



WP/06/191

# IMF Working Paper

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## What Explains Private Saving in Mexico?

*Aleš Bulíř and Andrew Swiston*



## **IMF Working Paper**

IMF Institute and Western Hemisphere Department

### **What Explains Private Saving in Mexico?<sup>1</sup>**

**Prepared by Aleš Bulíř and Andrew Swiston**

Authorized for distribution by Guy Meredith

August 2006

#### **Abstract**

**This Working Paper should not be reported as representing the views of the IMF.**

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper examines the factors influencing Mexico's private saving rate. Cross-country analysis finds that Mexico's private saving is somewhat higher than could be explained by its fundamentals, but lower than in the average country in the sample. This analysis suggests that Mexico's greater reliance on external saving, its relatively high population dependency ratio, and its less developed financial system have been the main factors holding back private saving. Time-series analysis finds that movements in private saving have not been associated with similar shifts in investment, as changes in public saving and external saving have tended to offset movements in private saving. This is consistent with the direction of causality being from investment to saving and suggests that policy measures should focus on creating conditions favorable to increased investment.

JEL Classification Numbers: E21, O54

Keywords: Mexico, private saving, Ricardian equivalence

Author(s) E-Mail Address: [abulir@imf.org](mailto:abulir@imf.org), [aswiston@imf.org](mailto:aswiston@imf.org)

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<sup>1</sup> The paper benefited from comments by Caroline Atkinson, Tam Bayoumi, Javier Hamann, Russell Kincaid, Guy Meredith, Steven Phillips, and seminar participants at the International Monetary Fund, the Bank of Mexico, and the Mexican Ministry of Finance. All errors remain ours.

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## **I. INTRODUCTION**

In the past quarter-century, the economies of Mexico and the rest of Latin America have grown more slowly than East Asia, other emerging market economies, and even advanced OECD countries. At the same time, both investment and saving in Latin America have fallen short of the levels prevailing in the rest of the world. If Latin America's relatively low long-term growth is related to low investment, which in turn either stems from or causes a scarcity of saving, then determining the main factors behind the low level of saving, and private saving in particular, may shed light on what policies would be most successful in kick-starting growth.

In this context, Mexico can be seen as a good case study, especially in determining how two decades of financial and other structural reforms have affected private saving. The last decade has seen several important developments that may have affected saving behavior, including the move to a more stable macroeconomic environment with low inflation and a floating exchange rate; more credible fiscal and monetary policies; reform and development of the domestic financial system (see, for example, Grandolini and Cerda, 1998; and Haber, 2005); and increased access to external saving (external saving is defined as the deficit on the external current account). While some of these developments might have boosted private saving, others may have reduced the need for saving.

This paper examines, from both the cross-country and time-series perspectives, the factors influencing Mexico's private saving rate. Section II looks at issues of causality between saving and investment, while Section III discusses some issues in the measurement of private saving. The cross-country analysis is found in Section IV, while the time-series analysis is in Section V. Section VI returns to issues of causality in light of the results obtained in Sections IV and V, and Section VII concludes.

## **II. GROWTH, SAVING, AND INVESTMENT IN AN EMERGING MARKET ECONOMY**

The common assumption that higher private saving tends to cause higher investment, in turn raising long-term economic growth, may not hold in some emerging market countries. Recent excess saving in some of these countries indicates that the level of private saving may not drive the level of investment (Bernanke, 2005; International Monetary Fund, 2005). Rather, the causality could be in the opposite direction, with the level of desired investment determining the quantity of private saving. In Mexico, for example, it has been argued that various factors have limited growth prospects, translating into a lower return on private investment and providing an explanation of why private investment remained subdued (Faal, 2005).<sup>2</sup> In essence, a scarcity of profitable investment opportunities may be limiting the desired level of saving.

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<sup>2</sup> Faal estimated that in Mexico total factor productivity growth was negative on average during 1980–2003 and, although positive since 1995, it has remained low in recent years.

In an economy where the optimal level of investment is chosen first and the components of saving—private, public, and external—are determined subsequently, financial reforms and macroeconomic stability have an ambiguous impact on the level of private saving. Financial reforms can increase the return to investment and promote higher saving, thus working through the substitution effect. However, if households expect an increase in future income as a result of these reforms, current saving may decrease through an income effect (Schmidt-Hebbel and Servén, 2002). In Mexico, even though bank privatization in the late 1990s and foreign bank entry in the early 2000s increased returns to financial saving as measured by real interest rates (Bank of Mexico, 2002), private saving decreased. Similarly, a more stable economic environment may result in lower desired private saving as households would need less investment (a smaller capital stock) to maintain a smooth consumption pattern.

Stylized facts seem to support the hypothesis of investment-to-saving causality in Mexico. First, public and private saving have been more volatile in Mexico than in other emerging markets (Figures 1 and 2). Large movements in the components of saving have occurred even in the absence of fluctuations in investment, supporting the idea that they have adjusted as needed to achieve the desired level of investment. Second, we find a negative relationship between external saving and private saving in Mexico, while in most countries this relationship is positive (Table 1).

Third, the negative correlation between private and public saving is stronger than in other countries.

In Mexico, external saving and public saving have served, to a greater degree than in other countries, as substitutes for private saving. The 1990s crisis illustrates this point.

External saving fell from 7 percent of GDP in 1994 to less than 1 percent of GDP in 1996, and public saving fell from almost 5 percent of GDP to -2½ percent of GDP in the same period, but fixed investment only fell by 1.5 percentage points, as private saving

leaped from 10 percent to 25 percent of GDP. Similarly, fiscal consolidation since the 1990s crisis raised public saving. With investment and external saving relatively stable in the last decade, the data thus show public and private saving moving in opposite directions.<sup>3</sup>

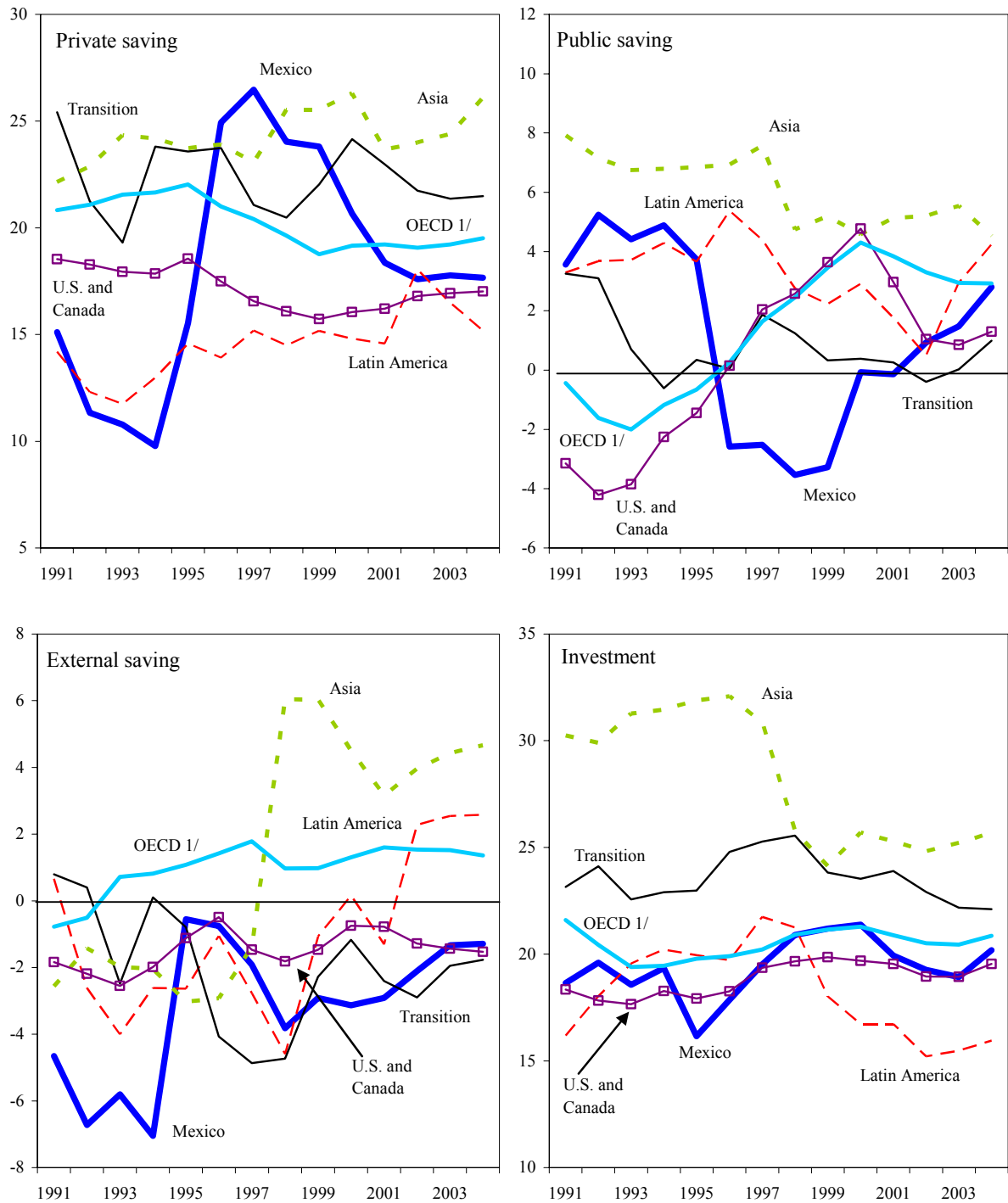
Table 1. Saving-Investment Correlation Coefficients

	Private saving	Public saving	External saving	Fixed investment
<b>Mexico: 1980-2004</b>				
Private saving	1.00	-0.58	-0.52	0.31
Public saving		1.00	0.16	-0.30
External saving			1.00	-0.05
Fixed investment				1.00
<b>Cross-country sample: 1991-2004</b>				
Private saving	1.00	-0.15	0.46	0.55
Public saving		1.00	0.27	0.47
External saving			1.00	0.00
Fixed investment				1.00

Source: IMF staff calculations.

