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Working Paper
The Mexican Oil Boom: 1977-1985

Working Paper, No. 314

Provided in Cooperation with:
Inter-American Development Bank (IDB), Washington, DC

Suggested Citation: Gavin, Michael (1996) : The Mexican Oil Boom: 1977-1985, Working Paper, No. 314, Inter-American Development Bank, Office of the Chief Economist, Washington, DC

This Version is available at:

<https://hdl.handle.net/10419/87904>

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Working Papers

The Mexican Oil Boom:

1977-1985

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Office of the Chief Economist
Inter-American Development Bank

Working Paper Series 314
Washington, D.C.

For Paul Collier and Jan Willem Gunning (eds) *Trade Shocks in Developing Countries*, Oxford University Press,
(forthcoming)

1. Introduction

Throughout the twentieth century petroleum has played a prominent, and occasionally a decisive role in Mexico's political and economic development, and the 1970s and early 1980s were no exception. Mexico was profoundly shaken by the oil-market disturbances that rocked the world economy during that period, and only with great difficulty did Mexico emerge from the macroeconomic cloud left by the shocks.

This chapter assesses the impact of these shocks on the Mexican economy. The principle difficulty in doing so lies in disentangling their effects from the effects of other external and domestic economic policy disturbances. On the one hand, macroeconomic policy was importantly influenced by the oil shock, while on the other, the petroleum-sector policies that made the boom possible were themselves heavily influenced by the need to extract the economy from the difficulties in which previous macroeconomic excesses had left it. Similarly, the rise in world interest rates that followed the United States and European disinflation after 1978 was a separate factor that had as much to do with the Mexican economic collapse - and much more to do with its timing - than did developments in petroleum markets, which were on balance favorable until well into the period of macroeconomic crisis after August 1982. But the rise in world interest rates would not have had such severe repercussions if economic policy had been more conservative during the 1970's, as it would necessarily have been in the absence of the oil boom. Indeed, a respectable argument can be made that the most important channel through which the Mexican oil boom was transmitted to the economy was by relaxing - for a time - fiscal and external constraints, thus permitting continuation of extravagant fiscal and monetary policies and, in short, providing the Mexican authorities with financial rope for the eventual macroeconomic hanging.

It would be futile, in light of these interactions between policy and petroleum markets, to try to analyze the Mexican oil boom outside a broad, macroeconomic context. Having said this, the oil boom was the dominant event of the period. Even if it had not been accompanied by self-inflicted macroeconomic wounds, the shock would nevertheless have rocked the economy severely. The fact that the effects of the oil boom were significantly altered, and in important ways amplified, by government policy responses makes the episode no less interesting. In particular, the episode is a particularly vivid illustration of the fact that not only trade policy, but also macroeconomic policy more generally can respond endogenously to resource booms, and of the unfortunate consequences that emerge when the induced policy response is perverse.

The chapter is organized as follows. Section 2 lays out some salient aspects of the structure and development of the Mexican economy up to about 1976, just before the oil boom may be said to have begun, and discusses key aspects of the control regime in place during the boom. This background is relevant because it sets the stage for the public sector responses that, I argue, comprised the most important mechanism through which the oil boom was transmitted - in the end disastrously - to the economy as a whole.

Section 3 discusses the nature and magnitude of the oil boom itself, quantifying the impact of the boom on the economy as a whole and on the distribution of the income between the public sector, which receives almost all of Mexico's petroleum-related income, and the private sector. I discuss here plausible expectations about the boom, as well as actual outcomes, taking up in particular the question whether the boom was considered temporary.

Section 4 describes the response of the economy to the boom, as well as the crash which followed the onset of the debt crisis in mid-1982 and the dramatic softening of oil markets in late 1985. The most dramatic feature of the aggregate developments is the phenomenal investment boom that accompanied the oil boom, and the equally dramatic crash after external financing dried up in mid-1982.

This investment boom raises the two key questions of this chapter: first, what caused the investment boom? And second, since the high rates of external borrowing of the late 1970's were accompanied by high domestic savings and investment, why did they lead to insolvency and economic crisis in August 1982? These questions cannot satisfactorily be answered without considering the fiscal authorities' response to the oil boom. Accordingly, section 5 of the paper disaggregates the economy into public and private sectors. We find that the private sector did in fact save a high fraction of the windfall income during the boom leading up to 1982, while the public sector was dissaving. This section also clarifies the means by which the public sector transferred the oil windfall to the private sector. Finally, Section 6 concludes with a summary and some tentative answers

to the key questions raised by the Mexican experience.

2. Macroeconomic Background

Overview: From "stabilizing development" to "shared development"

After a period of some substantial economic turbulence, which ended with a large devaluation and fiscal adjustment in the early 1950's, the Mexican economy entered a two-decade period of rapid economic growth, financial stability, and relatively robust external accounts which has come to be known as the time of "stabilizing development". Real GDP growth, at roughly 6 percent per year, was substantially in excess of Mexico's 3 percent population growth. With inflation approximately equal to that of her major trading partners, Mexico was able to maintain an exchange rate of 12.5 pesos to the dollar from mid-1954 until August 1976.

Thus, when President Luis Echeverria came to power in 1971, the Mexican economy had experienced nearly twenty years of macroeconomic stability and growth. However, proving that at least one cloud can be found within every silver lining, the Echeverria administration came to believe convinced that the preceding economic development had in several important respects fallen short of potential, and that economic policy required significant changes. In particular, the new administration emphasized the need to address apparently worsening problems of unemployment and income distribution, and to solve these problems announced an era of "shared development", embracing a strategy that focused on public-sector expansion, with the aim of rectifying social inequalities through provision of subsidized public services, and reducing unemployment by placing workers on government payrolls.

In the five years leading up to 1976 public-sector employment doubled, while total public spending rose from 20.5 percent to 30 percent of GDP. A failed 1972 attempt to reform the tax system left tax revenues stagnant, with the result that the public sector deficit rose dramatically. The government covered excess expenditure in part by money creation, and inflation accelerated dramatically. External deficits associated with government borrowing and an increasingly overvalued exchange rate led to a large increase in Mexico's foreign debt, which rose from \$6.3 billion in 1971 to \$28 billion by 1976. By that time the bankruptcy of the Echeverria model of development was apparent; capital fled the country, and domestic real investment fell from 14 percent of GDP in the early 1970's to 12.7 percent in 1975. In 1977 the incoming López-Portillo administration found itself constrained by an agreement with the IMF, which called for devaluation, limits on external debt accumulation, and very substantial fiscal retrenchment.

Mexico's history during these six years was perhaps exaggerated, but hardly unique. During 1976 and 1977 the IMF also had major rescue operations underway in the United Kingdom, Portugal, and Italy, where budgetary excess had similarly led to external crisis, necessitating IMF intervention and resulting, ultimately, in stabilization. The difference lies in the subsequent years, when the Mexican authorities were enabled by a sudden rush of oil revenue to terminate the recently negotiated IMF program, and to choose their own macroeconomic course for another 4-1/2 fateful years. This oil revenue was due, in part, to high oil prices and recent, surprisingly large oil discoveries in southern Mexico. But it also reflected an explicit decision by the government to exploit these reserves by producing for export, a decision that was itself a response to the financial and macroeconomic constraints that bound the incoming López-Portillo administration at the end of 1976.

The oil industry in Mexico

Petroleum has been produced in Mexico since 1901, and the country was in fact the world's second largest producer in 1921, when it supplied nearly 25 percent of world demand. But as the economy developed the petroleum sector became of decreasing relative significance. By the early 1970's, the petroleum sector accounted for less than 2.5 percent of GNP, and the state-owned oil company, Pemex, accounted for less than 3.5 percent of Federal tax revenue. Employment, at roughly 75,000 individuals, was a trivial fraction of Mexico's total employment - which then numbered about 13 million,¹ though a significantly higher fraction of the economy's physical capital was employed in that sector.²

Thus, in the early 1970's the petroleum sector was important to Mexico, but in no sense dominant. Indeed, by the early 1970's Mexico was for the first time a small net importer of petroleum products. Thus it was that in late 1973, when the first oil shock washed over the world economy, Mexico was in the short run adversely affected. However, developments had been set in train that would transform these high prices from burden into bonanza.

The control regime

Three aspects of the control regime are particularly salient here, commercial policy, exchange rate policy, and exchange controls.

Since the 1940's the government of Mexico had operated under the assumption that it was necessary for the public sector to

take the lead in shaping the nation's economic development. The 1941 First Law of Manufacturing Industries set the nation solidly on a course of import-substituting industrialization, toward which end the government utilized subsidies, tax incentives, tariff and quota protection, and in particular cheap energy. Import protection was applied more rigorously to finished industrial goods, with "productive" imports of industrial raw materials receiving more relaxed treatment. As external balances intensified during the 1971-1976 period of "shared development", import controls were tightened. However, as we shall see below, imports of final goods were not rigidly controlled, and fluctuations in the level of imports served partially to satisfy variations in domestic demand. But though quotas were not rigidly binding, the trade regime provided some protection for domestic production, and the relative price of domestic production clearly increased with domestic demand.

The second key feature of the control regime was a commitment to fixed exchange rates. Recall that Mexico maintained until 1976 the same U.S. dollar parity that had prevailed since 1954. In the midst of economic crisis the outgoing Echeverria administration had devalued, but this experience was remembered as a painful one, and the incoming López-Portillo administration was much more reluctant to abandon the exchange-rate parity than it was to abandon the policies required to make the rate sustainable.

The third, and arguably most important feature of the control regime was the relative openness of Mexico on capital account. This left great scope for the private sector to place their savings abroad, safe from high inflation and domestic taxation.

