

Mexico from the 1960s to the 21st Century:  
From Fiscal Dominance to Debt Crisis to Low Inflation\*

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**Abstract**

The objective of this paper is to analyze the monetary and fiscal history of Mexico using as framework the model of Sargent and Wallace (1981). I study the period 1960-2016. I evaluate the ability of the model to explain the crises of 1982 and 1994. The model can explain the 1982 Debt Crisis, but cannot explain the 1994 Crisis. A constitutional change in the relation between the Federal Government and Banco de México, and policy choices made in the aftermath of the 1994 Crisis, are consistent with a transition from fiscal dominance to an independent central bank. Inflation fell persistently after 1995, reaching values of 3 percent per year in mid-2016. That number is the target of the central bank. After a long transition after the 1982 Crisis Mexico succeeded controlling inflation. I discuss the forces that reduced inflation over time: A long sequence of primary surpluses, negotiations between the government, workers and businessmen, the constitutional change that gave independence and a goal to the central bank, and the current inflation targeting regime. On the fiscal side I observe a change in the downward trend of the total debt to GDP ratio, as it fell from the 1980s to 2009, year in which it started growing persistently.

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## 1. Introduction

The objective of this paper is to analyze the monetary and fiscal history of Mexico using as framework a version of the model by Sargent and Wallace (1981), presented in Kehoe, Nicolini and Sargent (2013). I want to verify whether important events can be understood according to predictions of the model. I evaluate the ability of the model to explain the crises of 1982 and 1994.

What does the model say about fiscal crises? The main prediction of the model of Sargent and Wallace (1981) is that, under certain assumptions, at a given point in time the public is not willing to finance a growing stock of public debt, which will lead to higher inflation. The reason is that the deficit is financed by the central bank via bigger seigniorage. The main assumptions are: a) The primary deficit is larger than sources of financing including seigniorage, other than public debt; b) at some date the level of interest-bearing government debt reaches a limit imposed by the financial market; c) if public debt is not enough to finance the deficit, the monetary authority will finance it via seigniorage, i.e. there is fiscal dominance. Under these assumptions, the stock of debt grows over time, until it reaches the limit the market is willing to finance. At that point in time the monetary authority finances the deficit with bigger seigniorage, which leads to higher inflation.

In terms of measurement, I describe how I calculate empirical counterparts of the theoretical components of the consolidated government's budget constraint. By consolidated I mean putting together the Treasury and the central bank.

The model describes well the events before and after the 1982 Debt Crisis. There was a large increase in the primary deficit before 1982. The Mexican government announced in 1982 that it could not fulfill the scheduled debt payments. There was a large increase in inflation and in the inflation tax as the government received credit from the central bank, the *Banco de México*, leading to a large increase in the monetary base.<sup>1</sup>

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<sup>1</sup> Throughout the paper I measure inflation using the growth rate of the GDP deflator, unless stated otherwise.

On the other hand, the model cannot account for the 1994 Crisis, in particular if I think of Mexico as being described by fiscal dominance. One fact that does not fit the premises of the model is that before the 1994 Crisis Mexico had primary surpluses. A second fact that does not fit well is that the debt-to-GDP ratio was not growing. However, it is true that the crisis occurred when a particular kind of debt, the Tesobonos, reached its historical maximum. In terms of post-crisis events, again the predictions of the model do not fit the data because the inflation tax remained at historically low values.

Analyzing the 1994 Crisis, I conclude that the change in legislation that granted independence to the Banco de México in 1993 represented a credible change from fiscal to monetary dominance. The fact that the inflation tax remained low, compared to historical values, is consistent with such change. Inflation fell persistently after 1995, reaching values of 3 percent per year in mid-2016. That number is the target of the central bank (+/-1 percentage point). The transition of Mexico from fiscal dominance to an independent central bank has been successful.

On the fiscal side I observe a change in the downward trend of the total debt to GDP ratio, as it fell from the 1980s to 2009, year in which it started growing persistently.

The rest of the paper is divided into the following sections. Section 2 describes briefly the choices I made when calculating empirical counterparts of theoretical variables. Section 3 analyzes the events leading to the 1982 Debt Crisis and asks if the model can explain it. Section 4 describes the period of reforms that took place after 1982. This section also analyzes the 1994 Crisis. Section 5 describes the recovery post 1995 and the evolution of public debt, monetary policy and inflation until 2006, before the Great Recession. Section 6 analyzes the period 2007-2016. Section 7 highlights facts coming out of the analysis, and provides a comparison of the measures of debt I use in the main part of the paper to alternative ones. Section 8 discusses the forces behind what I call the Great Reduction of inflation in Mexico. Section 9 concludes.

## 2. Measurement

In this section I provide details on the measurement of the components of the theoretical consolidated government budget constraint. I discuss the limitations of the data and the choices I made.

### 2.1 The Model

The theoretical budget constraint in Kehoe, Nicolini, and Sargent (2013) comes from consolidating the budget constraints of the fiscal branch of the government (i.e. the Treasury) and of the central bank, and using an equation that says that, for each kind of debt, total debt issued by the government  $B_G$  is equal to a part bought by the central bank,  $B_B$ , and a part bought by the public,  $B$ . Therefore  $B_G = B_B + B$ .

I modify the model by adding the international reserves of the central bank, because reserves are an asset for the consolidated government. This is a modification that was presented at the Chicago 2016 conference of the “Fiscal and Monetary History of Latin America” (FMHLA) project. A simpler analysis would not use international reserves to calculate net debt. I took reserves into account because the model includes foreign debt, therefore for consistency one should consider the role of international reserves as an asset. Of course, it is possible to construct the consolidated budget constraint in the model and in the data excluding international reserves.

It is important to note that I am obviously not saying that the Treasury can use at its discretion the international reserves of the central bank. In the modified model the budget constraint of the government includes Receipts from the Central Bank ( $RCB$ ). “Receipts from Central Bank” is the label used by Walsh (2003) for receipts from the central bank to the fiscal branch of the government. In the United States the Federal Reserve turns over to the Treasury most of its interest earnings from government debt. In the case of Mexico, the central bank, after determining its earnings and following rules specified legally, transfers resources to the Treasury. This is the *Remanente de Operación de Banco de México*.

A second modification to the model is I add to the Treasury's resources the revenue from selling oil. I make this addition because of the importance of PEMEX, Mexico's national oil company, for public finances. In this way I explicitly take the role of oil sales into account. The Treasury has historically taxed PEMEX to obtain revenue from oil sales. For simplicity I do not model this taxation.

A third modification is that I eliminate debt indexed to inflation from the model. The reason for doing this is that the raw data I use do not report it separately. The data I use is divided into two categories only: Foreign and domestic. There has been indexed debt issued by the Treasury in the past, and today it sells Udobinos. In the data, this kind of debt is included in domestic debt.

Here I omit the presentation of the mathematical expressions of my modified version of Kehoe, Nicolini, and Sargent (2013). It is available in the Appendix. In lieu of the equations I present verbally the budget constraint. When I plot the data I present the same variables relative to GDP. The consolidated budget constraint is

$$\begin{aligned} \text{Primary deficit excluding oil revenue} + \text{interest domestic debt} + \text{interest foreign debt} - \\ \text{interest received on international reserves} = \\ \text{Oil revenue} + \text{issuance of domestic debt} + \text{issuance of foreign debt} - \text{international} \\ \text{reserve accumulation} + \text{seigniorage} \end{aligned}$$

I now need to construct empirical counterparts of these theoretical variables. There are several issues with the available data, which I discuss below. I keep this discussion brief to go on and take a look at the data.

## 2.2 The Data

One question that arises is whether to use data for a narrow or broad definition of government. The benefit of a broad definition is that in Mexico the "government" includes not only the Federal Government but also other institutions and firms. The cost is that it is harder to find all the variables for institutions and firms outside the Federal Government. I choose working with a broad definition of government. This means working with data from the Federal Government, but also with data from the national

oil company PEMEX, the national electricity company CFE, the national social security institute IMSS, which are important for Mexico, plus other firms and institutions. Since the 1980s the government has compiled statistics for the “Public Sector”. I describe its components based on SHCP (2010).<sup>2</sup>

Table 1 shows a summary of the structure of the Public Sector, in Spanish. The Public Sector is A+B. In turn, Part A has two main components, the Federal Government (A.1) and certain institutions and government firms (A.2). Part B has two main components, a financial and a non-financial one. The financial component (B.1) is the set of development banks. I exclude more detail, including in Table 1 the components of the government which are more relevant in terms of revenue and spending.

A. Sector público de control presupuestario directo		B. Sector público de control presupuestario indirecto
A.1 Gobierno Federal	A.2 Organismos y empresas de control presupuestario directo:	Organismos y empresas de control presupuestario indirecto
	PEMEX CFE IMSS ISSSTE	B. 1 Financieros: Bancomext Bansefi Banobras Nafin SHF Other B. 2 No financieros

Source: SHCP (2010).

Table 1. Summary of Components of the Public Sector

To carry out the analysis I choose four periods. The first one goes from 1960 to 1982, ending in the year of the Debt Crisis. The second starts in 1983 and ends with the 1994 Crisis. The third starts in 1995 and ends in 2006. The last one covers 2007 to 2016.

I choose these periods based on the mechanism of the theoretical model. The model I described in Section 2.1 is richer than the original one of Sargent and Wallace (1982), but the mechanism is basically the same. Intuitively, if the deficit plus transfers are larger than the sum of seigniorage and oil revenue, the Consolidated Government will

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<sup>2</sup> In particular, see p. 9.

have to issue a growing amount of debt, until it hits an exogenous limit set by financial markets, and there will be a fiscal crisis. This chain of events describes well the period 1960-1982, and this is the reason why I settled on those years for the first period. The choice for the second period 1983-1994 is that it also ends in a large crisis. I want to know if the workhorse model can also account for the 1994 Crisis. The last two periods split roughly evenly into two the years 1995-2016. The period 1995-2006 ends before the Great Recession. The last period includes it and goes on until 2016.

It is important to note that the available data do not match exactly those periods. The main data source is Banco de México. It has a large amount of data for 1977 onwards. For 1960-1979 I use several sources (there is a small overlap with the Banco de México data for some variables). The scope and detail of the data are much smaller for this previous period. I now describe the data.

### 2.2.1 Data 1977-2016

The main source is Banco de Mexico. It reports debt and primary deficit statistics for the Public Sector. I first describe the debt data, and in second place I talk about primary deficit data.

Importantly, Banco de México consolidates the debt of the Public Sector with its own assets and liabilities, as I did above in the model, reporting consolidated debt. The name of these data is *Deuda Neta Consolidada con Banco de México* (DNCBM), meaning “net debt consolidated with Banco de México”.

Important points regarding DNCBM are the following:

1. Banco de México reports domestic and foreign debt (*interna* and *externa*, respectively, in Spanish).
2. External debt is net of the international reserves of Banco de México.
3. The data have a drawback. At the Chicago 2016 FMHLA Conference the question was raised whether I should measure debt at face value or at market value. The conclusion was that it would be better to do it at face value, because

then I would be measuring the “burden” of the debt, i.e the amount that the government promised to pay. The DNCBM measures debt at market value.<sup>3</sup>

4. I do not use in the analysis debt indexed to inflation. The raw data do not present it separately. In the 1980s there were Ajustabonos, and after 1995 there are Udibonos. Both are included in domestic debt.
5. Tesobonos, the debt that grew significantly during 1994 and was denominated in dollars and paid in pesos, is included in domestic debt.

Another possible source of data on debt for a broad definition of the government is a series computed by the *Secretaría de Hacienda y Crédito Público* (Mexico’s Treasury, SHCP). The series is called *Saldos Históricos de los Requerimientos Financieros del Sector Público* (SHRFSP), or Historic Balance of the Financing Needs of the Public Sector. The main drawback of that series is that it starts in the 1990s. In Section 7 I compare the DNCBM with the SHRFSP in terms of what components of the government are included in each one.

In the case of the primary deficit, Banco de México reports it for the Public Sector, as defined above. It includes revenue from the privatizations of the national phone company TELMEX, and of banks in the early 1990s. These banks were private until 1982, when they were nationalized after the Debt Crisis. I consider this variable to be the empirical counterpart of  $D_t + T_t$  in the model, which represents the primary deficit plus transfers.

I do not use data on interest payments because there is no guarantee that they make the theoretical budget constraint hold. Therefore I make the choice of measuring interest payments as a residual from the theoretical budget constraint.

#### 2.2.2. Data 1960-1979

I use data from several sources, including the SHCP and the *Instituto Nacional de Estadística y Geografía* (INEGI), the national statistics institute. The debt data do not consolidate the Public Sector with the Banco de México, as was the case with the

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<sup>3</sup> This is done whenever possible.

DNCBM. I did by hand a calculation of dollar-denominated debt net of international reserves of the central bank.

In fact statistics for the Public Sector start in the 1980s. I found data only for the Federal Government for the pre-1980 period. Given the heterogeneity in sources and characteristics of the data, when constructing the dataset I specify whether each variable refers to the Federal Government or to the Public Sector, when relevant. It is likely that there was no large difference in this period, as most spending and borrowing was carried out by the Federal Government.

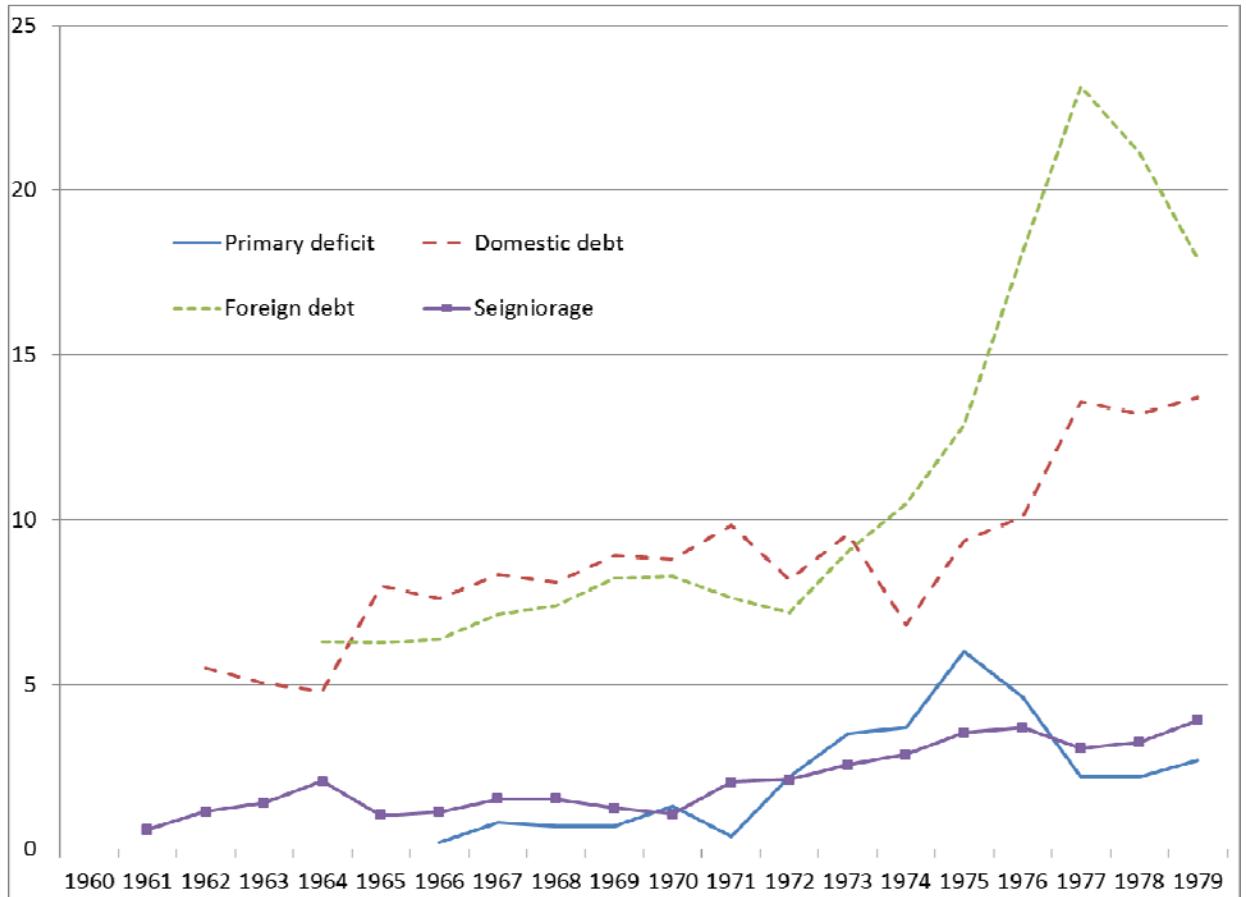
Important points regarding data in this period:

1. Debt data sources do not indicate whether data is at face value or market value.  
It is most likely debt at face value.
2. I keep track of two types of debt, domestic and foreign.
3. Debt data sources do not include separately debt indexed to inflation. There was none in this period.
4. As before, I do not use data on interest payments.
5. For some variables I could add more observations. But the data for a crucial variable, domestic debt, ends in 1979. I decided to use that year for the end of this sample.

Having constructed the dataset, I analyze the data. Recall that the main research question is whether the model can explain large events of Mexico's history.

### 3. 1960-1982: Low Primary Deficit, the Fiscal Expansion of the 1970s and the Debt Crisis of 1982

In Figure 1 I plot the data for 1960-1979. The figure shows that the primary deficit was very small, practically zero, in 1966. As I will discuss below, this period starts with relatively low and stable levels of debt. But the fiscal situation would deteriorate towards the second half of the 1970s. It would become even worse in the early 1980s, when the Debt Crisis took place. For this period I do not have data on oil revenue. Therefore I do not decompose the primary deficit into the deficit excluding oil revenue, and oil revenue.



Source: Author's calculations with data from Banco de México, INEGI and SHCP.

Figure 1. Fiscal and Monetary Variables 1960-1979, % of GDP

Kehoe and Meza (2011) provide some background on this period.<sup>4</sup> In this period the presidents of Mexico were Adolfo López Mateos (1958-1964), Gustavo Díaz Ordaz (1964-1970), Luis Echeverría (1970-1976), and José López Portillo (1976-1982). I focus the discussion mainly on the last two mentioned presidential terms, as those are the years for which I have more data.

During the presidential term of Gustavo Díaz Ordaz there was a small deficit. The data show primary deficits close to zero, and an increase to 1.3% of GDP in 1970, the last year he was in power. This can be seen in Figure 1.

The term of Luis Echeverría showed the first signs of public finance instability. It had a large increase in the primary deficit ratio. Part of this increase had to do with the

<sup>4</sup> Their references are Cárdenas (1996) and Solís Manjarrez (2000).

intervention of the government in the economy. This was a time in which it bought private firms that were bankrupt or had financial problems. Actually, this policy of rescuing failing firms was a continuation from the 1960s. By 1975 these firms, known as *empresas paraestatales*, had grown in number and scope of industry. By 1976 it became clear that the growth strategy based on public spending and intervention in the economy had failed. Cárdenas (2015) provides more detail.

The government borrowed in international markets to pay for the deficit. There was an increase in the foreign debt ratio. Figure 1 shows that the deficit ratio spiked in 1975 to a value of 6%. This administration ended with the first devaluation of the peso in 22 years. One interesting point about 1976 is that, despite the devaluation of the peso, there is no large fall in GDP per working age person, as would be the case in 1983 and 1995. This is shown in Kehoe and Meza (2011).

The 1982 Debt Crisis would occur in the last year of the administration of José López Portillo. In his term massive oil fields were discovered. Cárdenas (1996) says that proven oil reserves increased 151.2% between 1977 and 1978. The government decided to invest in the infrastructure of the oil industry. This industry was under control of the government since 1938, when it was nationalized by President Lázaro Cárdenas. The national oil company PEMEX was the only firm allowed to operate in each stage of oil production and refined products, from extraction to sales to consumers. Other features of these years include an expansion of investment in health and in education. Elementary school coverage and access to medical services increased significantly. The government created important policy tools, such as the value added tax (IVA, *impuesto al valor agregado*) and the short-term bonds named CETEs (for *Certificados de la Tesorería de la Federación*).