<sup>3</sup> Another reason for the recent stability of external saving is that it may have been constrained by the reluctance of financial markets to provide financing of the magnitude seen prior to the two large crises, 1982–83 and 1994–95. For a similar argument see Mendoza and Oviedo (2005).

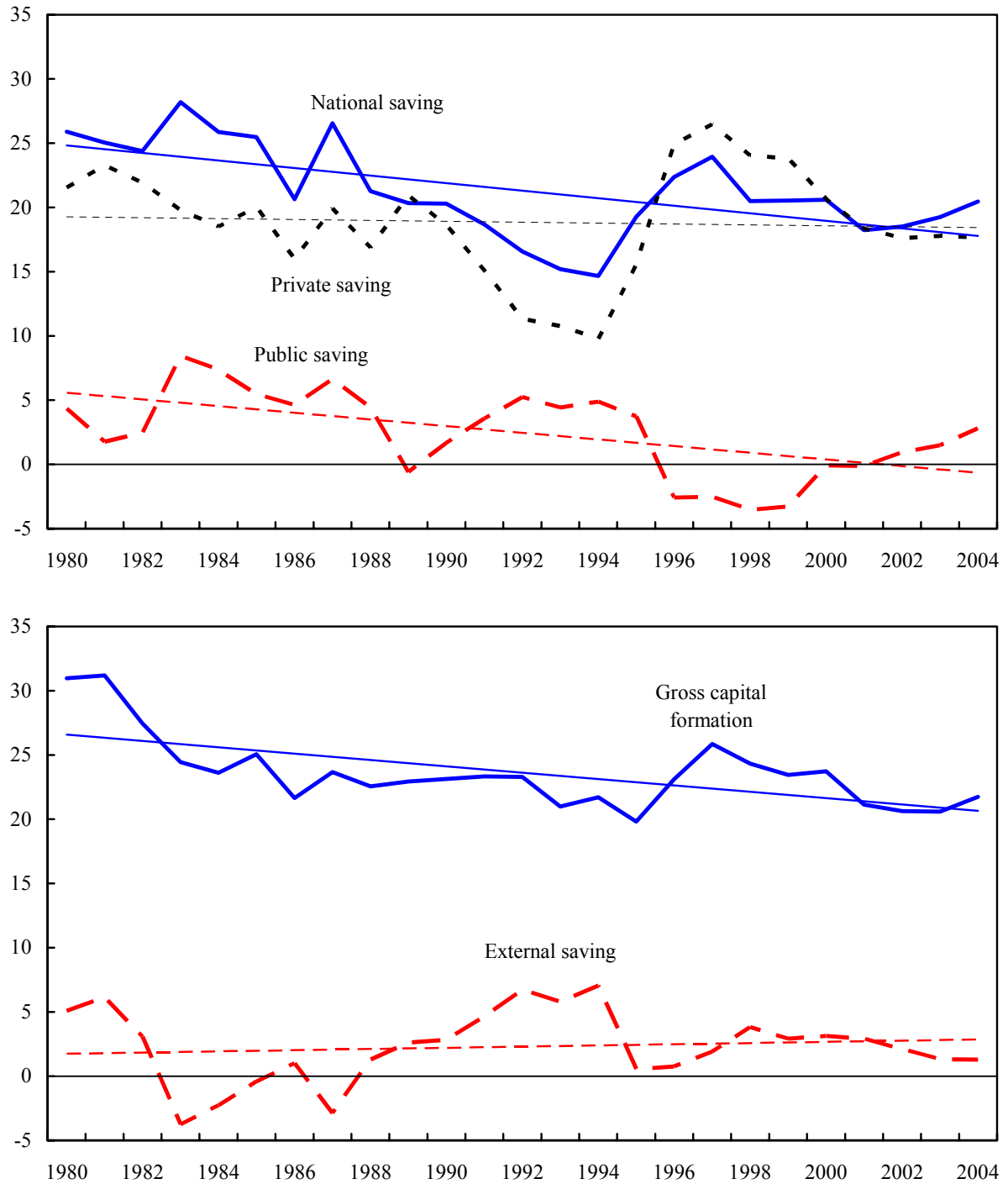
Figure 1. Selected Countries: Saving and Investment, 1991–2004  
(In percent of GDP)



Source: IMF, *World Economic Outlook*. Regional numbers are unweighted averages.

1/ OECD countries excluding Mexico, United States, Canada, Asian, and transition countries.

Figure 2. Mexico: Saving and Investment Balances, 1980–2004  
(In percent of GDP)



Source: IMF, *World Economic Outlook*.



### III. THE MEASUREMENT OF PRIVATE SAVING

Measurement problems associated with saving are significant. The quality of data differs widely, and many countries, including Mexico, do not publish official data on the composition of saving. Instead, private saving must be calculated as the “residual of a residual,” in two steps: (i) National Saving = Gross Investment – External Saving; and (ii) Private Saving = National Saving – Public Saving.<sup>4,5</sup> Our data sources and definitions are summarized in Table A2.

Empirical investigation of private saving is further complicated by the fact that such saving is one part of an accounting identity being regressed on other parts of the same identity (public and external saving). Clearly, any source of error in measuring either external saving or public saving will induce an equal and opposite error in the residually measured value of private saving, potentially introducing some degree of spurious negative correlation between private saving and each of these two variables.

Private saving can also be difficult to correctly measure because of the impact of inflation on measured private and public saving. The erosion of the purchasing power of money provides a source of revenue for the government, reducing true private saving (Annex 1). While this has been less of a problem for Mexico recently, it could compromise the pre-1990 data.

### IV. CROSS-COUNTRY EVIDENCE

Cross-country comparisons of private saving and its usual determinants suggest that Mexico does not stand out as an atypical case (Figure 3).<sup>6</sup> In these bivariate relationships Mexico is very close to the linear regression line, while there are larger divergences for most other Latin American countries. We note, however, that for Mexico the values of three of the explanatory variables differ from the typical country—Mexico’s average current account deficit and its dependency ratio have been comparatively high and its private credit-to-GDP ratio has been comparatively low. However, this bivariate analysis may hide more complex relationships, and these charts do not give an indication of the relative importance of individual variables in determining private saving.

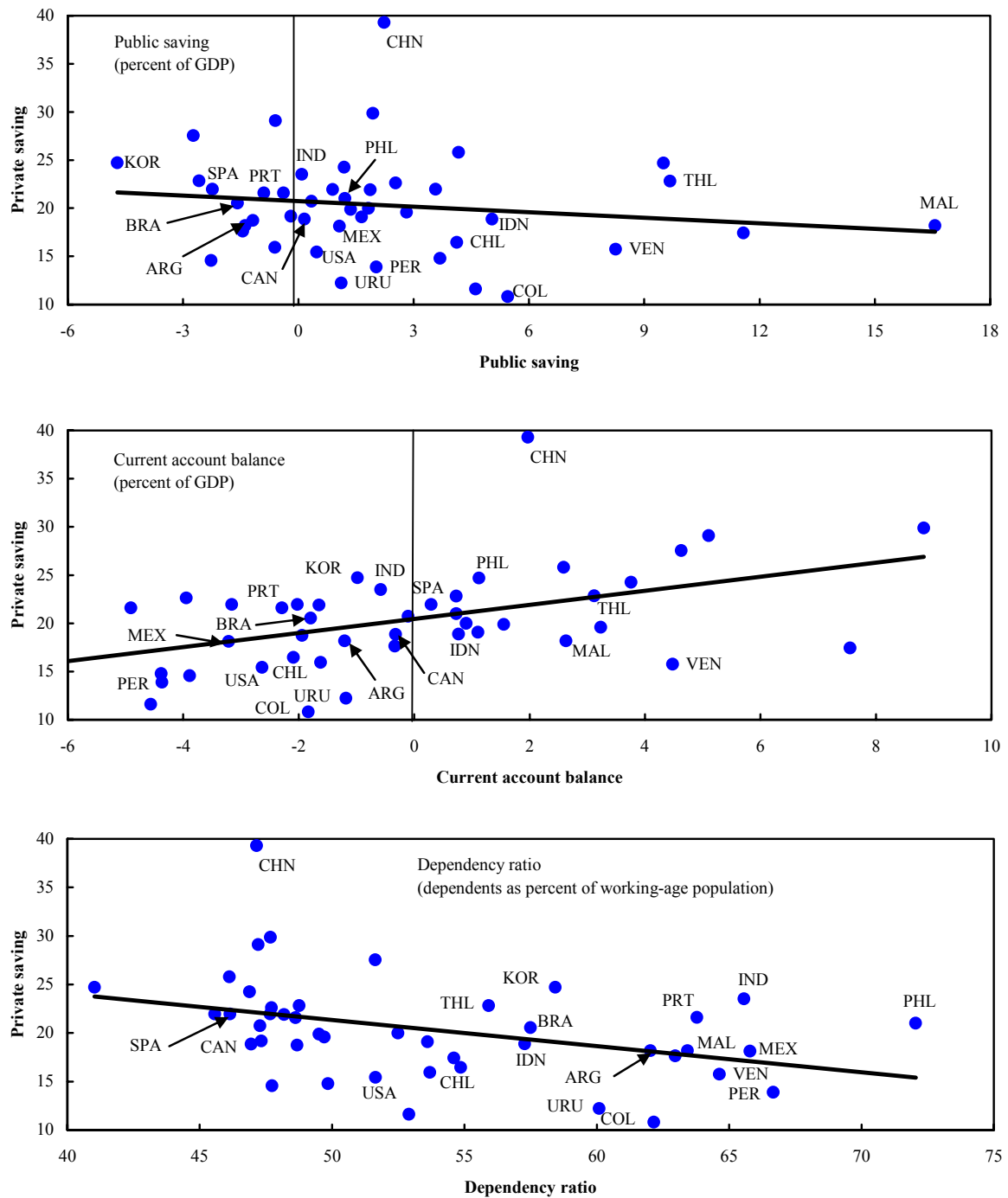
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<sup>4</sup> The coverage of fiscal data in Latin American countries tends to include public enterprises, a practice uncommon in other regions. To the extent that public saving in the national accounts is defined using fiscal data, this measurement difference could account for some of the negative correlation between public and private saving that we find in cross-section data; however, it would not contaminate the analogous correlation we find in the time-series data for Mexico.

