminishes the initial benefit that the exports would have generated. The relevance of the previous results is that although the country has managed to increase significantly its level of exports, at the same time – structurally – the industrial production requires an important amount of imports, particularly those related with both capital and intermediate goods, exhibiting as a collateral result, a systematic trade deficit which negatively affects GDP.

The bottom line appears to be that, despite the evidence around the positive effect that FDI has over economic growth,

[1] Since 1994, Mexico has received around 64 % of the its FDI from the United States (around 120 billions dollars).

there is a strong need to examine what happens when FDI is concentrated in the manufacturing sector, requesting in turn a higher share of imports in order to enhance the production performance.

In this case, while introducing the interrelations of the external sector, as well as the FDI, the GDP, and the economic cycle of the United States, this study examines if GDP causes the FDI or it is that the FDI maintains an exogenous effect over the Mexican economy.

Several other studies have searched for empirical evidence in favor of the argument around the advantages of the FDI over Mexico's economic growth. In a similar setting, Ramirez (2000) postulated his analysis through the development of endogenous growth models, with the specification of the existence of cointegration between the studied variables.[2] However, the process posits the idea of an economic linkage through a model of correction of error. This model captures some of the relationships, but leaves out some interactions of the Mexican economy, such as its dependency of the North American cycle and the linkage that exports and national production have on the imported intermediate goods and capital. Conjointly these effects could attenuate the initial benefits derived from the Mexican economic opening.

In an effort to further examine these effects, the present study estimates the causal interaction between FDI, the international trade and the main components of the GDP (industrial and services) in order to determine the transmission mechanisms that relate these variables in Mexico.

II Data and Methodology

The main objective is to examine the causal relationship and direction between the Mexican GDP, Foreign Direct Investment, Exports (EXP) and Imports (IMP) in a multi-varied framework, using the causality concept developed by Granger (1969). In a stationary setting, the null hypothesis "Y does not cause X, given other variables" is tested via standard F-test as defined by Ghartey (1993). Nevertheless, Toda and Phillips (1993a and 1993b), show analytically that autoregressive models are an unreliable basis for estimating causal relationships when the series are integrated processes. In this way, Sims, Stock and Watson (1990) affirm that asymptotical distributions can not be used to test restrictions in an autoregressive vector (VAR) model if the variables are integrated. In a VAR, if sets of two o more variables have common stochastic trends they are cointegrated and have a long-run economic relationship. A system of reduced forms with cointegrated variables may be estimated in two different ways: a VAR in levels (for example see Toda and Yamamoto proposal, (1995)) or as a vector error correction model (VECM). According to Engle and Yoo (1987), Lin and Tsay (1996) and Naka and Tufte (1997), there are some log-run advantages of using a VECM, specially because the results of the constrained model fit better to the expectations in longer horizons.

The VECM analysis procedure used in this paper was originally applied by Liu, Song and Romilly (1997), Chandana and Paratab (2002) and Liu, Burridge and Sinclair (2002), to examine the causality in the case of cointegrated series. First of all, two unit root tests were applied for each variable in order to determine the existence and number of such roots.[3]

In that sense, the decision-tree process, proposed by Charemza and Deadman (1992), testing for the significance of trend and drift together with non-stationarity was applied. Secondly, the Johansen (1988) and Johansen and Juselius (1990) cointegration analysis was implemented. The cointegration test applies maximum likelihood to a VAR model assuming that errors are Gaussian.

Basically, testing the existence of some log-run relationship requires a pth-order structural and dynamic VAR model. To this purpose, it is important to pay further attention to the choice of the optimal lag order (p). To accomplish this, the number of lags was selected using Schwartz (SIC), Hannah-Quinn (HQ) and the new Hatemi-J (2003) information criteria.

The Hatemi-J's criterion (H-J) is successful in finding the optimal lag order, particularly if the variables contain stochastic trends. Next, the Johansen and Juselius (1990) procedure testing for number and estimations of cointegrating relations were used. The proposal leads to two statistics for

[2] A similar result of significance between GDP and FDI was found in its analysis of 2002, using the real exchange rate peso-dollar like additional explanatory variable (RAMÍREZ, 2002).

