

Remittances and Relative Prices

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Abstract

Using Mexican data, this article analyzes the impact of the workers' remittances on the cross-section distribution of prices as well as on the evolution of individual relative prices over time for 272 consumer items. The results suggest that there are important differences in the responses of relative prices to remittances according to various categories of these items. While the relative prices of a number of nontradable service items such as housing consistently rise, the relative prices of several durable items such as furniture tend to fall in response to the remittance shock. Furthermore, remittances explain substantial variation in prices for a large number of consumer durables and services at various time horizons. The relative price responses are more volatile over time for most food items and less volatile for nonfood and service items reflecting different degrees of price flexibility.

1. Introduction

The economic impact of immigration on the migrant-sending countries has been the focus of much discussion in the recent literature. One of the most well-known consequences of out-migration is the monetary sums sent by migrants to their families and friends back home. Usually the amount of the individual transfers is not large. However, the total amount of these flows can reach an enormous dimension. Current recorded workers' remittance inflows into Latin America have surpassed the inflows of foreign direct investment and official development assistance. The money that the migrants send home has become an important source of income for receiving families.

If we treat remittances as a source of household income, other things being equal, an increase in remittances shifts the receiving household's budget constraint outward by the amount of the transfer and therefore has a positive impact on household consumption. However, the potential increase in consumption is not likely to be equal across the spectrum of all goods and services. Previous microeconomic studies have presented mixed evidence about the uses of remittances. While some studies argue that families receiving remittances from abroad typically spend the money on daily needs such as food and clothing (Orozco, 2003), others argue that the remittance receiving households tend to spend more on investment goods like education, health, and housing, and less on food than their non-remittance receiving counterparts (Adams and Cuecuecha, 2010; Taylor and Mora, 2006). Overall, these potential changes in demand for various consumption items may have an impact on the distribution of relative prices.

In this article, we study the impact of remittances on the cross-section distribution of consumer prices in Mexico, the largest recipient of remittances in Latin America. The

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study of the impact of remittances on the relative prices of the receiving country is important because relative prices play a pivotal role in decision making by millions of economic agents about consumption and production in the economy. Excessive variability in relative prices leads to an inefficient allocation of resources across different sectors of the economy and involves substantial welfare cost to the society. Thus, studying the effects of remittances on relative prices is important for understanding their macroeconomic consequences.

Our results also contribute to the understanding of the widely documented positive relation between inflation and standard deviation of relative price changes, particularly for the case of developing countries. Furthermore, information on the impact of remittances on relative prices can be useful for the formulation of appropriate fiscal and monetary policy in countries with large remittance inflows such as Mexico.

In this study, we seek answers to the following questions about the impact of remittances in the receiving countries. Do remittances have any impact on the cross-section distribution of prices? In particular, what are the effects of remittances on various moments of the price distribution? Which products or services relative prices are most affected by remittances? Is it possible to discern identifiable patterns in responses of relative prices to remittances according to various categories of consumer items such as durable and non-durable goods, and services? To the best of our knowledge, our paper is the first study that fully analyzes the impact of remittances on the relative prices of the receiving country.

2. Relevant Literature and Theoretical Background

Remittances have the potential to impact a large number of variables in the recipient country. Therefore, the literature that tries to assess the macroeconomic impact of remittances is varied in its scope and at times controversial in its conclusions.¹ Broadly, remittances may have both beneficial as well as detrimental effects. While effects like augmentation of the capital stock through financing investment are conducive to growth, other impacts such as a decrease in labor supply, may have adverse consequences for macroeconomic performances.

From the microeconomic perspective, some studies (especially earlier studies) conclude that remittance transfers are spent mostly on food. For example, Orozco (2003) showed that up to three quarters of the remittance transfers are spent on food in Mexico. However, some other recent studies suggest otherwise. Adams and Cuecuecha (2010), using data for Guatemala, found that the remittance receiving households spend more on education and housing, and less on food than do other households. Similarly, Taylor and Mora (2006), in a study using household level data from Mexico, concluded that the propensity to invest appears to be considerably larger for households with migrants. Zarate-Hoyos (2004) showed that the Mexican remittance receiving households devote a larger proportion of current expenditures to investment and savings and have lower income elasticities for current consumption and for durable goods.

Do these microeconomic impacts have any implications at the macroeconomic level? At the macroeconomic level, remittances may impact a series of variables including prices and the exchange rate. Amuedo-Dorantes and Pozo (2004), using data for 13 Latin American and Caribbean countries, found that remittances cause appreciation of the real exchange rate. Vargas-Silva (2009) provided further evidence of real exchange

rate appreciation for the specific case of Mexico. The impact of remittances on prices, however, has remained largely unexplored.

Our paper complements the previous literature on the macroeconomic impact of remittances in the recipient country by providing, for the first time, a detailed analysis of the impact of remittances on relative prices. By studying the impact of remittances on relative prices of various consumption items we not only improve our understanding of the household behavior as regards to the potential uses of remittances but also can learn a great deal about the macroeconomic consequences of remittances.

This line of research is also important in the context of the existing literature on the relation between inflation and the distribution of relative price changes. It is widely documented that there is a positive relation between inflation and the dispersion of relative price changes. However, the theoretical exposition has not been conclusive in regards to the causal mechanism that generates the observed relationships. According to one theory propounded to explain this relationship, both inflation and relative price variability are generated by some exogenous factor. Remittances may fit very well as that exogenous factor explaining the relation between inflation and various moments of relative price distribution for several developing countries.

This literature also indicates that there may be distinct patterns in responses of the relative prices to aggregate factors according to some identifiable common characteristics. For example, Golob and Bishop (1997) reported that there are important differences in the behavior of prices of durables, non-durables and services. Nath (2004) further suggested that intermediate and investment goods may respond differently than do consumption goods to changes in aggregate factors. These studies, however, do not provide a good explanation as to why these differences exist. As we have argued above, remittances may have differential effects on items with generally identifiable characteristics such as durable goods, non-durable goods, and services.