The administration of López Portillo is famous for the phrase “to manage abundance”, or in Spanish, *administrar la abundancia*. The increase in oil reserves was seen as leading to times of a booming Mexican economy. However, the opposite would come true. I have mentioned some potentially productive investments made by the government in this administration. At the same time, there was a large increase in public spending unrelated to the oil industry. Total government spending increased from 30.9% of GDP in 1978 to 40.6% in 1981. Out of those approximately 10 percentage

points, 7.3 came from increasing non-oil industry related spending. Besides, the productivity of projects on which these resources were spent was doubtful. Cárdenas (2015) provides some detail on the use of oil revenue.

Figure 2 below shows that the deficit ratio reached 7.6% in 1981. The figure also shows increases of the domestic debt-to-GDP ratio, and in particular of the foreign debt ratio. In 1982 this administration would default on payments to the principal of foreign debt. It would still pay interest. The government blamed capital leaving Mexico on Mexican banks, and chose to take control of them. Banks were nationalized towards the end of the presidential term of José López Portillo. For approximately nine years banks would be managed by the government.

### **Chronology of Events Leading to the 1982 Crisis: What Touched Off the (Partial) Default?**

Figure 2 below shows the debt-to-GDP ratios starting in 1980. The sum of domestic and foreign debt is equal to 31.2% of GDP in 1981, the year before the Debt Crisis. Timothy J. Kehoe and Juan Pablo Nicolini have asked me two questions regarding this information:

1. Why did Mexico default even though the amount of debt was relatively small?
2. What touched off the default? To be more precise, recall that Mexico stopped making payments to the principal of the debt, making payments only on interest.

To answer these questions I present a chronology of events, based on Cárdenas (2015).

1981:

1. Starting point: Cárdenas (2015) says that the two main problems of the economy were the growing fiscal and current account deficits.
2. Interest rates in the United States (U.S.) had increased because of the contractionary monetary policy that had the goal of reducing inflation. Importantly, international banks reduced the amount of lending, and shortened the maturity of loans.
3. There was disagreement within the government on the reduction of the deficit, and on its magnitude. The Secretaría de Hacienda y Crédito Público and the Banco de México wanted to reduce its growth. The *Secretaría de Patrimonio* y

*Fomento Industrial* opposed. The *Secretaría de Programación y Presupuesto* mediated between both stances. Perhaps for electoral reasons, as there would be presidential elections in 1982, the choice was made not to adjust the deficit. To reduce the current account deficit restrictions on imports were imposed.

4. The price of oil fell. Oil revenue was very important for the government. Therefore this fall deteriorated public finances. Note that this is certainly true when we think of the Mexican government's financial position in dollars vis-à-vis the rest of the world. In pesos oil revenue could have increased depending on the behavior of the exchange rate.
5. The lack of fiscal and exchange rate policy adjustment led to higher devaluation expectations and capital outflows.
6. Importantly, new debt could only be obtained at shorter maturities.

1982:

1. The international reserves of the Banco de México had reached a very low level.
2. On February 5<sup>th</sup> President López Portillo gave a speech, promising to defend the value of the peso.
3. On February 17<sup>th</sup> the peso suffered a devaluation of 80%. Afterwards unions demanded wage increases, which were implemented.
4. There was no fiscal adjustment because 1982 was a year of presidential elections.
5. On April 18<sup>th</sup> the peso lost approximately 75% of its value.
6. During the first half of 1982 foreign short term debt had grown by 20 billion dollars. Importantly, international banks made lending more and more restrictive.
7. After receiving a credit on June 30<sup>th</sup> from a group of international banks, Mexico suffered a total lack of access to more credit.
8. By the end of July, with central bank reserves at a very low level, for the first time in the history of Mexico capital controls were imposed. A system of dual exchange rates was created.
9. On August 20<sup>th</sup> the *Secretario de Hacienda*, Jesús Silva Herzog, announced in New York that Mexico did not have the resources to pay the principal of debt due in the rest of the year. Importantly, the moratorium was negotiated with

international banks. It was not a unilateral decision. The payment of interests continued.

10. The stock of foreign debt reached a level of 84 billion dollars, of which 68.4% was public, 21.8% was private (excluding banks), and 9.7% was bank debt.

The two questions posed by Timothy J. Kehoe and Juan Pablo Nicolini are interrelated. My answer would be the following. Mexico suffered important shocks in 1981. One was the higher level of interest rates in the U.S., which increased the opportunity cost of lending to Mexico. A second shock was the fall in the price of oil, which was a crucial source of revenue for the government, in particular when deciding to repay debt in dollars. These two shocks made international banks reduce their lending to Mexico, and shorten the maturity of the debt. Therefore the fiscal imbalance became worse. In 1982 the government had to devalue the peso. The cumulative devaluation of the peso was an astounding 266% between 1981 and 1982. The burden of foreign debt on GDP increased dramatically, to the point that in August 1982 the government announced it would keep making interest payments, having negotiated a moratorium on principal payments of foreign debt. The foreign debt-to-GDP ratio increased from 20.1% in 1981 to 57.6% in 1982. The moratorium would last until successive future rounds of renegotiation of the principal in the years post 1982.

### **Analyzing the 1982 Crisis Through the Lens of the Model**

I now analyze events leading to the 1982 Debt Crisis through the lens of the model. Sargent and Wallace (1981) discuss two possible arrangements between the fiscal and the monetary branches of the government. One is fiscal dominance, in which when the Treasury loses access to debt markets, the Central Bank has to adjust and create enough seigniorage to finance the gap in the government budget. The other arrangement is monetary dominance, in which it is the Treasury that adjusts in times of crisis, rather than the Central Bank.

In the case of Mexico, at least throughout the period 1970-1982 the Banco de México was dominated by the government. Cárdenas (1996) describes episodes in 1972 and in 1981 in which the Banco de México expanded the monetary base to finance growing deficits.

A prediction of the model of Sargent and Wallace (1981) is that the debt-to-GDP ratio increases when seigniorage is not enough to finance the primary deficit. Between 1965 and 1973 the domestic and foreign debt ratios are roughly constant. This is consistent with the fact that seigniorage is approximately equal to the primary deficit.

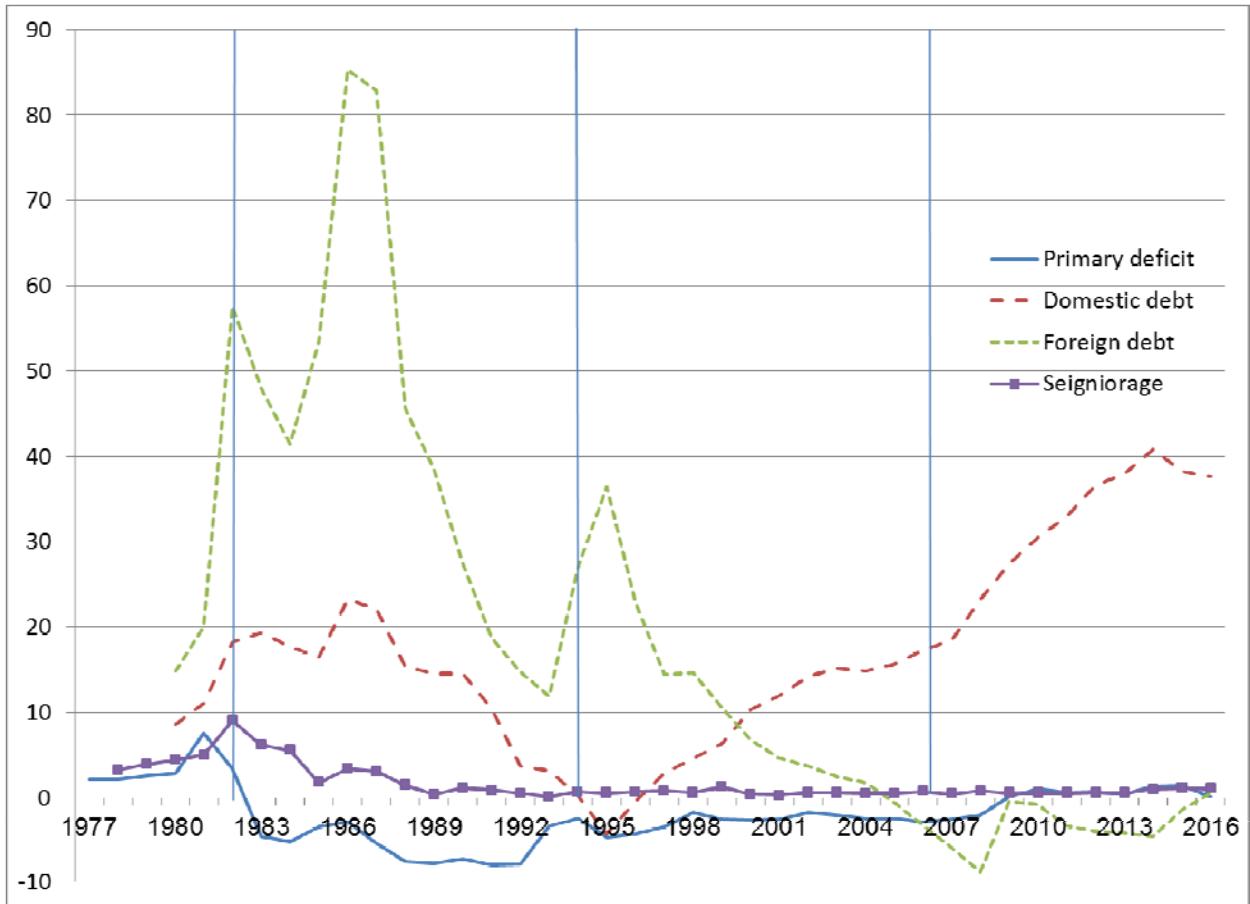
In 1975 there is a spike in the primary deficit, as it jumps to 6% of GDP. At the same time it becomes larger than seigniorage. The government had to issue more debt, leading to an increase first in the foreign debt ratio to 12.9%, and in the subsequent years in the domestic debt ratio. In this sample the maximum values of the foreign and domestic ratios are 23.1% and 13.6% in 1977, respectively.

Between 1977 and 1979 there is an effort to reduce the growth of the debt ratios. The primary deficit ratio had a smaller value of 2.2% in 1977. Additionally, seigniorage became larger than the primary deficit, reaching a value of 3.9% in 1979. The debt ratios stopped growing. In 1979 the foreign debt ratio actually fell to 17.9%, and the domestic debt ratio stabilized around 13.7%.

From this point on I use the data that starts in 1977, and that are much richer. Figure 2 shows the variables for 1977-2016. For now let us focus on the 1977-1982 period.

The fiscal situation deteriorated before 1982, as there was an increase in the primary deficit to 7.6% of GDP in 1981. In that year the primary surplus becomes larger than seigniorage. The government had to increase its borrowing. There were increases in both domestic and foreign debt between 1980 and 1981.

Finally, the Debt Crisis takes place in 1982. On August 20<sup>th</sup> 1982 the government announced that it was unable to pay the principal of the short term debt that was due in those days, as mentioned in Cárdenas (1996). A significant event is the large increase in the foreign debt ratio. It goes from 20.1% to 57.6% from 1981 to 1982.

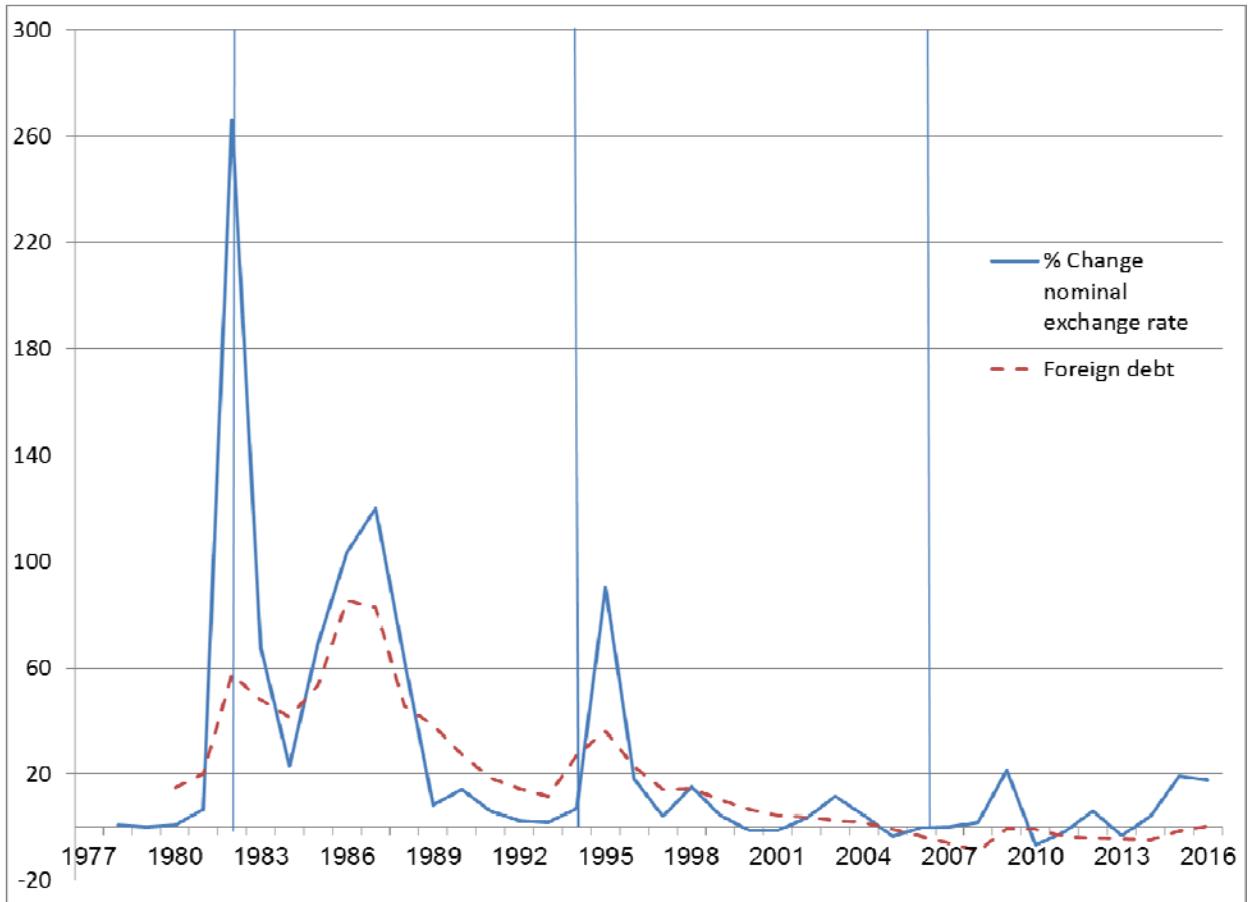


Source: Author's calculations with data from Banco de México and INEGI.

Figure 2. Fiscal and Monetary Variables 1977-2016, % of GDP

### **Devaluations of the Peso and Spikes in the Foreign Debt Ratio**

An important force behind this increase is the large devaluation of the peso in 1982. In the data the nominal exchange rate is defined as pesos per dollar. The currency devalued (i.e. the exchange rate increased) by 266.1%. In fact, the correlation between changes in the foreign debt ratio and the percentage change in the value of the peso is large throughout the rest of the sample. Figure 3a shows this. In general the change in the foreign debt ratio depends both on what happens to the real exchange rate over time and what happens to the stock of debt issued, in real terms. The figure shows spikes in the foreign debt ratio at the same time as the peso loses value sharply.



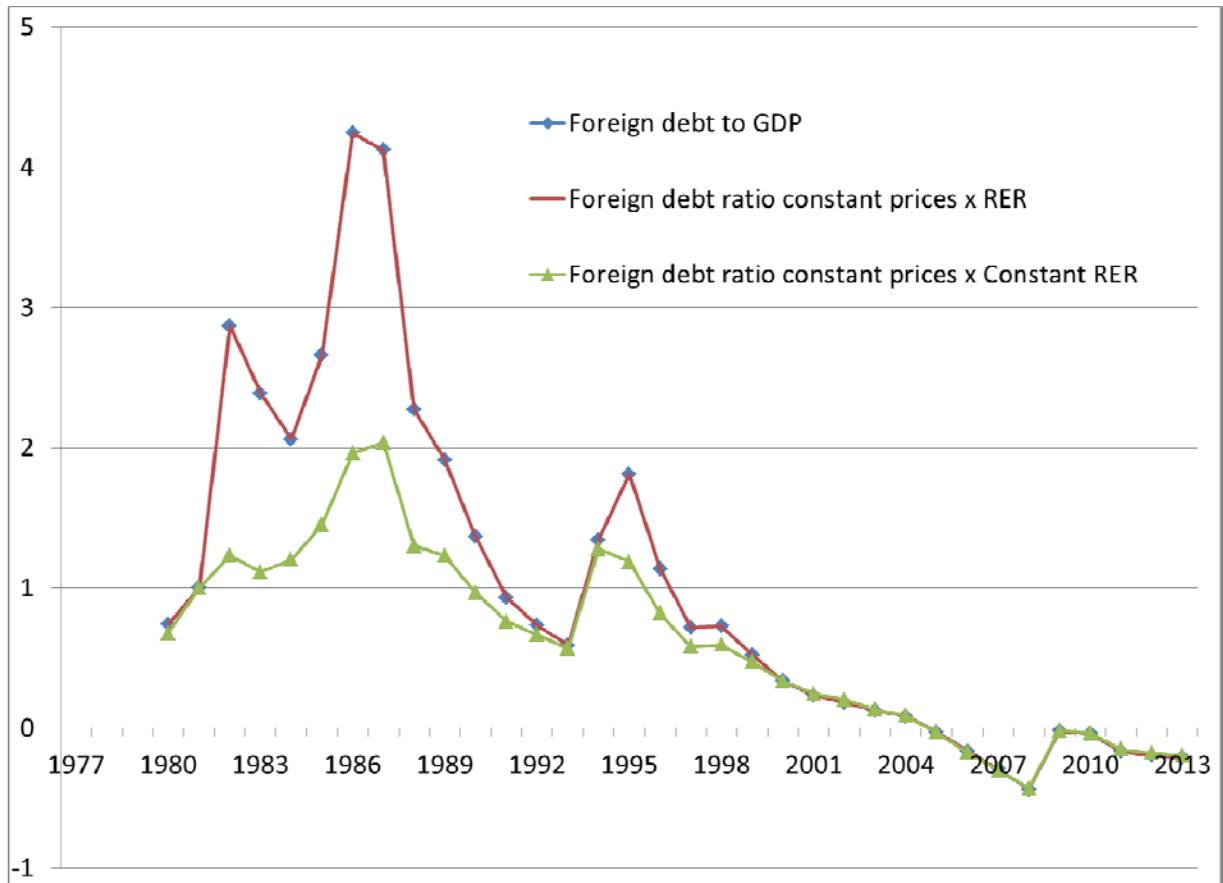
Source: Author's calculations with data from Banco de México and INEGI.

Figure 3a. Foreign Debt-to-GDP ratio in %, and % Change in Nominal Exchange Rate

To make this point even starker, in Figure 3b I use the model to decompose changes in the foreign debt to GDP ratio. “Foreign debt to GDP” is the same variable as in Figure 3a. “Foreign debt ratio constant prices x RER” decomposes the previous ratio into foreign debt to GDP at constant prices, multiplied by the real exchange rate (RER).<sup>5</sup> By construction these two series are identical. Finally, “Foreign debt ratio constant prices x Constant RER” keeps constant the value of the RER over time. I am plotting indexes of these variables, making their value in 1981 equal to 1. Notice the large difference between “Foreign debt to GDP” and “Foreign debt ratio constant prices x Constant RER” in 1982. The main point of Figure 3a is that most of the large fluctuations in the foreign debt ratio are due to large changes in the RER, which in turn have to do with

<sup>5</sup> The notation “x” stands for multiplication. One important point is that I am using the assumption, as in Kehoe, Nicolini and Sargent (2013), that the domestic price index is a function of the price of domestic goods and of foreign goods. Therefore I needed an empirical counterpart of the dollar price level of traded goods consumed in the country. I chose a historical import deflator provided by INEGI.

large devaluations of the peso. This observation is true up to 1992. It resurfaces in 1995 after the 1994 Crisis, and disappears rather quickly once the peso floats starting in 1995.