[3] Augmented Dickey-Fuller (ADF) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS).

cointegration: the trace statistic (Ho: there are at most r cointegration vectors) and the maximal-eigenvalue statistic (Ho: there are r cointegrating vectors against the alternative that $r+1$ exists). The cointegration analysis allows for building an adequate VECM to prove if some causal relationship among the variables exists.

The VECM avoids inconsistencies with the finding of causality in a bivariate environment such as: a) the resulting bias of omitting relevant variables, and b) the unreliable result as a consequence of estimation with non-stationary variables. Therefore, the proposed methodology can be resumed in the construction of a VAR with n variables and p lags.

$$y_t^* = J(L)y_{t-1}^* + \varepsilon_t \quad (1)$$

Where

$$J(L) = \sum_{i=1}^{p} JL^{i-1} \quad (2)$$

And y_t^* is I (1). So, the VECM is defined as

$$\Delta y_t^* = J_k^*(L)\Delta y_{t-1}^* + \Pi y_{t-1}^* + \varepsilon_t \quad (3)$$

$$J_k^*(L) = \sum_{1}^{k-1} J_i^* L^{i-1} \quad (4)$$

$$J_i^* = -\sum_{l=i+1}^{p} J_l \quad (5)$$

$$\Pi = \alpha\beta' \quad (6)$$

The error correction term in a VECM is written as in equation 6. The main goal becomes the study of the statistical significance of higher-order lagged coefficients in the VECM's as shown in equation 3. The methodology requests the application of the Wald test over each variable in turn. For that matter, if those coefficients are significant, the existence of causality is proved and it is possible to obtain the direction of every causal relationship.[4]

Finally, the present paper estimates whether the cointegration relationships obtained in the VECM remain constant during the time period's sample. Hansen (1992), Tanaka (1993) and Quintos and Philips (1993) and Quintos (1997, 1998) developed different tests to study the constancy in the cointegration rank. Basically, the constancy cointegration test shows if the number of the long-run relationships remains stable in the period's sample. If the cointegration rank does not change, the absence of structural change can be affirmed, and the outcomes will be more robust. This paper uses the results obtained by Quintos (1993, 1997 and 1998) to analyze the constancy rank. Quintos applies a likelihood ratio (LRQ+) test to compare the possibility of existence of more cointegration relationships and a Lagrange Multipliers (LMQ-) test for fewer relationships. The LR and LM statistics are compared with the tables including the critical values developed by MacKinnon, Haug, and Michelis (1999) and Quintos (1997) respectively.

The Mexican Gross Domestic Product, exports and imports series are available from the National Institute of Statistics, Geography and Informatics (INEGI). In turn, the Foreign Direct Investment inflows, ranging from 1980 to 2006, are available from the statistics department of the Mexican Central Bank (Banxico).

III Results.

Before the causality analysis, the KPSS (KWIATWSKI et al. 1992) and Augmented Dickey-Fuller (ADF) tests for unit roots are performed over the natural logarithm of each series. Table A.1 (see appendix) reports the results for these tests. The results for the KPSS and the ADF tests indicate that the series are not stationary. The next step is to examine whether each variable becomes stationary after taking the first difference. In general, Table A.1 reveals that each variable contains one unit root at maximum.

Prior to testing causality, the optimal lag order is chosen. The information criteria indicates that the optimal lag is 3 ($p=3$, see appendix Table A. 2). Before the vector is developed, it is necessary to prove if the series are cointegrated using the Johansen's cointegration test. The obtained results generate enough quantitative evidence to prove the existence of long-run relationships among variables (as shown in Table A. 3 in the appendix). Consequently we proceeded to develop a VECM,[5] model for estimating the causality relations as shown in Table 3.

