Productivity Growth in Mexico

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Why has Mexico's economic growth been so modest? In the last decade, Mexico has often been put forth as a leading example of the market-opening economic adjustment programs advocated by the international economic organizations. Since the mid-1980s, it has greatly liberalized its trade regime, sharply reduced the number of state-owned enterprises, reached fiscal balance with a reformed tax system, and established full convertibility for external capital account transactions. Yet, the country's rate of economic growth, even before the economic crisis of 1994-95, remained far below the near 7 percent growth rate achieved during the 1960s and 1970s.

The purpose of this paper is to review Mexico's economic growth experience within the confines of a simple growth-accounting framework, to put that performance in an international context, and to investigate some of the hypotheses that have been advanced to explain the low return to date from the reform program. The first section is devoted to a review of the basic data used to measure economic growth in Mexico and an allocation of output growth between those gains due to increases in the factor inputs, capital and labor, and improvements in the efficiency with which the factors are used. The review is necessary because of wide variations among earlier studies in the reported rates of productivity change due to differences in the choice of data used to construct the productivity measures. The second section compares Mexico's growth record with

that of other countries. Finally, the paper explores some potential explanations for the slow

growth and suggests additional policy actions to promote growth in the future.

Accounting for Growth

The analysis of Mexican economic growth begins with the construction of a set of growth

accounts that decomposes the growth in output per worker into the contributions from the

accumulation of physical and human capital and a residual measure of the change in total factor

productivity (TFP). A growth accounting exercise cannot identify the fundamental causes of

growth, but it does provide a consistent decomposition of growth among its proximate sources,

which can be particularly informative in comparing experiences across countries. It is particularly

well-suited for distinguishing between growth due to the painful process of sacrificing current

consumption in order to save and accumulate capital for the future and the seemingly less-costly

alternative of adopting existing technologies and management techniques from more advanced

economies.

The analysis uses a simple neoclassical framework that is based on an assumption of a

stable underlying relationship between output (Q), the inputs capital (K) and labor (L), and

technology (A):

(1) $\qquad Q_t = F(K_t, \hat{L}_t, A_t)$.

$\hat{L}$ is used to denote a skill-adjusted measure of the labor input such that

(2) $\qquad \hat{L} = HL$,

where H is an index of labor quality. In concept, estimates of the contribution to output of

growth in the factor inputs and TFP can be constructed without specific knowledge of the

functional form of the above production process. It is only necessary to assume a degree of competition sufficient to ensure that the earnings of the factors are proportionate to their marginal productivities. The shares of income paid to the individual factors can then be used to measure their relative importance in the production process. That is, an index of growth in TFP, *a(t),* can be identified as the growth in output, *q(t)*, less the share-weighted growth in the factor inputs, *k(t)* and *l(t):*

(3) $$a(t) = q(t) - s_k k(t) - s_l l(t).$$

In this formulation any contribution from increasing returns to scale is included in the residual of growth in TFP.

Output Growth

Measures of output are readily available from the national accounts as published by the Instituto Nacional de Estadística, Geografíca e Informática (INEGI). The accounts provide a detailed set of output measures extending from GDP at the level of the total economy to value added for 9 major divisions and 72 branches within those divisions.[1] Thus, for example, manufacturing can readily be divided into 9 branches. The production data appears to be of high quality in that the recent introduction of a new benchmark year of 1993, versus, the prior use of 1980, resulted in relatively minor changes in the estimates of real output growth. Most studies of productivity growth in Mexico have relied on similar output measures: differences in the output measures are not the source of variation in the alternative productivity indexes.

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[1]The published national accounts include output measures at the subgroup, or 4-digit classification, level of 362 industries, but the analysis of this paper does not go beyond the 2-digit level, and, even then, only within the manufacturing sector because of limitations of the data on factor inputs.

Data are available both for gross output, inclusive of intermediate purchased materials, and value added. In this study, value added is used as the basic measure of output in all of the analyses because the gross output measure is very sensitive to changes in the vertical integration of enterprises in the production process. This is a significant issue in Mexico because of the growing importance of enterprises, such as the maquiladores, where the ratio of value added to gross output is low. The introduction of the new base year, 1993, was accompanied by data revisions extending back to 1988. In addition, INEGI provides overlapping measures of physical output on both the 1993 and 1980 bases extending back to 1980. A consistent output series was constructed by using the 1993-base data after 1987 and the 1980-base data for the period prior to 1980. The data 1981-87 period are a weighted average of the two data series in which the weight attached to the 1993-base data linearly from zero in 1980 to 100 percent in 1988.[2]

Physical Capital

The Mexican national accounts do not include estimates of the capital stock. A rough measure at the level of the total economy was constructed as part of a World Bank study that estimated the capital stock for a large number of countries based on a perpetual inventory methodology with a common geometric rate of depreciation.[3] Those estimates were updated as part of this analysis to reflect the recent revisions of the Mexican national accounts. The capital stock is further divided into its residential and nonresidential components on the basis of

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[2]The weights are actually applied to the annual changes in each series. For output, the method of splicing the two source series is of minimal importance because the difference between the two is very small.

[3]Nehru and Dhareshwar (1993).

information provided in a study by Victor Elias.[4]

The above method of estimating the capital stock cannot be extended to sectors below the level of the total economy because the national accounts do not provide a breakdown of investment spending by purchaser at the level of major divisions. However, the Central Bank of Mexico conducts an annual survey of nonresidential, non-agricultural investment and uses that information to construct perpetual inventory estimates of the capital stock for 60 sub-sectors of the economy.[5] Over the period of 1970-94, the surveyed firms account for about one fifth of total nonresidential investment as recorded in the national accounts, and the coefficient of determination between the survey total and total nonresidential investment is only 0.65.[6] While an effort is made to use probability-based sampling from a universe of firms obtained from the industrial censuses, the infrequent updating of the sample raises concerns that it does not adequately capture the investment of new enterprises. The survey estimate of investment displays less cyclical variability than that of the national accounts, but is more erratic in its annual changes. At low levels of disaggregation there is also a problem that the investment is reported at the level of the enterprise whereas the output and other data are on the basis of individual plants.

As indexes of the growth in capital services, the two alternative series for the nonresidential capital stock differ substantially after the early 1980s. As shown in figure 1, the series from the central bank grows far less rapidly after 1982 than that based on national accounts

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[4]Elias (1992, p. 112). The assumed depreciation rates are 0.06 for non-residential and .025 for residential capital.

[5]Details of the methodology are provided in Villapando Hernández and Fernández Morán . Several studies have used the central bank data to measure the inputs of capital services. For an example, see Hernández Laos (1994).

[6]The survey also excludes some sectors, the most important of which are petroleum and utilities. The excluded ramas are 1-5, 6, 33-34, 36, 61-62, and 68-69.

data. The differences reflect both a slower expansion of investment in the Bank of Mexico series and a higher rate of assumed depreciation. The average depreciation rate is 12 percent per year compared to 6 percent in the series constructed from the national accounts.[7]

A third intermediate measure of the capital stock, based on the national accounts investment series and the higher depreciation rate of the central bank, is also shown in figure 1. It is evident that the differences in the investment series and the depreciation rates are both significant contributors to the divergent trends of the capital stocks. A high depreciation rate implies a smaller stock that responds more strongly to the falloff in investment in the 1982-90 period.

Labor Supply

Currently, Mexico has very good statistics on the size of the economically-active population (PEA), and the proportion that are employed. Since 1988, the statistical agency, INEGI, has conducted periodic national household surveys that include detailed questions on labor force status.[8] However, data for prior years are very limited. The decennial censuses all encountered significant problems in measuring the labor force; and, because of changes in the questions, they do not provide consistent measures of the PEA that could be used to estimate changes over time.

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[7]The two underlying investment series have similar long-run trends; but the national accounts' measure shows a stronger expansion in the late 1970s, a sharper collapse after 1981, and more growth after 1988.

[8]INEGI conducted national surveys in 1988, 1991, 1993, 1995, and 1996. Supplemental surveys of the urban population are conducted on a quarterly basis. The Mexican labor force is defined on the basis of the population aged 12 and over.

Large portions of the Mexican labor force are self-employed, unpaid family workers, or employed in the agricultural sector. All of these categories present significant problems of defining labor force status. In 1995, for example, less than 60 percent of all workers were classified as wage earners. Employers and those working on their own account represented 30 percent of the total, and another 13 percent were unpaid family workers. For these workers, labor force status is very sensitive to the precise nature of the questions that are asked; yet, a large national census is usually limited to a few questions and cannot probe labor force status in any depth. Furthermore, since Mexico does not have a formal unemployment insurance program, there is not a sharp line of demarcation between employed and unemployed. Workers without formal jobs, work on their own account or as unpaid family workers. Significant levels of unemployment are only reported among households with above-average income or for those who can be temporarily supported by other family members For others, the more meaningful distinctions are between fully employed and part-time or under-employed. As a result of the various problems, most Mexican demographers do not believe that the decennial censuses provide a consistent time series on the growth in the economically-active population. The problems were particularly severe in 1980 and 1990.[9]

An alternative source of employment information is the national accounts. INEGI publishes estimates of the total number of wage and salary jobs from the perspective of enterprises rather than households. This is the data that has been most commonly used in past studies of

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[9]Several Mexican demographers have argued that responses to questions that go beyond asking individuals if they are working or actively looking for work account for 15-20 percent of the workforce. For example, many respondents appeared confused by the questions in the 1980 census, and several demographers have argued that it overstated the labor force in that year. On the other hand, the simpler, but limited, questions of the 1990 census yielded estimates of labor force participation far below those of the more sophisticated employment surveys.

Mexican productivity. However, because a large number of Mexican workers hold more than one job, the average number of reported jobs is far larger than the number of wage and salary workers. For example, even though wage and salary workers only account for 50-60 percent of the total workforce in the household surveys, total wage and salary jobs were 90-95 percent of the PEA in 1970 and 1980, and 107 percent in the 1990 census. At present, the data are not adequate to convert the number of jobs to hours of work or full-time equivalents as a means of eliminating the overstatement due to multiple job holding. The national accounts data have the additional advantage that they are available at the level of very detailed industries.

On the other hand, the employment measure excludes the self-employed, unpaid family workers, and a large number of jobs in the informal sector, even though the output of these workers is included in the production measures. These are also categories of employment that have grown most rapidly since the 1982 crisis. Finally, while most of the data are derived from surveys, in some instances employment is estimated on the basis of a fixed relationship to output. If effect, an assumed rate of productivity change is built into some of the employment data.

The recent revisions of the national accounts, occasioned by the adoption of a new base year of 1993, incorporated large changes in the estimates of employment. In 1990, for example, agricultural employment was raised by 9 percent, that of industry by 15 percent, and service sector employment by 27 percent.[10] Since most previously-published studies of labor productivity were based on the national accounts data, the revisions have dramatically reduced the previously-

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[10]At present, the revised data are published only for the period of 1988-95. In constructing a longer time series, the previously published values for 1980 and earlier years are assumed to be correct, and the ratio of the new to the old series is allowed to rise linearly between 1980 and 1988.

estimated improvement in labor productivity during the post-reform period.[11]

Finally, with the emergence of relatively good information on labor force status in the 1990s, several efforts have been made to review and refine the historical data from the national censuses. A recent study by Mercedes Pedrero Nieto provides adjusted estimates of labor force participation by sex and age for the 1970, 1980, and 1990 censuses.[12] Aggregated across ages, the adjustments were as follows:

Table A. Official and Adjusted Measures of Labor Force Participation
Percent of population of labor force age

		1970	1980	1990
Men				
	Census	70.1	75.0	68.0
	Adjusted	74.7	74.9	72.8
	Difference	+4.6	-0.1	+4.8
Women				
	Census	17.6	27.8	19.6
	Adjusted	18.7	26.4	29.4
	Difference	+1.1	-1.4	+9.8

The adjustments to the participation rates average about 6 percent for both men and women in 1970, they are small in 1980, but extremely large in 1990, reaching 50 percent for women. Furthermore, the estimates of the labor force participation for 1980 are comparable to those of a

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[11]Hernandez Laos (1993) and World Bank (1994). INEGI has also regularly used the data to publish measures of labor productivity at the level of individual industries (ramas).