Source: Author's calculations with data from Banco de México and INEGI.

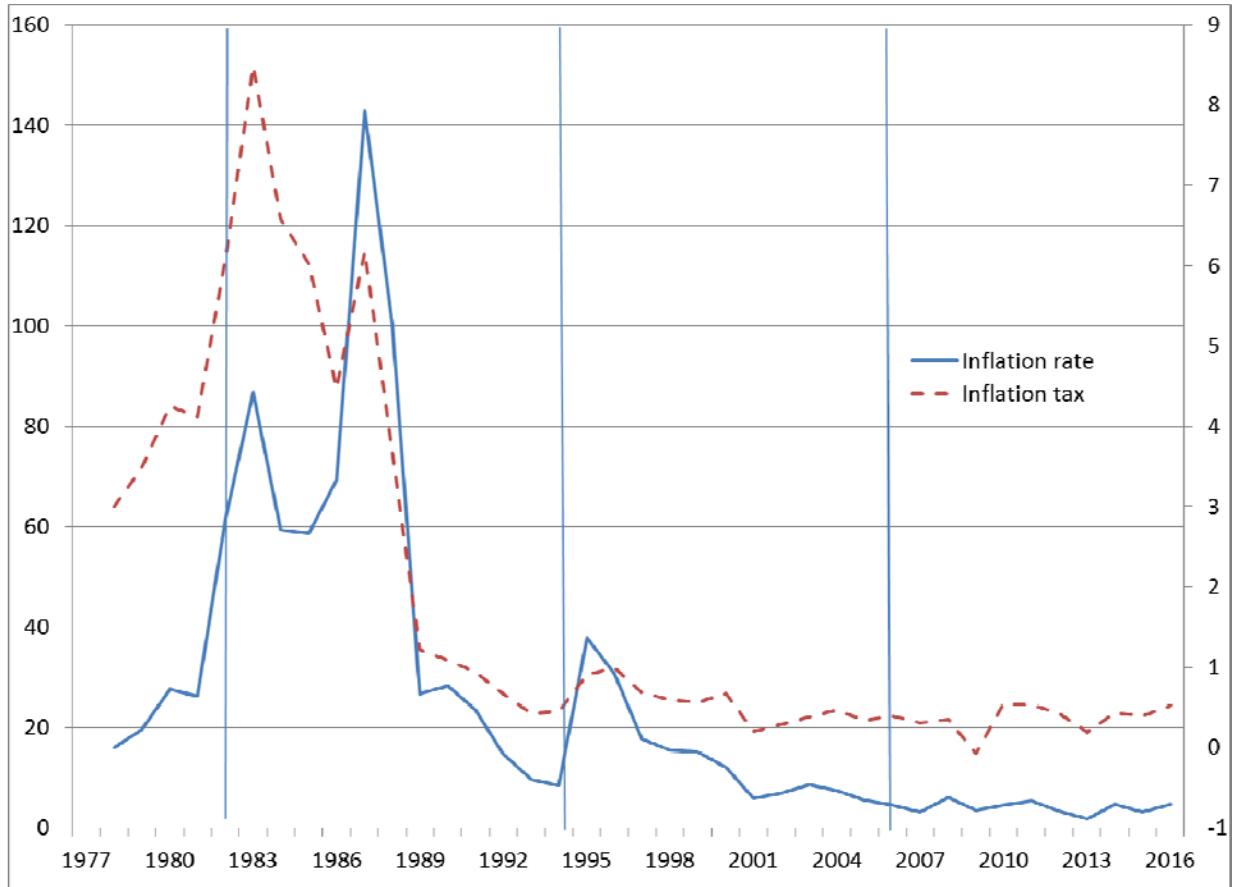
Figure 3b. Decomposition of Foreign Debt-to-GDP Ratio Keeping Real Exchange Rate Fixed, 1981=1

### The Monetary Side: Inflation and Inflation Tax

Another aspect I want to analyze of this period is the monetary side. The consequences of the Debt Crisis parallel the predictions of the model regarding seigniorage. The model predicts that when the government cannot issue debt, then it has to resort to inflation. This is what I observe in the data. In Figure 4 I plot the inflation rate and the inflation tax.

There is a large increase in inflation and in the inflation tax between 1981 and 1983. Inflation went from 26.3% to 86.6%. The inflation tax as a percentage of GDP went

from 4.1 to 8.5. Consistently with these findings, Aspe Armella (1993) reports an increase in the inflation tax in the beginning of the 1980s. Figure 4 shows a strong correlation between inflation and the inflation tax between 1977 and 2000. It is interesting to note that after 2000 both series become very stable, take low values, and show a smaller correlation.



Source: Author's calculations with data from Banco de México and INEGI.

Figure 4. Inflation Rate in % (left axis), and Inflation Tax as % of GDP (right axis)

### The Role of Exogenous Shocks: Oil Price and United States Interest Rates

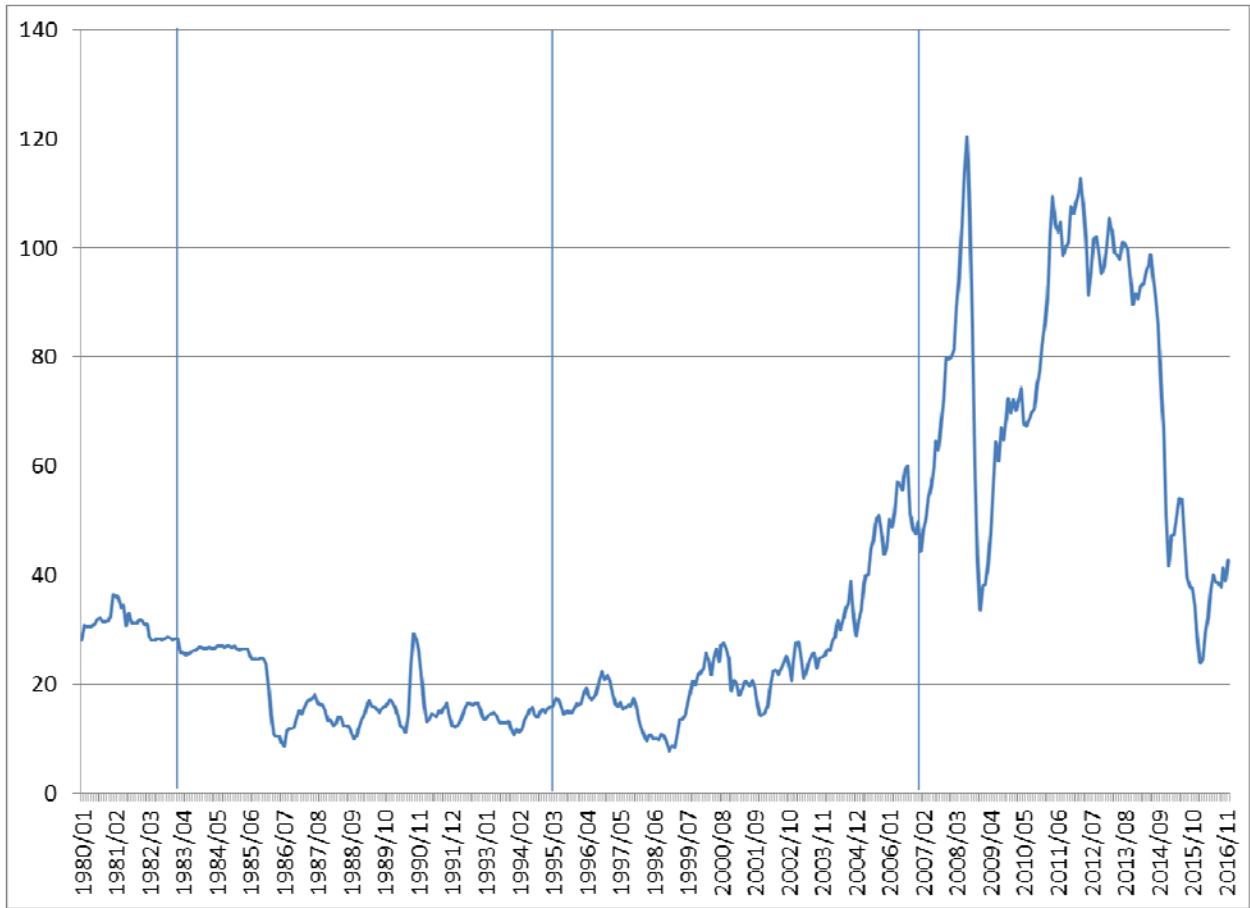
Here I consider additional forces that may have contributed to the origin of the 1982 Crisis. Two obvious candidates are the international price of oil, and the interest rates in the U.S. A lower oil price increases the primary deficit. A higher opportunity cost of lending to Mexico exposes Mexico to higher interest rates on foreign debt.

There was indeed a large fall in the international price of oil that Mexico produces, the *Mezcla Mexicana*, as reported in Figure 5.<sup>6</sup> Focusing on the period 1980-1982, there were large falls in the price between 1981 and 1982. The percentage yearly change in January 1982 was -14%, followed by -15% in February. Such a fall must have put pressure on public finances. At the same time, it is important to say that with this graph I cannot measure the contribution of the oil price shock to the origin of the 1982 Crisis. I can say that it was a contributing factor.

I can make additional important points by looking at the price of oil in real terms. Using the model as a guide, the price of oil that appears in the budget constraint is the *real* price. By real I mean the international price in dollars multiplied by the exchange rate, then divided by the Mexican price index. This real, or relative price, depends on the three underlying variables. Between 1980 and 1981 this price falls by 10% approximately. Therefore the Mexican government had fewer real resources to spend abroad and domestically. Between 1981 and 1982 this price increases. It does so because even though the dollar price is falling, the exchange rate had a very large devaluation in 1982, and the domestic price level did not increase as rapidly. The punch line of this discussion would be the following. The fall in the international price of oil in 1982 reduced the income in dollars of the Mexican government, therefore reducing its ability to repay foreign debt. At the same time, given that the peso lost so much value, oil revenue in pesos went up and therefore this represented an extra source of revenue to spend in domestic goods.

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<sup>6</sup> I show the entire sample available electronically at the INEGI website.

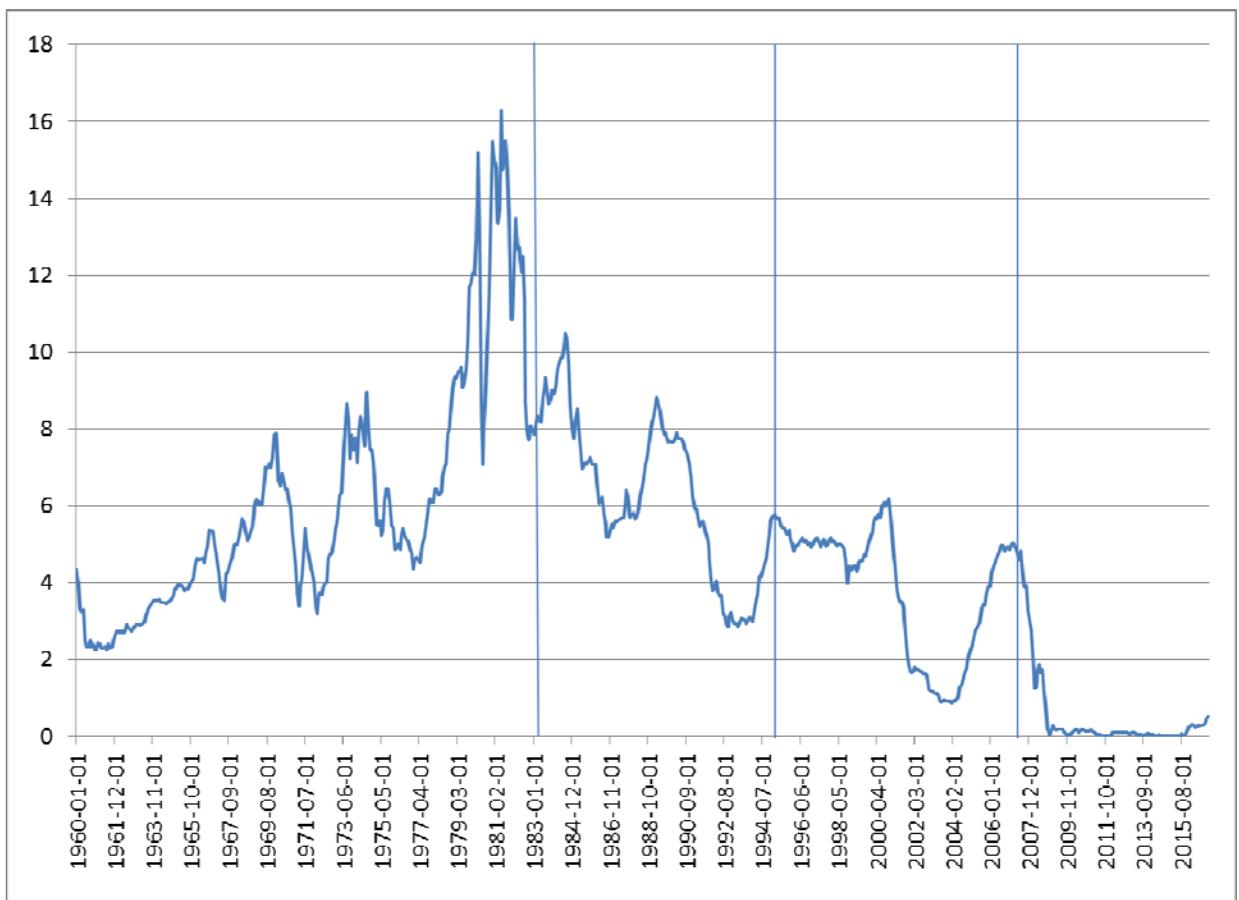


Source: INEGI.

Figure 5. Mexican Oil Price, in Dollars, Monthly Data

In the case of U.S. interest rates, they took historically large values, and were very volatile, between 1978 and 1982. Figure 6 reports the interest rate for 3-month Treasury Bills. Focusing on 1960-1982 I can clearly see high and volatile rates as Paul Volcker, Chairman of the Board of Governors of the Federal Reserve of the U.S., implemented tighter monetary policy to reduce inflation. Volcker focused on targeting the growth of reserves. There is an issue about timing, as the large increase in interest rates took place before 1982. The largest absolute yearly increase in interest rates took place between June 1980 and June 1981, when the rate went from 7.1 to 14.7 percent. Having made that point, it is plausible that the large increase in interest rates, especially during 1981, increased the cost of external funding for Mexico. It is important to say that with this graph I cannot measure the contribution of international interest rates to the origin of the 1982 Crisis. I can say that they were likely a contributing factor.

To make this point slightly more precise I did a back-of-the-envelope calculation of the real interest rate in the U.S. I took the time series above and subtracted yearly inflation. I did this in two ways: First, with inflation in the previous 12 months, and alternatively with inflation 12 months ahead. The message is the same: Real interest rates in the U.S. jumped from values around zero in 1980 to very high values between 1981 and 1986. The average value was, using both measurements, 4 percent. The values in this sample are the highest between 1960 and 2016. This increase in the real opportunity cost of investing in Mexico must have certainly put pressure on the ability to repay and roll over foreign debt.<sup>7</sup>



Source: FRED, Federal Reserve Bank of St. Louis.

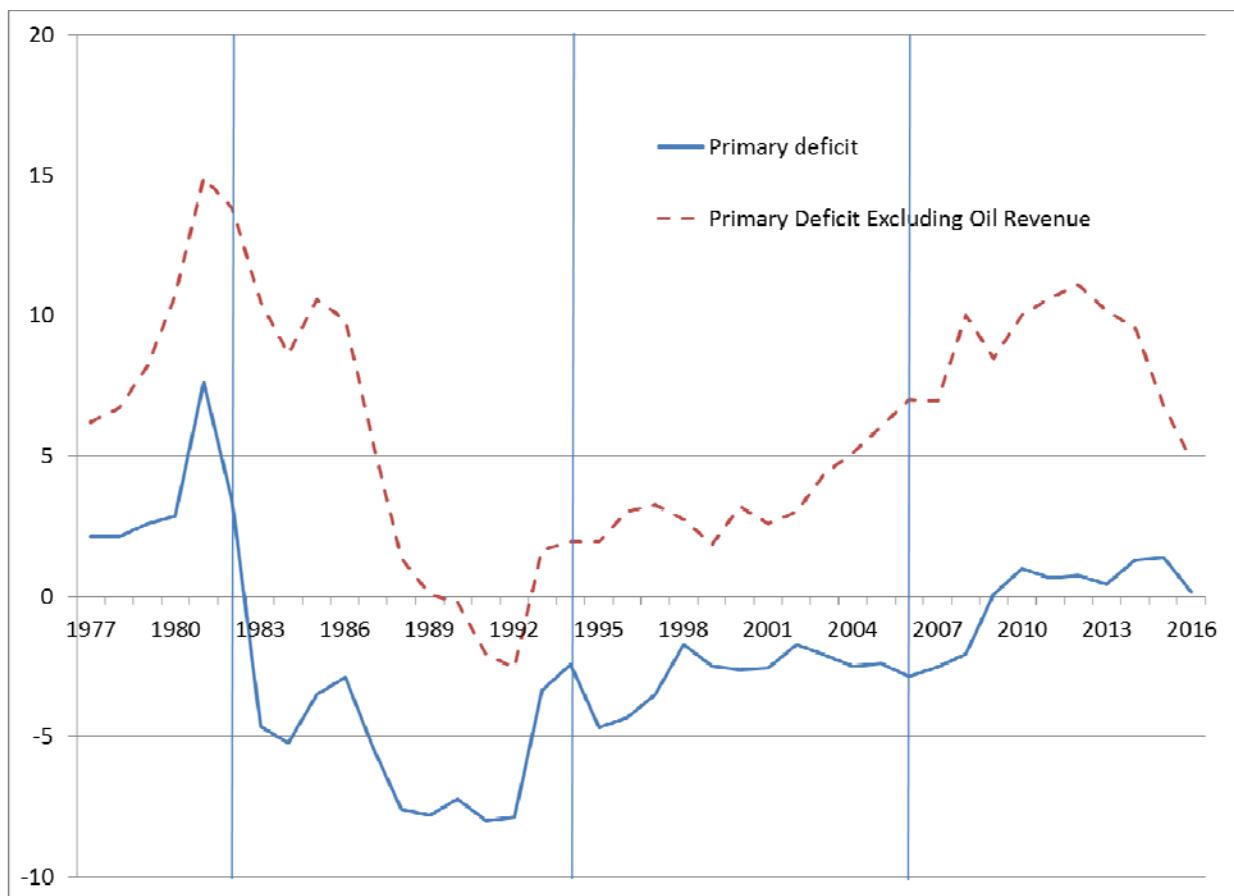
Figure 6. 3-Month Treasury Bill, Secondary Market Rate, in %, Monthly Data

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<sup>7</sup> Notice that this rough calculation is not an exact match to the real interest rate that would appear in the budget constraint. Having said that, given the sharp increase in the nominal interest rate I would expect the real interest rate to increase post 1980.

### The Important Role of Oil Revenue

It is well-known that oil revenue is very important for Mexican public finances. I illustrate that fact. Figure 7 shows the previous measure of primary deficit. It compares it to the same variable, excluding oil revenue. Clearly oil revenue is a large contributor to having lower deficits, and achieving surpluses. Focusing on the 1977-1982 period, the deficit would have been a lot higher without the revenue coming from oil sales. In fact, the deficit excluding oil revenue reached its highest value in that period, and in the entire sample 1977-2016, in 1981, attaining a value of 15% of GDP.



