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Abstract

After a two-year deceleration, in 2009 the Mexican economy suffered a contraction only matched, in its modern history, by the one recorded in 1995, in the wake of the peso crisis of December 1994. As in the latter crisis, the economy immediately bounced back, posting positive growth in 2010. Compared with the sharp rebound of exports, though, the overall recovery was weak, with GDP and industrial production surpassing (barely, in the latter case) their pre-crisis levels only in 2011. Motivated by these observations, the paper studies the transmission channels behind the 2009 recession in Mexico, the reasons for the weakness of the 2010–2011 recovery, and —based on that analysis— some of the risks the country faces for sustaining stronger economic growth in the future.

Keywords: Great Recession, manufactured exports, trade balance, vertical specialization, capital flows, investment, real exchange rate, monetary policy, Mexico.

JEL codes: C22, E22, E58, F14, F21, F32, F41, O11, O54.

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1. INTRODUCTION

After decelerating in the previous two years, in 2009 the Mexican economy suffered a contraction only matched, in its modern history, by the one recorded in 1995, in the wake of the peso crisis of December 1994. The economy immediately bounced back —as happened in the earlier crisis— posting positive growth in 2010. The recovery was weak, however, in the sense that, while exports strongly rebounded, GDP and industrial production surpassed (barely, in the latter case) their pre-crisis levels only in 2011. Motivated by these observations, the paper studies the transmission channels behind the 2009 recession in Mexico, the reasons for the relative weakness of the 2010–2011 recovery, and —based on that analysis— some of the risks the country faces for sustaining stronger economic growth in the future.

In addition to this Introduction and the Conclusions, the paper is organized in three main sections. Section 2 studies how the global crisis was transmitted to the Mexican economy. While there was a retreat of foreign capital inflows, a more important channel was the negative effect on private investment caused by the reduction of manufactured exports and industrial production. To show this effect, the section estimates an equation for private investment in Mexico. The estimations —which follow the so-called bounds testing approach of Pesaran et al. (2001)— use quarterly series for the post-liberalization 1988–2010 period. The investment channel helps to explain the paradox of a sharp contraction in GDP while net exports and the current account balance remained relatively stable.

Section 3 delves into the recovery. It centers on the puzzling observation of a strong rebound in manufactured exports, on one hand, and the weakness of recovery in GDP and industrial production on the other. The analysis stresses the real exchange rate's role in the export rebound, the influence of the so-called vertical specialization of production on the weak transmission of exports to industrial production and therefore investment, and the consequent limited absorption of foreign capital inflows during the recovery.

Section 4 examines some of the risks Mexico faces for sustaining faster economic growth in the future. A first risk stems from the mix of slow economic growth and low interest rates likely to persist in developed countries, a mix that may "push" large amounts of foreign capital to countries like Mexico and in that way appreciate the currency in real terms. The appreciation affects negatively not only exports but also investment —as shown by the investment equations presented in Section 2— thus compromising growth in the medium term. A second, related risk is the possible need to continue with a disinflationary stance that may turn monetary policy into an additional, "pull" factor for capital inflows and real currency appreciation. Here the analysis includes a detailed look at the management of monetary policy in Mexico during the crisis and recovery, particularly as reflected in the behavior of interest rate differentials.

A final risk is that, as a result of vertical specialization and the tight link between exports and intermediate imports, the real exchange rate may become a less effective tool of external adjustment —a risk that could materialize if future growth comes to depend not only on exports but also on a stronger expansion of domestic demand. The analysis is supported by the estimation —again following the bounds testing approach— of trade balance equations for Mexico. The equations test for a reduction in the effect of the real exchange rate on the trade balance in the more recent period, after the enactment of NAFTA.

2. THE 2009 RECESSION

2.1 Exports and GDP

Tracking the evolution of the US economy very closely, Mexico began to decelerate in 2007, with GDP growth falling from 5.2% in 2006 to 1.2% in 2008. The process culminated in the recession of 2009, when GDP fell by 6.1% —and which represents, together with the Tequila crisis of 1995, the largest single-year drop experienced by Mexico in its recent history (Table 1).

The Mexican economy was hit by two external shocks (Ros, 2011; Schwellnus, 2011; Sidaoui et al., 2010). One was the retreat of foreign capital inflows. As measured by the financial account balance in the balance of payments, *net* capital inflows fell from little more than 3% of GDP during 2007–08, to 1.2% in the year to mid-2009. The fall in *foreign* capital inflows was larger —from a peak of 7% of GDP in 2007 to 2.5% of GDP in the year to mid-2009 (Table 2).[1]

The second shock was a strong fall in manufactured exports. A relevant observation, though, is that while exports fell by some 14% in real terms, their effect on net external demand was minimal. In fact, although exports fell by more than 2 percentage points of GDP, the trade balance actually *increased*, from a deficit of 3.7% of GDP in 2008 to a deficit of only 1.6% in 2009. The reason, of course, is that the fall in exports was more than offset by a fall in imports. *Intermediate* imports, in particular, fell from 22.5% of GDP in 2008 to 19.7% in 2009 (Table 1).

[Tables 1 and 2]

The close link between exports and imports, and thus the subdued effect of exports on the trade balance, is a consequence of the intensive use of intermediate imports in export production in Mexico (Cardero and Galindo, 2005; Moreno-Brid et al., 2005; Ibarra, 2011a, 2011b; Blecker and Ibarra 2013). One reason is the large share of so-called maquila goods in manufactured exports, which according to balance of payments data increased from 51% in 1993 to 61% in 2006 —the latest year with official statistics about maquila exports.

[1] Despite the eruption of the global financial crisis, foreign capital inflows were particularly high in 2007. As noted by several authors, in the first stage of the crisis capital tended to flow from developed to developing countries, a movement that was later reversed, as the crisis deepened (Cetorelli and Goldberg, 2011; Milesi-Ferretti and Tille, 2010).

As is well known, maquila consists of the assembly of intermediate imports, with little value added, for re-sale in the export market —an extreme example of the so-called vertical specialization of export production (Feenstra, 1998; Hummels et al., 2001). The average ratio of intermediate imports to gross production (that is, basically exports) in the maquila sector rose from 0.75 in 1993 to 0.88 in 2006. But the use of imports is intensive also in the main non-maquila, export-oriented manufacturing industries. This is the case, for example, of the automobile assembly and production industry, which in the early 2000's accounted for more than 40% of non-maquila manufactured exports, and in which imports accounted for at least 50% of intermediate goods (Buitelaar and Padilla, 2000; Ibarra, 2011a).

Vertical specialization implies that changes in exports are matched by automatic changes in intermediate imports, with a muted effect on net exports (Figure 1). For this reason, their effect on value added is limited (UNCTAD, 2002). Because of these characteristics, the collapse in manufactured exports cannot explain *directly* the large fall in GDP observed in 2009. What were then the *indirect* channels?

[Figure 1]

2.2 Transmission channels

A first observation is that the fall in exports was soon accompanied by a strong reduction in investment (gross fixed capital formation). Thus, while GDP was falling by 6.1%, as already mentioned, investment as a share of GDP dropped from 23.2% in 2008 to 21.7% in 2009. This reflected a contraction of 16.9% in *private* investment, which more than offset a (counter-cyclical) increase in public investment.

In principle, the reduction in investment could be explained by the other shock affecting the Mexican economy, namely, the retreat of foreign capital. Lower inflows may force a downward adjustment in the current account deficit. But since the latter equals the

excess of investment over domestic saving, indirectly the fall in inflows may force a reduction in investment (which of course may be accompanied also by a decrease in consumption and increase in saving).

