WORKING PAPER

The Case of Mexico

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The Monetary and Fiscal History of Mexico, 1960–2017*

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Abstract

In this chapter, I employ a model of the consolidated government budget constraint to study the monetary and fiscal history of Mexico. I study the period 1960–2017, dividing it into three subperiods: rapid growth and monetary expansion, 1960–1982; crisis and reform, 1982–1995; and slow growth and macroeconomic stability, 1995–2017. The crisis and reform period includes the major economic crises of 1982 and 1994. I argue that a simple version of the model explains the 1982 debt crisis. A richer version is needed to explain the more complex 1994 crisis. A constitutional change that made the Banco de México independent of the federal government in 1993 was the first step in a transition from fiscal dominance to monetary dominance. Inflation fell persistently after 1995, reaching values of 3 percent per year in 2016, which was the inflation target of the Banco de México. On the fiscal side, I observe that the total debt-to-GDP ratio increased from 1960 to 1988 and fell from 1988 to 2009. Between 2009 and 2016, the total debt-to-GDP ratio grew persistently.

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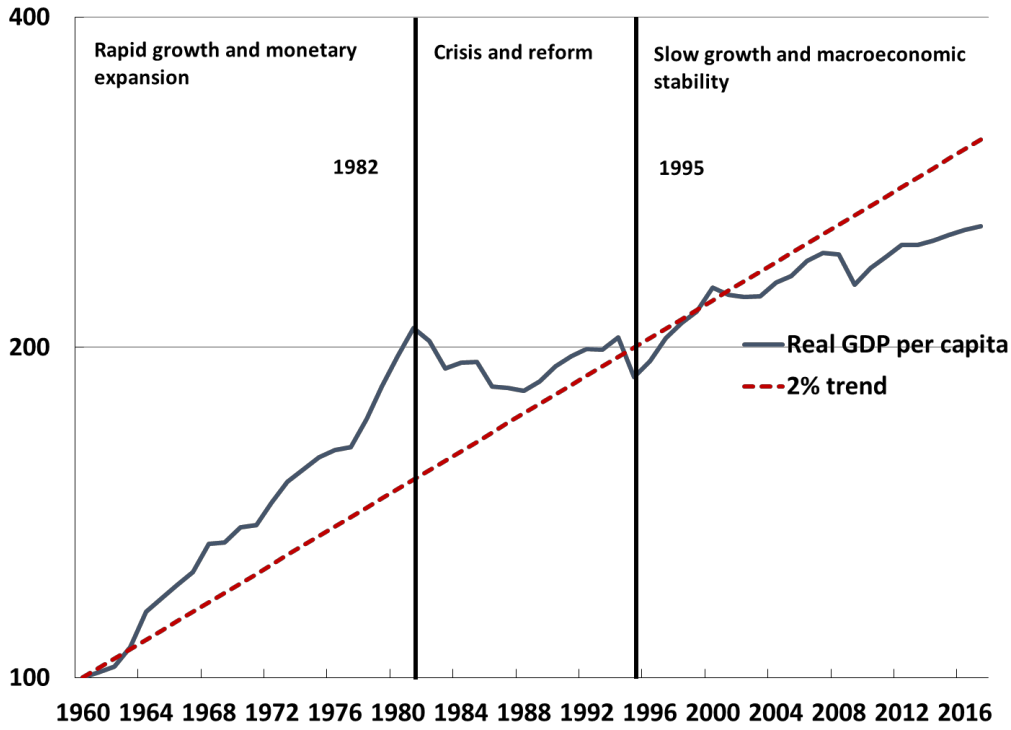
1. Introduction

Between 1960 and 1982 Mexico went through a period of rapid growth and fiscal expansion, up to the 1982 crisis. The country then went through a period with crises in 1982 and 1994. During this period the government implemented major important reforms. Finally, Mexico experienced a period of slow growth and macroeconomic stability, interrupted by the global recession of 2008–2010. Figure 1 plots real GDP per capita and compares it to a trend line of growth of 2 percent per year.

Figure 1. Real GDP per capita at 1993 pesos, 1960-2017, and 2 percent yearly trend, indexes 1960=100, vertical axis in logarithmic scale base 2



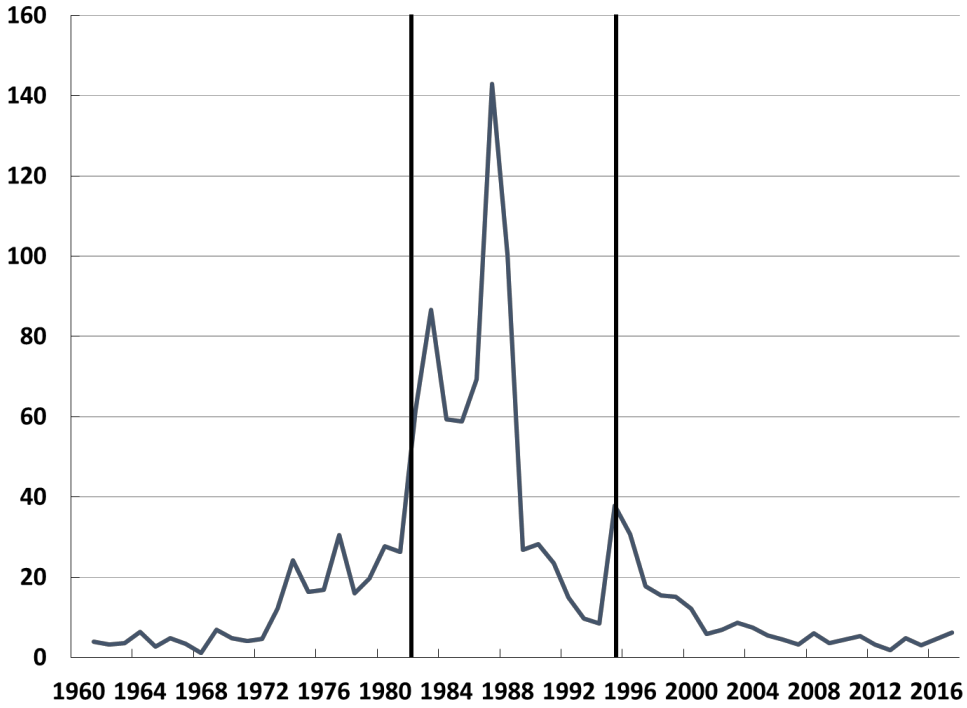
Sources: Author's calculations with data from Instituto Nacional de Estadística y Geografía (INEGI) and World Bank.

The 1982 crisis was clearly a turning point in Mexico's economic history. The annual growth rate of real GDP per capita between 1960 and 1982 was 3.3 percent. Between 1982 and 2016, it fell to 0.7 percent. The drop in the growth rate during and following the 1982 crisis has had a major impact on Mexico's catch-up with the world economic leader, the United States. The real GDP per capita of the United States grew by approximately 2 percent per year between 1875 and 2010.[1] Between 1960 and 1982, Mexico grew faster than the United States, closing the per capita income gap between the

[1]See, for example, Costa, Kehoe, and Raveendranathan (2016).

two economies. Between 1982 and 1995, Mexico suffered what Kehoe and Prescott (2007) classify as a great depression. Finally, between 1995 and 2017, Mexico grew at a pace that was faster than, but roughly equal to, that of the United States. In short, in terms of catching up to the United States, by 2017 Mexico had still not recovered from the 1982 debt crisis.[2]

Figure 2: Annual inflation rate, percentage change in GDP deflator



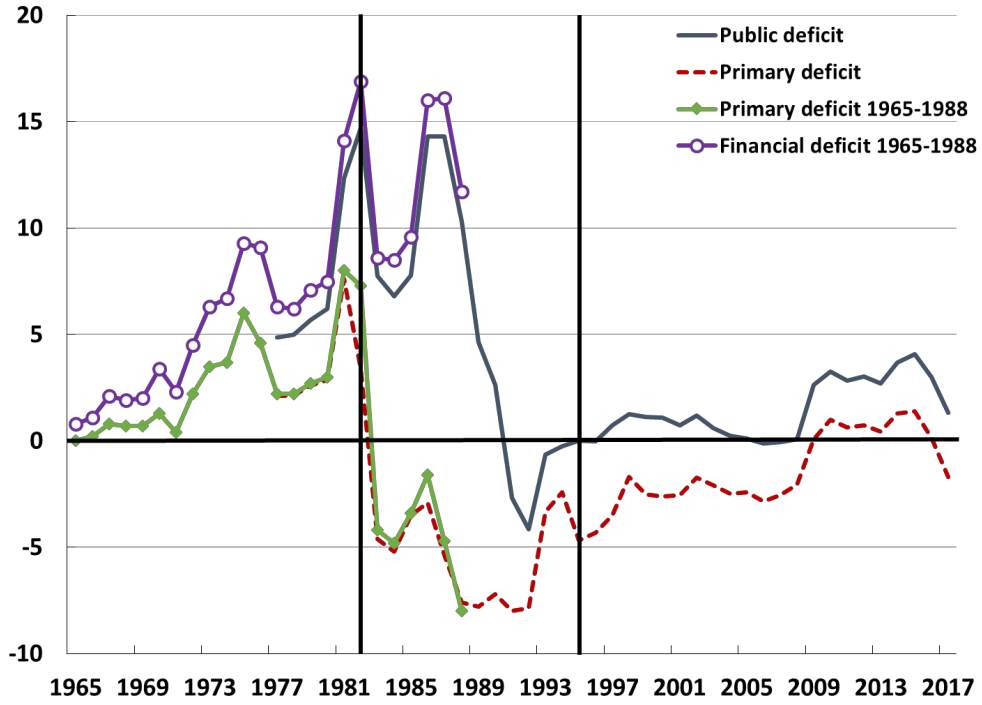
Sources: Author's calculations with data from INEGI.