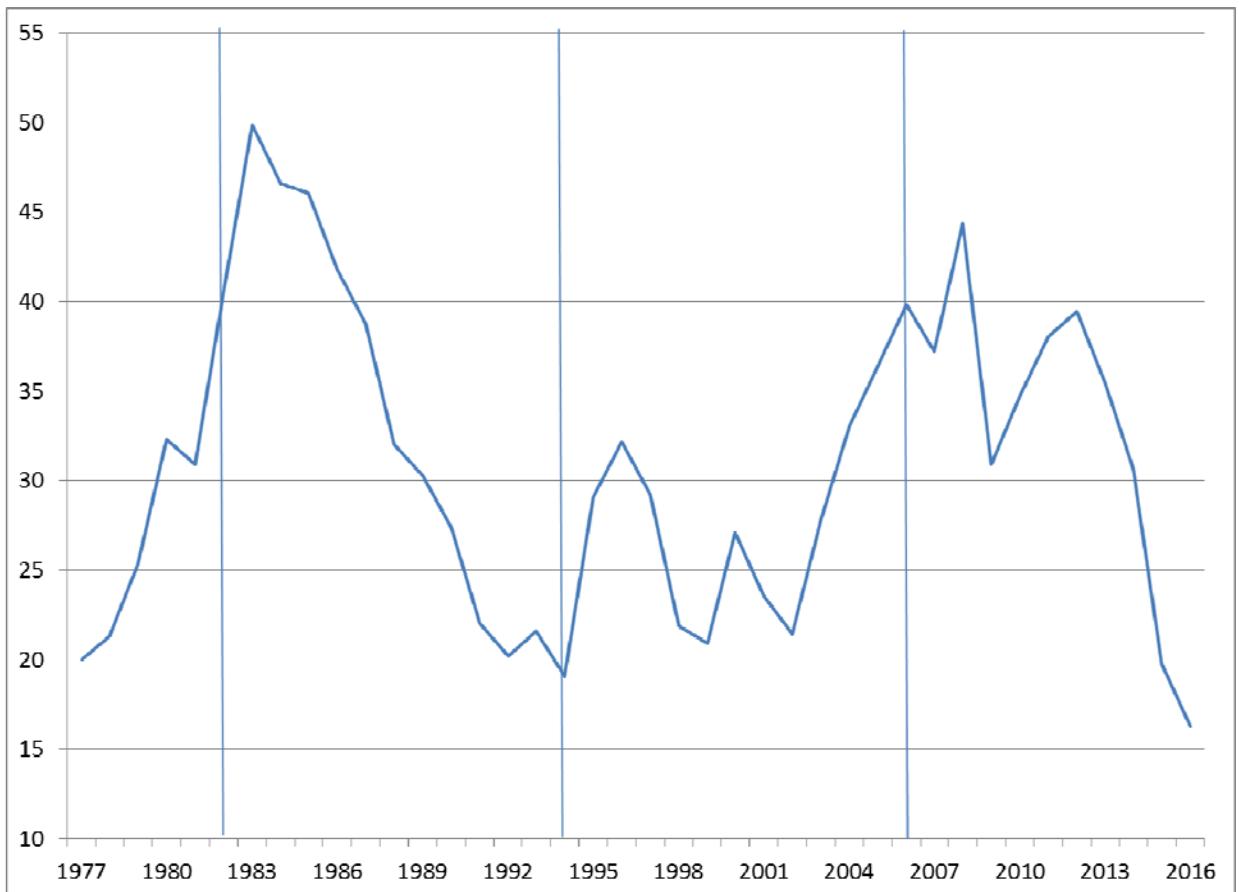
Source: Author's calculations with data from Banco de México and INEGI.

Figure 7. Primary Deficit, and Primary Deficit Excluding Oil Revenue, % of GDP

A complementary way to show the important role of oil revenue is to measure it with respect to total revenue. Banco de México reports the series *Ingresos Presupuestales del Sector Público*, or Budgetary Revenue of the Public Sector (BRPS).<sup>8</sup> This variable is the

<sup>8</sup> To see the precise composition of this variable, see:

sum of Oil Revenue and Non-Oil Revenue. The latter is in turn the sum of tax collection by the Federal Government, non-tax income from the Federal Government, and Revenue from Other Institutions and Firms under government control. In Figure 8 I plot the ratio of Oil Revenue to BRPS.



Source: Author's calculations with data from Banco de México and INEGI.

Figure 8. Oil Revenue, % of Budgetary Revenue of the Public Sector

Focusing on 1977-1982, the ratio shows a large increase. This is the result of a combination of higher oil revenue, and a fall in other sources of revenue. It may be surprising that oil revenue increases as the price of oil falls, which was shown in Figure 5. Even though I do not present an algebraic decomposition of changes in oil revenue, a simple reason why it increased in this period is the peso devaluation. Even if oil loses value in international markets, the devaluation of the peso may be larger, therefore

increasing the ratio of oil revenue relative to other sources of income. Another point that I make is that in the entire sample 1977-2016 the average value of this ratio is 31%, which reflects the importance of oil for Mexico's public finances. This series is very volatile, and is correlated with changes in the trend of the international price of oil.

#### 4. 1983-1994: Economic Reforms Post 1982. The 1994 Crisis

Part of the response of the government to the 1982 Debt Crisis was a sequence of primary surpluses. The presidential term of Miguel de la Madrid started in late 1982, and ended in 1988. Figure 2 shows that the government responded with a primary surplus of 4.6% of GDP in 1983, and an even larger one the following year. In fact Mexico had primary surpluses throughout the entire period under analysis, 1983-1994.

Another crucial part of the response was the control of inflation, although this goal was difficult to accomplish. Figure 4 shows a high and volatile inflation rate during 1983-1988. The inflation rate in 1987 was 142.8%. Figures 3 and 4 show that the spikes in inflation are correlated with devaluations of the peso in 1986 and 1987. Indeed, exchange rate pass-through was large in those years.

Figure 2 also shows downward trends in the foreign and domestic debt ratios, as well as a fall in seigniorage, although in the case of foreign debt the reduction is interrupted by devaluations of the peso. The reduction in debt ratios is consistent with the sequence of primary surpluses. This is a basic lesson of the model of Sargent and Wallace (1981). A government can reduce the debt ratio by reducing the primary deficit, to the point of having surpluses. Simultaneously, the figure shows that the government reduced its use of seigniorage. The fall in seigniorage, which went from 9% of GDP in 1982 to 1.5% by 1988, is consistent with the goal of reducing inflation. This is also a basic lesson of the model of Sargent and Wallace (1981), and of other monetary models. A government can obtain revenue through seigniorage, but at the same time inflation will increase.

A distinguishing feature of economic policy in the 1980s in Mexico is the use of *Pactos*, literally pacts, or agreements between the government and different economic agents. In December 1987 the government of de la Madrid created the *Pacto de Solidaridad Económica*, which had the goal of reducing inflation. The government insisted on

consensus-building (*concertación*) to achieve it. The government committed to a reduction in spending and a reduction in the number of government-owned firms (the *empresas paraestatales*). Workers committed to reducing wage increases in negotiations with business owners, and businessmen committed to reducing price increases and increase productivity. This *Pacto* had limited success, as inflation was 100% in 1988.

Fiscal stability and the control of inflation were goals of the 1988-1994 administration of Carlos Salinas. Figure 2 shows that the sequence of primary surpluses continued until 1994, as mentioned previously. The data used in the figure include revenue from privatizations of the national telephone company, TELMEX, and of the banks that had been nationalized in 1982. Additionally, there was progress in the control of inflation. Figure 4 shows a large fall in inflation in 1989 to 26.8%, and a value of 8.47% in 1994. The previously mentioned trends in debt ratios and seigniorage are even clearer in these years. Figure 2 shows the debt ratios falling almost continuously. It also shows seigniorage taking values under 1% of GDP during the early 1990s.

The Salinas government also used *Pactos*. In December 1988 it created the *Pacto para la Estabilidad y el Crecimiento Económico*. The goal was to achieve one-digit inflation. This pact was again an agreement between the government, workers and businessmen. There was a large fall in inflation, to a level of 26.8%, in 1989, as mentioned earlier.

The Salinas administration has two other important features. The first one was a continuation of the process of opening the economy to the rest of the world (the *Apertura*). In 1986 Mexico joined the General Agreement on Trade and Tariffs. It was under President Salinas that Mexico signed the North American Trade Agreement (NAFTA) with the United States and Canada, and which came into effect in January 1994. The second was to regain access to international financial markets, which Mexico had lost after defaulting on its debt in 1982. As mentioned in Kehoe and Meza (2011), the renegotiation of Mexican debt started in 1989. Negotiations with Mexico's creditors were successful. In 1989 the United States announced the Brady plan that allowed Mexico and other countries to return to international financial markets.

In the subsections that follow I want to focus on two important events that took place towards the end of the period under analysis: The independence of the Banco de México, and the 1994 Crisis. So far I have discussed the main trends in economic policy during 1983-1994. I now go into some detail regarding those events.

#### 4.1 Independence of the Banco de México

I discuss a change in the law that made the Banco de México independent from the fiscal branch of the government. This change was part of the reforms that took place in the presidential term of Carlos Salinas. One important question that arises is, of course, was such independence credible? In my view the answer is clearly yes, given monetary and fiscal policies undertaken in the aftermath of the 1994 Crisis. After 1995 fell persistently in the entire sample up to 2016.

I have previously described possible arrangements between the government and the central bank in the language of Sargent and Wallace (1981): Fiscal dominance or monetary dominance. I previously mentioned that in Mexico such relation was one of fiscal dominance in the decades before the term of Carlos Salinas.

In 1993 a constitutional reform specified the main task of the Banco de México and granted its independence from the government. Article 28 of the Constitution now included the protection of the purchasing power of the peso as its main task. This article also states that no authority can force the Banco de México to provide financing (in Spanish the phrase is *conceder financiamiento*).

In 1993 the Banco de México Law was signed, specifying the rules under which it would be related to the government.<sup>9</sup> In particular, it specifies rules under which the central bank can give credit to the fiscal branch of the government.

The new independence of the central bank would be tested shortly after 1993. At the end of 1994 Mexico suffered a crisis. The monetary response had to be consistent with

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<sup>9</sup> In Spanish, the law is the *Ley del Banco de México*. It can be downloaded from <http://www.banxico.org.mx/disposiciones/marco-juridico/ley-del-banco-de-mexico/ley-del-banco-mexico.html>.

the goal of reducing inflation. I now describe and analyze the events related to this crisis.

#### 4.2 The 1994 Crisis

During 1994, several political and economic negative events took place, in the months before the devaluation of the peso in December. This was the last year of the Salinas term. In January 1994 the Zapatista movement rose in southern Mexico. In March 1994 the ruling party's, the PRI (*Partido Revolucionario Institucional*, which had been in power since the late 1920s), presidential candidate Luis Donald Colosio was murdered. Large capital outflows took place. These flows put pressure on the exchange rate regime, which consisted of a pre-determined band inside which the peso was allowed to fluctuate.

During 1994 the government issued a growing amount of short-term debt with nominal value denominated in dollars and payable in pesos, the Tesobono debt. It became the largest source of short-term borrowing for the Federal Government, surpassing the amount of short term peso debt in circulation, the CETEs debt.

Towards the last quarter of 1994 the political situation worsened. The Secretary General of the ruling party José Francisco Ruiz Massieu was murdered in September. Capital outflows continued during the rest of the year.

These events preceded the collapse of the exchange rate regime and a large contraction in economic activity. In late December 1994 the government abandoned the exchange rate regime. The peso devalued considerably. In early January 1995 the government was unable to roll over the Tesobono debt. During 1995 the economy suffered its worst yearly contraction since the 1930s. Between 1994 and 1995 GDP and private consumption per working age person fell roughly 9% and 10% respectively.

#### **Analyzing the 1994 Crisis Through the Lens of the Model**

The question I will work on is whether the model of Sargent and Wallace (1981) can help us understand the origin of the 1994 Crisis. That model has been the theoretical framework throughout the paper.

One difficulty the model faces immediately when used to account for the 1994 Crisis is that there was a primary surplus before this event happened. This can be seen in Figure 2. The surplus was approximately 2.4% of GDP. The model cannot generate a growing path of debt unless there is a need for borrowing. Therefore there cannot be a crisis.

Another clear problem the model faces is that the paths of debt were not growing before 1994. Figure 2 shows that ratio of foreign debt increased in 1994. Part of that increase has a simple explanation mentioned earlier: The effect of the peso losing value. The peso lost approximately 30% between December of 1993 and December of 1994. However, the ratios of both kinds of debt were below historical maxima. In fact, both ratios had fallen continuously since 1986 and up to 1993. Obviously the path of debt was not explosive.

### **Previous Studies of the 1994 Crisis**

The 1994 Crisis led to a large amount of research on its origin. Table 2 summarizes some of the papers written in relation to this crisis. The list is not by any means exhaustive. I focused mainly on papers written by top-level ex policy makers. This is the case of the papers by Gil-Díaz and Carstens (1996), Gil-Díaz (1998), and Serra Puche (2011). Francisco Gil-Díaz and Agustín Carstens worked at the Banco de México. Gil-Díaz was *Subgobernador* of Banco de México between 1994-1997, and Secretary of the Treasury during 2000-2006. Carstens was Secretary of the Treasury during 2006-2009, and Governor of the Banco de México during 2010-2017. Jaime Serra was Secretary of Trade during the Salinas administration and was the leading negotiator of NAFTA. He was Secretary of the Treasury at the beginning of the 1994-2000 administration of President Ernesto Zedillo. I add to this list one of the first papers evaluating the origin of the Crisis, Kehoe (1995). I also include the analysis of Cárdenas (2015). Enrique Cárdenas is Mexico's most well-known contemporary economic historian.

To summarize the information, in Table 2 the rows represent factors explaining the 1994 Crisis. I marked with symbol \*\*\* the factors for which there is consensus in the sense that all authors mention the factor as key.

A first result is that there is consensus that two factors were key: 1. The exchange rate regime, and 2. The political shocks.

	Kehoe (1995)	Gil-Díaz and Carstens (1996)	Gil-Díaz (1998)	Serra Puche (2011)	Cárdenas (2015)
Exchange rate regime***	Was a factor	Was a factor	Was a factor	Was a factor	Was a factor
Debt, short term/indexed to Exchange rate (Tesobonos)	Was a factor	Not a factor	Was a factor	Was a factor	Was a factor
Political shocks***	Was a factor	Was a factor	Was a factor	Was a factor	Was a factor
Banking and financial liberalization, and expectations of good performance	Not mentioned	Was a factor	Was a factor	Was a factor	Was a factor
High U.S. interest rates	Was a factor	Not mentioned	Was a factor	Was a factor	Not mentioned
Reluctance to respond to crisis	Was a factor	Not mentioned	Not mentioned	Was a factor	Was a factor

Note: The symbol \*\*\* means consensus across papers that the factor was key.

Source: Papers cited.

Table 2. Papers on Origin of 1994 Crisis, Main Factors

Even though there is consensus that the exchange rate regime was key, the reasons behind its importance vary across authors. As mentioned earlier, the exchange rate regime was a pre-determined band in which the peso per dollar exchange rate was

allowed to fluctuate. The upper bound of the band grew at a known rate. Kehoe (1995), Serra Puche (2011) and Cárdenas (2015) argue that policy makers put a lot of weight on using the exchange rate as a nominal anchor to reduce inflation. A devaluation of the peso, say in mid-1994, would have caused not only higher inflation but also a loss of credibility. Therefore, policy makers were reluctant to devalue the peso in the months after the murder of Luis Donaldo Colosio. Gil-Díaz and Carstens (1996) put emphasis on the fact that there had been a transformation of international financial markets since the beginning of the 1990s, as capital flows grew and moved rapidly in and out of markets. This transformation made economies more vulnerable to changes in international portfolios. Additionally, they mention that even developed countries were not exempt from speculative attacks on currencies, as shown by the 1992 events in Europe in which many countries had to devalue.

There is also consensus that political shocks were crucial. The most important one was the murder of presidential candidate Luis Donaldo Colosio. Figure 9 below shows the path of international reserves of the central bank during 1994. At the beginning of 1994 Banco de México had a historically large amount of reserves, above 25 billion dollars. Today it does not sound like a large quantity, but it was back then. After the murder of Colosio in late March reserves fell dramatically down to approximately 17 billion dollars in April. Then reserves stabilized throughout most of the year. Below I describe changes in the composition of public debt throughout 1994 that likely contributed to the origin of the crisis in late December. In those final months of financial turbulence, political events may have also had an impact. Gil-Díaz and Carstens (1996) mention reports on renewed activity by the Zapatista movement in early December, that were later found to be exaggerated, having a negative effect on the peso.

Let me discuss briefly the contribution of other factors to the 1994 Crisis.

Figure 9 below shows the growth in a particular kind of debt, the Tesobonos, which as mentioned earlier had a face value in dollars but were payable in pesos according to the current exchange rate. Kehoe (1995), Serra Puche (2011), and Cárdenas (2015) stress that this growth made the economy more vulnerable. Investors realized that a devaluation of the peso would instantly multiply the burden of this kind of debt, assuming the government paid. Another possibility was some kind of default, as Kehoe

(1995) and Serra Puche (2011) mention. From my point of view, the benefit of issuing Tesobonos was to offer investors an asset protected against devaluations, thus guaranteeing the flow of funds to the government. The cost was precisely that in the event of devaluation, investors would worry about payment, thus exchanging pesos for dollars and reallocating funds abroad. Gil-Díaz (1998) points to the issuance of Tesobonos as one source of the growth in the indebtedness of the Mexican economy during 1994 that contributed to the Crisis.

Serra Puche (2011) includes an atmosphere of financial euphoria, a disconnect between expectations and the state of the economy, as a contributor to this crisis. Gil-Díaz (1998) and Cárdenas (2015) emphasize the banking and financial liberalization of the early 1990s in Mexico as a crucial factor generating the 1994 events. They both argue that the privatization of banks starting in 1991 was flawed. The opening of the economy to trade in goods and assets created a large inflow of foreign capital that was channeled through the banking sector to households and firms. The growth in lending was massive, with the bank credit to GDP ratio reaching levels not seen since the 1970s. Kehoe and Meza (2011) report that ratio. Regulators could not keep up with the growth in loans and were unable to monitor the risk features of the loan portfolios. Notice that there was a currency mismatch, as Mexican banks had liabilities in dollars and assets in pesos. This made banks very vulnerable to a devaluation.