[12]Pedrero Nieto (1995).

national employment survey conducted in 1979 that included some of the detailed questions about labor force status that are used in the current employment surveys.[13] Additional revised estimates of labor force participation from the 1950 and 1960 were obtained from the National Population Council (CONAPO). The magnitude of adjustment to the census data for those years was smaller than that for 1970.

In this study, the estimates of labor force participation from CONAPO and Pedrero Nieto for the 1950-80 period have been combined with the results of the employment surveys beginning in 1991 to construct time series of age and sex-specific labor force participation rates.   The participation rates, aggregated over age groups are shown in figure 2. The 1991 survey results are used in place of the 1990 census because of the large size of the adjustments in the latter case. The 1988 employment survey was also passed over because of some changes in the questionnaire between 1988 and 1991. The estimated participation rates were interpolated between census and survey years and combined with population data from CONAPO to estimate a consistent annual series on the Mexican labor force for the period of 1950 to 1995.

As shown in table 1, growth in the Mexican population of labor force age (12+) reached a peak in the 1970s and is now beginning to slow. That pattern of growth is amplified in the labor force because a falling male participation rate held down growth in the 1950s and 60s, and the female participation rate increased substantially after 1970. Over the past quarter century, women have accounted for about 40 percent of the growth in the labor force.

In figure 3, the estimated labor force is compared with establishment-based employment

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[13]Mexico does have a large number of household surveys, but they were generally limited to urban areas. The 1979 Continuous Occupational survey was national in scope, as were those in 1988 and thereafter. Differences between the 1979 survey and those of the 1990s imply that it provides an underestimate of the total workforce. See Fleck and Sorrentino (1994) for a detailed discussion.

from the national accounts. As indexes of the growth in labor inputs, these two measures are very different. Between 1970 and 1981, the national accounts' measure of wage and salary employment rose in parallel with the total labor force; but, since then, wage and salary employment has fallen far short of the growth in the labor force: large numbers of workers have been forced into marginal or informal sector jobs.[14] That development is also captured in the household employment surveys which show a fall in the proportion of wage and salary workers from 73 percent of total employment in 1979 to 57 percent in 1995. By excluding the self-employed and unpaid workers the national accounts measure misses much of the growth in labor supply; but the more inclusive labor force measure may overstate the growth of labor inputs, if the deterioration of employment opportunities has been accompanied by a reduction in hours worked.[15] Alternatively, the labor force concept can be viewed as the appropriate measure of labor supply, but a measure of productivity based on it will have a large component of change in allocative efficiency when workers cannot obtain employment commensurate with their skills and are forced into the informal market.

A third measure of aggregate employment, the number of workers covered by the social insurance system, excludes dual job holding and is sometimes interpreted as a measure of individuals employed in the formal sector. Because of an expansion of coverage, the number of insured workers grew faster than the total workforce in the 1960s and 1970s, and at roughly

[14]There are many different criteria for measuring the informal sector, such as work status, legal registration, and income level. They imply that the informal sector accounts for one fourth to one third of total employment in Mexico, and that percentage has risen over time. OECD(1997, p.72-73). The informal sector also has a markedly lower capital-labor ratio.

[15] Some data are available on hours, but only for workers in the formal sector. They suggest a secular rise in hours worked compared to the mid-1980s. Since a cyclical fluctuations in hours are likely to be accompanied by an offsetting change in informal employment, an hours adjustment is likely to involve substantial error in estimating labor inputs. The surveys imply that more than two-third of those in the informal sector work more than 35 hours (STPS, 1997, p.32).

parallel rates since then. Still, only about 40 percent of the workforce is current covered by the various programs, and the potential for variation in coverage makes it an unreliable measure of aggregate employment change.

A disaggregation of total employment to the level of agriculture, industry, and services is shown in table 2 for both the household census/survey data and the establishment-based data of the national accounts. The proportions of workers in each of the three sectors are interpolated between census and survey years and multiplied by the estimate of the labor force to construct time series of employment for the period of 1960-95.   While that is the maximum feasible disaggregation for the household-based data, the national accounts include employment data for the nine major divisions and nine sub-sectors within manufacturing for the period of 1970 to 1995.

The two data sources show similar broad patterns of change in the sectoral distribution of employment -- particularly given that the national accounts data include only wage and salary workers. There has been a large decline in the share of employment in agriculture, and the service sectors have grown to account for more than half of all employment. The size of the industrial sector is small for a country at Mexico's stage of development; and, while the share of employment in industry generally falls in the more advanced countries, the fact that it is already declining in Mexico is surprising. The rise in the labor force relative to wage and salary employment, shown in figure 3, is concentrated in agriculture and services where the growth in the total work force has out paced the increase in wage and salary employment. Both of these differences are consistent with the collapse of formal employment opportunities after 1981.

Educational Attainment

Some previous growth accounting studies have incorporated detailed adjustments of the labor force for changes in characteristics that are associated with differences in productivities, such as education, age, and gender.[16] This analysis incorporates only changes in the characteristic that has been found to be most important: education. Recently, a data set has become available that provides information on educational attainment for a large number of countries based on national censuses over the period of 1960 to 1990; and, in the case of Mexico, that data can be extended to 1995 using information from the national employment surveys.[17]

Table 3 summarizes the educational attainment of the population over age 15. As shown in column 1, there has been a dramatic decline in the proportion of the population with no schooling from 40 percent in 1960 to 10 percent in 1995. The proportion with some secondary education has increased 6-fold to 47 percent.

By itself, years of schooling is a poor measure of labor quality because it assigns a value of zero to workers with no education and implies disproportionate changes in quality in countries with low initial levels. More meaningful measures of quality can be obtained by combining the schooling data with information on the relative wage structure for workers with different levels of education.   There is a large body of empirical studies that have estimated the returns to schooling by relating the relative wage to years of schooling and job experience. In a previous article it was argued that those studies suggest an rate of return to education of between 7 and 12 percent.[18]

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[16]For example, Victor Elias, 1992.

[17]Barro and Lee (1994). This study uses a more recent revised data set provided by the authors.

[18]Collins and Bosworth (1996) and Psacharopoulos(1994).

Indexes of labor quality based on the educational attainment data and wage weights that embody

returns of 7 and 12 percent are shown in the last two columns of table 3. According to these

indexes, quality improvements augmented the effective labor force by 0.9 to 1.6 percent per year

in the 1970s and 1.3 to 2.2 percent in the 1980s. Those gains appear to have slowed substantially

in the 1990s.

As shown in table 4, Mexico's gains in the educational quality of the workforce compare

very favorably in an international context.[19] While a few individual countries have registered

larger improvements, Mexico's gains since 1960 exceed the average of Latin America and other

regions. It also has a level of educational attainment above the Latin American average.

Labor Productivity

The above data on output and labor inputs make it possible to construct two alternative

measures of aggregate labor productivity, output per worker, one based on the total labor force

and the other using wage and salary employment. As shown in figure 4, both of these concepts

imply a very sharp collapse of productivity growth at the time of the 1982 debt crisis, but it is

much more dramatic for the measure based on the total labor force. In the prior two decades,

output per worker expanded at a robust annual rate of 3.5 percent. Between 1981 and 1984,

labor productivity, based on the narrow concept of wage and salary workers, shows no significant

growth. The recovery of 1990-94 only restored productivity to its 1981 peak, and it then fell in

the 1995 recession. The broader measure, based on growth in the total labor force, shows a huge

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[19]This finding is different than that reported in Elias (1992, pp. 90-93). He argued that Mexico's gains in educational attainment were smaller than those of other Latin American countries. The differences can be traced to large discrepancies between Elias's estimates of improvements in educational attainment and those reported by Barro and Lee (1994). Our wage weights are flatter than those used by Elias -- a lower implied rate of return -- and the same for all countries.

30 percent decline, implying that large numbers of Mexican workers have been forced into marginal low-productivity jobs.[20] Even in the early 1990s, output growth was barely adequate to match the growth in the labor force. The broad measure shows the largest decline in the services sector (table 4) because that and agriculture account for the largest number of marginal job opportunities. When employment is restricted to wage and salary workers, labor productivity continues to rise between 1981 and 1995 in agriculture, is stagnant in industry, and falls by 14 percent in services.

Total Factor Productivity

Growth accounts provide a means of allocating the growth in output between the contribution of increased factor inputs, and a residual of changes in the efficiency of factor use. The analysis requires data on factor income shares to use as weights in constructing measures of the relative contributions of capital and labor. There are severe problems with such an approach in Mexico. First, the economic collapse of the early 1980s created a persistent disequilibrium situation in which large portions of the labor force are effectively under-employed and we cannot assume that factor payments are reflective of marginal productivities.

Second, we cannot obtain direct estimates of the appropriate measures of factor income. In the national accounts labor compensation includes only the costs of wage and salary workers. The contributions of the self-employed and unpaid family workers are allocated to the residual of the gross operating surplus, and, thus, they are lumped in with payments to capital.   This is

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[20]Measured productivity is much worse than in earlier studies because the recent national account revisions sharply raised the estimate of employment growth while leaving output roughly unchanged. For an example of the prior results see Hernández Laos (1994). In effect, prior reports of improvements in productivity have been revised away.

particularly important for Mexico because so many members of the labor force work on their own account. The labor share of factor incomes is estimated at only 32 percent for the aggregate economy in 1990, and that is a sharp upward revision relative to the old estimate on the 1980 base of 27.5 percent. As a consequence, too large a weight, 65-70 percent, is assigned to capital in accounting for the growth in output.

This study uses fixed factor shares, rather than allowing them to vary over time; and a specific value of 0.35 for the capital share that is based more on parametric estimates of the capital elasticity than income accounts. Strictly speaking, the assumption of fixed weights is applicable to a limited set of production functions; but, for those countries where data are available, the changes in factor income shares are small.[21]

The choice of a specific value for the capital elasticity is more critical. As discussed earlier, it is very important to adjust for the labor input of the self employed; but standard national account presentations allocate their income to capital. In the industrial countries, studies have obtained estimates of factor shares either by imputing a wage to the self employed, or by focusing on accounts for the corporate sector, excluding the self employed. Those studies find a capital share that is clustered about 0.3 and 0.4 and is largely free of trend.[22] There are only a few studies for developing countries that are based on imputations for the self employed, but they typically obtain results in the same range as for the developed economies.[23] Parametric estimates often find a higher value for the capital share in developing economies. For example, Kim and

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[21]The stability of the factor shares is most striking in presentations that model production as a two-factor (capital and labor) process. The expansion to include materials imputs results in greater variation of the factor shares.

[22]Englander and Gurney (1994) and Maddison (1987, p. 659).

[23]Young (1994). He obtained a higher value of 0.53 for Singapore.

Lau obtained a value of 0.4 for a set of developing countries using a common methodology that

yielded an estimate of 0.3 for the industrial economies; and Ann Harrison obtained coefficients in

excess of 0.4.[24] There are, however, reasons to believe that the parametric estimates are biased

upwards because of the endogenous response to capital formation to growth, whereas the labor

input is often based on a relatively exogenous labor force measure.[25]

Finally, the benefits of education are assumed to be embodied in workers. Thus, equation

(3) is re-arranged to report the results in a form the decomposes the growth in output per worker

(q/l), into the contribution of physical capital per worker (k/l), education (h), and the residual of

TFP (a):

(4) $q/l = s_k(k/l) + (1-s_k) h + a.$

The basic results for the aggregate economy are shown in figures 5 and 6, and summarized

in Table 6. Figure 5 shows the decomposition of productivity growth using the total labor force

as the basic measure of the labor input and the capital stock that was constructed from the

national accounts with a low depreciation rate. It shows by far the largest collapse of labor

productivity, 22 percent between 1981 and 1994; and, because it uses the capital stock with the

largest growth, the decline in labor productivity is reflected in at27 percent fall in TFP.[26]

In figure 6, there is a much smaller decline in labor productivity because it is computed

using the lower growth wage and salary measure of employment. For the same reason, there is an

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[24]Kim and Lau (1994), and Harrrison (1996).