This specific channel, though, seems to have played a relatively minor role in the transmission of the global financial crisis to investment in Mexico. Thus, while foreign capital inflows fell from 7% of GDP in 2007 to 2.5% in the year to mid-2009, and then partially recovered to 4.8% in 2009, *net* capital inflows fell by much less, because of a parallel reduction in domestic capital outflows.[2] In the end, net capital inflows, as mentioned, only fell from 3.2 to 2.4% of GDP in the mentioned period.

Not only did the fall in foreign capital inflows have a reduced impact on net inflows, but initially the current account deficit *increased*, from 1.2% of GDP in 2007 to 1.7% in the year to mid-2009. In the end, the current account deficit did fall, to 0.8% of GDP in 2009, but this adjustment seems too small to have forced a major reduction in investment (Table 2). More generally, below we will see that the transfer of capital inflows in Mexico, during both the crisis and recovery, was relatively minor —a phenomenon that has characterized Mexico over the medium term, and which suggests that investment in the country has been limited not by the availability of saving but by other factors affecting its profitability (Bulir and Swiston, 2006; Ibarra, 2008, 2011c; Ize, 2010; Trigueros, 1998).

The reduction in investment, instead, appears to be related to the negative impact of the export fall on gross industrial production.[3] The impact of exports on industrial production was strong —which is not surprising, given the increasingly outward orientation of industrial production in Mexico after the liberalization of trade in the mid-1980s. Thus,

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[2] *Domestic* capital as a determinant of *net* capital flows became important in Mexico (and other countries like Chile) in the second half of the 2000s (Forbes and Warnock, 2011).

[3] Some authors have argued that the instability in global financial markets contributed to a reduction in domestic demand —particularly in consumption— because of a tightening in domestic credit conditions (Schwellnus, 2011).

industrial production growth decelerated from 5.8% in 2006 to practically zero in 2008, and *minus* 7.3% in 2009.

To study the effect of industrial production on investment, Table 3 below presents estimations of an equation for private investment in Mexico. To focus on the detection of persistent, "level" effects, the estimations follow the so-called bounds testing approach of Pesaran et al. (2001). In addition to its good small-sample properties, the approach can combine stationary and non-stationary variables —both clear advantages over alternative, multiple-equation approaches such as Johansen's cointegrated VAR model. Moreover, thanks to the use of lags in an autoregressive distributed lag (ARDL) framework, the approach yields unbiased estimates of the long-run coefficients even if some of the regressors are endogenous (Pesaran and Shin, 1998).

The estimations are based on the following ARDL model in error-correction form,

$$(1) \qquad \Delta PI_t = \sum_{j=1}^{n} a_j \Delta PI_{t-j} + \sum_{i=1}^{k} \sum_{j=0}^{n} b_{i,j} \Delta Z_{i,t-j} + \sigma PI_{t-1} + \sum_{i=1}^{k} d_i Z_{i,t-1} + d_0$$

where *PI* stands for the natural log of private investment, posited to depend on *k* potential determinants Z_i. Δ indicates the first difference of the variable, while $-\sigma$ measures the speed of adjustment of *PI* toward its long-run equilibrium, as defined by equation (2) below.

After confirming —through a standard battery of diagnostic tests— the statistical adequacy of the estimated ARDL model, the existence of a long-run relationship can be explored by means of an *F*-test. The null hypothesis is that σ and the d_i coefficients in equation (1) are jointly equal to zero. For a level relationship to be established without ambiguity, the *F*-statistic must lie above the upper critical value (or upper bound) calculated by Pesaran et al. (2001). In that case, the existence of a relationship can be accepted even if all the variables in the estimated equation were integrated of order one, that is, non-stationary. While the critical values provided by Pesaran et al. (2001) are valid only asymptotically, Narayan (2005) calculated critical values for small samples of up to 80

observations and a maximum of k=7 regressors, which are the critical values used in the present paper.

Once the existence of a level relationship has been established —and the longest non-significant lags have been removed— the investment equation can be retrieved from the estimated coefficients in the ARDL model as,

(2) $$PI_{LR} = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \cdots + \delta_k Z_k$$

where $\delta_i = -d_i/\sigma$.

Regarding the Z_i determinants, in addition to the industrial production index, the equations include government investment (to control for possible complementary or substitution effects), the broad money supply M2 as an indicator of credit levels, and the real interest rate decomposed into the nominal interest rate and the inflation rate. The equations also include alternative indicators of the real exchange rate —namely, the Bank of Mexico's CPI-based multilateral rate; the relative unit labor cost in the manufactures between the US and Mexico; and the bilateral, CPI-based rate. An increase in any of these indicators means a real depreciation of the peso.[4]

The estimation sample begins in the first quarter of 1988 —after major trade liberalization was completed, and private investment had become the main component of capital formation in Mexico. One set of estimations ends on the second quarter of 2008, before the impact of the global crisis was felt in the country, while a second set is extended

[4] For a brief theoretical discussion of investment determinants, see Peltonen et al. (2011); and for alternative estimations of investment equations in Mexico that include the real exchange rate, see Blecker (2009), Lederman et al. (2003), Pérez (2004), and Ramírez (1994) —for macroeconomic equations— and Aguiar (2005) and Caglayan and Muñoz-Torres (2011) for studies using more disaggregated data.

until the final quarter of 2010, in order to explore whether the crisis and initial recovery had an effect on the estimated coefficients.

[Table 3]

In all cases the *F*-test supports the existence of a level equation for investment. The speed of adjustment coefficient (or error-correction coefficient) is always negatively signed, and in some of the equations, particularly in those using the multilateral real exchange rate index, is quite large —which also supports the existence of a level equation.

Except for M2 in the extended samples, the regressors tend to be statistically significant individually. A rise in M2 or a fall in the real interest rate (in the latter case, through either a lower nominal rate or higher inflation) increase private investment. Somewhat unexpectedly (although see Pérez, 2004 for a similar result), government investment appears to reduce private investment. This may be capturing a correlation created by the privatization of public assets in the country —that is, the retreat of government from economic activity and its replacement by private investment. Finally, in both samples and with the three alternative indicators, the estimations show a positive effect of the real exchange rate on investment —in other words, that a real depreciation of the peso tends to increase private investment— a result to which we will return.

For the moment, though, we may focus on the results concerning the industrial production index. The estimated coefficient is always highly significant in statistical terms, and shows an elasticity typically greater than 2 in the pre-crisis samples. Once the sample is extended, the estimated coefficient increases to a value of about 3, indicating that the sensitivity of private investment to industrial production may have increased after the eruption of the crisis.

To have an idea about economic significance, consider that manufactured exports fell by 41.5 billion dollars (3.1 percentage points of GDP at PPP) between the year to mid-

2008 and 2009. As we saw, the effect on net external demand was negligible, because of the parallel fall in intermediate imports. The contraction in manufactured exports, however, did affect industrial production, which fell by 9.1% in 2009 from its peak in the year to mid-2008. The fall in industrial production tended to have a large negative effect on investment. Using the estimated elasticity of 2.53 in column (1) of Table 3 —that is, excluding the crisis and rebound period— this predicted a contraction of about 23% in private investment. For comparison, the actual contraction was 20.4%.

3. THE 2010–11 RECOVERY

3.1 Exports and GDP, again

Despite its severity, the recession was short-lived and recovery began in early 2010. The GDP growth rate rose from *minus* 6.1% in 2009 to 5.4% in 2010. The recovery was led by exports, which increased to 33% of GDP in 2010 from 27.7% the previous year. At the same time, foreign capital inflows rose from 2.5% of GDP in the year to mid-2009, to 8.6% of GDP in 2010, while net capital inflows did it from 1.2% to 4.6% of GDP (Tables 1, 2).

The renewed dynamism of exports originated in the manufacturing sector, whose exports rose from 23.8% of GDP in 2009 to 29.1% in 2010, reflecting a growth of 28.8% in real terms. This showed once more the high sensitivity of Mexican exports to US economic activity, whose GDP growth rate swung in more than 6 percentage points, to 3% in 2010, while the growth rate of the industrial production index did it in more than 16 points, to 5.3% in the same year.

