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MEXICO

Selected Issues

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Contents Page

I. THE GLOBAL CRISIS AND POTENTIAL GROWTH IN MEXICO[1]

A. Introduction and Summary

1. **Financial crises tend to lead to some permanent output loss by slowing not only actual but also potential growth.** The range of the estimated permanent effects is large—at the high end, Cerra and Saxena (2008) suggest 4 to 16 percent loss in medium-term potential output, while others estimate smaller losses, with Furceri and Mourougane (2009) suggesting some 1½ to 4 percent, and the European Commission (2009) 3 to 5 percent.

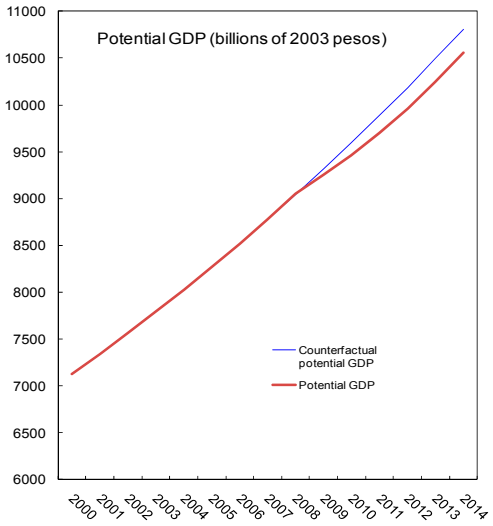
2. **Given the importance of distinguishing between shortfalls in output and a reduction in productive capacity, a well-considered view of the impact of the global financial crisis will be a key input to policy decisions over the coming years**. This paper uses two methodologies to assess to what extent the global crisis is likely to weigh on Mexico's growth potential.

- The first approach is sectoral, examining the historical relationship between financial stress and growth in manufacturing industries. Empirical results suggest that financial stress tends to act as a drag on growth, the more so the larger the sector's exposure to external (bank or market) financing. As persistently stressed conditions may reduce the likelihood that the associated output loss would be recouped over the medium term, the impact could show in lower actual as well as potential growth, particularly over the short term.

- The second approach uses a growth accounting framework to take a closer look at likely developments in the factors that drive potential growth. Slower capital accumulation due to higher funding costs and weaker confidence, combined with a dip in total factor productivity growth imply a sizeable drop in potential growth over the near term. Normalization in these factors following the crisis allows potential growth to recover gradually.

[1] Prepared by Kornélia Krajnyák.

3. **Both approaches suggest a short-term drop in potential growth of about ¾ to 1 percentage points, with gradual recovery to pre-crisis levels**. Comparing the implied potential output path with a counterfactual that assumes steady potential growth of about 3 percent (average growth in 2002–07) suggests a permanent output loss of about 2½ percent by 2014. Although this falls in the lower range suggested by the literature, it is significant, and highlights the importance of growth-enhancing reforms.



B. Financial Stress, Sectoral Growth, and Implications for Potential

4. **Disruptions to financial intermediation are expected to influence various economic sectors differently, depending among others on the sector's exposure and links to the financial system**. The direct impact of the crisis would be reflected in the performance of the financial intermediation and real estate (FIRE) sector. Other sectors would be indirectly affected: persistently tight financial conditions would slow investment and—as Estevão and Severo (2010) suggest—sectoral TFP growth through lower R&D and innovation, with the strength of the effect likely larger in sectors that use financial intermediation services more extensively.

5. **The direct impact on FIRE services may remain modest in Mexico**. Reflecting ongoing re-intermediation in the aftermath of the 1995 crisis, the FIRE sector's growth contribution averaged 0.8 percent in the 2004–07 period—higher than the 0.6 percent seen in the U.S. over the longer term or over the same period. However, the Mexican financial sector has experienced less stress and is looking ahead to less significant balance sheet adjustment than financial firms in the US. This suggests that the direct effects on the sector would be smaller and shorter-lived, probably close to or below the lower end of the 0.6 to 0.2 percent range suggested for the U.S. by Barrera *et al* (2009).

6. **In contrast, indirect effects are likely to be more significant**. For the US, Barrera *et al* (2009) estimate that the magnitude of indirect effects is about two-thirds of the direct effects. In Mexico, this ratio could be higher. Although Mexican firms are less exposed to market and bank financing, U.S. financial conditions exert a significant influence on economic activity in Mexico—in fact, the financial channel for spillovers appears to dominate the trade channel (Swiston and Bayoumi (2008)).

7. **To calibrate the indirect impact of the financial crisis, a closer look at sectoral growth and financial stress in the U.S. is warranted**. As a first step, a panel regression was estimated for the 1982–2007 period on annual data, linking growth in Mexico's manufacturing sectors to a measure of financial stress in the US:

$$dy_{it} = \beta_1 g_t^{US} + \beta_{2i} FSI_{t-2}^{US} + \beta_3 d95 + c_i + \varepsilon_{it}$$

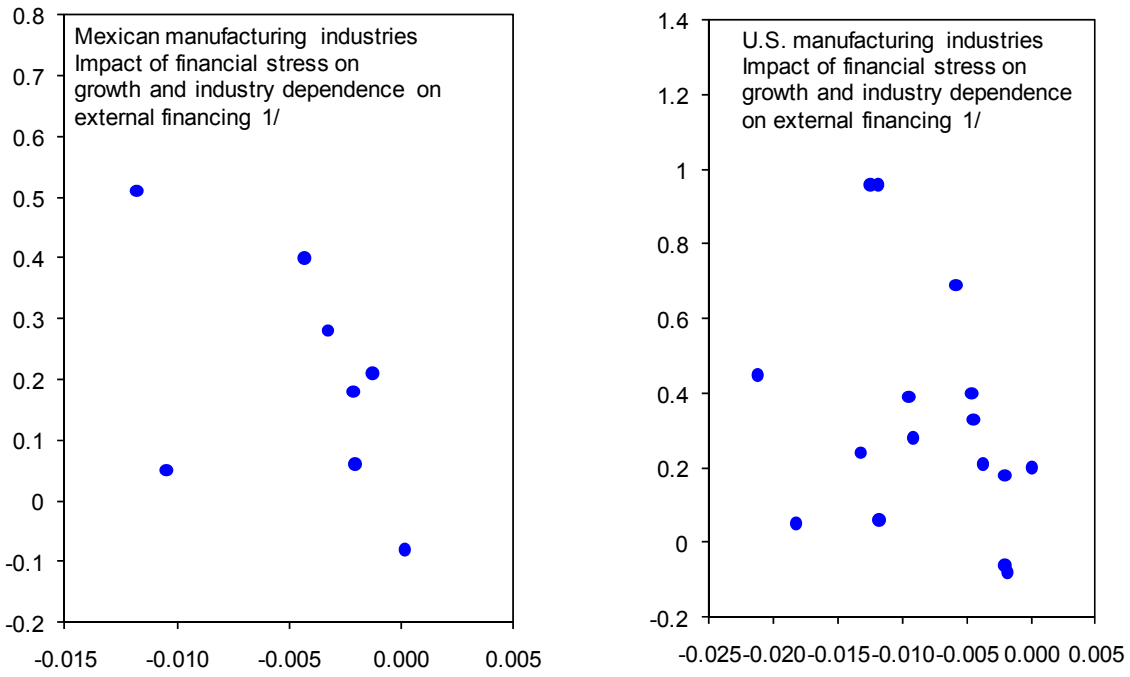
The dependent variable is log change in industrial production for 8 industries.[2] The explanatory variables include U.S. growth (g^{US}) measured in log changes; the Financial Stress Index for the U.S. (FSI^{US}); a dummy variable taking the value of one in 1995 and zero otherwise (*d95*); and industry constants (*c*).

8. **The Financial Stress Index (FSI) captures the extent to which the financial system is under stress and its ability to intermediate is impaired**. During periods of stress, there may be large shifts in asset prices, uncertainty, risk; reduced liquidity; and concerns about the banking sector. To capture these factors, Cardarelli *et al* (2009) and Balakrishnan *et al* (2009) constructed an index summarizing developments in security and exchange markets and in the banking sector. For advanced economies, the components of the index include (i) corporate bond spreads, stock market returns and stock return volatility (to capture the status of securities markets); (ii) exchange rate volatility (to capture the status of FX markets); and (iii) banking-sector stock price volatility, the interbank rate—treasury yield spread and the slope of the yield curve (to capture the status of the banking sector).[3] The index is normalized such that its long-term average is zero and its variance is one.

[2] One-digit manufacturing industries according to the old industry classification. "Other" industries were dropped from the sample.

[3] The construction of the FSI for emerging markets includes a somewhat different list of variables (banking sector beta, stock market returns and volatility, sovereign spreads, and an indicator capturing exchange rate and reserve developments). For Mexico, the index is available from 1997, and moves very closely with the U.S. FSI in the 1997–2007 period.

9. **Empirical results confirm that the strength of the effect of financial stress on growth shows significant dispersion across industries**. As the Figure illustrates, the estimated coefficients on FSI^{US} tend to be higher in sectors that are more exposed to external financing (as measured by the modified Rajan-Zingales (1998) index constructed by Estevão and Severo (2010)) both in Mexico and in the US.[4] The cluster of industries most affected by financial stress includes basic metals, fabricated metals, and machinery—industries with high reliance on external finance, and in the case of Mexico, strong ties to the US.



Source: Rajan, R. - Zingales, L, (1998), "Financial Development and Growth", American Economic Review, 88(3): 559-586, INEGI, Haver Analytics, and IMF staff estimates.

1/ The vertical axis depict the index of dependence on external financing. The horizontal axis represents the estimated sensitivity of industry growth to financial stress.

10. **To capture the idea that the effect of financial stress may vary with the sector's exposure to external finance, the relationship between sectoral growth and the interaction of FSI^{US} and the indicator of dependence on external finance was also examined**. Table 1 reports results from estimating the following equation:

$$dy_{it} = \gamma_1 g_t^{US} + \gamma_2 MRZ_i \cdot FSI_{t-2}^{US} + \beta_3 d95 + c_i + \varepsilon_{it}$$

[4] The U.S. sample includes a more detailed breakdown of manufacturing industries. Right-hand-side variables in the estimated equation are lagged GDP growth, lagged FSI, and industry constants.

where MRZ_i is the modified Rajan-Zingales index of the sectors' dependence on external finance, calculated as the fraction of capital expenditures not financed by cash-flow from operations.

Table 1. Financial Stress and Industry Growth Rate
Dependent Variable: Industry Growth Rate 1/

	Coeff	Std. err.	t-stat	Coeff	Std. err.	t-stat
Dependence on external financing * US FSI 2/	-0.016	0.01	-2.90	-0.013	0.01	-1.84
US growth	0.771	0.22	3.51	2.452	0.31	7.91
Fixed effects	y			y		
1995 dummy	y			n		
Estimation period	1982-2007			1998-2007		
Number of observations	208			88		
Adjusted R-squared	0.18			0.54		
F-statistic	5.46			12.53		

Sources: Rajan-Zingales (1998); Balakrishnan-Danninger-Tytell (2009), INEGI, Federal Reserve Board, Haver Analytics, and IMF staff calculations.
1/ OLS estimates. Growth for select manufacturing industries measured in log differences.
2/ Dependence on external financing is measured by the modified Rajan-Zingales index. Financial stress is measured by the Balakrishnan & al financial stress index for the US. The financial stress index is lagged 2 years.

11. **The magnitude of the estimated coefficient on the financial stress variable, taken together with the average dependence of Mexican manufacturing on external finance, suggests that a unit of financial stress tends to reduce manufacturing growth by about 0.4 percent**.[5] [6] The effect is economically significant: these estimates suggest that easy financing conditions added an annual ¾ percentage points to average manufacturing industry growth during 2003–07. Based on historical correlations, this would translate to an impact on GDP growth of about 0.4 percentage points.[7]

12. **With the caveat that the recently observed levels of financial stress are unprecedented in the sample, and simple extrapolation may be misleading, an estimate of the growth impact of the financial crisis can also be ventured**.