Figure 2 shows another crucial variable for the Mexican economy, the annual inflation rate measured using the GDP deflator. Mexico had low inflation up to 1972, when the rate was 4.6 percent per year. Between 1973 and 1981, inflation increased to levels around 25 percent per year. Then, in 1982, the year of the debt crisis, the annual inflation rate jumped to 61.8 percent. In the second period, 1983–1994, there are two stages: first, Mexico had difficulties controlling inflation, as it reached its historical maximum of 142.8

[2]The Maddison Project Database shows that, up until the 1982 crisis, Mexico was catching up with the United States. Between 1960 and 1982, Mexican GDP per capita grew from 19 percent of US GDP per capita to 39 percent. After the 1982 debt crisis, Mexico started lagging behind the United States, with its GDP per capita falling to 23 percent of the US level in 1995. The Maddison Project Database shows Mexico catching up somewhat between 1995 and 2016, with its GDP per capita growing to 30 percent of the US level. The Maddison Project compares GDPs across countries using a common purchasing power parity price index, rather than calculating real GDPs in each country using a country-specific GDP deflator. Consequently, the comparisons do not exactly match those obtained by comparing growth rates of real GDP across countries.

percent in 1987; then inflation fell steadily, reaching 8.5 percent in 1994. In fact, except for the transitory impact of the 1994 crisis, inflation had a downward trend from 1988 until 2006. Between 2007 and 2016, inflation remained stable, having an average value of 4 percent per year. The data in figure 2 make the important point that Mexico has never had hyperinflation according to the classic Cagan definition of 50 percent per month.[3]

Figure 3. Different measures of the deficit of the public sector, percentage of GDP



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

Figure 3 reports several measures of the deficit of the public sector. "Public sector" is a broad definition of the government that includes the federal government plus other institutions such as the national oil company PEMEX.[4] "Financial deficit" is "public deficit" plus the financial intermediation deficit from development banks.

Mexico had a very small primary deficit up to 1971. In 1972 Mexico's primary deficit started to rapidly increase from less than 1 percent of GDP to 6 percent in 1975. This increase was financed with seigniorage and foreign debt. The growth in the deficit was not sustainable. Mexico devalued the peso in 1976 for the first time in twenty-two years. Afterward, there was a reduction and stabilization of the primary deficit to levels

[3] A monthly inflation rate of 50 percent, if maintained over a year, would imply an annual inflation rate of close to 13,000 percent.

[4] Data marked "1965–1988" come from the Finance Ministry of Mexico: Secretaría de Hacienda y Crédito Público (SHCP). The rest of the deficit data come from the Banco de México. The financial cost of the debt is called *costo financiero*.

close to 3 percent. In the late 1970s, Mexico discovered a giant oil field at the same time as the international oil price rose. These events led to a new increase in the primary deficit. In 1981 it reached its historical maximum of 8 percent. This increase was again financed with seigniorage and foreign debt. The new indebtedness was unsustainable and increasingly dependent on the government's ability to finance debt payments in foreign currency. Following devaluations in 1982, which made it increasingly difficult for Mexico to service its debt, the government declared it could not pay part of the debt, starting the debt crisis.

Between 1983 and 1994, Mexico made a substantial effort to reduce the burden of the debt: large primary surpluses started in 1983. Then the 1994 crisis hit the economy. This crisis was not preceded by large fiscal deficits. It happened after a large increase in one type of dollar-denominated debt. I will discuss theories and evidence later on. The reaction to the 1994 crisis and the clear goal of achieving macroeconomic stability led to primary surpluses between 1995 and 2008.

I analyze the monetary and fiscal history of Mexico using a model of the consolidated budget constraint of the Mexican government.[5] In the model, when government policy is characterized by fiscal dominance, a debt crisis that is preceded by an increase in the primary deficit is then followed by an increase in inflation and the monetary base. I document that this narrative fits the events around the 1982 crisis.[6]

This fiscal dominance narrative does not account for the 1994 crisis, as I also document that monetary dominance prevailed after important changes in 1993. One important factor behind the crisis was the dollar-indexed tesobono debt. In late December 1994, the central bank had very few international reserves. On December 22, the government had to allow free floating, and the peso lost value. Investors refused to buy new issues of tesobonos, which had become the largest portion of government debt. The government had trouble financing debt that was increasing due to currency depreciations.

Analyzing fiscal and monetary policy around 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, the target of the central bank (+/−1 percentage point). On the fiscal side, I observe a

[5] This includes both the Treasury and the central bank.
[6] Throughout the paper, I measure inflation using the growth rate of the GDP deflator, unless stated otherwise.

change in the downward trend of the total debt ratio, as it fell between the 1980s and 2009, the year in which it started to grow steadily until 2016.

2. Measurement: model and data

The model is a version of that in Kehoe, Nicolini, and Sargent (2018). The budget constraint comes from consolidating the budget constraints of the fiscal branch of the government, the Treasury, and 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 include the international reserves of the central bank because reserves are an asset for the consolidated government. The reason for doing so is that the model includes foreign debt; therefore, for consistency, one should consider the role of international reserves as an asset.[7] In the 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 legally specified, transfers resources to the Treasury. This is the *Remanente de Operación de Banco de México*.

I add to the Treasury's resources the revenue from oil. I make this addition because of the importance of PEMEX, Mexico's national oil company, for public finances. In 1938 the Mexican oil industry was nationalized, and PEMEX was granted a monopoly on all activities related to the oil industry: exploration, extraction, exporting, refining, distribution, and sales to consumers.[8] Mexico became a large exporter of oil in the late 1970s after an increase in the international oil price and the discovery of a giant oil field. These exports provided a cash flow to PEMEX. The Mexican Treasury has historically taxed PEMEX to obtain revenue from oil sales. PEMEX has historically provided a large fraction of all income of the public sector. In terms of the model, in an online appendix, I show how oil revenue is included in the basic budget constraint. I assume that the source of revenue is oil exports, excluding all other possible sources, such as domestic sales of

[7] The Treasury cannot use the international reserves of the central bank at its discretion; their inclusion in the same budget constraint is to be consistent with the accounting of assets and interest payments implied by the model.

[8] This changed with the energy reform of 2013. Today, foreign and domestic investments are allowed in the oil industry along the production and distribution chain. This is one of the major structural changes that has taken place in recent years. As of November 2018, there was uncertainty about whether the newly elected government would block the reform.

refined products like gasoline. For simplicity, I do not model the particulars of the different ways in which the federal government has taxed PEMEX over time.

Given these considerations, the consolidated budget constraint of the government is

$$B_t + E_t B_t^* + M_t = D_t + T_t + (1 + r_{t-1})B_{t-1} + E_t(1 + r_{t-1}^*)B_{t-1}^* + M_{t-1}\,,$$

where B_t is the stock of domestic debt, B_t^* is the stock of foreign debt net of international reserves, D_t is the primary deficit of the consolidated government, M_t is the monetary base, E_t is the pesos per dollar nominal exchange rate, T_t are transfers, and the two kinds of debt have their respective nominal interest rates.

The fiscal and monetary branches of the government have two possible arrangements. One is fiscal dominance, in which case 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 case it is the Treasury, rather than the central bank, that adjusts in times of crisis.[9]

In the data analysis, I work 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; and the national social security institute, IMSS. Since the 1980s, the government has compiled statistics for the public sector. I describe its components based on SHCP (2010).[10] Table 1 shows a summary of the structure of the public sector. 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 nonfinancial 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 that are more relevant in terms of revenue and spending.[11]

Table 1. Summary of Components of the Public Sector

A. Public sector of direct budget control	B. Public sector of indirect budget control

[9] I exclude debt indexed to inflation from the model because the raw data I use do not report it separately. Indexed debt has been issued by the Treasury in the past, and today it sells udibonos. In the data, this kind of debt is included in domestic debt.
[10] In particular, see p. 9.
[11] In 2013, as part of the energy reform that allowed the private foreign and domestic sectors to participate in the energy industry, PEMEX and CFE were assigned to the category Empresas Productivas del Estado.

A.1 Federal government	A.2 Government enterprises and organizations of direct budget control	Government enterprises and organizations of indirect budget control
	PEMEX CFE IMSS ISSSTE	B.1 Development banks B.2 Nonfinancial

Source: SHCP (2010).

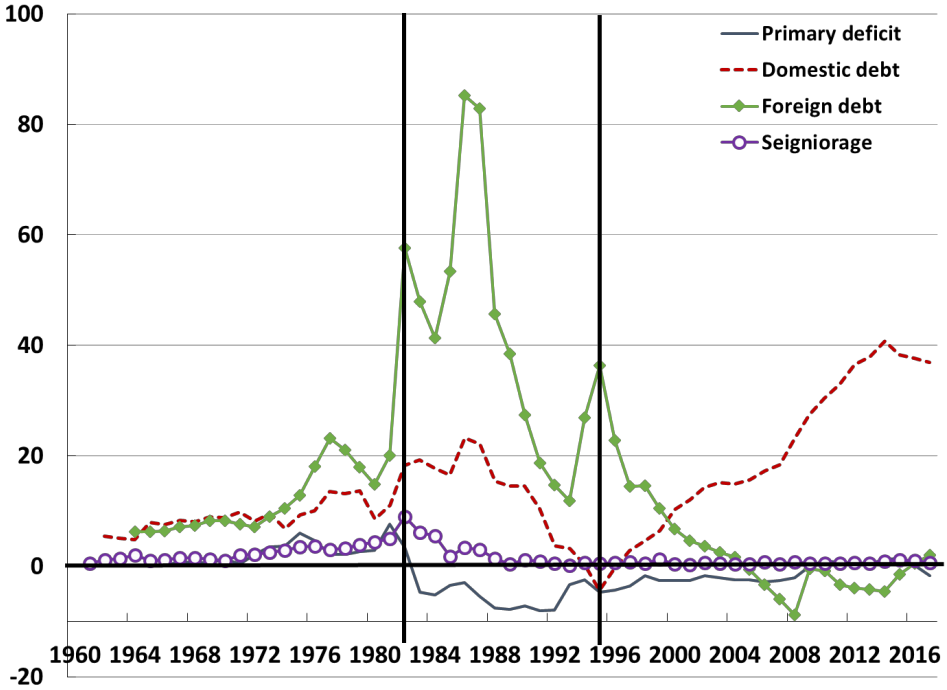
To carry out the analysis, I choose three periods. The first one runs from 1960 to 1982, the year of the debt crisis. The second starts in 1982 and ends with the crisis in 1994–1995. The third starts in 1995 and ends in 2017. I chose these periods based on the mechanism of the theoretical model. If the deficit plus transfers are larger than the sum of seigniorage and oil revenue, the consolidated government will 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. The last period, 1995–2017, includes the response to the 1994 crisis, as well as important changes in fiscal and monetary policy. It includes the impact of and the response to the international financial crisis. It also shows a change in the behavior of the debt-to-GDP ratio, which had fallen and remained stable for many years until it started growing in 2009.