<sup>5</sup> Gross investment could also be prone to substantial measurement error owing to difficulties in measuring inventories. For example, the Bank of Mexico observed discrepancies between the historical estimates of gross fixed capital formation in nominal and real terms as large as 3 percentage points of GDP. We are indebted to Jesús Cervantes for this observation.

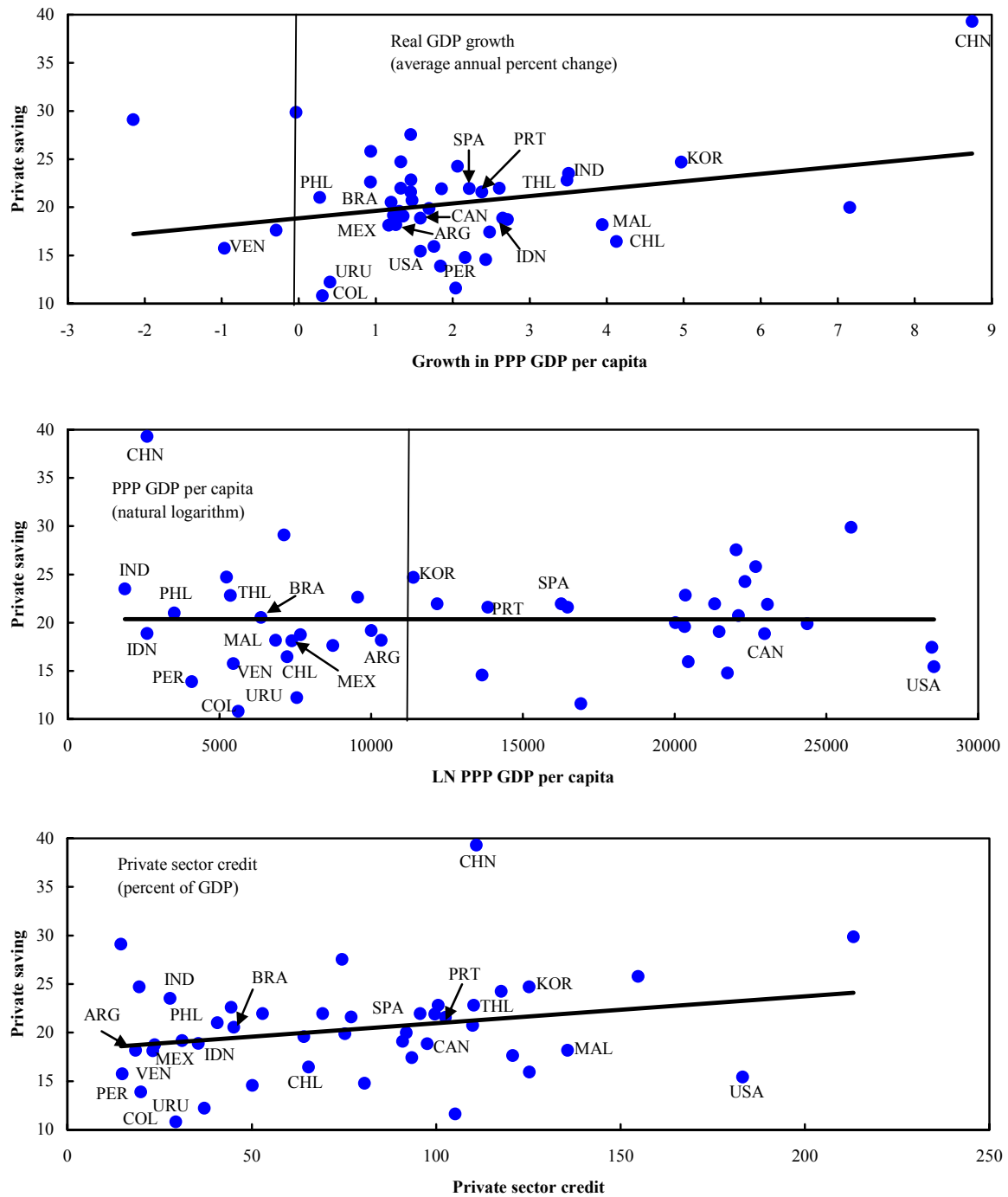
<sup>6</sup> Figure 3 is based on period averages (1991–2004). These bivariate relationships do not change materially when we split the sample into the shorter periods used in our cross-country regressions.

Figure 3. Private Saving and Explanatory Variables, Average 1991–2004



Sources: IMF, *World Economic Outlook*; UN, *World Population Prospects* database; Haver Analytics; and IMF staff calculations.

Figure 3. Private Saving and Explanatory Variables, Average 1991–2004 (Concluded)



Sources: IMF, *World Economic Outlook*; IMF, *International Financial Statistics*; World Bank, *World Development Indicators*; and IMF staff calculations.

### A. Cross-Section Regression Results

A more systematic analysis of the cross-country determinants of private saving was performed using a sample of 44 countries (see table A1) and a set of conventionally used variables. In this framework, private saving was found to be positively related to real GDP growth and the level of private sector credit. In contrast, private saving was found to be negatively related to public saving, external saving, the level of development (GDP per capita in purchasing power parity terms), and the dependency ratio.<sup>7</sup>

Table 2. Selected Countries: Cross-Section Results for Private Saving <sup>1/</sup>  
(Dependent variable: Private saving as a percent of GDP, t-statistics in parentheses)

Explanatory Variables	1991–1999				2000–2004			
	Full sample		Industrial countries		Full sample		Industrial countries	
Public saving 2/	-0.38*** (3.20)	-0.51*** (3.80)	-0.27** (2.11)	-0.39** (2.63)	-0.95*** (7.59)	-0.99*** (7.24)	-0.87*** (7.49)	-0.65*** (3.24)
External saving 2/	-1.06*** (4.91)	-0.97*** (4.56)	-1.16*** (4.98)	-1.10*** (5.68)	-0.91*** (6.34)	-0.83*** (6.88)	-0.88*** (5.65)	-0.85*** (6.71)
Real GDP growth 3/	0.10 (0.56)	0.70 (0.52)	0.14 (0.70)	-0.07 (0.49)	0.60* (1.94)	0.45* (1.88)	0.60 (1.79)	0.11 (0.36)
GDP per capita 3/	-0.48*** (4.16)	-0.34*** (2.77)	-0.37*** (3.28)	-0.278 (0.89)	-0.23*** (2.03)	-0.10 (1.26)	-0.16* (1.97)	-0.15 (0.95)
Private sector credit 2/	0.04*** (2.65)	0.03 (1.53)		0.03** (2.12)	0.03 (1.30)	0.01 (1.12)		0.01 (0.80)
Dependency ratio 4/	-0.26*** (2.75)	-0.30*** (3.82)	-0.26*** (2.80)	-0.41*** (2.96)	-0.29*** (2.83)	-0.31*** (3.25)	-0.27*** (2.68)	-0.63*** (3.27)
Latin American dummy 5/	-3.05* (1.88)		-3.99** (2.53)		-0.37 (0.19)		-1.32 (0.78)	
Asia dummy 6/		4.04** (2.04)				4.08** (2.04)		
Adjusted R <sup>2</sup>	0.63	0.64	0.59	0.65	0.62	0.68	0.60	0.73
F(6,34)	11.4***	11.9***	11.4***	7.3***	11.1***	13.9***	11.7***	10.2***
Log-likelihood	-111.5	-110.9	-114.1	-47.6	-110.6	-107.0	-112.5	-41.6
ARCH Test (F)	1.17	0.79	0.97	0.46	0.01	0.02	0.02	0.76
Durbin-Watson	1.94	1.90	1.91	1.55	2.53	2.45	2.63	2.23
Number of observations	44	44	44	21	44	44	44	21

1/ All variables are averages for 1991-1999 and 2000-2004, respectively. Estimation is by OLS, with robust standard errors adjusted for heteroskedasticity. Statistical significance at the 10, 5, and 1 percent levels is denoted by \*, \*\*, and \*\*\*, respectively.