[5] Industry weights were calculated based on production weights for manufacturing industries as reported by INEGI in http://www.inegi.org.mx/prod_serv/contenidos/espanol/biblioteca/Default.asp?accion=2&upc=702825001785&s=est&c=15696.

[6] Indirect effects through U.S. growth may amplify the negative impact. The estimated coefficient for U.S. industries is virtually identical, but stronger dependence on external finance amplifies the average effect to 0.6 percent.

[7] GDP growth and manufacturing growth co-moved strongly over the last decade, with a linear regression coefficient around 0.6.

- The observed levels of financial stress in 2008–09 would imply a cumulative drag of about 2½ percent in 2009–10 on manufacturing growth, or a GDP growth effect of about 1½ percent.

- Assuming that stress levels for the next few years will moderate considerably but remain around levels observed in 1986–87, the aftermath of the Savings & Loans crisis in the US, manufacturing growth would be lower by about ¾ percentage point, and GDP growth by about 0.4 percentage point. The effect would peter out over the longer term as financial conditions normalize.

13. **How to translate these back-of-the-envelope calculations for the impact on actual growth to the impact on potential growth?** The first observation is that the effects on actual growth are likely to represent an upper bound; indeed, proper policy responses to crises may mitigate the drag on potential growth as they minimize or offset lasting effects on labor input and TFP. The second observation is that, given the likely persistence of financial stress, most of the associated output loss is nevertheless unlikely to be recouped over the next few years—that is, the hit to potential growth may be similar to the hit to actual growth.

14. **Putting these considerations together, the combined direct and indirect effects suggest that the financial crisis may have lowered potential growth in Mexico by about ¾ to 1 percentage point**. As the performance of financial intermediation recovers and stress lessens, so should the drag on capital stock building and TFP growth, allowing potential growth to accelerate. Applying these markdowns to the potential growth estimate of about 3 percent in the years before the crisis suggests a slowdown to the 2 to 2¼ percent range followed by a gradual recovery to pre-crisis levels.

C. What Factors of Production Drive the Projected Potential Growth Path?

15. **Potential growth projections can also be approached from a growth accounting perspective.** In As Barrera *et al* (2009) and Estevão and Tsounta (2010) assume for the case of the U.S. and Canada, potential output growth can be thought of as the sum of potential total factor productivity (TFP) growth, contribution from potential capital stock growth, and contribution from potential labor input growth. the Cobb-Douglas case with standard labor and capital share assumptions, the growth accounting exercise yields the following decomposition of potential output growth:

$$dy^p = da^p + 0.33 \cdot (dk + dutil^p) + 0.67 \cdot (dwp + dpart^p + d(1 - u^p))$$

16. **That is, potential growth (measured as log change in potential output) on the left hand side is decomposed into**:

- The contribution from potential (or trend) TFP growth da^p;

- The contribution from potential capital stock growth— that is, the capital contribution assuming that the actual capital stock is fully utilized (the capital utilization rate is at its trend level $util^p$);

- The contribution from potential labor input growth—that is, the labor contribution assuming that both the participation rate and the unemployment rate of the actual working-age population (*wp*) are at their trend level ($part^p$ and u^p, respectively).

17. **Taking a bottom-up approach, the respective paths for the underlying potential growth components (illustrated in the Figure) were constructed as follows**:

- Capital stock was estimated based on the perpetual inventory methodology, assuming annual amortization of 7½ percent. Looking forward, staff's World Economic Outlook projections for investment are used to extend the series.

- Trend capacity utilization was assumed to stabilize around 81 percent in the future, broadly in line with the long-run average in U.S. manufacturing.[8]

- The projection for working-age population growth was based on World Bank estimates.

- The smoothed participation rate was assumed to stabilize at 59.4 percent, while the structural unemployment rate was assumed to increase a notch in 2009–10 before returning to 3.4 percent over the medium term.[9]

- For potential TFP growth, the observed dip in 2008 to 0.2 percent was assumed to persist in 2009–10. It then gradually recovers to around 0.6 percent, about the same level as observed on average in 2000–07.

18. **Of course, the historical decomposition of potential growth is subject to considerable error**. Data availability, including relatively short time series and the lack of hours and capital stock data, limits the robustness of the analysis. The short history complicates the identification of trends; it is particularly problematic to control for the effects of the 1995 crisis. In addition, the methodology used to estimate the capital stock may lead to understating TFP contribution to growth. Depreciation rates may be sensitive to structural shifts and crises, with a larger share of the capital stock amortizing as, for example, the economy becomes more open to trade and the environment changes significantly for some sectors. Not taking this into account would tend to bias estimated capital stock growth upwards and TFP growth (both actual and potential) downwards.

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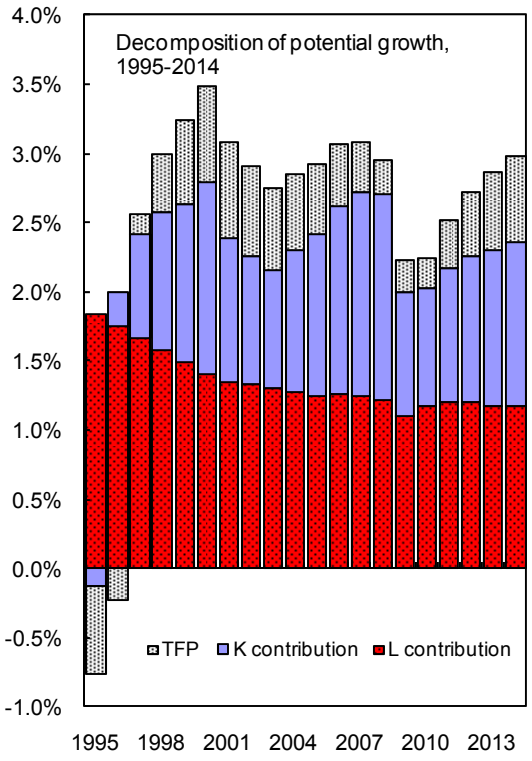
[8] The available capacity utilization series for Mexico is short, and is not conducive to deducing trends. The smoothed historical series are based on an HP-filter run on the available data.

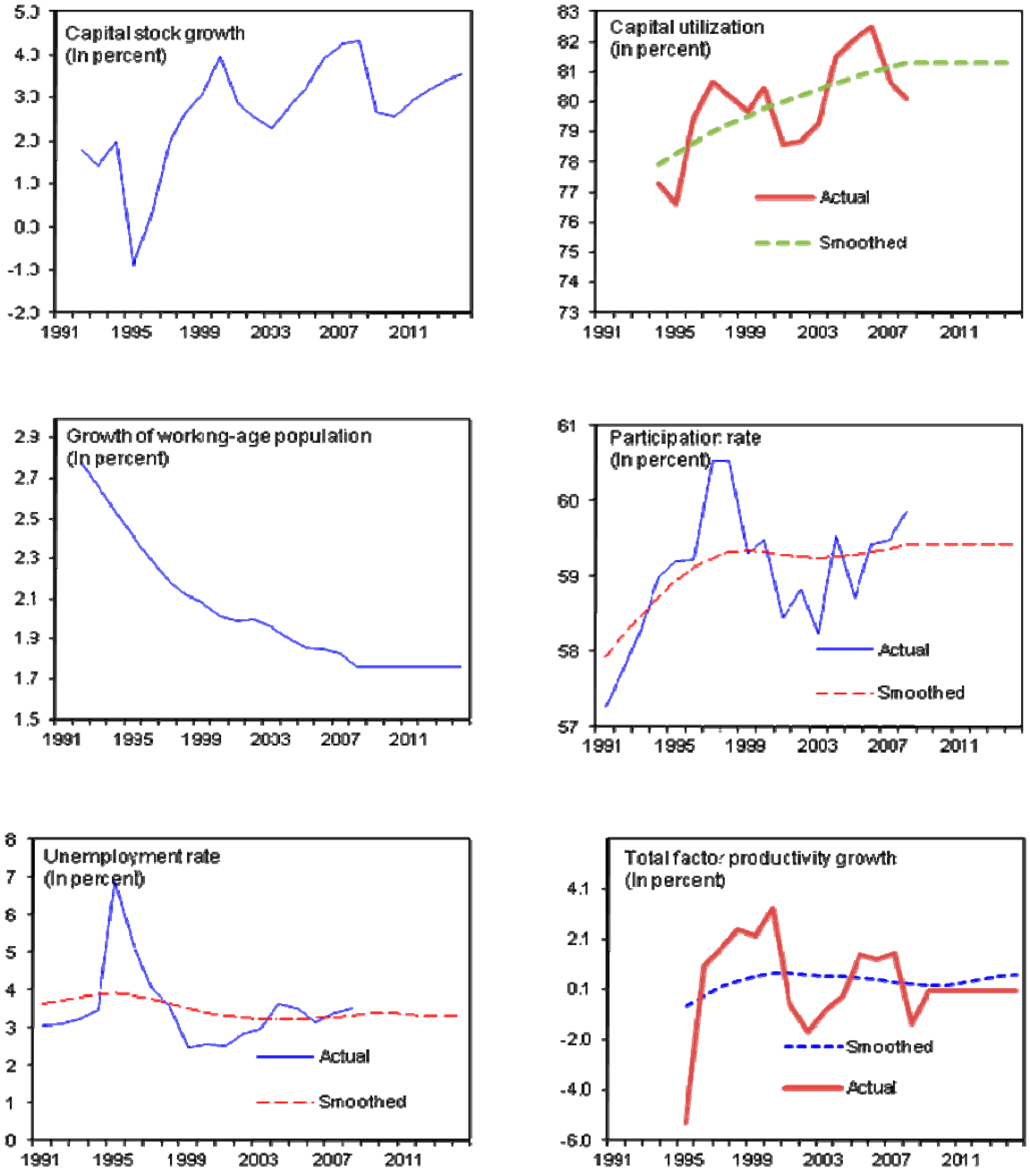
[9] For both the participation and the unemployment rate, the smoothed series are generated by HP-filtering.

19. **Projections are also surrounded by considerable uncertainty.** Growth-enhancing structural reforms may boost medium-term TFP growth, and the recovery of investment may be stronger than projected as the global economy recovers and financial conditions normalize. Considerable uncertainty surrounds labor market projections as well—participation rates may continue rising as a result of higher female participation, and reforms may influence the structural unemployment rate.



20. **With these caveats in mind, the resulting path for potential growth suggests that investment and TFP developments would be driving changes over the medium term**. The significant reduction in potential growth from around 3 percent in the past few years to 2–2¼ in 2009–10 is mostly the result of lower capital contribution—the consequence of the investment collapse during the crisis—with some added drag from lower TFP growth. The projected medium-term acceleration of potential growth back to around 3 percent is driven by the return of capital growth to its longer-term trend and a gradual recovery of TFP growth.

Figure 1. Mexico: Decomposing Potential Output Growth



Source: INEGI, OECD, Haver Analytics, and IMF staff estimates.

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II. Labor Market Informality and Macroeconomic Performance[1]

1. **More than half of the Mexican labor force is employed in the unregulated informal sector as workers or owners of predominantly small firms.** While this share of informal employment is in the middle of the Latin American distribution, it is a multiple of the average among Mexico's OECD peers (OECD, 2008, Perry et al, 2007). Since a common view of informal employment in Mexico as well as in other emerging markets is that of a disadvantaged labor market segment arising in response to rigidities in the formal sector, a high prevalence of informality could have important implications for macroeconomic performance. In a recession, the informal sector can then be thought to bear the brunt of the adjustment needed if inflexible labor contracts in the formal sector hinder lay-offs and downward pressure on wages. Over longer time horizons, high and persistent informality has also often been pointed to as an important factor behind the disappointing productivity growth in Mexico and other Latin American countries as informality for example severely limits access to finance and adoption of new technologies for firms, and adequate training for employees (Perry et al, 2007).