3. 1960–1982: rapid growth and monetary expansion

Figure 4 shows the evolution of the consolidated budget constraint of the government. The primary deficit was close to zero in 1966. The period started with relatively low and stable levels of debt, but the fiscal situation deteriorated toward the second half of the 1970s. It would become even worse in the early 1980s. When computing seigniorage, I use the monetary base.[12] I focus the discussion on the last two presidential terms, 1970–1976 and 1976–1982, as those are the years for which I have more data. My main historical reference is Cárdenas (2015).

Figure 4. Fiscal and monetary variables, 1960–2017, percentage of GDP

[12] I constructed a historical time series for the monetary base using INEGI and Banco de México data. In the online appendix, I compare seigniorage and the inflation tax implied by the series I constructed and the ones using only Banco de México data. The conclusion is that seigniorage is basically the same. The inflation tax does show a difference for some years.



Sources: For 1961–1979, author's calculations with data from Banco de México, INEGI, SHCP, and Gurría (1993). For 1980–2017, calculations with data from Banco de México and INEGI. The falls in domestic and public debt ratios 1979–1980 come from joining the two data sets.

During the presidential term of Gustavo Díaz Ordaz, 1964–1970, primary deficits were close to zero. There was an increase in the primary deficit to 1.3 percent of GDP in 1970, which was the last year he was in power.

The beginning of the term of Luis Echeverría, 1970–1976, showed the first signs of instability. The peso suffered a devaluation in 1976 for the first time in twenty-two years. This crisis is an example of a first-generation balance of payments crisis. The government increased spending. This spending was financed with foreign resources and via money creation by the Banco de México. The growth of money was inconsistent with a fixed exchange rate, and therefore a crisis developed.

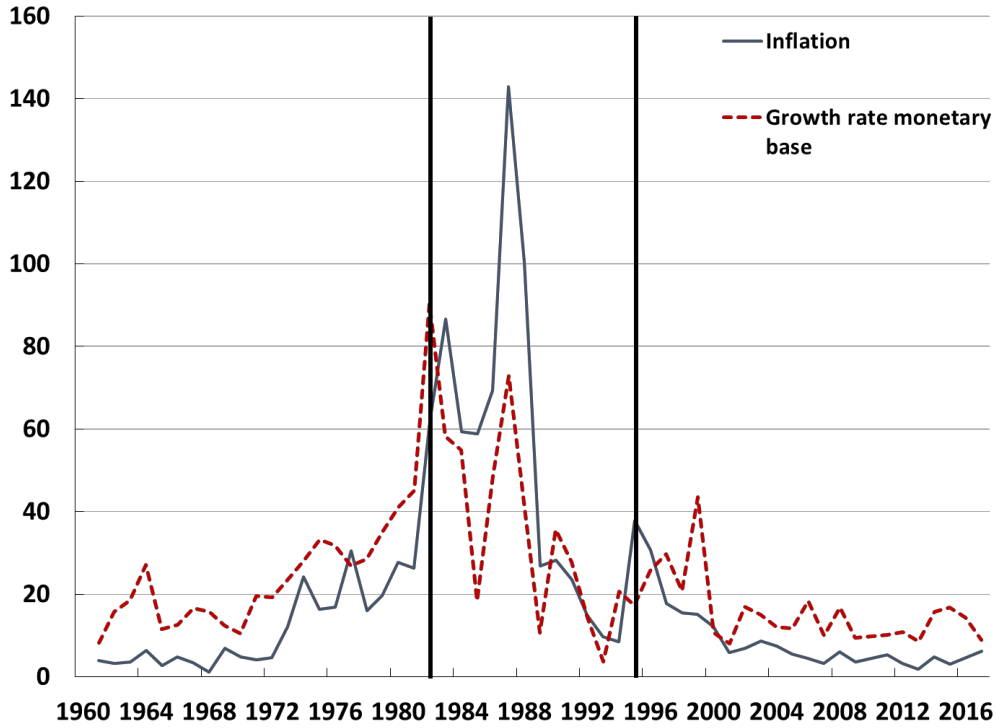
The year 1971 was one of low economic activity. President Echeverría decided to use public spending to stimulate growth. The economic team of the president opposed the large expansion, leading to the dismissal of the secretario de hacienda, Hugo B. Margaín. He was replaced by José López Portillo, who also used government spending as an instrument for growth when he became president in 1976. The deficit-to-GDP ratio went from 2.5 percent in 1971 to 4.9 percent in 1972.

The path to the crisis started in 1972, when the primary deficit ratio increased, as shown in figure 4. There was a large increase in government consumption and public investment. The government bought private firms that had gone bankrupt or had financial

problems. This policy of rescuing failing firms was a continuation from the 1960s, and by 1975, these firms, known as *empresas paraestatales*, had grown in number and industry scope. International financial markets went through important changes in the 1970s, including the collapse of the Bretton Woods system in the first years of that decade.[13] The peso had had a fixed nominal exchange rate with the dollar since 1954. The government borrowed in international markets to pay for the deficit, and there was an increase in the debt-to-GDP ratio. Figure 4 shows that the primary deficit reached 6 percent of GDP in 1975, the highest value in the sample before 1981. In 1976, the government was unable to keep the exchange rate fixed. It went from 12.5 pesos per dollar in August to 19.4 in September, a devaluation of 55.2 percent. On the monetary side, figure 4 shows a positive trend in seigniorage between 1970 and 1976, after having an average stationary value of approximately 2 percent of GDP from 1961 to 1969. In terms of the impact on prices, inflation and the growth rate of the monetary base had a correlation of 71.8 percent between 1961 and 1977, as shown in figure 5. Inflation jumped from 4.6 percent to 12.1 percent; the growth rate of the monetary base increased from 19.2 percent to 23.6 percent.

[13] Mexico participated in the Bretton Woods Conference in 1944.

Figure 5. Inflation and growth rate of monetary base (%)



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

Between 1960 and 1973, there was a roughly stationary current account deficit of 2.1 percent of GDP on average. In 1975 this deficit reached 4.5 percent and rapidly contracted to 1.8 percent in 1976. Even though the current account does not reverse its sign, it is clear that there was a large adjustment. The economy could not attract the capital flows necessary to maintain its level of expenditure. In 1977 real GDP per capita fell 4.1 percent below trend.[14]

3.1. 1973 oil crisis and Mexico as a net exporter of oil

One event was a key driver of Mexico becoming a net exporter of oil: the oil crisis of 1973. By 1968 Mexico had stopped exporting oil, limiting extraction to satisfy domestic demand. The oil embargo in 1973 generated a 70 percent increase in the international price to 5.1 dollars per barrel (dpb). In 1974 the price reached 12.0 dpb, at which point Mexico started exporting oil again. It is important to recall that the oil industry had been under control of the government since 1938, when it was nationalized by President Lázaro Cárdenas. The effect the international oil crisis had on Mexico was that it incentivized PEMEX to start exporting again.

[14] I show this in the online appendix.

3.2. Building up to the 1982 debt crisis

The 1982 debt crisis occurred in the final year of President José López Portillo's term. A crucial event during his term was the discovery of the massive oil field Cantarell in 1976. Proven oil reserves increased 151.2 percent between 1977 and 1978. Oil extraction started in 1979, and the government decided to invest in the infrastructure of the oil industry. Mexican oil exports grew very rapidly until 1982. To interpret this event in terms of a simple dynamic model, the discovery of Cantarell increased the permanent income of the economy, which caused an increase in foreign borrowing.[15] That is exactly what the Mexican government did.[16]

Other features of these years include an expansion of investment in health and 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." The increase in oil reserves was seen as leading to a boom in the Mexican economy. However, the opposite occurred. 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 percent of GDP in 1978 to 40.6 percent in 1981. Out of those approximately 10 percentage points, 7.3 came from increasing non-oil industry-related spending.

Figure 4 shows that the primary deficit increased to 7.6 percent of GDP in 1981. The figure also shows a substantial increase in borrowing prior to the 1982 crisis, particularly in foreign debt. In 1982 this administration would default on payments to the principal of foreign debt, though it would still pay interest. The government blamed Mexican banks for the capital leaving Mexico and chose to take control of them. Banks were nationalized toward the end of the presidential term of López Portillo. For approximately nine years, banks would be managed by the government.

[15] Arezki, Ramey, and Sheng (2016) document the effects of "giant" oil field discoveries on several macroeconomic variables in small open economies. They find that borrowing, consumption, and investment rapidly increase following an oil or gas field discovery, which was also the case for Mexico in 1977.

[16] In terms of theory, my framework is the dynamic endowment economy in Ljungqvist and Sargent (2004), chapter 10. The comments received from Manuel Ramos-Francia led me to analyze this episode with this tool.

