Exploring the Causes of the Slowdown in Remittances to Mexico

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Abstract

This paper examines some of the possible reasons for the slowdown of remittances to Mexico. The analysis suggests that improvements in remittance data collection, although important, do not account for the full reduction in the remittances growth rate. The findings show that different proxies for Mexican unemployment in the United States have a negative relationship with remittances to Mexico, while the impact of U.S. output on remittance transfers does not seem to be strong. The study also finds that U.S. housing variables affect remittance transfers, with a particular prominence of the number of houses sold in the United States. Overall, the results seem to suggest that there is not a single reason for the slowdown/decrease of remittances to Mexico, but rather a combination of factors. This fact makes the creation of policy responses to the reduction in migrants' transfers a challenging process.

Keywords: housing, Mexico, migration, remittances

JEL Codes: F22, F24, R31

1   Introduction

According to the World Bank (2008), migrants sent over US$305 billion back to their home countries during 2008. Recipients of remittances typically spend the money on necessities such as food and health services (Amuedo-Dorantes et al. 2007), the acquisition of human capital (Edwards and Ureta, 2003; Gitter and Braham, 2007), and investments including microenterprises and housing (Osili, 2004; Woodruff and Zenteno, 2001). Although the net impact of remittances in receiving countries is far from settled in the literature, there is no denying that the receiving families benefit from these monies. Moreover, remittances may help receiving countries deal with economic crises and can provide the needed, but often unavailable, capital for investment in developing countries (Barajas et al,. 2009). Finally, remittances represent a lucrative business for many banks and money transfer agencies in the sending and receiving countries (Samuels, 2003).

What, then, is the cause of the recent slowdown in workers' remittances to Mexico? From 1996 to 2006, remittances to Mexico registered an average annual growth rate of about 19 percent. However, remittances were almost flat in 2007, and actually decreased in 2008. Given the importance of remittances for receiving countries and the potential benefits of these flows, it comes as no surprise that this sudden decline in growth in workers' remittance flows to Mexico has generated significant attention from the media.[1]

The most often-mentioned explanation put forth by the press and policy experts is the deterioration of the U.S. housing market. That is, downward fluctuations in the U.S. construction sector negatively affect the migrant's budget, which, in turn, leads the migrant to decrease the

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[1] See for instance Dickerson (2007) in Los Angeles Times, Malkin (2008) in The New York Times, Farrell (2008) in Business Week, Hudson and Campoy (2007) in the Wall Street Journal, Minton (2008) in the Arkansas Democrat Gazette, Solis and Corchado (2008) in The Dallas Morning News and Williams (2007) in the Washington Post just to name a few.

amount transferred to family and friends abroad. A down turn in the housing/construction market hits migrants particularly hard because Mexican workers tend to concentrate in this sector. In fact, the Pew Hispanic Center (2007) estimates that of the 2.9 million Hispanics employed in the U.S. construction industry in 2006, 2.2 million were foreign born, representing about 19 percent of the industry's labor force.

According to other explanations put forth, workers' remittances may also be affected by the recent generally poor shape of the U.S. economy, not simply the housing market. Although an important percentage of Mexican immigrants work in the construction sector, Mexican immigrants also tend to participate in other sectors of the economy such as manufacturing, agriculture, and, in particular, in the service sector (e.g. customer support, housekeeping services and restaurants). In fact, a recent report by The Federal Hispanic Work Group (2009) indicates that twenty-four percent of Hispanics in the United States work in the tertiary sector of the economy. A downturn in these sectors, and in the economy as a whole, could result in a slowdown of remittances that may not be confined to tough times in the housing sector.

Other plausible explanation for the slowdown in remittances is the fiercer enforcement of migration controls including an increasing number of raids in factories that hire undocumented workers and additional security in the United States/Mexico border. These factors make it more challenging for undocumented workers to enter or stay in the United States and make job opportunities for these immigrants scarcer over time. Finally, its possible that the apparent increase in remittances during the 1990s may have been the result of improvements in the measurement of these flows and that the current trend is likely to be more closely reflecting the actual growth rate and not necessarily a slowdown. Before 2000, monthly remittance levels were inferred from an outdated 1990 census of financial institutions and information gathered from

money exchange houses and electronic wire-transfer companies (Cañas et al., 2007). Since 2000, additional efforts have been made to account for these flows. Furthermore, the portion of remittances that are transferred through formal channels has increased, making it easier to track flow amounts.

We examine these potential explanations for the slowdown/decrease in workers' remittances to Mexico. Note, however, that these explanations are not mutually exclusive. Indeed, it is unlikely that the decline in growth has a single cause. Rather, we seek to discern which—if any—of these explanations have merit and—if so—to what degree. Because the money that Mexican migrants send home has become extremely important for families and businesses on both sides of the border, the issue at hand is particularly timely and relevant.

2   The Recent Slowdown in Remittances to Mexico: A Closer Look

Table 1 shows that of the US$4 billion sent to Mexico in 1996, about US$1.5 billion in remittances, or 36% of total flows, were sent as money orders. In contrast, by 2008 only 2% of total remittances were money orders whereas wire transfers—which are much easier to track— had increased at an average annual rate of 23% since 1996 to reach 96% of total flows. Figure 1 shows that the growth in remittances closely parallels the growth in the amount of money sent as wire transfers. Over the same period, other transfer methods remain relatively flat. Part of this increase in wire transfers may be explained by the new financial services offered to immigrants by U.S. banks. An example is the acceptance of the *matricula consular* card as a valid identification method by over 350 US financial institutions to open bank accounts in the United States (National Council of La Raza, 2004).[2]

<<TABLE 1 ABOUT HERE>>

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[2] The *matricula consular* is an identification card issued by the Government of Mexico through its consulates in the United States to Mexican citizens regardless of their immigration status.

This change in transfer method has also facilitated the tracking of these flows by government authorities (Cervantes, 2007). Hence, it is possible to argue that the larger portion of the money transferred as wire transfers, in addition to the increased effort in tracking these flows, may be responsible for the dramatic increase in remittances. To examine the validity of this line of reasoning, we also look at the number of transactions with each transfer method. Table 2 shows that in 1996 migrants made approximately 13 million transactions, valued at over US$4 billion, equaling an average US$320 per transaction. In 2008, Mexican migrants made over 72 million transactions worth about US$25 billion, for an average of about US$346 per transaction. This compares with an average of the whole period in the Table of about US$325 per transaction. Therefore, the amount sent per transaction has remained relatively stable over time.

<<TABLE 2 AND FIGURE 1 ABOUT HERE>>

Table 2 shows clearly that, along with the total amount transferred, the number of transactions also increased since 1996, with an average growth rate of 17%. The most growth is seen in wire transfers transactions. Conversely, money orders and checks transactions experienced drops in transactions numbers at even larger rates than their respective drops in total amount of money sent through these methods, averaging an annual drop in growth rate close to 1% and 16%, respectively. That is, not only has the amount of money sent through these transfer methods declined, but also the number of transactions has decreased. Cash and in-kind transactions saw slight increases in the number of transactions as well as amount transferred.

However, even if some of the recent increases in remittances can be explained by different transfer method selection by immigrants and increased efforts on the part of Mexico's Central Bank in tracking these flows, it is unlikely that most of the drop in the growth rate of remittances can be explained by these two factors. According to Cañas et al. (2007), Mexico's

Central Bank improved its procedures for recording remittance data in 2000. Initially, it focused on record keeping and then on collecting data from remittance-related sources outside the bank. However, in 2002 the Central Bank decided that all banks and wire-transfer companies must register and report monthly remittance flows.[3]

Although the growth rate of remittances jumped somewhat significantly in 2000 (about an additional 6%), a large increase did not occur during 2002 (see Table 1). Moreover, from 2003 to 2006—after the new rules regarding remittances and reporting of wire transfers were in place—remittances increased at an annual average rate of 28%. This steady and significant growth contrasts sharply with the growth rate of just 2% during 2007, the lowest growth rate of the previous 11 years, and to the decline of about 4% in 2008.

