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The Mexican Value-Added Tax (VAT): Characteristics, Evolution, and Methodology for Calculating the Base

Prepared by Carlos A. Aguirre and Parthasarathi Shome 1/

Authorized for Distribution by Vito Tanzi

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Abstract

The value-added tax (VAT) is often a major component of national fiscal structures. While its effects on allocative efficiency, inflation, income distribution, and tax administration have been addressed, little work exists on the theoretical base of a VAT, given its structure. This is essential for knowing how much of the base is actually taxed. Using Mexican national accounts and input-output tables, this paper develops a methodology for calculating the theoretical base of the Mexican VAT for 1980 and 1983 (two years whose individual VAT structures were considerably different). The method is applicable to other VAT systems as well.

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Summary

The popularity of the value-added tax (VAT) has increased rapidly since the 1960s as its introduction has spread across Europe, Latin America, Africa, and Asia. Every year more countries introduce the VAT. Its ramifications for allocative efficiency, inflation, income distribution, and tax administration have been much discussed in the literature. One area which has not received much attention, however, is the calculation of the VAT base.

Authorities are often satisfied with the initial revenue collections from a VAT, especially when they are compared with the revenues from the taxes the VAT usually replaces. But it is forgotten that the base of the VAT is likely to be broader than those of the replaced taxes, and its revenue potential therefore may be higher than actual collections. While exogenous economic trends, such as changing patterns of production, consumption, and imports, as well as the changing share of exports in total production would certainly affect the VAT base, a calculation of the theoretical base of a VAT, given its structure, should help the authorities in gauging how much of the base they are actually capturing. This, in turn, would indicate how much more revenue may realistically be obtained from this tax.

The calculation of the VAT base is necessarily dependent on the availability of reliable and detailed national accounts data and input-output tables. This is because the VAT mechanism normally requires that tax paid on inputs be credited against tax payable on outputs. In this paper, a methodology for the calculation of the VAT base is developed for Mexico for 1980 and 1983 (two years when the VAT structure was considerably different), after a discussion of various external influences that might have affected the VAT base in those years. Provided data are available, this methodology could be applied in other countries to assess the true revenue potential from a given VAT structure.

I. Introduction

Several papers have been written on the feasibility of introducing and operating a value-added tax (VAT) in developing countries, most recently a collection of papers presented and discussed at an April 1986 conference organized by the World Bank. 1/ A wide range of issues has been addressed in the literature; for example, the VAT's effects on efficiency, inflation, distribution, and tax administration. 2/ One gap, which applies to studies on both developing and developed countries, remains, however. There is as yet no detailed calculation of the base of a VAT, even though a few attempts have been made to obtain broad estimates, for example, by McLure (1972) for the United States, Cnossen (1981) for the Netherlands, and Pedone (1981) for Italy. Yet, without a calculation of the base of a VAT, it is difficult to realize its proper revenue potential.

Often, the laws pertaining to a VAT are so complicated that tax experts consider a calculation of its base too unwieldy, if not impossible since available gross domestic product (GDP) (value-added) data cannot be incorporated into the framework of the law. But as more developing countries have begun to prepare their national accounts data in line with U.N. guidelines, the possibilities for making such an attempt have been increasing. For example, if an input-output table for an economy is available, it could be used in conjunction with gross production data from the national accounts to calculate the VAT base in a relatively straightforward manner by removing from the base all intermediate uses. Such a methodology is developed in this paper, with specific reference to Mexico. The exercise is attempted for two years, 1980 (the year the VAT was introduced), and 1983 (the year for which the latest data are available). Since there were considerable changes in the VAT laws between the two years, it was felt that the differential impacts of the changes in the law on the methodology would best be demonstrated by calculating the bases for the two years separately. The simplicity of the methodology should make it applicable to other developing countries in which comparable data are available.

1/ Conference on Value-Added Taxation in Developing Countries, Economics and Research Staff, The World Bank, Washington, D.C., April 21-23, 1986.

2/ See, for example, Lent (1974), Heller (1981), Tait (1981, 1986), Choi (1983), Aguirre, Alejandro, and Passarella (1984), Campo and Costa (1984), Contreras and Gonzalez (1985), Casanegra de Jantscher (1986), Chakraborty (1986), Giraldo (1986), Habibi (1986), and Jap (1986).

In Section II, the main characteristics of the Mexican VAT are described. Section III discusses the evolution of the VAT since its introduction in 1980, focusing on exogenous trends in the economy that could affect the performance of the VAT. Section IV summarizes the methodology and results of the calculation of the VAT base (a detailed analysis appears in the Appendix). Finally, Section V presents a summary of conclusions.

II. Structural Aspects of the VAT

The introduction of the VAT in early 1980 provided the Mexican tax system with a modern and efficient instrument for taxing consumption. The VAT was introduced in Mexico somewhat later than in many other Latin Amerian countries, which allowed time for careful studies to be conducted and for the original law to be meticulously prepared. 1/ European and Latin American legislation was analyzed and discussed in many domestic forums in an endeavor to determine whether their principles could be applied in Mexico. As a result, the law, which was approved in 1978 and entered into force in 1980, endowed the tax with a clear and highly rational structure.

1. Design of the tax: characteristics and development

The main features of the original law were (1) a single general rate and an adequate level (10 percent), which avoided complexities for both the taxpayer and the administration; (2) a reasonable number of exemptions, which reduced problems of interpretation without having too much impact on collections; (3) immediate deduction of the tax on purchases of capital goods, which, even though it implied a decrease in revenue, was an important incentive for capital formation; (4) use of the zero rate almost exclusively for exports, which limited the control problems its extension to other operations would entail, and prevented any noticeable erosion of the tax base; (5) a special regime devised for taxpayers defined as "minor taxpayers" that required less administrative effort to keep them within the system; and (6) exemption of agricultural products, which virtually eliminated the need for administrative controls in a sector where they would be difficult to apply.

1/ Brazil (at the state level) and Uruguay were the first to use valued taxes, which they introduced in 1966 and 1968, respectively. By the end of 1975, Argentina, Bolivia, Chile, Costa Rica, Ecuador, and Honduras had also introduced value-added taxes.

Some of these features were changed soon after the introduction of the VAT. Most notably, the rate structure of the VAT now includes exemptions as well as rates of 0, 6, 15, and 20 percent. Sales of unprocessed food products from the agricultural sector 1/ and primary food items such as meat, milk, eggs, edible oil, salt, bread, and sugar are taxed at the zero rate. Sales of fertilizers, pesticides, and agricultural machinery and tools and the provision of services relating to irrigation, fisheries, and related activities are also taxed at the zero rate, which means that the tax paid on inputs is recoverable in all these activities. 2/ Exports are likewise taxed at the zero rate.

A wide range of activities is exempt from the VAT. The tax on the inputs of those products that are exempt from the VAT cannot be recovered. Even so, because such exempt activities account for an important segment of GDP, they imply a significant exclusion from the VAT base. An attempt is made below to estimate the extent of this exclusion. These activities include, among others, sales by so-called union stores, housing construction and rentals, the national lottery, most passenger transport, book sales, life and agricultural insurance, bank interest, a large part of medical services, some entertainment services, education, and public administration.

Most sales of processed agricultural products and medicines are taxed at the 6 percent rate. Taxable operations or activities performed in the border zone, geographically a 20-kilometer band along the land borders, and certain free zones are also generally liable to a 6 percent rate. This system, which transforms a geographical area into a separate tax zone, is a distinctive feature of the Mexican VAT. There are indications that the tax base in that area plus the corresponding VAT could well represent about 10 percent of the sum of the total tax base and the VAT for the whole country. 3/

The general 15 percent rate affects most sales of manufactured and mining products, nonhousing construction, and the provision of services such as electricity, commerce, restaurants and hotels, transport and communication, and repairs. All these activities together make up the bulk of the VAT base.

1/ Agriculture accounted for between 7.5 percent and 8.5 percent, respectively, of GDP between 1980 and 1984.

2/ Inputs are taxed at the zero rate to prevent the VAT on such inputs from affecting costs of agricultural products if the farmer does not use the VAT as a credit (for instance, an unregistered farmer).

3/ The size of the VAT base attributable to the border zone (zona fronteriza) obviously affects the theoretical revenue from VAT because of the lower VAT rate which applies to the area.

Finally, a 20 percent rate is directed to the high-income segments of the population. This rate is virtually symbolic as it applies to sales of a few articles such as caviar, champagne, motorcycles with large displacements, firearms, and the provision of services, such as cable television, which are of negligible importance in terms of the tax revenue they generate.

In addition to these characteristics of the VAT, other structural features must be taken into account. First of all, the tax is levied on sales of movable and immovable property, provision of services, the temporary use and enjoyment of property, and imports of goods and services. Second, the tax is applied at all stages in the production and marketing process, where it is calculated by the difference between the tax added to sales and that charged on purchases. Third, it is a consumption tax, allowing for the immediate deduction of the total tax included in purchases of capital goods. Fourth, it should not appear separately on invoices for sales to final consumers (a provision that became applicable in August 1985). Finally, minor taxpayers receive special treatment, under which, in most cases, a presumptive tax debit and tax credit are established for them.

