

DOLLARIZATION AND THE MEXICAN LABOR MARKET

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Abstract

This paper examines how dollarization affects the internal wage structure in the Mexican labor market, and alters the incentives of Mexican nationals to emigrate to the United States. A simple model shows that by adopting a fixed rate regime tied directly to the U.S. dollar, Mexican policy-makers are in effect giving up “a degree of freedom” in their toolkit of policy remedies. If there are imperfections in the Mexican economy, such as downward wage rigidity, an adverse economic shock would generate more unemployment in a dollarized economy, further increasing the propensity of Mexican workers to migrate to the United States. The adverse effects of dollarization could be reversed if the adoption of the dollar as a medium of exchange signals a more stable Mexican economy, reduces political inefficiency in the monetary system, and helps to attract more foreign capital. The paper also investigates how legal and illegal flows of Mexican immigrants respond to relative changes in economic conditions between the two countries. It turns out that the illegal flow is very sensitive to relative economic conditions, but that the flow of legal immigrants is not. Dollarization will then have a relatively weak impact on the total number of immigrants because legal immigrants make up a relatively large part of the total flow and their numbers are insensitive to economic variables.

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I. Introduction

The adoption of the U.S. dollar as legal tender in Mexico may have a profound impact on the Mexican labor market, as well as on what is perhaps the most important—and politically sensitive—link between the Mexican and American economies, the large-scale migration of Mexican nationals to the United States. There is some uncertainty about whether dollarization will make the Mexican labor market more sensitive to asymmetric shocks, or help stabilize the Mexican economy. On the one hand, dollarization would reduce the number of policy parameters at the disposal of the Mexican government to tackle the effects of idiosyncratic adverse shocks on the Mexican economy, and would lead to more volatility in employment and perhaps a larger emigrant flow. On the other hand, dollarization would expose the Mexican economy to a more sophisticated regime of monetary policy, and might help reduce economic volatility.¹ This “dollarization externality” could hasten the process of economic convergence between Mexico and the United States and greatly reduce the incentives of Mexican nationals to emigrate.

There has been a very rapid rise in the number of Mexicans who migrated to the United States in the past few decades, with Mexican-origin immigrants becoming an ever-more important component of the foreign-born population in the United States. During the 1950s, about 30,000 thousand Mexican

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¹ Studies of the impact of dollarization on other developing economies include Calvo (1997b) and Moreno-Villalaz (1999).

immigrants entered the United States *legally* during a typical year. By 1996, the United States was admitting 164,000 Mexican nationals legally. The Immigration and Naturalization Service also estimates that another 150,000 Mexicans entered—and stayed in—the United States illegally. If account for both the legal immigrants and the undocumented workers, the Mexican immigrant flow in the 1990s was 10 times as large as it was in the 1950s.² As a result of these trends, Mexican nationals made up only 6.2 percent of the foreign-born population in the United States in 1960, but made up over 27.1 percent of the foreign-born population by 1998.

This paper presents a theoretical examination of how dollarization affects the internal wage structure in the Mexican economy, and alters the incentives of Mexican nationals to emigrate to the United States. The adoption of the dollar as legal tender will likely have important effects on the size and composition of the emigrant flow. A simple economic model shows that by adopting a fixed rate regime tied directly to the U.S. dollar, Mexican policy-makers are in effect giving up “a degree of freedom” in their toolkit of policy remedies. If all other prices in the Mexican economy were flexible, (asymmetric) adverse shocks in productivity or in foreign investment would have the same impact regardless of whether the Mexican economy was dollarized or not. However, if there are imperfections in the Mexican economy, such as downward wage rigidity, the adverse shocks would lead to more unemployment, and increase the propensity of Mexican workers—employed in both the tradable and non-tradable sectors—to migrate to the United States.

² Studies of the economic performance of Mexican immigrants in the United States include Trejo (1997). Borjas, Freeman, and Katz (1997) and Schoeni (1997) analyze the labor market impacts of the large-scale migration of less-skilled workers, particularly Mexican immigrants.

The adverse effects of dollarization could be attenuated, and perhaps even reversed, if the adoption of the dollar as a medium of exchange signals a more stable Mexican economy, and helps to attract more foreign capital. In doing so, dollarization would hasten the process of economic convergence between Mexico and the United States, perhaps leading to a large reduction in the number of Mexican emigrants.

To illustrate the potential importance of dollarization on the politically sensitive issue of Mexican emigration to the United States, the paper also presents an empirical study of how both legal and illegal flows of Mexican immigrants respond to relative changes in economic conditions between the two countries. Because data on the number of illegal aliens who enter the United States do not exist, studies that analyze the determinants of the illegal alien flow typically examine the trends in the number of undocumented persons apprehended by the Border Patrol. It turns out that the number of persons apprehended in any given year is very sensitive to relative economic conditions. The number of apprehensions rises when the real wage in the U.S. labor market increases or when the real wage in the Mexican labor market falls. In contrast, the evidence indicates that the flow of legal immigrants is unresponsive to changes in economic conditions, probably because of the types of immigration policies that regulate legal immigration into the United States.

In short, the impact of dollarization on Mexico-U.S. population flows will be most pronounced on illegal immigration. However, the impact of dollarization on the total net flow of migrants will be attenuated because the legal immigrant flow makes up a relatively large part of the total flow and because the legal flow is unresponsive to economic variables.

II. Framework

To illustrate the impact of dollarization on the Mexican labor market—as well as the on the incentives of Mexican workers to migrate to the United States—it is convenient to examine a highly stylized theoretical framework.³ The model sketched in this section builds on related work by Rodrik (1999), which analyzes how different exchange rate regimes alter the distribution of wages in the labor market.⁴

Suppose that the utility of the representative consumer/worker in Mexico depends on the consumption of two goods. One of these goods is imported from abroad (and, more specifically, imported from the United States); the other is a non-tradable good that is produced and consumed within Mexico. In addition, workers in the Mexican labor market produce a tradable good that is exported to the United States.

The production technology used to produce the tradable and non-tradable goods is quite simple. In particular, let L_1 be the number of Mexican workers who devote their efforts to producing the tradable good (i.e., the good that is exported to the United States), and let L_0 be the number of Mexican workers who devote their efforts to producing the non-tradable good. Suppose that different types of skills are required to produce each of these two goods, and that it is very costly to retool a

³ Classic studies that investigate how exchange rate regimes affect economic outcomes include Friedman (1957) and Mundell (1961). Although a large literature examines how exchange rate regimes affect macroeconomic outcomes, few of these studies actually focus on labor market outcomes; see Sachs (1980) for an exception.

⁴ Rodrik's (1999) theoretical framework is somewhat more general because he allows the domestic economy to produce two tradable goods and one non-tradable good. He then uses this framework to examine how the choice of an exchange rate regime alters the distribution of wages in the economy. Rodrik, however, assumes inelastic labor supply to each sector of the economy, and hence ignores the impact of the exchange rate regime on the incentives to emigrate the domestic economy.

particular worker with the skills that would permit this worker to move across sectors. As a result, there is no *internal* intersectoral mobility of workers in the Mexican labor market.

The constant marginal product of workers in the tradable sector is π_1 , so that the total amount of the tradable good produced in the Mexican economy equals $\pi_1 L_1$. For analytical convenience, the marginal product of workers in the non-tradable sector is normalized to equal 1, so that the total amount of the non-tradable good produced is simply L_0 .