4. 1982–1995: crisis and reform

The year 1982 saw large increases in the fiscal deficit and current account deficit. Interest rates in the United States had increased because of contractionary monetary policy. International banks reduced the amount of lending and shortened the maturity of loans. The oil price fell. Oil exports were a very important source of revenue for the government; therefore, this fall caused a further deterioration in public finances. The lack of fiscal adjustment led to expectations of devaluation and capital outflows. New debt could only be obtained at shorter maturities.

In 1982 the international reserves of the Banco de México had reached a low level. On February 5, President López Portillo gave a speech, promising to defend the value of the peso. On February 17, the peso suffered a devaluation of 80 percent. Afterward, unions demanded wage increases, which were implemented. There was no fiscal adjustment because 1982 was a year of presidential elections. During the first half of 1982, foreign short-term debt grew by 20 billion US dollars. International banks made lending more and more restrictive. After receiving a loan on June 30 from a group of international banks, Mexico suffered a total lack of access to more credit. 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. On August 20, the secretario de hacienda (secretary of the Treasury), 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. A moratorium was negotiated with international banks, and interest payments continued. The stock of foreign debt reached a level of $84 billion, of which 68.4 percent was public, 21.8 percent was private (excluding banks), and 9.7 percent was bank debt.

In summary, two external shocks severely deteriorated the fiscal and external balances in Mexico. One was the higher level of interest rates in the United States, which increased the opportunity cost of lending to Mexico. The other was the fall in the oil price, which was a crucial source of revenue for the government, in particular to make debt payments in dollars. The fiscal deficit increased, and in 1982 the government had to devalue the peso. Looking at yearly average data, the cumulative devaluation was 266 percent 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 continue making interest payments, having negotiated a moratorium on payments of principal of foreign debt. The foreign debt-to-GPD ratio increased from 20.1 percent in

1981 to 57.6 percent in 1982. The moratorium lasted until successive rounds of renegotiation of the principal post-1982.

I consider a third factor as the cause of the crisis: the lack of financial planning by the government. There was no guarantee in 1980 that the oil price would remain high or that international interest rates would remain low. The economy did suffer two very important exogenous shocks, but the lack of anticipation and financial planning contributed to making the situation much worse. This myopic behavior managing public finances, in particular the growth of the primary deficit, set the stage for the external shocks to trigger the 1982 crisis.

4.1. Causes of 1982 crisis

Throughout 1970–1982, the Banco de México was controlled by the government. There were episodes in 1972 and in 1981 in which the Banco de México expanded the monetary base to finance growing deficits.

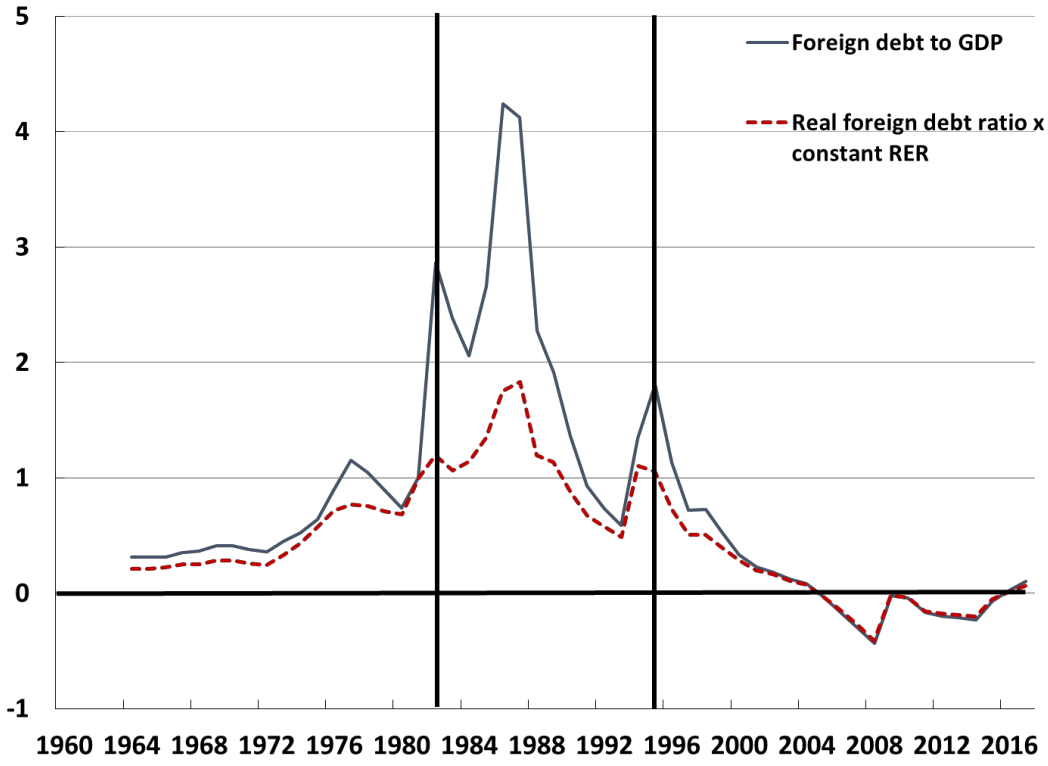
A prediction of the model is that, when there is fiscal dominance, the debt-to-GDP ratio increases when seigniorage is not enough to finance the primary deficit. Between 1965 and 1973, the domestic and foreign debt ratios were roughly constant. This is consistent with the fact that seigniorage was approximately equal to the primary deficit. In 1975 there was a spike in the primary deficit, as it jumped to 6 percent of GDP. At the same time, it became larger than seigniorage. The government had to issue more debt, leading to an increase first in the foreign debt ratio to 12.9 percent, and in the subsequent years in the domestic debt ratio. Before 1980 the maximum values of the foreign and domestic ratios were 23.1 percent and 13.6 percent in 1977, respectively. Between 1977 and 1979, there was an effort to *reduce* the growth of the debt ratios. The primary deficit ratio had a smaller value of 2.2 percent in 1977. Additionally, seigniorage became larger than the primary deficit, reaching a value of 3.9 percent in 1979. The debt ratios stopped growing. In 1979 the foreign debt ratio actually fell to 17.9 percent, and the domestic debt ratio stabilized around 13.7 percent.

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

4.2. Devaluation and spikes in the foreign debt-to-GDP ratio

An important force behind the increase in the foreign debt-to-GDP ratio was the large devaluation of the peso in 1982. Figure 6 shows the ratio of foreign debt to GDP fixing the nominal exchange rate to its 1981 value. The main source of the increase in the foreign debt ratio in 1982 is the devaluation of the peso. The story is different for the large increase in 1986. There is a sizable jump in the foreign debt ratio even when I keep the real exchange rate constant. This is also the case for 1994.

Figure 6. Decomposition of foreign debt-to-GDP ratio keeping real exchange rate fixed at its 1981 value, index 1981=1



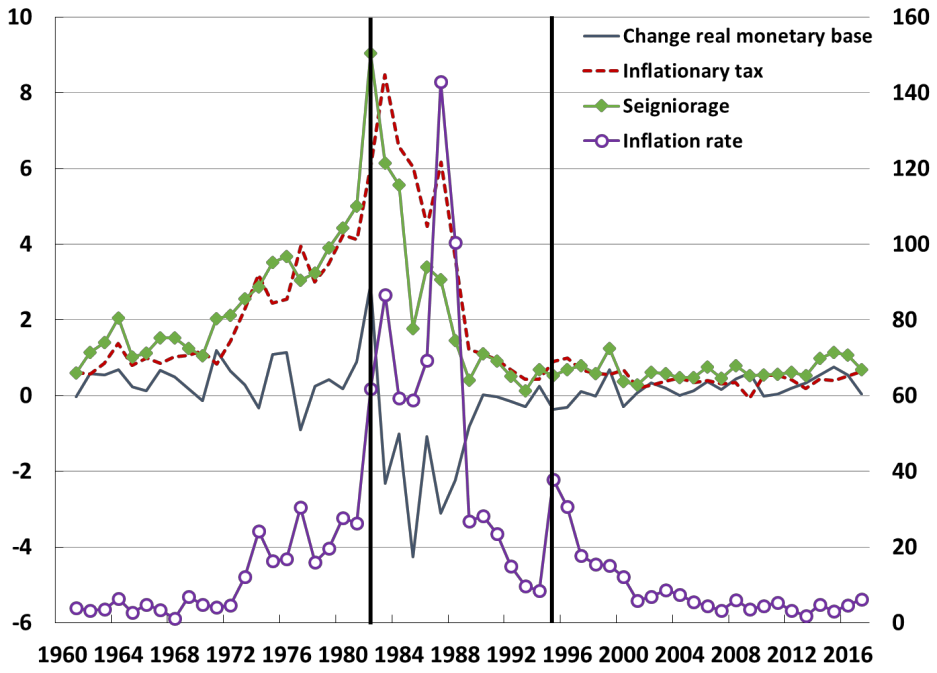
Sources: Author's calculations with data from Banco de México and INEGI.

Zooming in on 1982 by looking at monthly average data, most of the increase in the foreign debt-to-GDP ratio was the result of devaluations in February, March, August, and December. I computed the *cumulative* devaluation during 1982 with respect to December 1981. With this metric, in February the devaluation was 24 percent. By March it was 75 percent. The peso stayed roughly constant for several months until August, when another devaluation brought the cumulative figure to 167 percent. The peso again stayed roughly constant until December, when the cumulative devaluation increased to 210 percent.

4.3. Inflation and inflation tax

The consequences of the debt crisis parallel the predictions of the model regarding seigniorage. Figure 7 plots the inflation rate and the inflation tax. There was a large increase in inflation and the inflation tax between 1981 and 1983. Inflation went from 26.3 percent to 86.6 percent. The inflation tax as a percentage of GDP went from 4.1 to 8.5.[17] Figure 7 shows a strong correlation between inflation and the inflation tax between 1977 and 2000. After 2000 both series become very stable, take low values, and show a smaller correlation.[18]

Figure 7. Change in real monetary base demand, inflationary tax, and seigniorage, as percentage of GDP, and inflation rate in percentage



Sources: Constructed with data from Banco de México and INEGI. Inflation rate measured on right axis.