2. Major features of the tax

a. Minor taxpayers

Whatever form of sales tax is adopted, small taxpayers normally require special treatment, as they have less administrative capacity than larger enterprises. In general, this special treatment is not intended to favor them by reducing their tax burden but instead, enables them to use a simplified system that produces results approximating their real tax obligations, does not require excessive efforts on their part to determine their obligations, and facilitates control by the tax administration. A study carried out by the OECD's Fiscal Affairs Committee after the VAT was introduced in Europe concluded that applying special treatment to small taxpayers did not significantly affect competitive prices, but did relieve the tax administration and the taxpayers themselves of considerable burdensome efforts. Most countries applying a VAT have adopted this solution.

When it was introduced in Mexico, the VAT also included a special procedure for handling small taxpayers, although its actual application was postponed until 1982. The scheme adopted was similar to the approach used in other Latin American countries—making the tax authorities responsible for estimating, on the basis of specific indexes, the amount of receipts from sales and the corresponding tax. From that tax, taxpayers, who were expected to save their purchase invoices, were supposed to deduct the tax which had been passed on to them. This scheme had the advantage of keeping taxpayers tied into the general system but did not obligate them to fulfill its more complex requirements.

In 1982, when this procedure was first applied, the original idea was altered, enabling the tax authorities to estimate the creditable tax instead of the taxpayers. Another amendment was introduced in 1983, providing for a two-year transition period for minor taxpayers whose incomes exceeded the limit for their category; at the end of the period, they are excluded from the category. For 1985, estimated 1984 income must not have exceeded Mex$7,250,000 if the taxpayer was to avoid being excluded from the minor taxpayer system.

b. <u>Treatment of agriculture and the zero rate</u>

In most countries, agricultural producers pose a serious problem to the tax administration. In general, they are not well-organized adminis- tratively and they tend either not to keep accounts or to keep them inadequately. Moreover, they commonly reside in places that are not readily accessible to the tax administration. These problems, frequently compounded by a low level of education among agricultural producers, make it difficult to apply a tax like the VAT to them. For this reason, most countries do not include primary producers in the general VAT scheme, although there are exceptions--such as the United Kingdom and Denmark.

Excluding producers from the VAT system through exemption has the drawback of denying them compensation for the tax they pay when purchasing VAT-liable inputs. Accordingly, several of the arrangements in use for excluding farmers also aim at minimizing the effects of the inherent penalty. If products from the agricultural sector are by and large tax-free at the subsequent marketing or manufacturing stages, either because sales of agricultural products on the domestic market are exempt or because such products are primarily intended for export, the most commonly applied alternative is to exempt the sector and its principal inputs (seeds, fertilizers, and agricultural machinery). This procedure eliminates the need for the farmer to register himself or file a return, and substantially reduces the tax burden affecting his costs. It should not be forgotten, however, that value added by the primary sector tends to be high in relation to its inputs, and in this case, the tax burden on the inputs becomes less significant. In general, most Latin American countries have opted for exemption.

A contrasting situation exists in Europe, where products are gener- ally taxable in the subsequent marketing stages of farm production. The solution, envisaged by the Sixth Directive of the European Economic Community, is designed to circumvent agricultural producer registration and eliminate the VAT included in the sector's inputs from the farmer's costs by establishing a presumptive rate that is applied to the sale price of agricultural products. Under this procedure, registration by the farmers is optional. If a producer is not registered, a purchaser pays the producer a certain percentage on the amount of the transaction,

representing the average VAT burden on agricultural inputs in the sector. 1/ (In turn, purchasers may deduct this payment from the tax generated on their sales.) A farmer who registers must invoice the VAT at the relevant rate and, when making payment, deduct the VAT paid on inputs, like any taxpayer liable to the general scheme. As a result, very few European farmers opt for registration. The same method, with some variations, was used in Argentina during a period when most food-stuffs were subject to VAT.

In Mexico, agricultural sector sales are taxed at the zero rate. These unprocessed agricultural products also receive zero-rate treatment at successive marketing stages. Similarly, a large number of foodstuffs that have been processed to a greater or lesser degree are taxed at the zero rate. As the zero rate also applies to agricultural inputs, it may be concluded that approximately 80 percent of agricultural production, whether processed or not, is not subject to the VAT.

c.   Border (zona fronteriza) and free zone rates

The general VAT rate differs according to the geographical area where transactions take place. If they are carried out within the border areas or in the areas known as free zones, they are taxed at 6 percent; elsewhere, the applicable rate is 15 percent. Although this arrangement has no counterpart in the comparable laws of other countries, Mexico had unquestionably strong economic reasons for intro-ducing it, namely the proximity of easily accessible U.S. markets operating with consumption tax rates lower than the general VAT rate in Mexico.

Unfortunately, the existence of a special arrangement opens the way for stratagems that are hard to detect and whose size is not easy to measure, as operations transacted outside the areas where the lower rate is applied can easily be made to appear as if they had taken place within them, especially in the case of sales to final consumers. 2/ This arrangement also creates a discrepancy between domestic prices, which may adversely affect tax revenue as it encourages consumers who live close to the areas where the lower rate applies to make their purchases in these areas. Changes in the law since 1981 have been narrowing the arrangement's scope to some extent by excluding certain transactions from it.

1/ In Ireland, for example, this percentage is 1 percent.
2/ Countries that use free zones must establish genuine customs bar-riers to prevent fraud and accept an operation as having been performed in the area only if its documents are entirely in order and have been subject to strict controls. Even with all these precautions, revenue leakages occur frequently.

The size of the VAT base attributable to the border zone in the
exercise attempted in this paper obviously affects the overall theo-
retical tax revenue from VAT because of the lower tax rate that applies
to the area. Specific data were not available in this regard. However,
according to the staff of the Mexican Ministry of Finance, the border
area accounts for about 10 percent of the base. This estimate is con-
firmed by information collated by the Directorate General of Computerized
Information on Revenue in order to determine "assignable VAT" figures
for each state. Therefore, this paper assigns 10 percent of the VAT
base to the border zone. 1/

d. Multiple rates

Multiple rates for a VAT are not advisable as they add complexity
to administrative procedures and complicate the final marketing stage,
when, as frequently happens, the operations transacted are taxed at
different rates. When multiple rates differ considerably from each
other, they create additional problems by their effect on tax credits.
Thus, for instance, if a final product is taxed at a much higher rate
than its inputs, the seller will be more inclined to resort to evasion,
as he alone will be responsible for paying the government a propor-
tionately larger share of the total tax. In the reverse instance, if
the final products are subject to a much lower rate than their inputs,
negative effects, very similar to those mentioned in connection with
the use of the zero rate in the domestic market, occur.

In early 1983, in the wake of serious economic disturbances, Mexico
implemented a major adjustment effort. The need to increase tax revenue
prompted the Mexican authorities to raise the general VAT rate from
10 percent to 15 percent and to introduce special rates of 6 percent
and 20 percent. The 6 percent rate arose from the need to restrict
the use of the zero-rate scheme, but without making products excluded
from the zero rate taxable at the general 15 percent rate.

III. Exogenous Influences on the Tax Base

As a percentage of GDP, VAT fell from 2.8 percent in 1980 and
2.7 percent in 1981 to 2.3 percent in 1982, when the general tax rate
was 10 percent. When the rate was increased to 15 percent in 1983, VAT
revenue rose to 3.2 percent of GDP in both 1983 and 1984. Several
exogenous factors affected the base of the VAT during these years. In
this section, trends in the Mexican economy that reflected structural
changes and would affect the VAT base are examined.

1/ For further details of the rationale for using this percentage
assignment, see Section 1 of the Appendix.

First, the share of the agricultural sector in GDP fell between 1980 and 1982, but it increased from 1982 to 1984 from 7.4 percent to 8.5 percent, implying a negative impact for the VAT base in the later years (Table 1). However, the share of mining in GDP steadily increased from 6.8 percent in 1980 to 12.0 percent in 1984, most of which was accounted for by petroleum. While the export of petroleum represented a loss for the VAT base, increases in the domestic price during this period resulted in an augmented VAT base. The increased domestic prices also led to heavy increases in the gasoline excises in terms of GDP, which also had a positive impact on the VAT base since excises are included in it. Trends in manufacturing, much of whose output is taxed and whose share in GDP increased from 23 percent in 1980 to 23.9 percent in 1984, further helped to augment the VAT base. The share of financial services, much of which falls outside the purview of VAT, declined from 7.9 percent in 1980 to 6.2 percent in 1984, exerting an additional, if small, positive effect on the VAT base.

