Article

Mexico: Restricted Economic Growth and the Exchange Rate, 1950-2014

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Abstract
Recent literature has empirically demonstrated that the real exchange rate is essential to explaining the economic evolution of developing countries. It has been empirically proven that the anti-inflation exchange rate policy implemented systematically in Mexico has constituted a major restriction on the country's economic growth, a restriction that has persisted throughout this entire time period, even through different monetary and exchange rate regimes. This paper estimates an SVAR (1950-2014) that shows how the continuous appreciation of the real exchange rate has curbed Mexico's economic growth capacity and had an impact on other macroeconomic balances. This alone could be considered a highly potent structural macroeconomic reform.

Key Words: Economic growth, exchange rate, SVAR, monetary policy.

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Economists have long known that poorly managed exchange rates can be disastrous for economic growth. Avoiding overvaluation of the currency is one of the most robust imperatives that can be gleaned from the diverse experience with economic growth around the world, and it is one that appears to be strongly supported by cross-country statistical evidence.

Dani Rodrik (2008: 365)

INTRODUCTION[1]

[1] The author would like to acknowledge the support of the project: "México: crecimiento, ciclos y precarización laboral, 1980-2020," PAPIIT IN-302514, DGAPA, UNAM, as well as the technical collaboration and comments made by Emmanuel Salas and support by Jorge Ramírez, Iván Ramírez, Eduardo Becerril, and Ciro López in integrating the statistical series. The author would also like to acknowledge the comments and suggestions made by the journal's reviewers, while stating that he alone is solely responsible for what has been said or omitted below.

Recent literature dealing with economic growth (Rodrick, 2008; Rapetti et al., 2011; and Razmi et al., 2012) reflects a fundamental interest in the relationship between exchange rates and economic growth.

The fact is that governments and central banks have undeniably shown consistent concern for exchange rate (nominal and real) levels and dynamics, so the topic has long been at the heart of global and country-level economic policy debates and agendas, even if the mainstream literature has not reported this to be the case.

In effect, after the fall of the gold standard, the beggar thy neighbor policy, by way of competitive depreciations, meant that the Bretton Woods system would establish an essentially fixed exchange rate regime, among other things. The collapse of the accords at the beginning of the 1970s has breathed new flexibility and volatility into exchange rates and financial variables with significant effects passed on to real and trade variables, and with that, the resurgence of exchange rate concerns around the world. It would seem that this topic has gained particular importance over the past decade and a half, as the United States has repeatedly accused China of over-depreciating its currency, with a direct impact on its external balance and the cause of its deindustrialization (Coudert and Couharde, 2007). On the other hand, Japan – which has sunk into deflation since the mid-1990s – has on various occasions alleged that its strong currency appreciation against the dollar is related to this situation (Bernanke, 2000).

In the first case, the yuan/dollar parity has been kept very depreciated, from a minimum value of 5.57 in October 1993 to an all-time peak of 8.68 in February 1994. It is likely that the exchange rate turbulence set off by the 2001 recession can explain its recovery, and since May 2005, it has strengthened notably, hitting 6.54 in February 2016. [2]

On the contrary, in the case of Japan, following a high in August 1998 (144.69 yen/dollar), the currency began to appreciate until reaching a low in October 2001 (76.6). Propping up Japanese economic policy in recent years is something that has come to be known as Abenomics (Aso, 2013), which consists of applying highly expansive policies that have deliberately sought to depreciate the yen/dollar relationship. As of February 2016, the ratio was up to 114.68, which has been associated with a revival of growth.

In Europe, the long recession (2008 and since), independent of the structural factors that will not be analyzed in this paper, can be explained in large measure by the incapacity to depreciate the currencies of the member countries. However, the recent strengthening of the dollar since 2014 and the expansive monetary policy tack taken by the Eurozone are opening the door to recovery for the countries using the single currency.

Looking at Latin American countries, exchange rates have always been of vital importance by virtue of the fact that they have tended to vary in both level and magnitude (appreciation/depreciation) fairly regularly with the rising and falling

[2] Data on exchange rate parities obtained from (2016)

phases of the economic cycle. Traditionally, growth phases are associated with times of inflation that appreciate the real exchange rate, which, added to productive deficiencies (reflected in high coefficients of imports to the product), means that these short time periods are accompanied by high foreign deficits that then lead to a balance of payments crisis. As a result, expansive phases have regularly concluded with external crises, confronted by adjustment programs characterized by pro-cyclical remedial measures[3] and strong exchange rate depreciations, which, on the whole, produce recessive and redistributive effects. This process might be characterized as an important stylized fact in the economic history of Latin American countries.

Aiming to rigorously prove these arguments in the case of Mexico, this paper estimates an SVAR(2) for the time period 1950-2014, primarily, although not exclusively, to test and measure how product growth responds to variations in the real exchange rate. The conclusion is that a high (competitive) and stable exchange rate that prevents remedial depreciations is essential to boosting long-term economic growth capacity. This result is similar to that obtained by Rodrik (2008), although with a different methodology. In fact, I believe that in current economic conditions, the exchange rate is an essential macroeconomic instrument that could have strong macroeconomic implications, which could, together, jumpstart the Mexican economy out of the slow growth phase in which it has been submerged since 1982.

Because this is considered to be a developmental consistency, these ratios are analyzed since 1950, despite the fact that Mexico has gone through various exchange rate and monetary regimes. In other words, this consistency would seem to persist in spite of the varied policy conditions implemented over the past 65 years, rather than being a contextual or short-term effect.

This paper is divided into four sections and an introduction. The first section provides the literature review and some pieces of theory underpinning the empirical portion of this work. The second presents and analyzes the main stylized facts that constitute the rationale for the research problem since 1950. The third section discusses some econometric aspects. The fourth analyzes and discusses the main statistics results that prove the central hypothesis. Finally, I offer some conclusions and suggest some economic policy guidelines to follow in the current institutional framework.

1. LITERATURE REVIEW AND THEORETICAL ASPECTS

The hypothesis that the exchange rate is a determinant of growth, and not just a price, has been echoed in various other papers.

Hausmann et al. (2005) analyzed the times when economic growth has sped up in a sample of 110 countries in 1967-1992. Their results indicate that economic upturns

[3] Monetary, fiscal, revenue-related, and relative prices.

tend to be correlated with rises in investment, foreign trade, and the depreciation of the real exchange rate.