2/ In percent of GDP.

3/ In thousand of constant U.S. dollars, purchasing power parity (PPP).

4/ Dependents to working-age population, in percent.

5/ Dummy equal to 1 if the country is in Latin America, 0 otherwise.

6/ Dummy equal to 1 if the country is in Asia, 0 otherwise.

<sup>7</sup> This is our preferred specification—regressing national saving on the same set of variables, excluding public saving, does not change the results.

The regressions are estimated by ordinary least squares (OLS), with heteroskedasticity-consistent standard errors, and the ratio of private saving to GDP as the dependent variable.<sup>8</sup> Results are reported for 1991–1999 and for the post-Asian/Russian crisis period of 2000–2004 (Table 2). All variables are period averages for the period under consideration. To assess the robustness of our results, we estimated regressions for the whole sample and for industrial countries only.

The results for 1991–1999 are in line with earlier findings (Edwards, 1996; Masson and others, 1998; Loayza and others, 2000; International Monetary Fund, 2005), but the 2000–2004 results differ from the earlier period in three respects. First, the offset ratio between public and private saving increased from the usual 40–60 percent to more than 90 percent. Second, the impact of demographics has become more pronounced in the group of industrial countries, but not in the full sample. Finally, while Latin American countries previously saved on average less than predicted by the model, in 2000–04 they saved essentially as predicted by the model. East Asian countries continue to save more than predicted by the model. Overall, the regression estimates reported in Table 2 are statistically significant, and the regressions are able to explain between two-thirds and three-fourths of the cross-country variance of the private saving rate. The other summary statistics are also broadly satisfactory.

These results are in line with the usual economic assumptions and previous research:<sup>9</sup>

- First, we observe that an improvement in public saving by 1 percentage point of GDP was offset by a decline in private saving by about 0.4–0.5 percentage point of GDP during 1991–1999 in both the full and industrial country samples. However, this estimate increased to -0.9 percentage point of GDP during 2000–2004 for the full sample and to -0.7 percentage point of GDP in the sample of industrial countries. Thus, while for the initial period we find the usual outcome of higher public saving being associated with higher total national saving, in the later period we find that private agents offset most of the increase in public saving with lower private saving, keeping national saving unchanged (so-called Ricardian equivalence).
- Second, we also detected a negative, approximately one-to-one relationship between private and external saving in both periods (Edwards, 1996, and Masson and others, 1998 found negative coefficients close to minus one, but smaller in absolute value).<sup>10</sup>

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<sup>8</sup> Given the possibility of simultaneity bias and measurement errors in the key variables discussed earlier, we also re-estimated the equation using two-stage least squares (IV). The instruments included the trade balance, terms of trade, and logs of the dependent variables. The thrust of the IV regressions was not different from the OLS regressions.

<sup>9</sup> We failed—as have other authors—to detect any robust impact of real interest rates on private saving. See Table A2 for a summary of the statistical significance of all the regression variables analyzed in this study.

- Third, private saving was found to be positively correlated with the rate of growth of real GDP. However, this variable was statistically insignificant in most regressions.
- Fourth, richer countries tend to save less, presumably because their capital stock is large enough or their economies are stable enough, or both, to deliver the desired consumption path. Other things being equal, an additional US\$1,000 of per capita GDP was associated with a loss of private saving equivalent to 0.2 to 0.4 percentage points of GDP.
- Fifth, financial depth, as measured by bank credit to the private sector as a percentage of GDP, was associated with only slightly higher private saving—an increase of 10 percentage points in credit to GDP was related to a rise in private saving by about 0.3 percentage points of GDP. Furthermore, the magnitude of the impact diminished in 2000–2004. These findings could reflect what Schmidt-Hebbel and Servén (2002) called the “ambiguous impact of financial liberalization on private saving.”<sup>11</sup>
- Sixth, a higher dependency ratio places a significant drag on private savings (the so-called life cycle hypothesis): an increase in the dependency ratio by 1 percentage point is related to a reduction in private saving by about 0.3 percentage points of GDP. This effect is larger, and seems to be increasing, in industrial countries.
- Finally, and similarly to Edwards (1996), we find that Latin American countries save less than predicted by the model (we employed a dummy variable equal to 1 for countries located in Latin America and 0 otherwise). But while the difference was large—between 3 and 4 percentage points of GDP—and statistically significant in 1991-1999, it was much smaller and statistically insignificant in 2000-2004.

What may explain the apparent strengthening of the private-to-public saving offset? While globalization of financial markets has weakened the link between government and national saving, it would be premature to conclude that fiscal policy has no impact on national saving. It is possible that the finding for recent years is a temporary anomaly that will reverse itself eventually. One hypothesis is that a combination of easy global liquidity conditions and excess saving in a few countries during 2000–2004 could have led to a glut in global saving that depressed private saving in the rest of the world, while public saving increased as a result of global growth conditions (Bernanke, 2005, JP Morgan, 2005, International Monetary Fund, 2005). These issues are beyond the scope of this study.

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<sup>10</sup> In saving regressions, external saving variables have been conventionally used as explanatory variables. Whether it is private saving or external saving that adjusts to other variables is a matter of modeling choice to the extent that both variables are determined simultaneously.

<sup>11</sup> Caprio and others (1999) employ a more complex measure of financial reforms and find that the impact of financial liberalization is inconsistent across countries; for Mexico, they find a statistically significant negative impact.

Table 3. The Relative Contribution to Private Saving of Explanatory Variables 1/  
(In percentage points of GDP, two standard errors in parentheses)

	1991–1999	2000–2004
Public saving	-1.7 (1.1)	-4.3 (1.1)
External saving	-2.9 (1.2)	-4.7 (1.5)
Real GDP growth	0.5 (1.6)	1.6 (1.6)
GDP per capita	-3.7 (1.8)	-2.1 (2.0)
Private sector credit	1.6 (1.2)	1.3 (2.0)
Dependency ratio	-2.1 (1.5)	-1.9 (1.3)

1/ Product of the standard deviation of each variable and its respective full-sample regression coefficient from Table 2.

How much of the variance in the private saving variable is accounted for by the individual explanatory variables? We calculate the product of the standard deviations of each variable and its individual, full-sample coefficient from Table 2 (Table 3). The interpretation of these results is straightforward: for example, if a country has a public saving ratio one standard deviation above the cross-country mean in 2000–2004, the model projects that its private saving ratio would be  $4\frac{1}{4}$  percentage points of GDP lower than the cross-country mean. Quantitatively, fluctuations in public and external saving, the level of development and the dependency ratio seem to be the most potent sources of variation in private saving.

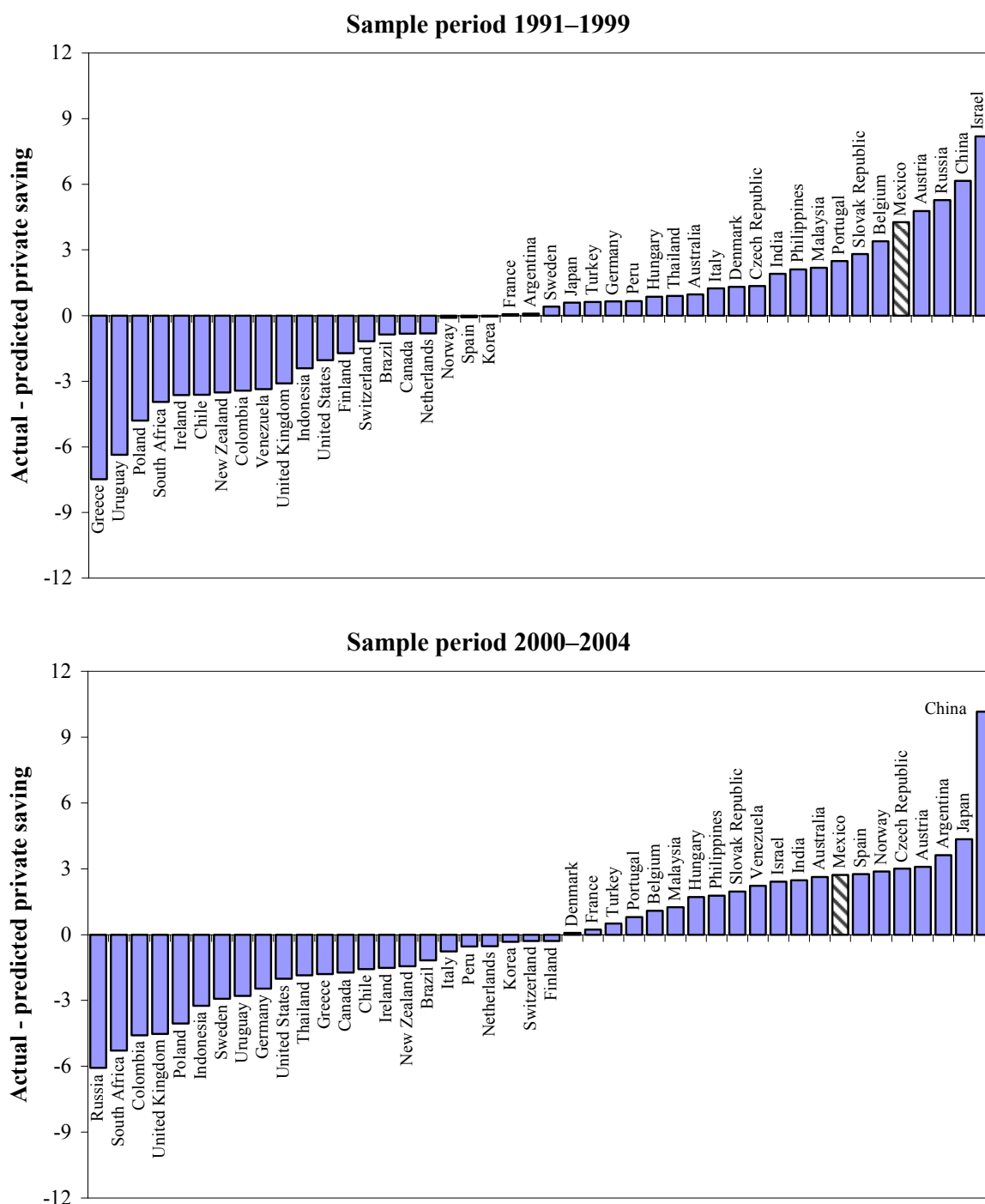
#### *B. Mexico's private saving in a cross-country context*