Even if money orders suffered the biggest percentage drop, falling 30% to under US$600 million, the slowdown in wire transfers remittances is, perhaps, most significant. In 2008, these transfers that had maintained an average annual growth rate of about 29% between 2003 and 2006, fell by about 3%. Moreover, this growth rate dropped suddenly, by 17%, between 2006 and 2007. Hence, the growth rate of wire transfers, which are most easily tracked and are reported directly to Mexico's Central Bank, dropped dramatically. This finding suggests that the drop in remittances is not just the result of the additional efforts in tracking these flows, which began in 2000 with new regulations and fortified in 2002 with new reporting policies. That is, if exclusively due to better data collection, the drop in growth rate would have been gradual rather than the observed sharp decline five years following the first regulation reform.

Table 3 shows remittances growth by state in Mexico. In 2007 the remittances growth rate decreased for all Mexican states compared with 2006, a situation that was almost repeated in

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[3] This decision was based on Article 31 in Chapter V of Banco de México's Law, which gives the Central Bank the power to regulate fund transfer services provided by credit institutions and by other companies.

2008. Moreover, 20 states reported a decrease in the volume of remittances during 2008. This finding contrasts starkly with the three previous years as in 2004 and 2005 just one state reported a decrease in the volume of remittances compared to the previous year, while in 2006 all states reported growth in migrant transfers. Table 3 shows that although the magnitude of the slowdown in remittances varies across the states, the slowdown seems to be affecting all Mexican states.

<<TABLE 3 ABOUT HERE>>

Cañas et al. (2007) addresses the issue of better measurement of remittances by generating a forecast of remittances using data through the fourth quarter of 2002. Their model predicts that macroeconomic factors would result in remittances of US$21.5 billion in 2006, accounting for about 90% of the remittance estimates for that year. Moreover, they estimate that the new methodology accounts only for US$700 million of total remittances in 2006—just 2.9% of the total flow. Even more important, the growth rate of remittances that they forecast is always positive and after 2004 from the shape of the forecast it seems that the growth rate of the forecast is larger than the actual growth rate in remittances.

Taken together, these observations suggest that even if the improvement in the collection of remittances data can explain a portion of the recent and sudden drop in remittances transfers, other factors are likely to be primarily responsible. In the remainder of the article, we look at some other potential explanations for the slowdown in remittances including the weakening of the U.S. housing market, the deteriorating conditions of the overall U.S. economy, and the economic situation of Mexicans in the United States.

3.   Theoretical Background

In this section, we develop a simple model to explain the potential impact on remittances of some of the possible explanations for the recent drop in migrants' transfers. Although Mexican migrants remit for a variety of reasons, altruism is widely regarded as the prime motive. To account for the altruistic motive for remitting, we assume that the migrant's utility depends, in addition to his or her current consumption of a composite commodity in the host country (z^{mp}), on household consumption of a composite commodity in the home country (z^{h}). Moreover, let household consumption of the commodity be itself a function of remittances (r) and any other income available to the household (y^{h}), that is:

$$z^{h}(er, y^{h}) , \tag{1}$$

where remittances multiplied by the exchange rate (e) expresses remittances in domestic currency.

Migrants also remit because they may gain potential benefits from sending money home. Some of these potential benefits include, for example, the return on investments in the home country. Therefore, we assume that there is some reward that the migrant obtains from remitting money home.[4] We assume that this reward is received by the migrant in terms of future consumption (z^{mf}). Therefore, a relation between migrant's future consumption and remittances is obtained by

$$z^{mf} = (1+i)er , \tag{2}$$

where i represents the rate of return of remittances in terms of future consumption. The migrant uses current income (y^{m}) to consume and to send remittances; therefore, the migrant's budget constraint is given by

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[4] See Hoddinott (1994) for an example of another theoretical model that assumes that the migrant receives these types of rewards for remitting.

$$y^m = z^{mp} + r.$$ (3)

Finally, let migrant's utility depend on present and future consumption of the composite commodity in the host country and household consumption of the composite commodity in the home country:

$$U(z^{mp}, z^{mf}, z^h(er, y^h)).$$ (4)

The migrant maximizes equation (4) subject to the constraints suggested by equations (2) and (3). The first order conditions of this problem imply[5]

$$U_{z^{mp}} = U_{z^{mf}}(1+i)e + U_{z^h}z^h_{er}e.$$ (5)

In equation (5), the left-hand side provides the marginal utility from the migrant's present consumption in the host country. As we can see, the marginal gain from consuming in the host country must equal the gain from remittances in terms of family consumption and future migrant's consumption.

What is this model telling us about the explanations of the recent slowdown/decrease in worker's remittances to Mexico? First, a decrease in the income of the migrant has a negative effect on the level of transfers.[6] Hence, if the recent slowdown in the U.S. economy negatively impacts migrants' job opportunities, we should also expect a negative impact on remittance transfers. Moreover, if the recent raids of undocumented immigrants decrease the numbers of jobs available to migrants, remittances will also be affected negatively. However, a decrease in household's income in Mexico (i.e., income other than remittances) appears to have a positive impact on transfers. Therefore, we cannot discard the possibility that the slowdown in the U.S. economy is affecting the Mexican economy and, therefore, worsening the economic situation of

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[5] Where U_i is the derivative of U with respect to argument i ,and z^h_i is the derivative of z^h with respect to i.

[6] See the Appendix for the explicit partial derivatives.

many of the households in Mexico. At the macroeconomic level, therefore, the impact of the slowdown in the U.S. may have two channels: On the one hand, the worsening in the economic condition of migrants decreases remittances, whereas the potential worsening of economic conditions in Mexico encourage transfers.

Finally, remittances can be expressed as a function of the parameters of the model y^m, y^h, i, e; that is, $r = (y^m, y^h, i, e)$. Therefore, as determinants of remittances, variables that represent migrants economic conditions, economic conditions in Mexico, returns to remitted money, and the exchange rate should be included in the analysis.

4 Methodology and Data

We start the analysis by calculating correlation coefficients between remittance flows to Mexico and several measures of economic activity in the United States and Mexico. Specifically, we estimate the correlation between remittances and industrial production in Mexico and the United States, two measures of Mexican unemployment in the United States, and several measures of U.S. housing activity.

Mexican unemployment is measured in two ways. First, we use the unemployment rate of Hispanics in the United States. This measure accounts for the employment conditions of all Hispanics, not just Mexicans. However, Mexicans account for almost two thirds of Hispanics in the United States (US Census Bureau, 2009). Hence, we think that this can be a good measure of the economic situation of the Mexican community in the United States. Nonetheless, we construct a second measure of Mexican unemployment in the United States. We created a weighted unemployment rate, where the unemployment rate of each state is multiplied by the proportion of the United States Mexican population that resides in that state. For instance, according to the US Census about 38 % of Mexicans in the United States reside in California,

hence, for each period we multiply the unemployment rate of California by .38. After, carrying out the same exercise for each state we aggregated the values across states. The two proxies for Mexican unemployment are presented in Figure 2. As it is obvious for the Figure, both measures tend to move together and have similar dynamics. The main difference is that the weighted measure by nature of its construction is smoother.