Changes in the patterns of demand and supply also help explain the exogenous effects on the VAT base. Fixed capital formation fell significantly between 1980 and 1983, from 24.2 percent of GDP to 17.3 percent, while the increase in stocks moved down from 4 percent of GDP to 2.9 percent, again implying the possibility of an increased proportion of GDP that could be captured by the VAT base (Table 2). Upon further observation, it is evident, however, that the share of consumption actually fell from 72.8 percent of GDP in 1980 to 69.7 percent in 1983, 1/ while that of exports increased from 12.6 percent of GDP in 1980 to 19.5 percent in 1983. On the supply side, the ratio of imports in terms of GDP also declined significantly from 13.5 percent in 1980 to 9.4 percent in 1983. Further, between these two years, imports of manufactured goods dropped materially in favor of agricultural goods, financial services, and transport and communications, clearly affecting the VAT base adversely (Table 3).

To conclude, the overwhelming change in the structure of the external sector between 1980 and 1983 in the direction of increased exports and lower imports, leading to lower domestic consumption, as well as the change in the composition of imports, created strong downward pressures on the VAT base. The accompanying decline in domestic investment and significant increases in domestic petroleum prices, together with the effect of increased petroleum excises on the VAT base, somewhat offset this downward pressure, but the net effect of these influences may have been to reduce the VAT base substantially between 1980 and 1983.

1/ The percentage of private to total consumption increased from 85.1 percent to 86.7 percent between 1980 and 1983 implying a shift to a wider VAT coverage within consumption, even though the overall share of total consumption in demand declined.

Table 1. Mexico: Structure of Production, 1980-84

	1980	1981	1982	1983	1984	1980	1981	1982	1983	1984
	(In billions of pesos at current prices)					(In per cent)				
Gross domestic product	4,276.5	5,874.4	9,417.1	17,141.8	29,439.0	100.0	100.0	100.0	100.0	100.0
Agriculture and fishery	357.1	477.5	693.3	1,358.9	2,509.9	8.4	8.1	7.4	7.9	8.5
Mining	291.4	369.5	934.3	2,047.4	3,533.8	6.8	6.3	9.9	11.9	12.0
Manufacturing	985.0	1,311.5	2,000.8	3,870.6	7,021.3	23.0	22.3	21.2	22.6	23.9
Construction	276.2	409.3	589.8	878.3	1,431.6	6.5	7.0	6.3	5.1	4.9
Electricity	42.0	52.4	77.3	155.4	293.5	1.0	0.9	0.8	0.9	1.0
Commerce, restaurants, and hotels	999.6	1,361.2	2,146.4	3,821.8	6,489.4	23.4	23.2	22.8	22.3	22.0
Transport, storage, and communications	279.1	388.8	604.4	1,138.6	1,934.6	6.5	6.6	6.4	6.6	6.6
Financial services, insurance, and rental of immovables	336.9	470.3	710.5	1,195.7	1,838.9	7.9	8.0	7.5	7.0	6.2
Community, social, and personal services	757.0	1,104.9	1,767.4	2,819.8	4,635.7	17.7	18.8	18.8	16.4	15.7
Imputed banking services	-47.8	-71.0	-107.1	-144.7	-249.7	-1.1	-1.2	-1.1	-0.8	-0.8

Source: National accounts, Ministry of Planning and Budget.

Table 2. Mexico: Patterns of Demand and Supply, 1980-83

	1980	1981	1982	1983	1980	1981	1982	1983	1980	1981	1982	1983
	(In billions of pesos at current prices)				(Percentage of demand)				(Percentage of GDP)			
Demand	4,854.3	6,672.5	10,470.9	18,759.1	100.0	100.0	100.0	100.0	113.5	113.6	111.2	109.4
Total consumption	3,114.3	4,268.3	6,833.7	11,946.3	64.1	64.0	65.3	63.7	72.8	72.7	72.6	69.7
Private consumption	(2,651.5)	(3,583.8)	(5,776.1)	(10,356.0)	(85.1)	(84.0)	(84.5)	(86.7)	62.0	61.0	61.3	60.4
Government con- sumption	(462.8)	(684.5)	(1,057.6)	(1,590.3)	(14.9)	(16.0)	(15.5)	(13.3)	10.8	11.7	11.2	9.3
Gross capital formation	1,032.9	1,509.4	2,098.8	2,872.3	21.3	22.6	20.0	15.8	24.2	25.7	22.3	17.3
Change in stocks	169.8	193.2	-98.0	499.9	3.5	2.9	-0.9	2.7	4.0	3.3	-1.1	2.9
Exports f.o.b.	537.2	701.6	1,635.5	3,340.6	11.1	10.5	15.6	17.8	12.6	11.9	17.4	19.5
Supply	4,854.3	6,672.5	10,470.9	18,759.1								
Imports	577.8	798.1	1,053.8	1,617.4	11.9	12.0	10.1	8.6	13.5	13.6	11.2	9.4
GDP	4,276.5	5,874.4	9,417.1	17,141.7					100.0	100.0	100.0	100.0

Source: National accounts, Ministry of Planning and Budget.

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Table 3. Mexico: Structure of Imports, 1980-83

	1980	1981	1982	1983	1980	1981	1982	1983
	(In billions of pesos at current prices)				(Percentage)			
Total	577.8	798.1	1,053.9	1,617.4	100.0	100.0	100.0	100.0
Agriculture and fishery	46.3	59.5	53.6	208.6	8.0	7.5	5.1	12.9
Mining	9.4	13.2	15.2	15.0	1.6	1.6	1.4	0.9
Manufacturing	394.2	522.5	655.3	788.5	68.2	65.5	62.2	48.7
Construction	--	--	--	--	--	--	--	--
Electricity	0.1	--	--	--	--	--	--	--
Commerce, restaurants, and hotels	--	--	--	--	--	--	--	--
Transport, storage, and communication	19.2	33.9	73.9	132.1	3.3	4.2	7.0	8.2
Financial services, insurance,and immovables	11.4	12.3	20.4	179.1	2.0	1.5	1.9	11.1
Community, social, and personal services	1.4	1.6	1.3	1.1	0.3	0.2	0.1	0.1
Direct purchases abroad by residents	95.8	155.1	234.0	293.0	16.6	19.4	22.2	18.1
Manufacturing	394.2	522.5	655.3	788.4	100.0	100.0	100.0	100.0
Food products, drinks, tobacco	29.9	30.3	42.6	64.7	7.6	5.8	6.5	8.2
Textiles and leather products	7.0	11.2	14.8	5.8	1.8	2.1	2.3	0.7
Wood and lumber	1.8	2.3	2.7	2.7	0.5	0.4	0.4	0.3
Paper, print,and publishing	15.3	18.0	24.2	34.3	3.9	3.4	3.7	4.3
Petroleum, chemicals,and rubber	60.7	75.0	115.7	200.3	15.4	14.3	17.7	25.4
Mining except petroleum	4.1	5.0	6.0	6.2	1.0	1.0	0.9	0.8
Basic metals industries	47.7	59.2	57.1	52.9	12.1	11.3	8.7	6.7
Machine and equipment	211.4	296.4	360.4	386.1	53.6	56.7	55.0	49.0
Other manufacturing industries	16.3	25.1	31.8	35.4	4.1	4.8	4.9	4.5

Source: National accounts, Ministry of Planning and Budget.

IV. Estimation of the VAT Base

In this section an estimation of the VAT base, which is influenced not only by the exogenous factors elaborated above but also by endogenous factors within the control of policymakers and tax administrators, is made and discussed. The estimates were made for 1980, the year in which the VAT was introduced, and 1983, the latest year for which necessary data are available. The estimates were made on the basis of information for the nine major economic sectors derived from the national accounts and the input/output tables.

The methodology utilized in the derivation of the base for the VAT may be described as follows:

(1) Supply was defined as sales (gross production plus imports) minus purchases (intermediate consumption); and

(2) Taxable supply, or the base of the VAT, was defined as taxable sales minus taxable purchases (net of purchases giving rise to exempted sales) and minus the effect of fixed capital formation.

The details of the methodology are presented in the Appendix. A summary of the results is presented in Table 4.

The ratio of taxable supply to supply gives an indication of the proportion of domestic value added plus imports that is captured in the VAT base. As detailed in Table 4, this ratio decreased significantly from 49.2 percent in 1980 to 43.4 percent in 1983. This decline was the net effect of several downward and upward exogenous pressures on the base in 1983, which were explained in Section III, together with substantial changes in the law, eroding the base over the years, as elaborated in Section II. Focusing on the effect of capital formation between the two years, it is interesting to note that creditable capital formation as a percent of taxable supply fell by about 3 percentage points from 22.2 percent to 19.3 percent between 1980 and 1983. On the other hand, mainly because of the changes in the VAT law between the two years, net purchases creditable as a percentage of taxable supply increased from 48.7 percent in 1980 to 60.7 percent in 1983. The contraction in the base attributable to this increase was clearly greater than the positive impact caused by the decline in investment. In any event, it would appear that the positive impact of the decline in investment was not as significant as the discussion above of the patterns of demand might have led one to believe.