But while easily explained in qualitative terms by the US economic recovery, the sharp rebound of exports is noteworthy because it occurred under conditions of weak external demand. In particular, by mid-2011 the US GDP was barely returning to the levels attained three years before, and both the industrial and manufacturing production indices

were still significantly below that mark. In contrast, Mexico's manufactured exports were 18.3% higher (Table 4).

[Table 4]

What explains then the sharp rebound in exports? One likely factor is the real exchange rate. In the initial stages of the crisis, under a global flight to quality and declining inflows of foreign capital, the peso depreciated significantly. Thus, the CPI-based real effective exchange rate index rose (that is, the Mexican peso depreciated) by nearly 20%, from 100 in 2007 to 118.4 in 2009. The same pattern is shown by alternative real exchange rate indicators, like the relative unit labor cost in the manufactures between the US and Mexico, which rose from 100 to 114.1 over the same period (Table 2). Currency depreciation made Mexican exports more competitive and undoubtedly contributed to their rapid post-crisis growth.

3.2 The transfer of capital flows

The export rebound helps to explain why —despite the difficulties faced by the US to return to pre-crisis production levels— in Mexico GDP and industrial and manufacturing production were by mid-2011 above that mark. Note, however, that while the rebound from their pre-crisis levels was strong in the case of manufactured exports (18.3%), it was not so in the case of industrial production (0.4%), manufacturing production (2.6%), and GDP (0.7%; Table 4).

The weak recovery in GDP —or, in other words, the relatively low transmission of exports to GDP— involves several factors. One is the intensive use of intermediate imports in export production, a factor that as mentioned before cushioned the impact of the fall in exports on the trade balance during the recession, but that of course applied symmetrically during the recovery: the intensive use of intermediate imports reduced the multiplier effect of exports on aggregate demand.

A second factor is the failure of exports to trigger a strong recovery in investment: during the first half of 2011, both total and private investment were 4% below their levels in the same period of 2008 (Table 4). The depressed levels of investment not only contributed to a weak recovery in GDP, but also hindered the transfer of foreign capital — which began flowing back after the crisis— to domestic capital formation. Instead, foreign capital inflows were mirrored by outflows of domestic capital and reserve accumulation.

To see the previous result, we may recall the balance of payments identity,

(3) $$FOC = DOC + RAC + CAD$$

which shows that, beyond any residual error, a larger inflow of foreign capital (*FOC*) must be matched by a combination of larger outflows of domestic capital (*DOC*), faster reserve accumulation (*RAC*), and a higher current account deficit (*CAD*).

Moreover, since the current account deficit must equal the gap between domestic investment and saving, we have,

(4) $$FOC = DOC + RAC + (I - S)$$

Thus, depending on the actual factors constraining investment (see Hausmann et al., 2007), an inflow of foreign capital may have as counterpart a larger deficit in the current account due to higher levels of domestic investment (for example, if investment is constrained by the external sector or by insufficient domestic credit) or lower domestic saving, or instead the inflow may have as counterpart larger outflows of domestic capital or a faster accumulation of reserves (for example, if investment is constrained by low profitability, and thus does not respond to the greater availability of credit).

Table 5 presents some calculations based on equation (4). Foreign capital inflows rose from 19.8 billion dollars in the year to mid-2009, to a peak of 82.4 billion dollars two years later (about 9% of GDP at PPP, as mentioned above), for an increase of 62.6 billion

dollars. The increase in foreign capital inflows had as counterpart larger outflows of domestic capital for 22.4 billion dollars (27.3 billion dollars if the residual error is included) and faster reserve accumulation for 40.9 billion dollars. The current account deficit, in contrast, *fell* by 5.2 billion dollars. Thus, as mentioned above, there was no transfer to the current account and instead the inflow of foreign capital was "used up" in reserve accumulation and outflows of domestic capital.

Over the same period, total investment (domestic capital formation) increased —although remaining below its early-2008 peak— by 16.3 billion dollars, most of which corresponded to private investment. The figures imply that the investment recovery had as counterpart a rise in domestic saving (since the current account deficit remained mostly unchanged), with no role played by the inflows of foreign capital.[5]

[Table 5]

4. RISKS FOR FUTURE GROWTH

4.1 Capital flows, currency appreciation, and investment

During the recovery, foreign capital inflows were not "transferred" to the current account deficit and therefore to domestic demand. As a positive aspect, this reduced the vulnerability of the Mexican economy to a possible reversal of capital inflows in the future, compared to a situation in which the current account deficit had undergone a *large* upward adjustment. Given the sluggish pace of growth of the Mexican economy, however, and the very low —and therefore manageable— inherited level of the current account deficit,

[5] The same qualitative conclusions arise if we consider the extended period from pre-crisis 2007 until the year to mid-2011: foreign capital inflows rose by 28.3 billion dollars, which were matched by reserve accumulation (17.5 billion) and domestic capital outflows (12.4 billion, including errors). There was no transfer to the current account and —through that channel— to investment.

perhaps a more important question is why the capital inflows were not translated into higher levels of current account deficit and domestic demand.

Given their high sensitivity to industrial production, and the failure of exports to produce a strong recovery in the latter, the depressed levels of investment are not surprising. As shown above in Table 4, during the first half of 2011 Mexico's industrial production index was only 0.4% above the level recorded three years before. Unsurprisingly, utilization rates remained below pre-crisis levels (Bank of Mexico, 2011). As long as industrial production and utilization rates remain depressed, it is difficult to expect a stronger recovery in private investment.

But over a longer term, after industrial production and utilization rate levels are back to normal, there is a risk that investment may be hindered by strong capital inflows and their effect on the peso's real exchange rate. In this respect, recent research shows that international capital inflows can strongly appreciate the peso, whether the inflows take the form of direct or portfolio investment (Ibarra, 2011d).[6] And the mix of slow growth and low interest rates, currently observed and likely to persist in developed countries, may "push" significant amounts of foreign capital to middle-income countries like Mexico, as indeed began happening in the second half of 2009.

Thus, as capital inflows gained speed in the second half of 2009, the real exchange rate began to reverse its initial, crisis-induced depreciation. After peaking at 118.4 in 2009, the ensuing appreciation reduced the real exchange rate index back to 107.9 in the year to mid-2011, only 8% above its 2007 pre-crisis level. The reversal was even stronger in the case of the relative unit labor cost in the manufactures, which in the year to mid-2011 was only 4.4% above its 2007 level. Thus, capital inflows can have a strong influence on the

[6] Bakardzhieva et al. (2010) and Saborowski (2011) study of the effect of capital flows on the real exchange rate, while Forbes and Warnock (2011) and Fratzscher (2011) consider the role of push versus pull factors in the determination of capital flows.

real exchange rate, even if the central bank leans against the wind and accumulates international reserves.

In theory, a real appreciation of the currency affects investment in an uncertain way. The appreciation may be expansionary, for example because of balance-sheet effects or because it reduces the local-currency price of imported capital goods. But it can also be contractionary, for example by squeezing profit margins in the capital-intensive tradable goods sector (Bhaduri and Marglin, 1990; Blecker 2007; Gala, 2008; Levy-Yeyati and Sturzenegger, 2007; Rodrik, 2008; Ros and Skott, 1998). For those reasons, the actual effect of the real exchange rate on investment may depend on the specific circumstances of each country and period (Bahmani-Oskooee and Hajilee, 2010).

For Mexico in the post-liberalization period, there is strong empirical evidence that an appreciation of the peso reduces private investment (Ibarra 2008, 2010, 2011c).[7] Table 3 above illustrates the effect. As may be recalled, the table shows estimations of a private investment equation for Mexico, distinguishing between a pre-crisis sample (1988Q1–2008Q2), and an extended sample ending on 2010Q4. The estimations included different indicators of the real exchange rate as a potential determinant of private investment.

