Investment, asset market, and the relative unit labor cost in Mexico

Carlos A. Ibarra (*)

Department of Economics
Universidad de las Américas Puebla
Ex Hacienda Santa Catarina Mártir s/n
Cholula, Puebla 72820 Mexico
carlos.ibarra@udlap.mx

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Abstract
The paper estimates equations for the Mexican/US manufacturing relative unit labor cost (RULC), and finds significant effects from asset market variables like interest rate differentials, foreign reserve accumulation, and international capital flows. The equations are motivated by a simple decomposition that reveals the large role played by relative manufacturing prices—and hence the nominal exchange rate—in the upward trend of RULC. The paper also estimates equations for aggregate private investment in Mexico, finding a negative RULC effect that agrees with the recent literature on the real exchange rate's profitability (or development) channel. The estimations apply the bounds testing approach to quarterly data from 1988 to 2013 to obtain long-run effects. Together, the results imply that the disinflationary stance of monetary policy and repeated surges in capital inflows contributed to the upward trend in RULC, which in turn affected Mexico's growth negatively by its depressing effect on investment.

Keywords: Relative unit labor cost (RULC); real exchange rate determinants; international capital flows; foreign reserve accumulation; real interest rate differentials; investment determinants; real exchange rate's profitability channel; bounds testing approach; Mexico.

JEL codes: C22, E22, F21, F32, F43, O11, O54.

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1 Introduction

Mexico stands out in the world economy for having embarked in deep reform—through a program of privatization, trade liberalization, and a successful drive to expand manufacturing exports—and yet failing to achieve high rates of economic growth. Thus, for the period 1988 to 2013, its average GDP growth rate was only 2.6% per year. This was a period characterized not only by reform but also by a long process of disinflation, surges in international capital inflows, and real currency appreciation. From an asset-market perspective, the combination of repeated capital surges and a prolonged disinflationary stance in monetary policy may have contributed to the real appreciation of the currency, by their effect on the nominal exchange rate. Moreover, according to the recent literature on the link between real exchange rate (RER) levels and growth rates in developing countries, the appreciation may have contributed to the country's slow GDP growth, by its depressing effect on profitability—and hence investment—in the tradables sector.

Thus, the questions of whether asset-market variables have a significant effect on the real exchange rate (RER), and whether the latter has a significant effect on investment, are potentially important for understanding the slow growth of the Mexican economy in its post-liberalization period. The present paper takes up these two questions, using the Mexican/US manufacturing relative unit labor cost (RULC) as RER indicator. In particular, the paper presents two separate sets of estimations. First, the paper estimates equations for the determination of RULC that test for a significant effect from asset market variables. The econometric estimations are motivated by a simple decomposition that uncovers the large role played by relative manufacturing prices in the upward trend of RULC. The asset market variables considered include the short-term

peso–dollar real interest rate differential and the Bank of Mexico's accumulation of foreign reserves (as indicators of the stance of monetary policy), and international capital flows, either total or disaggregated into their four major components (foreign direct, portfolio, and other investments, and domestic capital outflows).

Second, the paper estimates equations for the determination of aggregate private investment in Mexico. The estimations explore whether, after controlling for more traditional relative-price channels like manufacturing exports and industrial production, variations in RULC have a direct effect on private investment, as posited by the recent literature on the RER's profitability (or development) channel.[1] The motivation is that variations in the manufacturing RULC can be an indicator of changes in the profitability of tradable activities more generally (see for example Tressel and Wang 2014), which in turn may affect aggregate investment levels.[2]

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1 For alternative theoretical approaches, see Ros and Skott (1998), Frenkel and Ros (2006), Levy-Yeyati and Sturzenegger (2007), Gala (2008), Korinek and Serven (2010), Ros (2014). These studies are part of the literature, already too large to cite here, on the link between real exchange rate levels and economic growth in developing countries.

2 Studies of the RER's effect on economic activity in Mexico have reached mixed results. For example, Blecker (2009) studies the period 1980–2007 and finds that a real depreciation of the peso increases the country's GDP growth rate, while in contrast López et al. (2011), studying practically the same period (1980–2006), find that a real depreciation reduces Mexico's GDP level (see also Galindo and Ros 2008, Garcés-Díaz 2008). Regarding the RER's effect on investment, Blecker (2009) finds a negative one (although this is offset by a positive effect via GDP growth), while Ibarra (2011b), studying the period 1988–2006, finds a positive one (see also Ramírez 1994, Lederman et al. 2003, Pérez 2004). As usual, the differences in results may reflect differences in estimation methodology (in particular, whether the latter better captures short- or long-run effects) and, relatedly, in the measurement of variables (notably, whether the

Since RULC in this paper is calculated as the manufacturing unit labor cost ratio between Mexico and the US, an increase can be interpreted as a real appreciation of the peso. The ease of interpretation of the observed changes in RULC compared to other RER indicators—which generally are based on aggregate consumer price indices—may explain why studies of macroeconomic adjustment in advanced countries often rely on this indicator (for recent examples, see Kang and Shambaugh 2014, Pancotto and Pericoli 2014).[3] This, however, has not been the case in studies of Mexico, which typically turn to consumer price-based indicators.[4]

Besides its relative ease of interpretation, another attractive feature of RULC is that it can be decomposed into relative real wages (adjusted for labor productivity) and relative manufacturing prices (adjusted for the nominal exchange rate). This makes it possible to determine whether an increase in RULC, for example, is related to an excessive increase in wages, or instead to an increase in Mexican relative prices—which would imply a failure of the nominal exchange rate to offset an inflation differential between the Mexican and US manufacturing sectors. The "deeper" determinants of the increase in RULC are likely to be

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latter are measured in levels or first differences). In addition, in Mexico's case the results may change depending on whether the estimation sample combines or not observations corresponding to the pre- and post-liberalization periods, as the RER's macroeconomic effects are likely to depend on the economy's degree of openness.

3 Although even in the case of RULC there may be ambiguities in the interpretation; for two different views, see Lipschitz and McDonald (1991), and Felipe and Kumar (2011).

4 A possible explanation is that studies of developed countries can resort to a variety of unit labor cost measures, including for the whole economy, while those of Mexico must rely on a measure for the manufacturing sector alone. Of course, a premise of this paper is that RULC is affected by macroeconomic factors and can have macroeconomic effects.

different in each case. As mentioned above, the results of the decomposition—which uncover a large role played by relative prices—inform the specification of the RULC equation in the econometric estimations.[5]

The estimations use quarterly series from the post-liberalization period 1988–2013, following the bounds testing approach of Pesaran et al. (2001). The approach has several advantages. First, it produces estimates of persistent, long-run effects based on data in levels (instead of the short-run, more transitory effects associated to first-differenced data); thus, the

[5] Some authors have studied the long-run effect of asset market variables on Mexico's RER; while they use different estimation methodologies—typically applied to quarterly data—the studies always rely on a RER indicator based on aggregate consumer prices or GDP deflators, in contrast to the present paper, which uses a manufacturing relative cost indicator. Dabós and Juan-Ramón (2000) and Joyce and Kamas (2003) study the periods 1982–1998 and 1976–1994, respectively, a find a significant, long-run effect of capital flows on Mexico's RER; they do not explore whether different types of capital flows may have different effects, and do not incorporate interest rate differentials into their analyses. López-Villavicencio and Raymond-Bara (2006), on the other hand, find a significant effect from the peso–dollar interest rate differential during the period 1960–2005, but do not incorporate capital flows into their estimations; moreover, it is not immediately clear how to interpret the effect of interest differentials in the period before 1990, when international financial flows in Mexico were highly controlled. Ibarra (2011c) focuses on the post-liberalization period 1990–2006 and finds significant effects from the peso–dollar interest rate differential, but again does not incorporate capital flows into the analysis. Finally, Ibarra (2011b) considers both capital flows and interest rates, but fails to find robust effects from reserve accumulation, the dollar interest rate, and total capital flows and some of its components; these shortcomings may be related to the estimation sample (1988–2008), which leaves out the post-global crisis period, which in Mexico has featured large increases in foreign portfolio inflows, domestic capital outflows, and foreign reserve accumulation. Including post-2008 data may thus be expected to yield more significant results.