<<FIGURE 2 ABOUT HERE>>

We estimate U.S. housing activity using three alternative measures: (a) new privately owned housing units starts (housing starts), (b) new private housing units authorized by building permit (housing permits), and (c) new one-family houses sold (houses sold).[7] The three measures are presented in Figure 3. As can be appreciated from the Figure, while these variables are strongly related, the movements are not perfectly synchronized. Furthermore, as we will see below, the results tend to be somewhat different depending on the measure of U.S. housing that is included in the analysis.

<<FIGURE 3 ABOUT HERE>>

In these initial correlation coefficient estimations, we test whether these variables are related to remittances in lags or leads by calculating the correlation coefficients contemporaneously and with the remittances series shifted backward and forward up to two periods. Although the selection of the number of lags and leads is ad hoc, we find no large differences in the main conclusions when estimations with additional lags or additional leads are used. Moreover, as previously mentioned, remittances data collection methods have improved, especially since 2000. Therefore, it may be possible that the relation between remittances and

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[7] For further discussion on potential measures of U.S. housing activity, see Vargas-Silva (2008a).

these macroeconomic variables has changed over time. To address this matter, we also estimate the correlation coefficients using a rolling window of two years.

Although correlations are informative, they have important limitations. For instance, correlations are simple bivariate statistics that do not allow for the inclusion of additional factors. To address these limitations, we also estimate a series of six-variable vector autoregressive (VAR) models containing U.S. output (*USY*), a measure of the economic condition of Mexicans in the U.S. (*Migrant*), remittances (*REM*), Mexico's interest rate (*I*), Mexico's exchange rate (*E*), and Mexico's output (*MEXY*). The variables used for *Migrant* include the unemployment rates and housing measures discussed above.

The selection of the variables to include in the VAR follows the theoretical intuition that we gained above in Section 3. U.S. output, as a reflection of the condition of the U.S. economy, may have important effects on the budget constraint of migrants and thus an impact on remittances. We include Mexico's interest rate to account for transfers that are motivated by investment opportunities in Mexico, which previous studies have found can be an important motive for remittance transfers.[8] To better capture the difference in return between investments in the United States and in Mexico, we include Mexico's interest rate as a deviation from an equivalent U.S. interest rate. The exchange rate is included because although immigrants earn money in U.S. dollars, transfers to family members in Mexico are typically converted into Mexican pesos.[9] Finally, Mexico's output is a reflection of the economic conditions in Mexico and, therefore, serves as a proxy for the economic situation of families in Mexico.

In addition to addressing the previous concerns, the use of a VAR model addresses the potential endogeneity among the variables. For instance, although it is possible for remittances to

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[8] See, for example, Osili (2004) and Woodruff and Zenteno (2001).
[9] Previous studies such as Faini (1994), Higgins et al. (2004) and Vargas-Silva (2008b) show the importance of the exchange rate for remittance transfers.

impact Mexico's output, it is also likely that remittances respond to changes in Mexico's output. Once the VAR is estimated, we estimate impulse response functions and variance decompositions. Impulse response functions simulate the effect of a shock to one variable in the system on the conditional forecast of another variable. For example, if the response of remittances after a shock to the U.S. housing activity is positive, then presumably remittances will respond positively to innovations in the U.S. housing activity. Variance decompositions show how much of the k-step ahead forecast error variance for each variable is explained by innovations to each variable in the system.

To obtain orthogonal residuals, we use the conventional Cholesky decomposition, which imposes a recursive structure so that variables higher in the ordering are not affected contemporaneously by shocks to variables lower in the ordering. We use the following ordering of the variables in the model: *USY*, *Migrant*, *MEXY*, *I*, *E*, and *REM*. In this case, we assume that U.S. output is not contemporaneously affected by shocks to the other variables, that Migrant's economic conditions are affected contemporaneously only by U.S. output, and that remittances are affected contemporaneously by economic conditions in the United States and Mexico and by the housing variable.

We use monthly data for the period January 1999 to June 2009. The real exchange rate is defined as Mexican pesos per U.S. dollars and is constructed using the consumer price index of both countries. The consumer price indexes are seasonally adjusted, and the nominal exchange rate is not. Income is measured as seasonally adjusted industrial production for both the United States and Mexico. Note that although we would like to include gross domestic product as a measure of output, the data are not available at monthly frequency. The interest rate is the

difference between Mexico's government three-month bond rate (CETES interest rate or Certificados de la Tesorería de la Federación) and the three-month U.S. Treasury bill rate.

We use total family remittances as a measure of Mexico's inward remittances. This variable is seasonally adjusted and expressed in real terms. As measures of housing activity in the United States, we use the number of seasonally adjusted housing starts, seasonally adjusted housing permits, and seasonally adjusted houses sold. All the Mexican data are obtained from Banco de Mexico (the Mexican Central Bank). All U.S. data, except the unemployment rates, are obtained from the database of the Federal Reserve Bank of St. Louis. The unemployment rates are seasonally adjusted and are obtained from the U.S. Bureau of Labor Statistics and the weights are constructed using the information from the US Census. All variables, except the interest rate differential, are used as the first difference of natural logarithms to approximate growth rates.

5 Results

5.1 Correlations

Table 4 provides the correlations between remittance growth and the growth rate of U.S. and Mexico's output, both measures of the unemployment rate, and the three measures of housing activity in the United States. Column (1) reports the correlation coefficients with the remittances series shifted backward two periods, and column (5) reports the correlation coefficients with the remittances series shifted forward two periods. Table 4 shows that a strong correlation does not exist between remittances and most of the variables. There are, however, a few instances in which we get significant contemporaneous correlation coefficients. One case is Mexico's output and this may correspond to the fact that an important share of remittance transfers are motivated by self-interest reasons such as investments and worsening economic conditions in Mexico

discourages remittance transfers. However, when a lead of remittances is used, the correlation coefficient, while still significant, turns negative. This finding suggests that remittances have a negative correlation with Mexico's previous month's output, which can be interpreted as evidence of altruistic transfers.

<<TABLE 4 ABOUT HERE>>

The contemporaneous correlation coefficient between remittances and housing starts is also significant. This result suggests that increased activity in the U.S. housing sector encourages remittances. As previously discussed, a significant portion of Mexican immigrants in the United States works in the construction sector. Thus, increased activity in the construction sector leads to better job opportunities and therefore increased transfers. Although this result is intuitively appealing, note that a strong contemporaneous relation does not appear to exist between remittances and the other U.S. housing activity variables. In fact, housing starts seem to be correlated negatively with the two period lead of remittances, while housing permits have a positive relationship with the remittances series lagged two periods. Finally, the weighted unemployment measure is negatively related with the remittances series lagged two periods.

In sum the previous results seem to be all over the place and do not provide definite suggestions about how these factors are affecting remittances. Nonetheless, as previously mentioned a possible explanation for the lack of significance of some of these coefficients lies in the changing nature of the remittance series. Thus, we estimate the correlation coefficients using a rolling window of three years as shown in Figures 4, 5 and 6. In each figure, the horizontal lines represent confidence bands. That is, if the rolling correlation lies outside those bands, the null hypothesis that the correlation coefficient is equal to zero can be rejected.

Figure 4, which reports the rolling correlations of remittances with housing starts, housing permits, and houses sold, shows that during the first part of the sample, the correlation is positive and significant for housing starts and then it turns insignificant. For the case of houses sold there is some evidence of a negative relationship between this measure and remittances. However, the evidenced is limited as it is significant only for a few periods. Therefore, according to these rolling correlations, for the last two or three years, the correlation between remittances and housing variables is weak.