Mexico has been saving somewhat more than predicted by the cross-section model, while saving elsewhere in the region has typically been lower than predicted by the model, which is apparent from the estimated residuals from the two cross-section regressions (Figure 4 and Table 4). While the eight Latin American countries as a group on average saved less than predicted, by  $2\frac{1}{2}$  percentage points of GDP and  $\frac{3}{4}$  percentage point of GDP during 1991–1999 and 2000–2004, respectively, Mexico was saving more than predicted. The positive residuals for Mexico were  $4\frac{1}{4}$  percentage points of GDP and  $2\frac{3}{4}$  percentage points of GDP for these two periods, respectively.<sup>12</sup>

Still, Mexico's private saving rate (18.4 percent of GDP on average during 2000–2004) was lower than the sample mean by 1.8 percentage points of GDP. The main drags were Mexico's higher level of external saving (larger current account deficits compared to the sample mean), lower ratio of private sector credit to GDP, higher dependency ratio, and low growth (Figure 5). In contrast, lower-than-average public saving and comparatively low GDP per capita boosted the estimated level of private saving.

<sup>12</sup> Of course, the decline between the two periods does not necessarily imply that Mexico has started to save less—it indicates only that Mexico's positive residual relative to the rest of the sample declined in 2000–2004.

Figure 4. Actual Minus Predicted Private Saving Rates 1/  
(In percent of GDP)



Source: IMF staff calculations.

1/ Residuals from regressions of private saving on public and external saving, real growth, the level of development, private sector credit, and the dependency ratio. No regional dummies.



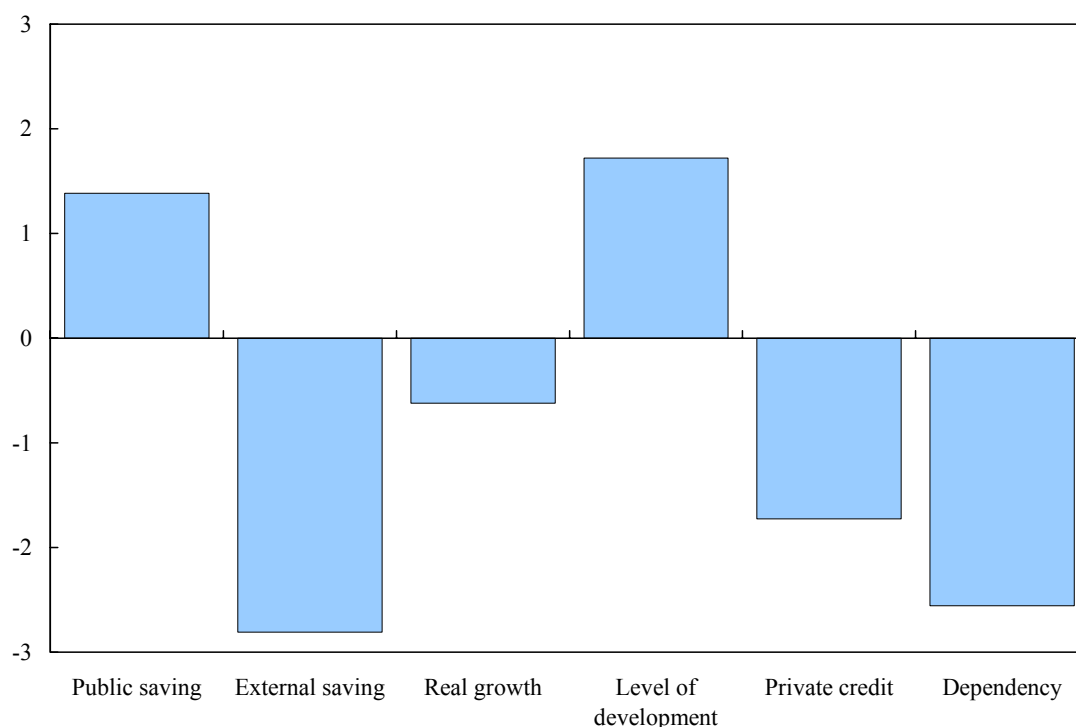
Table 4. Mexico and Other Countries: Saving More or Less than Predicted?  
(In percent of GDP)

Country 1/	1991–1999				2000–2004			
	Residuals	Private saving	External saving	Fixed investment	Residuals	Private saving	External saving	Fixed investment
Argentina	0.1	15.4	3.2	18.0	3.6	23.1	-2.3	15.3
Brazil	-0.9	19.9	2.0	19.4	-1.2	21.7	1.5	18.7
Chile	-3.6	16.0	2.8	24.6	-1.6	17.4	0.7	21.0
Colombia	-3.4	12.2	2.3	18.7	-4.6	8.3	0.9	13.4
<b>Mexico</b>	<b>4.3</b>	<b>18.0</b>	<b>3.8</b>	<b>19.1</b>	<b>2.7</b>	<b>18.4</b>	<b>2.2</b>	<b>19.9</b>
Peru	0.7	12.9	5.8	20.9	-0.5	15.7	1.8	18.5
Uruguay	-6.4	13.2	1.4	14.3	-2.8	10.4	0.8	11.2
Venezuela, Rep. Bol.	-3.4	13.4	-1.7	19.8	2.2	20.0	-9.4	16.7
Latin America excl. Mexico	-2.4	14.7	2.3	19.4	-0.7	16.7	-0.9	16.4
East Asia (incl. Japan)	1.4	23.9	0.4	29.7	1.8	24.9	-4.1	25.3
Transition Countries	1.1	22.3	2.0	23.9	-0.7	22.3	2.0	22.9
Industrial (excl. Japan)	-0.5	20.6	-0.3	20.4	-0.3	18.9	-0.7	20.9
Full sample	0.0	20.4	0.7	22.4	0.0	20.2	-0.8	20.9

Source: Estimated residuals from a regression that excludes regional dummies.

1/ Regional totals are unweighted averages.

Figure 5. What Factors Are Influencing Mexico's Private Saving? 1/  
(Contribution of explanatory variables to private saving rate, in percent of GDP)



1/ Products of the point estimates of the coefficients and the differences between Mexico's explanatory variables and the sample means of those variables.

Source: IMF staff calculations.

## V. TIME-SERIES EVIDENCE FOR MEXICO

The cross-country results provide a point of departure for time-series analysis. We note, however, that several factors make it difficult to draw firm conclusions from the time-series evidence. First, during the period under consideration Mexico underwent significant financial sector reforms (Bank of Mexico, 2002). Second, historical data are available for only a short period and are dominated by the impact of the 1982 and 1994 financial crises. Third, measurement errors are more likely to be problematic in a time-series analysis. Finally, we suspect that some of the apparent relationships in the Mexican data—the offset between private and public saving, in particular—may result from external saving and investment being constrained over time, effectively collapsing the saving-investment relationship into the private-public saving identity discussed earlier.

### A. Cointegration

We estimated a dynamic model with annual data for the period 1980–2004 and found that almost all the relationships observed for the cross-section, time-averaged sample of developed and emerging countries also hold for Mexico in time-series regressions. Specifically, we found a long-term, cointegrating relationship among private, public, and external saving, and the old-age dependency ratio, while public and external saving, and real income were also a part of the short-term dynamics.

We built the model according to the general-to-specific procedure. First, we observed that the variables in question appear to be nonstationary, but that first-differencing them produces stationary series. Second, we tested for the presence of cointegrating vectors in first-order vector autoregressions (VARs) using the Johansen-Juselius procedure.