[25]See Benhahib and Spiegel (1994, pp.169-73.) For more discussion of this issue. In his comparative study of Latin America and Asia , Hofman (1993) opted for a capital share of 0.3.

[26]Excluded from the figure, bus shown in table 6, is a steady rise in the contribution of improvements in education.

implied increase in capital per worker. even thought it uses a lower-growth measure of the

physical capital stock. The falloff in TFP is reduced to 15 percent between 1981 and 1994.

In figure 7 and table 7, the sectoral and industry detail available from the central bank's

estimate of the capital stock and the output and employment data of the national accounts are

used to compile the growth accounts at a more dis-aggregated level. In the absence of any

alternative information, we applied the aggregate index of educational attainment to all of the

industry calculations. In figure 7, output per worker falls in both industry and services, but there

is a sharp drop in the contribution of capital per worker in industry whereas it improves in the

services sector, mostly before 1981.[27] As a result, the deterioration of TFP is much more

pronounced in the services sector. Within industry, the story is more optimistic for

manufacturing, where output per worker recovered after 1988 and exceeded its 1981 peak by

1994.[28] However, the sector suffered a very sharp deterioration in the contribution of physical

capital per worker that did not begin to turn around until 1993.

Finally, table 7 provides some industry detail within the manufacturing sector. The results

are similar to those reported for more aggregative sectors; and they are strongly confirming of a

sharp and pervasive falloff in the capital-labor ratio after 1981. The trends in output per worker

and TFP are quite diverse within manufacturing; and some industries -- particularly basic metals -

- have recorded strong improvements in TFP.

Overall, these calculations provide a very discouraging picture of productivity

performance. The large fall in productivity and TFP between 1981 and 1988 is not unexpected;

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[27]For all countries, there are difficulties in developing effective measures of output and prices in services.

[28]The differences in the productivity trend between manufacturing and total industry can be traced to a sharp growth of employment in the construction industry.

but, even after 1988, the growth in output was barely adequate to match the expansion of the factor inputs, and there was little or no increase in capital per worker. From the perspective of society as a whole, the measure of productivity based on the total labor force provides the most meaningful measure of living standards. It suggests that the 1982 debt crisis represents a sharp break in economic performance. It resulted in a large shortfall of output relative to potential and sharply higher levels of underemployment, if not unemployment. Furthermore, despite an enormous expansion of foreign borrowing, Mexico has been unable to generate an expansion of the capital stock commensurate with the growth in the labor force. The performance of capital formation is disappointing even if the comparison is restricted to wage and salary workers in manufacturing. Yet, as will be shown in the following section, increased capital per worker plays the critical role in a successful growth program. The one bright light is the apparent gains in educational attainment that have continued under very difficult circumstances.

International Comparisons

Mexico's growth performance is placed in an international context in table 8. A growth accounting exercise, identical to that discussed above was carried out for 88 countries that provided representative coverage of all the major regions of the world economy.[29] It includes, for example, 22 countries in Latin America and 7 in East Asia.[30] It is evident, that Mexico was doing well in a comparative context up to the economic crisis of the early 1980s; but, it has been unable to recover in subsequent years. Output per worker grew at a faster rate than the rest of Latin

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[29]Collins and Bosworth (1996).

[30]The calculations for Mexico are based on the labor force measure of employment because that was used in the larger study.

America , and Mexico had a more rapid accumulation of physical capital and gains in educational attainment. After 1981, the growth in output per worker turns negative; but supply-side based growth accounts may not be particularly relevant because of the severe underemployment disequilibrium that developed in Mexican labor markets.

If the benchmark is the high-performing economies of East Asia, Mexico was doing equally as well up to the debt crisis of 1982. It had similar rates of gain in physical capital per worker and educational attainment. However, there is some evidence of a falloff in the rate of improvement in TFP prior to 1982 the 1982 crisis. East Asia stands out more for its ability to sustain the growth process over a 30-40 year period, whereas Mexico's gains have been lost in periodic crises.

In recent years, much of the analysis of the international experience has focused on the role of initial conditions and other exogenous or external determinants of growth. Barro and Lee, for example, sought to explain international differences in economic growth as being due to differences in the initial level of income per capita (catchup), life expectancy (health) and years of schooling.[31] In addition, differences in the external environment can be represented by the mean and standard deviation of the annual change in a country's terms of trade. These conditioning variables can explain about half of the variation in the growth of output per capita for the period 1960-94 across the above sample of 88 countries.

As shown in table 9, Mexico is a very typical developing country in terms of these conditioning variables: it differs only marginal from the rest of Latin America or East Asia. In a regression analysis based on the conditioning variables, Mexico's predicted growth in output per

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[31]Barro and Lee (1994b).

worker was nearly identical to the sample mean of 1.7 percent per year, whereas its actual

performance was only 1.3 percent.[32] However, if the statistical analysis is adjusted to allow for

regional effects, the Mexican economy actually performed significantly better than Latin America

as a whole since the predicted growth rate drops to 0.8 percent.[33] Furthermore, if the growth in

output per worker is decomposed into the contribution of increased capital per worker and

changes in TFP, all of the shortfall from the global average is in a low rate of TFP growth.

These global comparisons can be quite misleading, however, because Mexico's economic

performances before and after the 1982 debt crisis are so divergent. The pre-1982 growth of

TFP, shown in tables 6 and 8, was high by international standards, but it turned sharply negative

after 1981. In the following section I shall argue that the post-1981 performance of TFP is

largely a reflection of demand-side problems and does not provide a meaningful measure of

efficiency changes on the supply side of the economy. On the other hand, the post-1981 break in

the contribution of capital is less dramatic, but it is far below that achieved in the high growth

economies of East Asia.

Table 10 shows a comparison of Mexico with other economies for a selected set of policy

indicators that have been found to be important in prior studies of economic growth. In most of

these policy measures Mexico again does not stand out as being particularly different -- except

perhaps for fiscal policy where it had some very large deficits. However, the average over three-

decades hides a lot of short-term variation. In fact, the post 1981 deterioration in growth

performance coincides with sharp changes in the macroeconomic policy measures, and the

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[32]The regressions are discussed more fully in Collins and Bosworth (1996) and they are reproduced in an appendix.

[33]The predicted values are based on equations 1 and 2 in appendix table 1.

improvement in macroeconomic policy after 1987 represents only a small part of the overall

period that is being used to compare growth experiences. In the 1990s, Mexico typically reported

balanced budgets, the inflation rate came down sharply, and capital account convertibility

eliminated the black market for foreign exchange. Similarly, the trade regime has changed

dramatically. For most of the period, Mexico had a very restrictive trade regime, and it was

classified as a closed economy in the Sachs and Warner study. But it undertook a sharp reduction

of trade barriers in the late 1980s. The tariff and NTB measures shown in the table are for the

period after trade liberalization.

One international comparison that is of interest is that with Chile (see figure 8) which

suffered a similar output collapse in the early 1980s. Chilean GDP per worker fell by 18 percent

between 1981 and 1983, compared to 12 percent in Mexico. But, in Chile the collapse was

followed by an immediate and strong economic recovery that eventually turned into a sustained

growth expansion; whereas, in Mexico there was no recovery. Chile also experienced little or no

growth in capital per worker in the early years of recovery; but, eventually, increased capital per

worker was an important element of the gains in output per worker.

Why the difference? In part, there is the obvious contrast in the timing of the reforms

which were largely completed prior to the crisis in Chile, but were much later in Mexico. The

Chilean real exchange rate appreciated far more in the years running up to the crisis, but after

1981 both exchange rates fell sharply and followed extraordinarily similar paths up to 1995 (figure

9). However, the share of external trade in the GDP of Chile was nearly three times that of

Mexico; and, as discussed in the next section, the growth of the trade sector is an important

distinguishing feature of the two economies in the 1980s.[34]

The contrasts are also evident in the domestic financial sector. Both countries suffered a near-complete collapse of the banking system; but, whereas Mexico nationalized the banks and essentially cut the private sector off from formal credit, Chile assumed the foreign debts of the banks and moved quickly to recapitalize the system. As shown in figure 10, Mexico's deposit rates were highly negative in real terms until 1989 as further evidence of a severely distorted system. For much of the period, Mexico's financial institutions provided very weak incentives for saving and channeled most of the funds into the public sector; Chilean financial institutions offered high returns and channeled the funds into private enterprises.

If the explanation is largely one of the timing of reforms, Mexico should do much better as it comes out of the 1995 collapse since the major reforms were put in place in the late 1980s and early 1990s. However, the external debt crisis of the 1980s has been replaced by an under-capitalized domestic financial system in the 1990s that leaves the economy in a poor position to finance a large-scale expansion of investment.

Explaining the Productivity Shortfall

The above growth accounting exercise highlights the dramatic break in Mexico's economic performance after 1981. Based on data for the total economically-active population, output per worker declined by 22 percent between 1981 and 1994. While there were continued gains in the educational attainment of the workforce, physical capital per worker was lower in

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[34]The real exchange rate in that of Morgan Guaranty, and trade is measured as the sum of exports and imports over GDP. Trade was a much larger share of the Chilean economy even in the 1960s.

1994 than in 1981. The output decline was concentrated in the TFP component which fell by a staggering 28 percent.

This growth experience raises several questions. First, while the initial collapse of output and TFP is understandable in view of the magnitude of the 1982 economic crisis, it is difficult to explain why the situation persisted for so many years. Why did the economy not return to pre-1982 rates of growth; and, if TFP is interpreted as a measure of the efficiency of resource use, why was it not possible to at least restore previous levels of efficiency? In this respect, Chile offers an interesting and striking contrast. Finally, quite apart from the poor performance of the 1980s, why did growth remain so modest in the early 1990s in the aftermath of a very extensive economic reform program?

It seems evident that the initial decline in TFP cannot be analyzed as a supply-side phenomenon. For most of the 1980s, the Mexican economy was constrained by the ongoing nature of the debt crisis, which cut Mexico off from international capital markets, the sharp decline in world oil prices, and the fiscal costs of the Mexico City earthquake. The government spent much of the decade in a struggle to restore macroeconomic stability. The lack of growth was more reflective of demand than supply-side problems.

In such a state of affairs, the change in TFP should not be interpreted as a measure of changes in technology, specialization, or management expertise. It is more reflective of greatly increased allocative inefficiencies, as an excess supply of workers was pushed into jobs below their normal skill levels. Since 1981, output has failed to grow in line with the expansion of the labor force, and more and more workers have been forced into marginal jobs. The under-employment is evident both in the decline in the proportion of the workforce in wage and salary

employment, and the increase in the various measures of the informal sector. The excess labor is most evident in services and agriculture; but measured labor productivity also fell substantially in the construction sector. The manufacturing sector stands out with a partial recovery of labor productivity after 1988, presumably because of the stronger competitive pressures that accompanied Mexico's trade liberalization and growing linkages to the external economy.[35] However, the decline in capital per worker is more pronounced than for the economy as a whole, implying a growing focus on labor-intensive technologies.

Some key aspects of the demand-side problem are highlighted in figure 11. Again, Chile is a useful contrast. For both countries, the growth in GDP since 1980 is separated into the contributions of domestic investment, exports, and a residual of total consumption less imports. Investment and exports are highlighted because they play key roles on both the demand and the supply-sides of the economy. They are major components of aggregate demand and they play a particularly important role in generating the demand to support a sustained economic expansion. On the supply side, high rates of investment are critical to expanding capacity and providing for improvements in labor productivity through the adoption of more capital intensive techniques. Similarly, the opening to global markets and expansion of exports is an important mechanism for introducing new technologies and management skills.