estimations in the paper do not impose the condition that asset-market variables have a short-run effect only on our real exchange rate indicator, in contrast to a frequent practice in the literature (see MacDonald 2007 for a discussion). Second, the estimation method corrects for possible regressor endogeneity, thanks to the rich lag structure of an underlying autoregressive distributed lag (ARDL) model (see Pesaran and Shin 1998). Third, the bounds testing's single-equation approach is flexible enough to incorporate a relatively large number of regressors and combine stationary and non-stationary variables—specifically, variables integrated of order zero or one, which is a feature of our data (unit root test results are available from the author upon request).[6]

The paper is organized as follows. Section 2 analyzes the determinants of RULC, first by decomposing it into relative wages and prices, and then by econometric estimations. Section 3 presents the estimates for the private investment equation. Section 4 concludes, while an appendix details data sources and definitions.

2 RULC determinants: decomposition and econometric analysis

Unit labor costs measure the average labor cost of producing one unit of output. Denoting by C the unit labor cost in the Mexican manufacturing sector, and by C* the corresponding cost in the US (both in US dollars, to be comparable), the Mexican/US relative unit labor cost

[6] The need to include a relatively large number of regressors, while working with the typically limited size of a macroeconomic dataset (in our case, 104 quarterly observations), makes it impractical to use a simultaneous-equation method like the vector error-correction model; this is particularly so because the regressors in the RULC and private-investment equations are not the same.

(RULC) is C/C*. An increase in RULC makes the home manufacturing sector less competitive, and thus is generally interpreted as a real appreciation of the currency.

In Mexico during the post-liberalization period 1988–2013, there were three stages in the evolution of RULC (see Figure 1). From 1988 to 1993 RULC increased by 68%, reflecting a steady rise in Mexico's own cost. This initial increase was eliminated by the depreciation of the peso during the 1994–95 currency crisis. After the crisis, however, RULC began to increase again, and by 2001 it was 73% higher than in 1996. In contrast to the previous stage, this time the appreciation resulted from both an increase in Mexico's cost and a decrease in the US one. Finally, from 2002 to 2013, RULC fluctuated widely but without a clear trend. As a net result, by 2013 RULC was 71% higher than in 1988.

<<*Figure 1*>>

An attractive feature of using RULC as RER indicator is that it can be decomposed into relative real wages (adjusted for labor productivity) and relative manufacturing prices (adjusted for the nominal exchange rate; see van Ark et al. 2005). Thus,

$$(1) \qquad \frac{C}{C^*} = \frac{W/SY}{W^*/Y^*} = \left\{\left(\frac{W}{PY}\right) / \left(\frac{W^*}{P^*Y^*}\right)\right\}\left\{\frac{P}{SP^*}\right\},$$

where W and W* are the Mexican and US nominal wages, S is the nominal exchange rate (pesos per dollar), Y and Y* are indices of Mexican and US labor productivity, and P and P* are the manufacturing price indices. As can be seen, the real wage corresponds to the product wage (that is, the nominal wage deflated by the sector's own price index). According to equation (1), RULC

may increase because of an increase in the relative real wage, (W/PY)/(W*/P*Y*), and/or an increase in relative manufacturing prices, P/SP*.[7]

The decomposition of RULC in this paper was carried out using two alternative pairs of price indices: the US and Mexican manufacturing producer price indices (PPIs), and the respective manufacturing value-added price deflators (see the appendix for details on data sources and definitions). While the decomposition results depend to some extent on the choice of price index, a general conclusion is that the increases in RULC are associated to increases in both relative real wages and relative manufacturing prices (see Table 1, and Figures 1 and 2). Moreover, the increases in relative manufacturing prices are always quantitatively important. This is most clearly seen when using value-added deflators, in which case relative prices are the main component of the increase in RULC during each of the two initial stages mentioned above, and also during the entire period 1988–2013. While relative prices become less important when using PPIs, they remain an important component during those two stages (see the last two rows in sections A and B of Table 1).

<<*Table 1, Figures 2 and 3*>>

The large role played by relative manufacturing prices suggests that the persistent increases in RULC may be partly driven by developments in the asset market, through their effect on the nominal exchange rate. In the Mexican case, two developments are worth mentioning. First, Mexico went through a very long period of disinflation, from the late 1980s to

[7] In what follows, "relative real wages" and "relative manufacturing prices" will always refer to the variables adjusted for labor productivity and the nominal exchange rate, respectively.

the early 2000s, which coincides with the two major stages of increases in RULC; indeed, the evolution of RULC mirrors the disinflationary path of the Mexican economy (see Figure 4). Thus, the restrictive bias of monetary policy associated to disinflation (Ramos-Francia and Torres 2005, Galindo and Ros 2008) may be one factor behind the upward trend in RULC.

Second, the two major stages of increase in RULC correspond to capital surge episodes (see Figure 5). The increase in the demand for peso assets and corresponding appreciation pressures on the nominal exchange rate may be one reason for the increases in RULC. A formal analysis of this effect, however, must consider several elements. First, the composition of capital flows changed notably over time, with a shift from portfolio investments in the early 1990s, to foreign direct investment (FDI) in the late 1990s and early 2000s, and to portfolio investments again, plus an increase in domestic capital outflows, in recent years.[8] Second, in the early 2000s RULC stabilized at a high level—roughly similar to the peak observed before the peso crisis of 1994–95—even though net capital inflows were smaller than before. Thus, capital inflows may matter but they are not the sole influence on RULC. Finally, foreign reserve accumulation by the central bank has increased in recent years, at times tracking very closely the evolution of net capital inflows. This may have cushioned their impact on RULC.

<<Figures 4 and 5>>

8 Changes in composition may have important effects. Recent multi-country studies suggest, for example, that FDI may have a smaller appreciation effect—or even a depreciation effect—on the real exchange rate, when compared with foreign loans or portfolio investments (see Athukorala and Rajapatirana 2003, Bakardzhieva et al. 2010, Combes et al. 2011).

The above effects can be tested formally through the estimation of RULC equations. The estimations will follow the bounds testing approach of Pesaran et al. (2001), which involves several steps. The starting point is the estimation of an ARDL model in error-correction form,

(2) $$\Delta RULC_t = \sum_{j=1}^{n} a_j \Delta RULC_{t-j} + \sum_{i=1}^{k} \sum_{j=0}^{n} b_{i,j} \Delta Q_{i,t-j} + \sigma RULC_{t-1} + \sum_{i=1}^{k} d_i Q_{i,t-1} + d_0 + e_t,$$

where Δ indicates the first difference, there are k potential determinants Q_i of RULC, $-\sigma$ measures the speed of adjustment (or error correction) of RULC toward its long-run equilibrium, which is defined by equation (3) below, and e is a residual.