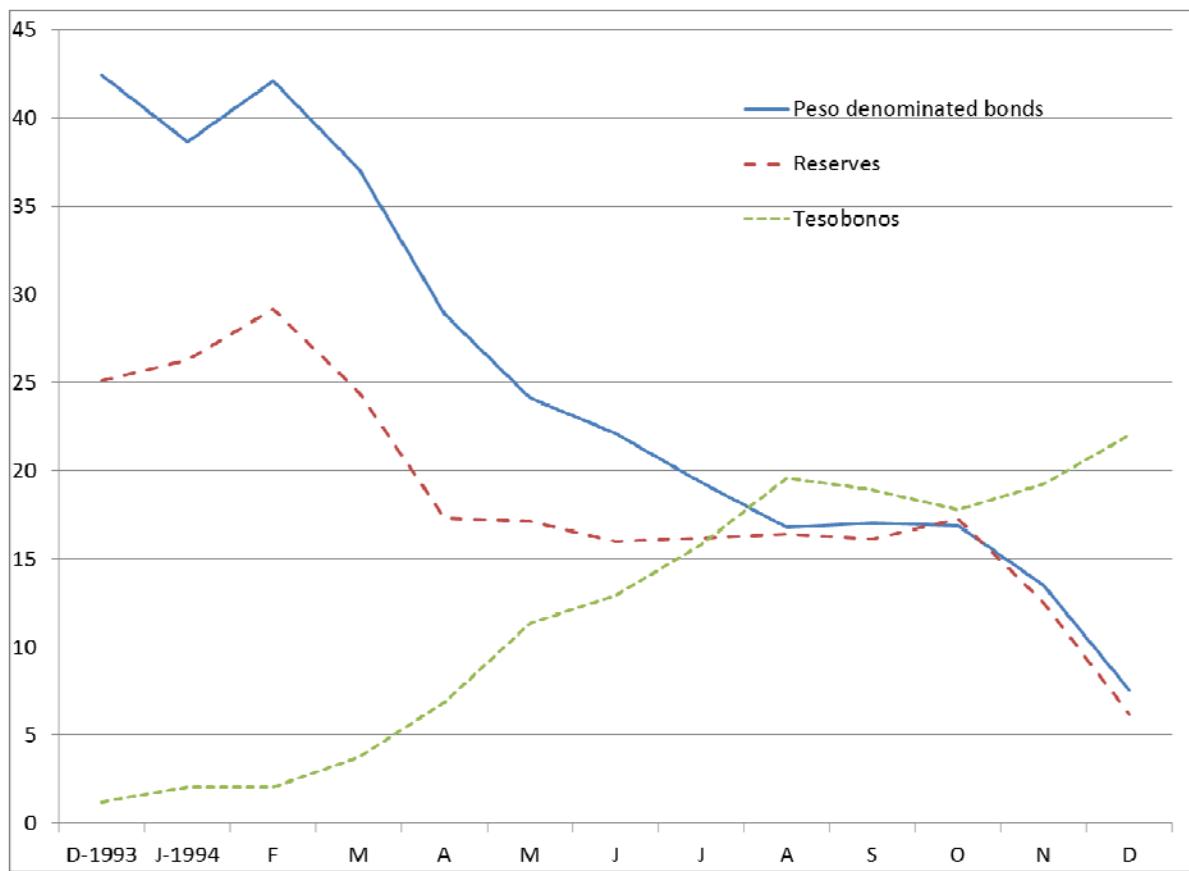
Kehoe (1995), Gil-Díaz (1998) and Serra Puche (2011) point to a simple, but in my opinion, powerful force that contributed to the Crisis: The increase in interest rates in the U.S. during 1994. Figure 11 below shows the absolute change in the U.S. 3-month T-bill rate, comparing the value in each month of 1994 with the same month in 1993. The change is positive and increasing. This means that during 1993 the interest rate was basically flat, and that it grew almost continuously during 1994. The interest rate in December 1994 was 250 basis points above its December 1993 level. The increment is large. Obviously the fact that interest rates increase in the U.S. represents a larger opportunity cost of investing in Mexico. The opportunity cost became higher during 1994, putting pressure on the peso.

The final factor was reluctance to respond to the ongoing worsening of the financial situation. Kehoe (1995), Serra Puche (2011) and Cárdenas (2015) argue that the

exchange rate regime could have been adjusted at a time when the Banco de México had a relatively large amount of reserves. This hypothetical adjustment would have taken place in the months that followed the death of Luis Donald Colosio. As mentioned earlier, reserves had stabilized by April 1994. In fact this point is closely related to the previous discussion on the contribution of the fixed exchange rate regime. The government had as one of its most important goals the reduction of inflation. The Salinas administration had been successful achieving an inflation of 10% per year roughly at the beginning of 1994. The government had set the goal of low inflation as part of the *Pactos* mentioned before. It would have lost credibility facing powerful union and business leaders. Therefore the government did not devalue in mid-1994 because the subsequent inflation would have undermined its bargaining power, and the goal of controlling inflation would have been postponed.

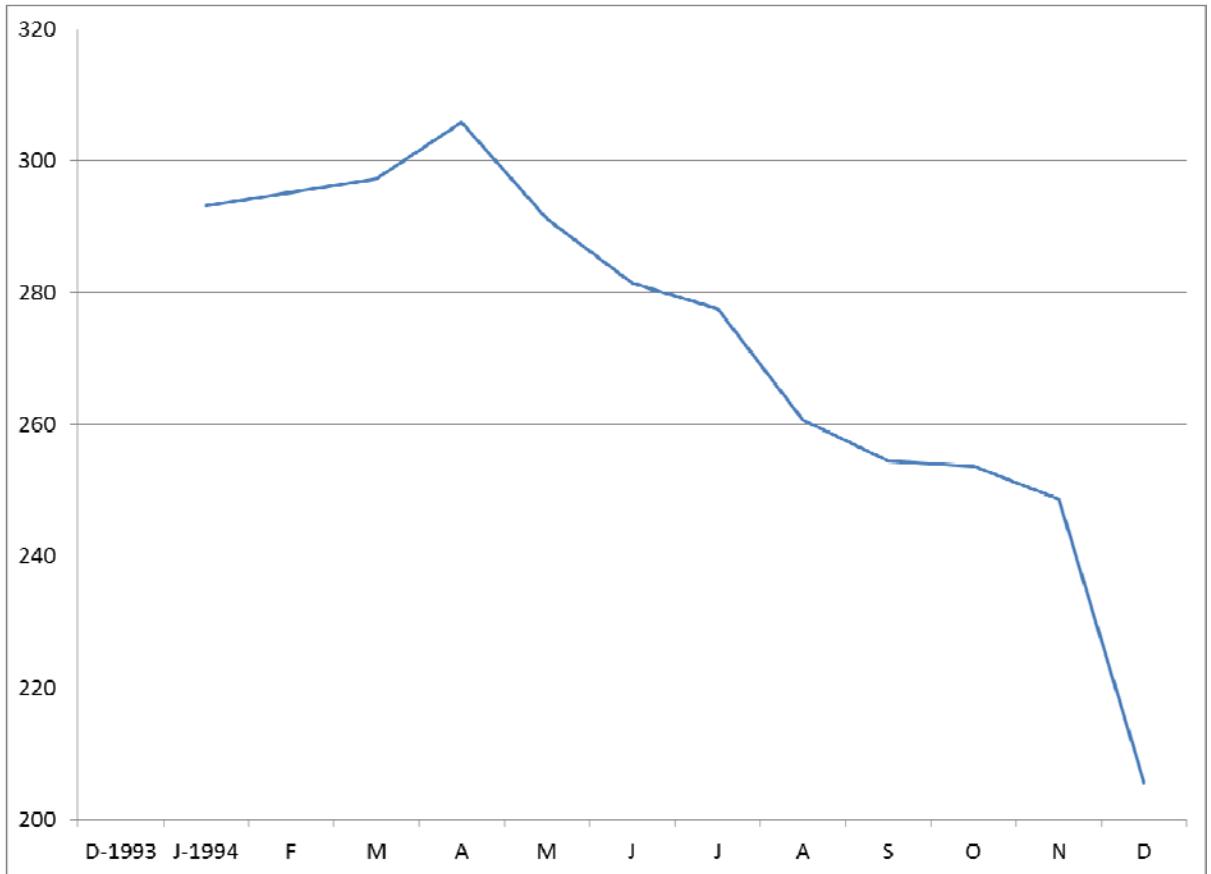
### **A Theory: Shorter Maturity of Debt and the Self-Fulfilling Crisis Model of Cole and Kehoe (1994)**

Given that the workhorse model cannot account for the Crisis, I discuss one alternative hypothesis: The characteristics of the Tesobono debt. This debt grew rapidly during 1994, having two consequences, as Cole and Kehoe (1996) point out. First, it increased the ratio of dollar-indexed debt to international reserves. Second, it reduced the average maturity of government debt. The first point can be seen in Figure 9, which I took from Cole and Kehoe (1996). By August 1994 the Tesobono debt was larger than international reserves: 20 billion dollars versus 16 billion, respectively. The figure also shows how the Mexican government carried out a substitution of peso-denominated debt (CETEs, Bondes and Ajustabonos) to dollar-indexed Tesobonos. The second point appears in Figure 10, also taken from Cole and Kehoe (1996). Through 1994 there is a large decline in the average maturity of Mexican government bonds from approximately 300 days in January 1994 to 200 days in December of that year. Therefore the need to go to the market to sell new debt became more frequent. Cole and Kehoe (1996) also report the yield of Tesobonos during December 1994 and January 1995. There is a large increase from 8.39% on December 6, 1994 to 24.98% on January 31, 1995. The interpretation is that there was an increase in the probability of default perceived by investors.



Source: Constructed with data in Cole and Kehoe (1996).

Figure 9. International Reserves and Government Bonds, in Billions of U.S. Dollars



Source: Constructed with data from Cole and Kehoe (1996).

Figure 10. Average Maturity of Government Bonds, in Days

What can economic theory say about the Crisis of 1994? I have discussed that the Sargent and Wallace (1991) model cannot help us explain this crisis. I consider another model. Cole and Kehoe (1994) construct a model of self-fulfilling crises. This is a quantitative model designed to produce predictions that can be compared directly to data. An outcome of the model is a crisis zone for values of government debt that depends on the maturity of debt. A shorter maturity implies the crisis zone is larger, including low levels of debt. If the level of debt is in that interval, the government finds optimal to repay if it can sell new debt. If the government cannot sell new debt it is optimal not to repay. If the debt level is in the interval, a crisis may occur or not, depending on the realization of a random variable, called a sunspot.

The interpretation of the facts at the end of 1994, seen through the lens of the model, is the following. Mexico had a low level of debt. At the same time, it had reduced its maturity. This reduction may have increased the zone for values of the debt in which a

self-fulfilling crisis could take place. The work of Cole and Kehoe (1991) shows that Mexico was in the crisis zone in 1994.

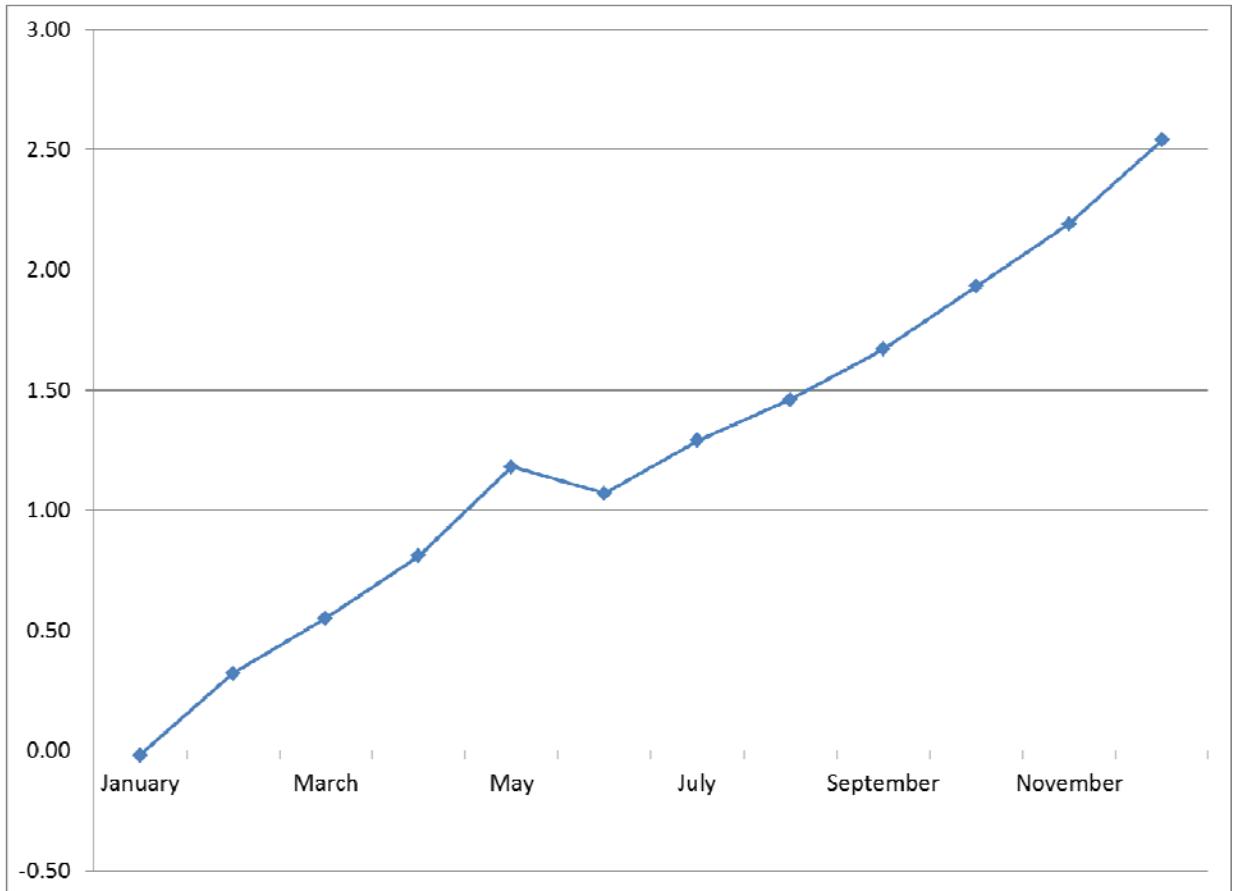
However, that does not imply that a crisis had to occur necessarily. In the model the fact that default takes place depends also on the realization of a random variable, which is not directly observable in the real world. We have a theory that helps us analyze the effects of a fundamental, the shorter maturity of Mexican debt during 1994, but it does not go as far as determining why the 1994 Crisis took place.

Towards the end of December 1994 Mexico abandoned its exchange-rate regime and let the peso float. The financial situation of the government was dire. At the same time, it is important to say that the Mexican government did not default. A factor in how events developed during 1995 was the financial aid program led by the United States.

### **The Role of the Price of Oil and International Interest Rates**

During 1994 there were some sizable fluctuations in the price of oil. However, during most of the year and especially since June 1994 there were large increases in the price. Figure 5 shown earlier shows its evolution. The largest yearly fall, of 21%, takes place in February. By May the yearly change in price is approximately zero. Starting in June there are yearly increases, the largest one of 39.2% in December. The conclusion is that changes in the price of oil were not likely a negative factor contributing to the Crisis.

In the case of international interest rates 1994 was a year of increases. Figure 6 shows that the U.S. T-Bill rate was going up throughout the year. One rather amazing fact is that the yearly absolute changes in interest rates were *growing* during the year. Figure 11 displays this fact. This continuous increase would have put pressure on public finances, as the international risk-free rate was increasing constantly.



Source: FRED, Federal Reserve Bank of St. Louis.

Figure 11. Absolute Yearly Change in 3-Month Treasury Bill Secondary Market Rate  
in 1994

### The Role of Oil Revenue

I now take a look at the role of oil revenue during 1994. I have discussed previously that oil revenue was very important for public finances. I have also just reported that there were increases in the price of oil starting in mid-1994. Figure 8 showed earlier the behavior of oil revenue, as a percentage of the budgetary revenue of the Public Sector. In the period 1983-1994 there is an almost continuous fall in this fraction. This means that the Public Sector was less dependent on this source of revenue. Another interpretation is that the Public Sector was less exposed to changes in the international price of oil. The fall in the share of oil revenue stabilizes between 1992 and 1994. I do not consider that public finances were affected by shocks to the size of oil revenue, and therefore it was not a factor explaining the Crisis.

### **Monetary and Fiscal Response to the Crisis**

A crucial question at this point is whether Mexico went in practice from fiscal dominance to monetary dominance. Central bank independence had become part of the Constitution in 1993. But what happened *de facto*? Fiscal and monetary policies were procyclical. The interpretation is that Mexico does have an independent central bank since 1993. The constitutional mandate of fighting inflation was the priority of the Banco de México during 1995. The fiscal branch of the government had to adjust public finances.

Fiscal policies undertaken in 1995 were procyclical. The primary surplus increased from 2.4% of GDP in 1994 to 4.7% in 1995, as Figure 2 shows. Additionally, the value added tax was raised from 10 to 15% in early 1995. There was an increase in prices controlled by the government, mainly energy prices. Real government consumption per working age person fell 3.9 percent.<sup>10</sup>

Monetary policy focused on reducing inflation. According to Ramos-Francia and Torres García (2005), who provide details on the implementation of that goal, the objective of the central bank was to reduce inflationary pressures and to prevent a situation of fiscal dominance.

I want to highlight that having an independent central bank is one of the major institutional changes that Mexican policy makers have implemented. The devaluation of the peso at the end of 1994 and the beginning of 1995 slowed down convergence to low inflation. Nevertheless, one of the main points of this text is that changes in the early 1990s, specifically the constitutional change of 1993, led Mexico from fiscal dominance and high inflation in the 1980s to central bank independence and eventually historically low levels of inflation in 2016.

In the next section I talk about the evolution of macroeconomic policy after 1994. I describe the behavior of fiscal variables. I also focus on how monetary policy changed towards the current scheme of inflation targeting, and on how inflation evolved over time.

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<sup>10</sup> The contribution to the fall in GDP of some of these changes in policy is quantified in Meza (2008).

## 5. 1995-2006: Recovery and the Evolution of Fiscal Variables, Monetary Policy and Inflation

The main goal of the post 1994 policy makers was macroeconomic stability. This was the case of the administrations of Presidents Ernesto Zedillo (1994-2000) and Vicente Fox (2000-2006). It is important that the goal of stability was a constant throughout two presidential terms, with presidents who came from different parties, the PRI and the PAN (*Partido Acción Nacional*, the right-wing party). President Zedillo was elected in 1994. President Vicente Fox from PAN was the first opposition winner of a presidential election. In this section I describe how fiscal and monetary policy and inflation behaved in this period.

On the fiscal side, I highlight two facts: A persistent primary surplus, and a substitution from foreign to domestic debt. Figure 2 shows that Mexico had primary surpluses from 1995 to 2006. It also shows that starting in 1995 the ratio of foreign debt fell while the ratio of domestic debt increased. In 2000 the ratio of domestic debt surpassed the one of foreign debt for the first time since the 1970s.

An important force behind the fall in the foreign debt ratio is the accumulation of international reserves by the central bank. Recall that I have been working with consolidated government debt, i.e. I use data from the Banco de México that “nets out” assets and liabilities of the Public Sector and of the central bank. In the case of the foreign debt ratio there is a continuous fall since 1995, as Figure 2 shows. In fact by 2006 the consolidated government has net assets, not net debt. The reason is the growth in international reserves of the Banco de México.<sup>11</sup> Ramos-Francia and Torres (2005) describe the policies leading to accumulation of reserves by the Banco de México after the 1994 Crisis.

The two facts previously mentioned had two consequences: A reduction in the burden of debt, and a lower exposure to changes in the nominal exchange rate. This can be seen in Figure 12. Starting in 1997 and until 2006 (and a few years beyond) the ratio of total

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<sup>11</sup> Note that I am not saying that the international reserves of the central bank can be used by the Federal Government, a point that I made clear earlier, and that has been clarified by the Banco de México in recent years. I am saying that if I consolidate the asset and debt position of the Public Sector and Banco de México, there is a net asset position.