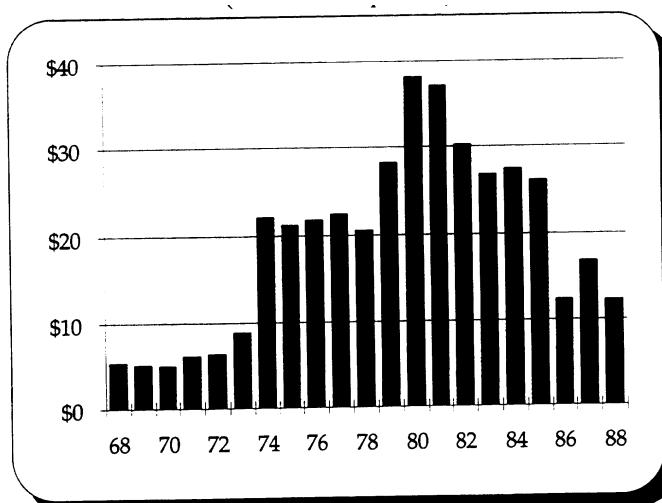
3. Nature and Magnitude of the Oil Boom

The oil boom: ex-post

Figure 1 illustrates the world price of Mexican petroleum in 1988 dollars.³ By this measure, the world price of Mexico's petroleum rose fourfold from about \$5.00 per barrel in the 1960's and early 1970's to over \$20.00 per barrel in 1974, and remained at roughly that level until the fourth quarter of 1979. At that point it rose even more dramatically, averaging nearly \$40.00 per barrel in 1980, and declining gradually to roughly \$27.00 per barrel in 1982- 1985. In 1986 the price fell dramatically, and during 1986-1988 it averaged about \$14.00 per barrel - a catastrophic fall compared with the previous 12 years, but still far more favorable than before the first oil shock.

Figure 1
World Oil Price
(1988 dollars per bbl)

In terms of prices, to span the 12 year Mexican oil boom approximately revenue accruing because, during the roughly exporter of any when petroleum became once again prices conferred many other oil effects from the oil production. We developments in quantification of their effects on Mexico's national income.



therefore, the oil boom would appear period 1974- 1985. However, the should really be dated from 1977 to 1985, with most of the during the 1980-85 period. This is period 1974-1976, Mexico was self-sufficient in petroleum, and not an significance. It is only after 1976, production exploded and Mexico a major oil exporter, that high oil major benefits for Mexico. Unlike for exporting economies, then, income boom were due largely to increases in turn now to a documentation of the petroleum sector, and a

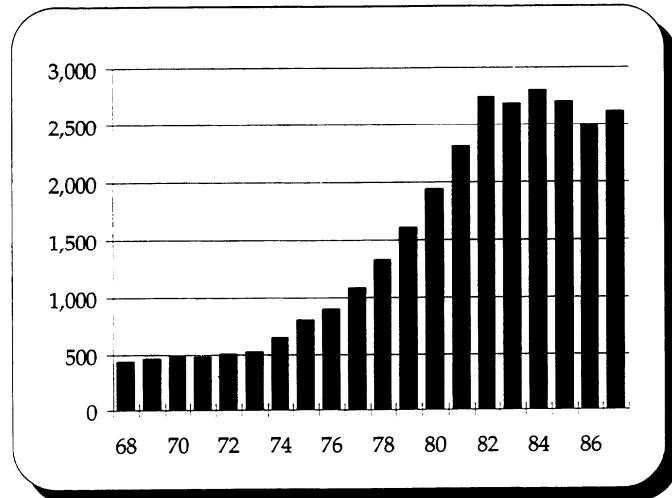
Table I
The Oil Industry in Mexico

Year	Proven reserves (bil. bbl)	Production (mil bbd)	World price (1988 \$)	Net	Exports (milt bbd)
1960	4.787	0.298	5.00		0.011
1965	5.357	0.362	5.75		0.051
1970	5.567	0.487	5.00		0.036
1971	5.428	0.486	6.19		0.001
1972	5.388	0.506	6.44		-0.019
1973	5.432	0.525	8.85		-0.042
1974	5.773	0.653	22.12		-0.011
1975	6.338	0.806	21.20		0.052
1976	6.350 (end)	0.897	21.71		0.072
1977	11.160 (Jan)	1.086	22.37		0.197
(1977)	16.001 (end)				
1978	40.192	1.330	20.49		0.338
1979	45.803	1.618	28.26		0.516
1980	60.126	1.941	38.18		0.863
1981	72.008	2.313	37.20		1.154
1982	72.008	2.748	30.30		1.152
1983	72.500	2.688	26.77		1.604
1984	71.500	2.806	27.46		1.608
1985	70.900	2.703	26.14		1.519
1986	70.000	2.500	12.38		1.345
1987	69.000	2.616	16.75		1.370
1988			12.18		

Sources: For estimated reserves, Gentleman (1984) and La Economía Mexicana en Cifras, various issues. Other data from La Economía Mexicana en Cifras, International Financial Statistics, and U.S. Dept. of Energy Monthly Energy Review, (various issues).

Table I documents the growth in Mexican oil production, along with some other data on the petroleum industry, and Figure 2 illustrates the rapid increase in production that occurred after 1976. Perhaps the most striking feature of Table I is the increase in the official estimate of petroleum reserves from 6.35 billion barrels at the end of 1976 to over 11 billion in January 1977, and 16 billion barrels at the end of 1977. In interpreting these data, it is useful to bear in mind some political aspects of the officially estimated reserves, and associated constraints on petroleum production.⁴

Figure 2
Oil Production in Mexico
('000 bbl per day)



Beginning around 1972, extract more substantial more-or-less efforts were of domestic subsidized Mexico's magnitude during 1972 allegedly to for big and as late as 1973 the director general of Pemex voiced his strong opposition to Mexican oil exports.

1970 efforts by Pemex to locate and extract more oil had intensified as the spectre of oil imports loomed on the immediate horizon. However, these efforts oriented entirely toward satisfaction demand at the customary, heavily subsidized prices, and not toward renewal of export potential. Indeed, the big discoveries which were made was intentionally understated,⁵ forestall domestic and U.S. pressure increases in production and exports, Mexican oil exports.

It was not until the end of 1976, when newly-inaugurated President José López Portillo appointed the aggressive, export-oriented Diaz Serrano to be director general of Pemex, that Mexican policy turned toward rapid expansion of output and exports. The leap in the officially estimated petroleum reserves, which was announced by Diaz Serrano some weeks after his appointment, should therefore be taken as a signal of the López Portillo administration's determination aggressively to develop Mexico's oil fields for immediate export, rather than pursue the previous administration's policy of conservation for future domestic use. The altered estimate of reserves was at least as much news about government policy as it was about geological reality. This policy decision was, in turn, motivated by the macroeconomic crisis that the López Portillo administration inherited.

Hence, the true dimensions of the boom could not have become apparent to informed observers until some time in middle or late 1976, before which neither the huge potential nor the official inclination to become an exporter was generally known. By December 1976, however, the government's plans to cash in Mexico's oil reserves had become crystal clear, as Diaz Serrano then announced a six-year plan to increase production to 2.25 million barrels per day by 1982. Table I and Figure 2 show that actual output was in fact slightly higher than contemplated in this plan, but actual output was roughly as announced in the 1976 six-year plan, and should therefore correspond roughly to expectations as of late 1976.

We now estimate the magnitude of the windfall generated by the high world prices and the production boom documented above. We begin by defining a counterfactual baseline, which is intended to represent a reasonable expectation for the sector as of about 1976. As noted above, Mexico's oil trade was in small deficit in the early 1970's. But attempts had been underway to increase domestic production and reduce domestic consumption to avoid becoming a significant importer of oil. The sector was receiving substantially higher investment, production was rising, and domestic prices had been increased somewhat to dampen demand. In short, it would have been reasonable to anticipate production increases roughly in line with overall economic growth, if only because the government had displayed a determination to avoid large imports or exports of petroleum.

Table 2
The Petroleum Windfall

Year	(1) Actual production	(2) Baseline Production	(3) Price (1988\$)	(4) Windfall (bil.1988\$)	(5) Winfall (%GNP)	(6) GNP (bil.1988\$)
1975	806	806	21.20	0.0	0.0%	163.1
1976	897	846	21.71	0.3	0.2%	158.1
1977	1086	888	22.37	1.3	1.0%	136.4
1978	1330	933	20.49	2.4	1.5%	158.6
1979	1618	979	28.26	5.6	3.0%	187.4
1980	1941	1028	38.18	11.4	4.8%	238.5
1981	2313	1080	37.20	14.9	5.3%	280.9
1982	2748	1134	30.30	15.5	8.3%	187.5
1983	2688	1191	26.77	12.4	7.9%	158.2
1984	2806	1250	27.46	13.3	7.3%	182.9
1985	2703	1313	26.14	11.2	5.9%	190.4
1986	2500	1378	12.38	3.4	2.5%	135.8
1987	2616	1447	16.75	5.4	3.8%	143.3

Present value of the windfall income as of 1977 (bil. 1988\$)

Sources: Table 1 and author=s estimates, as described in text. Petroleum production is in thousands of barrels per day.

Present value calculation uses a discount rate of 10%.

We therefore take a baseline scenario in which both production and consumption of petroleum grows at 5 percent per year; slower than during the "Mexican miracle" before 1970, but more rapid than during the 1970-75 period. This counterfactual level of production is given in column 2 of Table 2, in which the windfall is computed. Windfall production, then, is actual production (column 1) minus the 1975 expectatiore (column 2). The gross value of the production windfall is this quantity times the world price.

Of course this increase in production was achieved at a cost, and we must subtract this cost from gross revenues to obtain an estimate of the windfall. We face three difficulties in the use of Pemex data to obtain an estimate of the economic cost of extracting petroleum. First, the oil workers union was considered to be the most powerful union in Mexico, and wage payments certainly included a substantial element of monopsony rent. This rent is, of course, a means of distributing oil-sector revenue and not an element of cost. Second, data are lacking on the value of the capital stock employed in the petroleum sector, and on the rental return to capital so employed. And finally, Pemex is an integrated firm; domestic sales are of refined petroleum products, and exports are (almost entirely) of crude, but Pemex data do not separate the costs of extraction from those of refining crude. After allowing for these factors, the available data suggest an extraction cost of roughly \$4.00 per barrel (in 1988 prices).6 With this estimate of the cost of extracting the crude, we can compute the net increment to national income of the "surprise" in petroleum production: this is given in column 4 of Table 2.

The estimated windfall rises with Mexican production and world oil prices to a maximum of about \$15 billion (1988 prices) in 1981 and 1982, when it reaches about 8 percent of GDP. It then declines somewhat in 1983-85, and more sharply in 1986 and 1987. Another way of gauging the magnitude of the disturbance is to note that the windfall in 1981 was equal to more than 2-1/2 times Mexico's 1976 merchandise exports. The present value of the windfall, from the perspective of 1977, is about \$59 billion, in 1988 prices. The corresponding "permanent income" is on the order of \$6 billion per year, or about 4 percent of Mexico's 1977 GDP.