As in the cross-section regressions, we observed strong offsets between private and public saving, and between private and external saving, and a negative impact of aging on private saving. In addition, the analysis of adjustment coefficients suggested that the variables used in the cointegrating vector are weakly exogenous and, hence, that we can proceed toward an error-correction model. We are aware, however, that the saving process is likely to involve many endogenous, mutually dependent economic and political processes, and that the time-series analysis is highly stylized.

### B. An Error-Correction Model

In the next step we simplified the system of equations (VAR) into a parsimonious error-correction model (ECM) estimated by nonlinear OLS (Table 5):

$$\Delta y_t = c + \sum_{i,j=0}^{k,m} \alpha_i \Delta x_{t-j} + \gamma \left( y_{t-1} - \sum_{i=0}^n \beta_i x_{t-1} \right) + u_t,$$

where  $\alpha$ s,  $\beta$ s, and  $\gamma$  stand for the short-term dynamics, long-term dynamics, and error-correction coefficients, respectively. We denote first differences with  $\Delta$  and regression

residuals with  $u_t$ . We estimated this equation with both officially reported and inflation-adjusted private and public saving. The results are not materially different.

Table 5. Mexico: Error-Correction Model of Private Saving, 1980–2004 1/  
(Dependent variable = Private saving in percent of GDP, t-statistics in parentheses)

	Model I (Official definition of saving)	Model II (Saving adjusted for the money- based inflation tax)
Public saving,	-1.074 ***	-1.031 ***
1st difference 2/	(16.10)	(19.80)
External saving,	-1.379 ***	-1.367 ***
1st difference 2/	(17.41)	(13.65)
Real income,	3.463 ***	3.396 ***
1st difference 3/	(9.58)	(8.82)
Error correction term	-0.316 ***	-0.320 ***
	(6.20)	(5.28)
Public saving,	-0.851 ***	-0.944 ***
lagged one period 2/	(3.24)	(4.73)
External saving,	-1.556 ***	-1.509 ***
lagged one period 2/	(6.08)	(4.92)
Old-age dependency ratio,	-2.419 **	-2.654 *
lagged one period	(2.54)	(1.92)
Adjusted R-squared	0.95	0.96
Sum squared residuals	12.8	13.7
Log likelihood	-26.5	-27.3
Durbin-Watson stat	2.34	2.12
Number of observations	24	24

1/ Estimation is by nonlinear OLS, with robust standard errors (Newey-West). Statistical significance at the 1, 5, and 10 percent level is denoted by \*, \*\*, and \*\*\*, respectively.

2/ In percent of GDP.

3/ Real GDP per capita.

The estimated error correction coefficient implies that one-third of the deviation from the long-run equilibrium is corrected within one year. The estimated relationship is as follows:

- First, an increase in public saving by 1 percentage point corresponded to a long-run decrease in the level of private saving by about 0.9 percentage points of GDP. Statistically, the point estimate is not significantly different from 1. This is not a unique finding in Mexico's data: Burnside (1998) reported offset coefficients between 0.8 and 1.0 for the 1980–1995 period. Moreover, we find a strong reaction to short-term fluctuations in public saving.

- Second, the negative unitary relationship between external saving and private saving was similar to that found in the cross-section regressions.
- Third, the old-age dependency ratio enters with the expected negative sign: an increase in the ratio by 1 percentage point is associated with a reduction in private saving of about 2 ½ percentage points of GDP. Greater young-age dependency has a positive impact on private saving, but the effect is statistically insignificant (see Annex 2 for a more in-depth discussion of the dependency ratio in Mexico).<sup>13</sup>
- Fourth, we find strong evidence of the short-term income-to-saving relationship—an increase in annual real GDP per capita by US\$100 (measured on a PPP basis) corresponds to an increase in private saving of ⅓ of one percentage point of GDP. This result is comparable to the cross-sectional finding for the GDP growth rate variable (not the variable for the level of GDP).
- Finally, we ran specifications of the model including various measures of financial wealth—real stock prices, market capitalization, housing prices, household deposits, and financial system aggregates—and found that none had a statistically significant impact on private saving. From 2001 to 2004, stock prices increased by almost 90 percent and the M2-to-GDP ratio rose by almost 20 percent. While this continued financial deepening may or may not show up directly in private saving rates, it will likely have an indirect impact through the rate of GDP growth and level of income.

Overall, the regression estimates reported in Table 5 are highly statistically significant and explain about 95 percent of the variance of annual changes in the private saving rate.<sup>14</sup> Individually, all variables but the dependency ratio are statistically significant at the 1 percent significance level and robust to inclusion of additional variables. The models provide a good fit of changes in private saving (Figure 6). We also checked the stability of individual parameters in recursive regressions, confirming the stability of our dynamic model. Figure 7 plots the recursive coefficients of public and external saving.

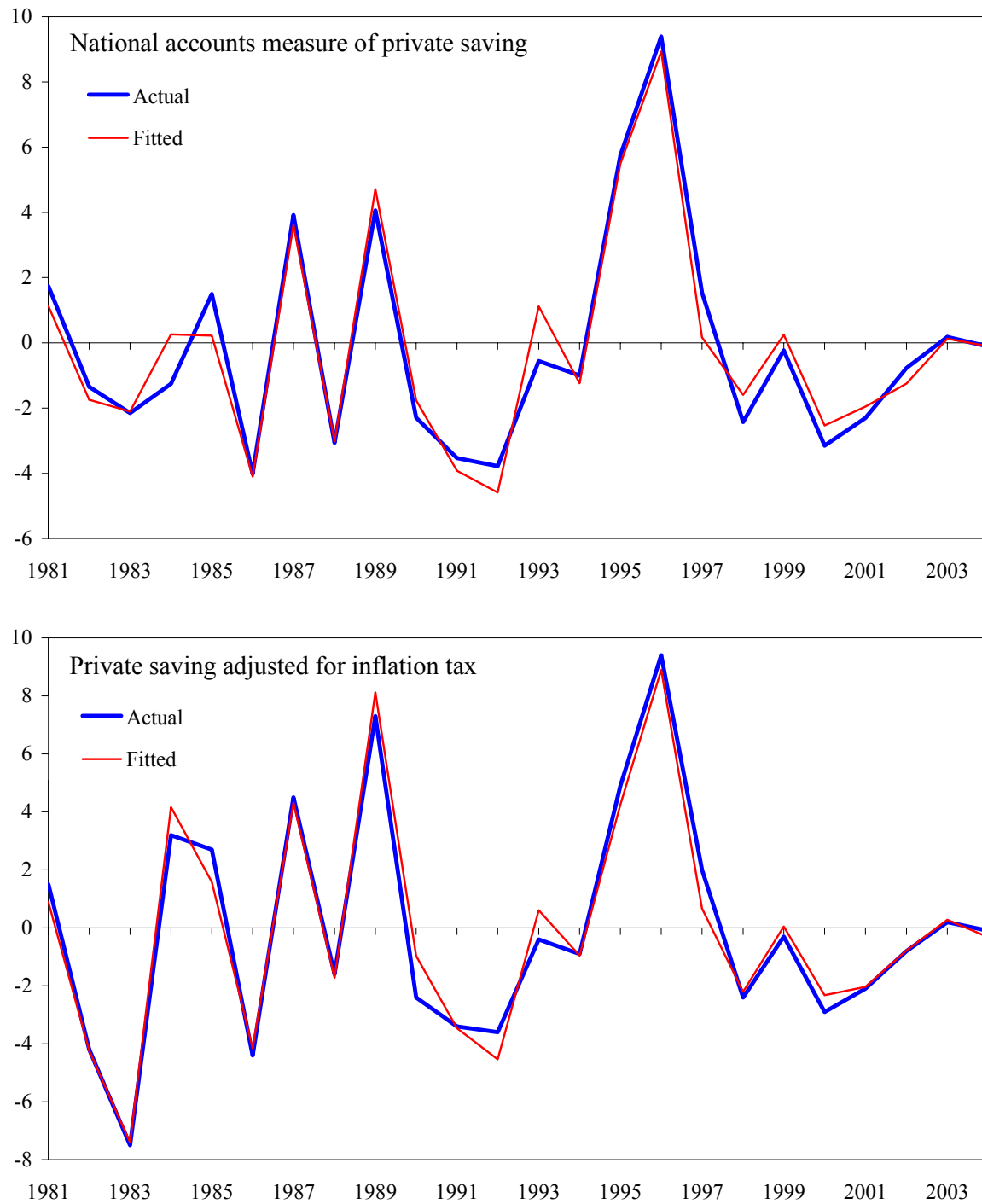
## VI. MEXICO'S SAVING: WHICH WAY DOES THE CAUSALITY GO?

The almost too-good-to-be-true overall fit and high public-to-private saving offset obtained in the above dynamic model beg the question of what factor is driving these results. One possibility is that, if both investment and external saving were targeted by agents in the economy, the parameter on the public saving variable would be biased toward negative one. Similarly, changes in oil prices affect public saving through their impact on government

<sup>13</sup> Here, the old-age dependency ratio and young-age dependency ratios are examined separately, while in the cross-country analysis, the overall dependency ratio was used.