The findings of the model estimated showed that FDI has a positive causality on imports, exports and industrial GDP (GDPI). The economic explanation of this issue basically resides in two facts: For one thing, the manufacturing industry is one of the

[4] (+) means a positive relationship between the variables.

[5] In the VECM we use like exogenous variable United States GDP. Also, we use some seasonal variables and a dummy variable in 1995, principally in order to capture the "Tequila effect".

preferred recipients of FDI, accounting for over 50% of such inflows and for the other manufactures production exhibits a strong link with total exports accounting for over 80% of the total. Moreover, inbound plants represent around 45% of the manufactures' export mix.

In addition it must be specified that the US, is the main receiver of Mexican exports and in the recent past has become the country with more FDI in Mexico (more than 60% in the last 15 years). Consequently, an economic relationship can be found supporting the statistical results obtained by the VECM. Here, FDI improves the industrial activity, which, at the same time, requires a stronger support of foreign intermediate inputs and capital goods in order to impel its manufacturing production. This output is partially re-directed to foreign markets, mainly to the United States.

Table 3 – Causality test results (p-values)[6]

	FDI	EXP	IMP	GDPS	GDPI	US GDP	Causality
FDI	-	0.0329 (+)[7]	0.2121	0.3803	0.2812	0.0459	EXP→FDI
EXP	0.0289 (+)	-	0.6040	0.8112	0.0495(+)	0.0000	FDI→EXP GDPI→EXP
IMP	0.0360 (+)	0.5339	-	0.0076(+)	0.0355(+)	0.0133	FDI→IMP GDPS→IMP GDPI→IMP
GDPS	0.6076	0.9612	0.0391(-)	-	0.0000 (+)	0.0317	IMP→GDPS GDPI→GDPS
GDPI	0.0079 (+)	0.0001 (+)	0.1938	0.0045(+)	-	0.0000	FDI→GDPI EXP→GDPI GDPS→GDPI

Table 3 also reports a bidirectional causal relationship from FDI and GDPI to the exporting activity, showing the close linkage between these variables. Additionally, the evolution of the GDPI has a positive causal influence over EXP and IMP.

Consequently, it can be stated that as output increases, exports are favored by a greater mass of available goods. To manufacture these goods, Mexican industrial production requires more intermediate and capital inputs, generating a further increase in its imports. Nevertheless, an important difference is found: While exports have a positive bidirectional relation with the GDPI, in the case of the imports this interaction only comes towards the GDPI. This means that in the long-run, imports do not improve the Mexican industrial production, mainly because its low value added.

Simultaneously, the US GDP is shown to have statistical significance for all the variables incorporated in the VECM, postulating that the evolution of the US economy exhibits great influence over that of Mexico. Table 3 also reports that Exports becomes the only variable showing a statistically relevant causal relationship with FDI, indicating that foreign capital inflows do not exhibit a strong link with the Mexican internal market.

Moreover, the findings in Table 3 show an important link of the Services GDP (GDPS) towards imports. It is explained by an increase in wealth that in turn generates a higher demand for foreign goods and inputs. In the same way, the rising imports negatively relate with GDPS. In the long-run the great amount of intermediate inputs and the final consumption goods annually imported by Mexico diminish the demand for domestic goods and inputs.

In addition, as it was mentioned before, great amounts of imported inputs are directed to low added value industrial sectors, leading to a marginal impact on wealth creation. Using the Pesaran and Shin (1998) methodology, the results of the impulse-response function confirm the closer relations that the variables FDI, EXP, and GDPI exhibit (Compare the graphs one to five in the appendix).

Finally, Table 4 indicates the existence of stability in the cointegration rank. To test for stability of the rank, $r = 2$, of the cointegrating relationship, we first apply the test with the null hypothesis that the rank r is constant at 2 over the whole sample period. The alternative hypothesis is that the rank is greater than 2. The test statistic takes on a value of 12.9. The 5% critical value from

[6] The sample covers 1980-2006.