Rodrik (2008) showed, by way of various estimation techniques and using different real exchange rate measurements, that high real exchange rates stimulate economic growth, particularly in developing countries[4]. Additionally, he demonstrated that economic growth tends to appreciate the real exchange rate significantly. Specifically, he concluded that for a group of countries, real growth of 10% in income per capita appreciated the real exchange rate by 2.4% on average annually. In the case of Mexico, the effect is even stronger. According to my own estimates based on data from the Penn World tables (2015), this effect is on the order of 2.5%[5]. Along these same lines, Glüzmann et al. (2012) confirmed that depreciation is positively associated with economic growth, in this way validating Rodrik's (2008) findings for China, India, Uganda, and Tanzania in 1950-2004, which have been tied to deliberate economic policies to counteract this appreciation trend and set these countries on the path to long processes of exchange rate depreciation. [6]

Ocampo (2011) asserted that a stable and competitive real exchange rate is fundamental to long-term growth because it has an effect similar to that of technology progress insofar as it promotes the international supply to the detriment of imports. Likewise, it favors the production of tradable goods (exports), which simultaneously generates a dual virtuous effect on supply and demand, which mitigates the aforementioned growth stylized fact. Altogether, this creates new investment opportunities that spur capital accumulation, in this way generating a virtuous cycle that raises production-productivity-demand and internal and external competitiveness.

In a sample of 58 developing countries in 1960-1999, Gala (2008) showed that a competitive exchange rate permits a country to increase savings, investment, and capital accumulation. Berg and Miao (2010), drawing on a group of 181 countries, demonstrated that exchange rate depreciation can promote growth.

Caglayan and Torres (2011) investigated the effects of the behavior of the exchange rate on fixed capital investment in the Mexican manufacturing sector in 1994-2002. They found that currency depreciation has a positive effect on investment; that the impact of exchange rate volatility is primarily felt in export-oriented sectors; and that the sensitivity of investment to exchange rate movements is stronger in the non-durable goods sectors and in industries with low profit rates.

Ros (2013, 2015) argues that a competitive exchange rate is crucial to growth by virtue of the fact that it contributes to the efficient allocation of investment in favor of

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[4] The analysis was conducted for 188 countries for the time period 1950-2004

[5] The foregoing results from estimating a VECM (2) for 1950-2012: $q_t=3.40-0.352*ppc_t+ e_t$; MCE=-0.3036 (t=-3.044); LM (10): 2.621 (0.625); Normality (Doornik-Hansen): 6.77 (0.148); Htsc (N.c.): 34.06(0.416). Where q = real exchange rate (logarithm), ppc =GDP per capita in purchasing power parity.

[6] Rapetti *et al.* (2011) and Razmi *et al.* (2012) arrived to the same conclusion, among others.

tradable goods and services and that recently, concerns about the depreciation of the peso against the dollar due to falling oil prices and other factors are unjustified, because for an economy such as the Mexican economy, which is very open to international markets, a depreciated exchange rate is desirable.

Ros (2013, 2015) and Ibarra (2008) agree that monetary policy has tended to appreciate the peso in real terms, which curbs investment profitability. The negative effect of exchange rate appreciation with profitability is combined with a long-term decrease in the product/capital ratio. The result is that aggregate investment does not reflect the momentum of exports, nor does it allow the country to achieve high economic growth rates.

Garcés (2002) investigated the role of economic integration (United States) on the gross domestic product (GDP) of Mexico in 1980-2000. He revealed that the effect of the real exchange rate is positive on the trade balance. It is also worthwhile to note, on the other hand, that when Mexico joined the United States productive structure with the signing of the North American Free Trade Agreement (NAFTA) (Loría and Salas, 015), the exchange rate lost relative weight in explaining the dynamics of exports[7] to the latter country. However, an appreciated exchange rate has favored imports and the trade deficit with other countries, like China, as noted by Dussel and Gallagher (2013), in the sense that domestic productive chains have been broken in favor of intra-firm commerce[8] by foreign capital enterprises located in Mexico that take advantage not only of its geographical benefits and liberalization, but also the appreciated exchange rate, which helps to cut costs and bolsters their commercial strategies.

Kamin and Rogers (2000) estimated a highly linear association between the real exchange rate and growth in production in Mexico for the time period 1980-1996. They reported that contractions are commonly preceded by a depreciation of the real exchange rate, and that positive growth episodes are related to the appreciation of the real exchange rate.

Galindo and Guerrero (2011), using a vector autoregression model (VAR) with cointegration of the product for the time period 1990-2000, concluded that the United States economic slowdown does not explain the essence of Mexico's falling growth rate and that the real exchange rate is the fundamental variable needed to explain the behavior of the economic growth rate.

This same idea is shared by Ibarra (2011), in addition to the notion that appreciation raises unit labor costs, which deteriorates competitiveness.

2. MEXICO: THE REAL EXCHANGE RATE AND VARIABLES. STYLIZED FACTS

[7] As well as the favorable balance of the trade account.

[8] Arévalo *et al.* (2014).

In Mexico, the exchange rate[9] and price stability enjoyed for decades now has been considered a synonym for policy and economic strength, and ever since Mexico began the process of trade openness and financial deregulation, the real exchange rate has gained relevance.

The trend towards appreciation has been constant throughout the long-term economic growth process, because the nominal exchange rate has an indirect impact on price formation[10], and, therefore, on real wages and income distribution.

In this way, economic authorities have traditionally centered their efforts on containing the nominal value of the peso against the United States dollar to anchor inflation. However, this inevitably has led to systematic real exchange rate appreciation that leads to balance of payment crises that are customarily resolved with maxi-nominal and real devaluations that generate the aforementioned repercussions.

The ratio of imported inputs to the product mean that in the short term, corrective actions have strong income and price effects on producers and consumers, and low substitution effects, all of which prompts falling salaries, distributional regression, and political and social instability (Harberger, 1950; Dornbusch, 1973). Druck et al. (2015: 16, 24) asserted that the result of a devaluation[11] has an ambiguous effect on the level of the product, because the total effect depends on the degree of import reliance and labor market flexibility. They pointed out that Mexico and Central America, contrary to South America, which is a major exporter[12] of primary goods, have shown positive effects in periods of dollar appreciation.[13]

In this sense, the central problem facing economies such as that of Mexico resides in the fact that – due to its structural nature – when the internal equilibrium is preserved (holding down inflation by appreciating the exchange rate), the external balance is affected, which sooner or later will affect the former and so on and so forth, forming a vicious cycle that will dramatically chip away at economic growth dynamics. [14]

It is therefore clear that the right economic policy effort consists of breaking the vicious cycle of the dynamics of growth-inflation-currency appreciation-balance of payments crisis-depreciation-stagflation.