The above estimates pertain to the economy as a whole, not distinguishing between the public and the private sectors. However, an important feature of the oil boom is that all revenue accrued in the first instance to the government, and absent some budgetary mechanism for transferring the revenue to individuals, private-sector income would actually have declined as a result of the higher petroleum product prices implied by the oil boom.7 We now estimate the impact of the oil boom on private-sector and public-sector incomes separately.

Table 3
The Petroleum Windfall
Public and Private Sectors

	1988 \$		Percent of GDP	
	(1) Public	(2) Private	(3) Public	(4) Private
1975	0.00	0.00	0.00	0.00
1976	0.47	-0.16	0.29	-0.10
1977	1.70	-0.38	1.25	-0.28
1978	2.14	0.24	1.35	0.15
1979	8.18	-2.53	4.36	-1.35
1980	17.76	-6.38	7.45	-2.67
1981	21.25	-6.31	7.57	-2.25
1982	19.26	-3.77	10.27	-2.01
1983	14.87	-2.42	9.40	-1.53
1984	16.18	-2.86	8.85	-1.56
1985	13.60	-2.37	7.15	-1.24
1986	-1.01	4.44	-0.74	3.27
1987	3.09	2.35	2.15	1.64

Sources: Table 1 and author's estimates, as described in text.

Columns (2) and (4) of Table 3 answer the question: what would have happened to private-sector incomes if domestic petroleum product prices had moved in line with world petroleum prices? This change in income is given by the change in petroleum prices, relative to the 1975 level, times the baseline rate of petroleum consumption, described above.

We see that until 1980 the reduction in private-sector income due to higher oil prices was small, because the price was in those years fairly close to the 1975 price. With the large increase in oil prices after 1979, however, we see that there would have been a very substantial transfer of income from the private to the public sector - assuming, of course, that domestic petroleum prices followed world prices and the absence of other transfers. Indeed, in 1980 and 1981 when oil prices were at their peak, the transfer of income would have resulted in a reduction in private-sector income equal to nearly 2.5 percent of GDP, with the public sector benefitting correspondingly. This means that, while the *national* income rose by 5 to 8 percent of GDP during 1980 - 1985, income at the disposal of the public sector rose by 7 to 8 of GDP. There is therefore an element of irony in the fact that, by the time the oil boom had played itself out, it was the government rather than the private sector that was insolvent.

The oil boom: ex-ante

The previous section discussed outcomes; in this section we turn to the more difficult task of evaluating plausible expectations about the boom. This is important because expectations - particularly about the duration of the boom - would have been a crucial determinant of both private and public responses.

We argued above that the boom in petroleum output was largely predictable - indeed, the path for output was essentially announced by the Director General of Pemex in December 1976, so we will work with the hypothesis here that individuals had perfect foresight about the evolution of petroleum production. Prices were, on the other hand, subject to much more uncertainty, and in particular the 1980 price increase and the 1985 decline were not forecastable in 1976. We try to get some perspective by asking how the windfall would have looked to an observer able to predict production, but with static expectations about prices. Table 4 contains the computations from the perspective of two key dates: 1976, when the oil boom began, and 1979-80, when it intensified with the further large increase in world oil prices. They are also illustrated in Figure 3, below.

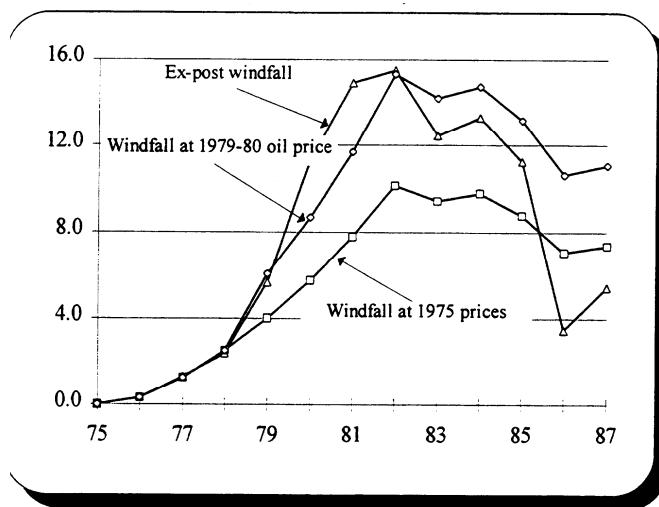
Table 4
The Petroleum Windfall – Ex Ante

	1975 Oil Price		1979-1980 Oil Price	
	1988 \$	% of GDP	1988 \$	% of GDP
1975	0.00	0.00		
1976	0.30	0.19		
1977	1.24	0.91		
1978	2.49	1.57		
1979	4.01	2.14	6.06	3.23
1980	5.73	2.40	8.66	3.63
1981	7.74	2.76	11.70	4.16
1982	10.13	5.40	15.31	8.17
1983	9.40	5.94	14.21	8.98
1984	9.77	5.34	14.76	8.07
1985	8.73	4.58	13.19	6.93
1986	7.04	5.19	10.64	7.84
1987	7.34	5.12	11.09	7.74

Sources: Table 1 and author's estimates, as described in text.

Notice that an observer who extrapolated the 1975 price into the future would have predicted the boom through 1978 very well; this is because the price was in fact relatively constant during those years. And while he would have missed the magnitude of the boom, and its sharp decline in 1986 and 1987, the prediction would have been surprisingly good.

Figure 3
The Petroleum Windfall
(Billion 1988 \$)



In late 1979 prices changed dramatically, and observers would of course have changed their expectations. Table 4 and Figure 3 show how expectations about the boom would have changed if observers had forecast a price of \$30.00 into the indefinite future. Again, the general outline of the boom is similar to the *ex-post* figures, but the abrupt decline in 1986 and 1987 is of course not forecast. In summary, the general profile of the boom would have been correctly forecast by observers using these simple price forecasts, though the magnitude of the boom would not have been forecastable at the beginning, and the sharpness with which it disappeared would not have been apparent in the early 1980's.

We can say a little more about the public sector's expectations, at least if their statements can be taken at face value, for officials in the López Portillo administration used the transitoriness of the oil boom as an explicit justification for their oil policies. In 1979, for example, Díaz Serrano stated: "Petroleum is like tomatoes or pineapples. Either they are consumed or lost."⁸ This perception that the oil boom was temporary, and should therefore be exploited aggressively, was even more explicitly enunciated by Díaz Serrano in 1977:

...the world can be sure of some twenty more years living in the petroleum era, and Mexico has this time to generate wealth by taking advantage of high demand levels, and the high prices paid at present.... Without losing a sense of proportion, we may point to other good businesses which have been lost to us in other areas, when artificial substitutes were found for cochineal, dogwood, natural rubber, and in recent years cotton and sisal. There are only about twenty years when we can be sure to benefit from hydrocarbons to such an extent that we can cover the country's necessities for a much longer period than that.... but we should not forget that this is a race against the clock.⁹

This statement makes it clear that at least part - and a very influential part - of the Mexican government saw the oil boom as a temporary phenomenon, though they did not of course forecast its brevity. And furthermore the necessity for setting aside some of the oil proceeds to sustain the economy after the oil boom had passed is clearly recognized; it is against this realization and these intentions that the government's later performance has to be judged.

Summary

In this section we have quantified the magnitude of the oil boom that hit Mexico during the 1977- 1985. At its peak the petroleum windfall amounted to approximately 8 percent of GNP, and the present value of the boom was, in 1977, equivalent to a permanent increase in income of nearly \$6 billion, or 4 percent of Mexico's 1977 GNP. This is probably a somewhat larger windfall than would have been perceived in 1977, because the 1980 oil price increases would not have been predictable then. Because in Mexico all petroleum revenue accrues to the government, the oil boom involved a large transfer of income from domestic petroleum consumers to the public sector.

The oil boom was perceived as temporary, though authorities expected that it would last rather longer than it actually did. At least some authorities understood that the transitory nature of the boom implied the desirability of high savings and investment, in order to provide for a future without oil revenue. On the other hand, another more profligate tendency was apparent in the public sector, and was well illustrated when President López Portillo said: "We have freed expenditure from the slavery of revenues and we have linked such expenditure to national objectives and economic planning."¹⁰ While the oil boom may have created a reason for saving by the public, as well as the private sector, it also lifted a binding borrowing constraint, and made possible the opposite, more exuberant, fiscal response.

4. Economic Response: The Economy in Aggregate

The output boom

As was discussed above, the López Portillo administration came to power at the end of 1976 in the midst of a major economic crisis. A major devaluation had already been undertaken by the outgoing Echeverría administration, and an IMF program negotiated, but it fell to López Portillo to administer the restrictive IMF agreement and stabilize the economy. The result was slow growth in 1977, when real GDP rose by only 3.4 percent. The contractionary measures hit the cyclical construction industry hardest, and GDP in that sector fell by more than 5 percent. But the program was having its intended effects - fiscal imbalances and external deficits were gradually declining, and capital flight slowing.

In 1978 the high rates of investment in the petroleum sector - which were in 1974-75 nearly 50 percent higher than in 1970-71 - combined with the new administration's determination to play the petroleum card, and began to pay off in a big way. In that year petroleum production rose by 14.3 percent, and annual increases were even larger in each of the next three years. By 1981 production in the petroleum industry was 85 percent higher than in 1977, having risen almost 17 percent per year. This rapid growth in petroleum production, and associated growth in oil exports, relieved Mexico's external payments problems, and in 1978 the government was able to terminate the 1976 IMF adjustment program. Prospective oil riches also danced in front of foreign bankers' eyes, and for the next four years Mexico had very easy access to foreign capital markets. Thus, from early 1978 through the middle of 1982 the Mexican government could make economic policy in an essentially unconstrained environment.

The rapid growth in the petroleum sector coincided with an overall economic boom of breathtaking proportions, which is documented in Table 5. Real GDP increased an average of 8.4 percent per year in the four boom years 1977- 1981, and while growth in the mining sector was exceptional, output growth in the non-mining sector averaged 8.2 percent per year. Only in the state-dominated electricity industry and in the financial services sector was economic growth slower than in the 1960's.