Let the world price of both tradable goods (the good produced in the United States and consumed in Mexico, as well as the good produced in Mexico and consumed in the United States) be equal to 1, and let e be the exchange rate between the two countries. In particular, e gives the number of Mexican pesos per U.S. dollar. Finally, let p be the price of the non-tradable good in Mexico. The total income of the Mexican economy then equals:

$$(1) \quad Y = e \pi_1 L_1 + p L_0.$$

Denote the demand function for the tradable good that is imported from the United States by $D(e, p, Y)$, and assume there is trade balance between the two countries. The trade balance equation is then given by:

$$(2) \quad \pi_1 L_1 - D(e, p, Y) = 0.$$

Suppose that the representative consumer in Mexico has a Cobb-Douglas utility function. We can then write the demand for the imported good as $D = \alpha Y/e$, where α is the parameter of the Cobb-Douglas utility function. Substituting this fact in (2) yields:

$$(3) \quad (1 - \alpha) \pi_1 L_1 = \alpha \left(\frac{p}{e} \right) L_0.$$

We can now introduce the emigration decision of Mexican workers into this highly stylized model. Although we have assumed that Mexican workers find it impossible to move between the two sectors of the domestic labor market, they are free to sell their skills in the U.S. economy. In particular, suppose that the labor supply to sector i ($i = 0, 1$) of the Mexican labor market is given by:

$$(4) \quad L_i = \bar{L}_i \left(\frac{w_i}{e w_i^{US}} \right)^{\beta_i},$$

where \bar{L}_i gives the total number of workers who have the types of skills that are required by employers in sector i ; and w_i^{US} is the wage that the U.S. labor market offers to those types of workers. Note that the wages in the two countries are converted into comparable units by using the exchange rate e , which also happens to be the price (in Mexican currency) of the good that is imported from the United States as well as the price (in Mexican currency) of the good produced in Mexico and exported to the United States.

Note that the labor supply elasticity is allowed to vary between the two different types of workers. As we will see below, intersectoral differences in the labor supply elasticity β_i can play an important role in determining the impact of dollarization in the Mexican economy. For simplicity, suppose that the type- i workers who are not employed in sector i in the Mexican economy emigrate to the United States. The total number of emigrants is then given by:

$$(5) \quad M = \bar{L}_1 - \bar{L}_1 \left(\frac{w_1}{e w_1^{US}} \right)^{\beta_1} + \bar{L}_2 - \bar{L}_2 \left(\frac{w_2}{e w_2^{US}} \right)^{\beta_2} .$$

The assumptions about technology and prices that are built into the model imply that the wages of workers in each of the two sectors of the Mexican labor market are given by:

$$(6a) \quad w_1 = e \pi_1,$$

$$(6b) \quad w_0 = p.$$

To illustrate the impact of dollarization on the wage structure in the Mexican labor market and on the number of persons who will choose to emigrate from Mexico, it is instructive to initially consider a benchmark case. In particular, suppose that there are no frictions in the Mexican economy (such as downward wage rigidity) and that the Mexican economy adopts a flexible exchange rate. Suppose further that there is a sudden and unexpected real adverse shock on the productivity of Mexican workers employed in the tradable sector, with $\tilde{\pi}_1$ measuring the percentage change in the marginal

product of workers in that sector ($\tilde{\pi}_1 < 0$).⁵ By assumption, this shock does not have any impact on the productivity of workers in the U.S. economy. By using the trade balance condition in equation (3) and the definitions of the wages in equations (6a) and (6b), it can be shown that the adverse productivity shock will lead to the following changes in real wages in the Mexican economy:⁶

$$(7) \quad \tilde{w}_1 - \tilde{e} = \tilde{\pi}_1,$$

$$(8) \quad \tilde{w}_1 - \tilde{p} = \frac{\beta_0 - \beta_1}{1 + \beta_0} \tilde{\pi}_1,$$

$$(9) \quad \tilde{w}_0 - \tilde{e} = \frac{1 + \beta_1}{1 + \beta_0} \tilde{\pi}_1,$$

$$(10) \quad \tilde{w}_0 = \tilde{p}.$$

Equations (7) and (9) give the percentage wage change in each sector of the Mexican economy relative to the adjustment in the exchange rate. These equations unambiguously imply that the productivity shock in the tradable sector induces a decline in the real wage of all Mexican workers relative to the wages that they could earn in the United States (since the U.S. wage is fixed).

Equations (8) and (10), however, show that the productivity shock in the tradable sector may either widen or narrow wage inequality in the Mexican economy, depending on the relative values of the labor supply elasticities β_0 and β_1 . Note that equation (8) indicates that the productivity shock will

⁵ Throughout the analysis, the tilda is used to denote a percentage change. Mendoza (1995) presents a detailed analysis of the link between economic shocks, exchange rates, and macroeconomic outcomes.

⁶ The model has four endogenous prices (w_0 , w_1 , e , and p), but only three equations to determine those prices (equations 3, 6a, and 6b). As a result, only identify three of the relative price changes are identified.

lower wages by the same relative amounts in the two sectors when $\beta_0 = \beta_1$, and that the productivity shock will widen (narrow) wage inequality when $\beta_1 > \beta_0$ ($\beta_1 < \beta_0$). To understand the intuition behind this result, suppose that the migration decision of workers employed in the tradable sector is more susceptible to changes in real wages than the decision of workers employed in the non-tradable sector. This assumption about the relative values of the labor supply elasticities could be justified by arguing that perhaps workers employed in the tradable sector of the Mexican economy have better information about the needs of consumers in the United States and hence find it “easier” to migrate to the United States. The assumption that $\beta_1 > \beta_0$ implies that the wage gap between workers in the tradable and non-tradable sectors widens because part of the adverse productivity shock on workers in the tradable sector is cushioned by the emigration of many of these workers to the United States.

It must be stressed, however, that the validity of the assumption that $\beta_1 > \beta_0$ is questionable. One could also argue, for instance, that the tradable sector in the Mexican economy corresponds roughly to the formal sector, while the non-tradable sector corresponds to the informal sector that provides goods and services within the Mexican economy. It may well be that workers in the informal sector are much more susceptible to changes in real wages, because they have few other options in the Mexican economy. If so, wage inequality would then narrow as a result of the adverse productivity shock.

Although the relative value of the labor supply elasticities alters the distribution of income in the Mexican economy, it does not have a qualitative influence on the impact of the adverse productivity shock on the number of emigrants. In particular, it is easy to show that:

$$(11) \quad dM_{\text{FLEXIBLE}} = -L_1 \beta_1 \tilde{\pi}_1 - L_0 \beta_0 \frac{1 + \beta_1}{1 + \beta_0} \tilde{\pi}_1 > 0.$$

The decline in real wages in the Mexican economy induced by the adverse productivity shock in the tradable sector, therefore, increases the size of the emigration flow.

Equation (11) also suggests a mathematical restriction that will be useful below. Note that the number of workers from the tradable sector who move to the United States as a result of the productivity shock is given by $-L_1 \beta_1 \tilde{\pi}_1$. Suppose that the productivity shock is sufficiently small so that the number of emigrants is smaller than the number of persons who were initially employed in that sector, or $-L_1 \beta_1 \tilde{\pi}_1 < L_1$. This assumption implies that $1 + \beta_1 \tilde{\pi}_1 > 0$.