In both Mexico and Chile, the residual demand components of consumption less imports represented the largest share of total output, but contributed almost nothing to the growth in GDP. The contrast lies in the performance of investment and exports, which expanded spectacularly in Chile, while they remained nearly stagnate in Mexico. Having undertaken the

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[35]Tybout and Westbrook (1995)

major elements of trade liberalization in the late 1970s, Chile was in a position to use export promotion as a major source of post-recession stimulus. On the other hand, Mexico had pursued a policy of actively discouraging imports and non-oil exports that remained in force until the trade liberalization of 1986. In 1980, Mexican exports were only 8 percent of GDP compared with 28 percent in Chile. Even though the percentage growth in Mexican exports was the equal of Chile in first few years after the crisis, the small role of the tradables sector implied a minimal impact on aggregate demand.

Trade liberalization in the middle of the decade provided the opportunity for a large expansion of the Mexican trade sector, but the initial gain in manufacturing exports was partially negated by a sharp reduction in oil revenues. In addition, as measured by the trade-weighted index of Morgan Guaranty, the exchange rate was allowed to appreciate by 20 percent in 1988, and it remained well above the pre-liberalization level in future years (figure 9). Normally, trade reform would be accompanied by depreciation to offset the reduction in the price of imports. In Mexico's case, the physical volume of exports expanded over the next five years at an average annual rate of 5 percent compared to 22 percent for imports -- effectively undercutting any significant stimulus to domestic production.

The performance of investment seems equally disappointing. Its weakness in the immediate aftermath of the 1982 crisis was predictable, but it continued at relatively low rates throughout the remainder of decade. One contributing factor, shown in figure 12, was a sharp decline in the price of labor relative to capital that had the effect of discouraging the use of capital-intensive production technologies. The ratio of average employee compensation in manufacturing to the price index for fixed capital fell by one-third between 1981 and 1987.

Devaluation raised the price of imported capital equipment, and the real wage fell by a fourth. Later, the reduction of tariffs and other restrictions on imports did bring down the relative price of imported investment goods; but not by enough to offset the fall in wage costs.

In addition, the government nationalized the banking system and redirected bank lending into the financing of a large public-sector deficit. Consequently, for many years, the private business sector was largely cut off from credit, and Mexico operated with little or no system of financial intermediation to move funds between savers and investors. The situation began to change only with the restoration of a private banking system in the early 1990s. Private business loans of the banking system fell from 14 percent of GDP in 1981 to 7 percent in 1987, and then soared to 27 percent by 1994 (table 11). In effect, during the 1980s, private investment could be financed only through enterprises' internal funds. Finally, the lack of strong investment incentives is also apparent in the falloff in foreign direct investment which remained below the 1980-81 peak in real terms until the early 1990s.

The failure of investment to respond to the reform measures has been noted in other countries. In the initial phase of an adjustment program, investment often falls, followed by a plateau in which it appears that investors adopt a wait and see attitude. Major gains may not occur until the reforms are consolidated and confidence rises.[36] In such a situation, very large incentives may be required to jump-start a sustained expansion of investment.

Investment plays an even larger role in some explanations for the poor productivity

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[36]Serven and Solimano (1994).

performance because some observers argue that the concentration of economic reforms in the later part of the 1980s led to large amounts of capital obsolescence that reduced the effective stock below measured levels. Trade liberalization in particular is likely to change relative prices and alter the appropriate production technologies.

In several respects, however, Mexico does not resemble an economy with increased capital obsolescence. When the argument about obsolescence was made in the United States after the first oil shock, it was buttressed by a strong decline in the market value of corporate capital.[37] As a result, the Q-ratio, the ratio of the market value of capital relative to its replacement cost, fell sharply. That would be the expected result if technical obsolescence reduced the value of existing capital. In the Mexican case, the Q-ratio fell after the 1982 crisis, but it rose very rapidly after the reform program began in 1988.[38] Second, obsolescence originating from the reforms should have given a strong push to new investment. Yet, the share of GDP devoted to investment rose only modestly in the early 1990s and never regained its 1981 peak.

Economic stagnation was also surprisingly consistent with conditions on the supply side of the economy. The earlier economic collapse had, of necessity, pushed many workers into non-standard employment situations in which the government was unable to enforce its system of employment regulation and wage taxation -- hence, the growth of the informal sector. Only about a third of the workforce currently contributes to the public social insurance system (figure 3). The large excess supply of labor pushed down the relative cost of labor, and the economy responded by shifting to more labor intensive -- less productive -- production processes.

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[37]Baily (1981).

[38]Bosworth (1997, table 1.11).

Mexican labor markets are quite flexible in the sense that real wages have adjusted to changes in the aggregate balance of the supply and demand for labor, and formal unemployment remains low; but these markets are very distorted in the sense of large allocative inefficiencies. In recent times, there has been a major shift toward dual labor markets, the formal and informal sectors. In the formal sector, workers earn significantly higher wages and use more capital-intensive technologies; but there is a very large discrepancy between the cost to the employer and the cash benefits to the worker. As shown in table 12, employment taxes add about 30 percent to labor costs, and income taxes are paid on a withholding basis. In addition, the cost to the employer is increased by the obligation to pay another 20 percent in fringe benefits and to make substantial payments upon termination of employment.[39]

Many of these contributions are linked to benefits that have value to the worker and can be expected to have an offsetting effect on the supply of labor to the formal sector. But for workers who value the benefits at less than their cost, the contributions constitute a tax wedge that diverts employment from the formal sector. Wages and productivity are much lower in the informal sector, but many workers may be better off in terms of take-home pay by continuing to avoid formal employment.[40]

A large informal sector, however, is not conducive to the upgrading of production technologies and productivity. To the extent that modern production processes are embodied in capital and require a larger scale of production, firms that adopt those technologies cannot

[39]Severance payments vary depending on the circumstances; but, in the case of collective dismissals, workers receive a minimum payment equal to 3 months pay plus 12 days of salary per year of service. (OECD,1997 p.98).

[40]It would appear that the minimum wage is not an important factor pushing employment into the informal sector. It has declined substantially over time both in real terms and relative to the average wage. In 1996, it was about 15 percent of the average wage in manufacturing.

maintain the low visibility and mobility that allows them to avoid the taxes and other obligations of the formal economy. The inability to enforce the tax and regulatory system in a uniform fashion imposes a very high tax on efforts to improve workers' productivity since the movement of a worker from the informal to the formal sector requires a productivity gain of 30-50 percent simply to cover the tax wedge.

Looking Ahead

The above review of productivity trends provides a picture that is somewhat more depressing than studies of just a few years ago. Recent revisions of the employment data of the national accounts have wiped out much of what appeared earlier to be a pick-up of productivity growth in the early 1990s. In addition, the refinement of measures of the labor force suggests the emergence after 1981 of an excess supply of labor that takes the form of extensive under-employment. That under-employment has persisted -- institutionalized in the development of a large informal sector -- and it is not fully included in many of the employment measures used to compute productivity. It has increased even further as a result of the 1995 crisis.

The large amounts of under-employment suggest that, at least for the near term, Mexico's problem is mainly one of generating adequate growth on the demand side. Fueled by a strong expansion of exports, the economy grew at an annual rate of 8.8 percent over the four quarters ending in mid-1997. But, with a rise of the real exchange back to the level of 1994, exports have leveled out, imports have grown, and Mexico is on the verge of returning to a position of significant trade deficits.

The second potential source of stimulus would be investment; and Mexico needs a much

higher level of investment if it is to provide the future capacity to sustain growth. Investment fell

by a third in the 1995 recession, and recovered to its 1994 peak by 1997. In the cyclical

recovery of 1996-97, capital was not a constraining influence; but balanced growth in the future

will require the capital stock to grow in parallel with GDP.[41] The nonresidential capital stock

used in this study implies a capital-output ratio of about two and a depreciation rate of 6 percent.

If Mexico had a target of 5 percent output growth, the gross rate of investment needed for

sustained growth would be 22 percent of GDP ((0.05 + 0.06)•2). With an allowance of 4 percent

of GDP for residential investment, the overall investment rate would be 26 percent.[42] A 7

percent growth rate would require an investment share of about 30 percent. In contrast, the

actual rate of investment averaged only 19 percent in the 1992-94 period, and it was 18 percent of

GDP in mid-1997. Mexico could support a very rapid growth of output over the medium term

simply by improving the utilization of the existing workforce. Capital is by far the most binding

supply-side constraint.

Thus, in future years, capital formation will play a critical role, both as a stimulus to

demand and as an input on the supply side. Achievement of a higher rate of capital formation will

require a focus on promoting higher rates of public and private saving; a strengthening of the

financial system as the primary means of moving resources from savers to investors and insuring

efficient use of the capital; and the encouragement of stable forms of foreign direct investment.

At least for FDI, the outlook is promising as spending rose from about $4 billion in the

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[41]In all of the international comparisons, countries with high rates of TFP growth experienced stable or rising capital-output ratios. It has been extremely difficulty to achieve sustained high rates of output growth without equal or larger rates of growth in capital.

[42]The estimate of a minimal allowance for housing investment of .04 is based on a depreciation rate of .03 and a ratio of capital to GDP that average about 0.5 in the 1960-95 period, but has been rising in the 1990s.

early 1980s to $11 billion in 1994, and it continues at about an $8 billion annual rate. Mexico also undertook significant actions to begin the process of recapitalizing the banks; but the system remains very weak, without the cash flow required to provide significant support to private investment. It may also prove necessary to find new incentives for fixed investment. Given a history of periodic crises, investors are likely to adopt a wait-and-see approach to future investment. On the tax side, the simplest and most preferred form of an investment incentive would be to eliminate the complexities and uncertainties of depreciation accounting and allow firms to write off investments in the year in which they are made.

Finally as growth picks up, it will become increasingly important to find ways to smooth the flow of jobs from the informal (low technology) to the formal sector. Under the current tax and regulatory system, an added job must embody a very large productivity premium before it is worth moving a worker from the informal sector. The larger firms and foreign-operated firms, which are most likely to incorporate capital and modern technology, are more visible and thus more likely to be taxed. Thus, the promotion of a level playing field in labor markets will play an increasingly important role over the medium term. This goal can be achieved by a combination of lower taxes on formal sector employment, improvements delivery of the benefits that lead workers to value the programs, and stronger enforcement of the tax laws on informal employment.

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Figure 1. Indexes of Nonresidential Capital Stock, 1960-95
1960 = 1.0

National Accounts
low depreciation

National accounts
high depreciation

Central Bank

Year
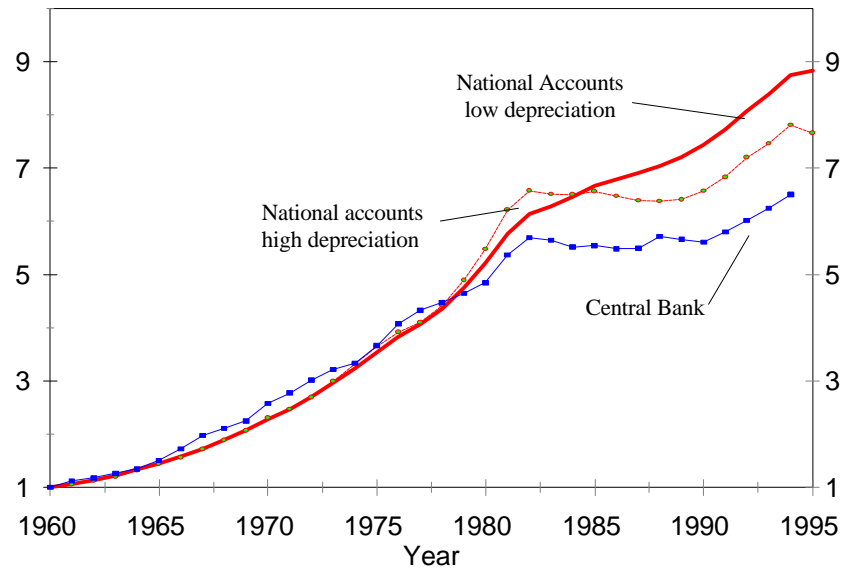
Source: Author's calculations based on data from INEGI and Banco de Mexico

Figure 2. Estimated Rates of Labor Force Participation
Male and Female, 1950-95
Percent

Males

Females

Year
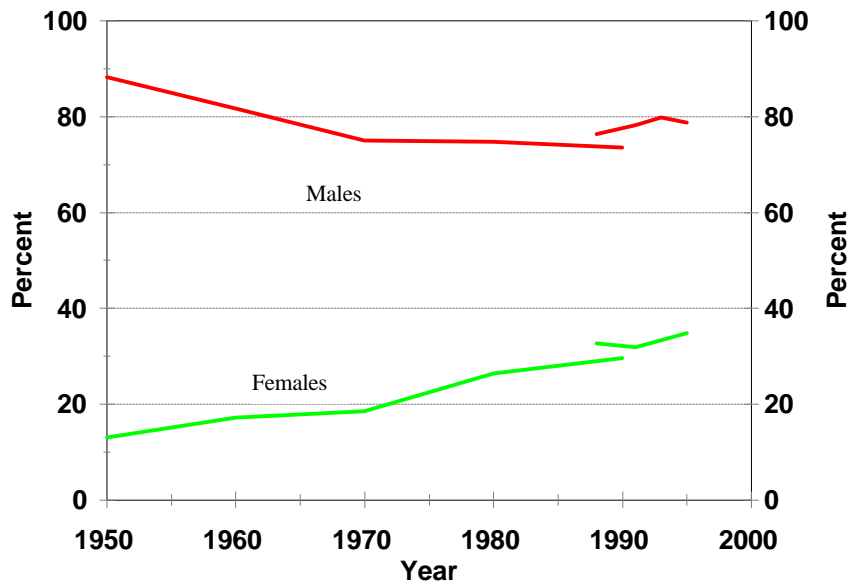
Source: author's calculations as explained in the text.