Table 4. Mexico: Base of the Value-Added Tax

(In billions of pesos)

		1980			1983		
		Supply	Taxable supply	Theo-retical tax revenue	Supply	Taxable supply	Theo-retical tax revenue
1.	Sales (debit)	7,327.2	4,267.5	373.3	28,179.6	15,718.8	1,876.5
2.	Purchases (credit)	2,472.8	1,650.6	144.4	9,420.5	6,339.8	762.4
3.	Purchases of exempted items (debit)		433.8	38.0		1,038.6	126.8
4.	Gross capital forma-tion (credit)		553.2	48.3		1,684.7	207.2
5.	Supply $\overline{/1-2/}$	4,854.4			18,759.1		
6.	Taxable supply $/\overline{1}-(2-3)-\underline{4/}$		2,497.5	218.6		8,732.9	1,033.7
7.	Base of VAT as percent of supply 1/ $/\text{taxable supply:supply/}$			49.2			43.4

Source: Tables 5 and 10.

1/ Net of tax.

V. Summary of Conclusions

An exercise estimating the base of VAT in 1980, the year of its inception, and 1983, the latest year for which detailed national accounts are available, reveals that the base of the VAT, as a percentage of total supply, decreased by about 12 percent between the two years. Several exogenous factors beyond the control of policymakers and tax administrators have exerted pressures, both negative and positive, on the base of VAT since its inception and may have contributed to these results. The negative influences include: (1) an increase in the share of agriculture in GDP between 1982 and 1984; (2) a significant increase in the share of exports in GDP between 1980 and 1983, including increases in petroleum exports; (3) a fall in the share of consumption in total demand between 1980 and 1983; (4) a substantial decrease in imports in terms of GDP; and (5) a further negative impact due to the change in the composition of imports in favor of agricultural goods from manufactured ones.

The positive influences on the VAT base include: (1) large increases in the domestic price of petroleum and the added effect of increased excises, which form a part of the VAT base; (2) a substantial fall in fixed capital formation between 1980 and 1983; (3) a fall in the share of financial services which lie primarily outside the VAT base; and (4) an increase in the percentage of private to total consumption between 1980 and 1983, implying a shift to a wider VAT coverage within consumption, even though the overall share of total consumption in demand declined.

Among the factors within the control of policymakers and administrators, some have affected the VAT base adversely, for example, changes in the composition of the base through legislation. These conclusions were arrived at by subjecting Mexican data to a detailed methodology for calculating the VAT bases in 1980 and 1983; the straightforwardness of the methodology should make it readily applicable to other countries.

Calculations for Estimating the VAT Base

The stepwise method for calculating the VAT base was explained in Section IV. The assumptions behind the derivation of the basic numbers presented in Tables 5 (for 1983) and 10 (for 1980) as a background to the calculations of the base of VAT are explained here.

Tables 5 and 10 are divided into four parts:

(1) Sales: VAT to be debited by sector;

(2) Purchases: VAT creditable by sector is calculated here;

(3) Purchases of exempted items: reconciliation between the effect of exempted items on the debit side (1), and the corresponding effect on the credit side (2); and

(4) Gross capital formation: gross capital formation by sector and its effect on revenue.

Thus, VAT revenue = (1) − $[(2)-(3)]$ − (4).

The methodology utilized in each part, first for 1983 and then for 1980, is elaborated below.

1.   Size of the zona fronteriza (border zone)

Problems were encountered in estimating the VAT base attributable to the border zone, because of lack of data. While figures on revenue collection do exist, they are difficult to interpret because they do not necessarily correspond to the appropriate base figures. For example, a trader selling Mex$100.00 worth of merchandise in the border zone at a VAT rate of 6 percent may in fact be eligible to receive a refund based on his having paid a 15 percent tax on purchases made outside the border zone as long as their value is more than Mex$40.00. Another problem is that taxes collected on imports from the United States entering Mexico by land are shown as border zone collections, irrespective of their destination in Mexico.

Statistics processed by the Dirección General de Informática de Ingresos for 1980 to 1982 show that the states along the border with the United States account for about 20 percent of the total VAT base for each year. For our purposes, the State of Nuevo León can be discounted since the border zone within this state does not contain a major city. Without Nuevo León, the percentage drops to slightly above 10 percent. This percentage (i.e., 10 percent) refers to the entire geographical area of the border states other than Nuevo León, not just to the border zone areas within them. The attribution of 10 percent of the base to the border zone can, therefore, be considered an upper limit for the VAT base in the border zone areas.

Table 5. Mexico: Calculations for the Base of the Value-Added Tax, 1983

(In billions of pesos)

	Gross Product (1)	Imports (2)	Supply (3)	Exemptions (4)	Zero Rate Exports (5)	Zero Rate Interior (6)	Change in Stocks (7)	Taxable Supply (8)	6% Base Zona Frontera (9)	6% Tax Revenue 1/ Interior (10)	6% Base Interior (11)	6% Tax Revenue 1/ (12)	15% Base (13)	15% Tax Revenue 1/ (14)	Total Tax Revenue (15)
Sales (debit):	26,562.2	1,617.4	28,179.6	5,181.9	2,737.0	4,188.6	353.3	15,718.8	1,571.9	88.9	782.2	44.3	13,364.7	1,743.3	1,876.5
Agriculture	1,919.6	208.6	2,128.2	--	56.1	2,072.1	--	--	--	--	--	--	--	--	--
Mining	2,502.6	15.0	2,517.6	—	1,867.4	10.9	3.3	636.0	63.6	3.6	--	—	572.4	74.7	78.3
Manufacturing	8,960.9	788.5	9,749.4	83.0	402.1	1,309.5	350.0	7,604.8	760.4	43.0	650.5	36.8	6,193.9	807.9	887.7
Construction	1,835.6	—	1,835.6	785.6	—	--	—	1,050.0	105.0	5.9	--	--	945.0	123.3	129.2
Electricity	219.8	—	219.8	--	--	--	--	219.8	22.0	1.2	--	--	197.8	25.8	27.0
Commerce and restaurants	4,405.3	—	4,405.3	27.3	263.3	796.1	—	3,318.5	331.9	18.8	131.7	7.5	2,854.9	372.4	398.7
Transport and communications	1,736.6	132.1	1,868.7	696.9	110.8	--	--	1,061.0	106.1	6.0	—	—	954.9	124.6	130.6
Financial services and rental of immovables	1,381.4	179.1	1,560.5	1,039.4	35.5	--	--	485.6	48.6	2.8	--	—	437.0	57.0	59.8
Community, social and personal services	3,600.4	1.1	3,601.5	2,256.7	1.7	--	--	1,343.1	134.3	7.6	—	—	1,208.8	157.7	165.3
Direct purchases abroad by residents		293.0	293.0	293.0			—	--			—	--	—	--	--
Purchases (credit):			9,420.5 2/	1,349.5		1,731.7		6,339.8	607.3	34.4	266.3	15.1	5,465.9	712.9	762.4
Agriculture			560.7	29.2		362.2		169.3	12.4	0.7	45.1	2.6	111.8	14.6	17.9
Mining			455.2	78.7		9.3		367.2	36.2	2.0	4.9	0.3	326.1	42.5	44.8
Manufacturing			5,090.3	350.1		1,299.9		3,440.3	325.4	18.4	186.4	10.6	2,928.4	382.0	411.0
Construction			957.4	97.7		12.9		846.8	84.0	4.8	6.9	0.4	755.9	98.6	103.8
Electricity			64.5	4.2		1.2		59.1	5.9	0.3	0.6	—	52.6	6.9	7.2
Commerce and restaurants			583.5	233.0		7.4		343.1	33.9	1.9	4.0	0.2	305.2	39.8	41.9
Transport and communications			598.0	108.1		12.2		477.7	47.1	2.7	6.5	0.4	424.0	55.3	58.4
Financial services and rental of immovables			185.7	82.4		1.5		101.8	10.1	0.6	0.8	—	90.8	11.8	12.4
Community, social and personal services			780.6	221.0		25.1		534.5	52.3	3.0	11.1	0.6	471.1	61.4	65.0
Imputed banking services			144.7	144.7											
Purchases of exempted items (debit):								1,038.6	102.3	5.9	15.5	0.9	920.8	120.1	126.8
Manufacturing								33.3	3.2	0.2	1.8	0.1	28.4	3.7	4.0
Construction								389.9	38.7	2.2	3.2	0.2	348.0	45.4	47.8
Commerce and restaurants								2.3	0.2	--	--	--	2.1	0.3	0.3
Transport and communications								191.6	18.9	1.1	2.6	0.2	170.0	22.2	23.4
Financial services and rental of immovables								70.5	7.0	0.4	0.6	--	62.9	8.2	8.6
Community, social and personal services								351.0	34.3	2.0	7.3	0.4	309.4	40.3	42.7
Gross capital formation (credit):			2,972.2					1,684.7	168.4	9.5			1,516.3	197.7	207.2
Construction			1,880.6					863.9	86.4	4.9			777.5	101.4	106.3
Machinery for transport			281.8					160.3	16.0	0.9			144.3	18.8	19.7
Machinery and equipment			809.3					660.5	66.0	3.7			594.5	77.5	81.2
Animal stock			0.5												

Source: Tables 18-26.
1/   The effect of IVA is removed from the base of the tax before applying the tax rate; thus where the tax rate is 6 percent, revenue equals the base divided by 1.06 times 0.06.
2/   Consumption of intermediate goods.