It turns out that this simple model—with flexible exchange rates and no market imperfections in the Mexican economy—serves as a good benchmark against which one can assess the impact of alternative exchange rate regimes. Consider, for example, the adoption of a fixed rate regime by the Mexican monetary authorities (of which dollarization is a particular example). The response of the exchange rate to the adverse productivity shock is then $\tilde{e} = 0$. It is well known that because other prices in the economy remain flexible, the real wages will adjust fully to the productivity shock, and the real wage responses given by the system in equations (7)-(10) still completely describe the adjustments that take place in the Mexican labor market. For instance, equation (7) implies that the nominal wage change in the tradable sector will equal $\tilde{w}_1 = \tilde{\pi}_1$, so that nominal wages take the full brunt of the adverse productivity shock. As a result, equation (11) still summarizes the impact of the adverse productivity shock on the number of emigrants. In short, fixed exchanged rate regimes and flexible exchange rate

regimes have similar labor market implications as long as other prices in the Mexican economy can adjust fully to the productivity shock.

The fixed and flexible exchange rate regimes will have different labor market effects when there is an imperfection in the Mexican economy that prevents full adjustment of prices. Such an imperfection could arise because of downward wage rigidity in at least one of the sectors. Suppose that the tradable and non-tradable sectors in the Mexican economy correspond roughly to the formal and informal sectors of the labor market, with the tradable sector being protected by minimum wage laws and other types of employment regulations, and the non-tradable sector being best characterized as a spot labor market that clears at the competitive wages. This perspective would then imply that nominal wages in the tradable sector are downward sticky.

The nominal wage rigidity in the tradable sector implies that an adverse shock on the productivity of workers in that sector will have severe disemployment effects among those workers. Recall that wages in that sector are proportional to marginal product, or $w_1 = e \pi_1$. If labor market productivity falls *and* the exchange rate is held fixed *and* the nominal wage is held fixed at w_1 , employers will not find it profitable to continue employing workers in that sector and the L_1 workers who previously worked in that sector will lose their jobs. In short, the sector shuts down and $dL_1 = -L_1$. Differentiation of the trade balance equilibrium condition and of the equation defining the wage in the non-tradable sector then implies that the wage responses in the Mexican economy are summarized by:

$$(12) \quad \tilde{w}_0 - \tilde{e} = -\frac{1 - \tilde{\pi}_1}{1 + \beta_0}.$$

$$(13) \quad \tilde{w}_0 = \tilde{p}.$$

Note that equation (12) implies that the real wage in the non-tradable sector (relative to the exchange rate) will decline because of the adverse productivity shock in the tradable sector.

The migration consequences of the adverse productivity shock in the presence of a fixed exchange rate regime and nominal wage rigidity are then given by:

$$(14) \quad dM_{\text{FIXED}} = L_1 + L_0 \beta_0 \frac{1 + \tilde{\pi}_1}{1 + \beta_0}.$$

It is of great interest to compare the emigration response summarized by equation (14) with the response that would have occurred if the Mexican economy—even with its downward wage rigidity in the tradable sector—had a flexible exchange rate regime. It is well known that the model then reverts back to the original situation of flexible exchange rates, as summarized by the system of equations (7)-(10). The reason is that the government can set the exchange rate so that $\tilde{e} = -\tilde{\pi}_1$. The Mexican economy would then adjust fully in real terms, even though the nominal wage in the tradable sector remained at w_1 . As a result, equation (11) would still give the impact of the adverse productivity shock on the number of emigrants.

By comparing equations (11) and (14), one can then show that:

$$(15) \quad dM_{\text{FIXED}} - dM_{\text{FLEXIBLE}} = \left(L_1 + \frac{L_0 \beta_0}{1 + \beta_0} \right) (1 + \beta_1 \tilde{\pi}_1) > 0.$$

The fixed exchange rate regime, therefore, increases the number of emigrants simply because the fixed exchange rate—*along with other market imperfections in the Mexican economy*—prevents the Mexican labor market from fully adjusting to the adverse productivity shock. The lack of full adjustment encourages Mexican workers to find economic opportunities in those economic sectors that were unaffected by the productivity shock, such as the U.S. labor market.

Capital Flight and Emigration

The simple model sketched above can also be used to describe the labor market impacts of an adverse shock in the capital market. To illustrate, suppose the trade balance equation were given by:

$$(16) \quad \pi_1 L_1 + K - D(e, p, Y) = 0,$$

where K gives the (exogenous) dollar value of the capital infusion into the Mexican economy. Suppose that either because of a shift in the economic or political conditions of Mexico, or in the economic and political conditions of the countries where the capital flow originates, there is a sudden change in the capital market, leading to capital flight from the Mexican economy. Let \tilde{K} give the percentage change in this foreign investment (with $\hat{K} < 0$).

Table 1 summarizes the wage adjustments that result from this adverse shock under the two basic structures of the model. It is worth noting that if Mexico pursued a flexible exchange rate regime and if there were no downward wage rigidity in the tradable sector, this adverse shock would not change the real wage in the tradable sector (since the wage in that sector is defined as $w_1/e = \pi_1$). The

adverse shock in the capital market, however, would lower the real wage in the non-tradable sector. In contrast, a fixed exchange rate with nominal wage rigidity would create unemployment in the tradable sector, and would also reduce the real wage in the non-tradable sector. The implications for the emigration flow—in the presence of nominal wage rigidity in the tradable sector—are then summarized by:

$$(17) \quad dM_{\text{FLEXIBLE}} = -L_0 \beta_0 \frac{\theta \tilde{K}}{1 + \beta_0}.$$

$$(18) \quad dM_{\text{FIXED}} = -L_1 - L_0 \beta_0 \left(\frac{\theta \tilde{K}}{1 + \beta_0} - \frac{1 - \theta}{1 + \beta_0} \right).$$

where $\theta = K/[(1-\alpha)\pi_1 L_1 + K]$. The comparison of equations (17) and (18) imply that “capital flight” would generate more emigrants when there is a fixed rate regime with nominal wage rigidity.

In sum, a simple economic model suggests that the dollarization of the Mexican economy will likely increase the propensity of Mexican workers to migrate to the United States in response to adverse economic shocks, regardless of whether the economic shock is a productivity shock or a shock in the capital markets.

Benefits from Dollarization

Despite the unambiguous nature of the results presented in the previous section, it has been argued that dollarization may have beneficial impacts on the Mexican labor market, and may reduce the

incentives of Mexican workers to migrate to the United States. This argument typically assumes that the adoption of the dollar as legal tender would impart some benefits on the Mexican economy.

For instance, dollarization might reduce uncertainty about economic trends in the Mexican economy and minimize the influence of political interference, inefficiency, and corruption in the setting of monetary policy. These “externalities” from dollarization could then improve the efficiency of the Mexican economy, increase the amount of foreign capital flowing into the country, and hasten the process of economic convergence between the United States and Mexico.⁷ The reduction of the wage gap between the two countries would then help reduce the size of the emigrant flow since income differentials are probably a key determinant of the migration flow between the two countries.

Although these externalities are theoretically plausible, there is little empirical evidence that documents the size of the externality, or that even proves their existence in other merging economies. In particular: How does dollarization move an emerging economy to a more efficient allocation of resources? By how much does dollarization increase the amount of foreign investments in countries that adopt this type of fixed rate regime? By how much does dollarization narrow the income gap between the adopting countries and the United States?