2. **Labor market surveys in Mexico enable interesting comparisons between the formal and informal sectors of the labor market.** The quarterly INEGI employment surveys are available for the period 1987–2009, thus covering the 1994 peso crisis, the years of trade liberalization following NAFTA and the current global crisis. They have an extensive coverage of informal and formal labor markets in terms of wages, hours worked etc, are representative of the city and state level and used by the government to generate unemployment statistics. In accordance with previous literature on informality in Mexico, for what follows an individual is considered to be in the informal sector if he/she is not registered at a social security institution or lacks medical insurance through the job.[2] Originally comprising only urban areas, rural municipalities were added to the surveys during the last decade. We stick to the original urban sample throughout to ensure consistency, although results hold up if the whole sample is used.[3]

3. **Like other emerging markets, the Mexican labor market is both similar and different from mature economies.** As in industrial countries Mexican unemployment increases when output falls in economic downturns; this countercyclicality is further shown by a negative contemporaneous correlation between the HP-filtered cyclical components of

[1] Prepared by Kristin Magnusson.

[2] Self-employed are not required to register with one of the above institutions. Following Alcaraz (2009), we hence classify self-employed as informal if they are not registered with the local or federal government to make sure that our measure of informality does not include self-employed who comply with existing regulations. The measurement of informality, including in public administration, likely reflects the employment of some part-time workers.

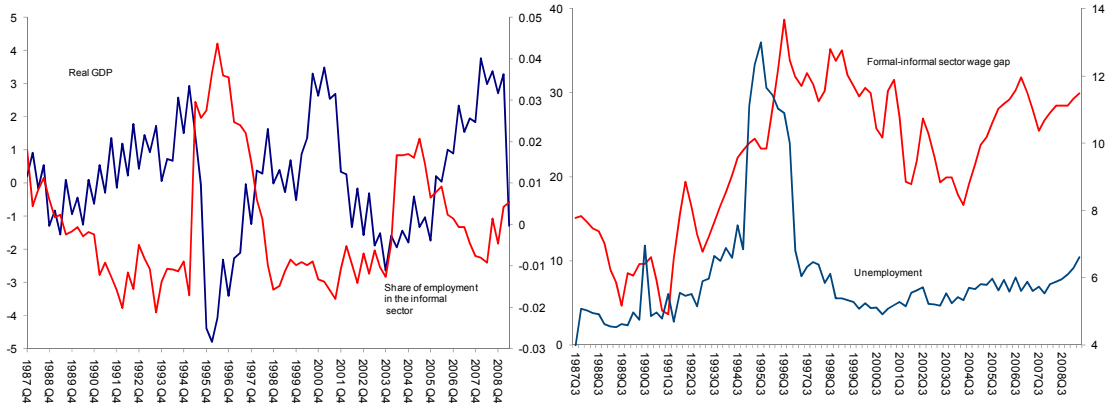
[3] The main difference when rural areas are included are discrete upward jumps in the size of the informal sector and the wage gap due to the high prevalence of informality in the agricultural sector, which dominates employment in rural municipalities and pays low wages.

unemployment and GDP.[4] Labor force participation increased in Mexico during the period under study, largely through women entering the workforce. Different from advanced countries but similar to other emerging markets, labor force participation is weakly countercyclical over the whole period of study meaning that households typically increase their labor supply in economic downturns. This aggregate view of the labor market however masks some important differences between the formal and informal sector.

4. **When Mexico faces economic downturns, the informal sector tends to buffer the blow to the formal sector.** As seen from the left-hand panel of Figure 1, the informal sector in Mexico typically increases its share of employment in recessions, something that is further confirmed by a negative correlation between the high-frequency variations in informal sector employment and GDP. Although the relative shares of formal and informal employment have been quite stable over the last two decades, the spike in informality induced by the 1994–95 recession took over three years to subside. It is noteworthy that informal employment and unemployment have increased less during the current crisis compared to then despite similar declines in output. Possible explanations for this positive outcome include the corporate sector's stronger resilience to shocks, the authorities' policy response and to a lesser extent declines as opposed to increases in labor force participation.[5]

Figure 1. Informal Sector Employment and Wages over the Business Cycle

Left panel: Cyclical component of GDP (left axis) and informal employment (right axis), as measured by the HP-filter. Right panel: Formal-informal sector wage differentials (left axis) and unemployment (right axis), in percentage points. Series in the right-hand chart have been smoothed using a three-quarter moving average.



Source: INEGI, IFS and staff calculations.

[4] For further information about these correlations and some summary statistics, see Appendix 1.

[5] During the 1994–1995 crisis the unemployment rate increased by about 6 percentage points as opposed to by 2 percentage points so far in the current crisis. Controlling for the extensive margin of employment, by assuming that all individuals who joined the labor force then would have remained outside the labor market and those who left this time around would have stayed and been registered as unemployed, would reduce this 4 percentage point difference in outcomes by about half a percentage point.

5. **Increases in informality are to a large extent driven by severe recessions rather than moderate cyclical swings.** Although we find informal employment to be countercyclical with respect to GDP over the whole period under study, this finding is mainly driven by the large increases in informality following the peso crisis in 1994 and to a lesser extent the 2008–2009 recession. For shocks to GDP that are more like the "normal" business cycles of the period, we find the response of the informal sector employment share to be of the expected sign but mostly insignificant in a standard unrestricted VAR framework.[6]

6. **Differences in hours worked and wages between formal and informal jobs are important mechanisms for the adjustment to shocks.** While formal and informal sector average hours worked per week are very similar in terms of levels and cyclical behavior, informal hours worked have more volatile short-run fluctuations. This suggests that the adjustment of hours worked in the informal sector over the business cycle is a response to the rigidities in the formal sector pointed out by Chiquiar and Ramos-Francia (2009) and others.

7. **Wage setting in the informal sector is in some ways similar to the formal sector…** There is a long-standing debate regarding the impact of minimum wage increases on the wage distribution in Mexico (Fairris et al, 2006). While only a small fraction of formal sector workers earned wages smaller than the minimum during the period under study, we find that up to a third of formal sector employees had wages set as quite exact multiples of the prevailing minimum wages.[7] To a somewhat lower extent this also held for informal sector wages, which is interesting given that minimum wage norms are only binding for the formal sector. We also found that minimum wage increases typically feed through to informal sector wages with a one-quarter lag. That is, while changes in minimum wages were implemented immediately for formal sector workers they are typically delayed for informal workers.

8. **…but informal sector wages are more responsive to macroeconomic shocks.** Informal wages fall relatively more in recessions but catch up in booms when the formal labor market recovers, as evidenced by a negative correlation between the formal-informal sector wage gap and the cyclical component of GDP. In line with Alcaraz (2009), we also find a negative correlation between the cyclical components of unemployment and informal sectors wages while formal sector wages do not seem to respond to deteriorating labor market conditions. When conducting a simple unrestricted VAR exercise, we find that a

[6] For VAR results and details on the estimation, see Appendix 2.

[7] To arrive at this share we repeated the exercise in Fairris et al (2006) who studies wage setting in Mexico during the period 1984–1992, for the last five years of our data set. We look at the distribution of daily wages and calculate the proportion that earns a multiple with increment 0.25 of the national minimum wage +/- 5 percent.

shock to unemployment has a significant negative effect on informal sector wages reaching its maximum impact after two quarters.[8]

9. **Neither formal nor informal sector wages are likely to recover quickly after the current crisis.** After the 1994–95 crisis, the reduction in the formal-informal sector wage gap was slow and gradual, as seen from the right-hand panel of Figure 1. From the figure, it is evident that while unemployment and the formal-informal sector wage gap have tended to move together, during the recovery from the 1994–95 crisis unemployment fell faster than relative wage differentials as activity rebounded. This time around, the output gap is projected to close only gradually over the medium term, and although there are signs that labor demand is beginning to resume it will take time before the formal sector fully recovers which in turn can allow informal sector wages to begin picking up in relative terms.[9]

10. **The informal sector not only works as a shock absorber but also affects Mexico's long-run economic performance.** There are strong indications from labor market surveys that firms with informal employees are much smaller than those with formal jobs. Moreover, many self-employed in the informal sector are older workers who return to this sector to start their own companies after a career in the formal sector (Duval-Hernandez and Orroca Romano, 2009). It is unfortunate that these workers seem to perceive formal-sector barriers to the start-up of companies as too high to operate there when they decide to leave formal salaried work for self-employment. Hence both for existing firms and start-ups, the combination of small-scale activities and informality reinforce each other in hindering access to external finance. This prevents firm growth and investment in new technologies, which have important links to improved productivity.

11. **Reducing informality would likely lead to productivity gains and boost output…** Mexico's average productivity growth was about 1 percent per annum during the 2000s, far below many OECD peers.[10] It is conceivable that part of this weak performance is due to the prevalence of a large informal sector; some tentative evidence is provided through the negative correlation between the growth rates of the informal sector employment share and manufacturing productivity (if we use the latter as a proxy for total factor productivity). The labor market surveys we have used in this paper do not provide information about output or sales and hence separate productivity series for the formal and informal sector cannot be constructed. The best available estimate of formal-informal sector productivity gaps is thus the wage differential between the sectors, if we assume that wages reflect workers'

[8] For VAR results and details on the estimation, see Appendix 2.

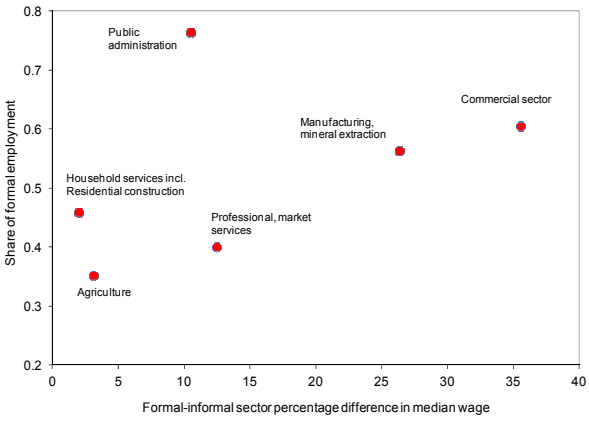
[9] Unemployment peaked at 6.1 percent in June 2009 and formal employment continued to increase until December when more than 185,000 jobs were lost. This drop was however largely due to seasonal effects as employers traditionally adjust their payrolls and reduce the work force in the last month of the year. Indeed, December 2009 saw the smallest drop for that month and variable over the last ten years.

[10] Using productivity data from the manufacturing sector.

efficiency. For all sectors, a wage gap of around 15 percent remains between formal and informal employment after controlling for observable and non-observable worker characteristics such as age and educational level.[11] Using this wage gap as a proxy for productivity and the historical average size of the informal sector, the current cost of informality is likely at most 9 percent of GDP.[12] The gains from reducing informality would however be larger than that as many of the possible measures to create incentives to move from informal to formal employment would also improve the productivity of already existing formal sector jobs.

12. …**but poses considerable challenges in terms of identifying and implementing the key economic reforms.** Both in Mexico and other countries barriers to the adjustment of formal sector employment such as restrictions on short-term contracts and high dismissal costs were designed to protect the welfare of workers but can also make it difficult to maintain formal sector employment, and especially so in times of rapid economic change. While the currently proposed labor market reforms include welcome changes in the aforementioned areas, their scope is relatively modest and thus unfortunately not likely to have major effects on the level of informal employment. An important remaining challenge is also to carefully design social programs, including the qualifications for benefits, to provide the proper incentives for the beneficiary to go from transfers to salaried work (Levy, 2008).

13. **The productivity loss stemming from informality also depends on the type of economic activity.** Informal employment makes up over a fourth of higher-productivity sectors such as manufacturing, and dominates e.g., services and agriculture which are often considered less efficient sectors. Percentage differences in median wages between formal and informal employment differ widely depending on the nature of the activity and ranges from less than 2 percent in agriculture to over 35 percent in the commercial sector. As seen from the figure to the right, the share of formal employment is positively related to the wage gap, apart from the



[11] To arrive at the average wage gap for the period, we calculate the ratio between the estimate in Alcaraz, Chiquiar and Ramos-Francia (2008) who control for observable worker characteristics for the years 2001–2004, and the crude wage gap we find for the same years, We then extrapolate this relation for the whole period 1987–2009 to arrive at the 15 percent wage gap.