Next, the existence of a long-run relationship can be determined by two separate tests. The first is a t-test on the significance of σ. For a level relationship to be established without ambiguity—that is, regardless of the order of integration of the variables—the absolute value of the t-statistic must be larger than the test's upper critical value (or upper bound), as calculated by Pesaran et al. (2001). The second is an F-test for the null hypothesis that σ and the level coefficients d_i in equation (2) are jointly equal to zero. Again, for a level relationship to be established without ambiguity, the F-statistic must lie above the test's upper bound.

Finally, once the existence of a long-run relationship has been established, the model can be simplified by removing the longest non-significant lags of each first-differenced variable, after which the long-run equation can be retrieved from the estimated ARDL coefficients as,

(3) $$RULC_{LR} = \delta_0 + \delta_1 Q_1 + \delta_2 Q_2 + \cdots + \delta_k Q_k,$$ where $\delta_i = -d_i/\sigma$.

The estimations consider a large number of RULC determinants, organized in three groups: controls, monetary policy indicators, and international capital flows. First, inspired by the literature on real exchange rate determination, the controls include the real price of oil (as the major component of the country's terms of trade index, which is also used in an alternative specification), the Mexican/US relative government consumption (as an indicator of relative demand for non-tradables), and the Mexican/US relative industrial production index. This latter variable, intended to capture the Balassa–Samuelson effect, is interpreted here as an indirect indicator of relative productivity in the tradables sector.[9] Standard macroeconomic theory suggests that increases in relative tradable productivity, the country's terms of trade, or government consumption should cause a real currency appreciation—in our case, an increase in RULC.

Second, as indicators of the monetary policy stance, the estimated equations include the Bank of Mexico's accumulation of foreign reserves and the short-term peso–dollar real interest rate differential. The real interest differential was calculated as the difference between the nominal interest rate differential between Mexico and the US, and the inflation differential between the same countries. The nominal interest differential corresponds to the difference

9 While data are available, the Mexican/US manufacturing relative labor productivity cannot be included directly in the estimations because that would create a built-in correlation between the regressor and the dependent variable (recall the definition of RULC in equation 1). As an alternative to the Balassa–Samuelson effect, the coefficient on relative industrial production could reflect a positive effect of industrial production on employment and hence on the workers' bargaining position. An analysis of this possibility is left for future research.

between the 91-day Mexican Treasury bill rate and the US Federal funds rate.[10] An increase in the peso interest rate (or in the nominal peso–dollar differential) raises the expected return on peso investments, which should encourage the demand for peso assets, appreciate the peso, and increase RULC; an increase in the dollar interest rate or the inflation differential should have the opposite effect. Reserve accumulation, on the other hand, reduces the supply of dollar assets to the private sector and is expected to depreciate the peso and decrease RULC.

Finally, the estimated equations include international capital inflows, either their total net amount (corresponding to the financial account balance in the balance of payments) or disaggregated into their four major components (foreign direct, portfolio, and other investments, and domestic capital inflows). A larger inflow raises the demand for peso assets, and therefore is expected to appreciate the peso and increase RULC.[11]

The estimation sample uses quarterly series from 1988 to 2013. Based on Akaike's criterion and the results of diagnostic tests (mainly for residual normality and serial correlation), the ARDL models were estimated with one or two lags. The choice of lag number also took into account the number of variables entering each estimated equation. Most of the equations

10 The Bank of Mexico's policy rate was introduced very recently, in 2008, which is why the estimations rely on the 91-day Mexican Treasury bill rate as an alternative indicator of the Bank's policy stance.

11 Note that domestic capital is measured here as an inflow (to facilitate the comparison with the estimated coefficients on the different types of foreign capital inflows); a net outflow, therefore, implies a negative value for the domestic capital variable, as observed very clearly since the mid-2000s (see Figure 5).

including capital flows, for example, were estimated with only one lag, since the disaggregation of capital flows increases significantly the number of regressors, while the size of the estimation sample is relatively small (104 quarterly observations). Finally, to pass the residual normality test, the majority of equations include outlier dummies for the first quarter of 1995 and the second quarter of 2006, but minor variations are noted in the tables.

The estimation results are presented in Table 2 (excluding capital flows) and Table 3 (including them). Column (2.1) shows an equation that includes the controls plus the components of the real interest rate differential, initially keeping the nominal peso and dollar interest rates separated.[12] The diagnostic tests are clearly passed, the existence of a long-run relationship is supported at 1% rather than 5%, and the speed of adjustment is relatively large at 0.33. The coefficients on the relative industrial production and the oil price are statistically significant and have the expected sign—although the coefficient on relative government consumption is not significant and shows an unexpected negative sign.

<<*Table 2*>>

The estimated coefficients indicate that an increase in either the US dollar interest rate or the inflation differential tends to reduce Mexico's relative cost, while an increase in the peso interest rate has the opposite effect. The positive sign of the peso interest rate coefficient is consistent with the existence of a policy effect of the interest rate on the relative cost, and is

12 To obtain more precise estimates, the equation includes interactions of the peso interest rate (or, in latter specifications, the nominal interest rate differential) and the inflation differential with 0–1 dummies for two atypical periods, namely, the transition from very high to moderate inflation rates in Mexico, 1988Q1–1989Q4, and the Lesser Depression, 2008Q4–2013Q4.

contrary to a reverse causality hypothesis based on fear of floating (Calvo and Reinhart 2002, Galindo and Ros 2008) or to the joint effect of a third variable (say, a shift in investor preferences; Blanchard et al. 2010). Assume a peso depreciation (which by definition would reduce the value of RULC) induces the central bank to tighten and raise the peso interest rate, or that an exogenous shift in investor preferences away from peso assets jointly increases the peso interest rate and depreciates the peso; in both cases RULC and the peso interest rate would be negatively correlated, contrary to the positive correlation shown by the estimations.[13]

The remaining columns in Table 2 explore the sensitivity of the previous results to changes in specification. Column (2.2) replaces the peso and dollar interest rates with their difference as a single regressor, following the result of the Wald test in column (2.1).[14] Column (2.3) replaces the oil price with the Bank of Mexico's terms of trade index. Finally, since the coefficient on relative government consumption keeps showing an unexpected negative sign, column (2.4) omits this variable. In all cases, the results are qualitatively similar to those presented in column (2.1), including a significant effect of the interest and inflation differentials on RULC.

13 From another perspective, the negative correlation possibly caused by reverse causality or shifts in investor preferences means that—to the extent that the ARDL framework does not completely eliminate the endogeneity bias—the estimated coefficient on the interest rate represents a lower bound on the true effect of the interest rate on RULC.

14 Note that the Wald tests in the remaining columns do not support further collapsing the real interest differential into a single regressor.

Table 3 presents equations that include capital flows and reserve accumulation as additional determinants of RULC (and omit relative government consumption, which kept showing a negative coefficient). The initial specification in column (3.1) includes total capital inflows as a single regressor. The bounds tests support the existence of a long-run relationship, the majority of diagnostic tests are fine (although the RESETs barely pass at 10%), and the signs on the estimated coefficients are the expected. The latter show that total capital inflows tend to increase Mexico's relative cost, while reserve accumulation has the opposite effect. The results are not entirely satisfactory, though, in that the coefficients on reserve accumulation and the interest differential, while correctly signed, are small and not statistically significant.

Thus, in a next step total capital inflows were disaggregated—again, supported by a Wald test—into FDI, foreign portfolio investment, other foreign investments, and domestic capital inflows (column 3.2). The estimates reveal that the different types of capital inflows have qualitatively the same increasing effect on RULC, but that quantitatively the individual effects are different. In particular, FDI appears to have a stronger appreciation effect than the other types of inflows, including portfolio investment; the difference, in most specifications, is statistically significant according to a Wald test. The result contrasts with recent multi-country studies, which conclude that FDI is relatively benign in its effect on the real exchange rate (see footnote 8).[15]

15 A possible reason is that FDI affects RULC twice, not only through the nominal exchange rate but also through an increasing effect on manufacturing wages, a possibility that is left for future research.