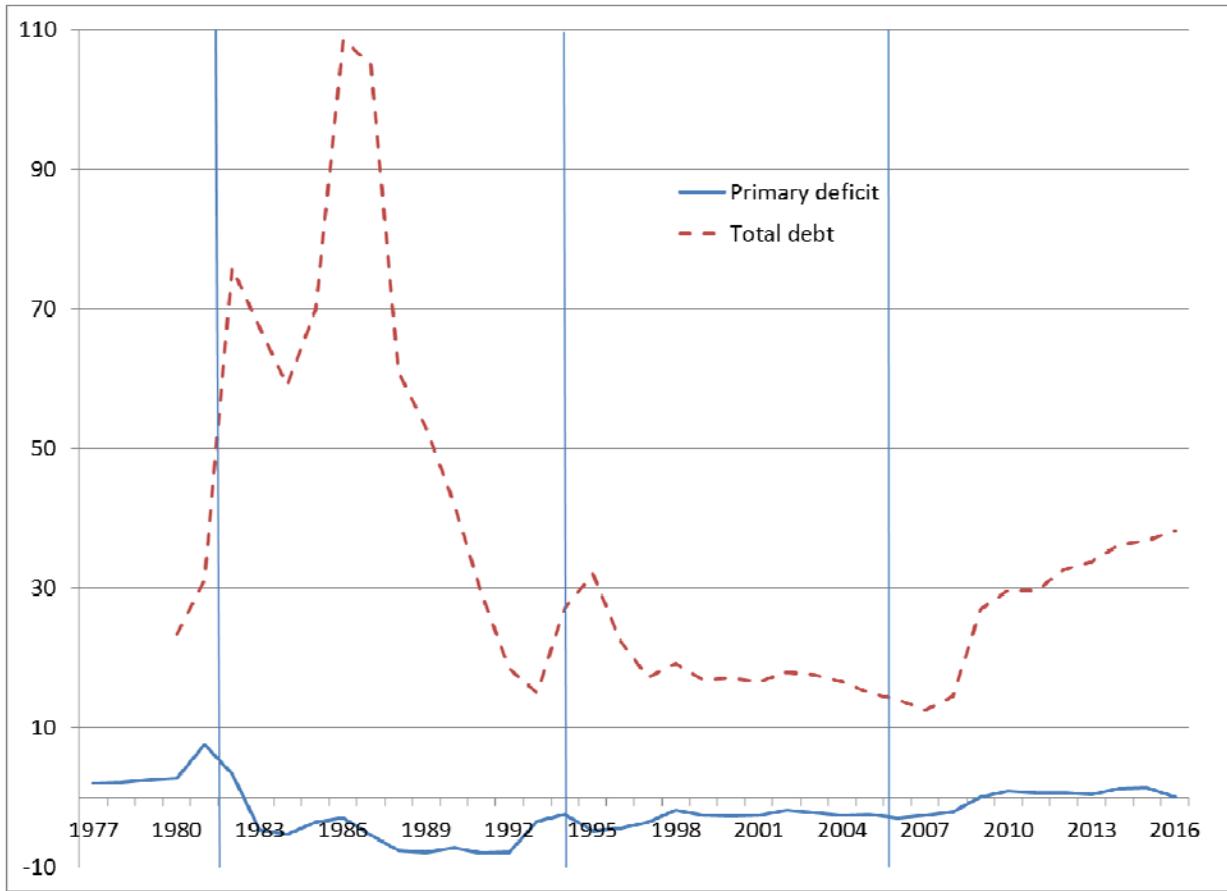
debt to GDP is low, below 20%. The fact that Mexico had primary surpluses since 1983 contributes to the fall in the debt ratio. Additionally, the ratio is stable when compared to its behavior in the two periods analyzed before. Switching from foreign to domestic debt over time, towards more domestic debt, reduced the swings in the burden of the debt caused by sudden and large depreciations of the peso.

Another factor that reduced the volatility of the debt ratio is the regime change to a flexible exchange rate at the end of 1994. Previous spikes during 1977-1994 are clearly correlated with adjustments in Mexico's fixed exchange rate regime. Notice that 1995-2006 is not exempt from large events in international financial markets. There was the 1998 Russian Crisis and the Dot-com Crash of 2000-2002, and the exchange rate was volatile during those events. However, the total debt ratio showed a much smaller variation compared to previous years.

A final comment related to debt dynamics is that comparing Figures 2 and 12 I see that the main driver of changes in the total debt ratio was the foreign debt ratio, from 1980 to 1995.

One important event in the Mexican economy was the banking crisis that took place after 1994. Both borrowers and banks received financial support from the government. I will later compare debt statistics that exclude or include this financial support. Debt is higher when this support is taken into account.

The events regarding the rescue of the banking system after 1994 have been analyzed in exhaustive detail by Cárdenas and Espinosa (2011). These authors gathered a large amount of material on the privatization of nationalized banks starting in 1991, the impact of the 1994 crisis, and the subsequent rescue of the banking system. I do not go into further detail on these very important events, referring readers to the work just mentioned. I focus on their impact on debt dynamics in a section below.



Source: Author's calculations with data from Banco de México and INEGI.

Figure 12. Primary Deficit and Total Debt as % of GDP

Now turning to monetary policy, the main feature I discuss is its evolution after the 1995 Crisis. It went through different stages until reaching the current regime of inflation targeting.

During the presidential term of Carlos Salinas the nominal anchor was the nominal exchange rate. The exchange rate regime was not a simple fixed exchange rate. The peso was allowed to fluctuate within a band. Monetary policy had to be consistent with the goal of keeping the peso within the band. When Mexico abandoned the exchange rate regime in December 22, 1994, choices had to be made regarding how to carry out monetary policy in a new environment with a floating exchange rate.

Starting in 1995 the Banco de México implemented monetary policy by affecting the cost of liquidity in the Mexican interbank market. This regime was informally known as

*El Corto*, using the word in Spanish for “short”, referring to the fact that one or more banks would become “short on liquidity”. The regime worked as follows. Private banks could borrow liquid resources from the Banco de México. The central bank chose a target for the cumulative (i.e. over a given number of days) balance of liquid funds provided to the banks. This target was called the *Objetivo de Saldos Acumulados*. A negative target meant that the central bank would carry out open market operations to reduce liquidity, and make one or more private banks have a negative balance. The central bank would provide that liquidity, at an interest double the market rate. Banks would try to avoid paying that penalty rate by raising interest rates on deposits or loans. A negative target implied a contractionary stance of monetary policy.

Starting in 1998 an important change in monetary policy was the goal of providing more information to the public about decisions made by the central bank, i.e. a move towards more transparency. Changes in the *Corto* target were discussed in official, public documents, explaining the reasons behind them. This information strengthened the link between changes in the target and informing the public on the stance of monetary policy.

Important changes in terms of transparency and objectives were made in the following years:

1. In 1999 the Banco de México announced that the medium term goal for inflation was convergence to external inflation by 2003. This goal probably turned out to be too ambitious. Below I will compare inflation to the target announced in 2002.
2. In 2000 the central bank started publishing quarterly inflation reports, including a detailed discussion of the sources of changes in inflation. The central bank also introduced core inflation to its discussion on inflation dynamics.
3. 2001 is a crucial year, as the Banco de México announced it would implement an inflation targeting regime.
4. In 2002 the inflation target was announced: 3% annual inflation +/- 1 %.
5. Since 2003 there exists an official, public calendar of monetary policy decisions.<sup>12</sup>

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<sup>12</sup> Ramos-Francia and Torres García (2005) provide more detail on the evolution of monetary policy up to 2003.

6. In 2005 the central bank started making policy announcements in terms of an interest rate.
7. In 2008 the Banco de México announced it substituted the *Corto* with having an operational target for the short term interbank interest rate.

Therefore since 2008 monetary policy is carried out as in developed countries, in the sense that the central bank adjusts short term interest rates. This is the current situation.

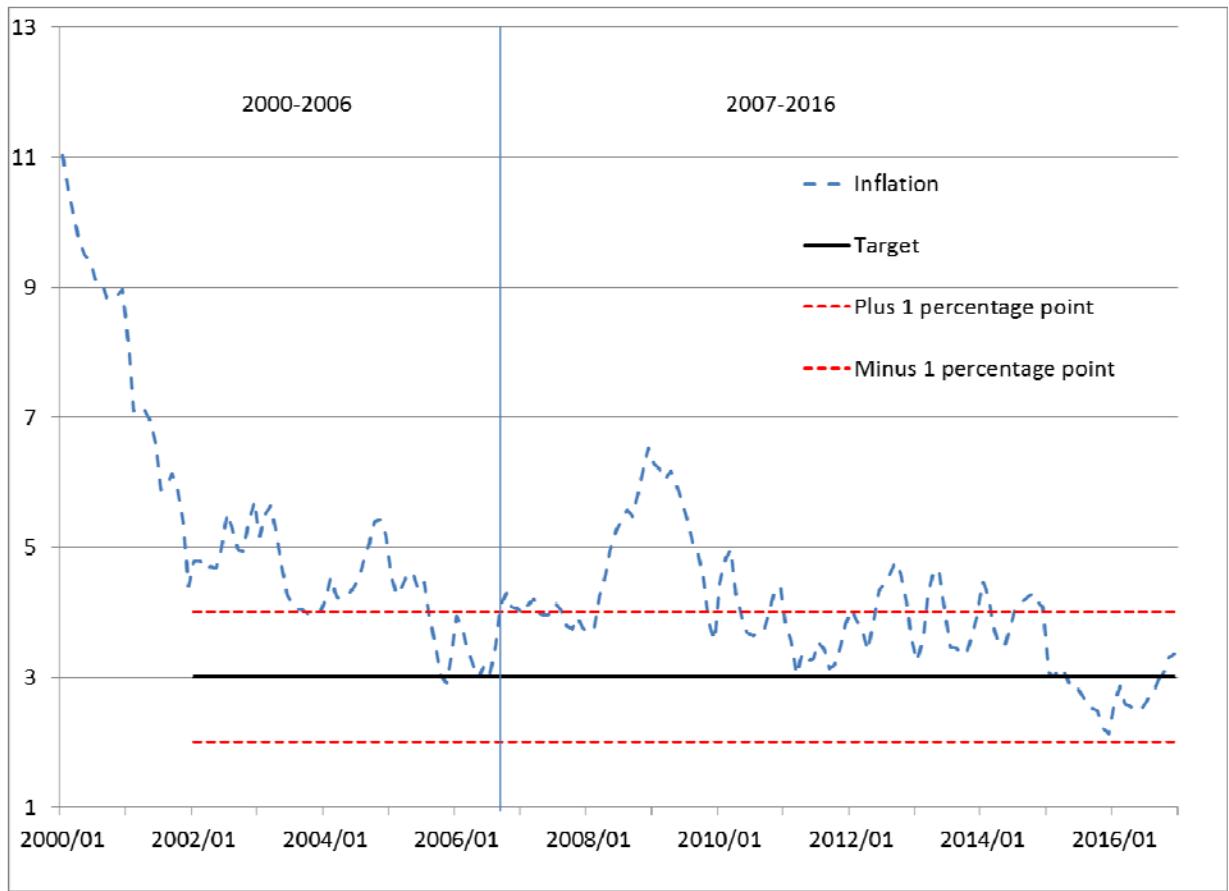
In terms of outcomes, the persistent fall in inflation observed in Mexico since 1995 is the result of several factors, including two important ones: The adoption of an inflation targeting regime, and monetary policy decisions consistent with the regime.

The effectiveness of the current monetary policy regime can be judged in a simple way by comparing inflation to the target, which I do in Figure 13. I plot inflation measured with the Consumer Price Index, which is what the central bank targets, and the 3 percent target and its band.

Two phenomena stand out: A sizable fall in inflation between 2000 and 2002, and inflation falling inside the band for most months starting in 2006. Therefore there is a fall in inflation in the years in which the implementation of the targeting regime starts. Of course, it is not enough to have a target. The target would not be useful unless the central bank responds to increases in inflation or inflation expectations by tightening monetary policy.<sup>13</sup>

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<sup>13</sup> Obviously the central bank also takes into account the nature of shocks hitting the economy and their impact on inflation, i.e. whether it is a demand shock or a supply shock.



Source: INEGI.

Figure 13. Annual Consumer Price Index Inflation versus Inflation Target with Band, in %, Monthly Data

The conclusion is that the central bank has been successful controlling inflation. Among the many challenges faced by Mexican policy makers after the 1982 Debt Crisis and the 1994 Crisis this is one in which there has been success. By the end of this period in 2006 inflation in Mexico took values within the range targeted by Banco de México.

## 6. 2007-2016

I now analyze the final period. Previous figures provide us with information on important changes in fiscal and monetary variables during this period. To give background, this period includes the presidential term of Felipe Calderón, from the right-wing party PAN. He was president during 2006-2012. It also includes 4 years of the administration of Enrique Peña Nieto, who was the candidate of the PRI in 2012.

This is a period of primary deficits and increases in domestic debt. Figure 2 shows these changes in fiscal variables. The first primary deficit takes place in 2009. Deficits have been persistent, reaching a maximum of 1.4% of GDP in 2015. There has been a persistent increase in domestic debt. At the same time, foreign debt has remained stable at values close to zero. Recall that this is a measure of consolidated debts and assets of the Public Sector and of the central bank, with international reserves generating the value close to zero. Figure 12 showed Total Debt. It fell in the previous period. During 2007-2016 its behavior changes, showing a large increase in 2009, and a persistent positive trend afterwards.

It is important to note that the implementation of a deficit in 2009 was a change regarding Mexico's fiscal response to an economic crisis. In the past, for example in 1995, the government reacted by increasing the primary surplus, as mentioned before. The response in this occasion was the opposite. The switch from surplus to deficit in 2009 was a result of countercyclical fiscal policies aimed at responding to the 2008 Financial Crisis in the U.S. One direct impact of the crisis in the U.S. was the fall in Mexican exports of durable goods. Kehoe and Meza (2011) report that Mexico was the Latin American country hit the hardest by the Financial Crisis, most likely because of its very close interaction with the U.S. A specific goal of the Calderón administration was to increase aggregate demand by increasing investment in infrastructure. For more detail, see Banco de México (2009, 2010).

A large part of the increase in debt can be explained, besides the switch to surplus, by two facts. The first one is the implementation of the Reform to the *Ley del ISSSTE*. The ISSSTE is the institution that provides health services, and other services, to workers in the Public Sector. This institution had a pay-as-you-go pension system which was running into a financial crisis. The Federal Government implemented a transition to a fully funded, individual account, system. The government became in charge of the pensions of the older ISSSTE workers. This cost represents 2.6 percentage points of the increase in Total Debt of 12.5 percentage points of GDP between 2008 and 2009. The second fact is the elimination of a special investment regime for PEMEX. This regime was called *Pidiregas*, which stands for *Proyectos de inversion diferida en el registro del*

*gasto*, or in English “investment projects with a differed expenditure registry”.<sup>14</sup> The registry of some investment projects carried out by PEMEX was deferred in time. Once the liabilities related to these investment projects were included in Total Debt, the resulting increase accounts for 8.8 percentage points of the total increase in Debt of 12.5 percentage points of GDP between 2008 and 2009. To conclude this point, the increase in the deficit contributed 1.1 percentage points.<sup>15</sup>

In terms of exogenous shocks, the price of oil has displayed historically large fluctuations, considering the sample starting in 1980, as shown in Figure 5. As I will point out below, oil revenue for the Mexican government is very highly correlated with changes in the oil price. There was a large increase that started pre-2007, reaching a maximum of 120 dollars per barrel in July 2008. Then the price fell sharply as the 2008 Financial Crisis developed. The price went up again, reaching a value of 110 at the beginning of 2012. Finally, the price dropped persistently down to a value of 24 dollars at the beginning of 2016.

The interest rate on U.S. T-Bills fell to approximately zero during this period, as the Federal Reserve Board implemented expansionary monetary policy in response to the 2008 Financial Crisis. Figure 6 shows a value of 6% in 2007, and a large drop during 2008. The interest rate remained at this value until the end of 2015, when the Federal Reserve Board started increasing the Federal Funds rate. Nevertheless, at the end of 2016 the interest rate remained at historically low values, at least since 1960.

The relative size of oil revenue for the Public Sector changed considerably over time, as shown in Figure 8. Recall that the Figure reports oil revenue as a percentage of the budgetary revenue of the Public Sector. The share peaked in 2008 with a value of 44%, the highest since 1985. This share follows closely the price of oil, which as I mentioned before peaked in July 2008. After 2008 the share goes up again tracking the price of oil. Finally, and this is an important development, the share goes down simultaneously with the price of oil, and reaches a value of 16.3%, the lowest value since 1977. I will show

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<sup>14</sup> That is my translation.

<sup>15</sup> This means that the cost of the ISSSTE reform, the change in the accounting of Pidiregas liabilities, and the deficit add up to  $2.6+8.8+1.1=12.5$  = increase in Debt between 2008 and 2009. For a quick reference see:<http://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=9&accion=consultarCuadro&idCuadro=CG7&locale=es>

below that, besides the effect of the fall in the price of oil post 2012, the historically low value of the share is also related to a historical increase in non-oil revenue of the Public Sector.

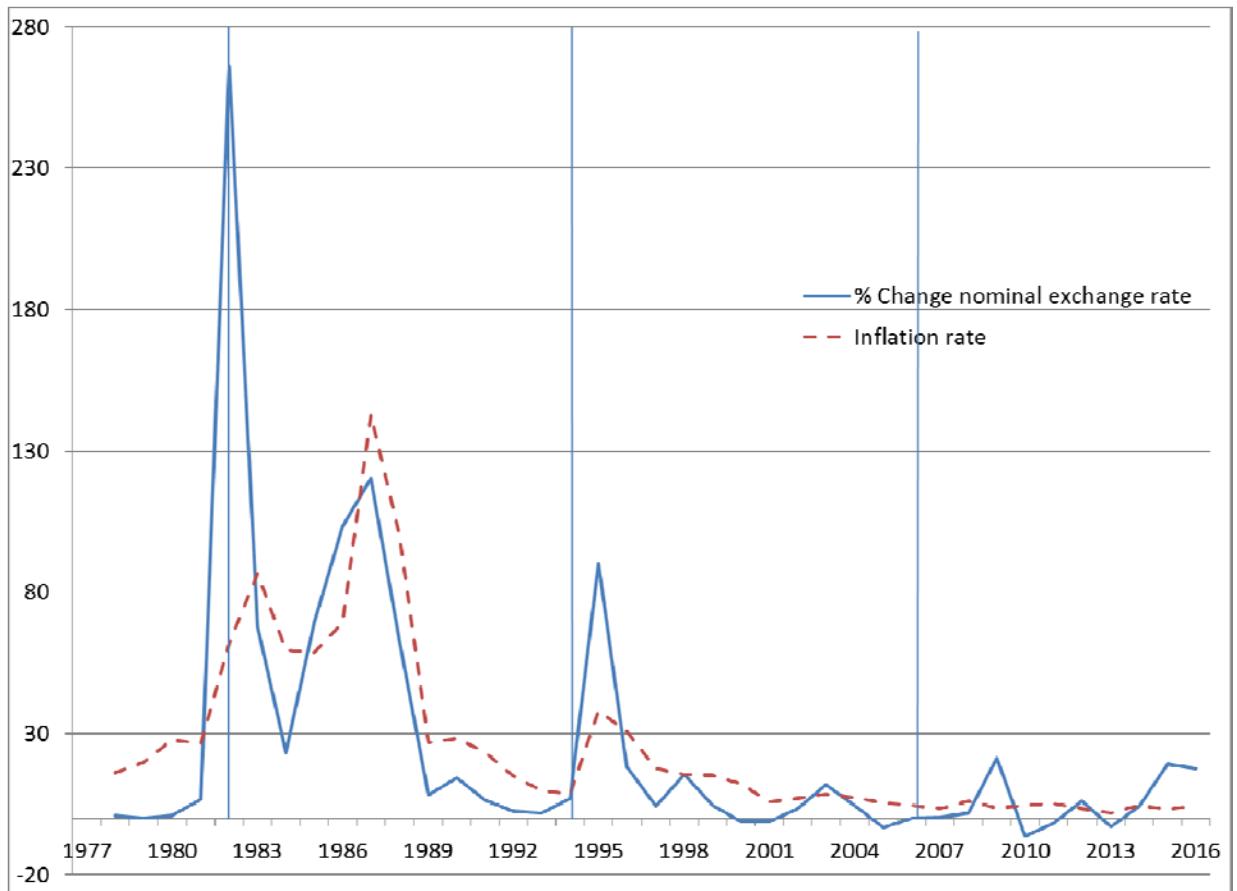
Given the increase in domestic debt and the stagnation of foreign debt, there is an increase in total debt. This is shown in Figure 11. There is a large increase in 2009, year after which the total debt ratio grows continuously. It reached a value of 38.2% of GDP, the highest since 1990.

Regarding inflation, during this period it remained mostly within the range targeted by Banco de México, as shown in Figure 13. There is a deviation from this range in the aftermath of the 2008 Financial Crisis. The main reason is that the peso lost value and there was a certain amount of exchange rate pass-through. Inflation went up to 6.5 at the end of 2008. Afterwards inflation went back to the range.