Table 5
Economic Growth in Mexico
(Percentage change per year)

	1960-70	1970-77	1977-81	1981-85
Agriculture	3.0	3.3	4.2	2.1
Mining	4.3	6.2	16.6	1.8
Manufacturing	8.1	6.3	8.6	0.0
Construction	8.1	4.7	12.4	-4.6
Electricity	13.5	9.8	8.3	5.7
Commerce, etc.	7.2	5.4	9.0	-1.9
Transport, etc.	6.4	10.3	13.2	-0.1
Finance, insurance, etc.	5.2	5.2	4.8	2.6
Personal, etc., services.	7.1	6.1	7.4	1.8
Total	6.5	5.8	8.4	0.1

Source: *La Economía Mexicana en Cifras*. various issues.

Apart from mining, the sectors that grew most rapidly during the 1977- 1981 boom were transport and construction. The boom in construction is attributable to the investment boom that was going on in these years, and about which we will have more to say below. But while growth was most rapid in the mining, construction, and transportation sectors, growth in other sectors was rapid as well, averaging 7.5 percent per year, a full percentage point higher than the rapid growth experienced during the 1960's, and 2.6 percentage points higher than in the 1970-1977 period.

The general contraction in economic activity during the second phase of the oil boom, 1982- 1985, is just as broad as was the expansion of 1977-1981. The sector that declined most dramatically during this period is construction, which declined by more than percent per year. But every sector in the economy grew substantially more slowly even than during the relatively troubled 1970-1977 period.

Table 6
Employment in Mexico
(Million workers)

	1970	1977	1981	1985
Agriculture	4.466	4.897	5.189	5.400
Mining	0.155	0.197	0.263	0.275
Manufacturing	1.726	2.051	2.542	2.400
Construction	0.810	1.163	1.881	1.550
Commerce, etc.	2.011	2.345	2.762	2.800
Personal, etc., services	2.985	4.557	5.927	6.510
Total	12.863	16.238	20.043	20.500

Source: *La Economía Mexicana en Cifras*, 1986.

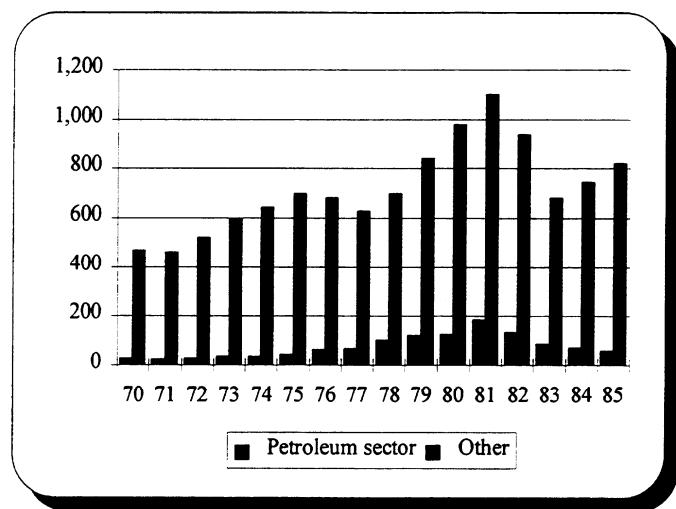
During the early stage of the oil boom the sectors in which employment grew most rapidly were, unsurprisingly, the sectors in which output grew most rapidly. These were mining, with a 33 percent increase in employment, and construction, with a 62 percent increase. The next largest rate of increase is the sector comprising personal, community and social services, in which employment grew more than 30 percent during 1977-1981. This presumably reflects the rapid growth of nontradables production generally, as the real exchange rate became increasingly overvalued during this period. Similarly, the changes in employment during the second stage of the boom correlate well with changes in sectoral production; most notable is the large decline in employment in the construction sector from 1981 to 1985.

What emerges from these data, then, is a generalized production boom during the early stages of the petroleum windfall, which was cut short by the international payments crisis of 1982. After 1982 the experience is of generalized economic weakness. Two points warrant emphasis at this point. First, what is *not* apparent from the production data is anything resembling the crowding out of nonbooming sectors depicted in "Dutch disease" theories; in the early stages of the oil boom the entire economy grew rapidly, and in 1981-1985 the entire economy was correspondingly depressed. It is, in particular, very hard to make the case that the 1977- 1981 expansion of the petroleum and the construction sectors were at the expense of other sectors. Second, the macroeconomic boom that began with the oil boom ended much earlier than did the oil boom itself. World petroleum prices were high by historical standards until late in 1985. In fact, we estimated above that the petroleum windfall averaged roughly 7 percent of GDP during the 1983- 1985 period - yet those years were as disastrous for Mexico as the previous years were prosperous.

Savings, investment and foreign borrowing The outstanding feature of the 1977- 1981 boom is the immense increase in domestic investment, which is documented in Figure 4. While total real GDP rose by roughly 40 percent in those four years, real gross fixed investment was in 1981 more than 95 percent above the (admittedly somewhat depressed) 1977 rate. This investment boom was almost entirely in the nonresidential sector; residential investment rose by only 18 percent during these boom years and actually declined from 5.3 percent of GDP in 1977 to 4.5 percent in 1981. Non-residential fixed investment, on the other hand, rose by almost 125 percent in this four-year period, increasing from 14.3 percent of GDP in 1977 to almost 22 percent in 1981.

Figure 4 also shows that, while investment in the petroleum sector rose more dramatically in proportional terms, the greater part of the increase was in the non-petroleum sector. "

Figure 4
Real Investment
(1980 Pesos)

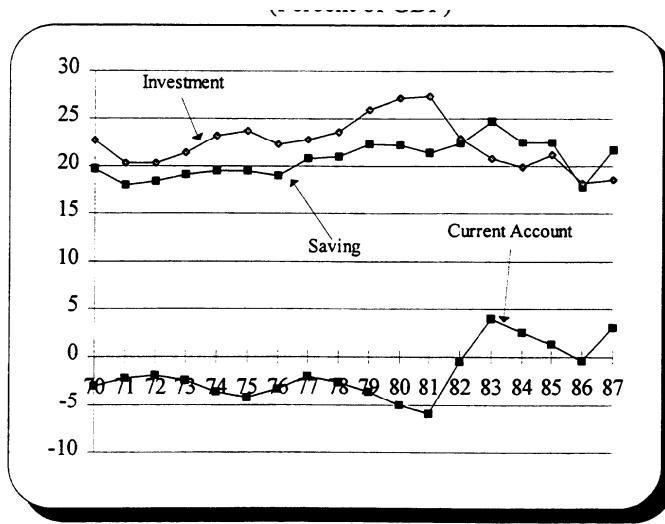


While investment boomed, consumption grew more or less in line with national income - public consumption growing somewhat more rapidly and private consumption less rapidly than GDP. Thus national savings averaged nearly 22 percent of GDP during the four-year boom period, up from 19 percent during 1970-76. This increase in national savings would, of course, have been perfectly rational if consumers believed that the boom was transitory, though it is also compatible with an explanation based upon myopic consumers with a Keynesian consumption function. Trends in savings and investment are depicted in Figure 5, below.

Figure 5
Saving, Investment and the Current Account
(Percent of GDP)

The investment of the petroleum with investment in 1977 to 27.4 increased from less than 20 roughly 22 percent because the increase in grew inexorably, until it finally (almost 6 percent trends changed from over 27

Savings rose somewhat, with the result that the current account swung abruptly into surplus.



boom that took place in the early phase boom is clearly visible in that figure, rising from less than 23 percent of GDP percent in 1981. The savings rate substantially during this period as well, percent of GDP before the oil boom to during the peak of the boom. But increase in savings was smaller than the investment, the current account deficit from 70 billion 1980 pesos in 1977, reached almost 300 billion 1980 pesos of GDP) in 1981. After 1981 these dramatically, and investment declined percent of GDP to 20 percent in 1984.

We now construct a counterfactual for Mexican savings and investment, and compare it to outcomes. It would make little sense to construct a counterfactual which simply subtracts the petroleum windfall income from national income; savings and investment were affected not only by that disturbance, but also by the macroeconomic fallout from expansionary government policies, policies which would have been unfinanceable in the absence of the windfall. On the other hand, construction of a complete macroeconomic model of the economy which tries to simulate what would happen if the petroleum boom had not happened and government policy had been more restrained is clearly beyond the scope of this paper. Instead we construct a simple scenario, based upon the presumption that, in the absence of the petroleum boom, the Mexican authorities would have been forced to respect the 1976 IMF program, that the fiscal deficit would have been accordingly reduced, and that real GDP growth would have returned to roughly the levels that prevailed before the middle 1960's.

In particular, I assume that, absent the petroleum shock, real GDP would have grown 6 percent per year after 1977. This is slower than in the 1960's, and approximately the rate achieved during the troubled 1970-1977 period. I further assume that the savings rate would have drifted up very slightly from 20.8 percent of GDP to 21 percent in 1978 and thereafter. Some increase in the savings rate would be expected because the IMF program demanded a reduction in the public sector deficit. Finally, I assume that the investment rate would have declined from 22.8 percent of GDP in 1977 to 22.5 percent in 1978, and 22.0 percent thereafter. Some reduction in domestic investment would have been called for if Mexico were to respect the restrictive limits on foreign borrowing which were included in the 1976 agreement with the IMF. The 22 percent figure is equal to the rate of investment during the seven years leading up to the petroleum boom, 1970-1976.

Table 7 lays out the implications of these assumptions. Notice that actual savings substantially exceed counterfactual savings during the early phase of the oil boom. This is both because actual income exceeds counterfactual income, and also because the actual savings rate was higher during those years. If we take the 1977- 1981 period as a whole, actual savings exceeded counterfactual savings by 345 billion 1980 pesos. Actual GDP exceeded counterfactual GDP by 1045 billion 1980 pesos. This

implies a windfall savings rate of about 33 percent, not extremely high, but substantially higher than the roughly 20 percent average rate which is typical for Mexico. Thus, for the economy as a whole, savings behavior seems to be consistent with the idea that the petroleum boom was perceived to be transitory.