Another interesting result is that, after controlling for capital inflows, the interest rate differential continues to have a significant effect on RULC. This effect is even larger if we include the peso and dollar interest rates as separate regressors (column 3.4). The result suggests that monetary policy can have a direct effect on Mexico's relative cost (presumably, by its effect on the nominal exchange rate), beyond the indirect, "pull" effect of the interest differential on the size of capital inflows. Also, reserve accumulation keeps showing a significant offsetting effect on RULC, which is quantitatively similar (but in the opposite direction) to that of capital inflows. In fact, controlling for the effect of reserve accumulation is important to obtain good estimates of the effect of capital inflows. If reserve accumulation is omitted, then the estimated coefficients on domestic capital inflows and other foreign investments become statistically not significant (see column 3.3). Overall, the evidence indicates that monetary policy, through adjustments in the peso interest rate and/or the pace of reserve accumulation, can cushion the impact of capital flows and the dollar interest rate on RULC.[16]

<<Table 3>>

3 RULC and the determination of private investment

Having shown the significant effect of asset market variables on RULC, this section tests for the possible effect of RULC on private investment (gross fixed capital formation) in Mexico.

16 Reserve accumulation in Mexico has resulted mainly from off-the-market operations between the central bank and the public sector—including PEMEX, the state oil company (see Adler and Tovar 2011). It remains to be seen whether the effect on RULC can be even stronger if reserve accumulation is carried out through *market* interventions by the Bank of Mexico (which could switch on portfolio-balance and/or expectational effects).

The estimation sample runs again from the first quarter of 1988 to the last quarter of 2013. The estimations control for standard macroeconomic determinants of investment, including the industrial production index (which in one specification is joined by manufacturing exports, both of them to control for the effect of economic activity on investment[17]), government investment (to control for either substitution or complementary effects), the broad money supply M2 (as a rough and ready indicator of credit levels), and the real interest rate (as an indicator of cost of credit) split into the nominal interest rate and the inflation rate. Also, following the literature on the aftermath of financial crises (see Reinhart and Tashiro 2013, Chari and Henry 2014), the estimations control for the persistent falls in private investment levels that took place in Mexico in the wake of the 1995 (Mexican) and 2008 (global) crises. This is done by including separate 0–1 dummies for the periods 1995–2008 and 2009–2013. Finally, the majority of equations include a single outlier dummy for the first three quarters of 2013 (to pass the residual normality test), but minor variations are noted in the tables.

Following again the bounds testing approach, the long-run equation to be estimated has the general form,

$$(4) \qquad PI_{LR} = \varepsilon_0 + \varepsilon_1 Z_1 + \varepsilon_2 Z_2 + \cdots + \varepsilon_k Z_k$$

[17] Using industrial production instead of GDP eliminates the risk of a spurious correlation with investment (since private investment is a relatively large component of GDP), and also takes into account the previous finding that investment in Mexico responds more strongly to tradable than to non-tradable output (see Lederman et al. 2003).

where private investment (*PI*) is a function of *k* potential determinants *Z*, including among them RULC or its two major components, namely, relative manufacturing prices and relative real wages. In general, the estimation results were better when RULC or its components were lagged one year, which is the specification presented in the majority of equations, but it is also shown that similar qualitative results are obtained if the current value of RULC is used.

Table 4 presents estimated equations that include RULC, while Table 5 presents equations that include the RULC components. Column (4.1) starts with a simple specification that considers, besides RULC, the industrial production index and government investment, plus the two post-crisis dummies. Despite its simplicity, the equation shows very good diagnostics, adjustment is fast at 0.51, and the two bounds tests support the existence of a long-run relationship at 1%. The estimates reveal a significant effect of industrial production on investment, with an elasticity of about 3. Government investment, on the other hand, appears to have a substitution effect—perhaps reflecting the retreat of government investment and the privatization of economic activity during the period (see Pérez 2004 for a similar result).[18] Finally, the estimates for the two post-crisis dummy coefficients indicate a permanent fall of more than 2% in the level of private investment, for given levels of the other variables.[19]

<<Table 4>>

18 The result contrasts with estimations for the pre-1988 period, when the government participated more heavily in the economy and there was evidence of complementarity with private investment (Ramírez 1994).

19 The figure comes from dividing the estimated value of the two post-crisis dummy coefficients by the level of private investment at the onset of each crisis (1994 and 2008, respectively).

Turning to our main point of interest, the estimates show a negative, highly significant RULC coefficient. The negative sign of the coefficient is relevant for the interpretation of results, as RULC and investment may be correlated for reasons other than the profitability effect. In particular, an exogenous increase in the world demand for Mexican assets could result in larger capital inflows, higher levels of capital formation, and a nominal appreciation of the peso, which by definition would increase RULC and yield a positive correlation with investment. Thus, the negative correlation obtained in the estimations supports a causal interpretation running from RULC to investment, rather than the joint effect from an exogenous change in the demand for Mexican assets. This causal interpretation is further supported by the fact that RULC is lagged one year in the regressions.[20]

The remaining columns in Table 4 explore the robustness of the RULC effect to changes in specification. Column (4.2) includes the current value of RULC. The bounds tests keep supporting the existence of a long-run relationship between the variables, although in this specification the ARCH tests and one version of RESET are less satisfactory, while the coefficient on government investment loses statistical significance. Column (4.3) adds manufacturing exports, while retaining the industrial production index; the addition ensures that the RULC coefficient is not capturing indirectly an activity effect on investment (rather than a

[20] Again, to the extent that the ARDL estimation does not totally eliminate the bias introduced by regressor endogeneity, the estimated RULC coefficient represents, in absolute terms, a lower bound on the true effect of RULC on investment, since co-determination by a third variable of the sort discussed in the text would tend to produce a positive correlation between the two variables. See Bahmani-Oskooee and Hajilee (2010) for further discussion supporting the use of the bounds testing approach to estimate long-run effects on investment.

profitability effect) via exports.[21] The export coefficient is relatively large (considering that the equation already control for industrial production) and positively signed, as expected, although its *p*-value is slightly above 10%; in addition, while the *t* bounds test does not support the existence of a long-run relationship, the *F* test does. Finally, column (4.4) adds the broad money supply M2 and the components of the real interest rate to the original specification. In all cases, the RULC coefficient remains negative and highly significant in statistical terms, with no major change in its absolute value.

Table 5 presents investment equations in which RULC is replaced by its two components, namely, relative manufacturing real wages and prices. The specifications are otherwise similar to those in Table 4, except for the inclusion of a linear trend, which improves the estimation results. Thus, column (5.1) controls for government investment and the industrial production index, plus the post-crisis dummies. As can be seen, relative prices have a negative, highly significant coefficient, which in fact is larger in absolute terms than the RULC coefficient in the analogous equation shown in column (4.1) (–0.66 versus –0.25). The coefficient on the relative real wage, in contrast, is practically equal to zero.

The remaining columns in Table 5 present alternative specifications. Column (5.2) adds the broad money supply plus the components of the real interest rate. Columns (5.3) and (5.4) present similar equations but using the value-added price deflators to calculate relative prices and

21 In addition, including manufacturing exports (together with industrial production) helps to control for the negative effect the penetration of Chinese exports into the US market in the 2000s—which contributed to the stagnation of Mexico's market share (see Blecker 2014)—may have had on investment in Mexico.

real wages. In all cases, the coefficient on relative prices remains large, negative, and highly significant in statistical terms, while that on relative real wages does not. These results imply that the RULC effect on investment is associated with changes in relative prices rather than with relative wages, which again stresses the important role played by asset market developments that affect the nominal exchange rate and therefore relative prices.