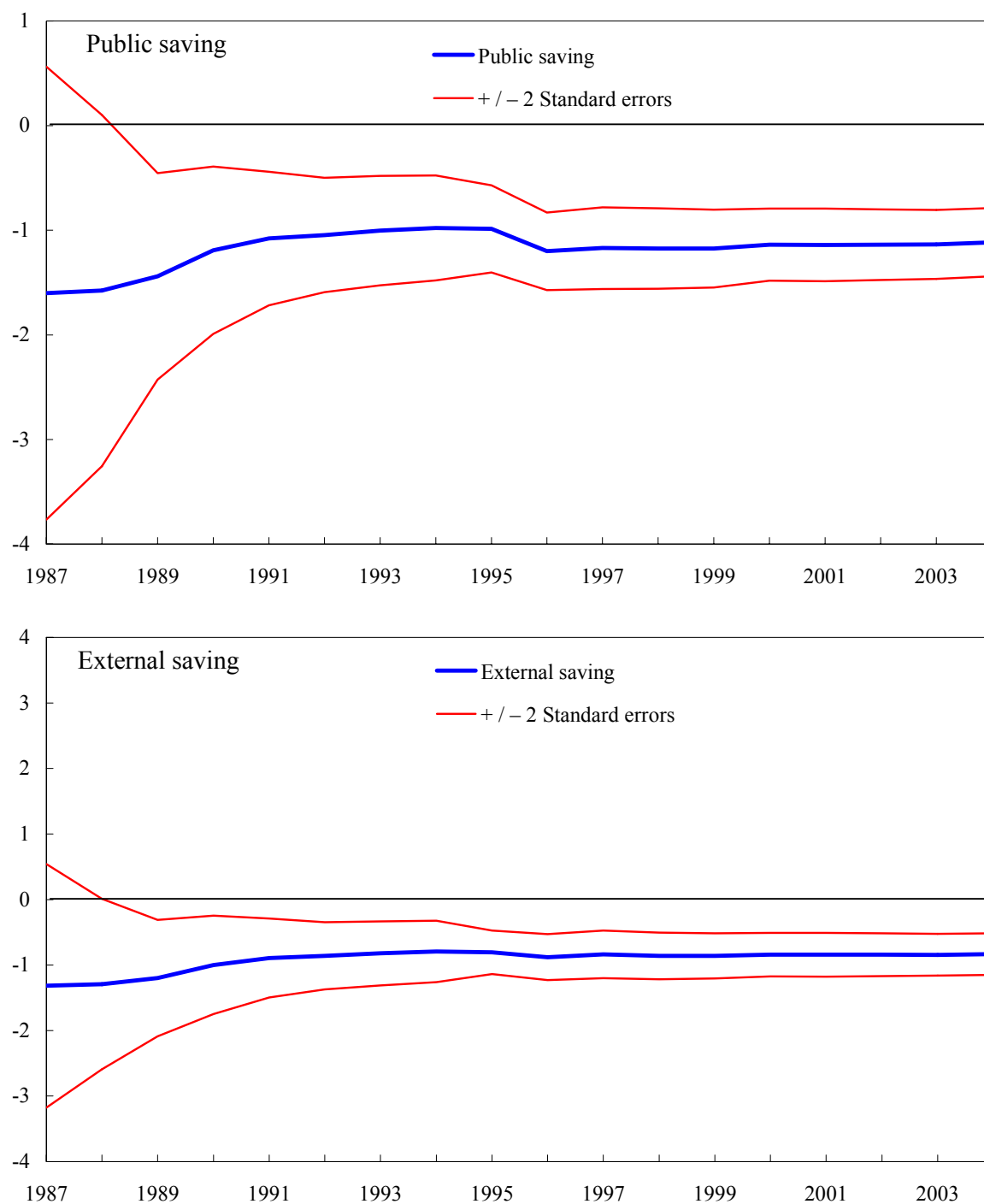
<sup>14</sup> Experiments with either intercept or slope dummies to capture any impact of the two crisis periods yielded statistically insignificant results.

Figure 6. Mexico: Actual and Fitted Values of Private Saving, 1981–2004  
(First difference, in percent of GDP)



Source: IMF staff calculations.

Figure 7. Mexico: Recursive Coefficients of Public and External Saving 1/  
(Coefficient on independent variable with private saving as the dependent variable)



Source: IMF staff calculations.

1/ The sample begins at 1980 and the first recursive coefficient is calculated for 1987.

revenue and external saving via higher exports. If investment is stable, those coefficients are also biased toward negative one. Finally, the offset may reflect the occurrence of an “expansionary fiscal contraction” (see Giavazzi and Pagano, 1990). If agents perceived Mexico’s fiscal consolidation as an important reduction of macroeconomic risks, they may have raised consumption and reduced private saving in the face of an increase in public saving. An examination of the data suggest that both investment and external saving have been more stable in Mexico than in most other emerging market countries, lending support to the above arguments (Table 6 and Figure 2).

Table 6. Volatility of Key Variables, 1980–2004 1/  
(In percent)

	GDP	Investment	External saving	Private saving	Public saving	National saving
<b>Mexico</b>						
full sample	6	16	78	37	915	10
excluding crises	4	13	81	25	3496	9
Latin America excl. Mexico 2/	7	31	106	28	149	14
OECD excl. emerging mkts.	2	10	120	9	308	8
Emerging Asia	5	19	346	11	319	7
Emerging markets excl. Mexico	6	25	198	20	217	10

Source: IMF staff calculations.

1/ Standard deviation of the Hodrick-Prescott filtered series, in percent of the mean of the unfiltered series.

2/ Regions are unweighted averages of included countries.

- First, Mexico’s investment did not show as much evidence of cyclical fluctuations as the typical emerging market country. The standard deviation of cyclical fluctuations was comparable to industrial countries and was substantially lower than in other emerging market countries. Moreover, investment fluctuations were less strongly related to output fluctuations.
- Similarly, the variation of external saving in Mexico was lower than in other countries, especially those in Asia. External saving has been relatively stable outside the 1982 and 1995 crises—particularly since 1995.
- Finally, consistent with our hypotheses of offsetting movements in public and private saving, volatility of both private and public saving was found to be a multiple of that of other countries in our sample. Moreover, the negative correlation between those two variables in levels was uniquely high in Mexico.

A word of caution is warranted. Given the low volatility of investment and external saving, it appears that the saving-investment identity in Mexico has been balanced mainly through changes in the components of national saving. This could give rise to the unusually high offsets between private and public saving, as well as between private and external saving,

found in the data. Therefore, it may be misleading to draw policy implications solely from these relationships.

Evidence on the business environment, however, also supports the idea that the causality runs from investment to saving. In surveys of investment attractiveness, Mexico scores below the level of Central European or Southeast Asian countries, and the OECD (2005) enumerates obstacles to setting up and running a business and obtaining credit. The perception of the business environment by foreign investors may also be reflected in Mexico's comparatively low level of foreign direct investment: during 1995–2004, the FDI-to-GDP ratio of 2.9 percent of GDP was about one-half of that in the group of the new EU accession countries, lagging even behind the Latin American average.

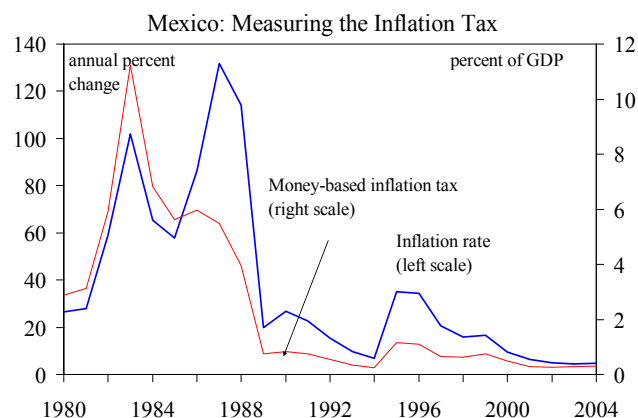
## **VII. CONCLUSIONS**

Despite Mexico's improved macroeconomic stability and financial sector reforms, private saving has not risen in recent years. This paper examines the factors determining the level of Mexico's private saving, updating and extending earlier research. We find that, while private saving in Mexico is not significantly out of line with fundamentals such as the level of financial development, incomes, GDP growth, and demographics, it is lower than the average country in the sample. The analysis suggests that Mexico's high reliance on external saving, a relatively high dependency ratio, and its less-developed financial system than the typical country in the sample are the main factors holding back private saving. The paper finds that movements in private saving have not been associated with similar shifts in investment, as changes in public saving and external saving have tended to offset movements in private saving. This is consistent with an investment-to-saving causality. In this setting, higher desired investment provides the most direct incentive to raise private saving. Overall, our findings seem consistent with the hypothesis that for a sustained increase in private saving, Mexico needs to create an environment with more favorable business and investment opportunities.