Some Intuition on the Effects of Remittances on Relative Prices

A recapitulation of our discussion and the findings of the existing microeconomic studies suggest that remittances, by changing household demand for various items, will have an impact on their prices. That the remittance income elasticity of demand varies across consumption items is an important finding of the literature and provides the intuitive basis for the expected results of our investigation. It is, therefore, conceivable that remittances may cause disproportionate changes in prices of various consumption items and that will have implications for relative prices.

If as Orozco (2003) suggested remittances are mainly spent on food, then after an increase in remittances we may see an increase in the price of food items relative to other items. However, if remittance money is mostly spent on services such as education, health, and housing then we may observe an increase in the price of these services relative to other items. This should be especially the case if, as Adams and Cuecuecha (2010) argued, remittance receiving households also decrease their spending on food compared to other households. Similarly, Zarate-Hoyos (2004) argued that remittance receiving households have lower income elasticities for consumption of durable goods. If this holds true, then we can expect remittances shocks to decrease the relative price of durable goods.

This intuition about changes in relative prices is further reinforced by the fact that remittance transfers are often targeted towards a specific household consumption. For example, some studies (e.g. Amuedo-Dorantes et al., 2007) suggested that remittances are targeted towards healthcare expenditures. This type of targeted transfers will change the consumption patterns of the remittance receiving households and, in aggregate, may have implications for relative prices.

The above discussion is based on the implicit assumption that prices are fully flexible, but as it is a well known, most prices are not fully flexible. Thus, even if remittances increase demand for various consumption items proportionately, there may be disproportionate changes in prices with implications for relative prices. Hence, although it is intuitively clear that remittances will cause changes in relative prices, it is not clear *a priori* how they will affect relative prices of individual items. Therefore, we now turn to an empirical investigation of the effects of remittances on prices in Mexico.

3. Methodology and Data

Methodology

As it is standard in most macroeconomic studies of this type, we use a vector autoregressive (VAR) model. We estimate a seven variable system that includes industrial production (*IP*), remittance inflows (*REM*), the overall consumer price index (*CPI*) (*P*), CPI of individual consumption item (*PICI*), the interest rate (*I*), M2 measure of money (*M*), and the exchange rate (*X*). All variables, but the interest rate, are used in natural logarithms.² Since the data are of monthly frequency, we include 12 lags of each variable as well as a constant in each equation of the VAR. In order to compute impulse response functions and variance decompositions, we use conventional Cholesky decomposition to obtain orthogonal residuals. We use the following ordering of the variables in the model: *IP*, *REM*, *P*, *PICI*, *I*, *M*, and *X*. In this case, we assume that output is not contemporaneously affected by shocks to the other variables, while the exchange rate is contemporaneously affected by shocks to all the other variables. We further assume that shocks to remittances have contemporaneous effects on individual prices, while shocks to prices affect remittances with a lag.³

We estimate the VAR model recursively including one individual consumer item price at a time. Thus, for each of the 272 individual prices, we estimate an equation relating that price series with the macroeconomic variables in the VAR. That is, for each price index we estimate an equation of the following form:

$$p_{it} = A_i + B_i(L)p_{it} + D_i(L)X_t + \varepsilon_{it}, \quad (1)$$

where p_{it} is the log of price index of good i , A_i is the constant term, X_t is the vector of macroeconomic variables, and B_i and D_i are lag polynomials.

It is very important to recognize that because we include the general price level (measured by overall CPI) in the VAR model, the impulse responses represent net effects of the remittance shock on individual prices. That is, these responses are to be interpreted as effects of remittances on individual prices over and above their effects on the general price level. Thus, the price of an individual item can be thought of as a “relative price”, relative to the overall price level.

This methodology has been used by several other studies on relative prices. For example, Balke and Wynne (2007) and Lastrapes (2006) used VARs to estimate the

impact of shocks to variables like money supply, interest rates and productivity on relative prices using data for the USA. Both papers include commodity prices and overall CPI in the VARs in order to see the impact of these shocks on relative prices. As with the current study, Balke and Wynne (2007) used short-run restrictions and include the commodity prices one at a time, while Lastrapes (2006) preferred long-run restrictions to identify the shocks.

The inclusion of standard macro variables such as output, money supply, interest rate, and exchange rate is primarily motivated by a desire to control for the effects of these variables on individual markets through well known channels. As we mentioned above, aggregate factors such as output, money supply and interest rates have been shown on previous studies to have an important impact on relative prices (Lastrapes, 2006; Nath, 2004). Moreover, the exchange rate with its possible impact on the prices of tradable and nontradable goods also has important implications for relative prices (Betts and Kehoe, 2008).

In this structure of the model, for each individual price series we assume no feedback to or from other individual price series.⁴ We estimate impulse responses of all individual prices for one through 24 months to a shock to remittances and generate the cross-section distributions at various time horizons after the shock. We also calculate various moments of these cross-section distributions at different time horizons. Finally, we estimate variance decompositions of individual prices to identify items for which variations in prices are explained by remittances.

Data

We use monthly CPI data for 272 consumption items for the period 1996:01–2007:06. A list of these individual price series is included in the Appendix (Table A1). The base year for the price series is June 2002. Seasonal adjustments have been made to the prices using the Census X-11 method. The choice of the sample period is dictated by two considerations. First, although data on remittances are available before 1996, they are more reliable only for recent years. Second, we want to avoid the years of the Mexican financial crisis, particularly 1994 and its immediate aftermath.

In addition to disaggregate prices, we also obtain data on overall CPI; industrial production that represents output; monetary aggregate, M2; short-term interest rate; and the nominal exchange rate that is defined as Mexican pesos per US dollar. Note that although we would like to include gross domestic product as a measure of output, the data are not available at the monthly frequency. The interest rate is the Mexican government's three-month bond rate (CETES interest rate). Finally, we use total family remittances as a measure of Mexico's inward remittances. All the data are obtained from Mexico's Central Bank.