<<*Table 5*>>

4 Conclusions

The Mexican/US manufacturing relative unit labor cost (RULC) showed large, persistent increases during the 1988–2013 post-liberalization period in Mexico; as a result, by 2013 its level was 70% higher than in 1988. A simple decomposition shows that this was related to increases in the Mexican/US relative manufacturing prices (although increases in the productivity-adjusted, relative real wages also played a part). Since relative prices are adjusted by the nominal peso/dollar exchange rate, the decomposition suggests that the increases in RULC may be partly explained by developments in the asset market, through their effect on the nominal exchange rate.

The paper presented evidence of significant long-run effects of international capital flows, foreign reserve accumulation, and the components of the short-term peso–dollar real interest rate differential on RULC. The evidence was derived from bounds testing regressions using quarterly data from the years 1988 to 2013. The four major types of capital inflows (foreign direct, portfolio and other investments, and domestic capital inflows) tend to increase

Mexico's relative cost, and—contrary to the finding in recent multi-country studies—the effect from foreign direct investment tends to be larger than that from other types of inflows. Reserve accumulation, on the other hand, has a negative, offsetting effect, with an absolute magnitude that is similar to that of capital inflows. Finally, the components of the real interest differential also have the expected effect on RULC, including an increasing one from the peso interest rate. The positive sign of the coefficient on the peso interest rate (or on the nominal peso–dollar interest differential) is consistent with the existence of a policy effect of the interest rate on Mexico's relative cost (presumably channeled through the nominal exchange rate).

Variations in the manufacturing RULC may indicate changes in the relative profitability of tradable activities more generally, and through this channel they may affect aggregate investment levels. To test this proposition, the paper studied the determination of private investment in Mexico. Focusing again on the post-liberalization period, bounds testing regressions uncovered evidence of a long-run effect of Mexico's relative cost on private investment. The result cannot be explained by the indirect effects of RULC on manufacturing exports and industrial production, since the regressions controlled for these variables; hence, the result may reflect the operation of the real exchange rate's profitability (or development) channel, as recently discussed in the literature. Interestingly, the RULC effect on investment appears to come from the underlying variations in relative manufacturing prices rather than in real wages, which suggests that developments in the asset market are transmitted to private investment through their effect on the nominal exchange rate and relative prices.

The above results imply that large capital inflows and the restrictive bias of monetary policy during disinflation (as reflected in the level of short-term interest rate differentials) can have a negative effect on private investment, and hence on medium-term growth, by their effect on the relative labor cost. This is a possible factor in the well-known problem of slow economic growth of Mexico, which after liberalizing its trade regime faced repeated surges in capital inflows and experienced a long process of disinflation. From a more normative perspective, the results imply that monetary policy can be useful to cushion the impact of capital flows and the dollar interest rate on RULC, through adjustments in the peso–dollar interest differential and/or the pace of foreign reserve accumulation.

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Appendix. Data sources and definitions

RULC equations:

Relative unit labor cost, RULC: Natural log (times 100) of the Mexican/US ratio of the manufacturing unit labor cost, in US dollars. The original seasonally-adjusted, monthly series based on the years 1980 (up to 1992), 1993 (1993–2008), 2003 (2009–2010), and 2008 (2011–2013) were quarterly-averaged and spliced. The original source added the maquiladora sector to the series based on the year 2008. The quarterly data before 1989 were interpolated from the annual series, using the quarterly pattern observed from 1989 to 1991. *Source*: Mexico's National Institute of Statistics (INEGI).
Relative industrial production: Natural log (times 100) of the Mexican/US ratio of the industrial production index. The ratio was calculated with quarterly averages of seasonally-adjusted monthly series. The original Mexican series based on the years 1993 (up to 2008M2), 2003 (2008M3–2013M6), and 2008 (from 2013M7) were spliced; the original US series was based on the year 2007. *Sources*: US Federal Reserve and INEGI.
Relative government consumption: Mexican/US ratio (times 100) of government consumption. Government consumption for each country was calculated as a share of GDP, using real, seasonally-adjusted data. The US series was based on the year 2009; the original Mexican series based on the years 1993 (up to 2007), 2003 (2008–2012), and 2008 (2013) were spliced. *Sources*: National Accounts data from the US BEA and INEGI.
Real price of oil: Natural log (times 100) of the international price of oil (quarterly average of the original monthly series), deflated by the US producer price index for finished goods. The international price of oil corresponds to the simple average of the spot quotations of Dated Brent, West Texas Intermediate, and Dubai Fateh, in US dollars per barrel. *Sources*: IMF and US BLS.
Terms of trade index: Natural log (times 100) of the Bank of Mexico's terms of trade index (exports to imports), in US dollars, based on the year 1980. The original monthly series was quarterly-averaged. *Source*: Bank of Mexico (BOM).
Inflation differential: Difference between the Mexican and US inflation rates, in percentage points. The inflation rate is the change in the consumer price index (quarterly average of the original monthly series) over the same quarter of the previous year. *Sources*: BOM and US BLS.

Interest rate differential: Difference between the Mexican (peso) and US (dollar) interest rates, in nominal percentage points. See the respective definitions, below.
Peso interest rate: Nominal interest rate on 91-day Mexican Treasury bills (CETES), annualized, in percentage. Quarterly average of the original monthly series. *Source*: BOM.
Dollar interest rate: Nominal US Federal funds effective rate, annualized, in percentage. Quarterly average of the original monthly series. *Source*: US Federal Reserve.
Foreign reserve accumulation and international capital flows: Percentage ratio of the central bank's foreign reserve accumulation, the financial account balance, or its four major components (foreign direct investment, foreign portfolio investment, other foreign investments, domestic capital inflows), in current US dollars, to Mexico's quarterly GDP. The latter was transformed from current pesos to US dollars using the peso/dollar nominal exchange rate calculated at purchasing power parity (PPP; i.e., the nominal rate that offsets the countries' inflation gap and leaves the real exchange rate constant). The financial account balance and domestic capital inflows include errors and omissions. *Sources*: BOM for balance of payments data, INEGI for nominal GDP, and author's calculations of the PPP exchange rate.

Private investment equations: (only variables not included above)

Private and government investment: Natural log (times 100) of gross fixed capital formation, in real pesos, by the private and public sectors, respectively. The original series based on the years 1980 (up to 1992), 1993 (1993–2007), 2003 (2008–2012), and 2008 (2013) were spliced. Source: National Accounts data from INEGI.
Industrial production index: See the description in the "Relative industrial production" variable, above.
Manufacturing exports: Natural log (times 100) of real manufacturing exports. Original export series from the balance of payments, in current US dollars, deflated by the US producer price index for industrial commodities less fuel. *Sources*: BOM and US BLS.
Broad money supply, M2: Monetary aggregate M2 (quarterly average of the source's monthly series) as a percentage of annualized GDP, both originally in nominal terms. *Sources*: BOM and INEGI.
Inflation rate: See the description in the "Inflation differential," above.
Producer price indices (used in RULC decomposition): Mexican PPI for manufacturing goods and services of final use; the original monthly series based on 2003M12 (until 2011M6) and 2012=100 (from 2011M7) were spliced. US PPI for total manufacturing industries, based on 1984M12. *Sources*: INEGI and US BLS.
Value-added price deflators (used in RULC decomposition): Mexico: Implicit price deflator for manufacturing GDP; the original series based on the years 1993 (until 2007Q4) and 2008 (from 2008Q1) were spliced. US: Implicit price deflator for the manufacturing sector, from the BLS's "Labor productivity and costs" database. The quarterly observations correspond to the annual average. The figure for 2013 was calculated using the growth rate of the US manufacturing PPI. *Sources*: INEGI and US BLS.