[12] Since INEGI started surveying both urban and rural areas in 2005, the informal sector employment share has been quite stable at around 60 percent. It is arguably a very strong assumption that all informal workers will become as efficient as formal ones if they change status, but a back-of-the-envelope calculation of the upper bound of foregone output from informality is given by the product of the average wage gap and the share of informal employment.

outlier public administration. The highest wage gaps are hence found in the more productive sectors such as manufacturing, mineral extraction and commercial activity and the lowest in less efficient sectors such as agriculture and services. Since the former also contribute over four times more to GDP than the latter, reducing the informal employment share in e.g., manufacturing and mining by one percentage point would probably give more leverage in terms of productivity gains compared to a corresponding change of household services and agriculture jobs.

Appendix 1. Summary Statistics and Correlation Coefficients

	Period Average	Standard Deviation	Cyclical correlation with output/[1]
Labor force participation, percent	54.5	3.18	-0.14
Unemployment, percent	6.1	1.83	-0.39
Urban informal sector employment share, percent	38.9	3.2	-0.35
Total informal sector employment share, percent/[2]	58.3	1.8	-0.16
Formal sector hours worked, per week	43.97	1.28	0.20
Informal sector hours worked, per week	42.97	1.57	0.17
Formal-informal sector wage gap, percent	22.4	9.0	-0.17

Source: INEGI, IFS and Staff calculations. Refers to the period 1987 Q1-2009Q3 and urban areas only unless otherwise stated.

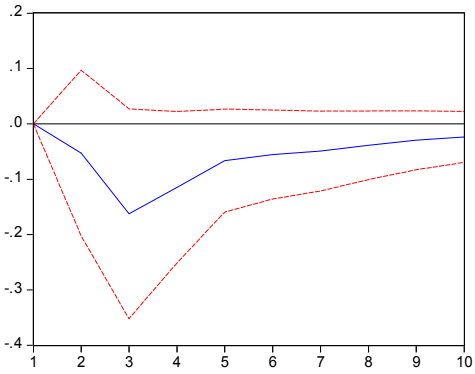
[1] As measured by the correlations between the cyclical components of the HP-filter.

[2] This refers to the whole INEGI sample starting in 2002.

Appendix 2. Results from VAR Estimations

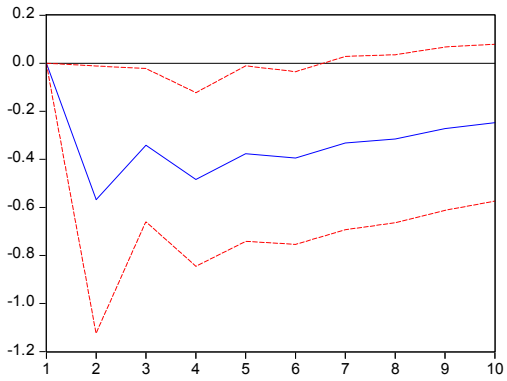
1. For the output that follows, the source is INEGI, IFS and staff calculations. Quarterly data for 1987:Q1-2009:Q3. Original series were transformed with logs and first differences to make data stationary before estimation. Lag length in the VARs were determined by the Akaike criterion.

Response of the informal sector employment share to a positive one-standard deviation shock to GDP



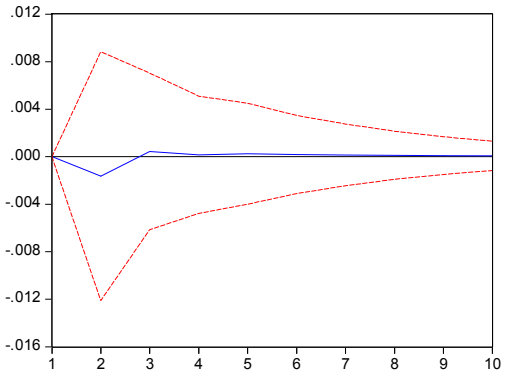
Time periods

Response of informal sector wages to a positive one-standard deviation shock to unemployment



Time periods

Response of formal sector wages to a positive one-standard deviation shock to unemployment



Time periods

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III. Reforming the Fiscal Framework: Budget Rules and Fiscal Risks[1] [2]

Adopting structural fiscal rules in Mexico would smooth spending fluctuations, improving spending planning. Introducing a structural rule at a time when growth is strong would also trigger savings and help build up fiscal buffers with positive effects on debt dynamics and the credibility of fiscal policy, as would eliminating permanently the limits on savings in the oil stabilization funds. The introduction of structural rules could increase the variance of the debt ratio around its projected baseline in response to unanticipated shocks in main macroeconomic variables—however, in the Mexican context, these effects are manageably small.

A. Expenditure Patterns and Cyclicality under the Mexican Fiscal Rule

1. **Over the last few years, Mexico has strengthened its fiscal framework, enhancing the credibility of fiscal policy and contributing to bring down public debt.** The 2006 Budget and Fiscal Responsibility Law (FRL) defined the budget approval process and basic fiscal transparency requirements. It also introduced a formula to calculate long-term oil prices for projecting budgetary oil proceeds and established a balanced budget fiscal rule (BBR) for the budgetary public sector (BPS) together with a two-tier system of reserve funds.[3] This framework has generated consistent primary surpluses (averaging 1.4 percent of GDP till 2008) and contributed to stabilize debt dynamics.

2. **The current framework has, however, contributed to a high degree of cyclicality of spending patterns that tend to respond to output and oil revenue fluctuations.** The obligation to target the nominal balance and the tight limits on the reserve funds imply that public spending has to rise and fall in line with fluctuations in revenue linked to economic growth and oil revenue proceeds; this can lead to sudden spending fluctuations that tend to reduce quality and efficiency of spending plans. The result is that expenditures and changes in spending from one year to another are closely correlated to non-oil tax and oil revenues as well as to changes in these revenues. The current framework is also not suited to fostering a gradual adjustment to the projected medium-term loss of oil revenue as fiscal adjustments do not reflect any stated long-term goal but are dictated by annual oil production and price fluctuations. Structural fiscal targets could address some of these limitations, though with some costs.

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[1] Prepared by Geremia Palomba.

[2] This paper applies to the Mexican case a modified version of the fiscal risks framework for annual budgets originally developed in Garcia-Escribano (2008) and a stochastic debt sustainability model defined in Celasun *et al* 2006, and further developed by staff of the SPR department at the IMF with inputs from Manrique Saenz.

[3] In this framework, excess revenues (relative to budget amounts) are saved in the first tier reserve funds until they reach an established limit. Revenues in excess of this limit are used, via second-tier funds, to finance pre-defined off-budget spending; in the case of revenue shortfalls, the funds may make transfers to the budget (see Appendix 1).

Mexico. Spending Correlations (2006-08)

	Non-oil tax revenue	Oil revenue (excl. domestic excises)	Annual changes in non-oil tax revenue	Annual changes in oil revenue (excl. domestic excises)
Total spending	1.00	0.86		
Annual changes in total spending			0.73	0.31

Source: Authorities data and Staff estimates

3. **Shifting towards structural fiscal rules can smooth spending patterns, though this could lead to some slight increase in the volatility of debt in the Mexican case**. This paper considers two alternative fiscal rules: a structural rule that adjusts for the impact of the economic cycle, and an oil revenue rule that, in addition to the economic cycle, adjusts for fluctuations in oil revenues (see Appendix 1). It shows that both rules (and modifications of these) smooth expenditure patterns over time and reduce risks of spending volatility associated with unanticipated shocks in macroeconomic variables. It also shows that, in principle, these rules tend to increase the volatility of debt ratios around baseline projections in response to unanticipated macroeconomic shocks.[4] However, simulations show that such risks in the Mexican case are very limited and easily manageable. Therefore, while in principle there is a possible trade-off between the objectives of smoothing expenditure patterns and of containing medium-term debt volatility when moving towards structural fiscal rules, this trade-off is not particularly binding in the case of Mexico. Moreover, reducing spending volatility, given its negative impact on spending quality and efficiency, may be more of a concern than debt volatility, particularly when the latter is limited and occurs in the context of a credible fiscal framework. Therefore, moving to a structural rule would be appropriate and easily manageable for Mexico.[5]

4. **The rest of the paper is organized as follows.** Section B examines spending patterns and risks of expenditures volatility from unanticipated shocks in macroeconomic variables under two alternative fiscal rules. Section C illustrates debt dynamics and volatility under the same fiscal rules. Section D discusses the limited policy trade-off arising from structural fiscal rules in the case of Mexico and suggests appropriate policies.

[4] Appendix 2 provides a formal proof of this argument.

[5] The paper considers two simple fiscal rules and alternative more complex rules (e.g,. a structural rule with a debt brake clause and an oil annuity rule) are possible. The simple proposed rules have the advantage of allowing complex simulations while preserving qualitative results also applicable to more complex rules; of course, quantitative outcomes may have some degree of approximation due to simplifications.

B. Spending Patterns and Fiscal Risks under Alternative Fiscal Rules

5. **A structural fiscal rule would smooth spending patterns over time and reduce the procyclicality of expenditure observed under the current rule**.[6] During bad (good) times, when the output gap is negative (positive), non-oil tax revenues fall below (above) their long-term potential level and the current fiscal rule requires the government to adjust expenditures to these revenue fluctuations. A structural fiscal rule reduces the impact of cyclical fluctuations on expenditure decisions. When the output gap is negative (positive), this rule allows for larger (smaller) deficits, and higher (lower) expenditures, than the current rule, thus smoothing the required adjustment of expenditure (Figure 1).

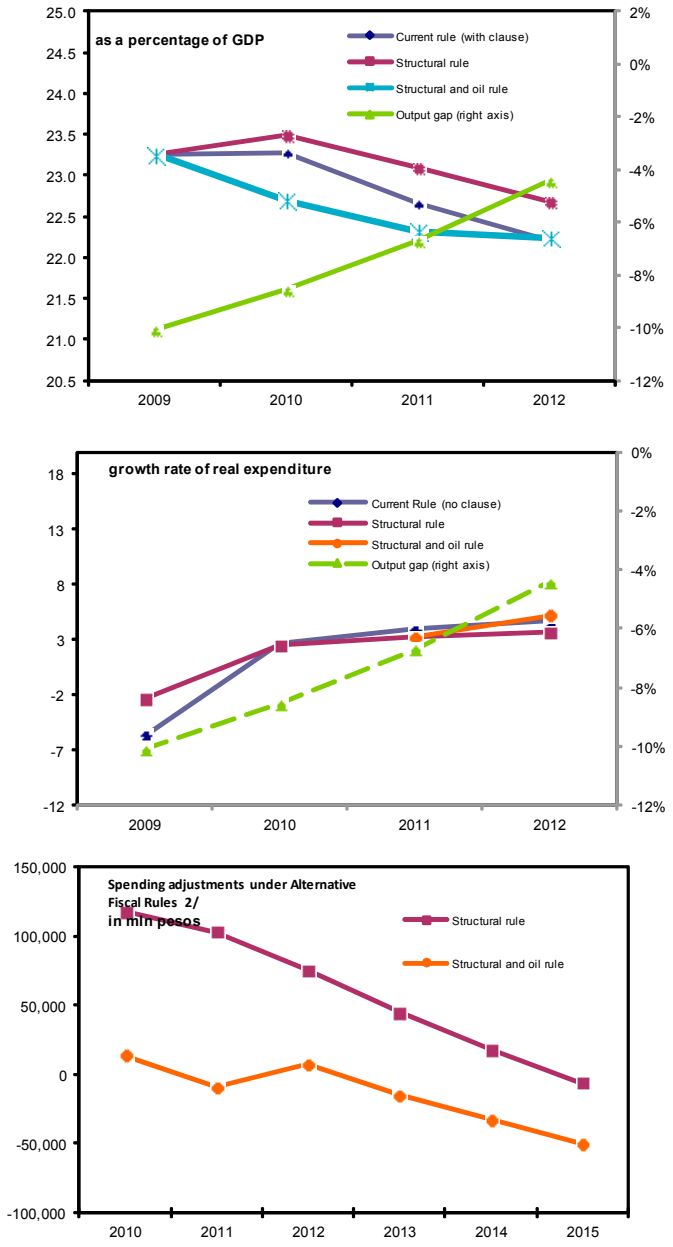
6. **The exceptional circumstances clause available in Mexico could deliver similar results in case of negative output shocks, but a structural rule has several advantages.** It applies automatically with no policy intervention, it is symmetric along the cycle—for it guarantees savings when economic conditions improve, and it constantly smoothes spending patterns thus, to some extent, reducing fluctuations in economic growth.[7] However, adopting a structural rule also poses a number of complex implementation issues (e.g. calculating the output gap and long-term oil revenue) that ought to be carefully addressed for the rule to work as desired (see IMF 2009).