A first glance at the data Figure 1 plots the smoothed cross-section distribution of the sample averages (i.e. averaged over the sample period) of the 272 price change series along with a theoretical normal distribution with the same mean and variance as the cross-section distribution of price changes. The price changes are the first log differences of seasonally adjusted price series. The sample average price change for each item is positive with an unweighted mean of 0.009225 for the cross-section distribution of 272 price changes. Note that although a mean of 0.009225 looks small, if one converts it into percentage annual rate, it equals 11.07% ($= 0.009225 \times 12 \times 100$). A comparison with the normal distribution reveals that the actual distribution is positively skewed and leptokurtic.

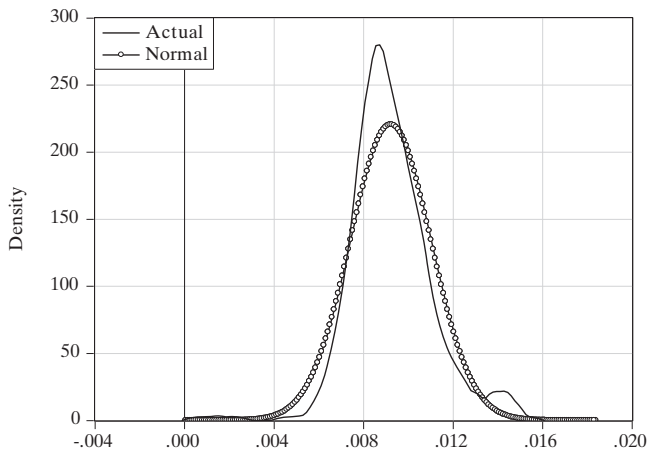


Figure 1. Cross-section Distribution of Sample Averages of Individual Price Changes

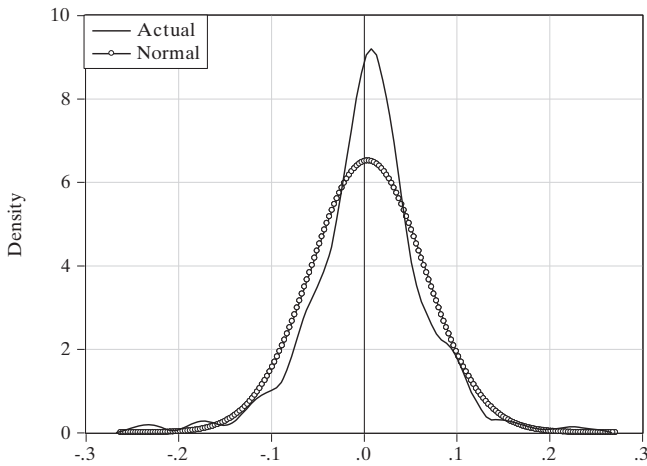


Figure 2. Cross-section Distribution of Average Correlations Between Price Changes and Remittance Growth

To shed light on the nature of the relation between remittances and prices, we calculate correlation coefficients between remittance growth and price changes for each of 272 items over the sample period. Figure 2 plots the cross-section distribution of the correlation coefficients, along with a theoretical normal distribution with the same mean and variance as the empirical distribution. The distribution has a positive mean and is slightly negatively skewed indicating that a relatively larger number of price changes have positive correlation with remittance growth.

In Figure 3 we plot various moments of the cross-section distribution of price changes along with remittance growth for the entire sample period. The first, the second, and the third order moments have positive relation with remittance growth while kurtosis has negative correlation. The skewness and remittance growth appear to have the strongest correlation. Although these figures capture the evolution of the cross-section distribution of price changes over the sample period, the