Whether measured by the Bank of Mexico's multilateral index, the bilateral US/Mexico relative unit labor cost in the manufactures, or the bilateral CPI index, in every case the estimations show a real currency appreciation (a fall in the real exchange rate) reduces investment. In every case, moreover, the effect strengthens as the estimation period is extended to include the crisis and initial recovery.

[7] Although the effect may be less clear if the estimation sample is extended to include pre-liberalization years (Blecker 2009).

4.2 Monetary policy

The link between investment, capital flows, and the real exchange rate implies that the stance of monetary policy matters for the Mexican economy's medium-term outlook. Monetary policy can contribute to establishing a more favorable setting for growth —a setting with perhaps smaller capital inflows, but a more competitive real exchange rate and thus higher investment levels— or instead reinforce the effect on the peso's real exchange rate exerted by the capital inflows pushed from developed countries. The basic issues are illustrated by the way monetary policy was managed in Mexico during the crisis and initial recovery.

The early stages of the crisis posed a policy dilemma: while inflation increased, the growth of GDP decelerated and eventually became negative. Moreover, although the inflationary hike preceded the global crisis' impact on the peso's exchange rate, eventually the depreciation of the peso added to the inflationary pressures. The dilemma, assuming policy cared about output, was clear: while the annual inflation rate shot in a year from 3.8% in late 2007 to 6.2% —well above the Bank of Mexico's 4% upper target, and calling for monetary tightening— the GDP growth rate collapsed from 5.2% in 2006 to 1.2% in 2008 (Figure 2).

[Figure 2]

Following its inflation-focused mandate, the Bank of Mexico reacted by tightening its policy stance (Ros, 2011; Sidaoui et al., 2010). As a result, the commercial banks' overnight funding rate rose from 7% in early 2007 to 8.1% in late 2008. The Bank's explicit interest rate target, introduced in January 2008, followed the same path. The change in the policy stance was effective, in that inflation began to yield in the second quarter of 2009 —an outcome presumably helped by the severe economic contraction under way.

Monetary tightening in Mexico took place even as developed countries, facing a recession, were moving in the opposite direction (Ros 2011; Blecker 2011). The asymmetry led to a widening interest rate differential in favor of the peso. More specifically, while the Bank of Mexico was adopting a tighter stance, the US Federal Reserve lowered its target rate from 5.3% in mid-2007 to 0.5% in late 2008, and later further down toward zero. The peso–dollar interest differential, as a result, shot from 1.8 percentage points in early 2007 to 7.6 points in late 2008 (Figure 3).

As inflation fell —and the exchange rate stabilized— the Bank of Mexico changed track and began lowering its interest rate target in early 2009. The interest rate differential narrowed over the next quarters. The Bank, however, stopped reducing its rate in late 2009, settling at a peso–dollar interest differential of 4.4 points. At the time, the level of the interest differential roughly corresponded to the inflation gap between Mexico and the US —but the situation changed afterwards.

[Figure 3]

Under a loose notion of purchasing power parity, investors may consider the inflation gap as a rough and ready guide to the future depreciation of the peso. Thus, if it merely covers the difference in inflation, a positive interest differential need not create expectations of extraordinary returns. Since late 2009, though, the inflation gap narrowed to less than 3 points, and by mid-2011 it had practically gone back to zero (Figure 4). As a consequence, although the nominal interest differential remained constant, the *real* differential rose from about 2 points during 2010 to more than 4 points by mid-2011.

The presumption that the real interest rate differential was interpreted by investors as an opportunity for extraordinary returns (rather than as a premium for country or currency risk) is reinforced by the evolution of capital flows. In particular, beginning in the second half of 2009, capital inflows surged. Rather than FDI, the surge was led by *portfolio* investments —in sharp contrast to what happened after the peso crisis of 1994–1995. In

fact, practically the entire increase of 4 percentage points of GDP from mid-2009 to mid-2011 in capital inflows was explained by net portfolio inflows (Figure 5). That the capital surge was led by portfolio inflows, which in contrast to FDI may be more sensitive to interest differentials, suggests that monetary policy contributed to the surge and to the reversal of the initial depreciation of the peso —a depreciation that had been the basis of Mexico's export-led recovery.

[Figures 4 and 5]

4.3 Trade balance and the real exchange rate

By leaning against capital inflows, monetary policy could attempt to shield investment from the threat of currency appreciation. Resisting appreciation may also be crucial as economic growth in Mexico gains speed —particularly if growth shifts to a more balanced mix of exports and domestic demand. Contrary to purely export-led growth, an acceleration jointly led by domestic demand could result in steeply rising current account deficits and an eventual tightening of the external constraint on growth. A competitive real exchange rate level may be the difference between a potential rather than a binding external constraint.

But besides the threat posed by surges in capital inflows —and by the so-far overriding commitment to a disinflationary policy stance— a further hurdle for real exchange rate management arises from the tight link between manufactured exports and intermediate imports —that is, from vertical specialization. Because of the tight link, specialization weakens the effect of the real exchange rate on intermediate imports, which instead tend to follow exports —thus explaining the paradox of a possible rise in imports when the currency depreciates (Ibarra 2011b). In other words, while the real exchange rate

may affect exports in the expected way, it may not affect *net* exports —or do so, but with less rather than more intensity (Kharroubi, 2011[8]).

To examine this issue, Tables 6a and 6b show estimations of an equation for the trade balance in Mexico, following the ARDL bounds testing approach introduced earlier for the analysis of investment. The theoretical basis is the so-called imperfect-substitutes model, in which trade flows are assumed to depend on relative prices and activity levels (Chinn 2006 and Bayoumi, 1999; Bahmani-Oskooee and Hegerty, 2009 and Fullerton and Sprinkle, 2005 present applications to Mexico). Accordingly, the trade balance —measured as a percentage of GDP in real pesos— was estimated as a function of the growth rates of GDP in the US and Mexico, and the real exchange rate (corresponding alternatively to the CPI-based real multilateral index or the bilateral relative unit labor cost in the manufactures).

The estimation uses quarterly series from 1986 to pre-crisis 2007. We probe the trade-balance response to the real exchange rate, and specifically whether the response has weakened over time. The motivation, as mentioned above, is the deepening of vertical specialization that may have occurred after the enactment of NAFTA in 1994. With that goal in mind, the sample was split into two equally sized sub-periods of 44 quarters each, from 1986 to 1996 (the "early" sample), and from 1997 to 2007 (the "late" sample). In addition, some equations were estimated over an "extended late" sample ending in 2010. Because of limitations in the availability of data, the sample in the equations including the relative labor cost begins in the last quarter of 1986.

[Tables 6a, b]

[8] Most of the recent research has focused on the effect of vertical specialization on income rather than exchange rate elasticities; see for example Chinn (2010).

As a preliminary step, the first column in the tables shows equations estimated with the complete series from 1986 to 2010. The estimated coefficients are signed as expected, with a negative sign for those on the speed of adjustment and on Mexico's economic growth, and a positive sign for those on US economic growth and the real exchange rate. While the equations' fit varies, most coefficients are statistically significant. The one on the US growth rate in the early sample stands as the exception, perhaps because of the smaller integration of the Mexican and US economies before NAFTA (Blecker and Esquivel 2010, 2013).

Some of the results indicate that estimation over the entire sample may not be appropriate: while as mentioned most of the coefficients are statistically significant and correctly signed, adjustment is slow and the RESET test fails. The next columns, therefore, present estimations for the split samples. They uncover, as expected, a weakening in the trade-balance response to real exchange rate variations. When measured by the CPI-based index, the level of the real exchange rate coefficient falls but remains statistically significant; when measured by the relative labor cost, the coefficient falls *and* loses its significance.