Table 1. The Population of Labor Force Age and the Economically Active Population, 1950-95

Annual rates of change

	Period				
	1950-60	1960-70	1970-80	1980-90	1990-95
Population (12+)					
males	2.6	3.1	3.4	3.1	2.6
females	2.3	3.0	3.5	3.2	2.7
total	2.4	3.0	3.5	3.1	2.7
Labor Force					
males	1.8	2.2	3.4	3.5	2.9
females	5.1	3.8	7.2	5.0	4.9
total	2.3	2.5	4.3	3.9	3.5
Employment (National Accounts	na	na	3.8	2.5	1.1

Source: Author's calculations as explained in text.

Figure 3. Alternative Employment Measures, 1960-95
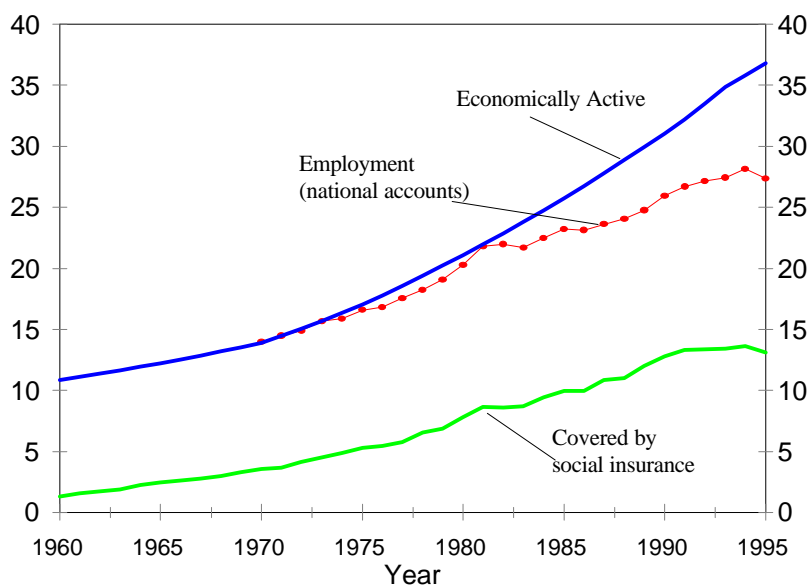
Source: author's calculations based on data from INEGI, CONAPO, and and data published in the Segundo Informe de Gobierno.

Table 2. Distribution of Employment by Major Sector, 1950-95
Percentage

	1950	1960	1970	1979	1991	1995
Household Surveys:						
Agriculture	58	55	41	29	27	25
Industry	18	19	27	28	23	21
Services	24	26	33	43	50	54
Total	100	100	100	100	100	100
National Accounts:						
Agriculture			37	29	23	23
Industry			20	22	24	22
Services			43	49	53	55
Total			100	100	100	100

Source: Garcia (1997) and INEGI. The category of unspecified is
excluded from the survey tabulations.

Table 3. Educational Attainment of the Population Aged 15 and Over, 1960-95
Percent

	No schooling	Primary Complete		Secondary Complete		Higher Complete		Annual Growth of Labor Quality Index	
		No	Yes	No	Yes	No	Yes	7 percent	12 percent
1960	40.1	40.2	12.0	4.6	1.9	0.8	0.5		
1970	30.3	39.2	17.5	6.2	4.4	1.6	0.9	0.7	1.3
1980	27.6	27.7	18.7	14.8	5.6	3.7	1.9	0.9	1.6
1990	13.7	23.1	19.7	20.4	14.6	5.0	3.5	1.3	2.2
1995	10.8	20.9	21.4	20.5	17.0	5.4	4.0	0.6	0.9

Source: Calculated by author from data in Barro-Lee data file and Segundo Informe, p35.
Labor quality indexes are based on 7 and 12 percent returns to schooling

Table 4. Labor Quality Indexes by Region, 7 Percent Return
Index

Region	1960	1990	Change
Mexico	124.8	166.7	1.0
Latin America	130.4	154.7	0.6
South Asia	111.0	133.8	0.6
East Asia	129.8	164.2	0.8
Africa	115.9	127.7	0.3
Middle East	111.3	142.7	0.8
Industrial Cos.	169.9	198.0	0.5

Source: Updated from Collins and Bosworth(1996)

Figure 4. Alternative Measures of Economy-wide Labor Productivity
Thousands of 1993 pesos per worker

Source: Author's calculations as explained in text.

Table 5. Labor Productivity Growth, Labor Force and Eatablishment Basis
Annual percentage change

	Period				
sector	1960-70	1970-81	1981-88	1988-94	1995
Labor-force basis	4.5	2.4	-3.7	0.2	-8.6
Agriculture	--	2.8	-3.1	-0.9	3.0
Industry	--	2.3	-2.8	2.4	-8.6
Services	--	0.1	-4.6	-1.0	-11.3
Wage and Salary					
(Nat'l Accounts)	--	2.6	-1.3	1.2	-3.5
Agriculture	--	2.6	-0.9	1.6	3.0
Industry	--	1.1	-0.7	0.6	0.8
Services	--	1.7	-1.8	0.6	-5.5

Source: Same as figure 4. Labor-force basis refers to estimates of
economically active populations from household surveys. Wage and Salary
is the establishment-based data of the national accounts.

Figure 5. Output per Worker and Its Components, Labor Force Basis
Indexes, 1960 = 1.0
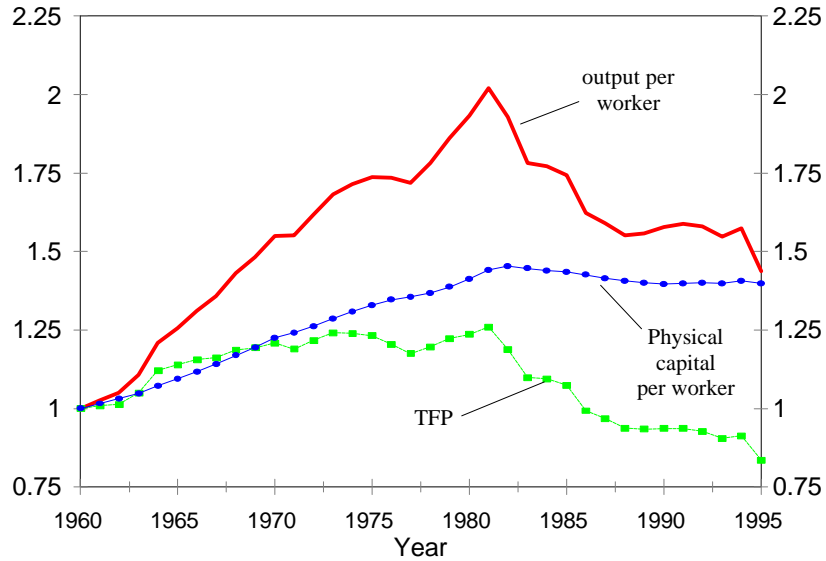
Source: Based on labor force concept of labor inputs, capital stock with low depreciation. Contribution of education is not shown, see table 6.

Figure 6. Output per Worker and Its Components, Wage and Salary Employment
Indexes, 1970=1.0
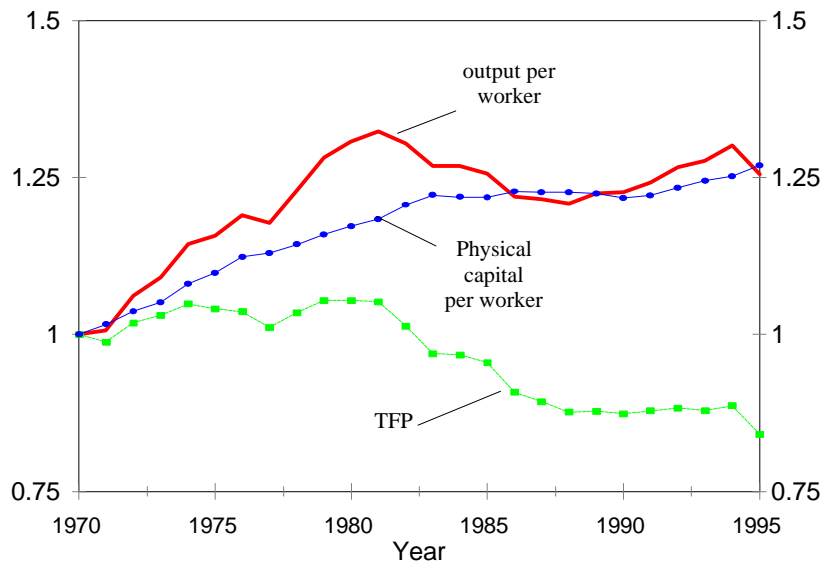
Source: Based on wage and salaryconcept of labor inputs, capital stock with high depreciation. Contribution of education is not shown, see table 6.

Table 6. Output per Worker and Its Components,
           Alternative concepts
annual percentage change

Period	Growth of output per worker	Contribution of:		
		Physical capital per worker	Education per worker	Total factor productivity
Labor force based employment, low capital depreciation				
1960-95	1.0	1.0	0.6	-0.5
1960-70	4.5	2.0	0.5	1.9
1970-81	2.4	1.5	0.5	0.4
1981-88	-3.7	-0.4	0.8	-4.1
1988-94	0.2	-0.0	0.7	-0.4
Labor force based employment, high capital depreciation				
1960-95	1.0	0.8	0.6	-0.4
1960-70	4.5	2.1	0.5	1.9
1970-81	2.4	1.7	0.5	0.2
1981-88	-3.7	-1.2	0.8	-3.3
1988-94	0.2	-0.1	0.7	-0.4
Wage and salary employment, low capital depreciation				
1970-95	0.9	1.0	0.6	-0.7
1970-81	2.6	1.5	0.5	0.5
1981-88	-1.3	0.5	0.8	-2.6
1988-94	1.2	0.3	0.7	0.2

Source: author's calculations as explained in text.