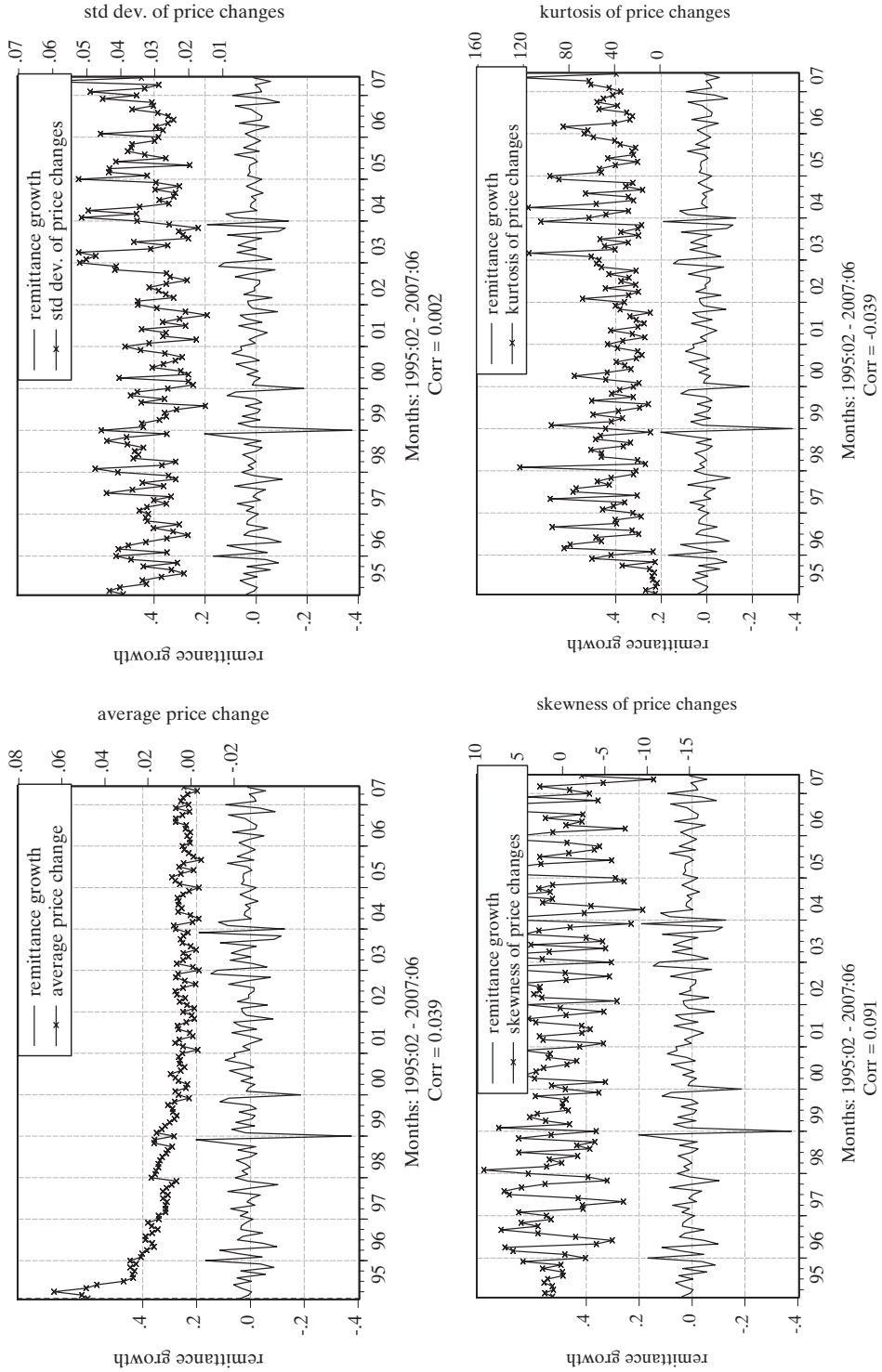


Figure 3. Time Series of Selected Moments of the Cross-section Distribution of Price Changes and Remittance Growth

contemporaneous correlations between remittance growth and the respective moments reported at the bottom of each graph do not reveal much about the dynamic relation between remittances and cross-section distribution of price changes. Therefore, we examine the dynamic relation between remittances and relative prices, controlling for a standard set of macroeconomic variables.

4. Results

Remittances and the Distribution of Relative Price Responses

In this subsection and the next, we present the results based on impulse responses of relative prices to a one standard deviation shock to remittances, generated from the estimation of the VAR model discussed above. Remember that these responses are to be interpreted as effects of remittances on individual prices over and above their effects on the general price level. This interpretation has two important implications. First, a negative response does not necessarily imply that the price decreases in response to a remittance shock. It may simply be that the increase in that particular price is lower than the overall price rise. Second, the response may be small in magnitude but to take full stock of the absolute price response we need to combine the responses of the general price level and the individual price. The following results are important to the extent that they change relative prices which, as we have discussed above, are crucial for consumption and production decisions of the millions of economic agents in the economy.

Figure 4 plots the fractions of negative and positive relative price responses to a remittance shock at various horizons. Until the ninth month, the proportion of negative relative price responses is not only higher than that of positive relative price responses but also the difference rises. After the horizon of 9 months, however, these two proportions converge. Past the 21st month, the proportion of positive relative price responses exceeds the proportion of negative relative price responses. It seems that in the short run, innovations to remittances have a negative impact on a larger number of

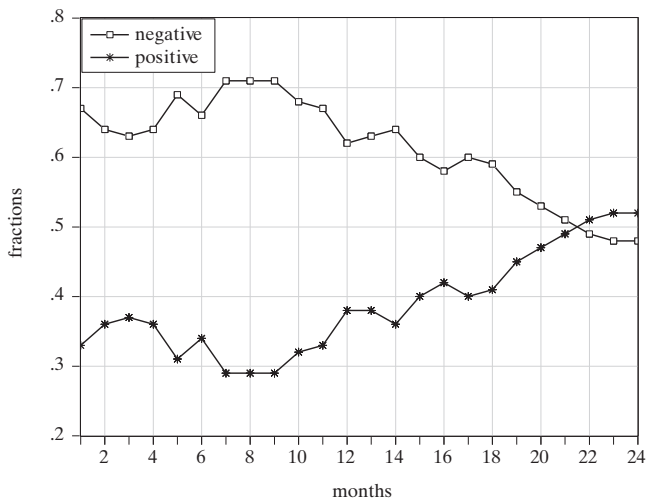


Figure 4. *Fractions of Negative and Positive Price Responses at Various Horizons*

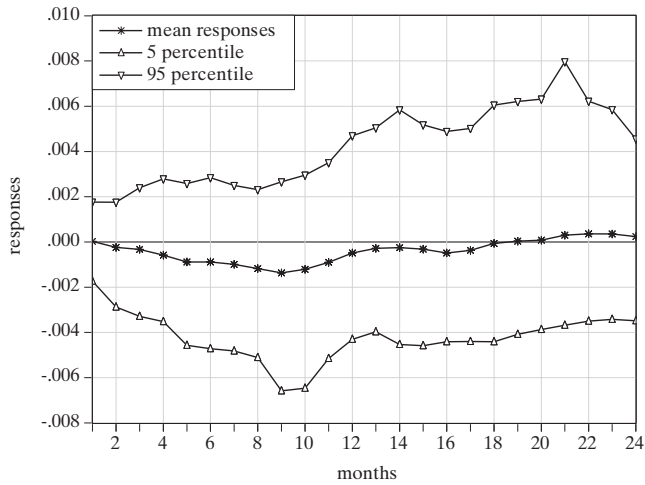


Figure 5. Mean, 5 Percentile and 95 Percentile of Price Responses to a Remittance Shock at Various Horizons

relative prices. A remittance shock has positive effects on a larger number of relative prices only in the longer horizon.

Figure 5 provides yet another look at the evolution of the distribution of relative price responses to a remittance shock. Figure 5 plots the mean, and the 5 and 95 percentile of the cross-section distribution of price responses over the horizons from 1 to 24 months. As we can see, the mean response becomes positive after eighteen months. Note that the lower 5 percentile decreases steadily until the eighth month, increases sharply between months 9 and 13 and increases very slowly after the 14th month. The 95 percentile increases until the 14th month and then becomes somewhat volatile.

In Figure 6, we present the cross-section distribution of relative price responses at horizons of 1, 6, 12, and 24 months, along with normal distributions with the same means and variances as the empirical distributions. Although the mean of contemporaneous price responses (i.e. at a horizon of one month) to a remittance shock is positive it is infinitesimally small. Then the mean responses are negative until the time horizon of nineteen months when it turned positive. For example, the annualized percentage mean (unweighted) price response at a horizon of one month is 0.03. At an horizon of 6 months, it is -1.06%, at 12 months it is -0.59%, and at a horizon of 24 months it is 0.29%.