An important change that appears clearly in this period is the fall in the exchange rate pass-through. Figure 14 shows the co-movements between the percentage change in the nominal exchange rate and the inflation rate.<sup>16</sup> Between 1977 and 1994 there are large increases in inflation as the peso lost value in large devaluation. During 1995-2006 the correlation between the two variables seems to fall, although right after the 1994 Crisis there is a spike in inflation after Mexico adopted a flexible exchange rate regime. During 2007-2016 it is clear that despite large changes in the nominal exchange rate, inflation has become much less volatile. The elasticity of inflation to percentage changes in the nominal exchange rate has fallen. One possible explanation, although correlation is not causation, is the adoption of the inflation targeting regime of Banco de México mentioned earlier.

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<sup>16</sup> Here I measure inflation calculated with the GDP deflator. The Figure is very similar if I use CPI inflation.

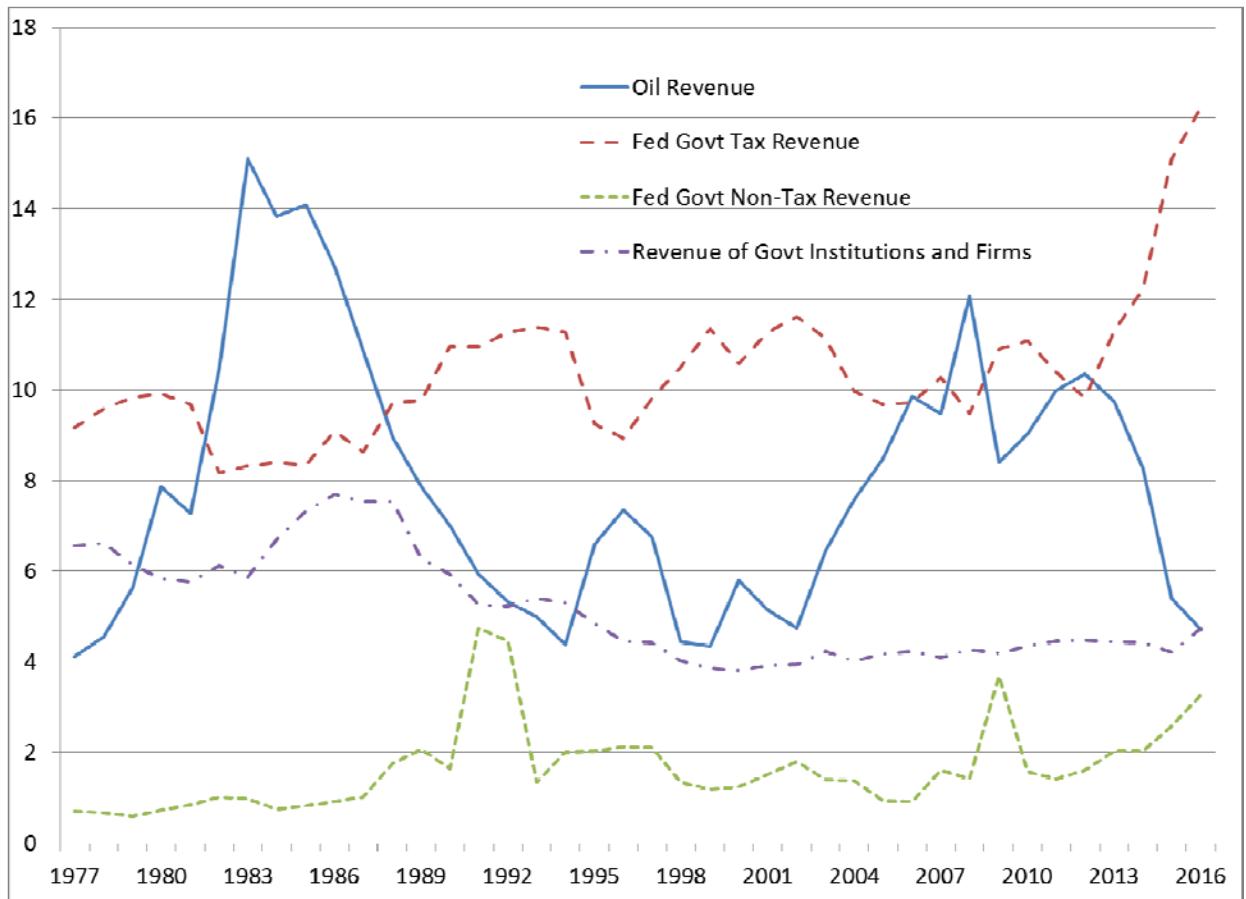


Source: Banco de México and INEGI.

Figure 14. Change in Nominal Exchange Rate, in %, and Inflation.

One of the last points I want to make is the recent increase in the size of the non-oil revenue of the Public Sector, especially tax revenue. In Figure 15 I plot both oil revenue and the three components of non-oil revenue, as a percentage of GDP. These components are tax revenue, non-tax revenue of the Federal Government, and revenue of government institutions and firms. Notice the fall in oil revenue after 2012, which is correlated with the decline in the price of oil. Notice also the large increase in tax revenue. Between 2012 and 2016 it gained 6.4 points of GDP. In 2016 it reached the highest level in history, 16.2% of GDP. This historical increase in tax collection is related to the Fiscal Reform of 2014 undertaken by the Peña Nieto administration.

This Reform included several changes in taxation. It is beyond the scope of this paper to determine which change contributed the most to the increase in tax revenue. The set of changes included: 1. A limit on certain tax deductions that firms can make when paying the corporate income tax; 2. Elimination of the fiscal regime that allowed firms belonging to a business group to file taxes jointly. With the Reform each firm files taxes separately; 3. A tax on capital gains was added to personal income taxation; 4. A limit on tax deductions allowed when filing the personal income tax; 5. An increase in marginal tax rates for high-income earners; 6. The creation of a tax regime designed to attract workers/entrepreneurs in the informal sector. They were offered tax discounts and incentives such as access to the financial system and credit; 7. The creation of taxes on carbon emission, and on sweetened beverages and high calorie-content food; 8. In Mexico states collect a tax based on the value of real estate. States were given an incentive to put effort and expend resources collecting this tax by keeping a share, the rest going to the Federal Government. For more detail see SHCP (undated).



Source: Banco de México and INEGI.

Figure 15. Oil Revenue of the Public Sector, and Components of Non-oil Revenue,  
% of GDP

## 7. Facts on Debt Dynamics and a Comparison of Alternative Measures of Debt

I highlight three facts on debt dynamics from previous sections:

1. First, there is a decline in the foreign debt ratio since the mid-1980s.
2. Second, there is a fall in the domestic debt ratio until 1994, and then the trend changes.
3. Third, after many years of reductions, total debt starts increasing in 2008.

The goal of this section is to verify if these dynamics are similar when looking at alternative measures of debt. Both Banco de México and the SHCP calculate statistics on debt issued by a broad definition of the government. As mentioned earlier, the SHCP calculates the *Saldo Histórico de los Requerimientos Financieros del Sector Público*

(SHRFSP). This measurement includes the Federal Government, plus several firms and institutions that are part of the Public Sector. Banco de México calculates two statistics. One is the *Deuda Económica Amplia* (DEA) which is similar to the SHRFSP in the sense that it takes into account a large definition of the government. The second one is the DNCBM which is the one I have been using as raw data.

A difference in coverage between the SHRFSP and the DEA is that the second one excludes *Organismos y empresas del Sector Público*. This is a set of heterogeneous institutions. One example is the social security institute, IMSS, which I mentioned in Table 1. Another example is Mexico's postal service (*Servicio Postal Mexicano*), which would be inside group B.2 in Table 1.

A second difference in coverage is that the SHRFSP includes the following set of items: *Pidiregas*, *FARAC (FONADN)*, *Programa de Apoyo a Deudores*, and *IPAB*. *Pidiregas* stands for *Proyecto de Inversión de Infraestructura Productiva con Registro Diferido en el Gasto Público*, which I translate as “Investment in Productive Infrastructure with Delayed Registration in Public Expenditure”. PEMEX and CFE used this instrument, in which the private sector carried out an infrastructure project and would be paid to after its completion. Liabilities on the side of PEMEX or CFE were registered only after completion of the project. *FARAC* refers to a rescue program of privately built highways. *Programa de Apoyo a Deudores* and *IPAB* refer to the rescue programs of debtors and banks after the 1994 Crisis.

The DNCBM is the same as the DEA, plus it takes into account assets and liabilities of the central bank.

Table 2 below gives more detail on coverage for each measure of debt. The SHRFSP include more components of government compared to the DEA and the DNCBM. That is one advantage for the analysis of the fiscal and debt situation of the government.

I work with the DNCBM in the main text for two reasons. The first one is that such data starts in 1980, whereas the SHRFSP starts later, in the 1990s. The Banco de México provides two times series for the SHRFSP. One is a yearly ratio of SHRFSP to GDP starting in 1994. Another is a quarterly time series of the level of the SHRFSP starting

in the last quarter of 2000. The second reason I choose the DNCBM is that it consolidates the fiscal branch of the government with the central bank, as in the model.

There are other dimensions in which the statistics compiled by the SHCP and the Banco de México differ. One is whether debt is valued at face or market value. Each kind of measurement provides different information. Debt at face value is an indicator of the burden of the debt, as it is the amount that the government promised to pay. Debt at market value takes into account the willingness of financial markets to buy government debt. For example, if markets have doubts about repayment, the price of debt will go down and this will reduce the value of debt.

One advantage of the statistics of the Banco de México is that they include long term debt. I could not find more detail on this point. But it is of course desirable to include debt of all maturities when analyzing the indebtedness position of the government.

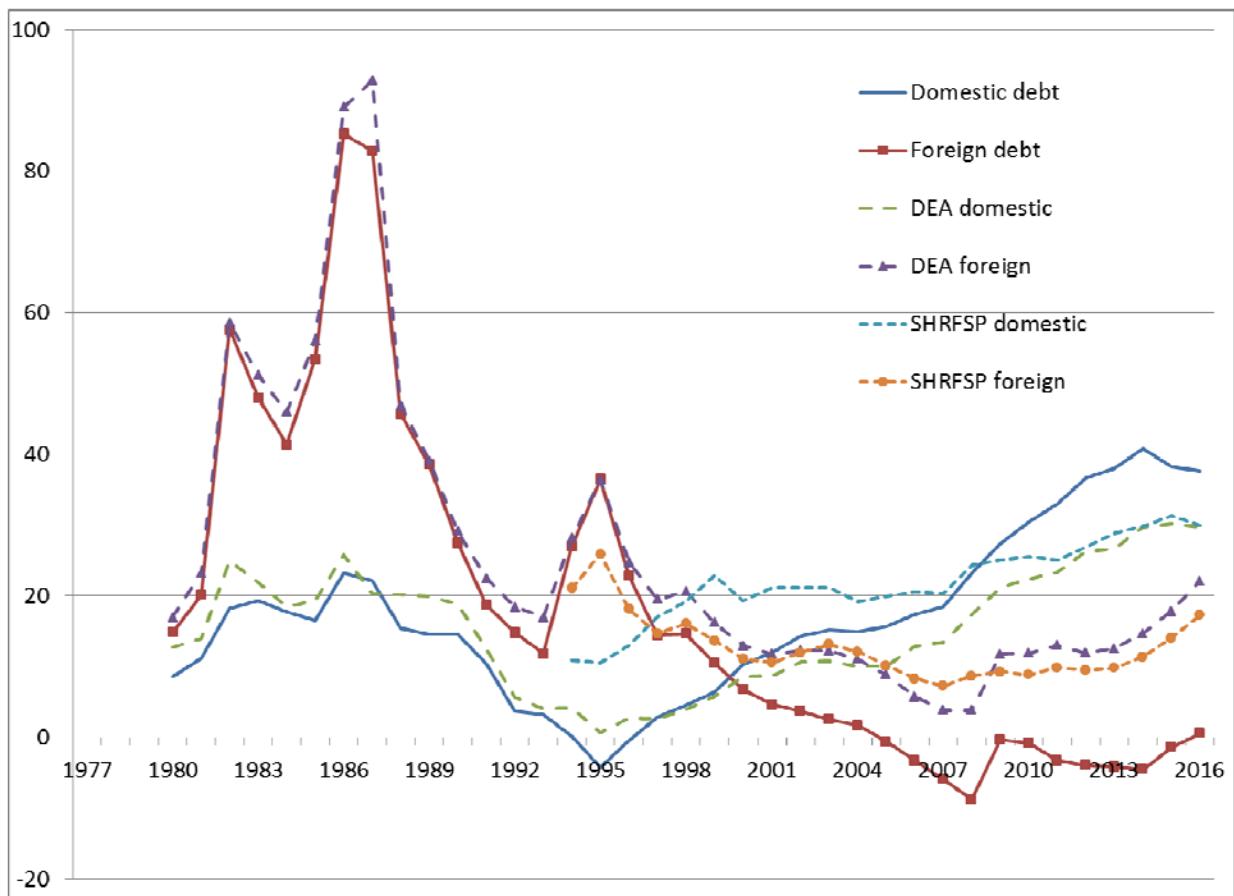
	<b>SHRFSP</b>	<b>DEA</b>	<b>DNCBM</b>
<b>Includes:</b>			
Gobierno Federal	Yes	Yes	Yes
Empresas productivas del estado (PEMEX, CFE)	Yes	Yes	Yes
Organismos y empresas del Sector Público	Yes	No	No
Banca de desarrollo	Yes	Yes	Yes
Fondos y fideicomisos de fomento	Yes	Yes	Yes
Pasivos Adicionales por Pidiregas, FARAC (FONADN), Programa de Apoyo a Deudores, IPAB	Yes	No	No
Activos de Banco de México	No	No	Yes
Pasivos de Banco de México	No	No	Yes
<b>Valuation:</b>	Face value	Market value (if possible)	Market value (if possible)
<b>Short or long term:</b>	Short	Short and long	Short and long
<b>Frequency:</b>	Quarterly (level), yearly (% of GDP)	Monthly	Monthly
<b>Domestic and foreign:</b>			
Domestic debt ( <i>deuda interna</i> )	Yes	Yes	Yes
Foreign debt ( <i>deuda externa</i> )	Yes	Yes	Yes

Source: SHCP and Banco de México.

Table 3. Comparison of Measures of Net Debt of Broad Definition of Government

Figure 16 shows the evolution of different measures of debt split into domestic and foreign. “Domestic debt” and “Foreign debt” are the time series shown in Figure 2. Recall that those series consolidate the Public Sector with the Banco de México. “DEA domestic” and “DEA foreign” are the debt series described in Table 2, calculated by the Banco de México. These series represent a measure of Public Sector debt. “SHRFSP domestic” and “SHRFSP foreign” are series calculated by the SHCP, and represent a different measure of debt.

The first fact listed at the beginning of this section does not hold, given what happens towards the end of the sample. Compared to the benchmark series, both DEA and SHRFSP show an upward trend starting in 2010. The second fact holds, as the three measures of domestic debt show an increase starting in 1995.



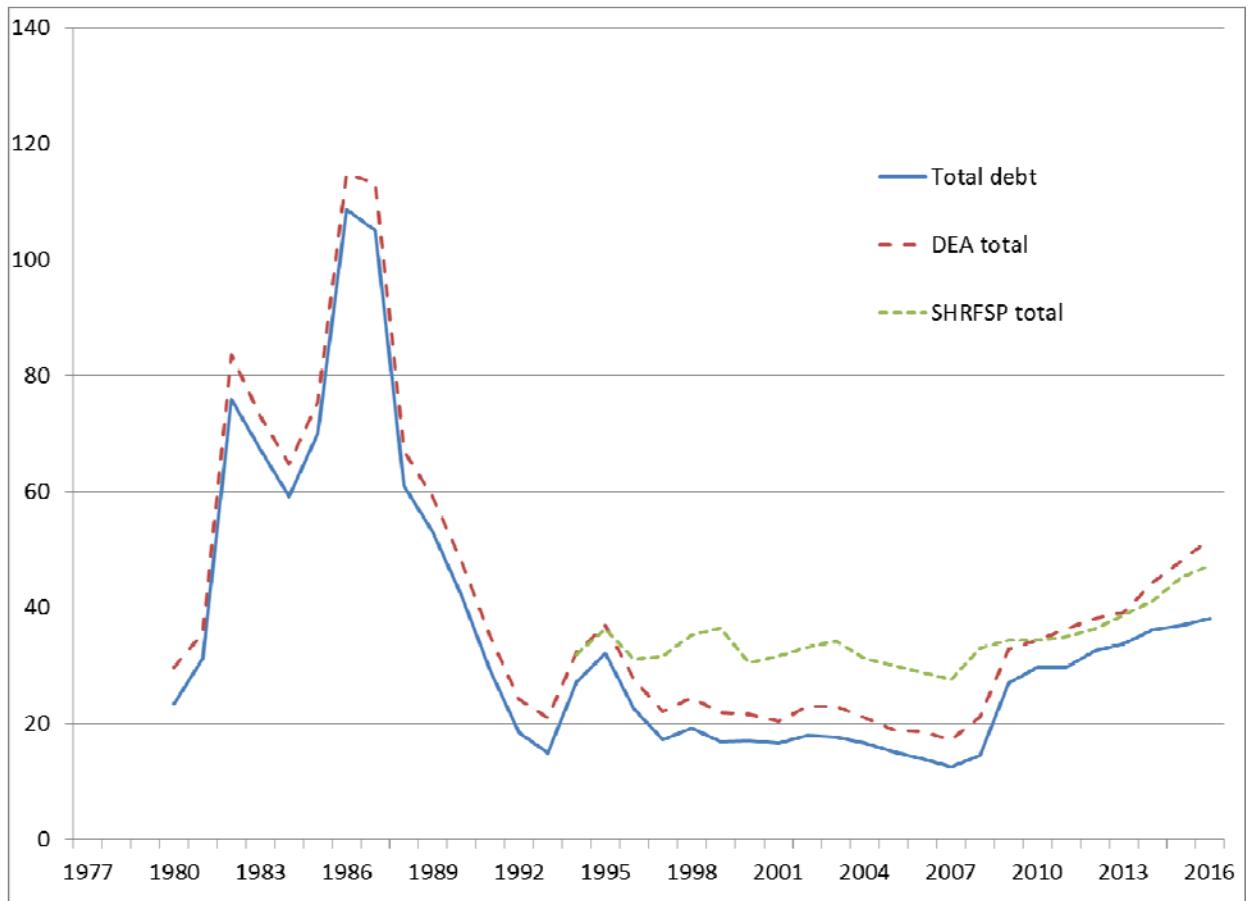
Source: Author's calculations with data from Banco de México and INEGI.

Figure 16. Measures of Foreign and Domestic Debt 1977-2016, % of GDP

Figure 17 shows the evolution of total debt. “Total debt” is the series I used in previous sections. “DEA total debt” is calculated by the Banco de México. “SHRFSP total debt” is calculated by the SHCP.

The third fact listed also holds. The three debt series show persistent increases starting in 2008.

An important observation is that the level of the SHRFSP is about 10 percentage points higher between 1995 and 2007. Table 2 says that a source of this higher level is the fact that the SHRFSP includes additional items compared to the Banco de México data: The first one is *Organismos y empresas del Sector Público*, and the second one is the *Pasivos Adicionales*, or “Additional Liabilities” coming from *Pidiregas*, *FARAC (FONADN)*, *Programa de Apoyo a Deudores*, and *IPAB*. It would be obviously interesting to get deeper in the data and find out which one of these items produces the difference in levels, as it is sizable. It is very likely that the main source of the difference is the expenditure on the rescue programs of debtors and banks after the 1994 Crisis.



Source: Author's calculations with data from Banco de México and INEGI.

Figure 17. Measures of Total Debt 1977-2016, % of GDP

## 8. The Great Reduction of Inflation

Last, but certainly not least, I would like to discuss on the sources of the persistent fall in inflation pre-2000, and on the low level reached afterwards. In August 2016 I published a blog in *Foco Económico* (Meza 2016).<sup>17</sup> The topic was a discussion on which forces had generated the fall in inflation in Mexico between 1982 and 2016. The possible answers to that question are very close to a summary of the recent monetary and fiscal history of Mexico, and it shows the linkages between fiscal and monetary policy.