The use of 10 percent as the proportion of the VAT base attributable to the border zone in both 1980 and 1983 needs some explanation. Increases in prices in 1983, at the start of the adjustment effort (see Section II), were probably faster in the border zone because of its direct linkage with the United States, than in the interior. For the same reason, the recession that followed the 1983 adjustments probably had less of an impact in the border zone than in the rest of the country. There is thus some reason to believe that the VAT base of the border zone in relation to the country as a whole might have been somewhat higher in 1983 than in 1980.

However, it should be pointed out that when the theoretical tax revenue for the border zone is calculated, owing to a lack of data, it is assumed that all items are taxed at the 6 percent rate. But the theoretical tax revenue should actually be higher--and, consequently, the VAT base (inclusive of tax) as well--because several activities undertaken in the border zone are taxed at the 15 or 20 percent rate, such as sales of excisable goods and services, automobiles and immovables, and services relating to transportation, telephones, electricity, and cable television.

In sum, given the available data, it was felt that 10 percent was a fairly reasonable figure for the VAT base of the border zone in relation to the national figure--even for 1983.

2.   Calculations for 1983 1/

   a.   Sales side (for tax to be debited)

Gross product figures (column 1) are taken from Sistema de Cuentas Nacionales, Tomo (T) 1, Cuadro (C) 17. Import figures (column 2) are from T 1, C 30. Total supply (column 3) is the sum of gross product and imports.

      (1)   Exemptions

Under exemptions (column 4), each sector has been treated separately according to the VAT legislation of the specific year.

         (a)   Agriculture: Nothing is exempted.

         (b)   Mining: Nothing is exempted.

1/   All references to column numbers in this section are with respect to Table 5.

(c) <u>Manufacturing</u>: Books, newspapers, and magazines are exempted. Their gross production was Mex$83 billion (T 11, C 414).

(d) <u>Construction</u>: The gross production of housing is exempt; the proportion of gross capital formation in housing in total gross capital formation in construction at 1970 prices (T 1, C 64) was found to be 42.8 percent; in terms of gross production of construction (T 11, C 772), this yields Mex$785.6 billion in exemptions.

(e) <u>Commerce and hotels</u>: The gross production of hotels, Mex$876.5 billion (T 1, C 30), is not exempt. The gross production of commerce, Mex$3,528.8 billion, is essentially the commercial margins or markups in the agriculture, mining, and manufacturing sectors. The exemptions in agriculture, mining, and manufacturing are therefore used to derive the exemptions in commerce, as shown in Table 6.

The exempted items in the remaining sectors are shown in Table 7.

(2) <u>Zero rate</u>

In the calculations for zero-rate activities, figures for exemptions under exports (column 5) are obtained from T 111, C 85; except for commerce, for which the derivation for commerce presented in Table 6 is used, yielding Mex$263.3 billion. The export figures for agriculture, mining, and manufacturing obtained from T 111, C 85 are, accordingly, reduced by the margins of commercialization in the exports of these sectors.

For the internal base (column 6), each sector is shown below.

<u>Agriculture</u>: Total supply minus exports = Mex$2,058.8 billion.

<u>Mining</u>:	Gross Production (<u>billions of pesos</u>)	<u>Source</u>
Salt	10.9	T 11, C 112

Table 6. Mexico: Calculation of Commerce Exemptions, 1983

	Margins (billions of pesos)	Percentage of Supply (Gross Production + Imports)			Margins Distributed, Based on Percentages (billions of pesos)		
		Exempt	Zero rate exports	Zero rate interior	Exempt	Zero rate exports	Zero rate interior
Agriculture	402.3	--	3.3	96.7	--	13.3	389.0
Mining	88.2	--	76.9	--	--	67.8	--
Manufacturing	3,038.3	0.9	6.0	13.4 1/	27.3	182.2	407.1
Total	3,528.8				27.3	263.3	796.1

Source: Statistical publications on Mexico (see references).

1/ For example, this is derived as 1,309.5 (Table 5, column 6), divided by 9,749.4 (Table 5, column 3).

Table 7. Mexico: Exemptions in Selected Sectors, 1983

Sector	Gross Product (billions of pesos)	Source
Transport and communication	696.9	
Passenger transport	613.7	T 11, C 856
International transport (assume		
half of air transport)	66.2	T 11, C 856
Post	6.3	T 11, C 866
Telegraph	3.0	T 11, C 866
Other	7.7	T 11, C 866
Financial services and rental		
of immovables	1,039.4	
Public institutions	54.9	T 11, C 892
Private institutions	262.5	T 11, C 892
Insurance (assume 25 percent exempted		
for life and agriculture)	21.5	T 11, C 902
Housing rentals	700.5	T 11, C 902
Community, social, and personal services	2,256.7	
Education	755.6	T 11, C 938
Public medicine	341.0	T 11, C 948
Private medicine (assume 50 percent		
exempted for consultation)	209.7	T 11, C 948
Public entertainment	34.0	T 11, C 958
Domestic services	221.4	T 11, C 968
Public administration	695.0	T 11, C 978

Source: Statistical publications on Mexico (see references).

Manufacturing:	Gross Production (billions of pesos)	Source
Manufacturing	1,400.5	
Meat 1/	171.0	T 11, C 156
Milk	221.4	
Wheat and corn	513.8	T 11, C 176, C 184
Coffee	85.4	T 11, C 194
Sugar	142.3	T 11, C 204
Oils	161.1	T 11, C 214
Chemicals (fertilizers, etc.)	58.9	T 11, C 468
Agricultural machinery and utensils	28.2	T 11, C 668
Tractors 2/	9.5	T 11, C 718
Commercial fishing boats	8.9	T 11, C 738

As part of the total of Mex$1,400.5 billion is already accounted for in column 5 for exports, the proportion of exports in gross production, 6.5 percent, is subtracted, yielding a total of Mex$1,309.5 billion.

Commerce: Mex$796.1 billion, from Table 6.

(3) Change in stocks: The figures for the change in stocks outside the VAT base (column 7) are derived in the presentation below.

	Change in Stocks: Supply (percent) (i)	Taxable Supply [column 3-(4+5+6)] (ii)	Stocks Outside VAT Base (i) : (ii)
Agriculture	2.5	--	--
Mining	0.5	650.2	3.3
Manufacturing	4.4	7,955.2	350.0

Taxable supply (column 8) equals supply (column 3), minus the sum of exempted items (column 4), zero-rated exports (column 5), zero-rated items sold domestically (column 6), and change in stocks (column 7).

1/ Of the gross production of meat, 35 percent is assumed to be at the zero percent tax rate. Source: Estadística Industrial Anual, Instituto Nacional de Estadística, Geografía e Informática, Secretaría de Programación y Presupuesto (1982).

2/ 3.7 percent of gross production of automobiles and tractors. Same source as footnote 1.

(4)   6 percent rate

First, it is assumed that the border zone (column 9) accounts for 10 percent of taxable supply. 1/ For the interior (column 11), the derivations are presented below.

(a) Manufacturing:

	Gross Production (billions of pesos)	Source
Manufacturing	722.8	
Meat products (assume 30 percent of total)	136.0	T 11, C 156
Milk products	12.5	T 11, C 156
Prepared fruit	60.7	T 11, C 166
Other food products	262.9	T 11, C 234
Prepared food for animals	102.3	T 11, C 224
Medicine	148.4	T 11, C 488
Manufacturing excluding border zone	650.5	90 percent of total

(b) Commerce: The margin of commercialization associated with the 6 percent VAT rate applicable to manufacturing is derived here.

The margin (gross production) of commerce with respect to manufacturing = Mex$3,038.3 billion.

Exemption + zero rate with respect to commerce = Mex$263.4 billion + Mex$796.1 billion = Mex$1,059.5 billion. 2/

Thus, taxable gross production in the interior = Mex$3,038.3 billion - Mex$1,059.5 billion = Mex$1,978.8 billion, of which, taxable gross production in the interior = 90 percent of Mex$1,978.8 billion, or Mex$1,780.9 billion.

The 6 percent VAT share of manufacturing in its gross production = Mex$722.8 billion divided by Mex$9,749.4 billion, or 7.4 percent.

Thus, the 6 percent VAT share of the gross product of commerce = 7.4 percent of Mex$1,780.9 billion, or Mex$131.7 billion.

1/   The sectoral tax revenues associated with the border zone are presented in column 10. Note that the effect of the VAT is first removed from the base before the tax rate is applied. This procedure is followed for all derivations of tax revenue.

2/   Columns 4 and 6.