The dispersion of price responses seems to increase from horizon one to horizon six. The distribution seems to be positively skewed at a horizon of 1 month while it seems to have a longer tail to the left at a horizon of 6 months. At horizons of 12 and 24 months, the distribution is almost symmetric with some fluctuations in between. Although the distribution is leptokurtic at all horizons, the kurtosis decreases over time. These changes in the distribution of price responses indicate that relative prices of various goods and services change at different horizons as a result of changes in remittances.

In Figure 7, we plot higher order moments along with the mean of impulse responses for horizons of 1–24 months. As discussed above, there is a substantial literature that indicates that positive relations between mean and higher order

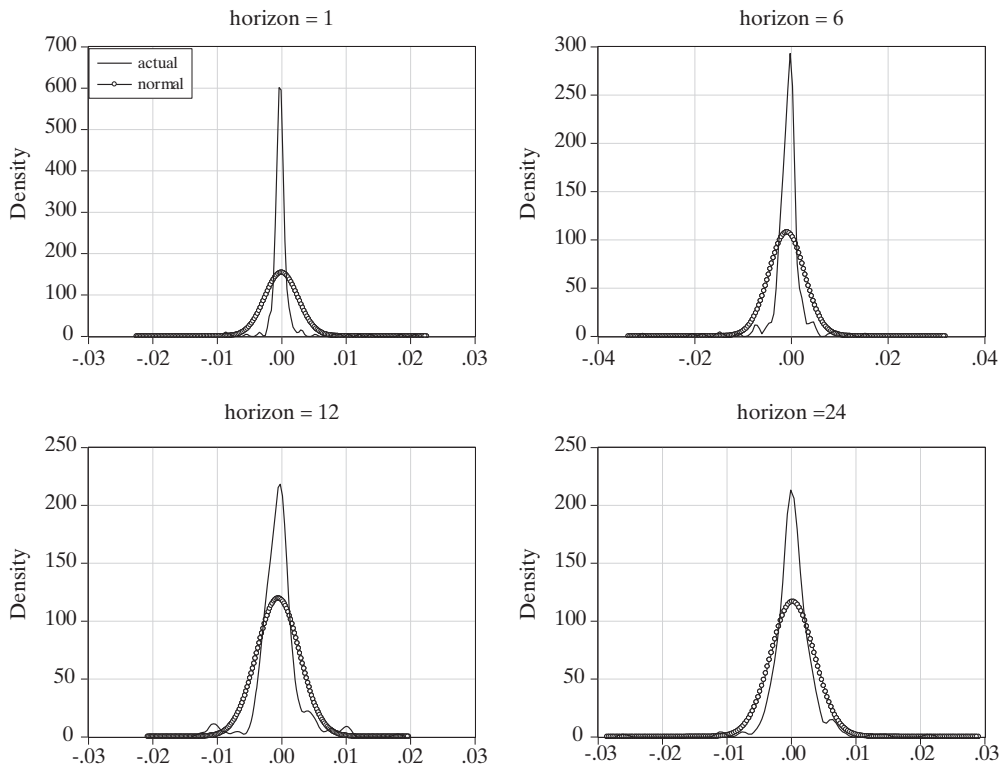


Figure 6. Cross-section Cumulative Distribution of Price Responses to a Remittance Shock

moments are robust empirical results. Although remittances do not seem to generate an empirically plausible relation between mean and standard deviation of relative price changes, they may have significant explanatory power for the relation between mean and skewness. In this case (mean and skewness), the estimated correlation coefficient is 0.60.

Remittances and Individual Relative Price Responses

While the previous discussion provides useful details about the impact of remittances on the cross-section distribution of relative prices, it is also important to look at the response of individual relative prices to the remittance shock over time. For space considerations we do not include the responses of all 272 consumer prices to the remittance shock. However, a few words regarding the responses of representative goods and services prices are in order.

Two food items, beef steak and fresh pasteurized milk, with relatively higher weights among food items in the consumption basket (1.14 and 1.86 respectively) differ in their responses to the remittance shock.⁵ For beef steak, a delicacy, as a result of the remittance shock, demand seems to increase steadily raising relative price over time. The price of fresh pasteurized milk, a necessity, meanders around zero indicating that the price change is similar to the change in the general price level. As we will see below, a large percentage of variation in relative prices of