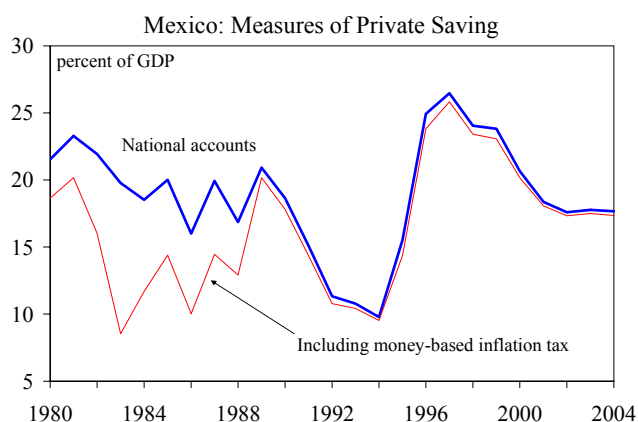


## Annex 1. Private Saving and the Inflation Tax

When inflation is high, the breakdown of national saving as measured by the national accounts overstates private saving and understates public saving (Hamann, 1993). Because money is a non-interest-bearing asset, inflation causes a direct loss of its purchasing power. Since no interest payment is made to compensate the private sector for its money holdings, this loss of purchasing power acts as a tax. The money stock is a government liability, and inflation reduces the value of this liability over time, with no offsetting interest payment being made. Therefore, the inflating away of the value of the money stock also represents an implicit source of revenue for the government. Because private saving equals income minus consumption, adjusting private sector income for the inflation tax reduces the true level of private saving. Similarly, adding the inflation tax to government revenue raises the true level of public saving. The money-based inflation tax,  $\tau^M$ , can be written (in percent of GDP) as:  $\tau_t^M = \pi_t * M_{t-1} / Y_t$ , where  $\pi$  is the inflation rate,  $M_{t-1}$  is the supply of currency in circulation and other nonremunerated central bank liabilities at the end of the previous year, and  $Y$  is GDP.



The difference between measured private saving and an adjusted measure accounting for the impact of the inflation tax varies considerably over time. The inflation tax was more than 5 percent of GDP through much of the 1980s, resulting from a largely unanticipated acceleration in inflation. However, as expectations of inflation adjusted, currency holdings as a share of GDP declined, causing a reduction in the inflation tax despite inflation remaining high through the early 1990s. Adjusting the level of private saving for the inflation tax shows a significantly lower private savings rate in the 1980s. Despite the large differences, the estimations of the determinants of Mexico's private saving are robust to whichever of the two measures are used (Figure 6).



## Annex 2. The Impact of Mexico's Demographics on Private Saving

The Mexican population is on average much younger than its counterparts in other countries. At present, only about 5 percent of the current population is 65 years or older, compared to 15 percent in advanced economies. However, it is projected to age more rapidly than in other countries in coming decades. Around 2020, the percentage of the population comprised of elderly people will quickly increase, closing the gap with other emerging markets in the 2040s. By 2050, 21 percent of the population is projected to be over the age of 65.

Population Aging, 1990 - 2050				
Country/Region 1/	Percent of Population 65 years old or more			Change 2005 to 2050
	1990	2005	2050	
Mexico	3.9	5.3	21.1	15.8
Latin America excl. Mexico	6.1	7.6	18.8	11.3
Emerging Markets excl. Mexico	6.7	8.3	20.5	12.1
Advanced 2/	13.4	15.5	27.6	12.2
All Countries excl. Mexico	10.1	12.0	24.1	12.1

Sources: U.N.'s *World Population Prospects*; and Haver Analytics.

1/ Figures for regions are unweighted averages.

2/ Includes Korea.

This trend toward an aging population would argue for raising the current rate of private saving in order to create a sufficient nest egg for tomorrow's pensioners. A pension system relying on individual accounts was set up in the 1990s to encourage today's workers to increase their savings for retirement. However, Espinosa-Vega and Sinha (2000) emphasize that the pension funds mainly held government debt issued to cover payments to current pensioners, as the stream of contributions from current workers was diverted from the government system to the privately managed personal accounts. Thus, the reform initially consisted of a transition from one type of pay-as-you-go system to another, as the destination of workers' contributions changed from the government pension plan to private accounts. However, over time the pension funds have been reducing the share of government debt in their portfolios. Meanwhile, the government has been retiring that debt by narrowing its fiscal deficit, instead of shifting the debt to other holders. Thus, the eventual result will be to raise national saving, but the full impact will only be felt over a period of many years.

The impact of the aging of the population on private saving should also be partly offset by a reduction in birth rates. This will cause the youth dependency ratio to fall, and the overall ratio of dependents to working people is not expected to change significantly in coming decades. Therefore, the pressures on the need for the working-age population to provide savings for demographic reasons will largely offset each other.

Dependency Ratios, 1990 - 2050				
Country/Region 1/	Dependents as percent of working age population			Change 2005 to 2050
	1990	2005	2050	
Mexico	75.9	57.0	60.9	3.8
Latin America excl. Mexico	65.7	56.0	57.8	1.9
Emerging Markets excl. Mexico	62.5	51.9	60.7	8.8
Advanced 2/	49.7	49.0	75.3	26.3
All Countries excl. Mexico	55.9	50.4	68.2	17.7

Sources: U.N.'s *World Population Prospects*; and Haver Analytics.

1/ Figures for regions are unweighted averages.

2/ Includes Korea.

Table A1. Countries Included in Cross-Section Analysis

Argentina	Hungary	Poland
Australia	India	Portugal
Austria	Indonesia	Russia
Belgium	Ireland	Slovak Republic
Brazil	Israel	South Africa
Canada	Italy	Spain
Chile	Japan	Sweden
China	Korea	Switzerland
Colombia	Malaysia	Thailand
Czech Republic	Mexico	Turkey
Denmark	Netherlands	United Kingdom
Finland	New Zealand	United States
France	Norway	Uruguay
Germany	Peru	Venezuela
Greece	Philippines	

Table A2. Variables Used in the Regressions

Series	Source	Cross-section regressions	Time-series regressions
<b>Private saving</b> (As a percentage of GDP)	<i>WEO</i>	Dependent variable	Dependent variable
<b>Public saving</b> (As a percentage of GDP)	<i>WEO</i>	Significant, point estimates close to minus unity	Significant, point estimates close to minus unity
<b>Social spending</b> (As a percentage of GDP)	<i>WEO</i>	Insignificant	Insignificant
<b>External saving</b> (Current account deficit as a percentage of GDP)	<i>WEO</i>	Significant, point estimates close to minus unity	Significant, point estimates between -1.3 and -1.5
<b>Dependency ratio</b> (Dependents as a percentage of working-age population)	<i>Haver</i>	Significant, points estimates between -0.3 and -0.6	Insignificant
<b>Old-age dependency ratio</b> (old-age dependents as a percentage of working-age population)	<i>Haver</i>	Not available for all countries	Significant, points estimates around -2.5
<b>Inflation</b> (annual percent change in CPI)	<i>WEO</i>	Insignificant	Insignificant
<b>Gross domestic product in purchasing power parity terms</b>	<i>WDI</i>	Marginally significant, point estimates between -0.1 and -0.5	Not applicable

Series	Source	Cross-section regressions	Time-series regressions
<b>Rate of economic growth</b> (Gross domestic product in purchasing power parity terms)	<i>WDI, OECD</i>	Marginally significant, point estimates between 0.1 and 0.6	Significant, point estimates around 3.4
<b>Urban population</b> (As a percentage of total population)	<i>WDI</i>	Insignificant	Insignificant
<b>Private sector credit</b> (As a percentage of GDP)	<i>IFS</i>	Marginally significant, point estimates between -0.2 and -0.5	Insignificant
<b>Broad money</b> (As a percentage of GDP)	<i>IFS</i>	Insignificant	Insignificant
<b>Real interest rate</b> (Deposit rate deflated by annual percent change in consumer prices)	<i>IFS</i>	Insignificant	Insignificant
<b>Real interest rate on private and government paper</b> (90-day CD and 3-month Cetes rate deflated by annual percent change in consumer prices)	<i>IFS, Haver</i>	Insignificant	Insignificant
<b>Income inequality</b> (Gini coefficient)	<i>WDI</i>	Insignificant	Insignificant
<b>Political risk</b>	<i>ICRG</i>	Insignificant	Insignificant
<b>Corruption</b>	<i>ICRG</i>	Insignificant	Insignificant
<b>Real stock prices</b> (deflated by CPI)	<i>Haver</i>	Not applicable	Insignificant
<b>Stock market capitalization</b> , (deflated by consumer price index)	<i>S&amp;P</i>	Not applicable	Insignificant
<b>Real housing prices</b> (deflated by CPI)	<i>Haver</i>	Not applicable	Insignificant
<b>Terms of trade</b>	<i>WEO</i>	Insignificant	Insignificant
<b>Net foreign assets</b> (Excluding foreign exchange reserves, as a percentage of GDP)	<i>L&amp;M-F</i>	Insignificant	Insignificant

The following abbreviations are used: *WEO* is IMF's *World Economic Outlook* database; *IFS* stands for the IMF's *International Financial Statistics* database; *WDI* is the World Bank's *World Development Indicators* database; *Haver* stands for the databases in Haver Analytics; *OECD* is the OECD's *National Accounts of OECD Countries: Volume I* database; *ICRG* is the *International Country Risk Guide*, *S&P* stands for the Standard and Poors' *Emerging Stock Markets Factbook*, various issues; *L&M-F* stands for Lane and Milesi-Ferretti (2006).

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