(5) <u>15 percent rate</u>

The base for the 15 percent rate (column 13) equals taxable supply (column 8) minus the sum of the 6 percent bases for the border zone (column 9) and the interior (column 11).

b.   <u>Purchases side (for tax to be credited)</u>

In column 3, the use of intermediate goods is presented by sector (T 1, C 17). Each sector's use of intermediate goods is then divided according to sectoral origin using the input/output table for 1980—the latest available. Once this use is obtained, a further division is made according to the different tax rates as they affect the different parts of the base. For this division, the different rates of VAT paid by intermediate products emanating from different sectors are classified according to the VAT legislation.

(1) <u>Agriculture</u>: Intermediate products from this sector do not result in any credit for the VAT system.

(2) <u>Mining</u>: Intermediate products from this sector result in 15 percent tax credit.

(3) <u>Manufacturing</u>: The effective rates by subsector are given below.

	Percentage of Gross Production 1/
Exempted and zero rate	44.8
Oils	6.4
Sugar	5.6
Coffee	3.4
Corn products	10.0
Wheat products	10.2
Milk products and others	9.2
6 percent rate	35.1
Food products	10.4
Animal products	4.0
Fruit products	2.4
Meat products	18.3
15 percent rate	20.1
Tobacco	3.2
Drinks	6.9
Beer	6.0
Alcohol	4.1

1/ T 11, C 140.

Credited at the 15 percent rate are textiles, wood products, paper and paper products, nonmetallic mineral products, metal products, machinery and equipment, other manufacturing products, and most chemical products. The exceptions are fertilizers and other chemicals purchased by the agricultural sector at a zero percent tax rate. It is assumed here that agriculture accounts for 95 percent of fertilizers.

Construction: No intermediate goods emanate from this sector.

Electricity: The rate is 15 percent.

Commerce: Allocation is made according to the sectoral distribution of the gross production of commerce appearing as margins of commercialization. They are 11.4 percent for agriculture, which is exempt; 2.5 percent for mining, which is subject to the 15 percent rate; and 86.1 percent for manufacturing. The credit derived from manufacturing is distributed as follows.

	(In billions of pesos)
Total supply of manufacturing	9,749.4
Total supply net of exports	9,165.1
Total supply net of exports and change in stocks	9,130.9

Of which: (In percent)

Exempted	83.0 1/	) 15.2
Zero rate	1,309.5 1/	)
Interior base at 6 percent rate	650.5 1/	7.1
Border zone at 6 percent rate	773.8 1/	8.5)77.7 2/
Interior at 15 percent rate	6,314.1 1/	69.2)

Given that manufacturing accounts for 86.1 percent of the overall gross product of commerce, the manufacturing component results are modified as follows.

Exempted:	15.2 percent x 0.861 =	13.1 percent
At 6 percent:	7.1 percent x 0.861 =	6.1 percent
At 15 percent:	77.7 percent x 0.861 =	66.9 percent

1/ From Table 5.
2/ The border zone is combined with the 15 percent rate at this stage, because the difference is accounted for at a later stage.

(4) _Transport and communication_: The exempted supply is
derived from Section a (sales side). In terms of total production
(T 11, C 856 and T 11, C 866), 40.1 percent is exempted, and 59.9 per-
cent is credited at 15 percent. The same methodology is followed for
the remaining sectors.

(5) _Financial services, etc._: 75.2 percent is exempted,
and 24.8 percent is credited at 15 percent.

(6) _Community services, etc._: 62.7 percent is exempted, and
37.3 percent is credited at 15 percent.

Given the above classifications, as well as the sectoral distribu-
tion of intermediate goods used by each sector, the intermediate goods
base can be divided into further components according to the different
tax rates payable. The derivations for the agricultural sector are
presented in Table 8 for illustrative purposes. An explanation of the
presentation follows.

(i) The total use of intermediate goods by agriculture is
Mex$560.7 billion. This figure is divided into goods originating in
different sectors using the 1980 input/output table (Table 9). Thus,
Mex$182.2 billion of agricultural goods is used by the agricultural
sector itself. Since this entire amount is creditable at a zero rate,
it is placed in the zero rate column.

(ii) The total for food products used as intermediate goods is
Mex$118.9 billion. Of this amount Mex$53.3 billion (44.8 percent) is
exempted; Mex$41.7 billion (35.1 percent) is at the 6 percent rate; and
Mex$23.9 billion (20.1 percent) is at the 15 percent rate.

(iii) The total intermediate use of chemicals amounts to
Mex$102.6 billion, 95 percent of which is credited at the zero rate,
and 5 percent at the 15 percent rate.

(iv) The total intermediate use of commerce in agriculture
amounts to Mex$56.5 billion and is divided as follows: Mex$6.5 billion
(11.4 percent) is at the zero rate for agriculture; Mex$1.4 billion
(2.5 percent) is at the 15 percent rate for mining; Mex$7.4 billion
(13.1 percent) is exempted for manufacturing; Mex$3.4 billion (6.1 per-
cent) is at the 6 percent rate for manufacturing; and Mex$37.8 billion
(66.9 percent) is at the 15 percent rate for manufacturing.

The other sectoral distributions are obtained in the same manner.

Table 8. Mexico: Intermediate Goods to be Credited:
Agriculture, 1983

(In billions of pesos)

	Exemptions	0 Percent	6 Percent	15 Percent	Total
Total	29.2	362.2	45.1	124.2 1/	560.7 2/
Agriculture		182.2			182.2
Mining				1.7	1.7
Manufacturing					
Food products		53.3	41.7	23.9	118.9
Textiles				10.8	10.8
Wood				1.4	1.4
Paper				5.2	5.2
Chemicals		97.5		5.1	102.6
Nonmetallic				2.3	2.3
Metallic				3.8	3.8
Machines				22.7	22.7
Other				3.9	3.9
Construction					--
Electricity				9.9	9.9
Commerce	7.4	6.5	3.4	37.8+1.4	56.5
Transport	7.5			11.1	18.6
Financial services	9.7			3.2	12.9
Community services	4.6			2.7	7.3

Sources: Table 9; and estimates.

1/ This figure is divided into 10 percent at a 6 percent rate in
the border zone and 90 percent at a 15 percent rate. This applies to
all other sectors as well.

2/ This figure is first used to obtain a base for the breakdown
among sectors. It is divided by 0.270865, which is the total input
coefficient in the input/output coefficient matrix (Table 9) to obtain
2070.0 as the base for distribution. Then the input/output coefficients
are used on this base to give the sectoral distribution in this column.

Table 9. Mexico: Input-Output Coefficients, 1980

	Agriculture (1)	Mining, excluding petroleum (2)	Petroleum and natural gas (3)	Food products, drinks, tobacco (4)	Textiles and leather (5)	Wood products (6)	Paper and paper products (7)	Petroleum products (8)	Nonmetallic products (9)	Metallic products (10)
(1) Agriculture	.088280	.000010	.000000	.302873	.041354	.136521	.005165	.005413	.000179	.000000
(2) Mining, excluding petroleum	.000829	.216622	.005770	.000214	.000837	.000000	.001536	.008466	.041846	.126210
(3) Petroleum and natural gas	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.119998	.000000	.000000
(4) Food products, drinks, tobacco	.057455	.000010	.000000	.115238	.016241	.000223	.014121	.016569	.000000	.000000
(5) Textiles and leather	.005216	.000828	.000106	.006454	.203938	.021847	.003938	.004475	.002477	.001070
(6) Wood products	.000668	.000900	.000000	.000011	.000830	.153062	.019456	.001251	.000468	.000000
(7) Paper and paper products	.002497	.000797	.000557	.009729	.008920	.002932	.198539	.021354	.026451	.002944
(8) Petroleum products	.049549	.015559	.008250	.012702	.097185	.029716	.048575	.142506	.048119	.010800
(9) Nonmetallic products	.001128	.003639	.000000	.008614	.000208	.001170	.000429	.006531	.086689	.001408
(10) Metallic products	.001828	.006205	.008548	.003631	.001386	.005083	.009934	.003060	.008255	.263250
(11) Machinery and equipment	.010979	.012329	.000000	.011917	.006020	.015951	.009703	.008175	.025472	.032913
(12) Other manufacturing	.001900	.000000	.000000	.000000	.002961	.000022	.002608	.000171	.000026	.000000
(13) Construction	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000
(14) Electricity, water, gas	.004781	.022521	.000848	.005545	.006294	.004849	.019217	.025707	.048519	.026390
(15) Commerce and hotels	.027188	.029943	.025834	.068325	.084997	.089784	.057127	.063100	.040298	.046029
(16) Transport and communications	.118902	.007892	.024549	.021074	.021278	.023909	.015158	.021898	.016221	.014961
(17) Financial services and rental of immovables	.006121	.007340	.001656	.005740	.312373	.013966	.016574	.007843	.013072	.004905
(18) Community, social and personal services	.003543	.018994	.019251	.011393	.010009	.010545	.017072	.016632	.027949	.012761
Total domestic inputs	.270860	.343590	.095373	.583462	.514728	.509580	.437190	.473151	.386039	.543649
Final demand	*1.000000*	*1.000000*	*1.000000*	*1.000000*	*1.000000*	*1.000000*	*1.000000*	*1.000000*	*1.000000*	*1.000000*