4.4. Oil price and US interest rates

[17] Aspe (1993) also reports an increase in the inflation tax in the beginning of the 1980s.
[18] I also calculated a monthly inflation tax *rate* and describe its behavior in the online appendix. In general, it increases in the same years as the inflation tax *revenue* reported here.

Measuring the contribution to the crisis of the two external shocks considered in this section is beyond the scope of this chapter; however, I argue that both are important factors and that both were likely contributing factors.[19]

Large falls in the price of oil took place between 1981 and 1982. The percentage yearly change in January 1982 was −14 percent, followed by −15 percent in February. Such falls put pressure on public finances.

If we use the model as a guide, the oil price that appears in the budget constraint is the *real* price.[20] Between 1980 and 1981, this price fell by approximately 10 percent. Between 1981 and 1982, this price increased. It did so because even though the dollar price fell, the exchange rate had a very large devaluation in 1982, and the domestic price level did not increase as rapidly. The fall in the international oil price in 1982 reduced the income *in dollars* of the Mexican government, therefore reducing its ability to repay foreign debt.

It is well known that oil revenue is very important for Mexican public finances. I compared the primary deficit to its value excluding oil revenue. The conclusion was that clearly oil revenue is a large contributor to having lower deficits and achieving surpluses. Focusing on the 1977–1982 period, we can see that the deficit would have been much 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 1977–2017, attaining a value of 15 percent of GDP in 1981.[21]

US interest rates rose to historically high values and were very volatile between 1978 and 1982. These high and volatile rates were the result of tighter monetary policy to reduce inflation in the United States. The largest absolute yearly increase in interest rates took place between June 1980 and June 1981, when the rate went from 7.1 percent to 14.7 percent. The large increase in interest rates, especially during 1981, increased the cost of external funding for Mexico.

I calculate real interest rates by subtracting one of two measures of expected yearly inflation from nominal interest rates: inflation in the previous twelve months and inflation twelve months ahead. The message is the same: real interest rates in the United States jumped from values of 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

[19] Almeida et al. (2018) analyze the role of US interest rates using a quantitative sovereign debt model.
[20] By *real* I mean the international price in dollars multiplied by the exchange rate, then divided by the Mexican price index.
[21] In the online appendix, I show that the average value of oil revenue to total revenue of the public sector is 31 percent for 1977–2016.

are the highest between 1960 and 2017. This increase in the real opportunity cost of investing in Mexico put pressure on the ability to repay and roll over foreign debt.[22]

4.5. Political factors in the 1982 crisis

The same political party, the PRI, Partido Revolucionario Institucional, ruled Mexico from the late 1920s until 2000. Each president handpicked his successor, who was part of the administration. There was little uncertainty about the characteristics of the newcomer. From 1976 to 1994, however, an economic crisis developed at the end of each presidential term. As mentioned earlier, 1976 was the year in which the peso was devalued after twenty-two years of being fixed. In 1982 Mexico suffered a debt crisis, and in 1994 it entered another crisis. In 1988 there was no large crisis, but there was a large devaluation of the peso in 1987.

In the case of the 1982 crisis, even though President López Portillo handpicked his successor, Miguel de la Madrid, the process was not exempt from political turmoil, particularly regarding the public deficit. The key participants in 1981 were Miguel de la Madrid, who was the *secretario* of the Secretaría de Programación y Presupuesto (SPP); David Ibarra Muñoz, who was in charge of the SHCP; José Andrés de Oteyza, who led the Secretaría de Patrimonio y Fomento Industrial (SEPAFIN); and Gustavo Romero Kolbeck, who was director general of the Banco de México. The issues were the following. First, the SPP reported a deficit of 9 percent of GDP, whereas the SHCP calculated 12 percent. Second, there was disagreement on the reduction of the deficit. The SHCP and the Banco de México wanted to reduce its growth. The SEPAFIN opposed. Third, there was disagreement on whether Mexico should devalue the peso. The SHCP and the Banco de México wanted to devalue to reduce the current account deficit. The SEPAFIN opposed, proposing instead restricting imports of consumption goods. The SPP mediated between the two sides. There was competition between these officials to become the presidential candidate of the PRI; my hypothesis is that this motivated the group to decide not to adjust the deficit since it would have been an unpopular decision. The exchange rate remained fixed. Restrictions on imports were imposed to reduce the current account deficit. This politically motivated reluctance to reduce the deficit likely contributed to the origin of the 1982 crisis.

[22] Notice that this rough calculation is not an exact match to the real interest rate that appears in the budget constraint. Having said that, given the sharp increase in the nominal interest rate, I would expect the real interest rate that is consistent with the model to increase post-1980.

4.6. Economic reforms post-1982

Part of the response of the government to the 1982 debt crisis was a sequence of primary surpluses. The presidential term of de la Madrid started in late 1982 and ended in 1988. Figure 4 shows that the government responded with a primary surplus of 4.6 percent of GDP in 1983 and an even larger one the following year. In fact, Mexico had primary surpluses throughout the entire period under analysis, 1982–1994. Another crucial part of the response was the control of inflation, although this goal was difficult to accomplish. Figure 7 shows a high and volatile inflation rate during 1982–1988. The inflation rate in 1987 was 142.8 percent.

Figure 4 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. 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 percent of GDP in 1982 to 1.5 percent by 1988, is consistent with the goal of reducing inflation. A government can obtain revenue through seigniorage, at the cost of increasing inflation.

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 business owners committed to reducing price increases and increasing productivity. This *pacto* had limited success, as inflation was 100 percent in 1988.

Fiscal stability and the control of inflation were goals of the 1988–1994 administration of Carlos Salinas. Figure 4 shows that the sequence of primary surpluses continued until 1994. 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 7 shows a large fall in inflation in 1989 to 26.8 percent, and a value of 8.5 percent in 1994. The previously mentioned trends in debt ratios and seigniorage are even clearer in these years.

Figure 4 shows the debt ratios falling almost continuously. It also shows seigniorage taking values under 1 percent 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 business owners.

The Salinas administration had two other important features. The first one was a continuation of the process of opening the economy to the rest of the world, which started in 1986 when Mexico joined the General Agreement on Trade and Tariffs. Under President Salinas, Mexico signed the North American Free Trade Agreement (NAFTA) with the United States and Canada, which went 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 discussed in Kehoe and Meza (2011), the renegotiation of Mexican debt started in 1989. Negotiations with Mexico's creditors were successful, and in 1989 the United States announced the Brady Plan, which allowed Mexico and other countries to return to international financial markets.

4.7. Independence of the Banco de México

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 credit. In 1993 the Banco de México Law was signed, specifying the rules under which it would relate to the government.[23] 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 the goal of reducing inflation.

5. 1994 crisis

During 1994, several political and economic 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

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

presidential candidate, Luis Donaldo Colosio, was murdered. Large capital outflows took place that put pressure on the exchange rate regime, which consisted of a predetermined band inside which the peso was allowed to fluctuate. Toward 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.

During 1994 the government issued a growing amount of short-term debt with nominal value indexed in dollars and payable in pesos. Known as 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.

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 had difficulties rolling 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 percent and 10 percent, respectively.

The 1994 crisis was not caused by accumulated deficits; as figure 4 shows, the surplus was 2.4 percent of GDP. An important factor behind the crisis was the tesobono debt. At the end of December 1994, the government lacked the ability to service this debt. The cause of this lack of ability was the large decrease in the stock of international reserves. In turn, this decrease was driven in part by the exchange rate regime.

In the following subsection, I discuss complementary theories regarding expected future fiscal deficits. In the online appendix, I summarize alternative forces discussed in previous important texts on the 1994 crisis written by Cárdenas (2015), Gil-Díaz and Carstens (1996), Gil-Díaz (1998), Kehoe (1995), and Serra Puche (2011). This list is not exhaustive, as this crisis led to a large amount of research on its origins. A paper that expected difficult times for the Mexican economy was Dornbusch and Werner (1994). A seminal paper on understanding the origins of the 1994 crisis is Calvo and Mendoza (1996), which analyzes the mismatch between short-term debt and international reserves.

5.1. Theories based on the banking sector

One theory is that the crisis happened because of *prospective deficits*. The existence of implicit bailout guarantees to failing banking systems and the expectation that at least part of the bailout would be financed by seigniorage could have led to a collapse of the

exchange rate. Burnside, Eichenbaum, and Rebelo (2001) propose this theory to account for the 1997 Asian financial crisis. I would call this a classic, first-generation explanation for a balance of payments crisis. A second theory is that the crisis was *banking system self-fulfilling*, that is, not based on public debt but on the characteristics of the liabilities of the banking system. In this theory, if banks had liabilities in dollars, a devaluation of the peso would hurt their balances. Assuming a bailout guarantee, the cost of rescuing the banks would reduce the ability of the government to defend the exchange rate regime. This sketch of a model would be an example of a third-generation explanation of a balance of payments crisis, in which the interaction between the financial system and the bailout guarantee of the government plays a crucial role.

As mentioned earlier, banks were nationalized in 1982. As part of the reforms during the term of President Salinas, banks were privatized. This happened between 1991 and 1992. At the same time, the financial system was liberalized, allowing for foreign capital flows. By 1994 three phenomena had taken place. The first was a large increase in the foreign short-term debt of the banking system. It increased from $8.6 billion in 1988 to $24.8 billion in 1994, as mentioned in Gil-Díaz and Carstens (1996). Banks had a large exposure to exchange rate risk. Second, there was a large expansion of credit. From 1988 to 1994, bank credit had increased on average at a yearly rate of 25 percent. Third, there was an increase in delinquency rates. Past due loans relative to total loans increased from 4.1 percent in 1991 to 7.3 percent in 1994.[24] The problem was larger than reported with such statistics, as official accounting considered as a past due loan only the amount that had not been paid and not the entire amount lent.