Figure 7. Output per Worker and Its Components. by Sector
Index, 1970=1.0
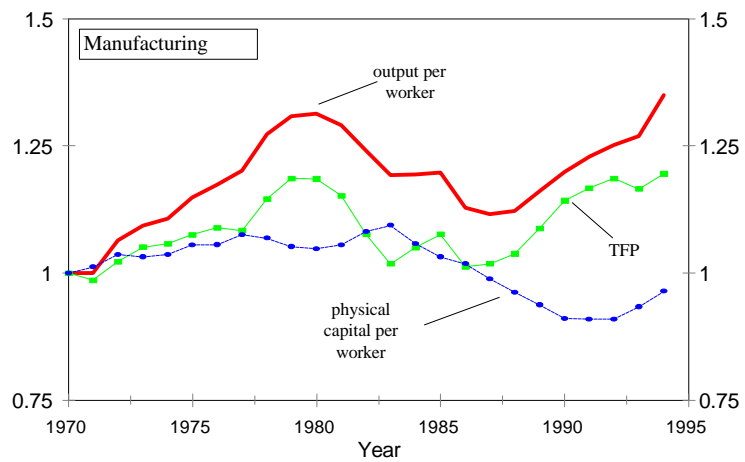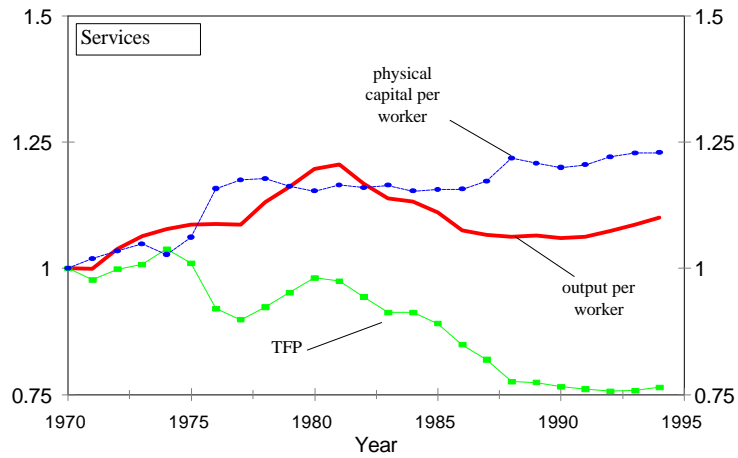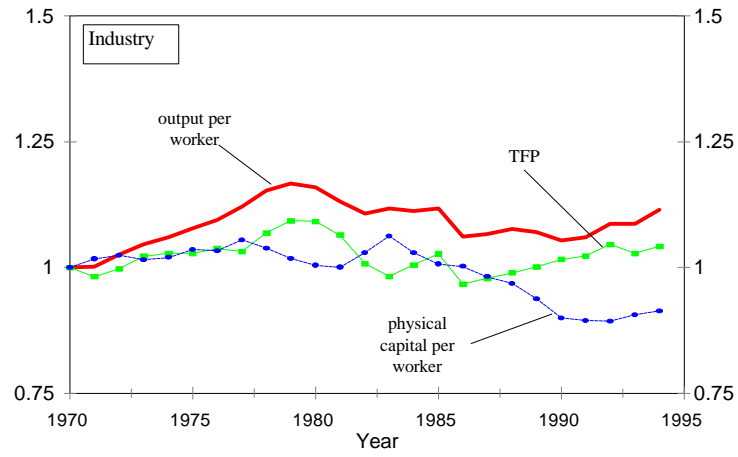
Source: same as table 7.

Table 8. Sources of Economic Growth by Major Region, 1960-94
annual percentage rate

Region/Period	Output per Worker	Contribution of: Physical Capital	Education	Factor Productivity
Mexico				
1960-94	1.3	1.0	0.6	-0.3
1960-73	4.1	2.0	0.4	1.7
1973-84	0.5	1.0	0.6	-1.1
1984-94	-1.2	-0.2	0.9	-1.8
Latin America				
1960-94	1.5	0.9	0.4	0.2
1960-73	3.4	1.3	0.3	1.8
1973-84	0.4	1.1	0.4	-1.1
1984-94	0.1	0.1	0.4	-0.4
East Asia (1)				
1960-94	4.2	2.5	0.6	1.1
1960-73	4.2	2.3	0.5	1.3
1973-84	4.0	2.8	0.6	0.5
1984-94	4.4	2.2	0.6	1.6
South Asia				
1960-94	2.3	1.1	0.3	0.8
1960-73	1.8	1.4	0.3	0.1
1973-84	2.5	0.9	0.4	1.2
1984-94	2.7	1.0	0.3	1.5
Africa				
1960-94	0.3	0.8	0.2	-0.6
1960-73	1.9	1.3	0.2	0.3
1973-84	-0.6	1.2	0.2	-2.0
1984-94	-0.6	-0.4	0.3	-0.4
Middle East				
1960-94	1.6	1.5	0.5	-0.3
1960-73	4.7	2.0	0.4	2.3
1973-84	0.5	2.2	0.6	-2.2
1984-94	-1.1	-0.0	0.5	-1.5
United States				
1960-94	1.1	0.4	0.4	0.3
1960-73	1.9	0.5	0.6	0.8
1973-94	0.6	0.3	0.2	0.1
1984-94	0.9	0.3	-0.0	0.7
Non-US Industrial Cs.				
1960-94	2.9	1.5	0.4	1.1
1960-73	4.8	2.3	0.4	2.2
1973-84	1.8	1.1	0.6	0.2
1984-94	1.7	0.8	0.2	0.7

Source: Authors' calculations as explained in text. Regional averages are weighted
The underlying data for Mexico are as shown in figure 5.
1. Excludes China.

Table 9. Initial Conditions and External Shocks, 88 Country Sample

Country/ Region	Income per Capita 1960 (% of USA)	Life Expectancy 1960	Years of Schooling 1965	Change in Terms of Trade	Standard Deviation of Terms of Trade	Investment Share (Int'l Prices)
Mexico	28.1	57.3	2.8	-0.2	11.7	16.4
Regions						
Latin America	22.1	55.4	3.2	-0.9	15.4	15.6
East Asia	11.4	55.0	3.3	-0.0	11.2	21.6
South Asia	7.8	47.7	1.7	-1.2	10.4	9.3
Sub-Sahara	9.2	42.1	1.2	-1.3	16.4	8.8
Middle East	15.7	54.5	2.6	1.7	14.3	17.2
Industrial Countries	55.6	69.3	6.4	-1.2	8.0	25.9
Total	25.3	55.1	3.4	-0.7	12.9	17.0

Source: Authors' calculations from World Bank (1995), Barro and Lee (1994), and
Summers and Heston (1991). The regional means are simple averages. Means and
standard deviations are measured over the period of 1960-94.

Table 10. Macroeconomic and Trade Policy Indicators, 83 Countries

Country/ Region	Macroeconomic Policy					Trade Policy			
	Budget Balance (% GDP)	Change in Real Exchange Rate	Standard Deviation of Real Exchange Rate	Inflation Rate	Black Market Exchange Rate Premium(%)	Open	OpenP (% Years)	Average Tariff (%)	Non-tariff Barriers (%)
Mexico	-5.1	-0.7	12.0	28.2	7.4	0.0	18.0	9.7	7.4
Regions									
Latin America	-3.8	-1.1	15.8	121.0	36.2	0.0	17.5	28.8	31.2
East Asia	-1.8	-1.7	9.4	16.4	7.6	0.9	73.7	16.4	19.1
South Asia	-6.0	-2.4	12.9	9.0	114.2	0.0	4.6	68.6	45.7
Sub-Sahara	-5.5	-1.8	15.4	26.9	76.7	0.1	6.3	30.6	31.5
Middle East	-5.4	-2.0	9.3	13.5	62.3	0.3	37.2	27.3	45.5
Industrial Cos.	-1.6	0.2	5.4	7.9	1.8	0.9	90.4	6.9	19.4

Sources: Budget balance and real exchange rate measures - see text.

Inflation - calculated from consumer price indices, International Financial Statistics.

Black market exchange rate - Barro-Lee data set.

Open and OpenP - Sachs and Warner(1995).

Average tariff and Non-tariff barrier coverage ratio - UNCTAD, Sachs and Warner(1995) and authors' calculations. Data refers to various years in the 1980s, and are available for 76 countries.

Note: Regional averages are unweighted.

Figure 8. Output per worker and Its components, Chile
Index, 1960=1
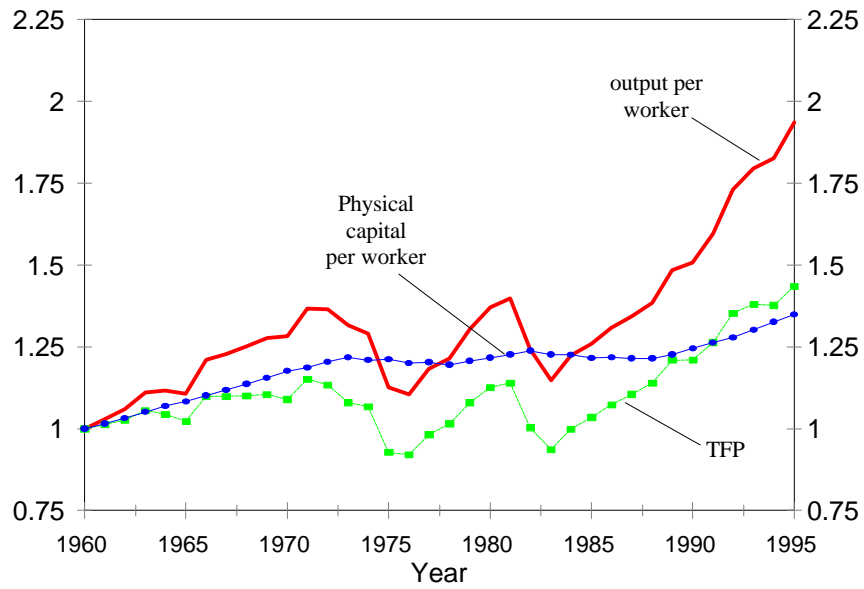
Source: Collins and Bosworth (1996)

Figure 9. The Real Exchange Rate of Chile and Mexico, 1970-97
Index, 1990=100
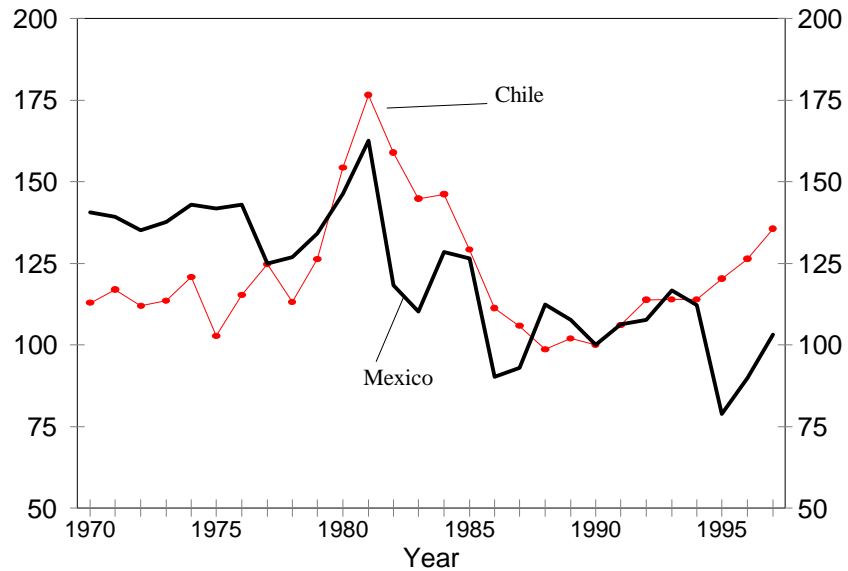
Source: Morgan Guaranty Trust Co.