	Machinery and equipment (11)	Other manufacturing (12)	Construction (13)	Electricity, water, gas (14)	Commerce and hotels (15)	Transport and communications (16)	Financial services and rental of immovables (17)	Community, social and personal services (18)	Consolidated manufacturing
(1) Agriculture	.000000	.004660	.000000	.000101	.000000	.000000	.000000	.002129	.10114
(2) Mining, excluding petroleum	.005987	.066285	.024679	.000000	.000000	.000000	.000044	.000178	.01520
(3) Petroleum and natural gas	.000000	.000000	.000000	.244859	.000000	.000000	.000000	.000000	.01849
(4) Food products, drinks, tobacco	.000015	.000021	.000000	.000025	.000000	.000000	.000000	.004469	.03939
(5) Textiles and leather	.003289	.011528	.001335	.001913	.002706	.001257	.000403	.007524	.02973
(6) Wood products	.008870	.010744	.037515	.000710	.000042	.000022	.000145	.000480	.00900
(7) Paper and paper products	.009101	.017313	.004573	.003979	.014679	.002329	.007611	.010792	.02075
(8) Petroleum products	.029198	.053189	.033698	.016649	.009399	.077902	.005051	.031227	.05107
(9) Nonmetallic products	.009331	.009748	.082425	.001090	.000211	.000173	.002035	.006607	.01007
(10) Metallic products	.080223	.034732	.113193	.001039	.000920	.000813	.000297	.001217	.03843
(11) Machinery and equipment	.113104	.007090	.057479	.006361	.006670	.039849	.002864	.030314	.03290
(12) Other manufacturing	.040541	.009642	.000949	.001406	.000394	.000338	.002666	.003136	.00081
(13) Construction	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.000000	.00000
(14) Electricity, water, gas	.006686	.004683	.003664	.045829	.007403	.002539	.005882	.004115	.01321
(15) Commerce and hotels	.090524	.083857	.058361	.065849	.017619	.040617	.008233	.026064	.07156
(16) Transport and communications	.023230	.020725	.032672	.011061	.019801	.015263	.007825	.013109	.02078
(17) Financial services and rental of immovables	.013454	.014647	.018735	.006893	.031461	.008428	.013304	.032660	.00972
(18) Community, social and personal services	.018822	.006845	.024806	.014267	.046331	.038880	.058897	.046640	.01458
Total domestic inputs	.412385	.355711	.494084	.422032	.157635	.226412	.115257	.220680	.49673
Final demand	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.00000

c.   Exempted products within intermediate consumption

Since all exempted items on the tax debit side were removed from the base, it is also necessary to remove them from the tax creditable side. For this purpose, all tax on exempt intermediate goods was removed from the tax creditable on intermediate goods. The methodology and the proportions of sales in each sector that are exempt are as follows: 1/

	(In billions of pesos)	Ratios
Manufacturing	83.0/8,541.1	= 0.0097
Construction	785.6/1,706.4	= 0.4604
Commerce	27.3/4,006.6	= 0.0068
Transport and communication	696.9/1,738.1	= 0.4010
Financial services and rental of immovables	1,039.4/1,500.7	= 0.6926
Community, social and personal services	2,256.7/3,436.2	= 0.6567

The tax creditable in each sector is reduced by these ratios.

d.   Gross capital formation

The base of the VAT is reduced by the gross formation of capital in construction, machinery and equipment (general and in transportation), and animal husbandry, after deducting the exempted portions. The sources are T 1, C 43, and T 1, C 64 of the national accounts. The methodology is presented below.

(1) Construction:	(In billions of pesos)
Gross capital formation	1,880.6
Of which:	
Housing	805.7
Improvement of land	18.8
Intermediate activities	192.2 2/
Thus, gross capital formation to be deducted	863.9

1/   Sales are defined as supply (column 3) minus change in stocks (column 7) minus tax revenue (column 15) for each sector.

2/   This figure represents 18.2 percent of 1,056.1, the remainder of the total after deducting housing and improvement of land. The 18.2 percent figure is derived from Table 5 as the exemptions net of agricultural and construction exemptions (5,181.9 - 0.0 - 785.6) expressed as a percentage of supply net of agricultural and construction supply (28,179.6 - 2,128.2 - 1,835.6). Note that construction and agriculture have already been accounted for directly under housing and improvement of land, respectively.

(2) <u>Machinery for transportation</u>:   (<u>In billions</u>
                                                                <u>of pesos</u>)

     National and imported gross capital formation   281.8
     Exemptions   121.5 <u>1</u>/

     Thus, gross capital formation to be deducted   160.3

(3) <u>Machinery and equipment</u>:

     Gross capital formation   809.3
     Exemptions   148.8 <u>2</u>/

     Thus, gross capital formation to be deducted   660.5

(4) <u>Animal husbandry</u>:   0.5

     Exemptions   0.5

From the totals for the base as well as revenue for Sections a, b, c, and d, the theoretical VAT revenue can now be derived as:

a (tax debit on sales) - b (tax creditable on purchases) - c (tax on exemptions within tax creditable) - d (hypothetical tax payable on capital goods).

3. <u>Calculations for 1980</u>

The methodology for 1980 is essentially the same as that for 1983; the derivation process is presented in Table 10. The differences between the two years and the actual numerical derivations for 1980 are discussed in the following section.

<u>1</u>/ 43.1 percent of the total, where the percentage is obtained from Table 5 as the proportion of exemptions (679.9) in the total gross product of transport (1,577.0). This approach is based on the assumption that the bulk of the machinery for transportation goes to the transport sector.

<u>2</u>/ Due to nonavailability of further information, 18.4 percent, the proportion of total exemptions (5,181.9) to total supply (28,179.6) from Table 5, is used.

Table 10. Mexico: Calculations for the Base of the Value-Added Tax, 1980

(In billions of pesos)

	Gross Product (1)	Imports (2)	Supply (3)	Exemptions (4)	Zero Rate Exports (5)	Change in Stocks (6)	Taxable Supply (7)	6% Base Zona Fronteriza (8)	6% Tax Revenue (9)	10% Base (10)	10% Tax Revenue (11)	Total Tax Revenue (12)
Sales (debit):	6,749.3	577.8	7,327.2	2,544.5	400.1	115.1	4,267.5	426.8	24.1	3,840.7	349.2	373.3
Agriculture	499.0	46.3	545.3	529.2	16.1		--	--	--	--	--	--
Mining	373.3	9.4	382.7	2.2	246.7	1.0	132.8	13.3	0.8	119.5	10.9	11.7
Manufacturing	2,335.2	394.2	2,729.4	336.2	65.3	114.1	2,213.8	221.4	12.5	1,992.4	181.1	193.6
Construction	575.6	—	575.6	199.7	—		375.9	37.6	2.1	338.3	30.8	32.9
Electricity	54.6	0.1	54.7	--	—		54.7	5.5	0.3	49.2	4.5	4.8
Commerce and restaurants	1,160.4	--	1,160.4	204.3	46.4		909.7	91.0	5.2	818.7	74.4	79.6
Transport and communications	400.7	19.2	419.9	153.0	14.3		252.6	25.2	1.4	227.4	20.7	22.1
Financial services and rental of immovables	383.1	11.4	394.5	282.9	10.7		100.9	10.1	0.6	90.8	8.3	8.9
Community, social and personal services	967.5	1.4	968.9	741.2	0.6		227.1	22.7	1.2	204.4	18.5	19.7
Direct purchases abroad by residents		95.8	95.8	95.8								
Purchases (credit):			2,472.8	822.2			1,650.6	165.0	9.3	1,485.6	135.1	144.4
Agriculture			141.8	98.1			43.7	4.4	0.2	39.3	3.6	3.8
Mining			81.9	17.2			64.7	6.5	0.4	58.2	5.3	5.7
Manufacturing			1,350.2	429.8			920.4	92.0	5.2	828.4	75.3	80.5
Construction			299.4	35.4			264.0	26.4	1.5	237.6	21.6	23.1
Electricity			12.5	1.1			11.4	1.1	0.1	10.3	0.9	1.0
Commerce and restaurants			160.9	71.6			89.3	8.9	0.5	80.4	7.3	7.8
Transport and communications			121.6	26.5			95.1	9.5	0.5	85.6	7.8	8.3
Financial services and rental of immovables			46.2	23.9			22.3	2.2	0.1	20.1	1.8	1.9
Community, social and personal services			210.5	70.8			139.7	14.0	0.8	125.7	11.5	12.3
Imputed banking services			47.8	47.8								
Purchases of exempted items (debit):							433.8	43.4	2.5	390.5	35.5	38.0
Agriculture							42.4	4.3	0.2	38.1	3.5	3.7
Manufacturing							115.5	11.5	0.7	104.0	9.5	10.1
Construction							97.1	9.7	0.6	87.4	7.9	8.5
Commerce and restaurants							16.8	1.7	0.1	15.2	1.4	1.5
Transport and communications							36.6	3.7	0.2	32.9	3.0	3.2
Financial services and rental of immovables							16.3	1.6	0.1	14.7	1.3	1.4
Community, social and personal services							109.1	10.9	0.6	98.2	8.9	9.6
Gross capital formation (credit):			1,031.2				553.2	55.3	3.1	497.9	45.2	48.3
Construction			587.7				271.7	27.1	1.5	244.6	22.2	23.7
Machinery for transport			116.1				67.7	6.8	0.4	60.9	5.5	5.9
Machinery and equipment			327.4				213.8	21.4	1.2	192.4	17.5	18.7

Source: Similar calculations as for Table 5.

a.   Sales side (for tax to be debited)

In 1980, as in 1983, exports were exempted. Goods for the domestic market, which were zero rated or exempted in 1983, were, by and large, all exempted in 1980. The items that were taxable at 6, 15, and 20 percent in 1983, were taxable at 10 percent in 1980. The numerical analysis is modified according to these changes in the tax law.