Table 1. RULC decomposition

Selected ratios and periods

	1993/1988	2001/1996	2013/2001	2013/1988
Relative unit labor cost (RULC), C/C*	1.68	1.73	1.08	1.71
Mexico's unit labor cost, in dollars, C	1.72	1.54	0.91	1.26
US unit labor cost, in dollars, C*	1.02	0.89	0.85	0.74
A) Decomposition using manufacturing PPI's:				
Mexico's labor productivity, Y	1.35	1.17	1.34	2.66
Mexico's real wage, W/P	1.74	1.26	1.01	1.72
Mexico's p.a. real wage, W/PY	1.29	1.08	0.75	0.64
US labor productivity, Y*	1.13	1.31	1.54	2.56
US real wage, W*/P*	1.01	1.09	0.90	1.02
US p.a. real wage, W*/P*Y*	0.90	0.84	0.59	0.40
P.a. relative real wage, (W/PY)/(W*/P*Y*)	1.43	1.29	1.29	1.62
Relative manufacturing prices, P/SP*	1.17	1.34	0.84	1.05
B) Decomposition using manufacturing value-added price deflators:				
Mexico's real wage, W/P	1.63	1.34	0.89	1.51
Mexico's p.a. real wage, W/PY	1.21	1.14	0.66	0.57
US real wage, W*/P*	1.06	1.19	0.89	1.19
US p.a. real wage, W*/P*Y*	0.94	0.91	0.58	0.46
P.a. relative real wage, (W/PY)/(W*/P*Y*)	1.28	1.25	1.14	1.22
Relative manufacturing prices, P/SP*	1.31	1.38	0.95	1.39

p.a. =Productivity-adjusted. The real wage is the nominal wage deflated by the manufacturing price index.

Source: Author's calculations, based on eq. (1). See appendix for data sources and definitions.

Table 2. RULC equations, I

Dependent variable: RULC, ln

Long-run coefficients from error-correction ARDL models, 1988Q1-2013Q4, 104 observations

	(2.1) ^a	(2.2)	(2.3) ^b	(2.4)
Speed of adjustment, σ	-0.326	-0.270	-0.269	-0.262
Relative industrial production, ln	3.12 (0.00)	3.42 (0.00)	3.04 (0.00)	3.70 (0.00)
Real oil price, ln	0.12 (0.00)	0.15 (0.00)	0.54 (0.00)	0.16 (0.00)
Relative government consumption/GDP, %	-0.05 (0.77)	-0.33 (0.09)	-0.75 (0.00)	
Inflation differential, % points	-1.98 (0.00)	-1.55 (0.00)	-1.53 (0.00)	-1.57 (0.00)
Interest differential, % points		0.93 (0.00)	0.70 (0.05)	1.00 (0.00)
Peso interest rate, %	1.10 (0.00)			
Dollar interest rate, %	-1.53 (0.04)			
Adjusted R-sq	0.897	0.881	0.865	0.881
Normality (Jarque-Bera)	0.768	0.854	0.904	0.931
Serial correlation (Breusch-Godfrey, 4 lags)	0.705	0.575	0.557	0.515
ARCH (1 lag)	0.432	0.786	0.975	0.487
ARCH (2 lags)	0.591	0.311	0.338	0.293
RESET (squared fitted values)	0.494	0.745	0.607	0.764
RESET (sq. and cubed fitted values)	0.642	0.633	0.686	0.618
Bounds t-stat	-7.89 ***	-6.53 ***	-5.88 ***	-6.56 ***
Bounds F-stat	11.39 ***	10.39 ***	8.52 ***	11.71 ***
Wald: Peso rate=(-)Dollar rate	0.464			
Wald: Interest differential=(-)Inflation diff		0.003	0.000	0.015

Notes: For illustrative purposes, p-values for the d_i coefficients from equation (2) in the text are shown in parenthesis, next to the estimated long-run coefficients.

Diagnostics: The table shows the p-values for the null hypotheses 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).

Bounds testing: *** (**) [*] The test statistic lies above the upper bound at the 1% (5%) [10%] significance level. The constant was omitted due to lack of significance, except in (2.4) (not shown). The initial specification included two lags in the first-differenced variables. The equations include outlier dummies for 1995Q1, 2001Q4, and 2006Q2. The equations include interactions of the inflation differential and the interest rate differential (or the peso interest rate) with 0-1 dummies for the transition period from high to moderate inflation in Mexico: 1988Q1-1989Q4, and for the Lesser Depression period: 2008Q4-2013Q4 (not shown).

^a Does not include outlier dummy 2001Q4.

^b Includes the Bank of Mexico´s terms of trade index instead of the oil price.

Source: Author's calculations. See appendix for data sources and definitions.

Table 3. RULC equations, II

Dependent variable: RULC, ln

Long-run coefficients from error-correction ARDL models, 1988Q1-2013Q4, 104 observations

	(3.1)	(3.2)	(3.3)	(3.4)
Speed of adjustment, σ	-0.249	-0.293	-0.242	-0.367
Relative industrial production, ln	2.94 (0.00)	2.48 (0.00)	3.95 (0.00)	2.74 (0.00)
Real oil price, ln	0.16 (0.00)	0.20 (0.00)	0.18 (0.00)	0.18 (0.00)
Inflation differential, % points	-1.10 (0.00)	-1.27 (0.00)	-1.40 (0.00)	-1.76 (0.00)
Interest differential, % points	0.22 (0.23)	0.70 (0.02)	1.11 (0.00)	
Peso interest rate, %				1.07 (0.00)
Dollar interest rate, %				-1.79 (0.00)
Foreign portfolio investment, % GDP		2.91 (0.00)	1.55 (0.07)	1.54 (0.00)
Foreign direct investment, % GDP		3.89 (0.00)	2.75 (0.00)	2.52 (0.00)
Other foreign investments, % GDP		1.70 (0.05)	-0.31 (0.54)	1.10 (0.03)
Domestic capital inflow, % GDP		2.09 (0.00)	0.42 (0.30)	2.06 (0.00)
Financial account balance, % GDP	1.11 (0.09)			
Reserve accumulation, % GDP	-0.13 (0.86)	-1.81 (0.03)		-2.36 (0.00)
Adjusted R-sq	0.860	0.886	0.889	0.930
Normality (Jarque-Bera)	0.897	0.410	0.481	0.795
Serial correlation (Breusch-Godfrey, 4 lags)	0.785	0.810	0.213	0.641
ARCH (1 lag)	0.680	0.307	0.419	0.500
ARCH (2 lags)	0.374	0.603	0.487	0.808
RESET (squared fitted values)	0.117	0.114	0.420	0.183
RESET (sq. and cubed fitted values)	0.135	0.248	0.309	0.196
Bounds t-stat	-6.66 ***	-7.29 ***	-6.58 ***	-7.12 ***
Bounds F-stat	8.54 ***	7.54 ***	7.24 ***	8.51 ***
Wald: Capital flows		0.052	0.006	0.000
Wald: Foreign investment		0.219	0.231	0.056

Notes: Same as for Table 2, except as follows:

The constant was omitted due to lack of significance, except in (3.3) (not shown). The initial specification included one lag in the first-differenced variables, except two lags in (3.4). The equations include outlier dummies for 1995Q1 and 2006Q2.