<<FIGURE 4 ABOUT HERE>>

Figure 5, reports the rolling correlations of remittances with the two measures of unemployment. Interestingly, it seems that the correlation of remittances with these two unemployment variables moves in opposite directions. In the case of the Hispanic unemployment rate we have a pattern of positive-negative-positive relationship across time, while the opposite is true for the weighted unemployment rate. Given that the weighted unemployment is constructed using the overall unemployment rates of the individual states, it seems feasible that there are timing differences between the two measures. That is, it may be that Hispanic unemployment leads (or lags) the total weighted unemployment rate.

<<FIGURES 5 AND 6 ABOUT HERE>>

The correlation of Mexico's output and U.S. output with remittances is reported in Figure 6. The Figure provides evidence of a positive and significant correlation between remittances and Mexico's output. Two potential explanations exist for this positive relation. First, as previously mentioned, a significant portion of remittance transfers to Mexico may be made for investment and other self-interest motives that are positively related to output. Alternatively, remittances

may have a positive impact on Mexico's output, which results in a positive correlation between these variables. The correlation with US output is not significant.

5.2   Impulse Response Functions

Correlations are simple bivariate statistics, by adding more variables, the analysis can control for additional factors. For instance, given the high degree of synchronization between Mexican and U.S. business cycles,[10] a slowdown in the U.S. economy would likely be accompanied by a slowdown in Mexico's economy. In fact, the current economic slowdown in the United States has reportedly already led to reduced production at the *maquiladoras* (manufacturing plants in Mexico whose production is mostly sold in the United States) and has affected other areas of Mexican production that primarily depend on U.S. demand.[11] The theoretical section suggested that migrants send money home to support their families, and thus worsening of economic conditions in Mexico should encourage transfers. Hence, degrading economic conditions in Mexico encourages transfers, whereas the tougher budget constraints on migrants in the United States discourage transfers. Therefore, to reach a clear conclusion regarding the macro level relation between remittances and the shape of the U.S. economy, we must control for Mexico's economic situation.

Although both the response of remittances to shocks to all the variables included in the estimation and the impact of remittances on the macroeconomic variables of the receiving country provide interesting insights about remittances in Mexico, for reasons of space we focus on the main question, that is, the response of remittances after shocks to U.S. output, U.S. housing activity, and proxies for the unemployment rate of Mexicans in the United States. The

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[10] See Chiquiar and Ramos-Francia (2005) and Torres and Vela (2003) for more on the synchronization between U.S. and Mexico's business cycles.

[11] See Ordonez (2008).

impact on remittances of the other variables included in the VAR (e.g., interest rates and exchange rates) has been widely discussed in the literature (see El-Sakka and McNabb, 1999; Fairchild and Simpson, 2008; Faini, 1994; Higgins et al., 2004; Vargas-Silva, 2008b; Vargas-Silva and Huang, 2006), as has the impact of remittances on the macroeconomic variables of the receiving country (see Amuedo-Dorantes and Pozo, 2004; Bourdet and Falck, 2006; Chami et al., 2005).

The top part of Figure 7 shows the response of remittances after shocks to the measures of U.S. housing activity. We estimate separate VARs in which the difference is the measure of U.S. housing activity included in the estimation. We find that shocks to U.S. housing starts show a positive effect on remittances. The impact seems to be in the magnitude of 2 to 4 %. However, the response is statistically significant for only two periods. Specifically, the response of remittances to U.S. housing starts shocks becomes significant in periods 12 and 18 after the shock. Similarly, the response of housing permits while positive is not significant. On the other hand, there is evidence of a strong relationship between houses sold and remittances. The response becomes significant after 14 periods and remains significant for six periods. The impact is about 4 percent at its peak during this period.

<center><<FIGURE 7 ABOUT HERE>></center>

Next we examine the response of remittances to shocks to U.S. output, and the two proxies for Mexican unemployment in the United States. These responses are reported in the bottom of Figure 7. It seems that US output has a positive and significant impact on remittances. Nonetheless, the impact is short lived, as it is significant for the first period only. The Figure also shows that there is no evidence of an impact of the Hispanic unemployment rate on remittances. Still, the weighted unemployment rate has a negative impact on remittances that is close to three

percent. Therefore, there is at least some evidence from the impulse response functions that the tougher economic conditions in the United States are having an impact on remittances.

5.3 Variance Decompositions

Table 5 reports the portion of the forecast error variance in remittances that can be explained by U.S. output, U.S. housing starts, U.S. housing permits, U.S. houses sold, and the two measures of unemployment after 24 periods. The results show that U.S. output explains a significant portion of the variance (about 20% in average), and after 24 periods, most measures of housing activity explain a relevant portion of the forecast error variance (i.e., 16% for housing starts, 15% for housing permits, and 6% for houses sold). From these measures, housing starts is the only one that comes up as significant. However, an important difference exists between the intuition we gain from the correlations and from the impulse response functions. Specifically, in the case of the unemployment rate of Hispanics in the United States, the portion of the forecast error variance of remittances explained is large (16%) and significant. Hence, Hispanic unemployment in the United States may play a relevant role in explaining the variation of remittances. Finally, it is still the case that the weighted unemployment rate seems a relevant measure in explaining remittances to Mexico.

<<TABLE 5 ABOUT HERE>>

6.   Conclusion

Remittance transfers to Mexico increased by an annual average rate of 20% between 1996 and 2006, before slowing dramatically to just 2% in 2007 and decreasing in 2008. This rapid slowdown has drawn increasing attention from government institutions as well as the media. We focus our attention on four possible explanations for this slowdown. First, we consider the decrease in U.S. housing activity, which has been consistently mentioned by policy experts and

the media as a reason for the slowdown in remittances given that a large portion of Mexican immigrants in the United States work in construction-related activities. Second, we examine the overall weak condition of the U.S. economy as a factor in the slowdown in remittances. Although an important portion of Mexicans immigrants work in the construction sector, large segments of the U.S. Mexican population works in the service sector and therefore may be directly affected by the weak condition of the U.S. economy. Third, we examine the argument that the recent increase in actions against undocumented workers has made it more difficult for immigrants in the United States to find and retain jobs. Finally, we examine the rationale that the recent improvement of remittances data may account for the growth rate of remittances and that the slowdown is simply the result of better measurement of remittance flows.

The analysis suggests that although improvements in remittance data may account for a portion of the drop in the remittances growth rate, the slowdown is too dramatic to be explained by this factor alone. We also find that several other explanations may help explain the slowdown in remittances. Specifically, the employment condition of Mexicans in the United States, that is proxy using different unemployment measures, shows some relation with remittance transfers. In this regard findings suggest that remittances to Mexico are more related to a state level unemployment rate weighted by the portion of Mexicans residing in each state than to the overall Hispanic unemployment rate.

On the other hand, U.S. output does not have a strong impact on remittance transfers (although it may affect the variation in the remittances series). Finally, several U.S. housing variables have an impact on remittance transfers. Among these variables the number of houses sold seems to be one of the key variables explaining remittances. Remittances are also positively correlated with U.S. housing variables over time. Thus, we find some evidence that the decline in

U.S. housing activity and, to some extent, the worsening of economic conditions of Mexicans in the United States can offer some explanations for the recent and sudden slowdown in workers' remittances sent to Mexico. However, the overall picture of the study seems to suggest that there is not a single reason for the slowdown/decrease of remittances to Mexico, but rather a combination of factors. None of the factors studied in the reviewed in the study is an all powerful determinant of the slump in remittances to Mexico.

The fact that the plunge in remittances is caused by multiple factors suggest that there is no easy fix for the decrease in remittances. This suggests that the creation of policy responses on the part of the Mexican government to the reduction in migrant's transfer is a challenging process and it should address issues involving Mexicans in the United States in a broad spectrum of conditions. These policies may include, for instance, further support of the Mexican government of financial assets that meet the needs of documented and undocumented Mexican immigrants, encouraging the United States government to create superior temporary worker programs for the agricultural sector and promote the legalization of undocumented immigrants in the United States, among others.