The results suggest that a shift to a more balanced pattern of growth between exports and domestic demand may be challenged by the weak response of the trade balance to variations in the real exchange rate. If the weak response persists, then faster, more balanced growth in the future may demand a larger adjustment in the real exchange rate than what was necessary in the past.

5. CONCLUSIONS

The paper studied the transmission channels behind the 2009 recession in Mexico, the reasons for the weakness of the 2010–2011 recovery, and —based on that analysis— some of the risks for sustaining faster growth in the future. Mexico was double-shocked by the retreat of foreign capital and a sharp fall in manufactured exports. How the shocks were

transmitted to GDP, however, is not self-evident. First, the retreat of capital did not force a strong adjustment in the current account deficit, and thus in domestic demand. And second, due to vertical specialization —the intensive use of intermediate imports in export production— the export fall had a minor effect on *net* external demand.

But although it left the trade balance largely untouched, the fall in exports strongly affected gross industrial production and, through that channel, private investment (fixed capital formation). Following the so-called bounds testing approach, the paper estimated equations for private investment in Mexico in the post-liberalization period. The equations show a large effect of industrial production on private investment —an effect that can account for most of the actual decline in investment observed during the recession.

Recovery began in 2010, with positive GDP growth, a rebound in manufactured exports, and a surge in foreign capital inflows. The export rebound was quite strong, and by mid-2011 exports were already 18% above their level in the same period of 2008. Since in the US —Mexico's main export market— GDP and industrial production remained depressed, the export rebound presumably reflects the beneficial effect of the depreciation —of between 15 and 18% in real terms, depending on the indicator— the peso experienced in the initial stages of the global crisis.

But in contrast to the strong rebound of exports, total activity in Mexico barely returned to its pre-crisis levels. One reason is vertical specialization: the intensive use of intermediate imports diluted the positive effect of exports on GDP, in the same way that it had cushioned the impact of the export fall during 2009. Another reason is the weakness of investment, an outcome of the persistently depressed levels of industrial production and capacity utilization in the country. With weak investment, the surge in capital inflows was not absorbed by the economy through a higher current account deficit, and instead was mirrored by large outflows of domestic capital and reserve accumulation.

The current and foreseeable mix of low interest rates and slow economic growth in developed countries may "push" large amounts of capital to middle-income countries like Mexico. While the inflows may support growth by loosening the potential external constraint on investment, they may also have the unwelcome effect of appreciating the currency. Indeed, by mid-2011, the initial, crisis-induced depreciation of the Mexican peso had largely reversed —particularly when measured by the relative unit labor cost in the manufactures. A risk for future growth is that —by squeezing profit margins in the tradables sector — the currency appreciation may depress the level of investment. The estimated equations for private investment, referred to above, show that the effect from the appreciation can be very significant.

The capital surge —and parallel currency appreciation— directs attention to the conduct of monetary policy, and how a disinflationary stance, rather than resisting them, may become an additional, "pull" factor for capital inflows. The Bank of Mexico's stance, as set by its policy rate and the resulting *nominal* interest differential with the US Fed rate, remained unchanged since the mid-2009. Given the basic facts of the Mexican economy — relatively large inflows of capital, low levels of private investment, and a basically unchanged current account balance— the nominal interest differential may have settled at too high a level. The conclusion is reinforced by the path of inflation. As the inflation gap between Mexico and the US narrowed, the *real* interest differential became positive in late 2009, and began rising in early 2011.

If the real differential merely offset rising country or currency risk, it would play no "pull" role for capital inflows; portfolio inflows, however, surged. The surge suggests that the unchanged nominal interest differential did *not* stand for a neutral policy stance, but rather one that was pulling capital in and adding to currency appreciation. While the policy stance presumably helped in cutting inflation below the Bank of Mexico's 4% upper target, it may also contribute, by the real appreciation of the peso, to a slow recovery of growth and investment in the country.

Growth immediately after the crisis proceeded slowly, with a small current account deficit, steady accumulation of reserves, and a reversal of the initial depreciation of the currency. But faster growth —particularly if featuring a stronger role by domestic demand— could create larger trade deficits. Again, this calls attention to the importance of keeping a competitive level of the real exchange rate to avoid a tightening of the external constraint. In this respect, the estimation of trade balance equations for Mexico after trade liberalization confirmed the potential role of the real exchange rate in external adjustment: they showed that, besides responding to economic growth in Mexico and the US, the trade balance responds in the expected direction to variations in the real exchange rate.

A source of concern, however, is that the vertical specialization of exports may reduce the response of intermediate imports —and hence the trade balance— to variations in the real exchange rate. The concern is bore by the estimations. They show that, in trade balance equations estimated for split samples, the value of the real exchange rate coefficient declined in the more recent sub-sample, after the enactment of NAFTA. This means that, because of vertical specialization, the real exchange rate may have become a less effective tool to avoid a tightening of the external constraint on growth in Mexico.

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Table 1. Economic activity

	2006	2007	2008	2009	2010	2011Q2 b/
GDP growth rate a/	5.2	3.3	1.2	-6.1	5.4	3.8
IPI growth rate	5.8	1.9	-0.4	-7.3	6.0	4.4
MPI growth rate	5.9	1.6	-1.0	-9.5	9.9	6.1
% of GDP a/						
Trade balance	-2.5	-2.9	-3.7	-1.6	-1.3	-0.1
Total exports	29.6	30.4	30.1	27.7	33.0	34.7
Manufactured exports	25.0	25.9	26.1	23.8	29.1	30.7
Total imports	32.1	33.3	33.8	29.3	34.4	34.8
Intermediate imports	21.8	22.3	22.5	19.7	24.4	24.4
Fixed investment	21.4	22.2	23.2	21.7	21.1	21.8
Private fixed investment	17.2	17.7	17.8	15.8	15.4	18.0
Public fixed investment	4.1	4.5	5.3	6.0	5.7	3.8
US GDP growth rate	2.7	1.9	-0.3	-3.5	3.0	1.9
US IPI growth rate	2.2	2.7	-3.7	-11.2	5.3	4.6
US MPI growth rate	2.5	2.9	-5.0	-13.5	5.4	5.0

IPI: Industrial production index, MPI: Manufacturing production index.

a/ The GDP growth rate and shares are based on National Accounts data in real terms.

b/ Growth rate with respect to the first two quarters of 2010.

Sources: National Institute of Statistics (INEGI) for Mexico's National Accounts data, IPI and MPI; US BEA for US GDP; and US Federal Reserve for US IPI and MPI.

Table 2. Balance of payments and real exchange rate

	2004-06	2007	2008	2009Q2 a/	2009	2010	2011Q2 a/ c/
% of GDP at PPP							
Financial account balance	2.1	3.2	3.4	1.2	2.4	4.6	5.5
Foreign capital inflows	4.0	7.0	4.4	2.5	4.8	8.6	9.2
Foreign direct investment	3.7	3.9	3.1	2.8	2.0	2.3	2.0
Foreign portfolio investment	0.7	1.7	0.6	-0.7	2.0	4.4	4.5
Other foreign investment	-0.4	1.3	0.7	0.4	0.8	1.9	2.7
Domestic capital outflows	1.9	3.8	1.0	1.3	2.4	4.1	3.7
Errors and omissions (outflow)	0.3	0.6	0.5	1.1	1.0	1.4	1.5
Reserve accumulation	0.9	1.4	0.9	-1.6	0.6	2.5	3.2
Current account deficit	0.8	1.2	1.9	1.7	0.8	0.7	0.9
Trade deficit	2.1	2.2	2.9	3.1	1.7	1.6	1.3
Exports	36.6	37.4	36.0	33.2	31.3	37.2	38.2
Manufactured exports	28.1	28.4	26.9	25.5	24.3	29.1	29.5
Imports	38.8	39.5	38.9	36.3	33.1	38.8	39.5
Intermediate imports	26.3	26.5	25.8	23.8	21.9	27.2	27.7
Net factor payments	2.2	2.5	2.0	1.6	1.8	1.7	2.0
Net transfers received	3.5	3.4	3.0	3.0	2.8	2.6	2.4
Real effective exchange rate	99.5	100.0	104.5	112.4	118.4	109.1	107.9
Relative unit labor cost	108.1 b/	100.0	99.7	108.9	114.1	105.6	n.a.
RULC incl maquila sector	n.a.	100.0	98.0	109.2	115.1	108.3	104.4

a/ Last four quarters; b/ 2005-06;
c/ BOP does not add up to zero due to relatively large valuation gains in the period.