Figure 10. Real Rates of Return on Bank Deposits, Chile and Mexico
percent
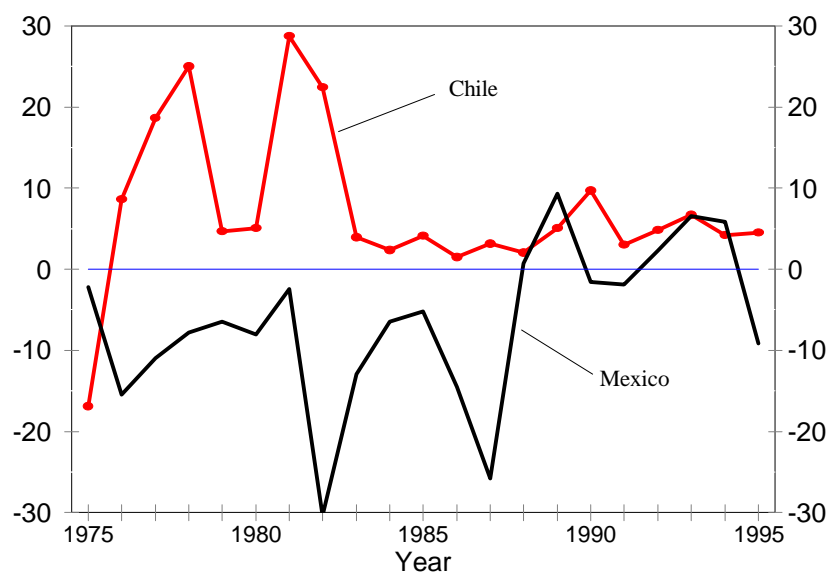
Source: For Mexico, the two-month deposit rate deflated by the rate of change
in the CPI. For Chile, the 30-90 day deposit rate.

Table 11. Net Credit and Liabilities of the Consolidated Banking System, 1981-94
Percent of GDP

| Year | Net Liabilitites | | | | Credit Extended | | | | |
| | Total | Private Sector | Nonbank Finance | Foreign | Total | Private Sector | | Public Sector | Other |
						Total	Business		
1981	37.5	26.7	2.1	8.7	37.5	15.9	14.2	21.7	-0.0
1982	45.7	23.0	2.0	20.8	45.7	11.0	9.7	33.9	0.8
1983	40.1	21.1	2.4	16.6	40.1	9.4	8.3	29.3	1.4
1984	37.0	22.1	2.3	12.6	37.0	10.7	9.1	24.1	2.2
1985	38.4	19.3	2.8	16.3	38.4	10.1	8.4	27.2	1.1
1986	43.5	18.9	3.3	21.4	43.5	8.8	7.2	33.1	1.7
1987	35.7	16.8	3.1	15.8	35.7	8.5	7.0	26.4	0.8
1988	32.5	15.7	3.1	13.6	32.5	10.1	8.1	22.1	0.3
1989	34.3	18.2	3.3	12.8	34.3	14.5	12.0	20.8	-1.0
1990	31.3	19.4	3.0	9.0	31.3	16.9	13.4	16.1	-1.6
1991	32.9	23.2	2.7	7.1	32.9	21.4	17.8	12.8	-1.3
1992	34.2	25.3	2.6	6.3	34.2	27.6	20.3	8.2	-1.5
1993	36.7	27.1	3.6	6.0	36.7	31.9	23.3	4.6	0.3
1994	52.2	29.6	5.0	17.7	52.2	40.8	27.0	8.6	2.7

Source: Bank of Mexico
Data are deflated by by the consumer price index for December on a base of 1980=1 and
expressed as a percent of GDP in 1980 prices.

Figure 11. Contribution of Investment and Exports to Growth, Mexico and Chile
Index, 1980 = 1.0
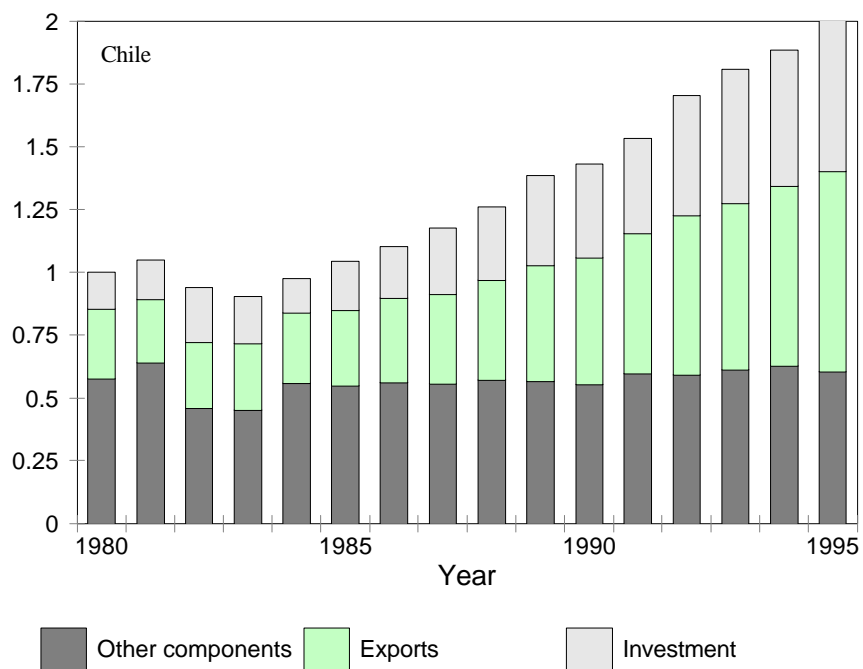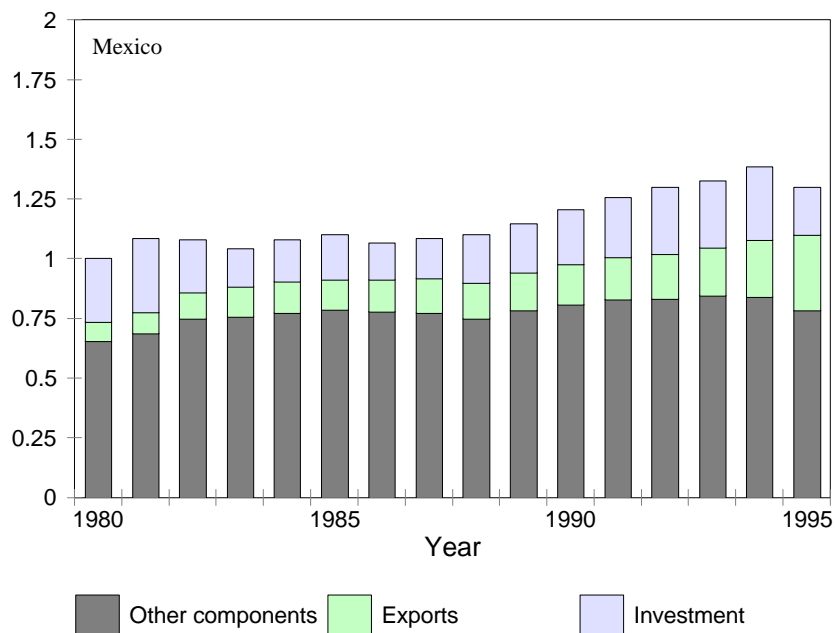
Source: National accounts data. Contribution is measured as 1980 share of GDP
times index of growth in the component

Figure 12. Relative Cost of Labor in Manufacturing, 1970-95
annual wage deflated by price deflator for fixed investment
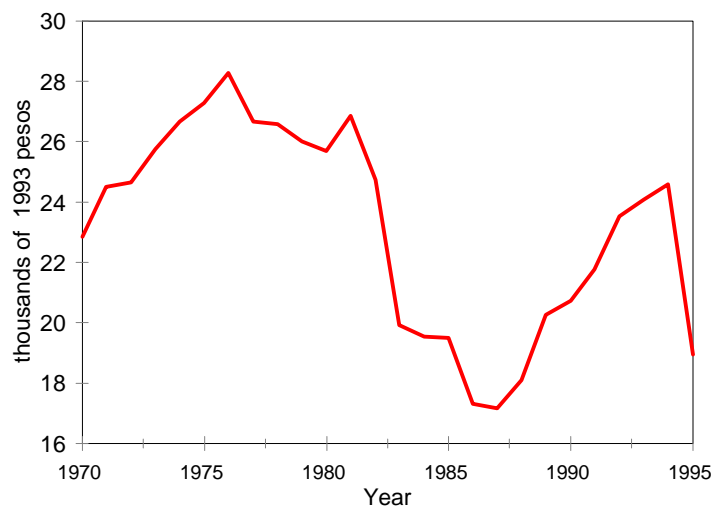
Source: INEGI, National Accounts. The price deflator is on a base of 1993 = 1.0.

Table 12. Employment Taxes and Contributions,1996

Category	percent of earnings
Payroll contributions	
Health and maternity	11.9
Retirement and disability	8.1
Occupational risks	2.5
Day care	1.0
Housing (INFONAVIT)	5.0
SAR	2.0
Total	**30.5**
Fringe benefits (wage equivalent)	
Rest days	14.3
Paid holidays	1.9
Year-end bonus	4.1
Vacation bonus	0.5
Paid vacation	1.6
Total	**22.4**

source: OECD (1997).

Appendix Table 1. Regression Results for Changes in Output per Worker and its Components, Initial Conditions, 1960-1994

Variable	Output per worker				Capital per worker		TFP		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Initial income	-0.05	-0.04	-0.02	-0.04	-0.02	-0.01	-0.03	-0.03	-0.02
	(4.5)	(4.0)	(2.8)	(3.9)	(3.3)	(2.3)	(3.5)	(3.2)	(2.8)
Years of schooling	0.19	0.04	0.15	0.08	0.03	-0.07	0.15	0.12	0.15
	(1.6)	(0.4)	(1.7)	(0.6)	(0.5)	(1.3)	(1.8)	(1.4)	(1.7)
Life expectancy	0.06	0.05	0.03	0.04	0.03	0.02	0.03	0.03	0.03
	(3.0)	(2.8)	(1.7)	(1.8)	(2.4)	(2.1)	(2.2)	(1.9)	(1.7)
Change in tot	0.24	0.05	0.08	0.19	0.13	0.02	0.11	0.03	0.08
	(3.8)	(0.8)	(1.7)	(2.9)	(3.5)	(0.6)	(2.4)	(0.6)	(1.7)
Standard dev. of tot	-0.11	-0.04	-0.06	-0.09	-0.04	-0.01	-0.06	-0.03	-0.05
	(4.7)	(1.9)	(3.2)	(4.3)	(3.2)	(0.5)	(3.9)	(1.9)	(3.2)
Capital-labor substitution			1.21						0.20
			(8.8)						(1.5)
Investment share				0.07					
				(2.8)					
Regional dummies	no	yes	no	no	no	yes	no	yes	no
South Asia		-1.7				-1.4		-0.2	
		(3.0)				(4.6)		(0.5)	
Africa		-2.2				-1.7		-0.5	
		(4.7)				(6.2)		(1.4)	
Middle East		-0.9				-1.0		0.1	
		(2.0)				(3.7)		(0.2)	
Latin America		-2.4				-1.5		-0.8	
		(5.5)				(6.1)		(2.3)	
Industrial cntry.		-0.4				-0.6		0.2	
		(0.7)				(2.0)		(0.5)	
Adj. R2	0.42	0.62	0.70	0.46	0.24	0.52	0.36	0.43	0.36

Numbers in parentheses are t-statistics. Capital per worker includes education. The investment rate is measured as a percent and is based on international prices.
The dependent variable is measured as an annual percent change, and the units of the other variables are shown in Table 9 of the text.