7. **A structural fiscal rule would also reduce risks of spending fluctuations due to unanticipated shocks in nonoil macroeconomic variables**. Unanticipated shocks to nonoil variables, like GDP, affect tax revenue and lead, under the current rule, to corresponding adjustments in expenditures. Under a structural rule, these shocks would also affect the output gap and generate a counterbalancing impact on permitted deficits that partially offsets the required adjustments in expenditures; this would reduce risks of wide spending fluctuations around the originally projected baseline spending paths.

[6] A structural fiscal rule targets a balanced structural traditional balance. See Appendix 1 for details.

[7] Given the relatively small size of the public sector and of automatic stabilizers in Mexico, the feedback effect on growth is, for simplicity, ignored in the rest of this paper. Ignoring the growth impact would, however, bias our simulations against structural rules for it tends to overestimate their impact on the debt ratio via low GDP.

Figure 1. Spending Patterns under Alternative Fiscal Rules 1/



Sources: Authorities and Staff estimantes.

1/ Expenditures net of Pidiregas and Pemex spending and 2009 one-off revenues.
2/ Difference with expenditure under the current rule with exceptional clause and net of Pemex and Pidiregas spending

8. **In the Mexican case, the reduction in the risk of spending fluctuations from adopting a structural rule may be significant.** The different risks under the current and a structural rule can be presented using fan charts (Figure 2). These charts plot the probability distribution of expenditure forecasts in response to several stochastic shocks in the three

macroeconomic variables that most affect the budget: real GDP growth, oil prices and oil production (for details see Appendix 3).[8] The wider the fan chart around the median projections, the greater is the volatility of expenditures in response to random shocks in the selected variables. A structural fiscal rule presents narrower fan charts than the current rule (Figure 2 parts (b)) as it absorbs the impact of GDP fluctuations, thus reducing spending fluctuation in response to shocks. The smoother spending patterns and the lower volatility would support better spending planning, improving expenditure quality and efficiency.[9] Under a structural rule, however, shocks to variables other than GDP (i.e., fluctuations in oil prices and oil production) would still affect budget revenues and be a source of risk.

9. **Spending volatility could be further reduced by adopting, in addition, a simple rule for oil revenue.** An oil revenue rule can be easily built in the context of the current fiscal framework. Specifically, such a rule can rely on the existing formula for budget oil prices as a price proxy to determine long-term oil revenue.[10] In addition, an oil rule would require reforming the system of oil stabilization funds by removing the limits on the accumulation of oil revenue windfalls in the first-tier funds and subjecting to the standard budget process expenses financed through the second tier spending funds. In such a scheme, the first tier funds would operate as financing accounts accumulating any oil revenue windfalls above estimated long-term revenues and providing resources to the budget at times of lower oil prices and weaker production. This modified fiscal framework would isolate budget spending both from the effect of the nonoil shocks (e.g., GDP) and, to some extent, from fluctuations in oil revenues, smoothing spending patterns over time (Figure 1) and further reducing risks of spending fluctuations due to unanticipated shocks (Figure 2, part c). This fiscal rule would also lead to lower expenditures, higher savings, and thus a stronger fiscal position compared to the current rule (Figure 1). Alternative formulations of the oil rule, such as an oil annuity, lead to similar qualitative results.[11]

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[8] Stochastic shocks could apply to other variables (e.g., interest rates, imports, exchange rate) but these would have less of an impact on the annual fiscal performance).

[9] It is worth noting that a structural rule reduces risks of fluctuations in nominal spending but increases the volatility of the expenditure to GDP ratio. Differently from the current fiscal rule, a structural rule would require the expenditure ratio to adjust to GDP shocks even if these shocks leave the revenue to GDP ratio unchanged (i.e., elasticity 1 of tax revenue to GDP).

[10] Current legislation defines oil prices for budget purposes as the average of the last ten years prices, next three year prices, and monthly future prices for the current fiscal year (times a precautionary factor of 84 percent) with weights of ¼, ¼ and ½, respectively. To some extent, this can be seen as an approximation of long-term oil prices.

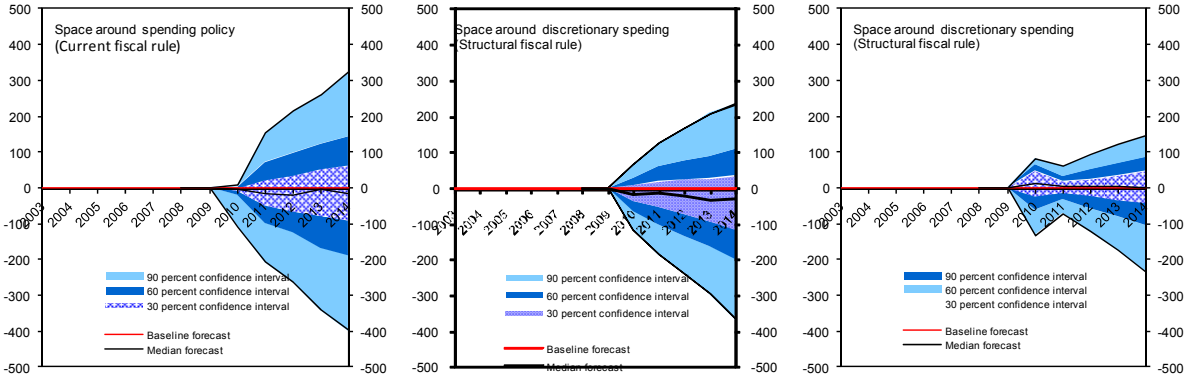
[11] While qualitative results may be similar, quantitative outcomes under alternative oil rules may differ significantly. An oil annuity would, for example, lead to significant savings in the earlier years. In defining the simplified oil rule used in the simulations, long-term oil revenues are assumed not to include excises on domestic consumption of fuel (usually classified as oil revenue in Mexican fiscal accounts), and domestic fuel prices to adjust fully to fluctuations in international oil prices. From the risk perspective, an alternative way to design the oil rule is to include oil excises in the oil revenue target and leave domestic oil price level as a policy

(continued)

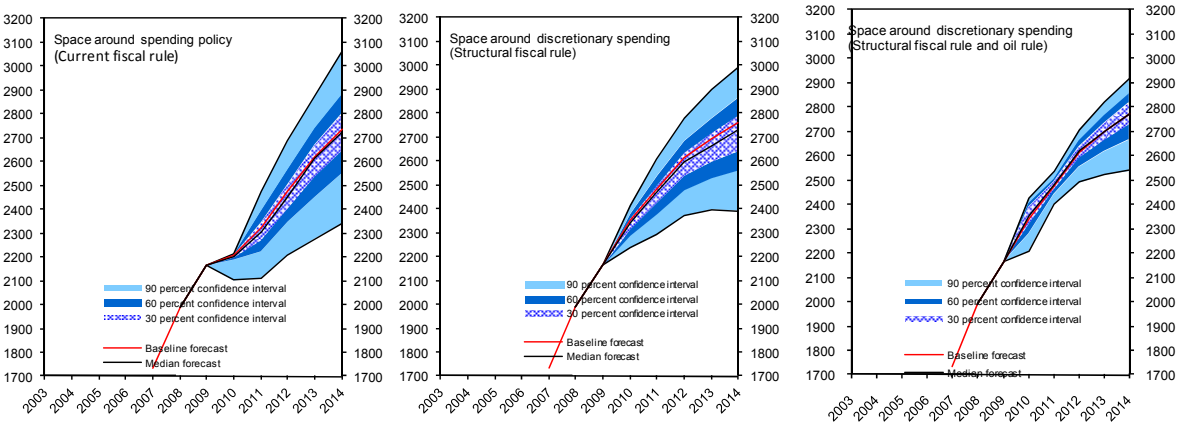
Figure 2. Risks of Expenditure Fluctuations under Different Fiscal Rules: Fan Charts for Spending Patterns

Fluctuations around the difference between baseline and shocked expenditures

(a) Current rule (b) Structural rule (c) Structural and oil rule



Fluctuations around total expenditures



C. Debt Dynamics and Fiscal Risks under Alternative Fiscal Rules

10. **Introduction of a structural fiscal rule when output is below potential could in principle lead to a small, albeit temporary, increase in the debt ratio.** Over the next few years, the output gap is projected to be negative and, under these circumstances, a structural rule would allow for larger annual deficits than the current rule. However, given the exceptional circumstances clause, the increase in the deficit, and in the debt ratio, over the next years compared to the base-line scenario is limited. This increase would in addition only be temporary as when output is above potential, a structural rule would require stronger fiscal

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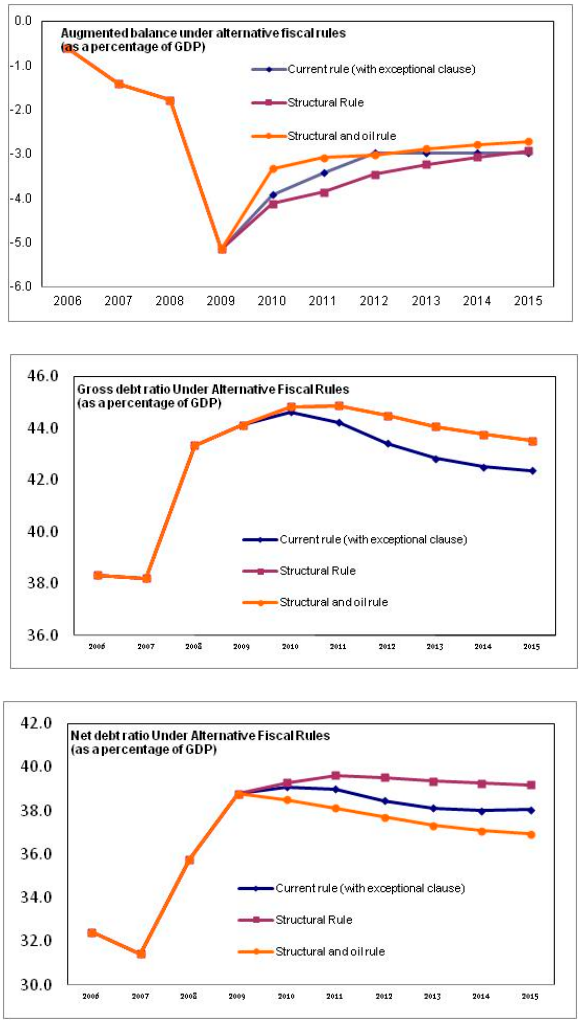
choice. While the two rules have the same implications in terms of risks of spending volatility, they lead to different spending patterns, with the second option commanding a larger level of expenditure and deficit.

balances and savings than the current fiscal rule, pulling debt down again.[12] Nonetheless, this suggests that adopting a structural rule at times of a small or positive output gap would improve the fiscal position from the outset and possibly strengthen the credibility of the fiscal framework. The contemporaneous introduction of an oil rule would support asset accumulation, particularly in the short-term, that would more than offset the impact of a structural rule on gross debt and lead to lower net debt (Figure 3).

11. **Structural and oil fiscal rules would in principle lead to some increase in the variance of gross debt ratios in response to unanticipated shocks in macroeconomic variables**. Under the current fiscal rule, adjustments in annual expenditures absorb risks from unanticipated macroeconomic shocks, contributing at the margin to insulate the debt ratio from these shocks. Both the structural fiscal rule and an oil rule would smooth expenditure patterns and increase the volatility of the annual fiscal balance. This enters the standard equation of motions for the debt dynamics, thus translating in principle into increased variances of debt ratios in response to unanticipated macroeconomic shocks.