Sources: Bank of Mexico for BOP data in current US dollars and real effective exchange rate;

INEGI for GDP in current pesos and relative unit labor cost; and author's calculations of the PPP exchange rate.

Table 3. Investment equations

Dependent variable: Private investment

Long-run coefficients from error-correction ARDL models

	(1)	(2) a/	(3)	(4) b/	(5)	(6) a/
Speed of adjustment, σ	-0.661	-0.667	-0.471	-0.234	-0.417	-0.366
Industrial production Index	2.53 (0.00)	2.94 (0.00)	2.32 (0.00)	3.30 (0.00)	1.82 (0.01)	3.10 (0.00)
Government investment	-0.30 (0.00)	-0.29 (0.00)	-0.36 (0.00)	0.09 (0.67)	-0.43 (0.00)	-0.41 (0.00)
Broad money supply, M2	0.75 (0.07)	0.19 (0.60)	2.17 (0.00)	0.12 (0.93)	2.43 (0.00)	0.62 (0.39)
Nominal interest rate	-0.67 (0.00)	-0.65 (0.00)	-0.56 (0.00)	-1.38 (0.00)	-0.66 (0.00)	-1.11 (0.00)
Annual inflation rate	0.35 (0.00)	0.37 (0.00)	0.30 (0.00)	0.71 (0.00)	0.24 (0.02)	0.41 (0.03)
Real effective exchange rate	0.47 (0.00)	0.57 (0.00)				
Relative unit labor cost			0.45 (0.00)	0.86 (0.00)		
Bilateral real exchange rate					0.60 (0.04)	1.33 (0.00)
Adj R-sq	0.929	0.919	0.923	0.921	0.914	0.908
Jarque-Bera	0.46 (0.79)	4.22 (0.12)	3.67 (0.16)	2.96 (0.23)	0.28 (0.87)	2.04 (0.36)
Breusch-Godfrey	0.37 (0.83)	0.51 (0.73)	0.68 (0.61)	0.34 (0.85)	0.95 (0.44)	0.63 (0.64)
ARCH	1.88 (0.17)	0.08 (0.78)	0.16 (0.69)	0.02 (0.89)	0.10 (0.75)	0.11 (0.74)
RESET	1.36 (0.25)	1.06 (0.31)	2.11 (0.15)	0.28 (0.60)	1.07 (0.31)	0.00 (0.97)
Bounds F-stat	6.89 ***	7.01 ***	6.86 ***	7.11 ***	4.78 ***	4.11 **
Sample	1988Q1-2008Q2	1988Q1-2010Q4	1988Q1-2008Q2	1988Q1-2010Q4	1988Q1-2008Q2	1988Q1-2010Q4
Number of observations	82	92	82	92	82	92

For illustrative purposes, *p*-values for the d_i coefficients from equation (1) (see main text) are shown in parenthesis next to the long-run coefficients.

Data: Private and government investment (from real National Accounts data), the industrial production index, and the three real exchange rate indices are in natural logs (times 100). The bilateral real exchange rate is equal to the CPI ratio between the US and Mexico. The annual inflation rate (based on the CPI index) and the nominal interest rate (91-day Treasury bills, annualized) are in percentage. M2 is measured as a percentage of GDP, both in nominal terms. The relative unit labor cost was lagged one year.

Diagnostics: The null hypotheses are that residuals are normally distributed (Jarque-Bera), and that there is no serial correlation of up to 4th order (Breusch-Godfrey), no ARCH errors, and no mis-specification error (Ramsey's RESET). $\chi 2$ (Jarque-Bera) and F-statistics with p-values in brackets.

Other notes:

All the models were initially estimated with 3 lags. They include a 0-1 intercept dummy for the post-Tequila crisis period, beginning in 1995Q1. The models in columns (2), (4) and (6) include a similar dummy for the Great Recession period, beginning in 2009Q1.

a/ With a 0-1 dummy for 1996Q4.

b/ With 0-1 dummies for 1996Q4 and 1994Q3.

Narayan (2005): critical I(1) F values, case III, unrestricted intercept and no trend, k=6 regressors, and n=80 observations, 1%: 4.76, 5%: 3.75.

*** (**): Rejects the null of no level relationship at 1% (5%).

Source: Author's calculations.

Table 4. Recovery

					% Variation	
	2008	2010	2008Q1-Q2 a/	2011Q1-Q2 a/	2010/2008	2011Q1-Q2 /2008Q1-Q2
Billions of 2003 pesos						
GDP	8,915	8,820	8,849	8,915	-1.1	0.7
Exports	2,687	2,912	2,706	3,096	8.4	14.4
Manufactured exports	2,324	2,570	2,315	2,738	10.6	18.3
Intermediate imports	2,009	2,155	2,005	2,172	7.3	8.3
Fixed investment	2,066	1,863	2,027	1,940	-9.8	-4.3
Fixed public investment	476	505	354	337	6.2	-4.6
Fixed private investment	1,590	1,358	1,674	1,603	-14.6	-4.2
Billions of 2005 dollars						
US GDP	13,162	13,088	13,289	13,250	-0.6	-0.3
Indices 2007 = 100						
IPI	99.6	97.9	100.9	101.2	-1.7	0.4
MPI	99.0	98.5	100.5	103.1	-0.5	2.6
US IPI	96.3	90.1	99.3	92.9	-6.5	-6.5
US MPI	95.0	86.6	98.7	89.7	-8.8	-9.2

IPI: Industrial production index, MPI: Manufacturing production index.

a/ Annualized data for GDP and its components.

Sources: INEGI for Mexico's National Accounts data, IPI and MPI; US BEA for US GDP; and US Federal Reserve for US IPI and MPI.

Table 5. Transfer of foreign capital

(billions of US dollars, last four quarters)

				Variation		
	2007	2009Q2	2011Q2	2009Q2 /2007	2011Q2 /2009Q 2	2011Q2 /2007
Balance of Payments data						
Financial account balance	24.6	9.2	49.4	-15.4	40.2	24.8
Foreign capital inflow	54.1	19.8	82.4	-34.3	62.6	28.3
Domestic capital outflow	29.5	10.6	33.0	-18.9	22.4	3.5
Error (outflow)	4.5	8.5	13.4	4.0	4.9	8.9
Reserve accumulation	10.9	-12.6	28.3	-23.5	40.9	17.5
Current account deficit	9.3	13.3	8.1	4.0	-5.2	-1.2
National Accounts data						
Fixed investment	219.0	208.9	225.1	-10.1	16.3	6.2
Public fixed investment	48.0	57.1	59.6	9.1	2.6	11.6
Private fixed investment	171.0	151.8	165.5	-19.1	13.7	-5.5
Saving (residual)	209.6	195.6	217.1	-14.1	21.5	7.4

National Accounts data, originally in current pesos, was converted to dollars at the current nominal exchange rate.

Saving was obtained as the difference between the current account deficit and fixed investment.

BOP may not add up to zero due to the rounding of figures and small valuation gains.

Sources: Bank of Mexico for balance of payments, and INEGI for National Accounts data.