Table 7
Saving, Investment and Foreign Borrowing: Summary
(Billion 1980 Pesos)

Year	Actual			Counterfactual		
	Saving	Investment	CAS	Saving	Investment	CAS
1977	727	797	-70	727	797	-70
1978	793	893	-100	777	833	-56
1979	921	1071	-149	824	863	-39
1980	991	1215	-224	874	915	-42
1981	1041	1331	-290	926	970	-44
1982	1082	1107	-25	981	1028	-47
1983	1143	961	182	1040	1090	-50
1984	1077	953	124	1103	1155	-53
1985	1106	1042	64	1169	1225	-56

Sources: Actual data are from *Sistema de Cuentas Nacionales de Mexico*, 1960-1985 and *La Economía Mexicana en Cifras*, various issues. For some years the U.S. dollar current-account figures implicit in these data differ noticeably from the balance of payments data. Counterfactuals are author=s calculations as described in the text. ACAS@ refers to Acurrent account surplus@.

The results for investment are more dramatic; during the 1977-1981 period actual investment exceeded counterfactual investment by 929 billion 1980 pesos, implying a propensity to invest out of windfall income of nearly 90 percent. With the propensity to invest out of the windfall so much higher than was the propensity to save, foreign borrowing was necessarily very high. The difference between the actual and the counterfactual current account sums to 583 billion 1980 pesos, 56 percent of the windfall, and roughly 13 percent of annual GDP.

During the second part of the petroleum boom, 1982 through 1985, the picture is again dramatically different. Actual investment declines well below the counterfactual level, while savings are actually somewhat higher than in the counterfactual. The result is a major improvement in the current account deficit, relative to the counterfactual level. Whereas the counterfactual implied current-account deficits of roughly one percent of GDP, the actual current account was in surplus by roughly 2 percent of GDP during 1982-1985. This sharp swing into surplus should not of course be interpreted as resulting from unconstrained intertemporal choice; during this period Mexico, along with many other developing countries, was simply unable to borrow to finance any excess of investment over savings.

Two features of these developments stand out and will require further discussion below. The first is the dissociation of the 1982 crisis from developments in the petroleum sector. True, in 1982 the oil market had weakened somewhat compared with 1981, but it was still strong by any historical measure, and would not weaken measurably for almost two years. Secondly, examination of the aggregate data on savings and investment raise a genuine puzzle about how Mexico's payments crisis emerged. The data clearly indicate that Mexico's large external deficits were associated with high rates of domestic investment; during 1977-1981 windfall investment is estimated, however crudely, at 929 billion 1980 pesos, while windfall external borrowing, at 583 billion pesos, was roughly 63 percent as large. As long as the return on domestic investment was at least 63 percent of the world interest rate, servicing the foreign debt should have posed no problems. Why, then, the debt crisis? We take up these issues in more detail below. Before doing so we take a closer look at developments in Mexico's external accounts, and at the evolution of relative prices.

External accounts

Table 8 summarizes Mexico's external payments during this period. Notice that while real exports nearly tripled between 1977 and 1981, the real value of imports rose by even more, leading to a worsening of the trade balance. At the same time, and owing largely to a severely and increasingly overvalued exchange rate, net tourism receipts declined from roughly \$1billion in 1978-79 to \$0.2 billion in 1981. And of course it was exactly during these years that the U.S. and European disinflations led to large increases in world interest rates, with a massively adverse effect on Mexico's debt service obligations. Thus, the service account worsened as well, and the current-account deficit grew to nearly \$20 billion at 1988 prices.

Table 8 reveals an important aspect of Mexico's 1981 payments imbalance that is not apparent from the previous discussion of the goods market. Beginning in 1981 there is evidence of a massive flight of capital from Mexico, with the entry for "errors and omissions" recording a \$10 billion deficit in 1981, and a further \$7 billion debit in 1982.

Table 8
Summary of the Balance of Payments

	Merch.	Capital Account			Current Account	
		Current	Recorded	Errors &		
1970	3.54	6.39	-2.85	-3.26	2.33	1.09
1971	3.64	6.02	-2.37	-2.48	2.39	0.52
1972	4.31	7.14	-2.83	-2.60	1.12	2.07
1973	4.90	9.21	-4.31	-3.62	4.85	-0.95
1974	5.87	12.64	-6.78	-6.63	7.86	-1.15
1975	5.67	12.41	-6.74	-8.23	10.11	-1.58
1976	6.49	11.19	-4.70	-6.54	9.01	-4.25
1977	7.75	9.51	-1.76	-2.66	3.79	-0.04
1978	9.38	12.25	-2.87	-4.17	5.03	-0.20
1979	12.28	16.68	-4.40	-6.78	6.31	0.96
1980	19.03	23.19	-4.15	-13.18	14.04	0.12
1981	22.57	26.89	-4.32	-18.03	30.82	-10.14
1982	22.92	15.58	7.33	-6.72	8.84	-7.38
						-5.25

Sources: La Economía Mexicana en Cifras (1988), International Financial Statistics, and Balance of Payments Statistics.

More careful estimates of capital flight during the 1977-1982 period yield estimates ranging from roughly \$15 billion to \$30 billion, depending upon the method of estimation.² This apparent capital flight represented a clear vote of no confidence in Mexico's financial stability; what is somewhat puzzling is the fact that it took place during the peak of the business investment boom. In the next section we resolve this puzzle by showing that private investment declined in 1981, so that the strength of total investment during that year reflects public-sector activity alone.

In any event, the apparent capital outflow signifies a desire by the private sector to accumulate foreign assets. The public sector, then, needed to borrow not only to finance the excess of national expenditure over income, but also indirectly to finance the private-sector's foreign asset accumulation. This is one reason the debt crisis in Mexico was a crisis of public sector, rather than national solvency.³ This massive capital flight demonstrates the ease with which private savings could leave Mexico and, as we shall discuss below, undermines explanations of the 1977- 1981 investment boom that are predicated upon a substantial degree of capital immobility.

Turning back to the goods market, Table 9 provides some detail on the composition of imports and exports which will be of interest below. The increase in consumer good imports is, in proportional terms, striking, and far exceeds the growth of aggregate consumption. However, as noted above, Mexico's import-substitution policies had focused upon the consumer-goods industry, and consumer-good imports remained in absolute terms relatively low.

Table 9
Merchandise Imports by Type of Good
(Billion 1988 \$)

	Consumer Goods	Intermediate Goods	Capital Goods	Total
1976	0.547	2.654	4.252	7.454
1977	0.700	3.163	4.665	8.528
1978	1.215	4.420	5.803	11.437
1979	1.369	5.548	8.935	15.852
1980	2.967	14.046	6.175	23.187
1981	3.154	15.231	8.506	26.892
1982	1.638	9.087	4.861	15.586
1983	0.652	6.102	2.334	9.087
1984	0.884	8.157	2.678	11.720
1985	1.117	9.253	3.266	13.636
1986	0.885	7.980	3.090	11.954
1987	0.786	9.035	2.693	12.514

Sources: *La Economía Mexicana en Cifras*, various issues.

Capital-good imports roughly doubled during the 1977- 1981 boom, which is not surprising in light of the growth in investment during this period. But the most dramatic growth occurred in imports of intermediate goods, which increased nearly five-fold during the boom, out of all proportion to the growth in demand, or in production. And there is another sense in which imports of intermediate goods behave rather differently than the other categories of import. After the 1977-1981 boom, imports of capital goods and consumer good decline roughly to pre-boom levels, and capital goods decline by even more. But imports of intermediate inputs remain nearly three times their 1977 level for most of the 1983-1987 period. We shall return to this point in the conclusion.

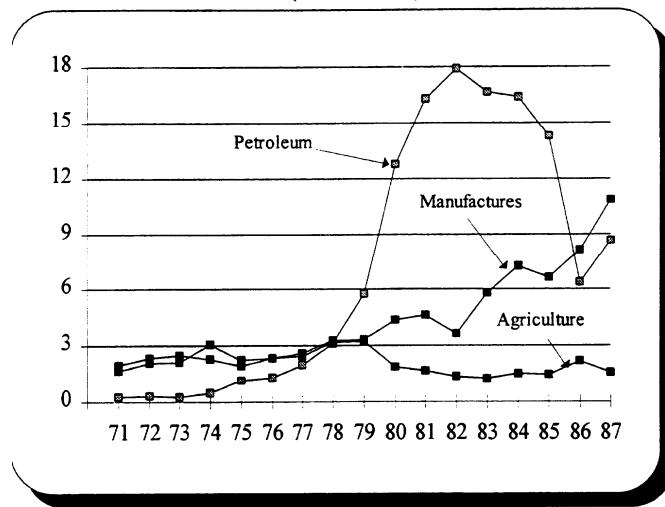
Figure 6, below, depicts the performance of Mexico's exports during the boom. We noted above that there is little evidence of "Dutch disease" in response to the oil boom - at least not if we mean declines or very slow growth of output in non-oil productive sectors. However, Figure 6 shows that the oil boom was, especially in 1981 and 1982, associated with slow growth in manufacturing exports and an absolute decline in real revenues from agricultural exports - a decline from which the sector had not by 1987 recovered. Thus, not only had the economy become increasingly dependent upon imported intermediate inputs during the oil boom, but the growth in agricultural and manufacturing output which was documented above seems to have been devoted almost exclusively to satisfaction of domestic demand, to the detriment of export performance. After the 1982 economic crisis, which was associated with a very large depreciation of the real exchange rate, manufacturing exports recovered rapidly, and by 1986 they were larger than oil exports.

Figure 6
Merchandise Exports by Sector
(Bil. 1988 \$)

Relative prices

We turn now to the oil boom. The most dramatic change in the relative price of petroleum, Figure 7 illustrates, is associated with a huge appreciation of the exchange rate, signifying a nontradable good relative to that of tradable goods.