[12] A structural fiscal rule would also benefit growth, thus leading to a lower impact on the debt ratio during bad times than shown under the current simulations that ignore feedback effects on growth.

Figure 3. Fiscal Balances and Debt Dynamics under Alternative Fiscal Rules



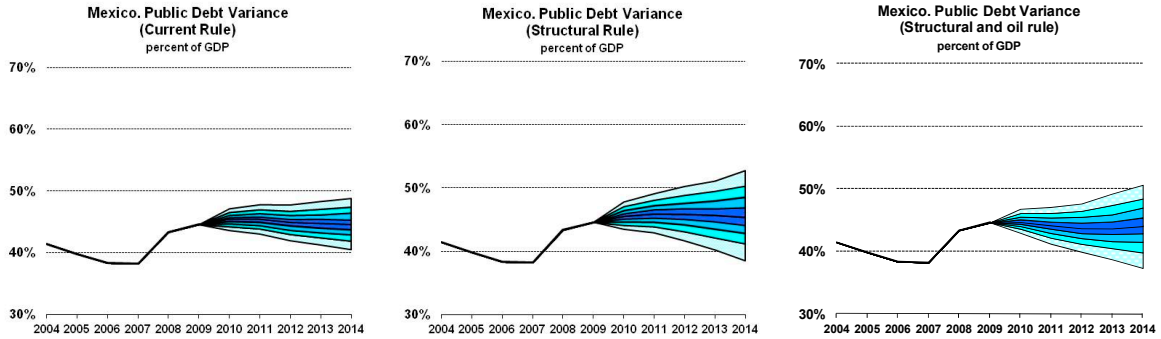
12. **However, the estimated increase in the variance of projected gross debt ratios from shifting to structural and oil rules in Mexico appears very limited.** These effects can be gauged by projecting the evolution of the distribution of debt ratios under stochastic shocks to the variables affecting the standard stock-flow debt equation, i.e., real GDP growth, real interest rates (domestic and foreign), and the exchange rate (see Appendix 4, for the oil rule oil prices shocks are also considered). Using one thousands joint shocks in these variables, under the current fiscal rule, we estimate that in 2014 the debt ratio could vary with 80 percent probability by about 4 percentage points of GDP around its median projected value. Moving to a structural (and oil) rule would add little to this and the debt ratio would vary by about 7 percentage points of GDP around its median projected value, Figure 4).[13]

[13] To estimate risks under an oil rule, shocks include variations in oil prices around a long-term price. See Appendix 4 for details. It is worth noting that under the framework described in Appendix 4, debt volatility under an oil rule may be underestimated because the framework only considers the primary balance impact on gross debt and ignores changes in assets due to possible accumulation/use of oil savings.

However, an oil rule would also imply larger savings than other rules and lead to a lower net debt ratio over time.[14]

Figure 4. Variance of Debt Ratios under Different Fiscal Rules: Fan Charts for Gross Debt[15]

(a) Current rule (b) Structural rule (c) Structural and oil rules



D. Reforming the Fiscal Framework—Fiscal Rules, Risks and Policy Options

13. **Shifting to structural fiscal rules would reduce spending volatility, but could in principle lead to some limited increase in debt ratios and in their variance.** On the one hand, a structural fiscal rule, strengthened with a rule on oil revenue, would smooth expenditure patterns over time and reduce risks of spending fluctuations associated to unexpected shocks in macroeconomic variables. On the other hand, moving to such a rule at the current juncture would likely lead to a small and temporary increase in the debt ratio and in principle to somewhat higher variance in the debt ratios over the medium term.

14. **However, in the Mexican context, the increase in debt variance appears limited and moving to structural rules is appropriate, as policy options are available to mitigate concerns.** Adopting a structural rule at the time when the output gap is not too large would limit any temporary deterioration in the debt ratio and possibly strengthen the credibility of the fiscal framework by committing to additional fiscal savings. Introducing in addition a simple oil rule could also offset the initial temporary debt deterioration. Policymakers should

[14] It is worth noticing that the simulation frameworks applied to determine risks for annual expenditures (derived from desk detailed projections) and for debt (derived via aggregate fiscal reaction functions) are conceptually similar but differ in a number of assumptions and methodological choices (specifically, magnitude of shocks, shock correlations, and mechanisms through which shocks impact annual balance). As a result, quantitative conclusions may, to some limited extent, differ.

[15] Variance under a structural and oil rule would be larger (and debt level lower compared to other rules) if net debt, including changes in assets, is considered.

be able to eliminate accumulation limits for the oil stabilization funds with no significant increases in the volatility of debt around the baseline path striking a fair balance between, on one hand, the objective of smoothing spending patterns and reducing risks of spending fluctuations and, on the other hand, limiting medium-term debt risks. Indeed, in the Mexican context, reducing spending volatility, given its impact on spending quality and efficiency, is more of a concern than any increased variance in debt ratios, particularly when this latter is limited and occurs in the context of a credible fiscal framework.

Appendix 1. The Mexican Fiscal Rule and Alternative Rules

The Current Fiscal Rule

The 2006 Budget and Fiscal Responsibility Law (FRL) regulates the budget process and its execution, including through a balanced budget fiscal rule (BBR). Amongst other things, it also introduces a formula to calculate long-term oil prices for projecting budgetary oil proceeds and, in support of the balanced budget fiscal rule, establishes a system of oil stabilization funds.

The BBR targets a zero cash balance for the budgetary public sector (BPS). The BPS is a hybrid concept that covers the central government and some pieces of the broader public sector (two social security systems, and some major ("directly controlled") public enterprises, including Pemex, the state-owned oil company), but excludes local governments. Targeting a cash balance, the rule also excludes accruals registered under long-term contracts to develop and manage infrastructure projects (e.g., PIDIREGAS). The coverage of the BBR is also limited as it targets a concept of fiscal balance (the *traditional balance*) that excludes not only accruals on PIDIREGAS projects, but also the impact on the fiscal balance of state-owned development banks, changes in the stabilization funds, and the operations of a number of public bodies that together constitute the so-called *augmented balance*. The FRL does however require that the augmented balance is projected and monitored.

The FRL also regulates a two-tier system of oil funds. Any excess revenue (relative to budgeted amounts) can first be used to compensate for certain nonprogrammable budget overruns (natural disasters and higher expenditures resulting from interest or exchange rate developments). The remainder is split among four first-tier funds—a stabilization fund, and funds to finance Pemex investment and investment by federal entities. If in any year total revenues are less than budgeted as result of lower oil prices or exchange rate effects, the oil stabilization funds may make transfers to the budget or to Pemex to cover the shortfall. Likewise, once these first-tier funds reach their statutory ceilings, any subsequent excess budgetary resources are allocated in equal shares to four second tier funds that finance off-budget investments by the Federal Government, by subnational governments, and by Pemex, and future costs of pension reforms.

A number of reforms to this framework have been introduced over the last few years. These include excluding Pemex's capital investment from the BBR (in 2008) and establishing temporary regulation in 2010 according to which 35 percent of any revenue windfalls above budget revenue has to be used to finance infrastructural investment and the remaining 65 percent be saved in the oil stabilization funds that, only for this year, have no ceilings.

Alternative Fiscal Rules

This paper examines the implication of two alternative fiscal rules: a structural rule and a structural rule associated to an oil revenue rule. The structural rule adjusts for the

impact of the economic cycle on the budget by targeting a zero structural balance. In absence of significant automatic stabilizers on the expenditure side and assuming unity elasticity of revenue to the output gap, the magnitude of the assumed cyclical component is assumed to broadly proportional to the non-oil tax revenue ratio to GDP and the size of the output gap. Hence, at times of negative (positive) output gaps, the rule allows for a larger (smaller) deficit than the current fiscal rule. The paper does not investigate the complexity of applying such a rule, including measuring the output gap, and possible integration to such a rule used in other countries as, for example, debt break arrangements.

Designing an oil rule may be complex and but a simple rule may lead to similar qualitative results as more complex rules (although with different quantitative impact on fiscal aggregates). This paper considers a simple rule that only requires minimal changes to the current fiscal framework. Specifically, the oil rule relies on the existing formula for budget oil prices as a price proxy to determine long-term oil revenue. It also requires a reform of the oil stabilization funds removing limits to the accumulations of oil revenue windfalls and bringing under the budget process expenditures under the existing second-tier oil spending funds. Under this rule, oil revenues do not include excise revenues from domestic consumption of fuel (usually classified as oil revenue in Mexican fiscal accounts), and domestic fuel prices are assumed to adjust fully to fluctuations in international oil prices. This rule is considered in conjunction with a structural rule.

Alternative oil rules could be considered such as an oil annuity. This annuity could be based on the current value of Mexico's oil wealth as implied by current estimates of the country's oil reserves, extraction capacity and medium-term price forecasts. The annuity would then be used as a notional oil revenue flow to set aggregate expenditure envelopes each year. Any excess above this flow would be saved with no limit in the oil stabilization funds that may make transfers to the budget in case of low oil revenue. In this way, expenditures plans would be based on longer drawdown of oil revenue than that implied by existing reserves and annual production amounts, resulting in a building up of savings in the early years. Adopting this rule would lead to different spending and debt dynamics than under the previous oil rule, but it would not change the qualitative results regarding the trade-off discussed in the paper between risks of spending fluctuations versus risks of debt volatility in response to shocks to macroeconomic variables.

Appendix 2. Impact of a Structural Fiscal Rule on Spending, Fiscal Balance, and Debt Ratio

This appendix shows that, under simplifying assumptions, a simple structural fiscal rule leads to lower volatility of spending (in absolute terms) and higher volatility of fiscal balances (as a share of GDP) in response to variations in GDP than a zero-balance budget rule. The higher volatility of the fiscal balance ratio under a structural rule also implies, through the standard stock-flow debt equation, a higher volatility of the debt ratio.

Definitions

Consider a simple case where the annual balance (B) is the difference between tax revenue $R(Y)$ and expenditures *E*,

$$B = R(Y) - E$$

where Y stands for GDP and $R(Y)$ indicates that tax revenues are a function of GDP. Furthermore, if the output gap is $Y_{gap} = \left(\frac{Y-Y_p}{Y_p}\right)$, where Y_p is potential GDP, then the structural balance B_{SR} can be defined as

$$B_{SR} = R(Y) - \alpha Y_{gap} Y - E$$

where α denotes the size of automatic stabilizers included in the budget. In the simple case of no automatic stabilizers on the expenditure side (i.e. the elasticity of expenditure to the output gap is zero) and assuming that the elasticity of revenue to the output gap is 1, then α can be approximated as follows:

$$B_{SR} = R(Y) - R(Y)\left(\frac{Y_P}{Y}\right)Y_{gap} - E = R(Y) - R(Y)\left(1 - \frac{Y_P}{Y}\right) - E = R(Y)\left(\frac{Y_P}{Y}\right) - E$$[16]

Impact of GDP fluctuations on spending patterns under alternative fiscal rules

The zero-balance budget rule

A zero-balance rule requires that $B = 0$, thus under this rule, expenditures are:

[16] This follows from the fact that the cyclical component of revenue (the second term in the equation on the left hand side) is $R^C = R - R^{CA} = R - R\left(\frac{Y_P}{Y}\right)^{\epsilon} = R\left(1 - \frac{Y_P}{Y}\right)$, where R^C and R^{CA} denote cyclical and cyclically adjusted revenue, respectively and ϵ is the elasticity of revenue to the output gap assumed to be equal to one.

$$E_{BR} = R(Y).$$

The structural budget rule

A structural budget rule requires that B_{SR}=0, hence, expenditures are

$$E_{SR} = R(Y) - \alpha Y_{gap} Y$$

In the simple case of no automatic stabilizers on the expenditure side and revenue elasticity to the output gap equal one, expenditures are:

$$E_{SR} = R(Y) - R(Y)\left(\frac{Y_P}{Y}\right)Y_{gap} = R(Y) - R(Y)\left(1 - \frac{Y_P}{Y}\right) = R(Y)\left(\frac{Y_P}{Y}\right)$$

Comparing budget rules

Under the two rules, expenditures respond differently to GDP variations; specifically, under a structural rule spending patterns fluctuate less than under the zero-balance rule in response to GDP fluctuations. To prove this, let us consider the expenditure adjustment in response to GDP changes under a zero-balance rule, i.e.

$$\frac{dE_{BR}}{dY} = R'$$

Where R' is the derivative of $R(Y)$ with respect to Y.
Under a structural rule, the response of expenditures to GDP changes, in the simplified case considered here, is given by:

$$\frac{dE_{SR}}{dY} = R' - R'\left(\frac{Y_p}{Y}\right)Y_{gap} + R(Y)\left(\frac{Y_p}{Y^2}\right)Y_{gap} - R(Y)\left(\frac{Y_p}{Y}\right)Y'_{gap} =$$
$$= R' - R'\left(1 - \frac{Y_p}{Y}\right) + \frac{R(Y)}{Y}\left(1 - \frac{Y_p}{Y}\right) - \frac{R(Y)}{Y} =$$
$$= R'\left(\frac{Y_p}{Y}\right) - R(Y)\left(\frac{Y_p}{Y^2}\right)$$

If for simplicity we assume that at any time $R' \sim \frac{R}{Y}$, i.e. revenues are a linear function of GDP, then the previous relation equals zero, that is under a structural budget rule expenditures do not respond to changes in GDP. We conclude that a zero-balance rule implies larger fluctuations in spending patterns (in absolute terms) than a structural rule in response to variations in GDP.