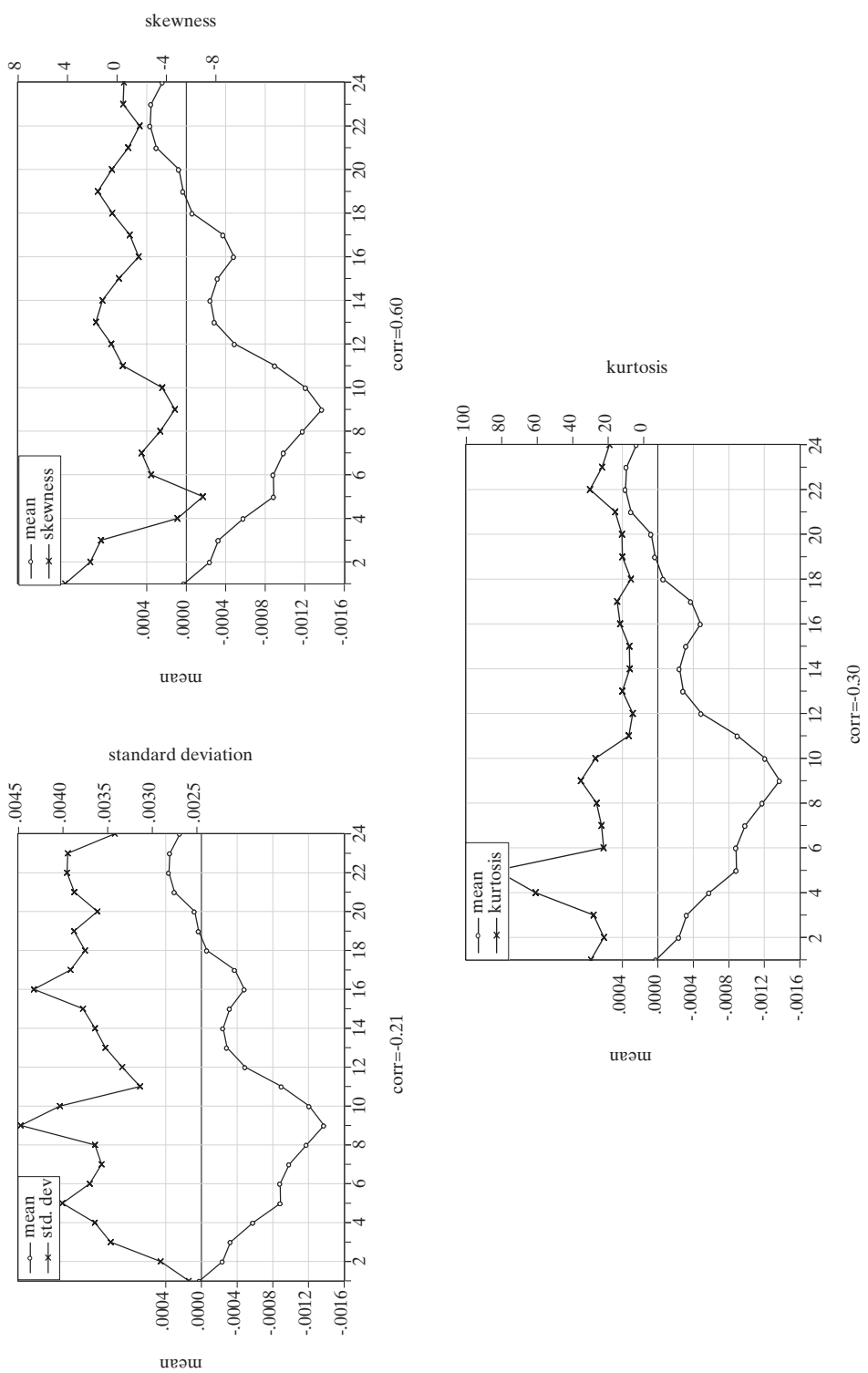


Figure 7. Mean, Standard Deviation, Skewness, and Kurtosis of Price Responses to a Remittance Shock

durable items like living room furniture, modular equipment, and glazed pottery is explained by remittances. The relative prices decrease in response to the remittance shock for all these three items. For consumption items that provide nontradable services such as housing, house for rent, electricity, cars, and restaurants and have larger weights in the consumption basket, relative prices rise steadily over time in response to the remittance shock.

The impulse responses of relative prices for two additional service items, education and health that have been shown to be affected by remittances in the previous microeconomic studies (Adams, 2005; Taylor and Mora, 2006) provide interesting results. The relative price of education (all levels) responds very little and meanders around zero. The relative price of doctor visits increases steadily in the first 5 months and then decreases until it starts rising again after 18 months.

In order to get an idea how remittances affect the volatility of prices of individual consumption items in Mexico, we order the items by the variability of impulse responses over horizons of 1–24 months (measured by standard deviation over this period). We report the standard deviation of the top 20 items in Panel A of Table 1 and the standard deviation of the bottom 20 items in Panel B of the same table. We also report the mean responses and the number of times the responses to a remittance shock are positive. Note that the items which are most volatile in their price responses almost exclusively include food items such as vegetables and fruits.

In contrast, the items that are least volatile in their price responses include a combination of nontradable services and tradable goods. For example, education at various levels shows very little variability in price responses. The average changes in prices are also relatively small for this group. Among others, visits to cafeterias, nightclubs, restaurants, and bars exhibit low volatility in their responses to a remittance shock. These results are not surprising. The prices of food items are generally more flexible than those of nonfood and service items and they respond very quickly to changes in the market conditions. The prices of education, restaurant food, etc., are slow to adjust to those changes and therefore exhibit less volatility.

Variance Decompositions

We further resort to variance decomposition to calculate the percentage of variation in individual prices that is explained by remittances. We order the consumption items according to the percentage of price variation explained by remittances from largest to the smallest at horizons of 6, 12, and 24 months and report the top 20 items in Table 2. Remittances seem to explain relatively larger proportion of price variations for a number of durable items at various horizons. For example, at a horizon of 6 months, significant variations in prices of stove, glazed pottery, antecomedores (specialty furniture), radio and recorders, and other domestic electronic gadgets seem to be explained by remittances. Further, at horizons of 12 and 24 months, modular equipment, cassettes, CDs and living room furniture are some additional durable items which are included among the top 20 items for which significant price variations are explained by remittances. Substantial variation in prices of nontradable services such as car insurance, phone line, other entertainment, and houses for rent is also explained by remittances at various time horizons. Note that there are few food items in Table 2.

To summarize, a positive shock to remittances lowers relative prices for a larger number of consumption items in the short run. At longer horizons, however, a larger number of relative prices rise in response to the remittance shock. The relative prices

Table 1. Items Ordered by Variability in Impulse Responses over 1–24 Month Horizons^a