There was a bailout guarantee in 1994–1995. First, to be able to pay their debt in dollars, banks requested the Banco de México to act as a lender of last resort. The Banco de México created the Ventanilla de Liquidez, a mechanism through which it provided dollars to the banking system. It is important to note that the resources came from the financial aid provided by the United States and the International Monetary Fund. Second, Guillermo Ortiz, then secretario de hacienda in 1995, established three guiding principles. The financial system had to perceive determination from government authorities to solve the developing banking crisis. An additional principle was that the banking system was not going to be nationalized again, as in 1982. Finally, no saver should lose deposits. There was an implicit unlimited deposit insurance.

[24] See Cárdenas and Espinosa Rugarcía (2011), vol. 5, table I.67.

The principle that no saver should lose deposits prevailed before Ortiz became secretario de hacienda after December 1994. Ortiz's statement simply reinforced this idea. One important piece of evidence supporting this is the analysis of the banking crisis by Eduardo Fernández, who was president of the National Banking Commission in 1994. He oversaw the rescue of the banking sector from 1995 to 2000.[25] In 1990, the trust Fondo Bancario de Protección al Ahorro (Fobaproa) was established in the Banco de México with contributions from banks to provide deposit insurance. According to Fernández, the banking system worked under the assumption that the federal government would protect all liabilities. Cárdenas (2015) makes the same argument. Depositors assumed that deposits were fully insured by the government.

The bank bailout entailed a large fiscal cost. In the next section, I will provide some detail on how the government eventually became officially indebted because of the bank rescue. The debt the government issued was equal to 11.7 percent of GDP in 1999.[26] In 1998 the government, for the first time, asked Congress to approve the transformation of debt issued to rescue banks into public debt. The total cost has been estimated at 13.3 percent of GDP by adding to the previous number the cost during 1995–1998.[27]

Burnside, Eichenbaum, and Rebelo (2001) look for evidence in favor of their hypothesis by plotting the monetary base, M1 and M2, for several Asian countries after the 1997 crisis. They also calculate the ratios of monetary aggregates using the value in 1999 relative to the one in 1997. In their theory, there is no immediate increase in monetary aggregates after a crisis. The increase happens with a lag. In my opinion, these tests are weak. A stronger test is to compute seigniorage and its components, the inflationary tax and the change in real monetary base. I plot them in figure 7 relative to GDP. These are the empirical counterparts of theoretical variables in the consolidated budget constraint that I presented at the beginning.

There is some evidence in favor of the theory. According to it, seigniorage should increase with a lag. The value in 1995 is very similar to the one in 1994. The inflationary tax goes up, as inflation went from less than 10 percent in 1994 to almost 40 percent in 1995. At the same time, the change in the real monetary base is negative. Seigniorage does have a local peak in 1999, the value being 1.2 percent. At that point, it was the

[25] See his chapter in Espinosa Rugarcía and Cárdenas (2011), vol. 1.
[26] See Cárdenas and Espinosa Rugarcía (2011), vol. 5, table II.18.
[27] Figure 4 shows that there is a small increase in the domestic debt-to-GDP ratio from 4.6 percent in 1998 to 6.4 percent in 1999. Recall that the data plotted in that figure are debt consolidated with the Banco de México. In the online appendix, I compare debt statistics that exclude or include this financial support, and without consolidation. Debt is significantly higher when this support is considered.

highest value since 1988. After 1999 it falls to persistently low levels.[28] The peak is due to an increase in the change of the real monetary base, not to an increase in the inflationary tax. To finish this discussion, more work is needed to disentangle whether there is strong evidence in favor of the prospective deficits theory. A specific model has to be chosen to test the predictions of a banking system self-fulfilling crisis.

5.2. The role of international interest rates

The US Treasury bill rate rose throughout 1994. The yearly absolute changes in interest rates grew during the year. This accelerated increase put pressure on public finances and was a contributor to generating the crisis.[29]

5.3. 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. I argue that the fact that in 1994–1995 fiscal and monetary policies were procyclical indicates monetary dominance.

The primary surplus increased from 2.4 percent of GDP in 1994 to 4.7 percent in 1995, as figure 4 shows. Additionally, the value-added tax was increased from 10 to 15 percent in early 1995. There was an increase in government-controlled prices. Real government consumption per working-age person fell 3.9 percent.[30]

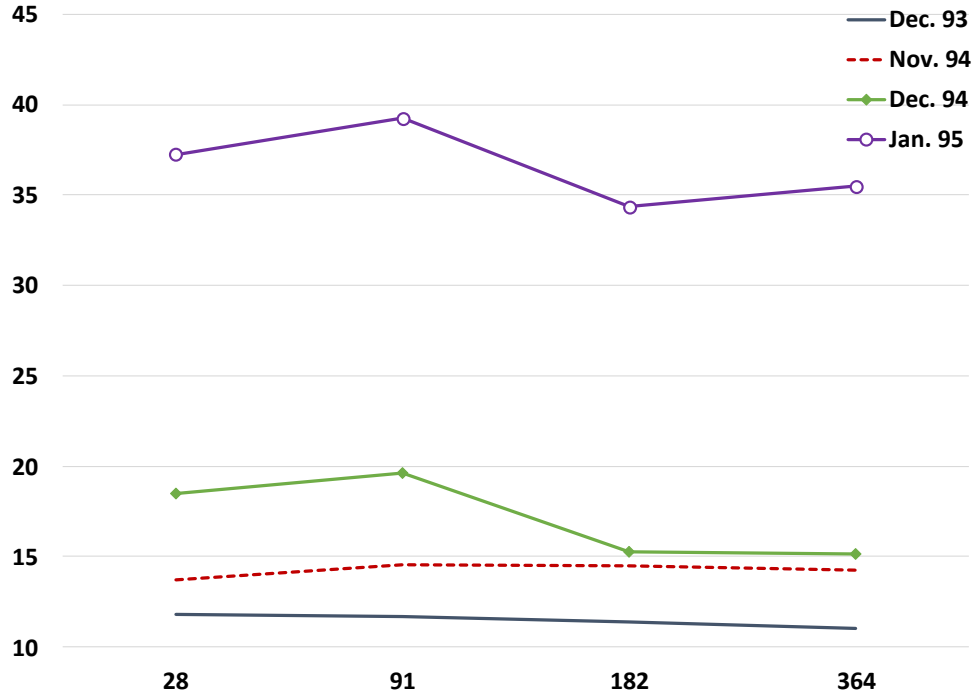
Monetary policy was focused on reducing inflation. According to Ramos-Francia and Torres García (2005), who provide details on the implementation of that goal, the objective of the central bank was to reduce inflationary pressures and prevent fiscal dominance. The devaluation of the peso at the end of 1994 and the beginning of 1995 slowed convergence to low inflation. Nevertheless, the constitutional change of 1993 led Mexico from fiscal dominance and high inflation in the 1980s to central bank independence and low levels of inflation in 2016.

5.4. Market perception of monetary dominance in 1995

There is evidence that, despite the crisis, inflation expectations did not increase. Figure 8 shows the term structure of interest rates around the crisis. Interest rates for short-term debt increased more than those for longer maturity bonds.

[28] The behavior changes at the end of the sample.
[29] I also looked at the oil price and found that it played no role in explaining the crisis.
[30] The contribution to the fall in GDP of some of these changes in policy is quantified in Meza (2008).

Figure 8. Nominal interest rates of *certificados de la tesorería de la federación* (CETEs), in percentages, at maturities of 28, 91, 182, and 364 days



Source: Banco de México.

This behavior of the yield curve before and after December 1994 shows that markets expected inflation to rise in the short term and be lower in the medium term. This is consistent with expectations that public finances would not resort to credit from the central bank and that monetary dominance would prevail.

The evidence presented above supports the hypothesis that a structural change happened in Mexico as monetary dominance prevailed after 1994. It is true that there was an increase in monetary variables in 1999. For future research, it is important to look at the sources of this increase in the monetary base, in particular the changes in the components of credit of the central bank. Having said that, given the downward trend in inflation that started in 1996 and led to a low and stable process, I argue that monetary dominance has prevailed in Mexico.

6. 1995–2016: slow growth and macroeconomic stability

The main goal of the post-1994 policymakers 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 stability was an important goal throughout two presidential terms, with presidents who came from different parties, the PRI and the PAN

(Partido Acción Nacional). President Fox, from PAN, was the first opposition winner of a presidential election.

An important change took place during the presidential term of Felipe Calderón (2006–2012, PAN) as Mexico reacted to the international financial crisis with expansionary fiscal policy. Finally, the first four years of the term of Enrique Peña (2012–2016, PRI) showed a persistent increase in the debt-to-GDP ratio.

6.1. Fiscal policy

Figure 4 shows two facts for the subperiod 1995–2008: a persistent primary surplus and a substitution from foreign to domestic debt. In 2000 the ratio of domestic debt surpassed that of the net foreign debt position for the first time since the 1970s. An important force behind the drop in the latter is the accumulation of international reserves by the central bank. 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. Ramos-Francia and Torres (2005) describe the policies leading to the 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 4. Starting in 1997 and until 2008, the ratio of total debt to GDP is below 20 percent. The fact that Mexico had primary surpluses since 1983 contributes to this drop.

Additionally, the ratio is stable when compared with its behavior in the two periods analyzed before. Switching from foreign to domestic debt over time 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. The spike in 1982 is correlated with the adjustment in Mexico's fixed exchange rate regime. Notice that 1995–2008 is not exempt from large events in international financial markets. There was the 1997 Asian crisis, the 1998 Russian crisis, and the dot-com crash of 2000–2002. The exchange rate was volatile during those events; however, the total debt ratio showed a much smaller variation compared with previous years.