[7] The symbol (+) implied a positive causal relationship from X to Y. The (–) symbol (–) is for the negative case.

MacKinnon et al. (1999) is 22.64. The null hypothesis is therefore accepted. The test for stability of the rank, $r = 2$, against the alternative hypothesis that $r < 2$ leads to a test statistic of 0.54. According to the critical values presented in Quintos (1997), the null hypothesis of rank constancy against the alternative of a rank less than 2 cannot be rejected even at a 5% level of significance. In other words, the long-run links remain stable during the period of sample.

Table 4 – Constancy in cointegration rank

Variable	Statistic	Critical Value (5%)
LR Q^+	12.9	22.64
LM Q^-	0.54	3.46

Conclusions

Under the framework based on the previous theoretical and empirical developments, there is clear evidence of the positive effect of the FDI on the economic growth of host countries, which is also confirmed in the case of Mexico.

With respect to the Mexican economy, in general the industrial activity and particularly the manufacturing sector, become the preferred recipients of FDI. For that matter the subdivision of GDP into two sectors, services and industrial, allow for further differentiation of the transmissions mechanisms that FDI has over the economic growth of Mexico.

First, the results establish that the FDI evolution exhibits long-run effects over the macroeconomic variables incorporated in the estimation, mostly with the GDPI, the exports and imports. In addition, the results are consistent with the existing relationship between foreign trade and the industrial activity, because manufactured goods predominate in national exports -the economic sector that receives more resources from the FDI-.

In the same way, the long-run relationships suggest that the Mexican international trade has a bidirectional interrelation. This interaction emerges from the structural requirement of a great amount of intermediate and capital inputs re-oriented towards goods manufactured and directed to the US market.

Second, the results indicate that the interaction of the Mexican economy with FDI occurs in first instance with the industrial sector and foreign trade, where this effect incidentally goes to the service sector. Thus, although FDI has a positive effect over the economic growth of Mexico, it is related to sectors associated with the international trade, which in turn depend on the US economic cycle. Consequently, since the Mexican exports exhibit solely a bi-directional relation with the FDI, and although there are benefits of the FDI into the Mexican economy, in the long-run such positive effects are delimited by the evolution of the economy of the United States.

Since the obtained statistical evidence remains steady in the period of sample, relevant evidence was found: as Bulmer-Thomas (2000) postulate, in the Mexican case where the benefits of international trade and the FDI have not been associated with the economic activity as a whole. According to Bulmer-Thomas the fact that the domestic market has not benefited integrally from the international trade, is considered a weakness of the model. Therefore, although Mexico is both an export-oriented country and an important host of FDI, those elements are not leveraged enough, in order for the country to consolidate its economy especially regarding its internal market.

The partial benefits of FDI over the Mexican economy are undeniable. Yet its concentration on export-oriented sectors – isolated from the domestic economic activity- demanding great quantities of imported inputs for enhancing production, opposes the initial purpose of using a model, to induce economic growth, based on trade opening. The supposed leverage effect of FDI is lost in the middle of a specific structural setting as it is the case of the Mexican economy.

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Appendix

Table A. 1 – Unit root test

Variable	ADF	Critical value (5%)	KPSS	Critical value (5 %)
L(GDPI)	-2.79	-3.45	0.147	0.146
L(GDPS)	-1.74	-3.45	0.205	0.146
L(EXPR)	-1.85	-3.45	0.173	0.146
L(IMPR)	-1.07	-3.45	0.297	0.146
L(FDI)	-2.03	-3.45	0.221	0.146
DL(PIBI)	-10.53	-3.45	0.046	0.146
DL(GDPS)	-5.55	-3.45	0.049	0.146
DL(EXPR)	-13.8	-3.45	0.065	0.146
DL(IMPR)	-3.89	-3.45	0.05	0.146
DL(FDI)	-4.83	-3.45	0.111	0.146