| Panel A: Top 20 items | | | | Panel B: Bottom 20 items | | | |
|-----------------------|------------------------------|-----------------|------------------------------|-----------------------------|------------------------------|-----------------|------------------------------|
| Items (1) | Standard deviation (2) | Mean (%) (3) | Positive responses (4) | Items (1) | Standard deviation (2) | Mean (%) (3) | Positive responses (4) |
| 1 Serrano chili | 0.0183 | -4.10 | 11 | 253 Shoes males | 0.0003 | -0.54 | 4 |
| 2 Chayote | 0.0135 | 8.77 | 17 | 254 Cafeterias | 0.0003 | 0.30 | 19 |
| 3 Green tomatoes | 0.0132 | -6.92 | 9 | 255 Underwear girls | 0.0003 | -0.31 | 6 |
| 4 Onions | 0.0124 | -23.62 | 0 | 256 Candy | 0.0003 | 0.69 | 24 |
| 5 Lemons | 0.0123 | -5.22 | 9 | 257 Other shoes | 0.0003 | -0.38 | 5 |
| 6 Tomatoes | 0.0118 | -1.34 | 8 | 258 Education, short career | 0.0003 | 0.15 | 19 |
| 7 Pineapples | 0.0103 | -0.73 | 9 | 259 BBQ, cooked | 0.0003 | 0.65 | 24 |
| 8 Avocados | 0.0103 | 3.33 | 11 | 260 Education, college | 0.0003 | -0.33 | 3 |
| 9 Pumpkins | 0.0089 | -0.31 | 12 | 261 Jackets and coats | 0.0003 | -0.94 | 0 |
| 10 Chickpeas | 0.0086 | 10.80 | 20 | 262 Nightclub | 0.0003 | -0.63 | 1 |
| 11 Oranges | 0.0076 | -10.31 | 4 | 263 Cotton pants males | 0.0003 | -0.19 | 8 |
| 12 Potatoes | 0.0073 | 3.61 | 16 | 264 Restaurants | 0.0003 | -0.01 | 12 |
| 13 Other chilis | 0.0073 | -5.16 | 9 | 265 Underwear males | 0.0002 | -0.62 | 1 |
| 14 Carrots | 0.0071 | 2.35 | 13 | 266 Textbooks | 0.0002 | 0.19 | 17 |
| 15 Papayas | 0.0071 | 1.06 | 12 | 267 Education, primary | 0.0002 | -0.46 | 1 |
| 16 Bananas | 0.0065 | 2.30 | 13 | 268 Tires | 0.0002 | 0.08 | 13 |
| 17 Chile poblano | 0.0064 | -2.39 | 9 | 269 Bars | 0.0002 | 0.08 | 16 |
| 18 Watermelons | 0.0059 | 1.79 | 13 | 270 Education, intermediate | 0.0002 | 0.27 | 21 |
| 19 Cucumber | 0.0058 | 1.54 | 14 | 271 Education, kindergarten | 0.0002 | -0.13 | 9 |
| 20 Subway | 0.0055 | 3.93 | 13 | 272 Beauty salon visit | 0.0002 | -0.08 | 6 |

Note: ^aColumn (2) reports the standard deviation of the impulse responses, column (3) reports the mean of the impulse responses (annualized percent rate), and column (4) reports the number of positive responses.

Table 2. *Items Ordered by Percentage of Variation Explained by Remittances^a*

| | Horizon = 6 | | | Horizon = 12 | | | Horizon = 24 | | |
|----|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|--------------|--|--|
| | Items (1) | Variation (%) (2) | Items (3) | Variation (%) (4) | Items (5) | Variation (%) (6) | | | |
| 1 | House deodorant | 49.09 | Other liquors | 62.26 | Tequila | 66.94 | | | |
| 2 | Other liquors | 41.41 | Powder milk | 55.98 | Modular equipment | 56.26 | | | |
| 3 | Tequila | 39.72 | House deodorant | 55.27 | Canned sodas | 54.36 | | | |
| 4 | Towels | 39.50 | Toilet paper | 52.91 | Other elect. domestics | 50.53 | | | |
| 5 | Car insurance | 38.08 | Tequila | 52.31 | Sausage | 47.19 | | | |
| 6 | Powder milk | 36.27 | Modular equipment | 51.24 | Wine | 45.84 | | | |
| 7 | Wine | 34.09 | Wine | 44.13 | Shirts for males | 45.51 | | | |
| 8 | Stove | 33.66 | Phone line | 43.28 | Living room furniture | 45.24 | | | |
| 9 | Phone line | 32.59 | Antecomedores | 40.29 | Cassettes and CDs | 44.95 | | | |
| 10 | Foreign buses | 32.14 | Dresses for females | 40.26 | Toilet paper | 43.79 | | | |
| 11 | Hats | 31.82 | Glazed pottery | 39.45 | Other liquors | 43.78 | | | |
| 12 | Glazed pottery | 31.62 | Shirts for males | 38.29 | Other spices | 43.59 | | | |
| 13 | T-shirts for babies | 31.00 | Towels | 37.55 | Newspapers | 42.50 | | | |
| 14 | Antecomedores | 29.35 | Stove | 36.16 | Other entertainment | 42.48 | | | |
| 15 | Toilet paper | 29.04 | Canned sodas | 35.77 | Napkins | 41.29 | | | |
| 16 | Radio and recorders | 27.65 | Cassettes & CDs | 35.59 | Galzed pottery | 39.99 | | | |
| 17 | Other personal hygiene | 27.23 | Napkins | 34.73 | Dresses for females | 39.46 | | | |
| 18 | Other services | 27.12 | Newspapers | 32.30 | Subway | 38.69 | | | |
| 19 | Beer | 26.51 | T-shirts for babies | 31.73 | Powder milk | 37.63 | | | |
| 20 | Other elect. domestic | 26.17 | Shirts and T. for boys | 31.58 | Houses for rent | 37.18 | | | |

Note: ^aColumns (2), (4) and (6) report the percentage of the variation in price of the product explained by remittances.

that remittances seem to affect positively include mostly those items that provide nontradable services such as house for rent, housing, electricity, cars, and restaurants. These positive effects are more prominent at longer horizons. The relative prices of durable items, in contrast, tend to respond negatively to the remittance shock. The impulse responses of most food prices are highly variable over time. Furthermore, remittances explain substantial variation in the prices of consumer durables such as antecomedores, living room furniture, glazed pottery, domestic electronic gadgets, modular equipment, radio and recorders; and services such as car insurance, phone line, entertainment, subway, and houses for rent at various horizons after a shock.

6. Concluding Remarks

Previous microeconomic studies have suggested that workers' remittances may have important effects on the spending patterns of the receiving households. Hence, at the aggregate level remittance flows may affect prices of different goods and services in a way that has implications for relative prices. In order to examine this possibility, we consider a fairly general VAR model of the Mexican economy, in which we include, in addition to standard macro variables and remittances, consumer price indices of 272 items.