Appendix

The second order condition (soc) for the problem is

$$soc = U_{z^{mp}z^{mp}} + U_{z^{mf}z^{mf}}(1+i)^2 e^2 + U_{z^h z^h}(z_{er}^h)^2 e^2 + U_{z^h} z_{erer}^h e^2 < 0.$$

The derivatives are

$$\frac{\partial r}{\partial y^m} = \frac{U_{z^{mp}z^{mp}}}{soc} < 0, \text{ and}$$

$$\frac{\partial r}{\partial y^h} = \frac{U_{z^h z^h} z_{er}^h e z_{y^h}^h}{soc} < 0.$$

References

Amuedo-Dorantes, C. and S. Pozo (2004) "Worker's Remittances and the Real Exchange Rate: A Paradox of Gifts." *World Development*, 32, 1407–1417.

Amuedo-Dorantes, C., T. Sainz and S. Pozo (2007) "Remittances and Healthcare Expenditure Patterns of Populations in Origin Communities: Evidence from Mexico", Institute for the Integration of Latin America and the Caribbean (INTAL), Inter-American Development Bank, Working Paper 25.

Barajas, A.; Chami, R.; Fullenkamp, C.; Gapen, M. and P. Montiel (2009) "Do Workers' Remittances Promote Economic Growth?", International Monetary Funds, Working Paper No. 09/153.

Bourdet, Y. and H. Falck (2006) "Emigrant's Remittances and Dutch Disease in Cape Verde." *International Economic Journal,* 20, 267–284.

Cañas, J., Coronado, R. and Orrenius, P. (2007) "Explaining the Increase in Remittances to Mexico." *Southwest Economy*, 4, July/August.

Cervantes, J. (2007, May) "Improving Central Bank Reporting and Procedures on Remittances." Presentation at the Federal Reserve Bank of Dallas-San Antonio Branch's Cross Border Banking Conference, San Antonio.

Chami, R., Fullenkamp, C., and S. Jahjah (2005) "Are Immigrant Remittance Flows a Source of Capital for Development?" *IMF Staff Papers*, 52.

Chiquiar, D. and M. Ramos-Francia (2005) "Trade and Business-cycle Synchronization: Evidence from Mexican and U.S. Manufacturing Industries." *North American Journal of Economics and Finance*, 16, 187–216.

Dickerson, M. (2007) U.S. Housing Slump Hits Home. Los Angeles Times, April 26.

Edwards, A.C. and M. Ureta (2003) "International Migration, Remittances, and Schooling: Evidence from El Salvador." *Journal of Development Economics*, 72, 429–461.

El-Sakka, M. and McNabb, R. (1999) "The Macroeconomic Determinants of Migrant Remittances." *World Development*, 27, 1493–1502.

Faini, R. (1994) "Workers Remittances and the Real Exchange Rate: A Quantitative Framework." *Journal of Population Economics*, 7, 235–245.

Farrell, C. (2008) As Housing Goes South, So Do Fewer Dollars. *Business Week*, March 3.

Gitter, S. and B. Braham (2007) "Credit, Natural Disasters, Coffee, and Education Attainment in Rural Honduras." *World Development*, 35, 498–511.

Higgins, M., A. Hysenbegasi, and S. Pozo (2004) "Exchange-rate Uncertainty and Workers' Remittances." *Applied Financial Economics*, 14, 403–411.

Hoddinott, J. (1994) "A Model of Migration and Remittances Applied to Western Kenya," *Oxford Economic Papers*, 46, 459–476.

Hudson, K. and A. Campoy (2007) "Hispanics' Hard Times Hit Wal-Mart." *Wall Street Journal*, August 29.

Malkin, E. (2008) "Mexicans Barely Increased Remittances in '07." *New York Times*, February 26.

Minton, M. (2007) "Aliens Phoning Mexico Less Cash." *Arkansas Democrat-Gazette*, September 30.

National Council of La Raza (2004) "NCLR Applauds Bipartisan Support of the Matricula Consular's use at Financial Institutions." Press Release, September 16.

Pew Hispanic Center (2007) "Construction Jobs Expand for Latinos Despite Slump in Housing Market." Fact Sheet, March 7.

Ordonez, F. (2008) "Economic Slump May Bring More Mexican Workers." *Seattle Times*, April 20.

Osili, U.O. (2004) "Migrants and Housing Investments: Theory and Evidence from Nigeria." *Economic Development and Cultural Change*, 52, 821–849.

Roache, S. and E. Gradzka (2007) "Do Remittances to Latin America Depend on the U.S. Business Cycle." IMF Working Paper no. WP/07/273.

Samuels, G. (2003) "Banking Unbanked Immigrants through Remittances." *Communities and Banking*, Federal Reserve Bank of Boston, Fall.

Sims, C. (1980) "Macroeconomics and Reality." *Econometrica,* 48, 1–49.

Sims, C., J. Stock, and M. Watson (1990) "Inference in Linear Time Series Models with Some Unit Roots." *Econometrica,* 58, 113–44.

Solis, D. and A. Corchado (2008) "Remittances to Mexico Drop as U.S. Economy Slows, Enforcement Increases." *Dallas Morning News*, January 31.

Torres, A. and O. Vela (2003) "Trade Integration and Synchronization Between the Business Cycles of Mexico and the United States." *North American Journal of Economics and Finance*, 14, 319–342.

U.S. Census Bureau (2006) "Relationship Between Building Permits, Housing Starts, and Housing Completions." www.census.gov.

Vargas-Silva, C., (2008a) "Monetary Policy and the U.S. Housing Market: A VAR Analysis Imposing Sign Restrictions." *Journal of Macroeconomics*, 30, 977–990.

Vargas-Silva, C. (2008b) "The Tale of Three Amigos: Remittances, Exchange Rates and Money Demand in Mexico." *Review of Development Economics*, Forthcoming.

Vargas-Silva, C. and P. Huang (2006) "Macroeconomic Determinants of Workers' Remittances: Host versus Home Country's Economic Conditions." *Journal of International Trade and Economic Development,* 15, 81–99.

Williams, K. (2007) Remittances to Mexico Slow. *The Washington Post*, August 9.

Woodruff, C. and R. Zenteno (2001) "Remittances and Microenterprises in Mexico." Working Paper, University of California, San Diego.

World Bank (2008) Migration and Remittances Factbook. Available at http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21352016~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html, accessed November 7, 2008.

Table 1. Remittances to Mexico by Transfer Method

Date	Total Remittances		Money Orders		Checks		Wire Transfers		Cash and In-Kind	
	Flow	Growth	Flow	Growth	Flow	Growth	Flow	Growth	Flow	Growth
1996	4,223.69	15.00	1,519.70	4.35	26.19	185.64	2,221.85	17.48	407.35	36.23
1997	4,864.85	15.18	1,728.81	13.76	74.81	4.64	2,637.88	18.72	419.85	3.07
1998	5,626.84	15.66	1,870.69	8.21	78.28	-21.44	3,250.25	23.21	444.38	5.84
1999	5,909.55	5.02	1,448.36	-22.58	61.50	-16.72	3,935.05	21.07	474.97	6.88
2000	6,572.75	11.22	1,434.40	-0.96	51.22	-83.23	4,641.97	17.96	487.74	2.69
2001	8,895.27	35.34	803.29	-44.00	8.59	18.63	7,783.55	67.68	298.25	-38.85
2002	9,814.45	10.33	686.52	-14.54	10.19	-1.18	8,798.09	13.03	319.83	7.24
2003	15,040.73	53.25	1,665.26	142.57	10.07	-36.25	13,114.43	49.06	254.60	-20.40
2004	18,331.31	21.88	1,869.67	12.27	6.42	-100.00	16,228.04	23.74	233.61	-8.24
2005	21,688.70	18.32	1,747.87	-6.51	0.00	0.00	19,667.66	21.20	273.15	16.93
2006	25,566.83	17.88	1,359.70	-22.21	0.00	0.00	23,853.96	21.29	353.17	29.30
2007	26,068.68	1.96	859.68	-36.77	0.00	0.00	24,821.68	4.06	387.30	9.66
2008	25,137.37	-3.57	598.18	-30.42	0.00	0.00	24,112.99	-2.86	426.65	10.06
Average	13672.39	16.73	1353.24	0.24	23.16	-3.84	11928.26	22.74	367.73	4.65

Note: Remittances figures are given in millions of U.S. dollars.