The 1976 depreciation is in fact that the real exchange rate consistently appreciated during the 1981 the real exchange



evolution of relative prices during the dramatic change is, of course, in

which was documented above. As the first stage of the oil boom was also associated with a major increase in the price of

tradeables.⁴

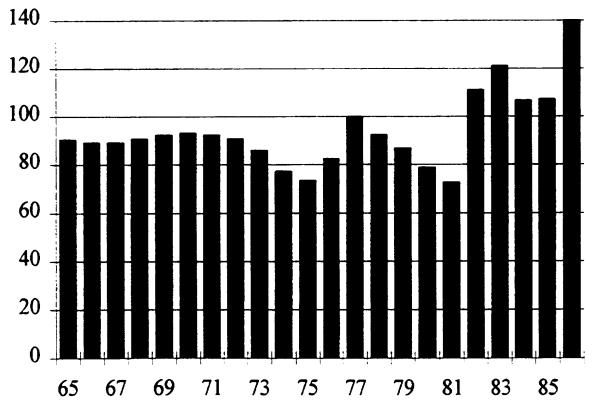
clearly visible in Figure 7, as is the early stage of the oil boom. By 1987 the real exchange rate had appreciated some 30

percent from the 1977 rate, largely as a result of the high inflation during those years, which was unaccompanied by nominal exchange-rate depreciation. After the 1982 crisis, when external financing evaporated, the real exchange rate depreciated to historically unprecedented levels. The real exchange rate, then, does not follow oil price fluctuations very closely, being affected much more by monetary factors before the 1982 crisis, and by the sudden unavailability of external credit after that crisis.

Figure 7
The Real Exchange Rate in Mexico
(CPI Basis)

There were other, significant changes focus on the prices sectors. Figure 8 in the construction the manufacturing, overall GDP

(1970= 100)



Notice that from construction goods relative price of same amount. This investment boom and we recognize partially insulated relative price of participated much sharDly durin~ the

During the boom these relative 1981 and 1985 the relative price of output in the construction declines dramatically, while the price of manufactures rises substantially. This can be explained by the collapse of investment during the 1981 - 1985 period, which sharply reduced the demand for construction services, and by the substantial depreciation after 1982, which reduced the intensity of foreign price competition faced by manufacturers.

Summary

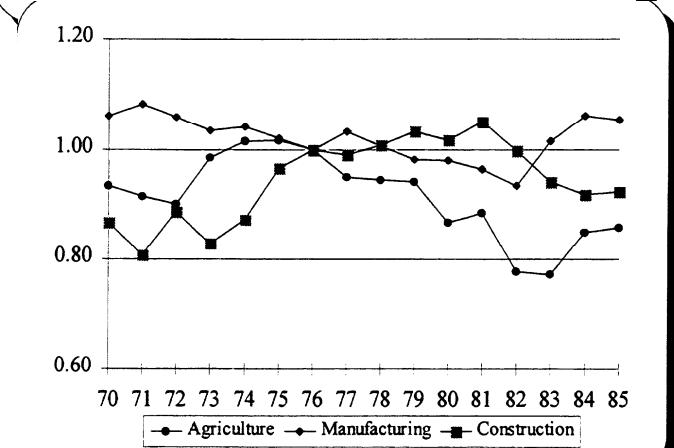
Summarizing, we argued in this section that the first stage of the petroleum boom in Mexico coincided with a generalized production boom, in which all major sectors of the economy participated. This production boom ended in 1982, with the onset of the debt crisis, well before the petroleum boom had itself ended. The production boom during 1977- 1981 was accompanied by an immense investment boom; we estimate that nearly 90 percent of the windfall was in those years invested domestically. The investment boom was concentrated in the business sector; while business fixed investment more than doubled during these four years, residential investment actually declined considerably as a fraction of GDP. Savings were also high during the 1977-1981 boom. We estimate that 33 percent of the windfall during these years was saved. This left, however, a substantial fraction of the domestic investment to be financed with the expedient of foreign borrowing. We estimate that the

somewhat more subtle but nevertheless in domestic relative prices. Here we of the construction and the manfacturing depicts the relative prices of value-added

and the agricultural sectors, relative to the deflator.

1977 to 1981 the relative price of rises roughly five percent, while the manufacturing declines by roughly the makes sense if we remember the that was underway during that period, that domestic manufactures were only from international competition.⁵ The output in the agriculture sector, which less in the 1977-1981 boom, declined 1977-1981 boom.¹⁶

subsequent phase of the petroleum price trends are reversed. Between



windfall-induced investment was roughly 930 billion 1980 pesos; of this 580 billion 1980 pesos - roughly two-thirds - was financed by foreign borrowing.

The end of the production boom in 1982 had little to do with developments in petroleum markets, and much more to do with an inability to service the external debts that had accumulated during the previous four years. This external crisis was associated with very rapid capital flight in 1981 and 1982, which suggests that the private sector desired and was able to increase their holdings of foreign assets. After 1982 production, employment, and investment decline as consistently as they had previously risen; the depression, like the boom before it, was not confined to any specific sectors.

Relative prices move in ways that can be understood in light of the investment boom, which was associated with an increase in the relative price of construction, and changes in competitiveness associated with variations in the real exchange rate. However, changes in broad price indexes - and specifically the real exchange rate - are associated much more with changes in the monetary and macroeconomic environment than with developments in the petroleum sector.

These developments raise at least two important questions. First, what explains the huge increase in investment during the 1977- 1981 period? This question is of very general interest, because the external deficits which triggered the debt crisis in 1982 were clearly associated with high investment, rather than low rates of national saving. This brings us to the second puzzle: given the fact that Mexican external deficits were associated with an investment boom, rather than low rates of national savings, why did they lead to payments difficulties at all? Put differently, why was the apparent return on the 1977-1981 investment so low? I suggest below that misguided government policy responses to the petroleum boom explain both puzzles. To see this we must now turn to a more careful look at the private and the public response to the petroleum boom.

5. Private and Public Response

Savings, investment, and foreign borrowing

We now investigate the private and public response to the aggregate boom developed above. We begin by estimating private and public savings and investment behavior. Unfortunately, the Mexican national income accounts do not provide exactly the disaggregation that we need, so the following analysis utilizes a combination of budgetary and national income data. We use the national income accounts for national savings and investment, and the budgetary accounts to obtain an estimate of the public sector's savings and investment. Private sector outcomes are then estimated as the difference between national and public-sector quantities.

In order to make meaningful comparisons an important adjustment must be made to the budgetary data. Those data treat all interest payments as a transfer of income to the private sector. In an inflationary environment, however, a substantial portion of interest payments are not real private-sector income, but merely compensate holders of peso-denominated debt obligations for inflation-induced erosion in the real value of that debt. Except where noted below, we subtract this component of interest payments from domestic government expenditure." If this adjustment were not made private-sector savings and public sector dissavings would be grossly overestimated, especially in 1982 when the Mexican price level increased approximately 100 percent.

Table 10 gives our estimates of private and public sector savings and investment. Notice first that public sector savings increased somewhat from their rather low 1977 level. This increase was not large, and it vanished in 1981 and 1982. During those two years public sector savings, at 3.3 percent of GDP, are actually less than in 1977; this despite the massive oil windfall that was received by the government in those years.

Table 10
Saving and Investment by Sector

Year	Public Sector			Private Sector			Total		
	S	I	Net	S	I	Net	S	I	CAS
1977	3.6	7.6	-3.9	17.2	15.2	1.9	20.8	18.9	-2.0
1978	4.4	8.7	-4.3	16.6	14.9	1.7	21.0	19.3	-2.7
1979	5.2	9.8	-4.5	17.1	16.2	0.9	22.3	21.4	-3.6
1980	5.6	9.6	-4.0	16.6	17.6	-1.0	22.2	23.2	-5.0
1981	2.9	12.9	-9.9	18.5	14.5	4.0	21.4	17.4	-6.0
1982	3.7	10.2	-6.5	18.7	12.7	6.0	22.4	16.4	-0.5
1983	9.9	7.5	2.4	14.8	13.3	1.5	24.7	23.2	3.9

1984	8.3	6.7	1.6	14.2	13.1	1.0	22.5	21.4	2.6
1985	7.6	6.1	1.5	14.9	15.1	-0.2	22.5	22.7	1.3

Public-sector savings and investment are from budgetary figures, while national data are from the national income accounts. The private sector's savings are computed as the difference between national savings and public-sector savings. An adjustment for inflation is made to the figures for private and public savings, as described in the text.

Public-sector investment meanwhile surged from 7.6 percent of GDP in 1977 to nearly 13 percent of GDP in 1981. This surge in investment, unaccompanied as it is by any significant increase in public saving, led to an increase in the overall deficit from less than 4 percent of GDP in 1977 to nearly 10 percent of GDP in 1981.¹⁷

Movements in the private sector's saving and investment were less dramatic. Savings remained relatively high through 1982, while investment increased from 15 percent of GDP in 1977-1978 to 17.6 percent in 1980. There was some decline in domestic investment during 1981, which is also the period of rapid capital flight, so that the excess of private savings over investment rose to 4 percent of GDP. But this increase was not enough to prevent a major increase in Mexico's current account deficit, which rose from 2 percent of GDP in 1977 to 6 percent in 1981.

Explaining the current-account deficits that emerged during the petroleum boom clearly requires a better understanding of government income and spending, so we turn now to a more detailed examination of the fiscal accounts.

Fiscal policy

The question we need to address is: how did the government dispose of the windfall oil revenue? How is it that this massive increase in government resources during the 1980-1982 period led to huge fiscal deficits? Some insights are provided in Table 11, which presents basic budgetary data.¹⁹

Table 11
Finances of the Public Sector
(Percent of GDP)

	1977	1978	1979	1980	1981	1982	1983	1984	1985
Revenue									
Nonoil federal revenue	10.9%	11.3%	11.5%	11.2%	11.0%	9.7%	9.4%	9.0%	9.3%
Petroleum sector	4.3%	5.0%	6.1%	7.8%	7.7%	11.1%	16.1%	15.1%	13.3%
Other parastatal	9.4%	9.6%	9.1%	8.0%	7.9%	8.1%	7.4%	8.1%	8.6%
<i>Total</i>	24.6%	25.9%	26.7%	26.9%	26.7%	28.9%	32.9%	32.2%	31.2%
Expenditure									
Wages and purchases	12.1%	12.0%	11.4%	10.6%	11.7%	11.8%	11.3%	11.3%	11.8%
Capital Spending	7.6%	8.7%	9.8%	9.6%	12.9%	10.2%	7.5%	6.7%	6.1%
Interest	3.0%	3.2%	3.4%	3.5%	5.0%	8.3%	12.4%	11.9%	11.5%
Other transfers	7.2%	7.6%	8.2%	9.2%	9.7%	13.4%	9.4%	8.9%	9.3%
Current expenditure	22.4%	22.7%	22.9%	23.3%	26.4%	33.4%	33.0%	32.1%	32.6%
Total expenditure	30.0%	31.4%	32.7%	32.9%	39.2%	43.6%	40.5%	38.8%	38.6%
Saving	2.2%	3.3%	3.8%	3.6%	0.3%	-4.5%	-0.1%	0.1%	-1.4%
Overall Surplus	-5.3%	-5.4%	-6.0%	-6.0%	-12.6%	-14.6%	-7.6%	-6.6%	-7.4%

Source: *La Economía Mexicana en Cifras* (1988).