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[9] Read nominal and real appreciation.

[10] Garcés (2002) asserted that the influence of the variation in the exchange rate in explaining inflation is more important than that of monetary aggregates.

[11] This was the term used when in a fixed exchange rate regime, the monetary authorities decided to alter the parity with the dollar. Since 1995, where there has been a flexible exchange rate, it has become more common to use the term depreciate, which refers more to market movements than to specific policy decisions.

[12] However, this is not necessarily true in the medium and long terms, as will be seen shortly.

[13] Which implies a depreciation of the peso against that currency.

[14] In fact, this was the characteristic of Mexico's economic history, especially between 1982 and 1988.

In the empirical evidence about Mexico, the foregoing arguments are underscored by stylized facts derived from the analysis in Figure 1. This figure shows the evolution of economic growth (y) and the real exchange rate (Q).[15] Because this figure is so important, I will briefly analyze the stylized facts that emerge from it.

In terms of how economic growth has evolved, this long time period can be divided into two sub-periods: 1950-1981 and 1982 and thereafter. In the latter time period, the Mexican economy underwent the fastest economic expansion in its history (6.6% annual average) with real currency appreciation of 46%. This was due to the higher inflation observed in Mexico, where the nominal exchange rate was essentially fixed, except for the devaluations in 1976, 1977, and 1978.

This high growth was extremely stable, with a standard deviation of only 2.08 as compared to 3.08 in the subsequent period. Starting in 1981 (the second period), economic growth and the real exchange rate evolved rather differently insofar as annual average growth was around 2.2% in the midst of greater volatility. In fact, a look at Figure 1 suggests that the evolution of the two variables in this time period was "mirrored," in the sense that strong depreciation was associated with falling growth, particularly in 1983, 1986, 1995, and 2009. However, it is important not to lose sight of the fact that these depreciations were accompanied by comprehensive adjustment programs, which by nature are contractionary. So if both variables are displayed, but this time lagging the real exchange rate (Q), precisely the opposite effect emerges. In other words, after one year, currency corrections have strong effects of growth and vice versa (see Figure 2).

The lagged positive effect of depreciations on growth can be clearly observed, because quadrant 1contains practically all of the points relating depreciation with economic growth. On the contrary, the points found in quadrant IV connect depreciation with a declining product in 1986, 1995, and 2009. Only in 1995 was there a crisis of internal origin, whereas the rest were rooted in adverse international episodes. Moreover, Table 1 shows the strong and significant correlation between the two variables after Q is lagged, particularly with one lag alone. [16]

Note: The series were linked with different bases to build the historical series. See methodology note in the statistical appendix. "Q" is on the left vertical axis and "y" on the right vertical axis.

Source: Created by the author based on data from Villarreal (1998), INEGI (2015), and Banxico (2015).

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[15] This variable was constructed as $Q = e\frac{P^*}{P}$, where e = the nominal exchange rate, pesos per one U.S. dollar; P*= the NCPI of the United States and P = the NCPI of Mexico, 1993=1. See the historical data source in Section 2 of the statistical appendix.

[16] This analysis is free from spuriousness by virtue of the fact that both variables are stationary. See unit root tests in Table A1 of the appendix.

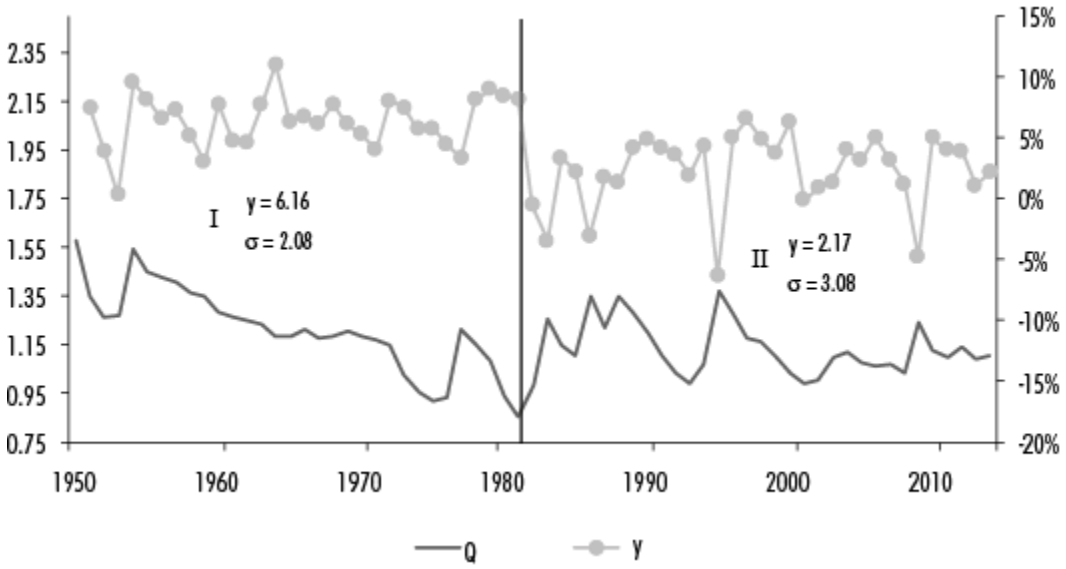

Figure 1. Mexico: Real Exchange Rate (Q) and Growth (y), 1950-2014

Source: Created by the author based on data from Villarreal (1998), INEGI (2015), and Banxico (2015).