Table 2. Number of Transactions by Transfer Method

Date	Total Remittances		Money Orders		Checks		Wire Transfers		Cash and In-Kind	
	Flow	Growth	Flow	Growth	Flow	Growth	Flow	Growth	Flow	Growth
1996	13208.06	17.27	4226.87	-4.39	110.17	82.25	8162.53	32.84	708.49	11.20
1997	15368.59	16.36	4865.16	15.10	79.54	-27.80	9636.21	18.05	787.67	11.18
1998	19419.53	26.36	5656.19	16.26	81.67	2.68	13060.16	35.53	621.53	-21.09
1999	20937.31	7.82	3679.64	-34.94	58.89	-27.89	16578.47	26.94	620.33	-0.19
2000	17999.05	-14.03	3602.52	-2.10	15.32	-73.99	13737.04	-17.14	644.18	3.84
2001	27744.29	54.14	1903.54	-47.16	10.22	-33.29	25246.47	83.78	584.07	-9.33
2002	29953.84	7.96	1780.01	-6.49	10.48	2.54	27703.97	9.73	459.42	-21.34
2003	47651.30	59.08	4498.06	152.70	6.86	-34.54	42798.10	54.48	348.31	-24.18
2004	57011.26	19.64	4602.83	2.33	0.00	-100.00	52085.78	21.70	322.65	-7.37
2005	64923.31	13.88	4066.92	-11.64	0.00	0.00	60511.01	16.18	345.41	7.05
2006	74183.61	14.26	2844.61	-30.05	0.00	0.00	70696.69	16.83	642.31	85.96
2007	75700.76	2.05	1585.88	-44.25	0.00	0.00	73343.65	3.74	771.23	20.07
2008	72627.30	-4.06	1352.70	-14.70	0.00	0.00	70487.38	-3.89	787.22	2.07
Average	41,286.79	16.98	3,435.76	-0.72	28.70	-16.16	37,234.42	22.98	587.91	4.45

Table 3. Remittances by State or Territory

State or Territory	2004 (%)	2005 (%)	2006 (%)	2007 (%)	2008 (%)
Aguascalientes	22.1	1.9	17.6	-6.9	-6.7
Baja California	16.9	55.9	17.6	8.6	1.8
Baja California Sur	-5.7	37.2	16.3	11.0	9.6
Campeche	4.0	23.4	24.6	-3.6	-8.1
Coahuila	29.6	34.0	14.3	4.2	1.8
Colima	30.8	22.9	10.9	4.7	0.8
Chiapas	35.6	29.6	22.2	-4.0	-11.7
Chihuahua	18.9	39.4	21.7	-2.8	0.7
Distrito Federal	12.3	43.6	14.3	-9.8	-19.6
Durango	26.7	16.7	11.4	3.1	0.0
Estado de México	31.8	22.2	17.8	2.9	-3.5
Guanajuato	23.6	9.8	21.8	1.5	-1.2
Guerrero	16.2	13.7	23.3	2.9	-1.2
Hidalgo	18.5	12.0	20.9	14.8	-13.5
Jalisco	10.4	16.0	16.6	0.0	-3.3
Michoacán	29.2	7.1	2.4	-5.1	2.7
Morelos	16.6	17.5	16.6	4.5	1.0
Nayarit	16.4	15.4	15.1	6.2	1.8
Nuevo León	56.8	-3.8	20.6	2.0	-7.7
Oaxaca	20.6	13.3	25.4	7.5	2.5
Puebla	19.6	17.7	25.8	9.1	0.8
Querétaro	26.3	15.3	19.4	-3.6	-6.8
Quintana Roo	28.3	26.1	17.4	-2.5	0.1
San Luis Potosí	17.0	19.8	27.4	7.1	-0.3
Sinaloa	18.2	20.7	11.4	1.8	-5.3
Sonora	33.8	73.3	10.5	0.4	-5.2
Tabasco	23.5	48.7	20.1	-3.8	-13.9
Tamaulipas	22.2	49.7	16.6	2.6	-1.9
Tlaxcala	26.7	20.2	22.9	9.5	2.0
Veracruz	17.5	17.4	22.6	3.8	-6.7
Yucatán	22.7	21.6	34.0	12.1	-3.3
Zacatecas	21.2	11.5	23.8	13.1	-10.5
Average	22.1	24.1	18.9	2.8	-3.3

Note: Percentage are changes in the volume of remittances for the indicated year and state.

Table 4. Correlations

Variable	Remittances				
	(1) $t-2$	(2) $t-1$	(3) t	(4) $t+1$	(5) $t+2$
Mexico's output	-0.05	-0.10	0.30*	-0.27*	0.12
U.S. output	0.06	0.15	0.06	-0.05	0.05
Housing starts	0.12	-0.12	0.22*	0.10	-0.21*
Housing permits	0.18*	-0.03	0.16	0.13	-0.07
Houses sold	0.04	0.01	-0.01	0.10	0.07
Hispanic unemployment	-0.12	-0.12	0.08	-0.08	0.04
Weighted unemployment	-0.24*	-0.08	-0.08	-0.06	-0.09

Note: Column (1) presents the correlation of the remittance series lagged two periods and the variable of selection, and column (5) presents the correlation of the remittance series forwarded two periods and the variable of selection. All variables are used as growth rates. * indicates significance at the 0.05 level.

Table 5. Variance Decompostitions

Portion of the Forecast Error Variance Explain by

U.S. Output	Housing Starts
20	16
(10)	(8)^
U.S. Output	Housing Permits
17	15
(9)	(9)
U.S. Output	Houses Sold
25	6
(10)^	(8)
U.S. Output	Weighted Unemployment
26	23
(11)^	(11)^
U.S. Output	Hispanic Unemployment
18	16
(9)^	(8)^

^ indicates that the points estimate is at least twice as large as its standard error.

Note: These numbers are point estimates after 24 periods. Standard errors are in parenthesis and are constructed via Monet Carlo with 1,000 repetitions. Each row represents a separate estimation.

Figure 1.– Remittances to Mexico by Transfer Method

Note: Remittances figures are reported in millions of US dollars.