6.2. The fiscal cost of the 1994 banking crisis

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.[31]

As mentioned earlier, in 1990 the trust Fobaproa was established to provide deposit insurance. At the beginning of 1995, high real interest rates produced an increase in past due loans. In 1995, the Programa de Capitalización y Compra de Cartera (PCCC) was created. Fobaproa cleaned up the assets of the banking system by buying loans; in exchange, bank owners provided new capital. The ratio was 2 pesos of loans per peso of capital. The loans were bought with promissory notes (*pagarés*) issued by Fobaproa and signed by the subsecretario de hacienda, the second highest ranking official in the SHCP, and by the tesorero de la federación, the official in charge of the financial management of the resources and assets of the federal government.

Fobaproa created several programs to provide financial support for different types of loans: credit to small and large firms, mortgages, credit to the agricultural sector, and credit to local governments, among others. In 1998 President Zedillo sent Congress an initiative to approve the recognition of Fobaproa debt, the promissory notes it issued, as public debt, which represented 15 percent of GDP. Political opposition was very strong. At the beginning of 1999, the Instituto para la Protección al Ahorro Bancario (IPAB) was created. Its goal was to complete the process of the bailout of the banking system. The IPAB assumed the liabilities created by the banking rescue. From a legal point of view, these liabilities were not public debt. In 2005, after a long legal process, the Fobaproa *pagarés* became public debt.

The debt originated by the rescue of banks and borrowers was 11.7 percent of GDP in 1999 and decreased steadily over time. In 2011 its value was 5.7 percent of GDP.[32] It is also important to say that this debt has been paid using three different sources: payoffs from loans bought from banks (as some bad loans produced payments), fees paid by banks, and government resources. The contributions from each of these sources have accumulated over time; 23.6 percent has come from loan payoffs, 15.8 percent from bank fees, and 60.6 percent from the government.[33]

6.3. The evolution of monetary policy

[31] The events regarding the rescue of the banking system after 1994 have been analyzed in exhaustive detail by Cárdenas and Espinosa Rugarcía (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.
[32] See Cárdenas and Espinosa Rugarcía (2011), vol. 5, table II.18.
[33] See Cárdenas and Espinosa Rugarcía (2011), vol. 5, table II.17.

During the presidential term of Carlos Salinas, the nominal anchor was the nominal exchange rate; the regime was not a simple fixed exchange rate. The peso was allowed to fluctuate within a band, and monetary policy had to be consistent with the goal of keeping the peso within that band. When Mexico abandoned this exchange rate regime on 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 Spanish word 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 balance (over a given number of days) 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 cause one or more private banks to 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.

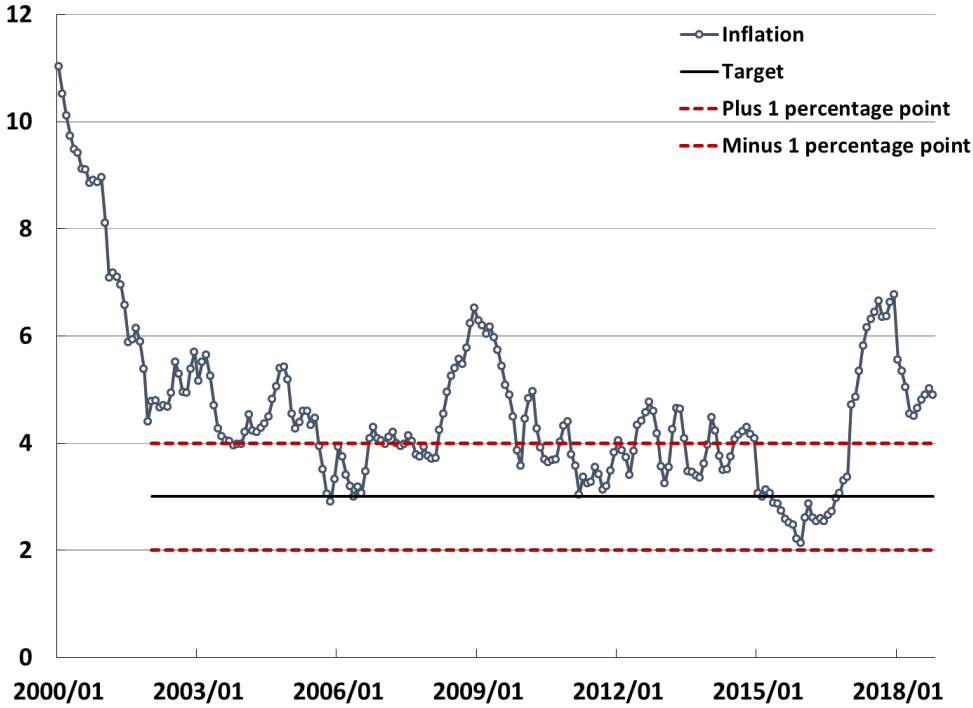
Starting in 1998, an important change in monetary policy was to provide more information to the public about decisions made by the central bank. Changes in the *Corto* target were discussed in official public documents, explaining the reasons behind them. This information strengthened the link between changes in the target and informing the public on the stance of monetary policy. In 1999 the Banco de México announced that the medium-term goal for inflation was convergence to external inflation by 2003. This goal turned out to be too ambitious. Below I will compare inflation to the target announced in 2002. 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. In 2001, the Banco de México announced it would implement an inflation-targeting regime. In 2002 the inflation target was announced: 3 percent annual inflation +/−1 percent. Since 2003, there exists an official public calendar of monetary policy decisions.[34] In 2005 the central bank started making policy announcements in terms of an interest rate. In 2008 the Banco de

[34] Ramos-Francia and Torres García (2005) provide more detail on the evolution of monetary policy up to 2003.

México announced that it substituted the *Corto* with having an operational target for the short-term interbank interest rate.

The persistent drop 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. Figure 9 plots inflation of the consumer price index, which is what the central bank targets, and the 3 percent target and its band. There was a sizable drop in inflation between 2000 and 2002. Also, inflation remained inside the band for most months starting in 2006. It is worth mentioning that having a target is not useful unless the central bank responds to increases in inflation, or in inflation expectations, by tightening monetary policy.

Figure 9. Annual consumer price index inflation versus inflation target with band, in percentages, monthly data



Source: INEGI.

6.4. Fiscal policy in response to the international financial crisis

The period 2009–2017 is one of primary deficits and increases in domestic debt. The first primary deficit took place in 2009. Deficits were persistent, reaching a maximum of 1.4 percent of GDP in 2015. There was a persistent increase in domestic debt, and at the same time, net foreign debt remained stable at values close to zero.[35] Total debt fell in the previous period. During 2009–2017 its behavior changes, showing a large increase in 2009 and a persistent positive trend afterward.

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 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 United States. One direct impact of the crisis in the United States was the drop in Mexican exports of durable goods. Kehoe

[35] Recall that this is a measure of consolidated debts and assets of the public sector and of the central bank, with international reserves generating a value close to zero.

and Meza (2011) report that Mexico was the Latin American country hit the hardest by the financial crisis because of its very close interaction with the United States. A specific goal of the government's response to the crisis was to increase investment in infrastructure. For more detail, see Banco de México (2009, 2010).

Two additional facts help to explain the increase in debt during this period. The first is the implementation of the reform to the Ley del ISSSTE. The ISSSTE is the institution that provides health and other services to workers in the public sector. This institution had a pay-as-you-go pension system that was running into a financial crisis. The federal government implemented a transition to a fully funded individual account system and took charge of the pensions of the older ISSSTE workers. This cost represented 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 deferred expenditure registry." 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 accounted for 8.8 percentage points of the total increase in debt of 12.5 percentage points of GDP between 2008 and 2009; thus, public deficit contributed, at most, 1.1 percentage points.[36]

To understand the reaction of financial markets to the increase in debt, I compare the Emerging Markets Bond Index spreads for Colombia, Mexico, and Peru. The comparison with other countries is important because Mexico and the rest of the world suffered the consequences of the international financial crisis of 2008. Therefore, it was not enough to look at Mexico to try to find evidence of a possible increase in the sovereign debt spread due to the increase in debt. The result is that there is no evidence of Mexico behaving much differently from Colombia or Peru in terms of the spreads during 2009 and 2010. There is a higher level of the Mexican spread relative to the other countries in 2012, but it is temporary. I interpret the data as saying that financial markets did not have a negative response in reaction to the increase in debt in Mexico.

Mexico showed a remarkable achievement generated by years of macroeconomic stability. Despite the increase in the government deficit, there was no negative reaction from markets. Fiscal policy evolved from relying on monetary policy during bad times in

[36] 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 Banxico.org, "Sistema de Información Económica," http://www.banxico.org.mx/SieInternet/consultarDirectorioInternetAction.do?sector=9&accion=consultarCuadro&idCuadro=CG7&locale=es.

the 1970s and early 1980s to having the flexibility of policy in developed countries. Having said that, in 2016–2017 the Mexican spread was several basis points above those of Colombia and Peru. This higher level is correlated with the persistent increase in the debt-to-GDP ratio of Mexico after 2009. In 2016, credit rating agencies announced a change in the perspective on Mexican debt, lowering it from stable to negative.