Comparing the 1981 with the 1977 budget, we identify the following key influences on the budget:

@ During this period petroleum-sector revenue rose by much less than our estimate of the oil windfall. During 1980 and 1981 petroleum-sector revenue is only 3.5 percentage points of GDP above the 1977 level, considerably less than our estimate of the oil windfall in those years.

@There is a sharp drop in non-oil parastatal revenue, from roughly 9.5 percent of GDP in 1977-1978 to less than 8 percent of GDP in 1981.

@ Non-interest transfers increase from 7.2 percent of GDP in 1977 to 9.7 percent of GDP in 1981.

@ Current expenditure does not rise dramatically but, as was discussed above, capital spending surges from 7.6 percent of GDP in 1977 to nearly 13 percent of GDP in 1981.

The first and quantitatively most important task is to explain why petroleum-sector revenues were so much smaller than our estimate of the public sectors' windfall income from the oil boom. In Table 3, above, we calculated that the oil windfall should have augmented the public-sector's income by some 7.5 percent of GDP in 1980 and 1981, rising to over 10 percent of GDP in 1982. Yet we see that *gross* petroleum-sector revenue (which includes all Pemex receipts plus the proceeds of a gasoline tax) was in 1980-81 only 3.5 percent of GDP higher than in 1977, and was only 6.8 percent of GDP higher in 1982. Net proceeds presumably increased less, and the question we address now is why.

The answer lies in the policy of selling petroleum-based products at very steep discounts in the domestic market. These pricing policies brought domestic Mexican energy prices very far out of line with world prices. To illustrate: in 1980-81 the domestic relative consumer price of petroleum products was only 8 percent higher than it had been in 1970, despite the fact that the relative world price had risen nearly eight-fold in that period. Indeed, Buffie and Krause (1989) estimate that the domestic price of all energy products was in 1980 only one-quarter the world price. In addition to distorting consumption and production decisions, these price subsidies had very major fiscal implications. Here we focus on petroleum-price subsidies, though it should be remembered that electricity, public transit, and some food products were also very heavily subsidized.²⁰

In order to estimate the magnitude of domestic petroleum subsidies, Table 12 lists the revenue obtained per barrel of oil sold on the domestic market and compares it with the revenue obtained per barrel of oil sold for export. Nearly all export sales are of crude, while all domestic sales are of refined products, so we would expect the revenue per barrel of domestic sales to be substantially higher, and so it was during the 1960's (not shown).

Table 12
Domestic Oil Subsidy

	\$ Revenue per barrel	Domestic Sales (‘000bbl)	\$	1988 \$	%GDP
1975	11.45	10.92	242.8	0.00	0.00
1976	12.74	9.60	260.3	0.68	0.78
1977	13.75	8.28	282.3	1.40	1.75
1978	13.69	8.35	310.5	1.49	1.49
1979	20.29	9.86	332.1	3.29	2.51
1980	32.49	10.96	378.4	7.95	4.21
1981	34.34	11.22	412.5	9.32	3.87
1982	29.63	7.74	409.8	8.76	5.35
1983	27.32	11.51	398.7	6.09	4.55
1984	27.49	14.05	421.9	5.45	3.29
1985	25.50	13.94	438.4	4.84	2.75
1986	11.98	10.90	473.8	0.26	0.21
1987	16.12	12.07	429.3	1.51	1.13

Note: The benchmark is 1975 pricing behavior, not world prices. The subsidies listed in this table should therefore be understood to be in addition to the subsidies implicit in 1975 pricing policies.

During the 1960's domestic sales yielded about ten 1988 dollars per barrel more than foreign sales, or roughly 25 cents per gallon. In the early 1970's this relationship changed dramatically, as prices charged by Pemex in domestic markets failed to keep pace with world prices. By 1975 domestic sales were earning Pemex *less* per barrel than were foreign sales, despite the fact that foreign sales were (largely) crude and domestic sales were entirely refined product. For purposes of rough quantification, we

take the 1975 price differential as a baseline, and measure changes in subsidies relative to that baseline. Remember, however, that the baseline already incorporates a substantial subsidy element, so that the figures in Table 12 should not be interpreted as measures of the total cost of petroleum subsidies, but rather the change from 1975 levels.

Column 1 of Table 12 lists actual Pemex revenue per barrel of oil exported. As is to be expected, this tracks the world price very closely. Column 2 lists the revenue earned by Pemex per barrel of domestic sales, and column 3 gives the volume of domestic sales in thousands of barrels. In column 4 we estimate the increase in revenue that would have been generated if the domestic price had borne the same relation to the world price that it bore in 1975: that is, if the domestic revenue per barrel had been 53 cents below the world price instead of the figure given in column 2. Column 5 translates this to 1988 dollars, deflating as before with the U.S. producer price index, and the final column gives the change in subsidies relative to GDP.

The lesson that emerges from Table 12 is that the price subsidies were of very major importance. In 1980 and 1981 this subsidy alone increased by 4 percent of GNP, compared with pre-boom years, which is more than half as large as the public sector's windfall income from the oil boom.²¹ Thus, domestic petroleum subsidies were the dominant mechanism through which oil boom revenue was recycled to the private sector. The increase in petroleum subsidies was, by the same token, the most important single adverse influence on the fiscal situation in the early 1980's.

Table 13 (below) draws out the implications of these estimates by computing the public-sector and the private sectors change in income after accounting for these petroleum-price subsidies.²² In the absence of an increase in petroleum-price (or other) subsidies the private sector would have been made worse off by the petroleum-price movements that occurred, because the public sector earns the oil revenue while the private sector pays more for petroleum products. The changes in petroleum subsidies that in fact occurred are large enough to make the private sector substantially better off in every year. In the years when the windfall was large, the subsidies amount to roughly half the public sector's windfall.

Table 13
The Petroleum Windfall by Sector: Before and After Price Subsidies
(Bil. 1988 \$)

	Before Subsidies		After Subsidies	
	Public	Private	Public	Private
1975	0.00	0.00	0.00	0.00
1976	0.47	-0.16	-0.74	1.05
1977	1.70	-0.38	-0.63	1.95
1978	2.14	0.24	-0.17	2.55
1979	8.18	-2.53	3.60	2.05
1980	17.76	-6.38	8.01	3.37
1981	21.25	-6.31	10.79	4.15
1982	19.26	-3.77	9.81	5.68
1983	14.87	-2.42	8.39	4.06
1984	16.18	-2.86	10.51	2.81
1985	13.60	-2.37	8.61	2.62
1986	-1.01	4.44	-1.28	4.71
1987	3.09	2.3	1.54	3.90

Sources: Author's estimates, as described in text.

Table 14 ties this discussion together by summarizing various important influences on the fiscal accounts during 1978-1982. The first row gives the change in public-sector windfall income between 1977 and the year of interest. Thus, in 1981 the public sector's petroleum windfall income was 6.3 percentage points higher than in 1977. The last column of this table summarizes the outcomes by adding up the yearly figures. Thus, roughly speaking, during the five-year period 1978-1982 the petroleum windfall augmented the Mexican public sector's income by about 25 percent of a year's GNP.

Subsequent rows of Table 14 give the various means by which the public sector disposed of this windfall. The second row of Table 14 gives the revenue foregone by domestic petroleum price subsidies. During 1978 through 1982 this sums to 17.5 percent of a year's GNP, just over 71 percent of the oil windfall. The third row gives the impact on the budget of higher explicit (non-interest) transfers. These transfers cover a wide range of items; it has been estimated, for example, that in 1980 food subsidies comprised nearly 3 percent of the Mexican GDP.²³ Transfers like this were, during the period as a whole, the second most important means by which the oil revenue was channeled to the private sector. Indeed, by 1982 these subsidies

are more significant than even the oil price subsidies. Over the 1978- 1982 period as a whole these cumulate to 12 percent of a year's GNP, about half the magnitude of the petroleum windfall income. The third significant item is the reduction in income earned by non-oil parastatal corporations. This represents largely price subsidies of publicly-provided goods such as electricity, transportation, and so on. The only form of revenue which increased significantly during these five years is the inflation tax on nominal debt; this was offset, however, by increased nominal interest payments, and real interest payments remained high in all years except 1982, when the inflation rate suddenly and unexpectedly jumped upward.

Table 14
Influences on the Budget- 1977 to 1982
(Percent of GDP)

	1978	1979	1980	1981	1982	Sum
Petroleum windfall	0.1	3.1	6.2	6.3	9.0	24.7
Domestic oil subsidy	-1.5	-2.5	-4.2	-3.9	-5.4	-17.5
Budgetary transfers	-0.4	-1.0	-2.0	-2.5	-6.2	-12.1
Parastatal income	0.2	-0.3	-1.4	-1.5	-1.3	-4.3
Inflation tax	-0.3	0.3	0.6	0.6	5.5	6.7
Other factors	2.6	1.3	1.2	-1.7	-0.9	2.5
Public saving (adj.)	0.7	0.9	0.4	-2.7	0.8	0.1
Investment spending	-1.1	-2.2	-2.0	-5.3	-2.6	-13.2
Overall surplus	-0.4	-1.3	-1.6	-8.0	-1.8	-13.1

Sources: Author's estimates, as described in text. This table gives changes in the budgetary accounts compared with 1977, not absolute levels.

In short, the Mexican government responded to the petroleum windfall by increasing domestic subsidies. The most significant of these subsidies seems to have been the subsidy on domestic sales of petroleum products. Thus, the oil windfall was used largely to shelter the private sector from the painful petroleum-price increases which the rest of the world was experiencing. But other transfers were increased significantly as well.

Summary

We sought to address two related questions here. First, we uncovered the sectoral patterns that underlay the national savings and investment trends discussed in the previous section. We found that, while private-sector savings remained reasonably high, the public sector moved increasingly into deficit - and dramatically so in 1981 and 1982. We then identified the mechanisms by which the government transferred the oil windfall - and more - to the public sector. We found that petroleum and other subsidies increased during the 1977- 1982 period by even more than the increase in windfall income, with the result that over the 1978- 1982 period government savings declined slightly. This meant that the surge in government investment that took place during these same years translated directly into the public sector's fiscal deficit.