Impact of GDP Fluctuations on Annual Fiscal Balance (and Debt) Ratios Under Alternative Fiscal Rules

The zero-balance budget rule

The fiscal balance to GDP ratio under a zero balance rule is

$$b_{BR} = \frac{B}{Y} = \frac{R(Y)}{Y} - \frac{E}{Y}$$

Under this rule, changes in GDP cannot affect the fiscal balance, therefore $\frac{db_{BR}}{dY} = 0$

The structural budget rule

Under a structural rule, the annual balance ratio is $b_{SR} = \frac{R^C + R^{CA} - E}{Y}$ where, because of the rule $R^{CA} = E,$ thus, under the simplified case considered above, $b_{SR} = \frac{R^C}{Y} = \frac{R(Y)}{Y}\left(1 - \frac{Y_p}{Y}\right)$ and, changes in GDP will have the following effect:

$$\frac{db_{SR}}{dY} = \left[R'\left(1 - \frac{Y_p}{Y}\right) - \left(\frac{R(Y)}{Y}\right)\left(1 - \frac{Y_p}{Y}\right) + \frac{R(Y)}{Y}\left(\frac{Y_p}{Y}\right)\right]\left(\frac{1}{Y}\right) =$$

Comparing budget rules

If for simplicity we assume that at any time $R' \sim \frac{R}{Y}$, previous equation becomes

$$\frac{db_{SR}}{dY} = R(Y)\left(\frac{Y_p}{Y^3}\right) > 0$$

This is always positive, implying that, differently from a zero-balance fiscal rule, under a structural rule the balance ratio varies in response to variations in the GDP. Hence, we conclude that under a structural rule the fiscal balance ratio is more volatile than under a zero-balance rule in response to GDP changes.

In turn, the larger volatility of the fiscal balance to GDP ratio under the structural fiscal rule feeds into the standard stock-flow debt equation, implying that under this rule the debt ratio is more responsive to changes in GDP than under a zero-balance rule.

Appendix 3. A Framework to Assess Budget and Expenditures Risks[17]

Under this framework, one thousand forecasts for selected fiscal variables over a 5-year period are generated in response to stochastic disturbances to the path of certain macroeconomic variables. Disturbances are applied to three macroeconomic variables that are considered particularly important for budget projections: real GDP growth, international oil prices and the Mexican oil production platform. Shocks to each of these three variables are considered jointly, although there is no assumed correlation between shocks. The probability distribution of the forecasted fiscal variables is depicted in a fan chart allowing to calculate the probabilities that the identified variable reaches a specific level in a given year.

In this framework, real GDP growth is modeled as a second order autoregressive process. $g_t = \mu + \alpha g_{t-1} + \beta g_{t-2} + \varepsilon_t$ with $\mu=1.96$, $\alpha=0.45$, and $\beta=-0.05$. The annual projections from this AR(2) are then adjusted to reproduce on average the growth rate under the baseline scenario. Projections start from 2010.

International oil prices (as logs of average annual values) are modeled as a random walk. $P_t = P_{t-1} + u_t$, where the initial annual value, P_{t-1} in 2009 is used to derive P_t for the year 2010 and so on. The price of the Mexican oil mix is projected simply as a fixed proportion of the projected WEO prices, so that $P_t^{Mexican} = \widetilde{P}_t^{Mexican} \cdot P_t / \widetilde{P}_t$, where $\widetilde{P}_t$ and $\widetilde{P}_t^{Mexican}$ are the international crude and Mexican mix prices in the baseline for year t, respectively. The annual projections are also adjusted to reproduce on average the price level projected under the baseline.

The oil production platform (average annual values) is modeled as the mix of two random walks to account, to some degree, for the systematic under-projections of oil production observed over the last few years. Each random series is modeled as $A_t^i = A_{t-1}^i + \varepsilon_t^i$. In order to derive A_t^i for the year 2010, the initial annual value in 2009, A_{t-1}^i for the series i=1, is set at 2,622 million barrels per day (the baseline platform for 2009) , while for i=2, A_{t-1}^i is set at 2,098 million barrels, i.e. 20 percent lower than in series i. The mix distribution includes 900 draws from series i=1 and 100 from i=2.

Innovations for GDP growth, oil price and oil production platform, ε_t, u_t and v_t, for the period 2010-2014 are drawn from a normal distribution with zero mean and standard deviation 2.2 for GDP growth, 0.071 for log oil price and 155.2 for the production platform.[18] Innovations

[17] This appendix reflects the framework developed in Garcia-Escribano (2008).

[18] The standard deviations for oil price and the oil production platform are derived from the data for the period 2000–2008.

are then fed into the equations describing the dynamics of these variables. As mentioned, the possible correlation between growth, oil price, and oil platform or their innovations is ignored.

The distributions for the simulated macroeconomic variables are shown in following table.

Table A3. Percentiles of the Simulated Macroeconomic Variables

real GDP growth	2009	2010	2011	2012	2013	2014
5th	-6.8	0.5	0.7	1.4	1.2	0.5
25th	-6.8	2.6	3.0	3.8	3.6	2.9
50th	-6.8	4.0	4.6	5.4	5.2	4.6
75th	-6.8	5.4	6.2	7.1	6.7	6.2
95th	-6.8	7.5	8.8	9.4	9.2	8.5
oil price						
5th	62	68	69	69	68	68
25th	62	72	77	78	78	80
50th	62	76	82	85	86	89
75th	62	80	88	92	95	99
95th	62	85	97	104	109	115
platform oil production						
5th	2,622	2,020	1,934	1,906	1,841	1,786
25th	2,622	2,353	2,295	2,259	2,220	2,203
50th	2,622	2,477	2,465	2,459	2,457	2,454
75th	2,622	2,587	2,630	2,643	2,681	2,713
95th	2,622	2,735	2,855	2,921	2,982	3,026

The results of the probability distribution of nominal expenditures under different fiscal rules are depicted with fan charts in the text. Fan charts illustrate the uncertainty for the projection of nominal expenditures as a fan of probabilities around the median path. The median line represents the "central" scenario of the 1,000 simulations, and the bands around this line illustrate the uncertainty surrounding the forecast.[19]

[19] Differences between the baseline and the median scenarios are very limited and may arise, for example, because the average projection for the shocked variables differs from the baseline assumption.

Appendix 4. A Framework for a Stochastic Debt Sustainability Analysis[20]

Under this framework, thousands of forecasts for the future debt ratios are generated for each year under stochastic economic disturbances and for given policy responses. Analyzing the distribution of the projected debt levels as depicted in a fan chart allows to calculate the probabilities that debt reaches a specific level in a given year. Looking at the upper tails of the projected debt distribution also allows to gauge tails risks for public debt sustainability.

Debt level forecasts reflect the standard stock-flow debt equation:

$$d_t = \frac{\left(1+r_t^{us}\right)\left(1+\Delta z_t\right)dx_{t-1} + \left(1+r_t\right)dd_{t-1}}{1+g_t} - ps_t$$

where *d* is the debt to GDP ratio, and *dx* and *dd* denote public debt denominated in foreign and local currencies, respectively and at each time t, *d* depends on the primary surplus (*ps*), external and domestic real interest rates (r^{us}, *r*), real GDP growth rate (*g*), and the change in the REER or the real depreciation rate (Δz). Under this formulation, the primary balance is fully financed through changes in debt and any balancing between foreign and domestic currency is projected by staff under the baseline scenario.

Debt forecasts depend on stochastic disturbances in the macroeconomic variables that enter the debt equation, i.e. r^{us}, *r*, *g*, and *z*. Disturbances in these variables and in the *ps* are generated in a two-step procedure. First, a vector auto-regression model (VAR) with these variables is used to generate projections for each of the four variables using (i) a deterministic projection from the VAR, and (ii) a random shock drawn from a multivariate normal distribution with the same variance-covariance matrix as the one estimated for the in-sample errors of the VAR. For the case of the oil rule, the VAR includes as an additional variable Mexican blend oil prices. Second, policy responses in terms of project *ps* are considered using alternative fiscal rules (e.g., under the current rule the *ps* does not vary with shocks; under a structural rule *ps* varies with the output gap; for the structural fiscal rule augmented for an oil rule, an HP filter is applied to determine long-term oil prices and the difference between projected and long-term oil prices enter the fiscal reaction function with parameters estimated by the desk). Finally, the central projections for r^{us}, g, and the primary surplus are also adjusted (by appropriately shocking the system) to make the best use of information available from WEO and staff projections.

Following this procedure, one thousand random shocks are drawn for each variable to produce one thousand possible debt paths. Analyzing distributions of debt paths in any given year allows to calculate probabilities that debt reaches a specified level or increases/decreases by a certain number. These results are depicted in the fan charts used in the text that illustrate the impact of shocks on the magnitude of risks to the debt ratio under alternative fiscal rules.

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[20] The framework for stochastic debt sustainability analysis described in this Appendix was developed by Celasun et al. (2006) and subsequently expanded by staff of the SPR department at the IMF.

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IV. EXPANDING THE REGULATORY PERIMETER: THE CASE OF SOFOLES AND SOFOMES[1]

A. Introduction

1. **A key lesson of the recent global financial crisis is the importance of expanding the regulatory perimeter of financial supervision.** As unregulated financial institutions may have close linkages with regulated ones, the regulation and supervision of non-bank, non-traditional financial firm's remains one of the priorities for the supervisory authorities.

2. **In Mexico, Sofoles and Sofomes have grown in their importance as financial intermediaries, pointing to the need to broaden the regulatory perimeter.** The *Sociedades Financieras de Objeto Limitado* (Sofoles) started operating in 1993, with 21 entities recognized by the authorities. Since 2006, when the authorities decided to foster financial intermediation by liberalizing financial activities through creating the Sofomes (*Sociedad Financiera de Objeto Multiple*) the number of institutions has increased substantially (see below).[2] [3]

B. Size and Linkages with the Banking System

3. **Of the entire universe of Sofoles and Sofomes, the Comisión Nacional Bancaria y de Valores (CNBV) supervises the largest institutions and those with equity links to banks.** Published financial information on Sofoles and Sofomes is limited—public information is available for only 25 of the regulated institutions. According to CNBV, as of June 2009, the 25 regulated Sofoles for which financial information is publically available accounted for about 2 percent of reported assets of the financial system,[4] or about just over US$10 billion.[5]

4. **The bulk of the portfolio of Sofoles in the CNBV data comprised primarily mortgage loans and commercial loans.** Mortgage loans account for about 47 percent of the portfolio of the system, and commercial loans 34 percent. However, the participation of consumer loans has

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[1] Prepared by Jose Giancarlo Gasha.