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<sup>17</sup> It can be read at <http://focoeconomico.org/2016/08/22/la-gran-reduccion-de-la-inflacion-en-mexico-el-factor-institucional/>.

Four forces likely contributed to the “Great Reduction” of inflation in Mexico. Compared to my blog, here I list one more separately, the *Pactos*. The first one is the sequence of primary surpluses that started in 1983 and lasted for decades. This sequence is consistent with an objective of reducing the burden of the debt, and thus with a goal of eliminating the possibility of fiscal crises. In short, this fiscal policy was a step towards moving from fiscal dominance to central bank independence. The lesson from the 1982 Debt Crisis was that public finances had to be in check.

The second force consists of the negotiations between the government, workers and businessmen, the *Pactos* of the late 1980s. They have been pointed to as important factors behind the fall in inflation after in the late 1980s and before the 1994 Crisis. The model I used as theoretical framework is not designed to analyze their contribution, so this is an interesting line for future research.

The third force is the constitutional change of 1993. For the first time in the history of Mexico it was written in the law that no one (“no authority”, as written in the Constitution) can force the central bank to provide financing. Plus, a clear goal was established for the central bank: Low inflation. What happened in practice? The 1994 Crisis was a test for this institutional change. During 1995 both fiscal and monetary policies were contractionary. There was an objective of preventing markets from having the perception that there would be fiscal dominance. The Banco de México focused on the control of inflation.

The fourth force is the implementation of an inflation targeting regime since 2002. One benefit of this regime is that the goal of the Banco de México is very simple, and it is very easy to evaluate whether the monetary authority is achieving the target or not. Again, what happened in practice? The data in this paper showed inflation converging to the target. This phenomenon shows that the adoption of the inflation targeting regime has been a success. Of course, it is not enough to have such regime. The central bank has to react in a consistent way when inflation and inflation expectations are increasing.

Having discussed the forces that I think contributed to the reduction of inflation, the next question would be to determine the quantitative contribution of each one. This decomposition would require a model with possibly many ingredients: A fiscal-

monetary connection, a government that bargains with union and business leaders (to represent the *Pactos*), and the adoption of an inflation targeting regime. I do not have such a model but here I discuss some related quantitative findings.

There have been a few econometric estimations that try to find structural breaks in the stochastic process that inflation follows. The structural break consists either in a lower mean, or in inflation becoming a stationary process. This line of work is represented by Capistrán and Ramos-Francia (2009) and Chiquiar, Noriega and Ramos-Francia (2007). Using data at quarterly frequency for 1980-2007 Capistrán and Ramos-Francia (2009) find evidence of structural changes in the mean of inflation in 1984Q2 (increase), 1988Q2 (decrease), 1999Q1 (decrease).<sup>18</sup> Using monthly data for 1995-2006 Chiquiar et al. (2007) find evidence of the process of inflation changing from a unit root to stationary in December 2000.

. The main result is that the structural changes in inflation are found close to when certain important events took place:

1. The *Pacto de Solidaridad Económica*, signed on December 1987 by the de la Madrid administration. Inflation did fall between 1987 and 1988 from 143% to 100%, but the level remained high.
2. The *Pacto para la Estabilidad y el Crecimiento Económico*, signed on December 1988 by the Salinas administration. Inflation fell between 1988 and 1989 from 100% to 27%, a large decrease.
3. The announcement in 2001 of a future inflation targeting regime that would be implemented in 2002.

There is no econometric evidence that the constitutional change of 1993 led, or is correlated, with a fall in inflation. This is likely due to the 1994 Crisis, which created a spike in inflation in 1995. Having said that, even in econometric techniques cannot detect a correlation, the goal and response of the Banco de México in 1995 and afterwards are indicative that the central bank committed to the constitutional mandate of keeping inflation low.

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<sup>18</sup> These dates were selected by the Bayesian Information Criterion.

A point I want to make here is that expectations may have played an important role in the fall in inflation. Notice that the dates of structural changes found by econometric studies do not coincide with the dates of events that may have reduced inflation. In the case of Capistrán et al. (2009) the structural change they find in 1988Q2 takes place between the two *Pactos*. The first one does not seem to be very successful, as inflation remained high in 1988, although there was in fact a reduction in price changes. The second one was more successful, as inflation fell almost 75 percentage points. A hypothesis is that inflation fell in 1988 in anticipation of a new administration that was willing and capable of achieving a large fall in the growth of prices.

A similar point can be made regarding the detection of structural breaks in 1999Q1 by Capistrán et al. (2009), and in December 2000 by Chiquiar et al. (2007). The changes in the process of inflation occur before Banco de México announced in 2001 the future implementation of an inflation targeting regime, which happened in 2002. A hypothesis is that inflation fell in 1999-2000 in anticipation of future credible policies aiming at the reduction of inflation.

Having said that, notice that one thing lacking in the model I have used as benchmark is precisely the role of expectations. The model is useful, but too simple in an important way.

In connection to that comment, recently Sargent, Williams and Zha (2009) have combined a framework similar to Sargent and Wallace (1991) with a real balances demand equation with expectations, as in the classic work of Cagan. They have used this model to analyze the reduction in inflation in several South American countries. Their main result is that structural changes in the deficit, as opposed to “cosmetic” ones, have produced large and persistent falls in inflation.

The analysis of Sargent et al. (2009) has been applied to Mexico by Ramírez Aguilar de Wille (2017). He used this model, which adds expectations to Sargent and Wallace (1981), to analyze the relation between deficits and inflation in Mexico. His main result is that the fall in the deficit during 1989-1992 led to a fall in inflation, and to a persistent low level.

## 9. Conclusions

I find that the 1982 Debt Crisis can be accounted for with the Sargent and Wallace (1981) model. In the model and in the data a higher primary deficit leads to growth in debt that reaches a limit. At that point, under fiscal dominance, the central bank adjusts its policy to satisfy public finances. In the data this led to higher inflation.

On the other hand, the model cannot account for the 1994 Crisis. Mexico had a primary surplus and the debt-to-GDP ratio was falling. I discussed several hypotheses advanced by academics and ex policy makers. Two conclusions are that the exchange rate regime created vulnerabilities, and that political shocks had a tremendous importance. I discussed how the model of Kehoe and Cole (1996) can help us account for that crisis. In the model a reduction in the maturity of debt enlarges the crisis zone of debt levels, and a debt crisis is possible even for low levels of debt. In the data the average maturity of Mexican debt fell.

Another important finding is that there is evidence that the constitutional change of 1993, granting a goal and independence to the central bank, was actually a change from fiscal dominance to a strong central bank. Fiscal policy in 1995 was procyclical. The Banco de México had as its main goal a rapid control of inflation. There was no persistent high level of inflation in the late 1990s, as happened throughout the 1980s after the Debt Crisis.

The benchmark data showed three facts. First, there is a decline in the foreign debt ratio since the mid-1980s. Second, there is a fall in the domestic debt ratio until 1994, and then the trend changes. Third, after many years of reductions, total debt starts increasing in 2008-2009.

When looking at alternative series of debt I found that the first fact is sensitive. This happens because the benchmark series of foreign debt takes into account reserve accumulation, which is a powerful force that pushes this debt downwards. However, when I looked at measures of debt that exclude this force, foreign debt increases towards the end of the sample.

The change in the mix of debt from foreign to domestic reduced the volatility of total debt. The total debt ratio is very stable after 1995. In the period 1995-2007 there were several large events abroad, such as the crises in Asia in 1997 and Russia in 1998, and the dot-com crash of 2000. But those crises do not seem to affect the volatility of Mexico's foreign and total debt ratios. Another factor into this reduction in volatility is the adoption of a flexible exchange rate regime.

To conclude, I comment on the current and future outlook of the Mexican economy. I analyzed data up to the end of 2016. The statistics I analyzed showed an increase in the Public Sector debt-to-GDP ratio. Economists have pointed to an upward trend in the ratio. In 2016 the SHCP received the mandate of achieving a primary surplus in 2017 to reduce debt. In my opinion this was extremely relevant. It has taken Mexico many decades to achieve macroeconomic stability. Policies aimed at keeping public finances in check are necessary to have low inflation. And perhaps more importantly, macro stability is necessary to pursue other policy goals, such as growth, poverty reduction, and redistribution.

To give an example, the lack of sustained per capita growth has been linked in previous research to the lack of credit, as in Kehoe and Meza (2011). In the *Seminario de Perspectivas Económicas 2017* that took place at the Instituto Tecnológico Autónomo de México in January 2017 the President of the bankers' association Luis Robles talked about the recent growth in the private credit-to-GDP ratio, after years, actually decades, of stagnation (except briefly before the 1994 Crisis). His statement was that this growth was possible because of the large progress in macro stability, and he insisted on the need to preserve it. My conclusion is that sound public finances and an independent central bank are important, necessary for other crucial goals, and should be sustained.

In that regard, I took a look at the latest available data for the SHRFSP in 2017. There was a stabilization and a reduction, which I think are very positive news. The main challenges the Mexican economy faces at the beginning of 2018 are:

1. To achieve a reduction and long term stabilization of the SHRFSP.
2. To analyze the impact of the December 2017 corporate tax reform in the U.S. and propose possible policy responses.

3. To conclude successfully the renegotiation of NAFTA and analyze the impact of any changes, or of a break-up.
4. To take inflation back to the Banco de México range after the large spike at the end of 2017.

## 10. References

- Aspe Armella, Pedro. 1993. *Economic transformation the Mexican way*. Cambridge, Massachusetts: MIT.
- Banco de México. 2009. *Informe Anual 2008*. Mexico D.F., Mexico: Banco de México.
- Banco de México. 2010. *Informe Anual 2009*. Mexico D.F., Mexico: Banco de México
- Capistrán, Carlos and Manuel Ramos-Francia. 2009. “Inflation Dynamics in Latin America,” *Contemporary Economic Policy*, 27(3), pp. 349–62.
- Cárdenas, Enrique. 1996. *La política económica en México, 1950-1994*. Mexico D.F., Mexico: Fondo de Cultura Económica.
- Cárdenas, Enrique. 2015. *El largo curso de la economía mexicana*. México D.F., México: Fondo de Cultura Económica.
- Cárdenas, Enrique and Amparo Espinosa Rugarcía. *La privatización bancaria, crisis y rescate del sistema financiero. La historia contada por sus protagonistas*. (five volumes) CEEY, México 2011.
- Chiquiar, Daniel, Antonio Noriega and Manuel Ramos-Francia. 2007. “Un Enfoque de Series de Tiempo para Probar un Cambio en Persistencia de la Inflación: La Experiencia de México”. Banco de México Working Paper 2007-01. Also published in English in 2010 as “A time-series approach to test a change in inflation persistence: the Mexican Experience,” *Applied Economics*, 42(24), pp. 3067–75.
- Cole, Harold L. and Timothy J. Kehoe. 1996. “A self-fulfilling model of Mexico’s 1994-1995 debt crisis.” *Journal of International Economics*, Vol. 41(3-4), pp. 309-330.
- Gil-Díaz, Francisco. 1998. “The origin of Mexico’s 1994 financial crisis.” *Cato Journal*, Vol. 17(3), pp. 303-313.

Gil-Díaz, Francisco and Agustín Carstens. 1996. "One Year of Solitude: Some Pilgrim Tales About Mexico's 1994-1995 Crisis." *The American Economic Review*, Vol. 86(2), pp. 164-169.

Kehoe, Timothy J. 1995. "What Happened in Mexico in 1994-95?" In Patrick J. Kehoe and Timothy J. Kehoe, editors, *Modeling North American Economic Integration*, Kluwer Academic Publishers, pp. 131-147.

Kehoe, Timothy J. and Felipe Meza. 2011. "Catch-up growth followed by stagnation: Mexico, 1950-2010." *Latin American Journal of Economics*, Vol. 48(2), pp. 227-268.

Kehoe, Timothy J., Juan P. Nicolini and Thomas J. Sargent. 2013. "The Monetary and Fiscal History of Latin-America 1960-2005".

Meza, Felipe. 2008. "Financial Crisis, Fiscal Policy, and the 1995 GDP Contraction in Mexico." *Journal of Money, Credit and Banking*, Vol. 40(6), pp. 1239-1261.

Meza, Felipe. 2016. "La gran reducción de la inflación en México: el factor institucional". Blog published online at fococonomico.org and available as [http://focoeconomico.org/2016/08/22/la-gran-reduccion-de-la-inflacion-en-mexico-el-factor-institucional/](http://fococonomico.org/2016/08/22/la-gran-reduccion-de-la-inflacion-en-mexico-el-factor-institucional/).

Ramírez Aguilar de Wille, Alberto. 2017. La historia reciente de la inflación en México: Una perspectiva desde las expectativas y el déficit fiscal." Tesis de Licenciatura, Instituto Tecnológico Autónomo de México.

Ramos-Francia, Manuel and Alberto Torres García. 2005. "Reducing Inflation Through Inflation Targeting: The Mexican Experience." *Banco de México Working Papers*, 2005-01.

Sargent, Thomas J. and Neil Wallace. 1981. "Some Unpleasant Monetarist Arithmetic." *Quarterly Review*, Federal Reserve Bank of Minneapolis, Vol. 5(3), pp. 1-17.

Sargent, Thomas J., Noah Williams and Tao Zha. 2009. “The Conquest of South American Inflation.” *Journal of Political Economy*, Vol. 117, No. 2, pp. 211-256.

Secretaría de Hacienda y Crédito Público. 2010. “Balance Fiscal en México. Definición y Metodología” (in Spanish). Downloaded in 2010 from [www.shcp.gob.mx](http://www.shcp.gob.mx).  
Reforma de la Hacienda Pública”. Available online at <http://reformas.gob.mx>

Serra Puche, Jaime. 2011. “Reflexiones sobre la crisis de 1994”. In *Privatización bancaria, crisis y rescate del sistema financiero. La historia contada por sus protagonistas*, edited by Enrique Cárdenas and Amparo Espinosa, Volume I, CEEY, México, p. 177-179.

Solís Manjarrez, Leopoldo. 2000. *La realidad económica mexicana: Retrovisión y perspectivas*, third edition. México: El Colegio Nacional, Fondo de Cultura Económica.

Walsh, Carl E. 2003. *Monetary theory and policy*. Cambridge, Massachusetts: MIT.

## 11. Appendix

### 11.1 The model

The Treasury's budget constraint, expressed in pesos, says that the primary deficit plus transfers plus interest payments can be financed by issuing more debt and with  $RCB$ :

$$B_{Gt} + b_{Gt}^* E_t + RCB_t = (D_t + T)P_t + B_{Gt-1}R_{t-1} + b_{Gt-1}^* r_{t-1}^* E_t$$

where

$B_{Gt}$  is the stock of debt in pesos issued in period  $t$

$b_{Gt}^*$  is the stock of dollar-denominated debt

$E_t$  is the nominal exchange rate

$D_t$  is the primary deficit, in real terms

$T_t$  includes all transfers, in real terms; Kehoe et al. (2013) include this term to represent transfers that might occur in times of crisis.

$R_{t-1}$  is the gross nominal interest rate on debt in pesos issued in  $t-1$

$r_{t-1}^*$  is the gross dollar interest rate on debt in dollars.

$P_t$  is the price level in pesos.

The primary deficit, measured in real terms, is defined as

$$D_t = G_t - NOR_t - OR_t$$

where

$G_t$  is government expenditures

$NOR_t$  is non-oil revenue

$OR_t$  is oil revenue.

I assume for simplicity that oil revenue comes from oil sales in the international market.<sup>19</sup> Therefore

$$OR_t = \frac{P_t^* O_t E_t}{P_t}$$

where

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<sup>19</sup> In reality things are obviously more complex. Historically the taxation of PEMEX has many details.

$P_t^*$  is the international price, in dollars, of oil

$O_t$  is the quantity of oil sold.

The central bank budget constraint, expressed in pesos, says that the  $RCB_t$  and purchases of government debt can be financed with the interest payments received and with an increase of the monetary base

$$M_t - M_{t-1} + B_{Bt-1}R_{t-1} + b_{Bt-1}^*r_{t-1}^*E_t + IR_{t-1}r_{Rt-1}^*E_t = RCB_t + B_{Bt} + b_{Bt}^*E_t + IR_tE_t$$

where

$M_t$  is the monetary base

$IR_t$  stands for international reserves

$r_{Rt-1}^*$  is the gross dollar interest rate on international reserves.

The Consolidated Government (CG) Budget Constraint is

$$B_t + M_t + (b_t^* - IR_t)E_t = (D_t + T_t)P_t + B_{t-1}R_{t-1} + M_{t-1} + E_t(b_{t-1}^*r_{t-1}^* - IR_{t-1}r_{Rt-1}^*).$$

This equation is identical to the one in the Kehoe, Nicolini and Sargent (2013) except that it takes into account that international reserves are an asset for the CG (and of course, except that I eliminated inflation-indexed debt). International reserves receive a gross interest rate  $r_{Rt-1}^*$  different than the one that the Treasury pays on foreign debt  $r_{t-1}^*$ .

The equation says that the primary deficit plus transfers plus interest payments to the public can be financed with more debt and with an increase in the monetary base.

The previous equation can be written in terms of debt-to-GDP ratios. Dividing by nominal GDP, the budget constraint is

$$\theta_t^N + \theta_t^* + (m_t - m_{t-1}) + m_{t-1} \left( 1 - \frac{1}{g_t \pi_t} \right) = d_t + \theta_{t-1}^N \frac{R_{t-1}}{g_t \pi_t} + \frac{E_t(b_{t-1}^*r_{t-1}^* - IR_{t-1}r_{Rt-1}^*)}{P_t y_t}$$

where

$\theta_t^N$  is the nominal debt-to-GDP ratio

$\theta_t^*$  is foreign debt net of international reserves, relative to GDP

$m_t$  is the monetary base relative to GDP

$g_t$  is the growth factor of real GDP

$\pi_t$  is the growth factor of the GDP deflator

$d_t$  is the primary deficit plus transfers, relative to GDP.

The first term in parenthesis on the left-hand side is the change in the monetary base ratio. The subsequent term is the inflationary tax. The sum of these two terms is seigniorage. On the right-hand side the second term represents gross interest payments on nominal debt. The subsequent term represents gross interest payments on foreign debt net of gross interest received on international reserves. One comment: I am using the same symbol  $\theta_t^*$  as in Kehoe, Nicolini and Sargent (2013), but it represents something different. In this case it represents net foreign debt relative to GDP. In their case that symbol represents real foreign debt relative to real domestic output. They split the foreign debt-to-GDP ratio into real foreign debt relative to real domestic output, and the real exchange rate. I prefer to write the budget constraint without using explicitly the real exchange rate, as the available data are an index, and the base year would affect the magnitude of the variable.

To separate the role of oil revenue, I substitute the definition of the primary deficit into the previous two equations:

$$B_t + M_t + (b_t^* - IR_t)E_t = (G_t - NOR_t - OR_t + T_t)P_t + B_{t-1}R_{t-1} + M_{t-1} + E_t(b_{t-1}^*r_{t-1}^* - IR_{t-1}r_{Rt-1}^*).$$

and

$$\theta_t^N + \theta_t^* + (m_t - m_{t-1}) + m_{t-1} \left( 1 - \frac{1}{g_t \pi_t} \right) + or_t = dEOR_t + \theta_{t-1}^N \frac{R_{t-1}}{g_t \pi_t} + \frac{E_t(b_{t-1}^*r_{t-1}^* - IR_{t-1}r_{Rt-1}^*)}{P_t y_t}$$

where

$dEOR_t$  is the primary deficit excluding oil revenue, relative to GDP

$or_t$  is oil revenue relative to GDP, that is,

$$or_t = \frac{OR_t P_t}{P_t y_t} = \frac{P_t^* O_t E_t}{P_t y_t}.$$

These equations are straightforward. A higher primary deficit  $dEOR_t$  or higher interest payments can be financed with oil-related revenue. Oil revenue relative to GDP increases when the international price of oil is higher. It goes up when the peso loses value, as each dollar sold abroad could then buy more pesos.