Figure 2. Weighted Unemploymnet Rate and Hispanic Unemployment
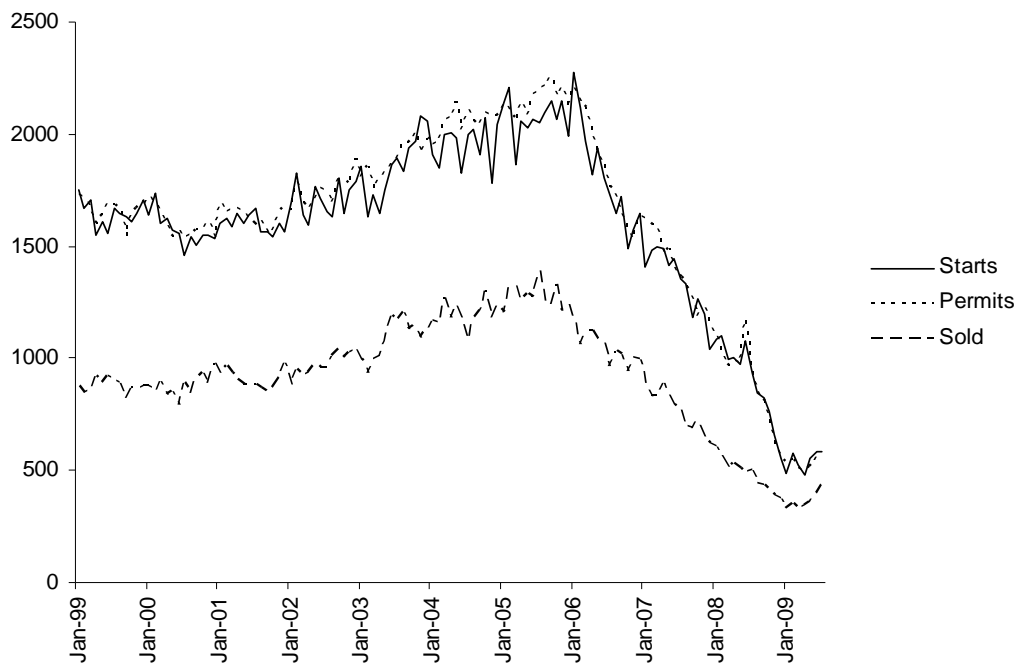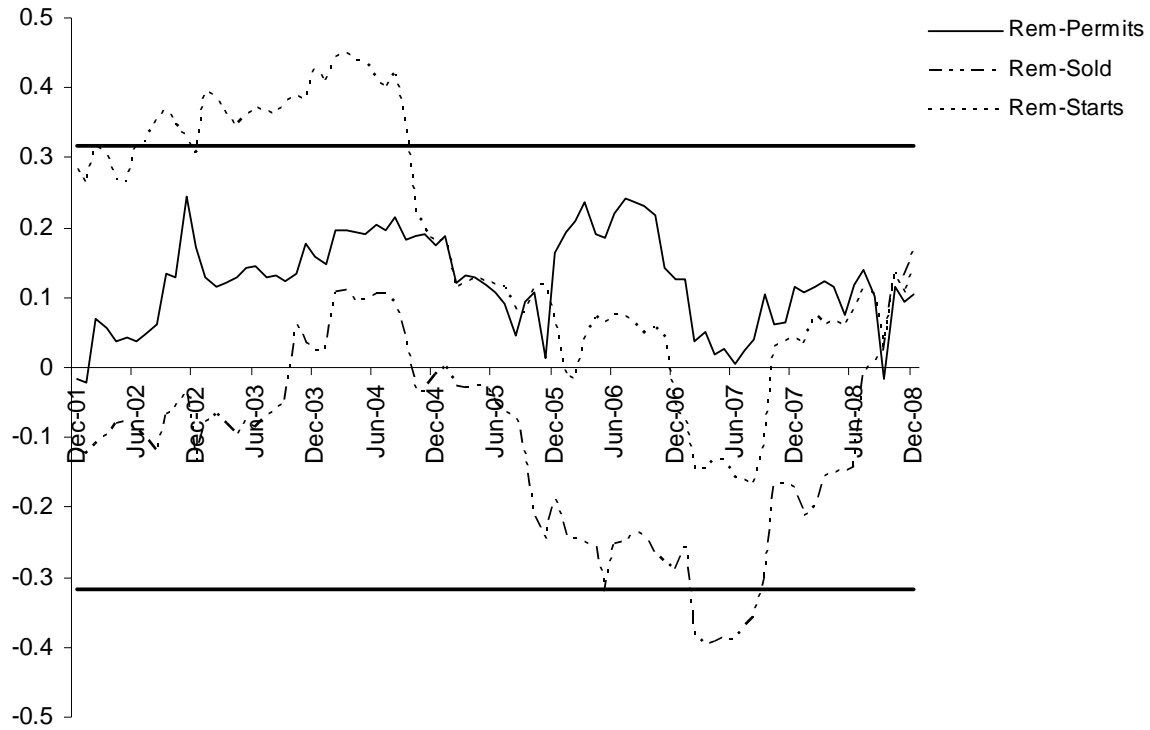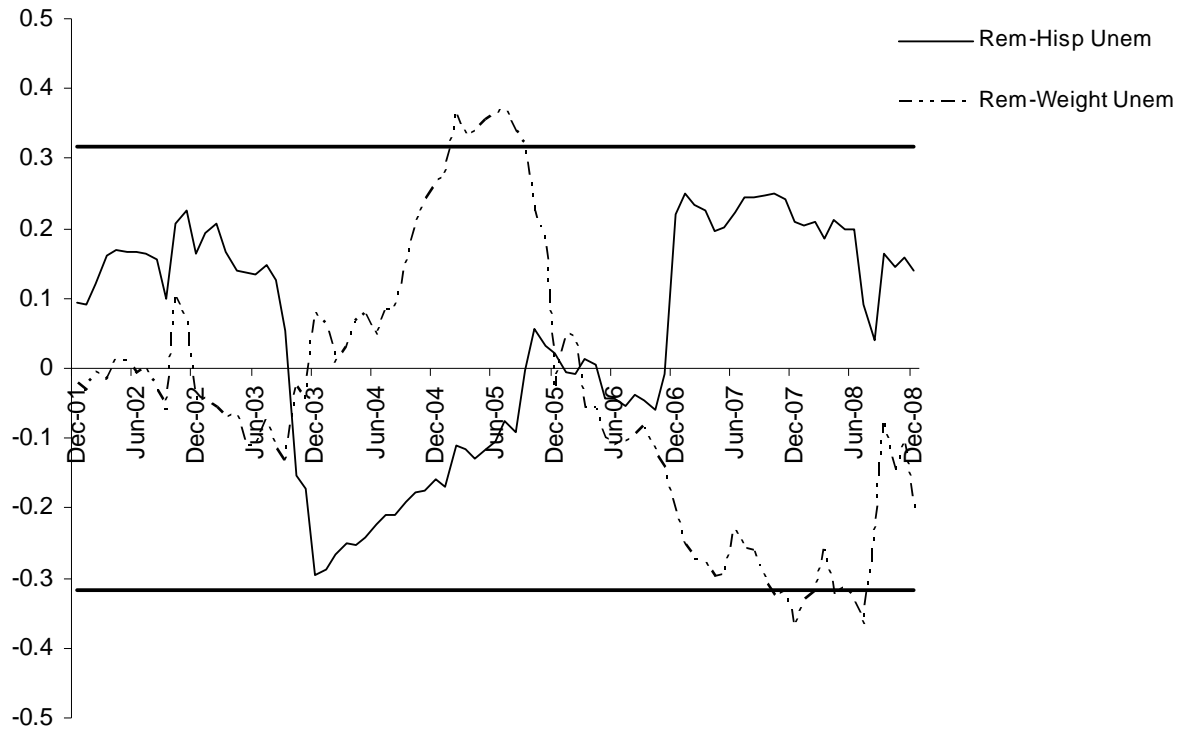
Figure 3. Measures of Housing Acitivity