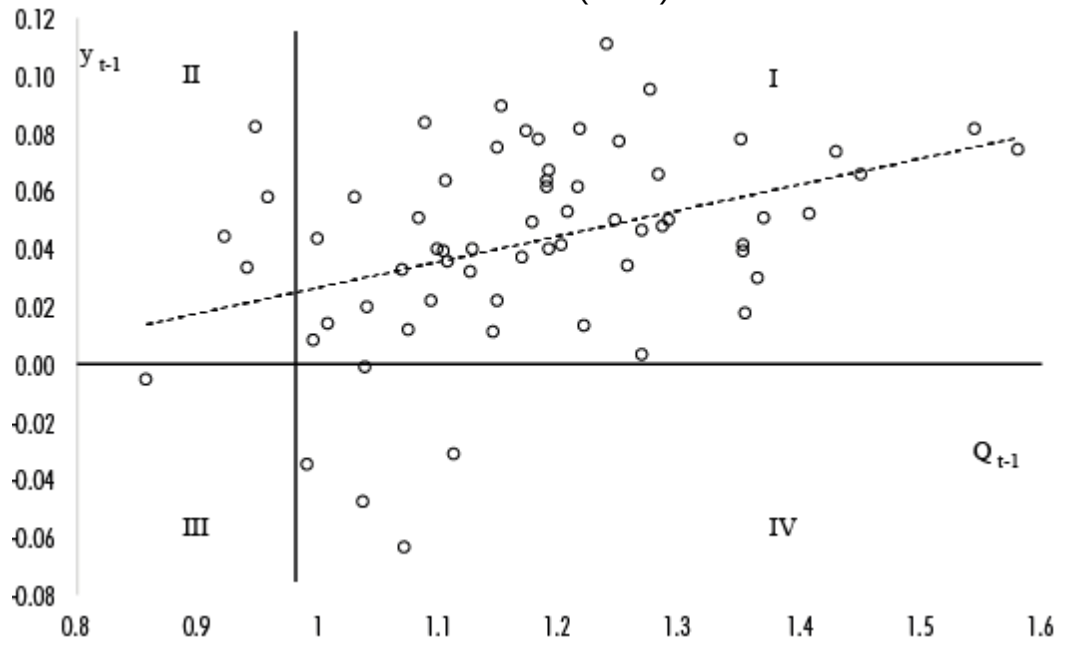

Figure 2. Mexico: Economic Growth (y) and the Real Exchange Rate with One Lag (Q-1), 1950-2014

Source: Created by the author.

	Q	Q_{t-1}	Q_{t-2}	Q_{t-3}
y	0.008	0.3823	0.3575	0.2408
(t)	(0.063)	(3.3584)	(2.99)	(1.92)
$[P_{value}]$	[0.9496]	[0.0013]	[0.004]	[0.0594]

Table 1. Partial Correlation y – Q (lagged), 1950-2014

In this first time period, as real currency appreciation took off, growth was sustained on progressive imbalances in the current account that considerably raised foreign debt and the debt service (Wijnbergen, 1989). The decision by authorities to define this growth pattern, based on systematic currency appreciation, reigned in inflation but came at the cost of elevating the foreign debt, with the consequent increase in debt service payments, which thereafter would be reflected in the factorial services balance. Essentially, while in 1960 debt interest payments accounted for 39% of factorial services expenditures on the balance of payments, this figure had reached 60% by 2014. [17]

Once the nominal exchange rate became quasi-fixed and the foreign debt was renegotiated (1989), Mexico experienced brief growth with marked currency appreciation, which once again ended up in an external sector crisis in December 1994, also characterized by the application of the aforementioned remedial economic policies.

These depreciations had immediate contractionary effects, but only for four quarters, and by 2000, Mexico was in the highest growth phase of the entire second period. This process notably once again was accompanied by currency appreciation. However, the sharp depreciations of 1995 and 1998 seem to have yielded results for growth leading up to 2000.

Striking due to its magnitude was the depreciation of 1995[18], exceeded only by that of 1954. However, in the latter year the current account deficit to the product was 3.54% against 7% in 1994. Moreover, the depreciation of 1954 happened in a practically closed economy, as compared to an extremely open economy in 1995. From 1995 and onwards, Mexico adopted a free floating regime, but the exchange rate once again followed the path of sharp depreciation[19], culminating in the depreciations brought on by the Great Recession of 2009.

[17] Own calculations based on Banxico (2015).

[18] With a fixed exchange rate (1954) or semi-fixed rate, as it was in 1994 (also called the crawling peg), customarily when the peso was losing value, the term devaluation was used, as this term indicated a decision made by the currency authorities. Subsequently, the term has shifted to depreciation in the context of a more flexible exchange rate.

[19] Between 1995 and 2009, annual average real appreciation amounted to 2.11%, with a total of 24% throughout the entire period.

Marked currency appreciation coincided with the 2001-2003 recession, and is comparable with the 1993-1994 pre-crisis levels. In fact, this appreciation, which took place on par with the recession in the United States, could well explain why the recession lasted only one year in the United States, but three years in Mexico (2001-2003). It is also noteworthy that in the first quarters of the recession in the United States, Bank of Mexico consistently raised the short-term exchange rate, seeking to: a) reduce capital flight; b) mitigate pressure on the exchange rate; and c) contain inflationary pressure. As it is, many appreciation and recession phases have been induced or prolonged by monetary policy.

The rising foreign debt service burden may help explain the drastic cuts in the ratio of public investment spending to the product that have taken place since 1981, which, in turn, could be added as another factor to the reduction of capital accumulation that explains the overall slow economic growth seen since then (see Figure 3).

Source: Foncerrada (2015).

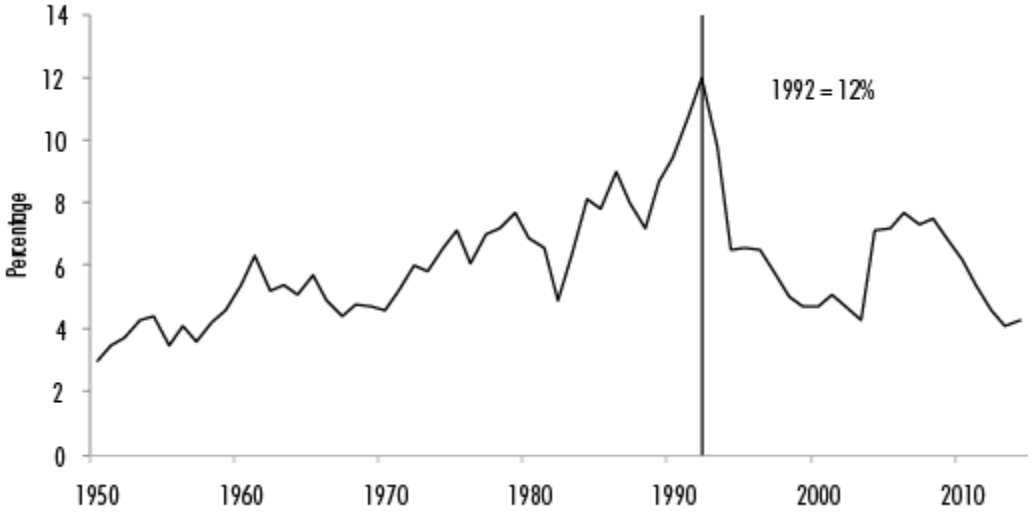

Figure 3. Mexico: Public Investment/GDP, 1950-2014

Figure 4 elucidates the close positive relationship of the real exchange rate and the current account balance, proven econometrically in the third section.