It is also important to note that even if the externalities did exist, they need not be sufficiently large to overcome the adverse impacts that a fixed rate regime—in the presence of nominal wage rigidity—would have on real wages and employment in the Mexican economy. To illustrate, consider the following extension of the theoretical framework developed above. As before, the Mexican

⁷ Bacchetta and van Wincoop (1998) present a theoretical discussion of how exchange rates affect capital flows. Calvo (1999a) argues that the benefits from dollarization should not be assessed by comparing a fully-dollarized economy with a flexible exchange rate regime, but by comparing a fully-dollarized economy with the

economy is hit by an adverse productivity shock, with $\tilde{\pi}_1 < 0$. Suppose the trade balance equation is given by equation (16), with $K > 0$, and that there is wage rigidity in the tradable sector. If the Mexican authorities adopted a flexible exchange rate, it is easy to show that the change in the number of immigrants resulting from this productivity shock would be given by:

$$(19) \quad dM_{\text{FLEXIBLE}} = -L_1 \beta_1 \tilde{\pi}_1 - L_0 \beta_0 \frac{(1-\theta)(1+\beta_1) \tilde{\pi}_1}{1+\beta_0}.$$

where $\theta = K/[(1-\alpha)\pi_1 L_1 + K]$. Equation (19) reveals that the adverse productivity shock would unambiguously raise the number of emigrants since there would be no dollarization externalities to benefit from.

Suppose that if the Mexican authorities dollarize the currency the externality takes the form of an infusion of foreign capital, with $\tilde{K} > 0$. Since the wage in the tradable sector is given by $w_1 = e \pi_1$, and both w_1 and e are fixed, the adverse productivity shock creates unemployment in the tradable sector, and $dL_1 = -L_1$. It can be shown that the change in the number of emigrants resulting from the interaction of the productivity shock and the dollarization externality is given by:

$$(20) \quad dM_{\text{FIXED}} = L_1 - L_0 \beta_0 \left(\frac{1-\theta}{1+\beta_0} \tilde{\pi}_1 - \frac{1-\theta}{1+\beta_0} + \frac{\theta}{1+\beta_0} \tilde{K} \right).$$

economic outcomes that result from partial dollarization, where part of the economy, such as the debt, is already dollarized.

The comparison of equations (19) and (20) reveals that the difference in the number of Mexican emigrants under the two exchange rate regimes is:

$$(21) \quad dM_{\text{FIXED}} - dM_{\text{FLEXIBLE}} = \left(L_1 + \frac{L_0 \beta_0 (1-\theta)}{1+\beta_0} \right) (1 + \beta_1 \tilde{\pi}_1) - \frac{\beta_0 L_0 \theta}{1+\beta_0} \tilde{K}.$$

Note that the more important foreign investment is to the Mexican economy (i.e., the greater θ) and the greater the dollarization externality (i.e., the greater \tilde{K}), the more likely that the number of emigrants will decline as a result of dollarization.

In the end, the question of whether dollarization increases or decreases the incentives of the Mexican population to emigrate to the United States is an empirical question. On the one hand, the dollarization externality would tend to reduce the number of emigrants. On the other hand, the fact that the economy could not adjust fully through exchange rate and price changes would tend to increase the number of emigrants. The net impact of dollarization could then be determined only by collecting evidence on the value of the externality, and comparing this effect to the adverse impact that fixed rate regimes have on employment and wages when price rigidities prevent the economy from fully adjusting to productivity or capital shocks.

III. The Migration of Mexicans to the United States

To determine the relevance of the model presented in the previous section for analyzing how dollarization might influence the size of the migration flow between Mexico and the United States, it is

instructive to briefly describe the nature of Mexican immigration into the United States. It is well known that this population consists of two main categories: legal immigration and illegal immigration.

Consider first the policies that regulate legal immigration. Prior to 1965, U.S. immigration policy was guided by the national-origins quota system. Under this system, visas allocated to persons who originated in the Eastern Hemisphere were awarded mainly on the basis of national origin (with two countries, Germany and the United Kingdom, receiving about 60 percent of the available slots). In contrast, persons originating in the Western Hemisphere were exempt from the quotas and faced no numerical restrictions on the number of visas, presumably because of the close economic and political ties between the United States and its geographic neighbors. Visas for Western Hemisphere applicants were awarded on a first-come, first-served basis as long as the persons satisfied a long list of health, moral, and political requirements.

The 1965 Amendments to the Immigration and Nationality Act (and subsequent minor legislation) repealed the national origins quota system, set a world-wide numerical limit (507,000 visas in 1996), and enshrined a new objective for awarding entry visas among the many applicants: the reunification of families. The United States sets aside the bulk of the visas (62 percent in 1996) to certain persons who have relatives already residing in the country, including the adult children and siblings of U.S. citizens, as well as the spouses and minor children of permanent resident aliens. “Immediate” relatives of U.S. citizens—such as spouses, parents, and minor children—are exempt from the numerical limits, and are entitled to immediate entry. In the mid-1990s, 32 percent of the immigrants

entered with an “immediate relative” visa, and over 70 percent entered through one of the family reunification provisions of the law.⁸

The policy shifts in the 1965 Amendments had a profound impact on the number of legal immigrants. Even though only 250 thousand legal immigrants entered the country annually during the 1950s, almost one million were entering by the 1990s. Figure 1 illustrates the increase that occurred in legal immigration from Mexico between 1968 and 1996. In the late 1960s, only about 45,000 Mexican legal immigrants were entering the United States annually. By the mid-1990s, over 100,000 Mexican legal immigrants were entering the country.⁹

The very rapid increase in the size of the legal immigrant flow from Mexico in the past thirty years should not be too surprising.¹⁰ The family reunification provisions that drive U.S. immigration policy likely create a “multiplier effect” where the presence of a certain number of immigrants from a particular country in the United States virtually ensures that more immigrants will originate from that country in the future, as the current immigrants sponsor the entry of additional relatives. Consider, for instance, the long-run impacts of admitting a married couple into the United States. After five years (the time required for naturalization), both of these immigrants can sponsor the entry of their siblings. Once

⁸ U.S. Immigration and Naturalization Service, *Statistical Yearbook of the Immigration and Naturalization Service, 1996* (Washington, D.C., 1997), p. 34. The period refers to 1994-96, so that the statistics are unaffected by the large number of illegal aliens who received amnesty and were awarded permanent residence in the early 1990s.

⁹ A large number of the Mexican legal immigrants admitted in the 1990s were illegal aliens who had received amnesty through the 1986 Immigration Reform and Control Act. The counts of Mexican legal immigrants used in this paper are adjusted to net out the legal admission of these illegal aliens into the United States.