Figure 4. Correlation of Remittances with Measures of U.S. Housing Activity
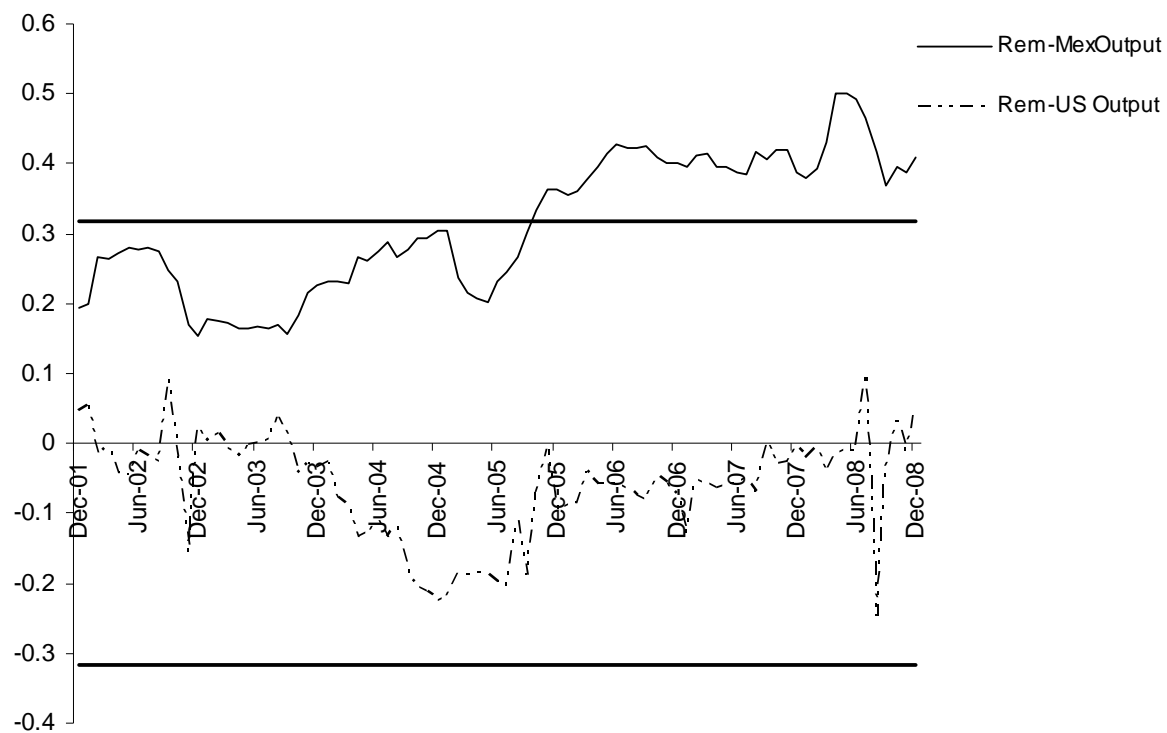

Note: Rem - Permits represents the correlation of remittances with housing permits, Rem - Starts represents the correlation of remittances with housing starts, and Rem - Sold represents the correlation of remittances with houses sold. The rolling window corresponds to two years.

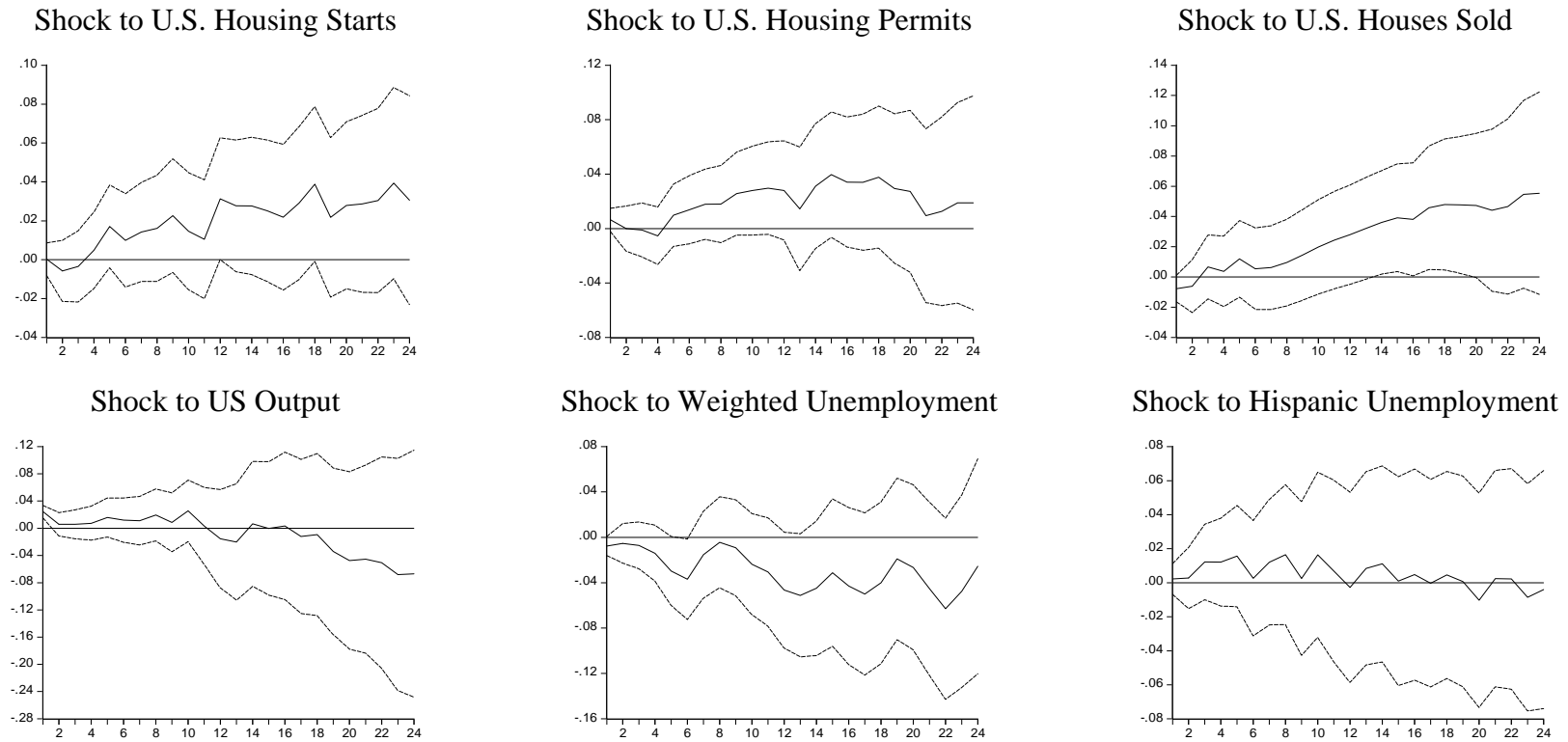**Figure 5. Correlation of Remittances with Hispanic Unemployment and Weighted Unemployment**

Note: Rem - Hisp Unem represents the correlation of remittances with Hispanic unemployment, Rem - Weight Unem represents the correlation of remittances with the weighted U.S. unemployment. The rolling window corresponds to two years.

Figure 6. Correlation of Remittances with Mexico's Ouput and US Output

Note: Rem - Mex Output represent the correlation of remittances with Mexico's output, Rem - US Output represents the correlation of remittances with U.S. output. The rolling window corresponds to two years.

Figure 7. Response of Remittances to Shocks in US Housing Measures

Note: The figure shows impulse response functions derived from individual vector autoregression estimations that also includes U.S. output, (US housing starts, US housing permits, US houses sold, weighted unemployment or Hispanic unemployment), Mexico's output, the interest rate differential, and remittances. The bands represent asymptotic two standard deviation intervals.