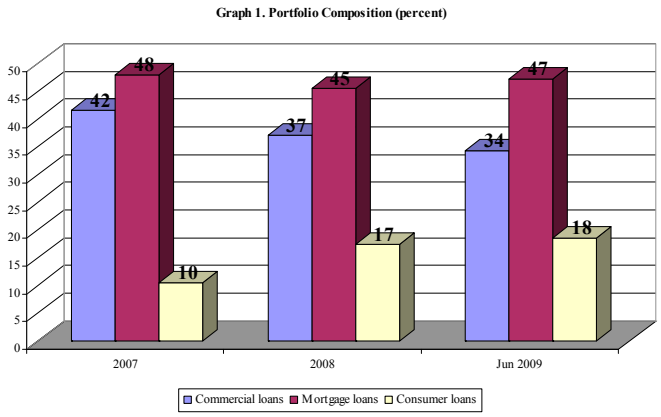
[2] The original institutions Sofoles are financial institutions that extend credit and financing to specific sectors of the economy. Sofomes are financial institutions that, besides extending credit and financing, are allowed to perform leasing and factoring, and can operate in different sectors of the economy. These non-deposit taking institutions were created to primarily operate with costumers who did not have access to the banking system.

[3] The main consideration for the creation of Sofomes were to: (i) creating a financial vehicle that, under a sole denomination, could engage in lending, leasing and factoring; (ii) giving the access to judicial process and fiscal benefits of the regulated system to the unregulated one; (iii) promoting basic surveillance of the system via the financial conditions requested by the providers of funds; and (iv) avoiding regulatory arbitrage between "unregulated" financial institutions, and their connected counterparts.

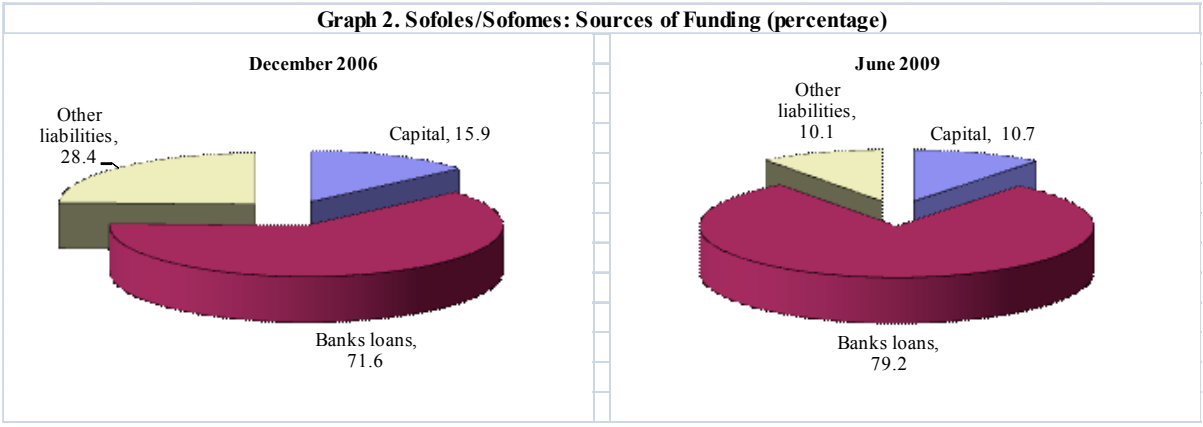
[4] The denominator comprises only the main credit/deposit taking institutions: commercial banks, public banks, and Sofoles/Sofomes.

[5] However the total number of institutions operating is reportedly higher such that the sectors' overall balance sheet is likely larger.

increased importantly in the last few years. While in 2006 consumer loans accounted for about 4 percent of the portfolio, by end June 2009 they had risen to 18 percent (see Graph 1). All the data have been obtained from various CNBV Statistical Bulletins for Sofoles.



5. **The Sofoles have linkages to the rest of the financial system through credit lines from commercial and public banks, and liabilities traded in the Mexican stock exchange (See Box 1).** As of June 2009, about 79 percent of funding came from banks loans, and 11 percent from other liabilities—mainly bonds traded in the stock exchange—accounting for 111 billion and 15 billion pesos respectively (see Graph 2).[6]



[6] According to Banxico's July 2009 "Report on the Financial System", in recent years banks have been allowed to separate their credit card business and create subsidiary Sofomes, which obtain the bulk of their funding from the parent bank. According to the Law of Credit Institutions the funding of a parent bank to other institution belonging to the same financial group is exempt from operational limits (i.e., "unlimited" funding). This arrangement allows banks to benefit from differences in the tax treatment of provisions: while banks can only deduct provisions for up to 2.5 percent of the portfolio, Sofomes are not subject to this limit. These regulatory differences may have had an impact in the increased activity of the sector. Importantly however, the supervision of the institutions is performed on a consolidated basis.

Box 1. Housing Finance, Sofoles, and the Public Sector

Historically, the government has participated actively in providing housing finance, especially for low income borrowers. The government established the *Instituto del Fondo Nacional de la Vivienda para los Trabajadores* (INFONAVIT) and *Fondo de la Vivienda del Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (FOVISSSTE) in 1972 and 1973, respectively, to channel mandatory pension contributions into home mortgages. It set up *Fondo de Operación y Financiamiento Bancario a la Vivienda* (FOVI) in 1963 and the *Sociedad Hipotecaria Federal* (SHF) in 2002 to promote housing finance, while creating the *Sociedades Financieras de Objeto Limitado* (Sofoles), an entirely new class of mortgage lenders, in 1993. It introduced home mortgage interest rate deductibility and direct subsidies for home acquisition, improvement, and rental for low income individuals. A new law in 2004 provided for a discontinuation of SHF's direct lending to the Sofoles by 2009, and of the government's direct backing of SHF liabilities a few years thereafter. However, SHF's role was expanded to provide mortgage insurance (MI), support issuance of mortgage-backed securities (RMBS) by Sofoles, and give liquidity and credit enhancement for RMBS.

As a result, the public sector has thus far played a leading role in housing finance in Mexico. As of end-2008 mortgages provided by INFONAVIT and FOVISSSTE represented nearly 80 percent of the outstanding stock of mortgage loans, and the mortgages provided by Sofoles accounted for about 8 percent of the outstanding stock. The public sector also has a considerable involvement in housing finance through SHF's provision of mortgage insurance, purchases of RMBS, and as a market-maker for RMBS.

External and domestic factors have weakened the financial soundness of Sofomes and Sofoles. The global financial crisis has led to a significant drop in wholesale funding for all borrowers, including Sofoles, many of which depended on borrowing from the commercial paper market, in particular during the 2004–08 period. This, compounded by relatively loose lending standards in some cases, rising NPLs, accounting concerns, and the inability of some Sofoles to repay or renew their short-term commercial paper, has led a few Sofoles to experience severe liquidity and even solvency problems. The authorities have responded quickly to resolve the situation in troubled institutions which are now under resolution.

6. **The importance of banks loans in the funding of Sofoles has increased in the last few years.** The proportion of banks loans in the funding of Sofoles has increased with the introduction in 2008 of the authorities' program to support the financial markets in the context of the global financial crisis (see Box 2). While in December 2006, banks loans represented about 70 percent of funding, by end-June 2009 the participation of banks loans in the funding of Sofoles had increased to about 80 percent.

Box 2. Measures to Support Housing Financing Intermediaries[7]

The 2008 authorities' plan to support housing finance intermediaries envisaged more than 40 billion pesos of SHF resources to foster and refinance mortgage loans. In addition, SHF was authorized to:

- Establish guarantees for the issuance of debt of non-bank financial institutions to finance their liabilities for up to 22 billion pesos.
- Use up to 20 billion pesos to offer lines to non-bank financial institutions to finance their liabilities.
- Use up to 20 billion pesos to offer medium-term credit lines to finance mortgage loans.
- Buy and sell mortgage-backed securities to guarantee the liquidity of the markets.

[7] See Banxico's "Inflation Report June-September 2008".

C. Financial Soundness

7. **The financial soundness of the Sofoles has deteriorated in the last two years.** In the context of the global financial crisis, pressures on the Mexican financial system have increased. However, the financial soundness of the Sofoles has come under greater pressure than for the core commercial banking system. As the real estate market and commercial activity have declined—main markets for Sofoles—nonperforming loans have more than tripled in the last two years reaching almost 9 percent of the portfolio as of end-June 2009. At the same time, provisions cover less than half the portfolio at risk, and profitability and capitalization have declined significantly.[8]

Table 1. Mexico: Financial Soundness Indicators, 2005 - 2009
(percent)

	2005	2006	2007	2008	Aug-09
NPLs					
Commercial Banks	1.81	1.99	2.54	3.21	3.61
Sofoles 1/	3.07	2.97	2.69	6.82	8.72
Provisions/NPLs					
Commercial Banks	242.24	210.27	168.89	161.18	155.91
Sofoles 1/	84.15	73.07	70.35	42.52	42.77
ROA					
Commercial Banks	1.73	2.16	1.97	1.22	1.12
Sofoles 1/	2.52	1.41	2.53	1.98	0.03
ROE					
Commercial Banks	20.16	24.27	20.85	12.97	11.88
Sofoles 1/	21.10	10.42	18.70	7.43	0.29
Capital Adequacy Ratio					
Commercial Banks	16.10	14.32	15.95	15.27	15.20
Sofoles 1/2/	12.44	13.69	11.82	12.56	10.67

Source: CNBV.
Notes:
1. As of June 2009.
2. Ratio Capital / Assets.

8. **The higher risk nature of the portfolio of Sofoles and Sofomes raises some concerns and it will be important to increase information on the sector.** For the institutions for which public information is available, the high risk nature of their portfolio could further erode their thin capital base. In this regard, further information about the size of the sector, its overall financial soundness, and specific linkages to the rest of the financial system would be useful and is among the initiatives being undertaken by the authorities.

D. Policy Implications

9. **The Sofoles/Sofomes system assets and linkages to the rest of the financial system have grown substantially in the last years.** Therefore, after putting in place reforms—such as the creation of Sofomes in 2006—to liberalize the credit activity in Mexico, the authorities now intend to expand the regulatory perimeter of financial supervision to the non-bank financial subsystems that could represent some degree of material risk.

[8] The financial indicators presented belong to the 25 institutions for which CNBV reports information publicly.

10. **Various modalities are being considered for expanding the regulatory perimeter.** Until now, all Sofoles and only those Sofomes which have equity linkages with other credit institutions (mainly banks) are regulated. According to a draft law presented at the Mexican Senate, a Sofom will also be regulated if:[9]

- It has equity linkages with "*entidades de ahorro y credito popular*" (another type of non-bank financial institutions).
- It funds its credit operations in the capital markets by issuing debt above a threshold of 400 million UDIS.[10]

11. **Regulation and supervision of the system is to be stepped-up.** Besides expanding the regulatory perimeter to all the Sofoles/Sofomes that represent material risks, the authorities intend to strengthen the procedures for applying for authorization, the background check of persons who intend to open a Sofom, and the sanctions and attributions of the CNBV for regulating the system.

12. **Besides these considerations, additional measures to strengthen the supervisory framework could include:**

- Establishing minimum information reporting requirements for Sofoles/Sofomes (e.g., providing financial statements, financial soundness indicators, at least quarterly.
- To make the supervisory regime manageable, establishing "subsidiary" supervision for the universe of Sofoles/Sofomes that are deemed non-systemic and so remain "unregulated" (for example, reporting financial information to the industry association).

[9] A draft law in the Senate proposes amendments to the legal framework of Sofoles and Sofomes to expand the regulatory perimeter and strengthen the supervisory regime.

[10] According to SHCP presentation "Challenges and Opportunities of the Sofom in Mexico" of July 2009, the rationale of this criterion would be to protect investors that do not have adequate risk management tools.

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