¹⁰ One of the most surprising aspects of the large-scale Mexican immigration in the 1970-1990 period is that it did not occur earlier. The income gap between Mexico and the United States has been quite large for many decades. Prior to 1965, Mexican nationals could migrate legally to the United States without facing any numerical restriction (although consular officials may have well pursued administrative policies that discouraged this type of migration).

the siblings arrive in the United States, they can then sponsor the entry of their spouses, who can in time sponsor the entry of their siblings, and so on. The powerful combination of this type of “chain immigration” policy, the very large wage gap between Mexico and the United States, and the relatively low migration costs encountered by Mexican emigrants probably go a long way towards explaining the very rapid increase in legal immigration from Mexico over the past three decades.¹¹

Of course, the size of the Mexican-origin population in the United States depends not only on the immigration statutes that regulate legal immigration, but also on the large number of Mexicans who illegally choose to enter the United States. The latest wave of illegal immigration from Mexico began in the late 1960s, after the discontinuation of the bracero program. This program was launched in 1942, when the U.S. and Mexican governments agreed to allow the temporary migration of agricultural workers due to a labor shortage caused by World War II. The program continued in various guises until 1964, when it was unilaterally ended by the United States. The main reason given for the discontinuation at the time was the undocumented presumption that the bracero program depressed the wages of native-born American workers in the agricultural industry.

The number of illegal aliens apprehended by the Border Patrol began to increase soon after the bracero program ended. In 1964, fewer than 42,000 Mexican illegal aliens were apprehended; by 1974, nearly 710,000 Mexican illegal aliens were apprehended. The number of apprehensions peaked in 1986 when 1.7 million Mexican illegal aliens were apprehended. In 1986, Congress enacted the Immigration Reform and Control Act (IRCA), hoping to stop the flow of illegal aliens by providing

¹¹ Note that the costs of migration are low not only because of the proximity between the two countries, but also because the large Mexican-American population in the United States forms a large ethnic network that further reduces migration costs by providing relevant information about economic and social conditions in the United States to potential migrants.

amnesty to a large number of illegal aliens already residing in the United States, and by setting up a system of employer sanctions designed to penalize employers who knowingly hire illegal aliens. Nearly 2.7 million illegal aliens were granted amnesty (of whom about 2 million were Mexicans). The employer sanctions, however, did not achieve their objective. After a temporary dip, the number of annual apprehensions of Mexican illegal aliens rose steadily in the early 1990s. By the mid-1990s, over 1 million Mexican illegal aliens were being apprehended annually.

Figure 2 shows the trend in the number of monthly apprehensions made by the Border Patrol on “linewatch” duty. The data on linewatch apprehensions are useful because the illegal aliens are apprehended while they are attempting to enter the United States illegally.¹² As a result, the trend in linewatch apprehensions is likely to be most correlated with changing economic conditions. Although the data on linewatch apprehensions refers to all apprehensions made by the Border Patrol, it turns out that 99.2 percent of linewatch apprehensions in the 1977-96 period occurred at the U.S.-Mexico border. The figure illustrates the highly seasonal nature of apprehensions. Linewatch apprehensions tend to peak in the spring (at the height of the growing season), and typically reach their annual lows in December.

Determinants of Migration Flows from Mexico

The relevance of the implications of the model presented earlier for the number of Mexican emigrants depends on the extent to which emigration responds to changes in relative economic conditions between the two countries (i.e., the size of the labor supply elasticities β_0 and β_1). The

¹² The Border Patrol also captures many persons in locations away from the border. However, we do not have any information on when the illegal aliens captured in “non-linewatch” duty entered the United States. As a result, the data on non-linewatch apprehensions need not reflect the economic conditions facing the two countries at the time of the capture.

empirical analysis presented in this section investigates the extent to which the two types of Mexican migration flows—illegal and legal—respond to economic factors.

It is worth noting that studies of the determinants of the size of the illegal immigration flow typically focus on the trends in the apprehension data summarized in Figure 2 simply because we do not know how many illegal aliens actually enter the United States in any given year. The use of the apprehension data is problematic because 1 million annual apprehensions may imply that 1 million different persons were caught trying to enter the United States illegally, or that 100,000 persons were each caught ten times during the entry attempt. In other words, the number of apprehensions depends on the probability that someone attempting to enter the country illegally is caught by the Border Patrol, and there are no reliable estimates of the apprehension probability or of how this probability has changed over time.

Despite this measurement problem, it is not difficult to isolate the impact of economic variables on the size of the illegal alien flow (as opposed to the number of apprehensions). We can write the number of illegal aliens who are apprehended at time t as:

$$(22) \quad \log A_t = \log p_t + \log I_t,$$

where A_t gives the number of apprehensions; p_t gives the probability of apprehension; and I_t gives the number of persons who attempt to enter the United States illegally. To isolate the impact of economic factors on I_t (the relevant measure of illegal immigration), it is crucial to control for differences in the probability of apprehension over time.

The empirical analysis estimates the following reduced-form regression model using a measure of Border Enforcement activities to adjust for variations in the probability of apprehension:

$$(23) \quad \log A_t = \alpha_0 \log H_t + \alpha_1 \log w_t^M + \alpha_2 \log(e_t w_t^{US}) + \text{other variables},$$

where A_t gives the number of baseline apprehensions made by the Border Patrol in month t ; H_t gives the number of person-hours spent by the Border Patrol policing the U.S. border; w_t^M is the real wage in the manufacturing sector of the Mexican economy (available since 1968), deflated by the Mexican consumer price index; e_t is the exchange rate (defined as the number of pesos per dollar); w_t^{US} is the real wage in the manufacturing sector of the U.S. economy, deflated by the U.S. consumer price index. Note that all of the wage variables are in units of Mexican currency.¹³ The “other variables” included in the regression include a vector of fixed effects indicating the month of the year (to control for seasonality effects in apprehensions), and a time trend (set to unity for January 1968).¹⁴ The regression is estimated using data for the period January 1968 through December 1996.

Figures 3, 4, and 5 illustrate the trends in the real wage data for Mexico and the U.S., respectively, as well as in the exchange rate. It is evident that the Mexican real wage has experienced several periods of substantial decline, typically associated with a major devaluation of the currency, as in

¹³ The data on apprehensions, border enforcement, real wages in the Mexican manufacturing sector, and the exchange rate are drawn from Hanson and Spilimbergo (1999). The data on wages in the U.S. manufacturing sector and the U.S. CPI are available in the web site of the Bureau of Labor Statistics.

¹⁴ The regressions also include dummy variables indicating if the data is for the post-1977 period or for the post-1990 period, as well as interactions between these dummy variables and the time trend. These time trends are designed to control for administrative changes in the way that the Immigration and Naturalization Service measures apprehensions.

1982-83 and in 1994-95. The U.S. real wage declined slightly in the 1980s, but the drop was slight compared to the wage observed in the Mexican economy. Finally, the trends in the exchange rate illustrate the impact of the severe devaluation of the Mexican peso in the past two decades.

Gordon and Spilimbergo (1999) have used these data to investigate the determinants of apprehensions at the U.S.-Mexico border using a variety of time-series specifications. The key results of their study can be easily replicated with the simpler, more parsimonious specification given by equation (23). The simpler simplification allows direct comparison of the parameters estimated in models that examine the trends in illegal immigration (where the data are available monthly) and the trends in legal immigration (where the data are available annually).