(1)   Exemptions

(a)   Agriculture: Completely exempted.

(b)   Mining:

	Gross Production (billions of pesos)	Source
Salt	2.2	T 11, C 114

(c)   Manufacturing:

Total	350.4	
Meat 1/	45.6	T 11, C 156
Milk	58.3	T 11, C 156
Wheat	61.8	T 11, C 176
Corn	65.2	T 11, C 184
Coffee	28.6	T 11, C 194
Sugar	34.7	T 11, C 204
Books, newspapers, and magazines	24.4	T 11, C 414
Agricultural machinery and utensils	12.0	T 11, C 668
Fertilizers, etc.	11.7	T 11, C 468
Tractors 2/	8.1	T 11, C 718

A part of manufacturing is, however, already accounted for in exports, whose share in gross product is 4.05 percent. Thus, the total for exempted manufacturing items should be Mex$336.2 billion.

(d)   Commerce and hotels: The calculations are similar to those for 1983.

1/   35 percent of gross production of meat. Source: Estadística Industrial Anual, Instituto Nacional de Estadística, Geografía e Informática, Secretaría de Programación y Presupuesto, 1980.

2/   7 percent of gross production of automobiles and tractors. Same source as footnote 1.

	Margins (billions of pesos)	Percentage of Supply (Gross Production + Imports)		Margins Distributed, Based on Percentages (billions of pesos)	
		Exempt	Zero rate exports	Exempt	Zero rate exports
Agriculture	103.6	97.0	3.0	100.5	3.1
Mining	20.3	--	68.1	--	13.8
Manufacturing	844.0	12.3	3.5	103.8	29.5
Total	967.9			204.3	46.4

(e) Construction: The calculations are similar to those for 1983. The gross production of housing, is exempt. The proportion of gross capital formation in housing in total gross capital formation in construction at 1970 prices (T 1, C 64) is 34.7 percent; 34.7 percent of the gross production of construction (T 11, C 772) is Mex$199.7 billion, or the portion exempted.

The exempted items of the remaining sectors are shown in Table 11.

(f) Change in stocks: The calculations are similar to those for 1983.

	Change in Stocks: Supply (percent)	Taxable Supply (billions of pesos)	Stocks Outside VAT Base (billions of pesos)
Agriculture	6.1	--	--
Mining	0.7	136.0	1.0
Manufacturing	4.9	2,328.2	114.1

Taxable supply is now obtained as total supply minus exports minus exemptions minus change in stocks.

Table 11. Mexico: Exemptions in Selected Sectors, 1980

Sector	Gross Production (billions of pesos)	Source
Transport and communication	153.0	
Railway	19.9	T 11, C 856
Passenger transport	116.2	T 11, C 856
International transport 1/	12.5	T 11, C 856
Post	1.3	T 11, C 866
Telegraph	0.7	T 11, C 866
Other	2.4	T 11, C 866
Financial services and rental of immovables	282.9	
Public institutions	19.8	T 11, C 892
Private institutions	64.7	T 11, C 892
Insurance 1/	6.7	T 11, C 902
Housing rentals	192.3	T 11, C 902
Community, social and personal services	741.2	
Professional services 2/	33.7	T 11, C 928
Education	223.1	T 11, C 938
Public medicine	95.4	T 11, C 948
Private medicine 3/	80.5	T 11, C 948
Public entertainment 4/	34.5	T 11, C 958
Domestic services	77.9	T 11, C 968
Public administration	196.1	T 11, C 978

Source: Statistical publications on Mexico (see references).

1/ Same assumptions as for 1983.
2/ Includes independent professionals and notaries, as opposed to 1983.
3/ All of this was exempted in 1980, as opposed to 1983.
4/ Excludes radio and television and production and distribution of films.

(2) 6 percent rate

It is assumed that the border zone accounts for 10 percent of taxable supply.

(3) 10 percent rate

The remainder of the taxable supply is at the 10 percent rate.

b.   Purchases side (for tax to be credited)

The following assumptions are made regarding intermediate consumption based on the 1980 legislation.

(1) Agriculture: Intermediate products from this sector do not result in any credit.

(2) Mining: Intermediate products from this sector result in a 10 percent credit.

(3) Manufacturing: Exempted are sugar, coffee, corn, wheat, milk, and other milk products that have a gross production of Mex$251.5 billion or 37.6 percent of the total gross production of the category of food products. Thus, the 10 percent rate applies to 62.4 percent of this category.

Fertilizers and agricultural machinery are also exempted but are treated effectively as zero rated since they received credit for their purchases in accordance with Article 13 of the 1980 Law. Everything else in the manufacturing sector results in 10 percent credit.

(4) Construction: No intermediate goods emanate from this sector.

(5) Electricity: This sector's activities are credited at 10 percent.

(6) Commerce: The sectoral distribution of the total commercial margin is 10.7 percent in agriculture, 2.1 percent in mining, and 87.2 percent in manufacturing. Thus, 10.7 percent is not credited, and 2.1 percent is credited at 10 percent. Of the remainder--manufacturing--the distribution is as follows. The numbers are in billions of pesos.

                                        (Billions of pesos)

Total supply of manufacturing   2,729.4
Total supply net of exports   2,634.6
Total supply net of exports and
    change in stocks   2,522.0
Of which:

                                                        (In percent)

Exempted   13.3 1/
Credited at 10 percent   86.7

Given that manufacturing accounts for 87.2 percent of the overall gross product of commerce, the manufacturing component results are modified as follows:

Exempted: 13.3 percent x 0.872 = 11.6 percent
At 10 percent: 86.7 percent x 0.872 = 75.6 percent

Transport and communication: From T 11, C 856, 38.2 percent is exempted, and the remainder is credited at 10 percent.

Financial services, etc.: From T 11, C 892 and T 11, C 902, 73.8 percent is exempted, and the remainder is credited at 10 percent.

Community, social, and personal services: From T 11, C 912 and T 11, C 968, 76.6 percent is exempted, the remainder is credited at 10 percent.

These assumptions, together with the technical coefficients from Table 9 are used to calculate the values of intermediate goods to be credited in different sectors. Table 8 presents an illustrative calculation for the agricultural sector using 1983 data.

c.   Exempted products within intermediate consumption

The same methodology is followed as was used for 1983. The proportions of total sales 2/ in each sector which are exempt are as follows:

1/   Amount exempted, Mex$336.2 billion, divided by Mex$2,522.0 billion.
2/   Sales are defined as supplies minus change in stocks minus tax revenue in each sector.

	(In billions of pesos)		(Ratios)
Agriculture	529.2/545.3	=	0.9705
Manufacturing	304.4/2,425.6	=	0.1255
Construction	199.7/542.7	=	0.3679
Commerce	204.3/1,080.8	=	0.1890
Transport	153.0/397.8	=	0.3846
Financial services, and rental of immovables	282.9/385.6	=	0.7337
Community, social and personal services	741.2/949.2	=	0.7809

The tax creditable in each sector is reduced by these ratios. A correction for fertilizers and agricultural machinery is included to obtain an effective zero rate for them, by reducing the total amount of exemptions in manufacturing (Mex$336.2 billion) by the exemptions for these specific items (Mex$31.8 billion) and then obtaining the proportion. Thus, from Table 10, 0.1255 = Mex$ (336.2 - 31.8) billion divided by Mex$2,425.6 billion.

d.   Gross capital formation

The methodology is similar to that used for 1983.

Construction:	(In billions of pesos)
Gross capital formation	587.7
Of which, exemptions:	
Housing	199.8
Improvement of land	4.1
Intermediate activities	112.1 1/
Thus, gross capital formation to be deducted	271.7

Machinery for transportation:	
Gross capital formation	116.0
Exemptions (41.7 percent) 2/	48.4
Thus, gross capital formation to be deducted	67.7

Machinery and equipment:	
Gross capital formation	327.4
Exemptions (34.7 percent) 2/	113.6
Thus, gross capital formation to be deducted	213.8

1/   29.2 percent of Mex$383.8 billion. The 29.2 percent figure is derived in the same manner as the corresponding one for 1983.

2/   Based on the same assumptions as for 1983.

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