Note: Variables have been normalized for visual comparison: $x_i = \frac{x_{it} - \bar{x}}{\sigma}$

Source: Created by the author based on data from INEGI (2015) and Banxico (2015).

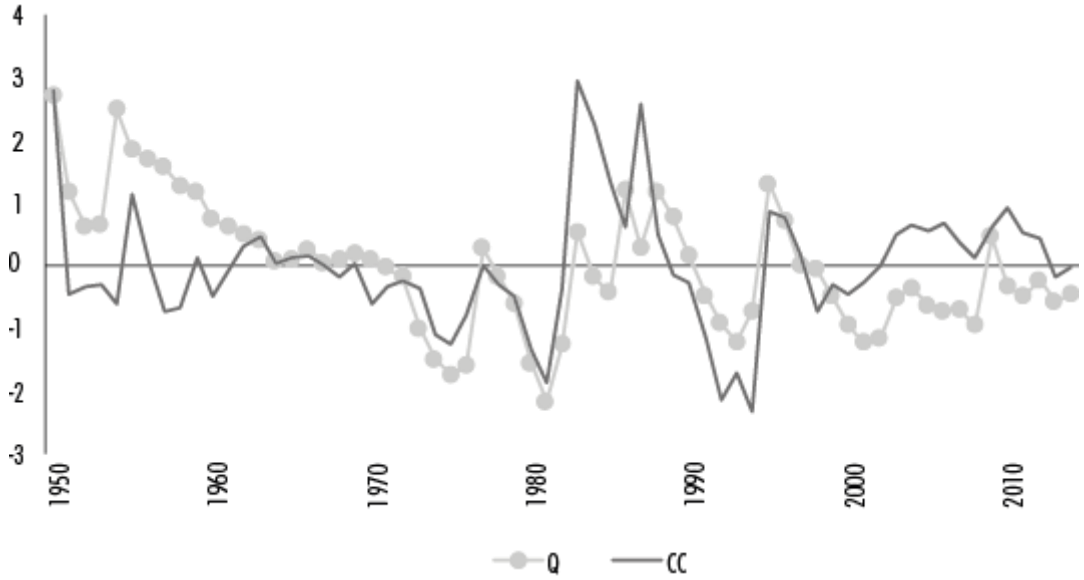

Figure 4. Real Exchange Rate (Q) and the Current Account as a Proportion of GDP (cca). Normalized series*

Finally, the new monetary policy of Bank of Mexico demonstrates its aversion to depreciation, evidenced by the fact that since 2008, when the nominal exchange rate depreciated 2% in a single day, it has intervened in the currency market to contain depreciation, and in April 2015, it announced a daily injection policy (first for 52 and later 400 million USD) of reserves to contain currency pressures; and, on the contrary, it has no mechanism to operate to prevent appreciation.

3. ECONOMETRIC ASPECTS

Aiming to empirically prove the above arguments, and following the traditional information criteria set forth by Akaike, Schwartz, and the final error prediction, an SVAR(2) model was estimated for 1950-2015 with the following information set (Z):

$$Z = \{cca_t, p_t, y_t, q_t\} \quad (1)$$

Where, cca: current account to product deficit; p: factorial growth rate of total productivity; y: annual GDP growth rate; and q: logarithm of the real exchange rate. In addition, two dummies with the right specification and annual GDP growth of the United States were used, yust as an exogenous variable[20]. The model passes all of

[20] See the statistical appendix (section 2) for the Hyeon-Seung (2005) exogeneity test. The inclusion of this variable is especially important because it allows for the incorporation of the effect of the terms of exchange and the domestic product growth derived from the growth of the United States economy. According to Druck, Magud,

the correct specification tests[21]. The series were constructed as explained in Section 3 of the statistical appendix.

One of the benefits of the SVAR model is that when it comes to analyzing time series, this model permits evaluation of causality, sensitivity, and dynamic responses, eliminating undesired disturbances by identifying the system based on the data structure and the arguments derived from economic theory, Stock and Watson (2001).

An unrestricted (standard) VAR estimates a model based only on the lags of the endogenous variables and the exogenous variables assigned:

$$y_t = Cy_{t-1} + w_t + v_t \quad (2)$$

Where yt is an endogenous variable vector, wt is a deterministic components vector (constant and dummy variables intervening), and exogenous economic variables or control, and vt is the structural innovation vector. The contemporary effects among the variables are contained in the matrix of variances and covariances generated by vector vt.

An exhaustive analysis of a primitive VAR leads to a better understanding. Let us consider the following expression (Enders, 2004), which, for ease, excludes the exogenous variables:

$$By_t = \mathrm{A}y_{t-i} + \varepsilon_t \quad (3)$$

The VAR in its reduced form (2) is simply a reparameterization of the more general specification given in (3). In fact, it is easy to denote it given that $C = B^{-1}A$ y $B^{-1}v = \varepsilon_t$. The foregoing implies that the errors of the final model (3) are linear combinations of the shocks and are not self-correlated with ε_t.

To recover the contemporary interactions of interest contained in matrix B, Cholesky's standard triangular structure is traditionally imposed (Enders, 2004). However, an identification derived from economic theory and the data structure required imposing ad hoc restrictions to compute with the greatest economic sense possible – in addition to the strictly statistic – the impulse-response and variance

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and Mariscal (2015), there is a decline factor in the growth of countries such as Mexico derived from the appreciation of the dollar via the income effect, which causes raw material prices to fall. This phenomenon, although outside the scope of this study, must be considered as an additional factor that comes into play in determining the exchange rate.