Table 6a. Trade balance equations, I

Dependent variable: Trade balance, as % of GDP

Long-run coefficients from error-correction ARDL models

	Entire sample, 1986Q1-2010Q4 (1) a/	Early sample, 1986Q1-1996Q4 (2)	Late sample, 1997Q1-2007Q4 (3)	Extended late sample, 1997Q1-2010Q4 (4)
Speed of adjustment	-0.176	-0.551	-0.343	-0.221
Mexico's GDP growth rate, in %	-0.74 (0.00)	-0.58 (0.00)	-0.41 (0.01)	-0.62 (0.01)
US GDP growth rate, in %	0.95 (0.00)	0.36 (0.23)	0.60 (0.03)	0.56 (0.09)
100*ln(Real effective exchange rate)	0.13 (0.01)	0.19 (0.00)	0.11 (0.05)	0.13 (0.02)
Adj R-sq	0.460	0.645	0.569	0.539
Jarque-Bera	4.53 (0.10)	0.02 (0.99)	4.39 (0.11)	2.47 (0.29)
Breusch-Godfrey	1.55 (0.20)	0.22 (0.93)	0.69 (0.60)	0.82 (0.52)
ARCH	0.88 (0.35)	0.00 (0.99)	0.22 (0.64)	6.16 (0.02)
RESET	16.13 (0.00)	0.42 (0.52)	2.37 (0.13)	0.01 (0.93)
Bounds F-stat	5.49 **	9.30 ***	6.06 **	5.71 **
Number of observations	100	44	44	56

For illustrative purposes, p-values for the d_i coefficients from equation (1) (see main text) are shown in parenthesis, next to the long-run coefficients.

The trade balance, as % of GDP, was calculated with National Accounts data in real terms.

See Table 3 for an explanation of the diagnostic tests.

All models initially estimated with 2 lags.

a/ With 0-1 quarterly dummies for 1986Q1, 1990Q4, and 1994Q1.

Narayan (2005): critical I(1) F values, case III, unrestricted intercept and no trend, k=3 regressors:

n=80 observations, 1%: 5.96, 5%: 4.51.

n=50 observations, 1%: 6.36, 5%: 4.70.

*** (**): Rejects the null of no level relationship at 1% (5%).

Source: Author's calculations.

Table 6b. Trade balance equations, II

Dependent variable: Trade balance, as % of GDP

Long-run coefficients from error-correction ARDL models

	Entire sample, 1986Q4-2010Q4 (1) a/ c/	Early sample, 1986Q4-1996Q4 (2) a/	Late sample, 1997Q1-2007Q4 (3) b/	Extended late sample, 1997Q1-2010Q4 (4) b/ d/
Speed of adjustment	-0.239	-0.747	-0.205	-0.156
Mexico's GDP growth rate, in %	-0.50 (0.00)	-0.33 (0.00)	-0.43 (0.09)	-0.44 (0.10)
US GDP growth rate, in %	0.17 (0.37)	0.13 (0.42)	1.25 (0.04)	0.08 (0.85)
100*ln(Relative unit labor cost)	0.10 (0.01)	0.15 (0.00)	-0.02 (0.78)	0.04 (0.52)
Adj R-sq	0.677	0.676	0.531	0.656
Jarque-Bera	1.47 (0.48)	2.48 (0.29)	2.68 (0.26)	0.83 (0.66)
Breusch-Godfrey	0.55 (0.70)	1.51 (0.23)	0.86 (0.50)	0.93 (0.46)
ARCH	0.02 (0.88)	1.63 (0.21)	1.53 (0.22)	0.32 (0.57)
RESET	17.2 (0.00)	0.81 (0.38)	1.48 (0.23)	0.02 (0.88)
Bounds F-stat	5.43 **	6.87 ***	5.15 **	5.41 **
Number of observations	97	41	44	56

For illustrative purposes, p-values for the d_i coefficients from equation (1) (see main text) are shown in parenthesis, next to the long-run coefficients.

The trade balance, as % of GDP, was calculated with National Accounts data in real terms.

See Table 3 for an explanation of the diagnostic tests.

a/ Initially estimated with 2 lags. c/ With 0-1 quarterly dummies for 1989Q3, 1990Q2, and 1994Q1.

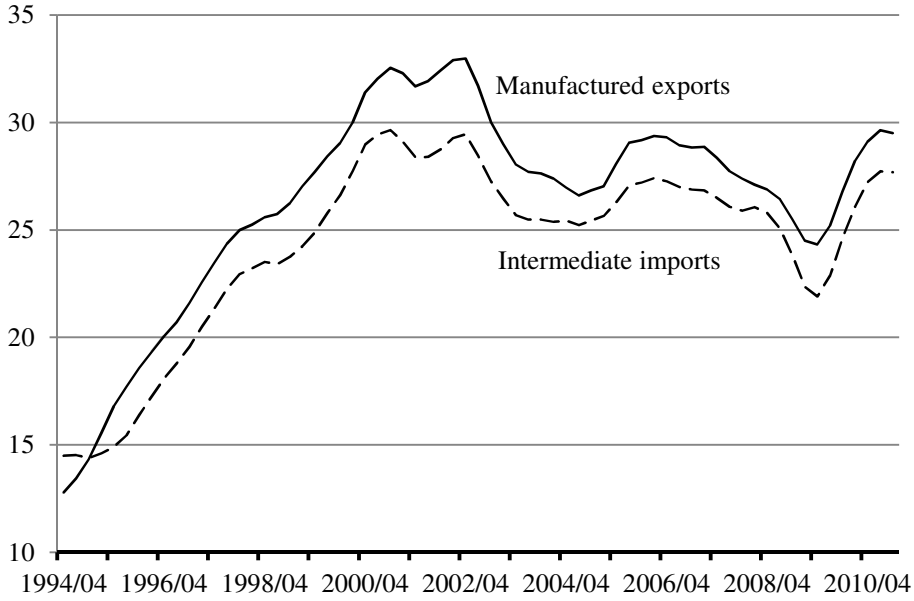
b/ Initially estimated with 1 lag. d/ With 0-1 quarterly dummies for 2002Q2 and 2005Q1.

See critical values for the bounds F-test in Table 6a.

*** (**): Rejects the null of no level relationship at 1% (5%).

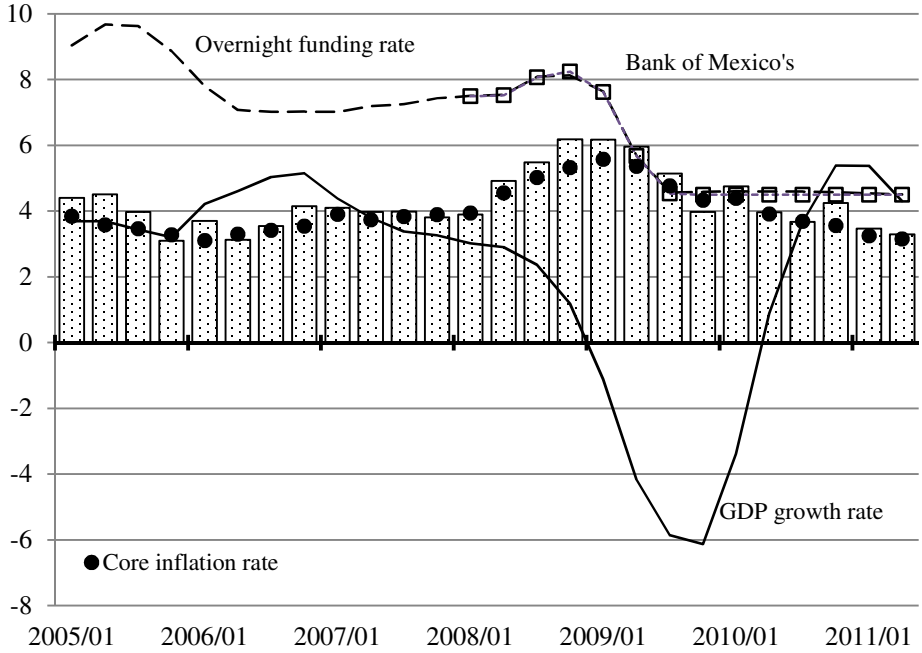
Source: Author's calculations.