The null in "Wald: Capital flows" is that the coefficients on the different types of capital flows are all equal.

The null in "Wald: Foreign investment" is that the coefficients on foreign direct and portfolio investments are equal.

Source: Author's calculations. See appendix for data sources and definitions.

Table 4. Investment equations, I

Dependent variable: Private investment, ln

Long-run coefficients from error-correction ARDL models, 1988Q1-2013Q4, 104 observations

	(4.1)	(4.2) ^a	(4.3) ^b	(4.4)
Speed of adjustment, σ	-0.506	-0.430	-0.326	-0.513
RULC, lagged one year, ln	-0.25 (0.00)	-0.38 (0.01)	-0.44 (0.00)	-0.34 (0.00)
Industrial production index, ln	3.08 (0.00)	3.18 (0.00)	2.33 (0.00)	2.63 (0.00)
Government investment, ln	-0.27 (0.00)	-0.12 (0.15)	-0.20 (0.00)	-0.32 (0.00)
Manufacturing exports, ln			0.47 (0.11)	
Broad money supply M2, % GDP				1.16 (0.02)
Peso interest rate, %				-0.37 (0.03)
Annual inflation rate, %				0.25 (0.00)
Post-peso crisis dummy, 1995-2008	-2.70 (0.00)	-2.71 (0.00)	-4.74 (0.00)	-2.71 (0.00)
Lesser Depression dummy, 2009-2013	-2.75 (0.00)	-3.20 (0.00)	-5.30 (0.00)	-3.39 (0.00)
Adjusted R-sq	0.868	0.864	0.896	0.898
Normality (Jarque-Bera)	0.781	0.663	0.943	0.803
Serial correlation (Breusch-Godfrey, 4 lags)	0.702	0.406	0.361	0.462
ARCH (1 lag)	0.524	0.159	0.913	0.516
ARCH (2 lags)	0.779	0.298	0.925	0.558
RESET (squared fitted values)	0.874	0.619	0.910	0.454
RESET (sq. and cubed fitted values)	0.648	0.297	0.823	0.402
Bounds t-stat	-4.75 ***	-3.89 **	-3.33	-4.10 *
Bounds F-stat	16.90 ***	7.55 ***	12.45 ***	6.70 ***

Notes : Same as for Table 2, except as follows:

All the equations include a constant (not shown). The initial specification included three lags in the first-differenced variables. The equations include an outlier dummy for the first three quarters of 2013.

To facilitate their interpretation, the estimated long-run coefficients on the post-crisis dummies are expressed as a percentage of the private investment level in the years 1994 and 2008, at the onset of each crisis.

^a With current RULC. Includes an outlier dummy for 1996Q4.

^b Includes an outlier dummy for 1994Q3.

Source : Author's calculations. See appendix for data sources and definitions.

Table 5. Investment equations, II

Dependent variable: Private investment, ln

Long-run coefficients from error-correction ARDL models, 1988Q1-2013Q4, 104 observations

	With producer price indices		With value-added deflators	
	(5.1)	(5.2) ^a	(5.3)	(5.4) ^b
Speed of adjustment, σ	-0.579	-0.598	-0.547	-0.496
Relative manufacturing prices, ln	-0.66 (0.00)	-0.76 (0.00)	-0.45 (0.00)	-0.73 (0.01)
Productivity-adjusted relative real wage, ln	0.03 (0.75)	-0.03 (0.71)	-0.12 (0.50)	-0.01 (0.99)
Industrial production index, ln	2.59 (0.00)	2.36 (0.00)	2.49 (0.00)	2.22 (0.00)
Government investment, ln	-0.33 (0.00)	-0.31 (0.00)	-0.37 (0.00)	-0.30 (0.01)
Broad money supply M2, % GDP		-0.04 (0.94)		-1.50 (0.09)
Peso interest rate, %		-0.36 (0.00)		-0.73 (0.00)
Annual inflation rate, %		0.17 (0.02)		0.45 (0.71)
Post-peso crisis dummy, 1995-2008	-2.24 (0.00)	-2.19 (0.00)	-2.74 (0.00)	-2.25 (0.00)
Lesser Depression dummy, 2009-2013	-2.88 (0.00)	-3.07 (0.00)	-3.32 (0.00)	-2.88 (0.00)
Adjusted R-sq	0.885	0.927	0.877	0.931
Normality (Jarque-Bera)	0.813	0.644	0.991	0.864
Serial correlation (Breusch-Godfrey, 4 lags)	0.903	0.694	0.844	0.543
ARCH (1 lag)	0.379	0.306	0.441	0.456
ARCH (2 lags)	0.203	0.436	0.730	0.735
RESET (squared fitted values)	0.481	0.078 *	0.766	0.488
RESET (sq. and cubed fitted values)	0.484	0.210	0.476	0.408
Bounds t-stat	-5.19 ***	-5.20 **	-5.05 ***	-4.86 **
Bounds F-stat	12.96 ***	6.57 ***	11.82 ***	5.85 ***

Notes: Same as for Table 2, except as follows:

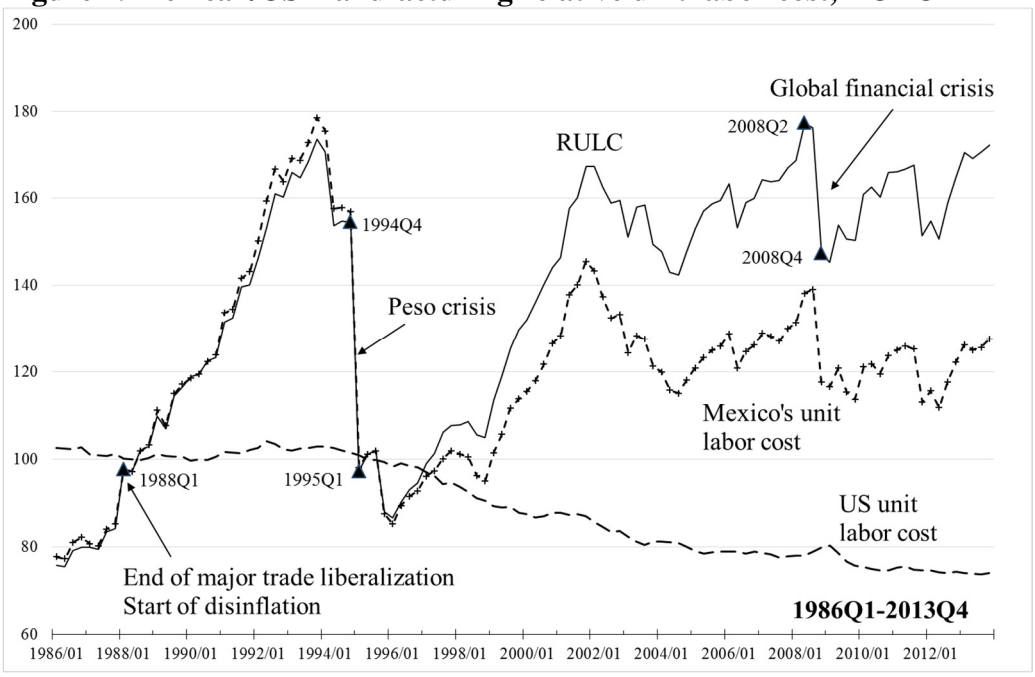
All the equations include a constant and linear trend (not shown). The initial specification for all the equations included three lags in the first-differenced variables. The equations include an outlier dummy for the first three quarters of 2013. Relative prices and wages were lagged one year, except in (5.4).