**Appendix Table 2. Regression Results for Changes in Output per Worker and its Components,
Initial Conditions, Macroeconomic Policy and Openness: 1960-1994
83 Countries**

Variable	Output per worker			Capital per worker			TFP		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Initial income	-0.06	-0.05	-0.04	-0.03	-0.03	-0.02	-0.03	-0.03	-0.03
	(5.6)	(6.0)	(4.2)	(4.7)	(5.1)	(2.8)	(3.7)	(3.7)	(3.1)
Years of schooling	0.25	0.21	0.10	0.09	0.06	-0.03	0.16	0.14	0.13
	(2.3)	(2.1)	(1.0)	(1.3)	(1.0)	(0.6)	(2.1)	(1.9)	(1.6)
Life expectancy	0.04	0.02	0.03	0.03	0.01	0.01	0.02	0.01	0.02
	(2.3)	(1.4)	(1.7)	(2.2)	(1.2)	(1.3)	(1.3)	(0.8)	(1.1)
Change in tot	0.18	0.14	0.02	0.13	0.10	0.02	0.05	0.03	0.00
	(3.0)	(2.5)	(0.3)	(3.5)	(3.1)	(0.5)	(1.1)	(0.8)	(0.0)
Standard dev. of tot	-0.09	-0.07	-0.03	-0.05	-0.03	-0.01	-0.04	-0.03	-0.02
	(4.1)	(3.4)	(1.5)	(3.4)	(2.7)	(0.5)	(2.7)	(2.3)	(1.4)
Standard dev. of RER	-0.05	-0.04	-0.03	0.00	0.01	0.01	-0.05	-0.05	-0.04
	(3.2)	(2.7)	(2.4)	(0.2)	(0.7)	(0.7)	(4.5)	(4.1)	(3.5)
Budget surplus (% GDP)	0.10	0.07	0.07	0.07	0.06	0.04	0.02	0.02	0.03
	(2.9)	(2.3)	(2.1)	(3.4)	(2.9)	(2.1)	(1.0)	(0.6)	(1.0)
Open		1.32	0.64		0.86	0.47		0.44	0.17
		(4.3)	(1.6)		(4.6)	(2.0)		(1.9)	(0.6)
Regional dummies	no	no	yes	no	no	yes	no	no	yes
South Asia			-0.83			-0.92			0.10
			(1.4)			(2.6)			(0.2)
Africa			-1.49			-1.29			-0.18
			(2.8)			(4.1)			(0.4)
Middle East			-0.35			-0.49			0.15
			(0.7)			(1.6)			(0.4)
Latin America			-1.54			-1.07			-0.44
			(2.9)			(3.4)			(1.0)
Industrial cntry.			-0.35			-0.46			0.12
			(0.7)			(1.6)			(0.3)
Adj. R2	0.55	0.64	0.68	0.36	0.50	0.58	0.49	0.51	0.51

Numbers in parentheses are t-statistics. Capital per worker includes education.
The dependent variable is measured as an annual percent change, and the units of the other variables are
shown in Table 10 of the text.

Table A1. Population, Labor Force and Employment, 1960-95
thousands of persons

Year	Population - 12+			Labor Force						Employment -National Accounts			
	Males	Females	Total	Males	Females	Total	Agric.	Industry	Services	Total	Agric.	Industry	Services
1960	10907	11217	22124	8929	1937	10865	5937	2070	2859				
1961	11221	11516	22738	9115	2003	11119	5922	2201	2996				
1962	11551	11834	23385	9309	2074	11382	5905	2339	3139				
1963	11896	12166	24062	9508	2147	11655	5886	2482	3288				
1964	12258	12517	24775	9714	2225	11940	5865	2632	3443				
1965	12638	12890	25528	9928	2308	12236	5842	2789	3606				
1966	13036	13283	26319	10150	2396	12545	5816	2953	3777				
1967	13452	13698	27150	10379	2489	12868	5788	3125	3955				
1968	13885	14134	28019	10616	2587	13203	5757	3305	4142				
1969	14337	14590	28927	10860	2691	13551	5721	3493	4336				
1970	14805	15067	29872	11110	2801	13911	5681	3690	4539	13994	5165	2843	5986
1971	15292	15567	30859	11457	3015	14472	5721	3857	4894	14485	5347	2875	6262
1972	15799	16091	31890	11820	3241	15061	5756	4032	5272	14893	5262	3070	6562
1973	16330	16637	32967	12201	3480	15681	5788	4218	5676	15700	5505	3317	6878
1974	16887	17212	34099	12605	3734	16339	5816	4415	6108	15890	5210	3472	7207
1975	17477	17816	35294	13036	4004	17040	5843	4625	6572	16588	5386	3567	7635
1976	18097	18447	36545	13494	4290	17784	5865	4849	7070	16829	5171	3683	7975
1977	18741	19103	37844	13974	4593	18567	5880	5086	7602	17587	5664	3650	8272
1978	19404	19782	39186	14475	4912	19388	5885	5334	8168	18228	5658	3918	8651
1979	20080	20481	40560	14993	5248	20241	5879	5594	8768	19088	5477	4293	9318
1980	20761	21195	41956	15522	5601	21123	6099	5759	9265	20282	5670	4662	9950
1981	21447	21926	43373	16092	5900	21992	6312	5914	9765	21801	5838	5197	10766
1982	22146	22675	44821	16679	6212	22891	6531	6070	10289	21988	5653	5176	11159
1983	22860	23441	46301	17284	6536	23820	6755	6228	10837	21722	5899	4632	11190
1984	23587	24219	47807	17907	6871	24777	6984	6386	11407	22471	5975	4887	11609
1985	24324	25007	49331	18543	7217	25760	7217	6543	12000	23215	6141	5127	11947
1986	25072	25803	50875	19194	7575	26769	7454	6700	12615	23133	5998	5081	12054
1987	25830	26609	52439	19862	7944	27806	7695	6855	13255	23623	6098	5202	12323
1988	26594	27420	54014	20542	8323	28866	7939	7009	13918	24067	6260	5290	12517
1989	27362	28236	55599	21233	8714	29947	8185	7160	14602	24761	6131	5656	12974
1990	28136	29058	57193	21936	9116	31052	8434	7308	15310	25955	6230	6124	13601
1991	28913	29883	58795	22648	9529	32177	8684	7453	16040	26722	6214	6295	14213
1992	29691	30709	60401	23486	10035	33520	9076	7592	16853	27158	6157	6411	14590
1993	30469	31536	62005	24332	10555	34887	9476	7721	17689	27462	6244	6425	14793
1994	31245	32361	63606	24800	11048	35848	9314	7800	18734	28163	6318	6563	15282
1995	32018	33184	65202	25259	11552	36811	9129	7872	19810	27365	6193	6005	15168
1996	32786	34003	66790										
1997	33551	34819	68370										
1998	34313	35632	69945										
1999	35073	36441	71514										
2000	35828	37247	73075										

Table A2. Output and Capital Stock by Sector, 1970-95
billions of 1993 pesos

| Year | Value Added | | | | Capital Stock | | | | |
| | | | | | National Accounts | | Central Bank | | |
	Total	Agric	Industry	Services	Low depr.	High depr	Total	Industry	Services
1970	457.3	43.5	126.1	287.7	671.2	349.8	464.9	343.9	121.0
1971	474.6	46.0	127.8	300.8	727.7	375.3	499.4	365.6	133.8
1972	513.6	46.3	139.8	327.5	792.8	408.9	543.8	397.5	146.3
1973	554.0	48.2	154.0	351.8	869.8	453.5	578.6	419.4	159.2
1974	586.0	49.4	163.2	373.4	952.2	502.9	601.9	444.4	157.5
1975	619.6	50.3	170.7	398.6	1041.8	553.1	660.4	477.2	183.2
1976	647.0	50.9	178.9	417.3	1126.8	594.1	734.3	489.1	245.2
1977	669.0	54.8	181.6	432.5	1196.7	621.8	779.6	514.4	265.2
1978	728.9	58.1	200.4	470.3	1283.6	670.1	806.5	527.3	279.2
1979	799.6	56.9	222.3	520.3	1397.2	741.5	836.7	546.5	290.1
1980	873.4	60.9	239.9	572.6	1532.5	831.0	873.2	570.8	302.3
1981	950.5	65.5	260.9	624.2	1695.2	942.0	966.9	630.2	336.6
1982	944.7	64.1	254.2	626.5	1805.4	996.3	1025.5	680.5	345.0
1983	907.8	65.5	229.8	612.5	1849.0	986.7	1016.9	667.0	349.8
1984	939.2	66.5	241.1	631.6	1899.8	986.0	994.1	641.2	352.9
1985	961.0	68.6	254.1	638.4	1960.3	994.4	998.9	633.2	365.6
1986	929.8	67.4	239.2	623.2	1996.5	982.1	988.5	618.5	370.0
1987	946.1	68.3	246.1	631.7	2030.4	968.9	989.7	597.2	392.5
1988	958.2	66.0	252.9	639.3	2071.1	966.9	1029.1	584.5	444.6
1989	998.5	65.9	268.4	664.1	2118.7	971.6	1020.4	570.5	450.0
1990	1049.1	69.6	286.4	693.0	2186.1	996.0	1010.2	547.4	462.9
1991	1093.4	71.2	296.1	726.1	2270.7	1034.9	1044.7	554.6	490.1
1992	1133.0	70.5	309.0	753.5	2373.7	1090.8	1084.5	562.5	522.0
1993	1155.1	72.7	309.9	772.5	2464.5	1130.9	1125.4	587.3	538.1
1994	1206.7	73.4	324.8	808.5	2569.4	1183.2	1171.2	613.9	557.4
1995	1131.9	74.1	299.6	758.2	2594.6	1161.1			

Table A3. Output per Worker and the Contribution of Capital, Education, and TFP
indexes

| Year | Labor Force Basis: Figure 5 | | | | Employment Basis: Figure 6 | | | |
	Output per worker	TFP	Physical Capital	Education	Output per worker	TFP	Physical Capital	Education
			Contribution of:				Contribution of:	
1960	1.00	1.00	1.00	1.00				
1961	1.03	1.01	1.02	1.00				
1962	1.05	1.01	1.03	1.00				
1963	1.11	1.05	1.05	1.00				
1964	1.21	1.12	1.07	1.01				
1965	1.26	1.14	1.09	1.01				
1966	1.31	1.16	1.12	1.02				
1967	1.36	1.16	1.14	1.02				
1968	1.43	1.19	1.17	1.03				
1969	1.48	1.19	1.19	1.04				
1970	1.55	1.21	1.22	1.05	1.00	1.00	1.00	1.00
1971	1.55	1.19	1.24	1.05	1.01	0.99	1.02	1.00
1972	1.62	1.22	1.26	1.05	1.06	1.02	1.04	1.00
1973	1.68	1.24	1.29	1.05	1.09	1.03	1.05	1.01
1974	1.71	1.24	1.31	1.06	1.14	1.05	1.08	1.01
1975	1.74	1.23	1.33	1.06	1.16	1.04	1.10	1.01
1976	1.73	1.20	1.35	1.07	1.19	1.04	1.12	1.02
1977	1.72	1.18	1.36	1.08	1.18	1.01	1.13	1.03
1978	1.78	1.20	1.37	1.09	1.23	1.03	1.14	1.04
1979	1.86	1.22	1.39	1.10	1.28	1.05	1.16	1.05
1980	1.93	1.24	1.41	1.11	1.31	1.05	1.17	1.06
1981	2.02	1.26	1.44	1.11	1.32	1.05	1.18	1.06
1982	1.93	1.19	1.45	1.12	1.30	1.01	1.21	1.07
1983	1.78	1.10	1.45	1.12	1.27	0.97	1.22	1.07
1984	1.77	1.09	1.44	1.13	1.27	0.97	1.22	1.07
1985	1.74	1.07	1.44	1.13	1.26	0.96	1.22	1.08
1986	1.62	0.99	1.43	1.15	1.22	0.91	1.23	1.09
1987	1.59	0.97	1.42	1.16	1.22	0.89	1.23	1.11
1988	1.55	0.94	1.41	1.18	1.21	0.88	1.23	1.12
1989	1.56	0.93	1.40	1.19	1.22	0.88	1.22	1.14
1990	1.58	0.94	1.40	1.21	1.23	0.87	1.22	1.15
1991	1.59	0.94	1.40	1.21	1.24	0.88	1.22	1.16
1992	1.58	0.93	1.40	1.22	1.27	0.88	1.23	1.16
1993	1.55	0.91	1.40	1.22	1.28	0.88	1.25	1.17
1994	1.57	0.91	1.41	1.23	1.30	0.89	1.25	1.17
1995	1.44	0.84	1.40	1.23	1.26	0.84	1.27	1.18