[21] Max Eigen-value: 0.79. Normality (structural factorization) = 10.82(0.21); LM(8) = 21.86(0.14); White N.C. = 247.78(0.100).

decomposition functions. This procedure helps achieve the identification that establishes that the number of elements not equal to zero in the B matrix must be equal to or less than ((n^2-n)/2) (Enders, 2004: 272; Hamilton, 1994: 334).

3.1 SVAR Model

An SVAR (2) with a constant for the period 1950-2014 and annual data for the pre-defined information system was estimated[22].
The following constraints were applied to the matrix B,

$$\begin{pmatrix} b_{11} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ b_{31} & b_{32} & b_{33} & b_{34} \\ b_{41} & b_{42} & 0 & b_{44} \end{pmatrix} \begin{pmatrix} cca \\ p \\ y \\ q \end{pmatrix} = \begin{pmatrix} \varepsilon_{cca} \\ \varepsilon_{p} \\ \varepsilon_{y} \\ \varepsilon_{q} \end{pmatrix}$$

obtaining an SVAR(2) precisely identified whose structural equations are pursuant to the theory[23] and are shown below:

$$cca = \varepsilon_{cca}$$

(4)

$$p = \text{-}07.62 * \varepsilon_{cca} + \varepsilon_{p}$$

(5)

$$y = \text{-}1.214 * \varepsilon_{cca} + 0.552 * \varepsilon_{p} - 0.378 * \varepsilon_{q} + \varepsilon_{y}$$

(6)

$$q = 0.027 * \varepsilon_{cca} + 0.020 * \varepsilon_{p} + \varepsilon_{q}$$

(7)

All of the equations report the expected signs, but for analytical purposes, it is useful to make some observations about the short-term effects, while the impulse-response and the decomposition of variance have longer-lasting effects. First and foremost,

[22] The series are stationary as presented, so this estimation method is pertinent (see Table A2). Only the real exchange rate is expressed in logarithms. The others are in the aforementioned units.
[23] It is important to note that the coefficients estimated do not refer to elasticities, but rather to structural errors of which only the signs are interpreted.

the depressive effect of the deficit of the current account (cca) on factorial productivity is of note, as is its effect on growth (y). On the other hand, there is a short-term contractionary effect of q on y, but this is corrected in the long term.
In addition, cca depreciates q and productivity plays a similar role. It has already been said that rising productivity has a competitive effect similar to that of depreciation.
Finally, to prove the joint congruence and replication capacity of the historical data, the system was simulated using the Broyden algorithm (see Figure 5).

Source: Created by the autor

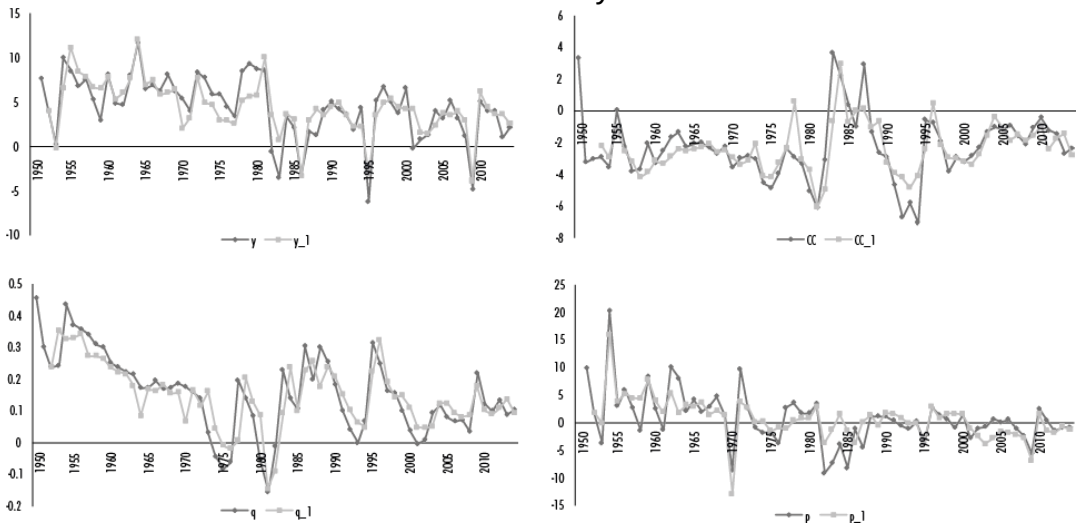

Figure 5. Historical Simulation of the Information System

The structural equations can be projected with good clarity in time intervals longer than in the figures reporting the structural impulse-responses (see Figure 6). Notable is the immediate contractionary effect (although not significant) of q on y which becomes positive and significant between periods 2 and 5, proving the main hypothesis; the other impulses help analyze the transmission channels that lead to this outcome.

Source: Created by the author.