^a Includes additional outlier dummies for 1991Q3 and 2009Q1.

^b Includes additional outlier dummies for 1996Q4 and 2009Q1.

Source: Author's calculations. See appendix for data sources and definitions.

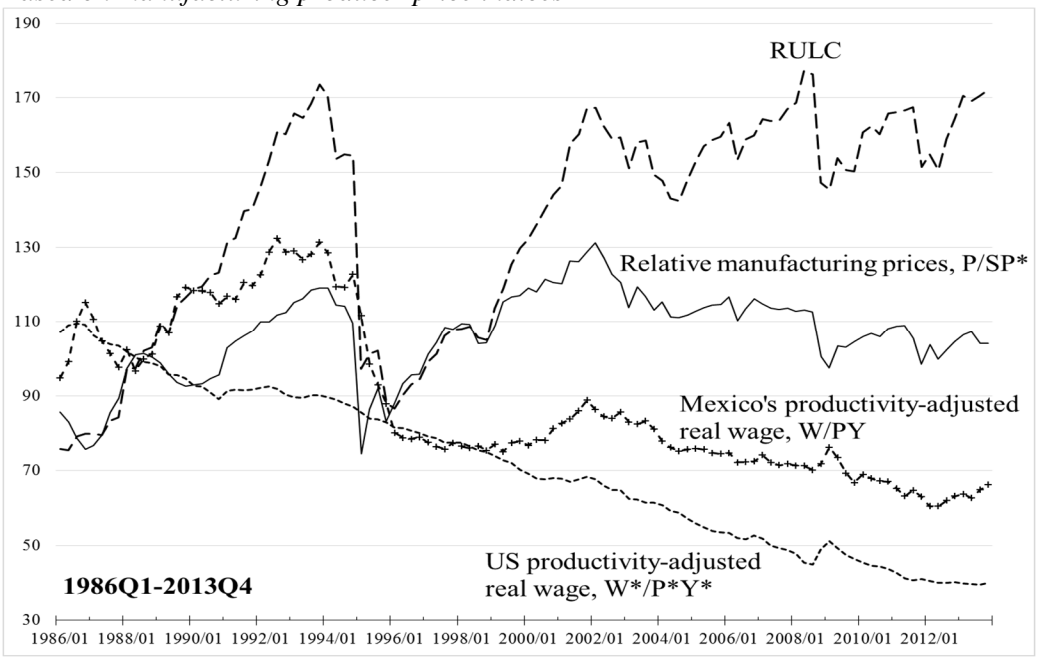
Figure 1. Mexican/US manufacturing relative unit labor cost, RULC



Sources: See appendix.

Figure 2. RULC decomposition, I

Based on manufacturing producer price indices



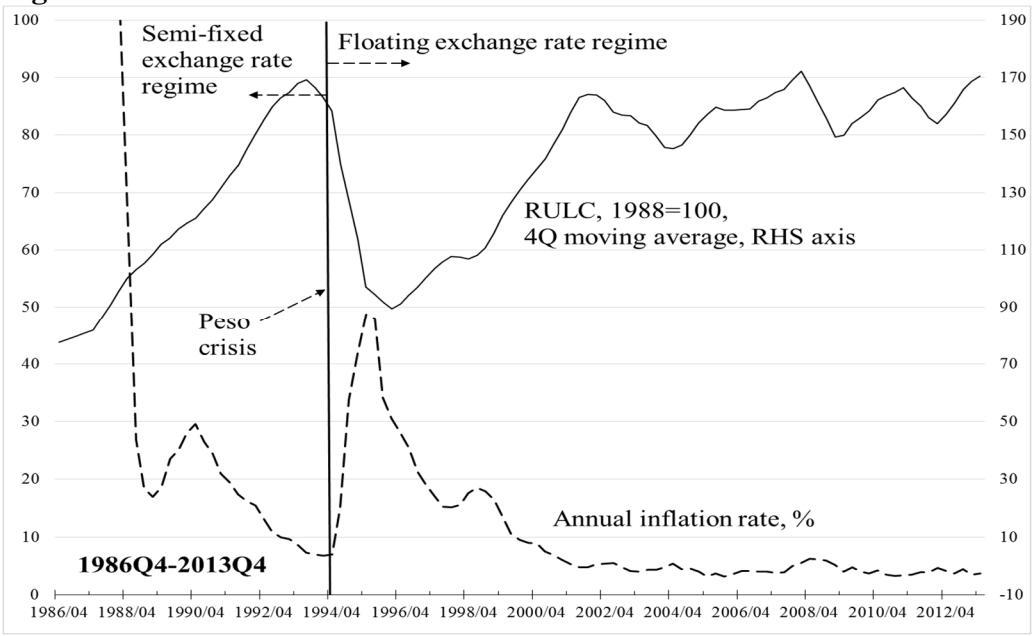
Sources: See appendix.

Figure 3. RULC decomposition, II

Based on manufacturing value-added price deflators

Sources: See appendix.

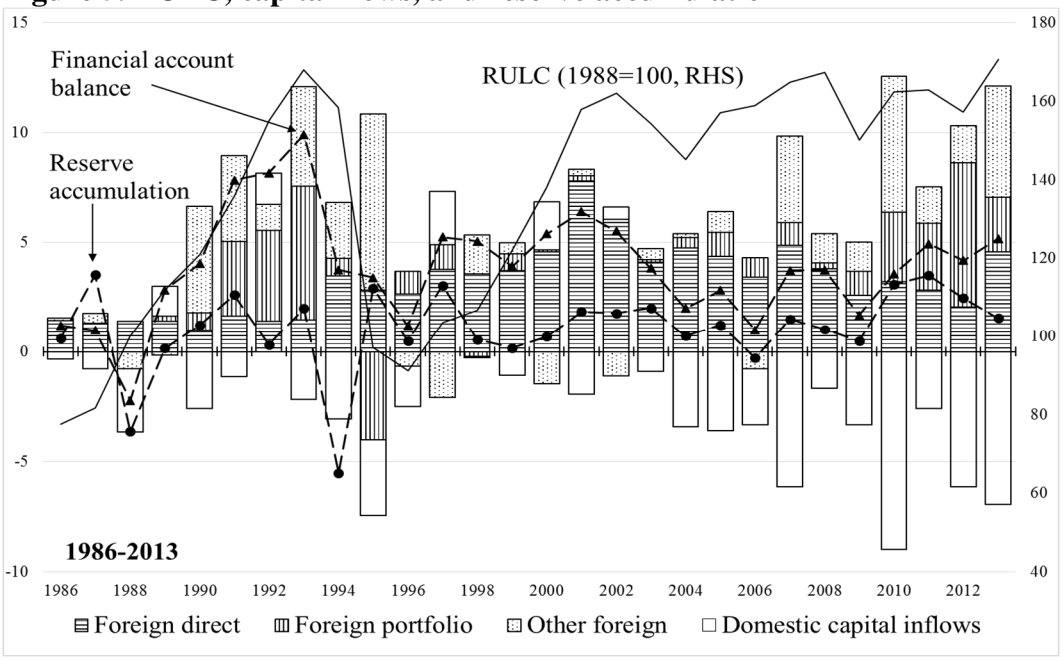
Figure 4. RULC and annual inflation rate



Note: The inflation rate is the change in the consumer price index over the same quarter of the previous year.

Sources: See appendix.

Figure 5. RULC, capital flows, and reserve accumulation



Note: Capital flows and reserve accumulation are calculated as % of GDP. Domestic capital inflows and the financial account balance include errors and omissions from the balance of payments.
Sources: See appendix.