6. Summary and Assessment

The oil boom of 1977-1985 was an immense windfall for Mexico; our estimate of windfall income peaks at about 8 percent of GDP 1982. The ex-post windfall amounted to an increase in Mexico's permanent income of roughly 4 percent of 1977 GDP. The oil boom was in fact temporary, and government authorities perceived it as such, though they thought that it would last longer than it did.

The eight-year oil boom divides into two clearly delineated phases; an immense boom from 1977 through the first half of 1982, and an equally impressive bust after the onset of the debt crisis in August 1982. The most notable aspect of the first phase was a breathtaking boom in nonresidential investment, which more than doubled between 1976 and 1981. We estimate that 90 percent of the boom in income during the 1977- 1981 period was invested domestically. Construction, not surprisingly, boomed during this period, but so did the rest of the economy. There is in particular no evidence that the expansion of the construction or oil sectors crowded out other sectors of the economy.

A substantial fraction, though not the preponderance of the windfall was saved; we estimate that 33 percent of the 1977-1981 windfall was saved. This left a substantial fraction of the investment boom to be financed by borrowing from abroad; of the

930 billion 1980 pesos worth of windfall investment, 345 billion pesos was financed with windfall saving, and 585 was financed by borrowing from abroad. This borrowing amounted to roughly 13 percent of Mexico's annual GDP in that period.

In the first instance, the windfall accrued entirely to the government. It returned the windfall to the private sector in the form of petroleum subsidies, subsidies on products provided by parastatals other than Pemex, and explicit budgetary transfers. In fact, the government returned the windfall income so effectively that the increased transfers soon amounted to more than the government's windfall income. The boom ended in the resulting fiscal and external payments crisis of August 1982. It bears repeating that the end of the production boom in mid-1982 had very little to do with developments in petroleum markets.

The Mexican experience raises at least two intriguing questions. First, what explains the investment boom of 1977-1981? Changes in investment were at the heart of the external payments deficits that triggered the debt crisis in Mexico, a fact contrasts sharply with the Brazilian, the Argentine, and to a lesser extent the Chilean experiences in these years.²⁴

We note first that the 1977- 1981 investment boom was economy-wide and not confined to one or a few sectors. Though investment increased most dramatically in the petroleum sector, most of the investment was in fact in the nonpetroleum sector and, until 1981, the private sector responded as aggressively as did the public sector. Theories that focus on the impact of high savings in an environment of limited capital mobility cannot explain the Mexican experience. First, investment in Mexico rose significantly more than did savings; indeed, our estimate of windfall investment was more than twice as large as the estimate of windfall savings. Far from high domestic savings rates pushing domestic investment upward, the Mexican experience was one in which high domestic investment pulled in foreign savings. A second ground for ruling out "savings-push" explanations is the absence of binding restrictions on capital outflows, as evidenced by the very high rates of capital flight experienced during 1981 and 1982. These suggest that domestic residents were in fact able to place their savings abroad relatively easily when they so desired.

I suggest that the response of private investment had much more to do with other aspects of the control regime in place during the boom, and in particular with the implicit and explicit production subsidies instituted by the government. Because the final-goods sector was at least partially protected from foreign competition, the price of import-competing goods rose during the income and expenditure boom of 1977- 1981. Meanwhile, the price of inputs was held artificially low by, most importantly, domestic energy price subsidies which held the cost of energy as low as one-quarter world prices. These explicit subsidies were augmented by the effects of a major real exchange-rate overvaluation during 1977-1981 which dramatically reduced the price of imported intermediate goods and capital goods. There is evidence that producers were induced to switch toward production techniques that are intensive in such intermediate inputs for, even after the production boom ended, imports of raw materials and intermediate goods were very substantially higher than they were before the boom began. In short, private investors seem to have been taking advantage of the fact that the government was, implicitly, offering to pay for a significant fraction of their products' true production cost. This explains their willingness to expand production so dramatically, and to invest in new capacity during 1977- 1981.

This brings us to the second question posed by the Mexican experience. We established that Mexican external deficits were very clearly associated with an investment boom rather than low rates of national savings. Why, then, did they lead to payments difficulties at all? Here again government price subsidies enter the picture, and in two ways. On the one hand, they were the chief cause of the fiscal difficulties that emerged in 1980 and became unsustainable in 1981. Absent the fiscal hemorrhaging caused by these subsidies the monetary disorders, overvaluation, and consequent capital flight that characterized 1980, 1981 and 1982 might not have emerged, and would certainly have been less severe. Secondly, the subsidies must have induced producers to invest in production techniques that were heavily reliant upon energy and imported intermediate goods, while protection of domestic markets made it privately profitable to produce for satisfaction of domestic demand rather than export sales. Though privately profitable, these investments certainly had very low, and conceivably negative, value-added at world prices. Thus, the social return on much of the investment undertaken during the 1977- 1981 boom may have been quite low, so that when world interest rates became positive in the early 1980's, the massive investments undertaken during 1977-1981 were of little help in servicing the external debt.

The Mexican experience yields lessons of general significance. First, it underscores the fact that not only trade policy, but also macroeconomic policy more generally can respond endogenously to resource booms, and it illustrates the unfortunate consequences that emerge when the policy response is perverse. It also highlights important interactions between macroeconomic and microeconomic policy responses. In particular, the energy price policies that were financed by the oil boom had both macroeconomic and microeconomic dimensions. They were the chief cause of the public-sector fiscal crisis which, in turn, underlay the monetary disorders of the period. They may also have been a key cause of the investment boom which explains the external deficits that emerged in the early 1980's. And they help explain why that investment boom did

not, in the end, generate income sufficient to service the external debt that had financed much of the investment. In the end it was the macroeconomic dislocations implied by energy subsidies and other extravagant fiscal policies that were decisive in turning the oil boom into nightmare.

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1 Petroleum-sector wages were, however, much higher than average, reflecting the high skills required and physically demanding nature of much petroleum-sector work. In addition, the petroleum workers' union was considered the strongest in Mexico, and it seems likely that the high wages in this sector reflect that power to some degree. Thus, while the petroleum sector in 1973 employed only 0.6 percent of the workforce, its wage bill was roughly 2 percent of aggregate wage payments.

2 During the ten years up to and including 1973, petroleum-sector investment was about 6.3 percent of aggregate investment, and its share of the capital stock was probably somewhat higher.

3 Here, and throughout this paper, we deflate dollar values with the United States Producer Price Index, which we take to be a good proxy for the world price of Mexican imports. (Imports from the United States comprise roughly 60 to 70 percent of Mexico's total imports.) Thus, the numeraire is the price of imported goods.

4 The following discussion follows Randall (1984), El Mallakh et. al. (1984), and especially Teichman (1988). Teichman

contains a particularly useful discussion of bureaucratic and political aspects of Mexican oil policy.

5 United States government estimates of Mexican oil reserves exceeded official Mexican estimates by a factor of two in this period. See Gentleman (1984).

6 The following analysis is not particularly sensitive to the estimate of extraction costs, because during the boom period world prices were so much higher than plausible estimates of cost. That the estimated cost is reasonable, and in particular, not too low, can be seen from the fact that the Mexican petroleum industry was in reasonably good shape during the 1960s and early 1970s when the world price was approximately \$5.00 per barrel (again, in 1988 prices) and domestic sales were at subsidized prices. The analysis that underlies the estimated extraction cost is contained in a technical appendix that is available from the author upon request.

7 In fact the government did increase energy-price subsidies, by enough to be of major budgetary and macroeconomic significance. We discuss these subsidies below.

8 Teichman (1988) p. 64, quoting from *Proceso*, núm. 286 (April 26, 1979).

9 Gentleman (1984), pg. 85, citing Díaz Serrano, "Economic and Social Conditions in Mexico", *Comercio Exterior*, Dec. 1977.

¹⁰ Cited in Randall (1989) p. 159.

" As a fraction of total investment, however, investment in the petroleum sector increased substantially, rising from about 5 percent of the total to average about 12 percent during the boom, and reaching a peak of nearly 15 percent of total investment in 1981. After 1981 investment in the petroleum sector declined much more rapidly than total investment, until by 1985 the share of the petroleum sector in total investment had declined to about 6 percent, in line with previous historical experience.

[2] See the summary in Buffie and Krause (1989), p. 152.

[3] The second reason, which we shall take up below, is that the private sector had a substantially higher saving rate than did the public sector during this episode.

[4] This is a bilateral real exchange rate *vis à vis* the United States dollar, computed using Mexican and US consumer price indices. An increase in the index represents a depreciation of the Mexican real exchange rate.

[5] The price of domestic manufactures rises considerably if compared with the price of imported goods. Manufactures must therefore have received some protection from the commercial-policy regime that was then in place. That this protection was not absolute is illustrated by the large increase in manufactured imports that took place during the 1977-1981 boom.

[6] These price indexes, referring as they do to domestic value-added, are for domestic production in these sectors. The sharp appreciation of the real exchange rate that occurred during the 1977-1981 boom ensures that the relative price of imported investment goods would have declined sharply during that period. The subsequent depreciation of the real exchange rate means that the price of imported investment goods would have risen sharply after the 1982 crisis. Thus, the relative price of imported investment goods and of domestic value-added in the construction sector move in opposite directions in both phases of the petroleum boom.

[7] Computation of the inflation adjustment is straightforward. The peso-denominated debt at the beginning of a year is multiplied by price inflation between the beginning and the end of the year. The reader can easily see that this is the payment to debt-holders which would suffice to maintain the real value of the outstanding debt.

[8] The conventionally-estimated deficit, that is, without the inflation adjustment described above, increases to roughly 13 percent of GDP in this year.

[9] These data do *not* make the inflation adjustment described above, but are otherwise consistent with the figures for savings and investment given in Table 10.

[10] These subsidies manifest themselves in the decline of non-oil parastatal income documented in Table 11.

[11] See Table 3 where we estimate that the public sector's windfall income from the oil boom amounted to 7.5 percent of GDP in 1980 and 1980.

22 These figures should be compared with those in Table 3, above.

23 See El Mallakh et. al., p. 50.

24 See Dornbusch (1985)