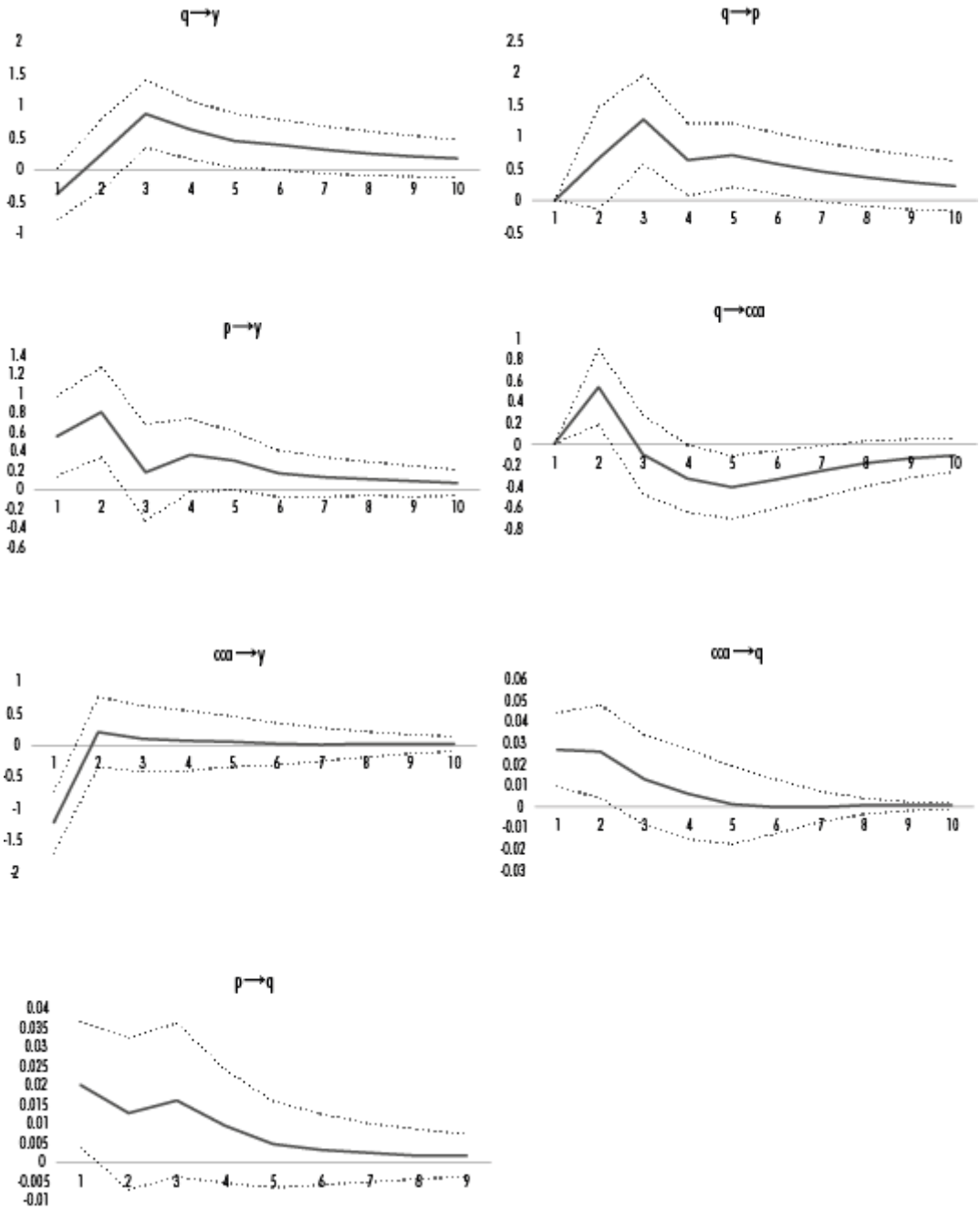

Figure 6. SVAR: Structural Impulse-Responses. ± 2 Standard Deviations

First and foremost, currency depreciation acts clearly and extensively on p, which, as is known, is the crucial long-term growth variable. Likewise, q corrects cca immediately, which, in turn, depresses growth in the short term. Finally, it is observed that p has the aforementioned “depreciation” effect.

The importance of the real exchange rate for the Mexican economy is evident once again in the terms described in the foregoing sections with the variance decomposition analysis (see Table 2).

On the one hand, it is possible to observe exogeneity[24], insofar as since the beginning and up until period 30 it is 77% dependent on itself. On the other, it explains to a great extent (nearly 23%) the variation of cca, a little over 25% of the growth variation, and 26% of the variation in p. In other words, these results demonstrate the centrality of q in the movements of all of the other variables in the system.

With the above results, I prove the main hypothesis in the sense that the real exchange rate is: a) fundamental in explaining the behavior of all of the variables in the model, b) is exogenous by virtue of the fact that it has systematically been handled as a policy instrument and, therefore, c) the usefulness of continuing to employ it in this manner, not to contain inflation, but rather to promote economic growth.

Source: Created by the author.

[24] Proved in the methodological appendix but added to the information system to view its interaction with the other variables.

Decomposition of the variance of *cca*:					
Period	S.E.	*cca*	*p*	*y*	*q*
1	1.353	100.000	0.000	0.000	0.000
5	1.829	80.044	2.044	0.734	17.178
10	1.907	73.971	2.937	0.676	22.416
15	1.912	73.578	2.990	0.673	22.759
30	1.912	73.539	2.995	0.672	22.794
Decomposition of the variance of *p*:					
Period	S.E.	*cca*	*p*	*y*	*q*
1	3.093	6.083	93.917	0.000	0.000
5	3.667	5.404	69.894	2.941	21.761
10	3.788	5.111	66.319	2.776	25.793
15	3.800	5.084	65.988	2.759	26.169
30	3.801	5.081	65.951	2.758	26.210
Decomposition of the variance of *y*:					
Period	S.E.	*cca*	*p*	*y*	*q*
1	2.111	33.074	6.833	56.890	3.203
5	2.709	20.886	16.337	41.633	21.144
10	2.791	19.687	16.261	39.317	24.736
15	2.800	19.557	16.241	39.046	25.157
30	2.801	19.542	16.238	39.016	25.203
Decomposition of the variance of *q*:					
Period	S.E.	*cca*	*p*	*y*	*q*
1	0.072	13.918	7.752	0.000	78.330
5	0.105	14.452	8.470	0.318	76.760
10	0.106	14.188	8.541	0.314	76.958
15	0.106	14.159	8.550	0.313	76.978
30	0.106	14.156	8.551	0.313	76.980

Table 2. Structural Decomposition of Variance

CONCLUSIONS AND POLICY RECOMMENDATIONS

The main objective of this paper was to empirically demonstrate that maintaining a systematically appreciated real exchange rate is a burden (and therefore a constraint) on growth. I estimated an SVAR(2) model based on arguments made by Rodrik (2008), Rapetti et al. (2011), and Razmi et al. (2012), and the stylized facts of the Mexican economy in the period 1950-2015, a time interval that reveals important longstanding features that characterize economic development.

The signs of the coefficients estimated and the results of the impulse-response and variance decomposition analyses coincide with the literature review in terms of the positive effect of a competitive real exchange rate on long-term economic growth. Likewise, they are entirely congruent with the theoretical model and the analysis of the stylized facts in sections 2 and 3. These empirical results, together with the recent literature cited in this paper, suggest that the real exchange rate is a fundamental variable that stimulates long-term growth of the product, via a correction of the current account, by driving the domestic market, and due to its positive effect on factorial productivity. As such, within the current controlled floating exchange rate regime, the central focus of the economic authorities should be on maintaining a competitive and stable real exchange rate in the long term.

It could be argued – contrario sensu – that following this policy would generate an inflationary spiral. However, I believe that a competitive real exchange rate, as demonstrated in this paper, would strongly stimulate production and domestic demand, which would drive factorial productivity and counteract the deindustrializing effects generated by currency appreciations. Maintaining a competitive real exchange rate must not be confused with corrective depreciations. History has shown that the latter have contractionary and inflationary effects because they are combined with structural adjustment policies that produce adverse effects on growth and inflation. On the other hand, recent documents published by the Bank of Mexico itself (Cortés, 2013) have demonstrated that the transfer effect of the nominal exchange rate on inflation has fallen notably since a decade earlier.