The first column of Table 2 reports the key regression showing the determinants of illegal immigration. The number of Mexican illegal aliens apprehended by the U.S. Border Patrol is quite sensitive to enforcement expenditures, as well as to changes in economic conditions in Mexico and the United States. The elasticity of apprehensions with respect to enforcement is .224, indicating that doubling the number of person-hours spent by the Border Patrol policing the border increases the number of apprehensions by 22.4 percent. The elasticity of apprehensions with respect to the Mexican real wage is almost -1 , suggesting that a substantial reduction in the Mexican real wage will lead to a large increase in the number of apprehensions. Finally, the regression reveals that the elasticity of apprehensions with respect to the U.S. real wage is .312, so that a 50 percent increase in the U.S. real wage increases the number of apprehensions by about 16 percent. As in the Hanson-Spilimbergo study, the number of illegal aliens apprehended is much more sensitive to changes in Mexican economic conditions than it is to changes in U.S. economic conditions. Note also that the structure of the model in equations (22) and (23) implies that the wage elasticities given by the coefficients α_1 and α_2 measure

the impact of wage changes on the number of persons who attempt to enter the United States illegally—as long as the border enforcement variable controls for changes in the intensity of border enforcement over time.

To compare the results obtained in the monthly data for illegal aliens with the annual data for legal immigration, it is instructive to reestimate equation (23) after aggregating the illegal alien data up to the annual level. The dependent variable now gives the log of the number of apprehensions during the fiscal year, and the enforcement variable gives the log of the number of person-hours devoted to policing the border during that year. The wage variables are defined as the average real wage during the year (calculated by adding the respective monthly wages and dividing by 12). The second column of Table 2 shows that the annual-frequency regression leads to the same results as the monthly-frequency regression. In particular, the apprehension of illegal aliens is still much more sensitive to changes in Mexican economic conditions than it is to changes in U.S. economic conditions.

The third column of the table illustrates the impact of the enforcement and real wage variables on the number of *legal* Mexican immigrants who enter the United States. The dependent variable is now the log of legal Mexican immigrants admitted in the United States during a fiscal year (and summarized in Figure 2). The regression shows that neither the enforcement variable nor the real wage variables have much impact on the number of legal immigrants who originate in Mexico. In other words, the flow of legal immigrants—in contrast to the flow of illegal aliens—is *not* sensitive to year-to-year changes in Mexican real wages or to changes in U.S. real wages.

The insensitivity of the legal immigrant flow to short-run changes in economic conditions probably has much to do with the mechanics of the family reunification provisions in current U.S. immigration policy. In particular, the process of sponsoring the entry of a relative often takes years.

Many of the sponsoring provisions in current policy require that the sponsors be naturalized citizens, a process that takes at least five years for newly arrived immigrants. After the sponsorship application is filed, there is often a long queue that determines when the sponsored relatives can actually enter the United States. Consider, for instance, the queues faced by potential Mexican immigrants in September 1999. In that month, the State Department was processing applications for the entry of unmarried sons and daughters of U.S. citizens that were filed in October 1993, as well as applications for the entry of the siblings of U.S. citizens that were filed in August 1988.

These long queues suggest that the legal immigration flow is likely to be quite insensitive to transitory changes in economic conditions in either country. After these long waits, the legal immigrant will move to the United States when he or she reaches the head of the queue regardless of the year-to-year blips in relative real wages. Over the long haul, of course, the legal immigrant flow should be more responsive to permanent trends in economic variables, such as a narrowing of the wage gap between Mexico and the United States. But because family reunification plays such a central role in U.S. immigration policy the long-run elasticity of legal immigration with respect to relative real wages will probably be relatively small.

The differential response of legal and illegal immigration to economic variables has important implications for the impact of dollarization on the size of the immigrant flow from Mexico to the United States. Suppose that adopting a fixed rate regime does not lead to a very rapid convergence in real incomes between the two countries (so that dollarization externalities are small). The flow of illegal aliens will then be very responsive to adverse economic shocks in Mexico. In fact, the theory suggests that the impact of an adverse economic shock may be larger under dollarization than it was under the flexible rate system in effect in the 1980s and 1990s.

At the same time, however, the empirical evidence shows that the flow of legal immigrants from Mexico is essentially independent of changes in economic conditions. Moreover, the available data suggest that the legal immigrant flow is almost as large as the *net* illegal alien flow. As a result, the total net flow of immigrants from the United States to Mexico may not be very responsive to dollarization, even if dollarization leads to a significant improvement in economic conditions in Mexico.

The INS estimates that the net flow of illegal aliens into the United States is about 275,000 persons per year.. The INS also estimates that of the 5 million illegal aliens present in the United States in 1996, 2.7 million (or 54 percent) were of Mexican origin.¹⁵ Suppose that the Mexican representation in the annual net flow is proportional to their representation in the stock. This assumption implies that about 150,000 “permanent” Mexican illegal aliens enter the country annually. Between 1993 and 1996, however, an average of about 115,000 Mexican legal immigrants entered the country annually. In short, legal immigration—that part of the Mexican immigrant flow that is least responsive to changes in economic conditions—accounts for 40 percent of the total net flow of Mexicans to the United States.

An economic justification for dollarization—at least in the short run—is that it may reduce the size of the Mexican immigrant flow to the United States because “dollarization externalities” may speed up the process of economic convergence between Mexico and the United States. Suppose that these externalities are indeed important and that they swamp the potential adverse effects of removing an important adjustment mechanism in the Mexican economy (i.e., removing a flexible exchange rate). It is then possible that dollarization would not have a substantial impact on the net number of Mexican

¹⁵ Immigration and Naturalization Service (1996, pp. 197-199).

emigrants, simply because a relatively large fraction of these immigrants enter the United States legally, and their migration decision seems to be unresponsive to current economic conditions.

As an example, suppose that an adverse productivity shock and the dollarization externalities leads to a change in Mexico's real wage on the order of 25 percent (in either direction). The supply elasticity estimated in this section implies that dollarization would cut the size of the net illegal flow by about 25 percent, and would leave the size of the legal flow unchanged. Because legal immigrants make up about 40 percent of the total flow, dollarization would only increase or reduce the net flow of immigrants by about 15 percent. In short, the impact of dollarization on the total number of permanent Mexican emigrants will probably be smaller than might be expected, simply because a relatively large part of the flow is unresponsive to changes in economic conditions.

There is an important caveat to this conclusion. In particular, a large part of the illegal alien flow from Mexico to the United States may be of a temporary nature. These undocumented workers enter the United States for a few months (during the harvest season, for example), and go back to Mexico at the end of the season. We have little information on the magnitude of these transitory flows, although they probably make a large part of the illegal aliens who are apprehended by the Border Patrol. Their migration decision is probably very sensitive to changes in real wages in the two economies, and, as a result, dollarization might have a particularly large impact on the migration decision of these temporary aliens.

IV. Summary

This paper investigates how the dollarization of the Mexican economy will affect economic conditions in the Mexican labor market, and particularly how dollarization will alter the incentives of

Mexican workers to migrate to the United States. In the past two decades, the Mexican economy has reacted quite strongly to major devaluations of its currency. During the currency crisis of 1994-95, for example, the unemployment rate in large urban areas of Mexico more than doubled in less than a year.

A simple economic model of dollarization suggests that by choosing a fixed rate regime tied directly to the U.S. dollar, Mexican policy-makers are in effect giving up “a degree of freedom” in their toolkit of policy remedies. If all other prices in the Mexican economy were flexible, adverse shocks in productivity or in foreign investment would have the same impact regardless of whether the Mexican economy was dollarized or not. If there are imperfections in the Mexican economy, however, the adverse shocks would likely result in more unemployment, lower real wages for Mexican workers, and a greater propensity for the typical Mexican worker to migrate to the United States.