Table A. 2 – Lag order selection

Lag order	SIC	HQ	H-J
1	-10.09	-11.56	-10.54
2	-10.51	-11.95	-10.87
3	-10.59	-12.17	-11.09
4	-9.05	-11.33	-10.63
5	-8.04	-10.87	- 9.55

Table A. 3 – Cointegration Test

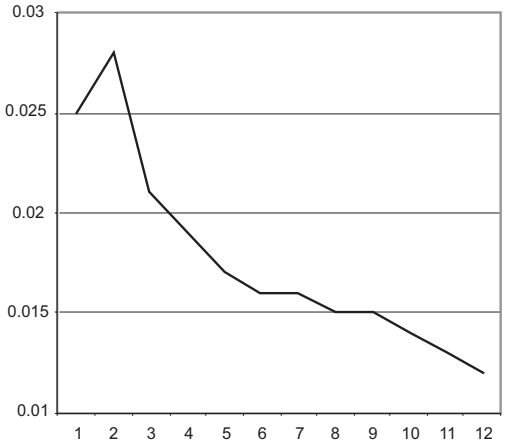
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.283722	85.48759	68.52	76.07
At most 1 *	0.242228	50.78413	47.21	54.46
At most 2	0.132132	21.93739	29.68	35.65
At most 3	0.044830	7.198966	15.41	20.04
At most 4	0.023084	2.428871	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level

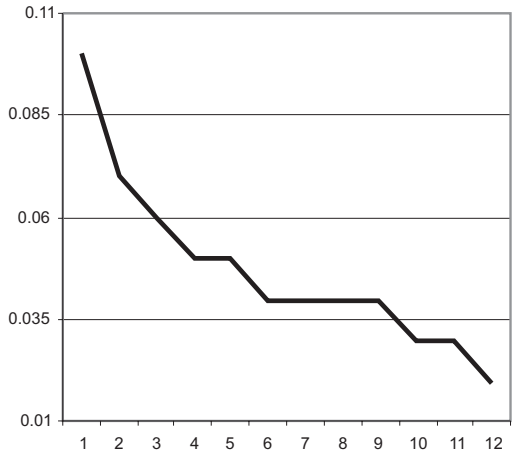
Trace test indicates 2 cointegrating equation(s) at the 5% level

Impulse-Response graphs

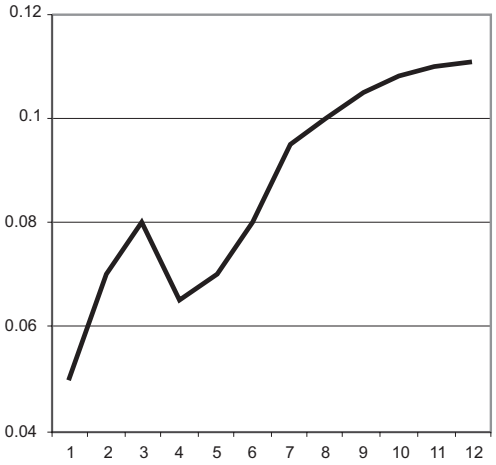
Graph 1 – Response of GDPI to FDI



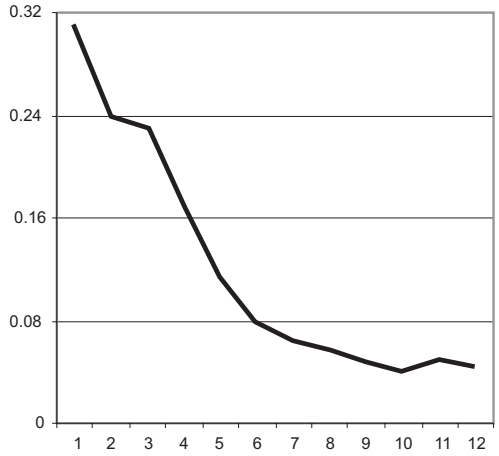
Graph 2 – Response of EXP to FDI



Graph 3 – Response of GDPI to EXP



Graph 4 – Response of EXP to GDPI



Graph 5 – Response of FDI to EXP