In this way, by stimulating economic growth with policies that buttress the domestic equilibrium and maintain a competitive exchange rate, it is plausible to assert that productive value chains could be generated that would reduce the high rate of imports to the product and the income elasticity of imports, with which the inflationary pressure derived from a competitive exchange rate should be reduced.

Despite all of the foregoing, it is important to note that the currency authorities currently enjoy less liberty than in the past in the sense that globalization has imposed autonomous dynamics on the exchange rate, including the following: a) the effects of appreciation (depreciation) of the dollar against the price of raw materials; b) hedging positions in pesos taken by emerging economy governments as the Mexican peso is the eighth-ranked currency worldwide in terms of transaction volumes; c) the enormous volatility of capital that has been observed as a result of the “flight to quality,” which has distanced the exchange rate from its macro-foundation.

In summary, what must be sought at any cost – despite the dynamics of globalization in terms of reducing the currency authority's leeway – is a monetary policy favorable to growth that avoids appreciation and the consequent remedial currency depreciations, which, by their very nature, have always come with sharp social and economic costs, as demonstrated long ago by Krugman and Taylor (1978).

The objective of maintaining a competitive exchange rate would prevent the corrective maxi-depreciations that have taken place, thereby also preventing the resulting inflationary shocks and, in this way, softening economic cycles.

The unconventional monetary policies that have been implemented practically the world over since the Great Recession (2009), which are highly pragmatic, could also contribute to the goal of driving economic growth. This could be a way to pursue a real exchange rate goal without formally establishing activist rules, which in the current context has been managed by the central banks of developed countries.

In fact, in a flexible exchange rate regime, it is the monetary policy which should command economic growth derived from aggregate demand policies through the effects on the interest rates and, therefore, on the exchange rate, but above all due to its strong effects on factorial productivity.

In this sense, greater priority should be given to recovering internal credit through less conservative monetary policies, therefore allowing the real exchange rate to play the role it should in a flexible exchange rate regime, as a factor to grow domestic demand and, at the same time, obtain external equilibrium. Recent history has proven that the 2001-2003 recession and the slow growth phase in which Mexico has found itself since 2010 are tied to real appreciations, while the country was able to emerge rapidly from the 1995 crisis thanks in large part to a sharp currency correction.

STATISTICAL APPENDIX

1. Unit Root Tests

Note: * the hypothesis of the presence of a unit root is rejected at 95%; (i) the presence of a unit root is rejected at 90%.

Source: Created by the author.

		Q	p	cca	y
PP	Trend and intercept	-3.918*	-8.054*	-5.291*	-6.290*
	Intercept	-3.657*	-7.163*	-5.245*	-5.333*
	Nothing	-2.471*	-7.109*	-2.698*	-3.098*
KPSS	Trend and intercept	0.176(i)	0.184(i)	0.058*	0.073*
	Intercept	0.537(i)	0.674(i)	0.073*	0.809

Table A1. Unit Root Tests, 1950-2014

2. Exogeneity Tests

The Hyeon-Seung (2005) exogeneity test was used to demonstrate the Exogeneity of q and the product of the United States yus. The statistical significance of the constraint within SVAR is proven in the following way. Consider an SVAR of n dimensions.

$$\Phi(L) X_t = v_t$$

(1)

Where $X_t = (x_{1t}, x_{2t}, x_{3t}, \ldots, x_{nt})$. $\Phi(L) = \left[\Phi_o - \sum_{i=1}^{p} \Phi_o L^i \right]$ and L is the lagging operator and vt is the set of structural innovations.

$$\Pi(L) X_t = \varepsilon_t$$

(2)

Where $\Pi(L) = \left[\Phi_o - \sum_{i=1}^{p} \Pi_i L^i \right]$

$$X_t = \Phi(L)^{-1} v_t = \Psi(L) v_t$$

(3)

$$X_t = \Pi(L)^{-1} \varepsilon_t = C(L) \varepsilon_t$$

(4)

$\Phi_0^{-1} v_t = \varepsilon_t$ is the ratio between structural innovations and those of the reduced form.

The following set of restrictions is imposed on $\Pi(L)$, except the first element:

$$\Pi_0^{12} = \Pi_0^{13} = \Pi_0^{14} \ldots = \Pi_0^{1n} = 0 \text{ as}$$

$$C_i^{12} = C_i^{13} = C_i^{14} \ldots = C_i^{1n} = 0$$

(5)

To verify the significance of the constraint, an over-identification is imposed that is tested jointly with the statistic x2, and secondly, the non-causality in the sense of Granger is proven for the variable with respect to the rest of the variables that comprise the information system. Test on q:

$$\chi^2 = 0.094863 (0.7581)$$

(6)

Source: Created by the author

Excluded	*Chi-sq*	*df*	*Prob.*
cca	0.549674	2	0.7597
z	1.054400	2	0.5903
y	0.120101	2	0.9417
All	2.203734	6	0.9000

Table A2. Causality in the Sense of Granger, 1950-2014

Ho: there is no causality in the sense of Granger.

Test on yus:

$$\chi^2 = 1.206700 \ (0.2720)$$

(7)

Source: Created by the author.

Excluded	Chi-sq	df	Prob.
cca	5.437529	2	0.0660
z	2.741503	2	0.2539
y	0.379555	2	0.8271
All	7.810480	6	0.2523

Table A3. Causality in the Sense of Granger, 1950-2014
Dependent variable: Yus

The conclusion is that both q and yus are exogenous for the information system, but for analysis purposes, q is left in the SVAR as an endogenous variable, which allowed us to see the structural shocks derived from that variable, as well as its contribution to the variance decomposition for all of the variables.

DATA SOURCES

In order to build long series on the GDP growth of the Mexican economy, the current account, and the real exchange rate, which are not officially available by the National Statistics and Geography Institute (INEGI), the choice was made to link them together by adding new information to the historical series provided by Villarreal (1988). The complete total factorial productivity historical series was obtained from the National Development Plan (2013) and updated for 2012-2014 with an ARIMA (3,1,3). The following references were used to put together the long series:

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