It is also possible, however, that dollarization generates a number of beneficial externalities, such as providing a signal to foreign investors that the Mexican economy may become more stable. In doing so, dollarization might help attract more foreign capital, help stabilize the Mexican economy, and hasten the process of economic convergence between Mexico and the United States. This economic convergence would then reduce the number of Mexican emigrants. There is, however, little empirical evidence to suggest that these externalities are important by-products of dollarization.

The paper also examined the extent to which the migration flow from Mexico to the United States—both of legal immigrants and of illegal aliens—responds to differences in economic conditions between the two countries. It turns out that the illegal alien flow is quite responsive to economic variables, but that the legal immigrant flow is not. This fact suggests that the impact of dollarization on the number of Mexican emigrants is likely to be weaker than is typically claimed by either the proponents or the opponents of dollarization. Because the legal immigrant flow makes up a sizable

fraction of the net flow of Mexican immigrants—and because the legal immigrant flow is insensitive to changes in economic variables—it is possible that shifting to a fixed rate system might not have a very large impact on the number of Mexican nationals who move to the United States permanently.

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Figure 1. Legal Immigration from Mexico to the United States, 1968-1996
(annual data)

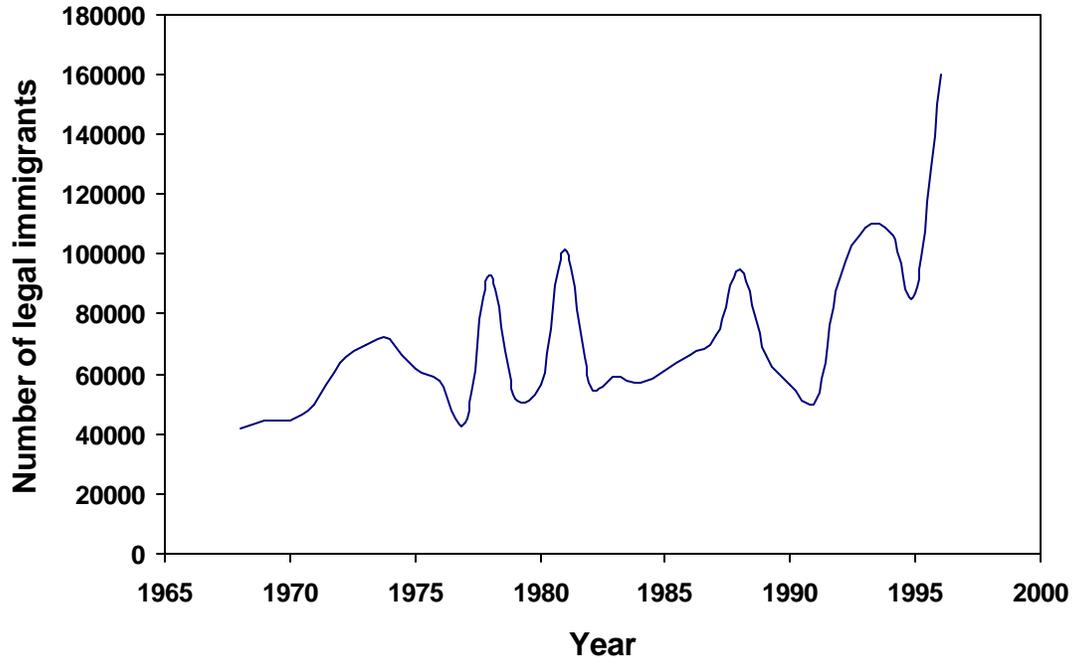


Figure 2. Number of Baseline Apprehensions, 1968-96
(monthly data)

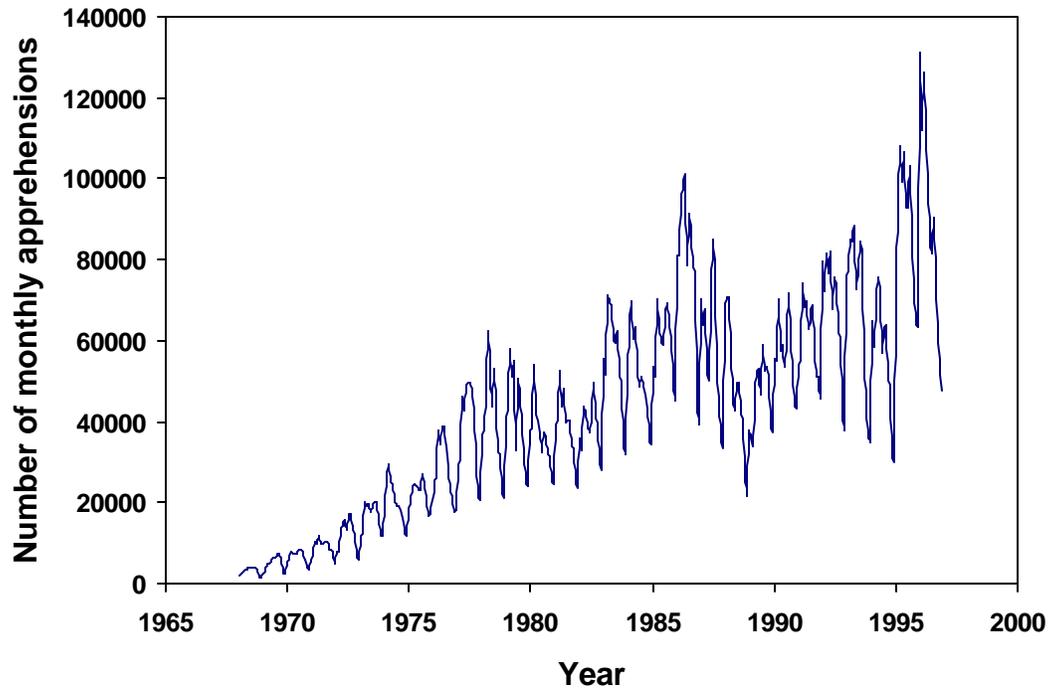


Figure 3. Trends in Mexican Real Wage
(monthly data)

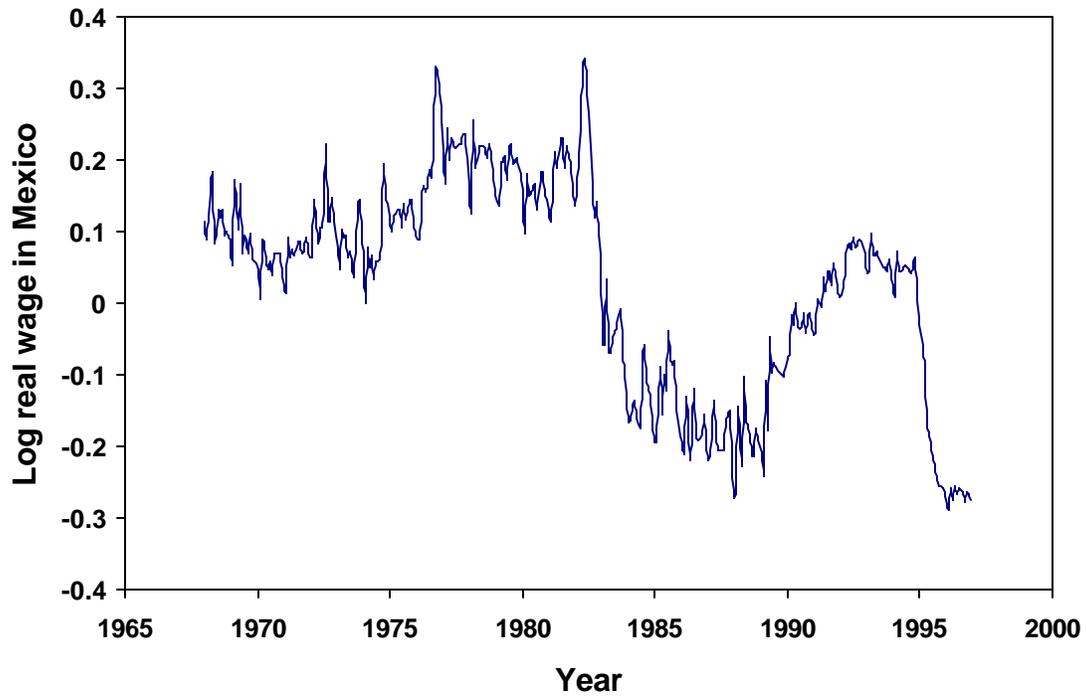


Figure 4. Trends in U.S. Real Wage
(monthly data)