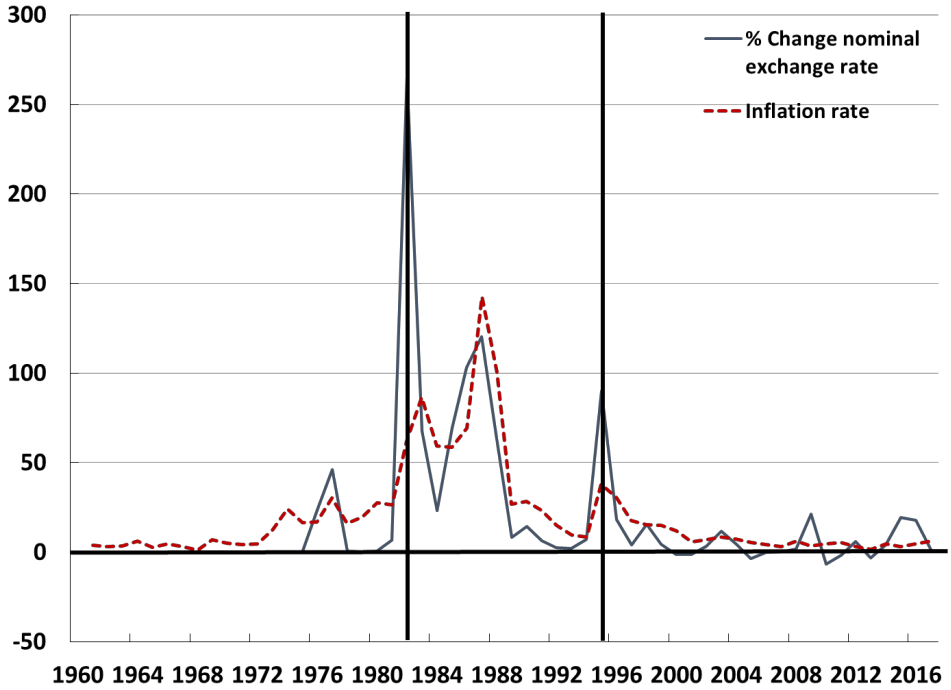
6.5. Inflation and the reduction in exchange rate pass-through

Inflation during this period remained mostly within the range targeted by Banco de México, as shown in figure 9. There is a deviation from this range in the aftermath of the 2008 financial crisis. Inflation increased to 6.5 percent at the end of 2008. Afterward, inflation went back to the previous range.

An important change during this period is the decline in the exchange rate pass-through. Figure 10 shows the percentage change in the nominal exchange rate and the inflation rate.[37] Between 1977 and 1994, there were large increases in inflation as the peso lost value in large devaluations. During 1995–2006, the correlation between the two variables seems to fall. During 2007–2016, it is clear that despite large changes in the nominal exchange rate, inflation has become much less volatile.

[37] Here I measure inflation calculated with the GDP deflator. The figure is similar if I use CPI inflation.

Figure 10. Change in nominal exchange rate in percentages, and inflation rate



Sources: Banco de México and INEGI.

Capistran, Ibarra-Ramírez, and Ramos-Francia (2011), and Kochen and Sámano (2016) do econometric estimations of pass-through in Mexico for the periods before and after the adoption of the inflation-targeting regime by the central bank and document its decrease after 2001. A simple statistic that indicates the fall in the pass-through is the correlation between inflation and the depreciation rate, which was 0.61 between 1976 and 2001 and close to zero, −0.04, between 2002 and 2017.

Another statistic that indicates the fall in the pass-through is the ratio of inflation to the depreciation rate in years of large depreciations. This ratio was 42 percent in 1995, 16.5 percent in 2009, and 16 percent in 2015. There were large depreciations in those years: 1995 is, of course, the year after December 1994 when Mexico had to float the peso; 2009 is the year in which the subprime crisis in the United States led to the international financial crisis; 2015, in December, was the first time the Federal Reserve increased interest rates in nine years. The pass-through was large in 1995, as the exchange rate market produced the new equilibrium value. It was much smaller in 2009, despite the historical magnitude of the international financial crisis. It was also much smaller in 2015, compared to 1995, when markets adjusted expecting an increase in US interest rates.

Here I use a Neo-Keynesian model as the one laid out in Urrutia (2017) to analyze the change in pass-through. In that model, an expansionary monetary shock produces a depreciation of the peso and an increase in inflation. Therefore, the model predicts a

certain pass-through after an expansionary monetary shock. The fact that the pass-through in Mexico has fallen could be accounted for by smaller monetary shocks.

Monetary policy in Mexico became credible in its goal of low and stable inflation in 2002. Starting that year, inflation has either remained within the band targeted by the Banco de México, or deviations have been temporary and caused mainly by exogenous international and domestic shocks.[38]

6.6. Fiscal reform and increase in non-oil revenue of the public sector

I want to highlight the recent increase in the size of the non-oil revenue of the public sector. Its components are tax revenue, nontax revenue of the federal government, and revenue of government institutions and firms. There was a fall in oil revenue after 2012, correlated with the decline in the oil price. At the same time, there was a large increase in tax revenue. Between 2012 and 2016, it increased by 6.4 points of GDP. In 2016, it reached the highest level in history, 16.2 percent of GDP. This historical increase in tax collection is related to the fiscal reform of 2014 undertaken by the Enrique Peña Nieto administration. This reform included several changes in taxation; however, it is beyond the scope of this chapter to determine which change contributed the most to the increase in tax revenue.[39]

7. Implicit transfer in the budget constraint

The main tool in the project is the consolidated government budget constraint, in this case,

$$B_t + E_t B_t^* + M_t = D_t + T_t + (1 + r_{t-1})B_{t-1} + E_t(1 + r_{t-1}^*)B_{t-1}^* + M_{t-1}\,,$$

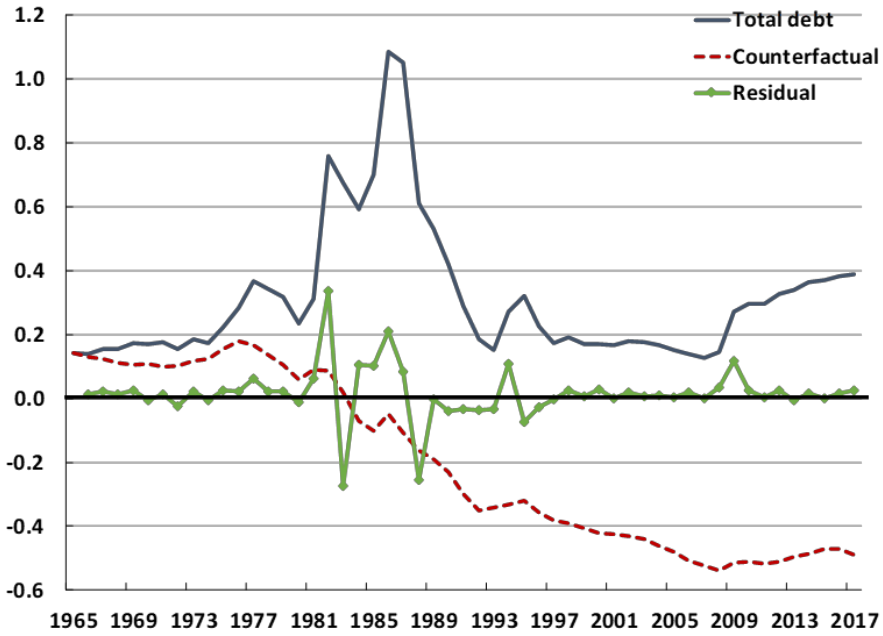
where B_t is the stock of domestic debt, B_t^* is the stock of foreign debt net of international reserves, D_t is the primary deficit of the consolidated government, and M_t is the monetary base.

The term T_t corresponds to transfers not registered in the primary balance. I use this residual term to make the budget constraint hold after plugging in the empirical counterparts of the theoretical variables. The existence of this residual could be due to particular transfers implemented in times of crises, and transfers that might not be registered completely or accurately in the data sources.

[38] An example of the latter is adjustments to energy prices, which have been managed by the government. The increase in inflation at the beginning of 2017 comes from the liberalization of the price of gasoline. Inflation was persistently high in that year.
[39] In the online appendix, I list the changes that took place.

Figure 11 shows how debt would have evolved if this residual term were zero. The initial value of this debt and the observed one are the same. Afterward, debt fluctuates according to the budget constraint.

Figure 11. Total debt and counterfactual debt, fraction of GDP



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

The residual term is small and positive for most years before 1982. My interpretation of these values is additional deficits, from either the central government or the other entities I include, that were not properly registered in the data. These missing deficits accumulate and imply a much lower counterfactual path for the debt in this exercise.

The residual term becomes large and volatile in periods with large exchange rate adjustments. The reason is that I use the same (period average) nominal exchange rate for different debt adjustments during the same year, which makes the calculation inaccurate in periods with high exchange rate volatility. It is positive when large devaluations occurred in 1982, 1986, and 1994, and during the large depreciation in 2008 due to the international financial crisis. It is large and negative in 1988 during an important appreciation of the exchange rate. It is worth noting that it is large and negative in 1983 despite a very large devaluation in that year, owing to the important fiscal shift from primary deficit to surplus during 1983.

8. Conclusions

For the1982 debt crisis, I documented that higher primary deficits lead to growth in debt, and under fiscal dominance, the central bank adjusted its policy to satisfy public finances. In the data, this adjustment led to higher inflation.

This fiscal dominance narrative does not account for the 1994 crisis. An important force behind this crisis was the dollar-indexed tesobono debt. At the end of December, with very few reserves at the central bank and the peso allowed to float, investors refused to buy new issues of tesobonos, which had become the largest portion of government debt. The government had trouble financing debt that was increasing due to currency depreciations. Additionally, I showed evidence regarding two possible theories of expected future fiscal deficits that reconcile the 1994 crisis with the theory. One is expectations of a bank bailout by the government; the other is a self-fulfilling crisis created by the banking system's vulnerabilities.

Institutionally, there is evidence that the 1993 constitutional change, granting a goal and independence to the central bank, was actually a change from fiscal dominance to independence. 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.

Solid public finances and an independent central bank are necessary to pursue other policy goals, such as poverty reduction and redistribution. As I have shown in this work, major economic crises in Mexico have been triggered by deviations (or expected deviations) from these policy principles. I hope this chapter contributes to understanding and preventing economic crises that resemble those of 1982 or 1994 in Mexico.

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