Figure 1. Mexico: Manufactured exports and intermediate imports



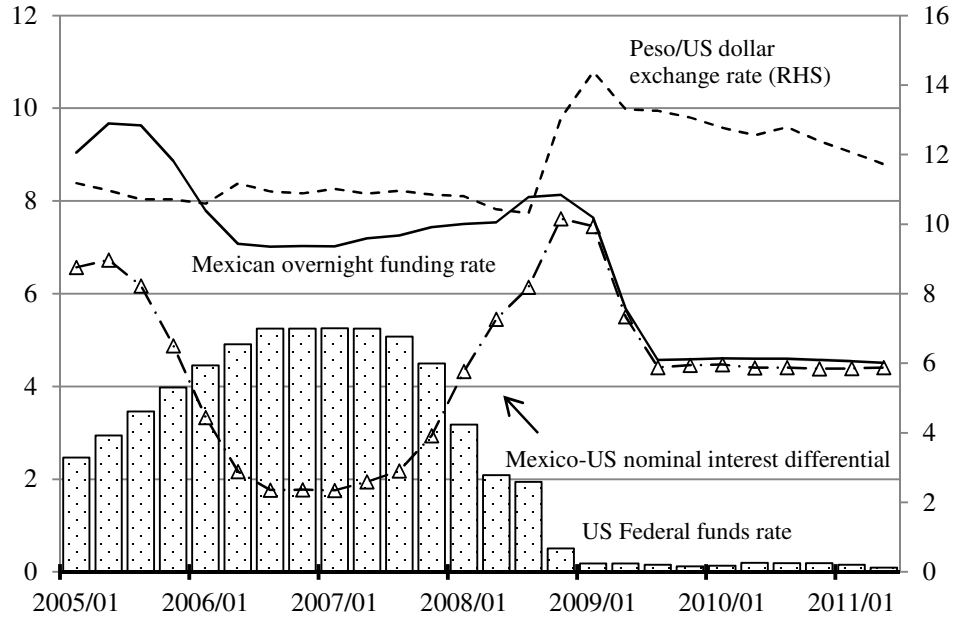
Notes: 1) 1994Q1–2011Q2. 2) Averages from last four quarters. 3) Trade flows from BOP in current dollars, as % of GDP at PPP dollars.
Source: Bank of Mexico, and author's calculations of the PPP nominal exchange rate.

Figure 2. Mexico: Inflation, GDP growth, and interest rates



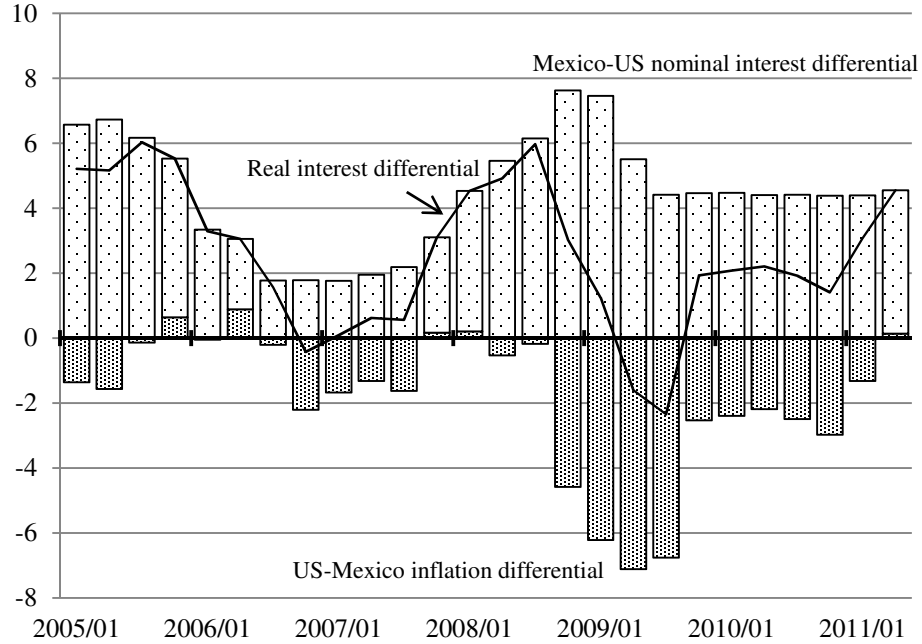
Notes: 1) 2005Q1-2011Q2. 2) All variables in %. 3) Inflation is the yoy change in the CPI index. 4) The GDP growth rate is the yoy rate, using 4Q-moving averages of the original GDP series.
Source: Bank of Mexico, INEGI, and US BLS.

Figure 3. Exchange rate and nominal interest rate differential



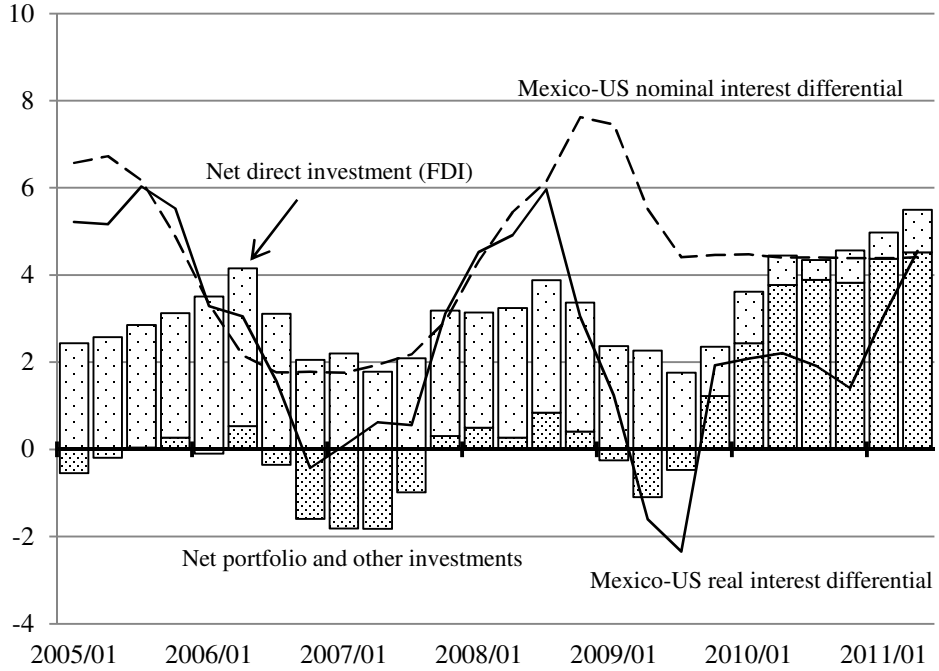
Notes: 1) 2005Q1-2011Q2. 2) All variables in %, except the peso/dollar exchange rate.
Source: Bank of Mexico and US Federal Reserve.

Figure 4. Real interest rate differential



Notes: 1) 2005Q1-2011Q2. 2) All variables in %.
3) Nominal interest differential=(Mexican overnight funding rate)–(US Fed rate).
Source: Bank of Mexico and US Federal Reserve.

Figure 5. Capital inflows and interest differentials



Notes: 1) 2005Q1-2011Q2. 2) 4Q cumulative inflows, equal to the difference between foreign capital inflows and domestic capital outflows, in % of GDP at PPP.
Source: Bank of Mexico, INEGI for nominal GDP, author's calculations of the PPP exchange rate, and US Federal Reserve.