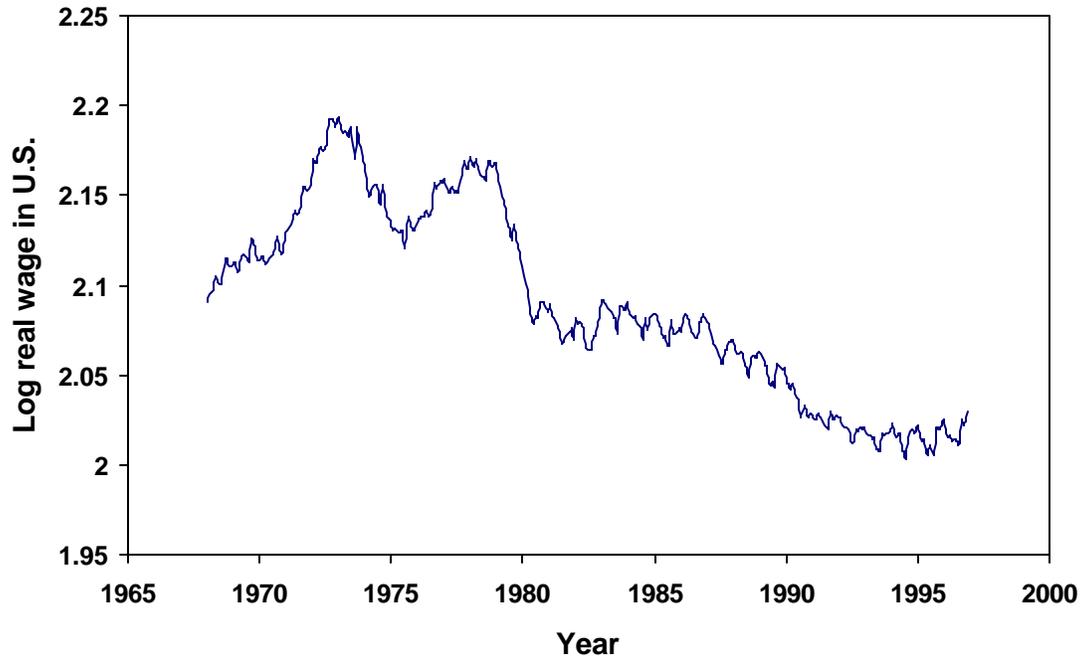


Figure 5. Mexican Exchange Rate
(new pesos per dollar)

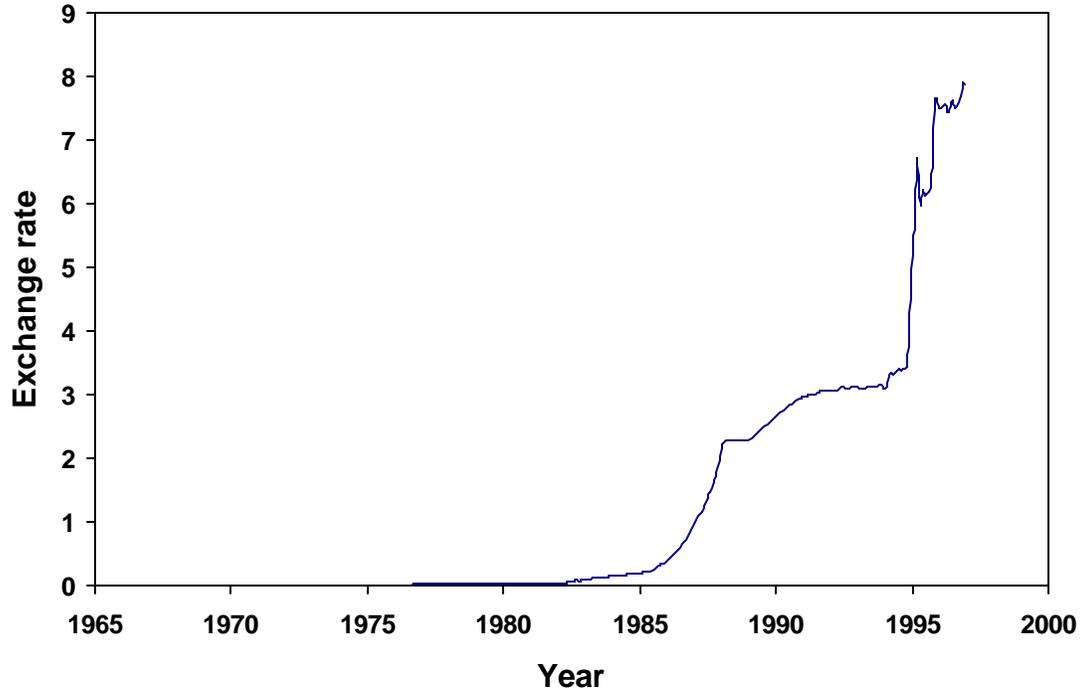


Table 1. Effects of Shocks in Capital Market in an Economy
with Downward Wage Rigidity and $\tilde{K} < 0$.

<u>Variable</u>	<u>Flexible exchange rate</u>	<u>Fixed Exchange rate</u>
$\tilde{w}_1 - \tilde{e}$	0	---
$\tilde{w}_1 - \tilde{p}$	$\frac{-\theta\tilde{K}}{1+\beta_0}$	---
$\tilde{w}_0 - \tilde{e}$	$\frac{\theta\tilde{K}}{1+\beta_0}$	$\frac{\theta\tilde{K}}{1+\beta_0} - \frac{1-\theta}{1+\beta_0}$
$\tilde{w}_0 - \tilde{p}$	0	0

Table 2. Determinants of Mexican Migration Flows

<u>Independent Variable:</u>	<u>Dependent Variable:</u>		
	<u>Log number of apprehensions (monthly)</u>	<u>Log number of apprehensions (annually)</u>	<u>Log number of legal immigrants (annually)</u>
Log enforcement hours	.224 (.094)	.116 (.237)	-.345 (.600)
Log real wage in Mexico	-.980 (.132)	-.877 (.384)	-.191 (.706)
Log real wage in U.S.	.312 (.072)	.429 (.218)	-.555 (.400)
Time trend	.023 (.001)	.293 (.030)	.074 (.054)
R ²	.968	.988	.692

Notes: Standard errors are reported in parentheses.