Our results indicate that in the short run a positive shock to remittances lowers relative prices for a larger number of consumption items. At longer horizons, however, a larger number of consumer prices rise in response to the remittance shock. More importantly, our results suggest important differences in the responses of relative prices according to various categories of consumer items. While there is a consistent rise in relative prices for a number consumption items providing nontradable services such as housing, electricity, cars, and restaurants, the relative prices of several durable items such as furniture, glazed pottery, and modular equipment tend to respond negatively to the remittance shock. Furthermore, remittances explain substantial variation in prices for a large number of consumer durables and services at various time horizons. The relative price responses are more volatile over time for most food items and less volatile for nonfood and service items reflecting different degrees of price flexibility. These results are consistent with the previous microeconomic studies that suggest that remittance transfers are spent on a wide range of goods and not on food alone.

Overall, our results clearly indicate that remittances affect prices of various consumption items, having important implications for relative prices. It will be far-fetched to draw any definitive conclusions on their implications for the overall price level and inflation. However, that relative prices change as a result of remittances is in itself an important result because changes in relative prices affect the decisions of consumers and producers, and therefore have implications for the allocation of resources and the overall well-being. To avoid distortions owing to these changes in relative prices, the policymakers may take into account the differential effects of remittances on prices of various categories of consumer items and accommodate fiscal and monetary policies accordingly.

Appendix*Table A1. List of Consumer Prices Series*

| | | | | |
|--------------------|--------------------|-----------------------|---------------------|----------------------|
| Corn tortillas | Candy | Doctor visit | Oil (cooking) | Local calling |
| Corn meal | Gelatin | Surgery | Apples | Long dist. nat. call |
| Corn | Other food. | Dental care | Bananas | Long dist. int. call |
| Sweet bread | Carnitas. | Haircut | Oranges | Phone line |
| White bread | Roasted chicken. | Beauty salon visit | Avocadoes | Domestic service |
| Sandwich bread | BBQ, cooked. | Hair products | Mangos | Kitchen furniture |
| Cakes, pies | Beer | Perfumes and lotions | Papayas | Antecomedores |
| Noodles | Tequila | Hand soap | Lemons | Stove |
| Popular cookies | Other liquors | Toothpaste | Grapes | Water heater |
| Other cookies | Rum | Deodorant | Melons | Living room furnit. |
| Wheat flour | Brandy | Skin lotion | Watermelons | Dinning table |
| Cereal | Wine | Shaving machine | Pears | Sofa |
| Rice | Cigarettes | Other hygiene | Peaches | Bed furniture |
| Poultry | Shirts males | Toilet paper | Grapefruits | Fridge |
| Chicken (pieces) | Underwear males | Diapers | Pineapples | Washing machine |
| Whole chicken | Socks males | Pads (females) | Guavas | Other electro. |
| Pork pulp | Pants males | Napkins | Tomatoes | Fans |
| Pork chops and fat | Suits males | Facial tissue | Potatoes | Iron |
| Pork loin | Other pants males | Colectivo | Onions | Blender |
| Pork legs | Clothe males | Urban bus | Other legumes | Modular equipment |
| Beefsteak | Shirts females | Taxi | Green tomatoes | Radios/recorders |
| Ground beef | Underwear fem. | Subway | Pumpkins | Light bulbs |
| Cow remnants | Pantyhose | Foreign bus | Serrano chili | Matches |
| Special beef cuts | Cotton pants fem. | Air transportation | Carrots | Batteries |
| Liver | Other pants fem. | Cars | Other chilis | Candles |
| Other cow | Suits females | Bicycles | Chile poblano | Brooms |
| Ham | Dresses females | Lubricant oil | Lettuce and cabbage | Glazed pottery |
| Sausage | Skirts females | Tires | Chickpeas | Cookware |
| Chorizo | Cotton pants boys | Other car accessories | Prickly pears | Utensils (plastic) |
| Other stuffed food | Other pants boys | Car batteries | Chayote | Other utensils |
| Dry meat | Shirts boys | Car insurance | Cucumber | Bedsread |
| Bacon | Dresses girls | Other car spending | Green beans | Other home textiles |
| Other fish | Underwear boys | Car maintenance | Beans | Bed sheet |
| Shrimp | Underwear girls | Tolls | Dry chili | Blankets |
| Mojarra | Socks boys | Parking | Other dry legumes | Towels |
| Other seafood | Dresses babies | Private edu., college | Canned juices | Curtains |
| Bass and grouper | Shirts babies | Private edu., primary | Processed chili | Laundry detergent |
| Huachinango | Jackets and coats | Private edu., high | Canned vegetables | Soap for dishes |
| Tuna | Hats | Private edu., int. | Tomato paste/soup | House deodorant |
| Canned seafood | Sweaters child | Private edu., short | Other canned fruits | Pesticides |
| Fresh milk | School unif. Boys | Private edu., kinder | Fruits for babies | Antibiotics |
| Powder milk | School unif. Girls | Textbooks | Sugar | Analgesics |
| Evaporated milk | Tennis shoes | Other books | Instant coffee | Cardiovascular md. |
| Fresh cheese | Shoes females | Notebooks | Toasted coffee | Nutritional supp. |
| Yogurt | Shoes males | Pens, pencils | Canned sodas | Birth control pills |
| Oaxaca cheese | Shoes boys | Hotels | Mayonnaise/mustard | Gastrointestinal Md. |
| Sour cream | Other shoes | Cinema | Chicken/salt spices | Expectorant |
| Chihuahua cheese | Baggage | Nightclub | Other seasoning | Other medicines |
| Other cheeses | Watches, jewelry | Other entertainment | French fries | Flu medicine |
| Ice cream | Houses for Rent | Sport clubs | Concentrated drinks | First aid |
| Yellow cheese | Housing | Sport events | Chocolate | Glasses (eye) |
| Butter | Electricity | Newspapers | Toys | Cameras and related |
| Eggs | Domestic gas | Magazines | Cassettes and CDs | Musical instruments |
| Sport accessories | Restaurants | Cafeterias | Memorial services | Other services |
| Lunch places | Bars | | | |

References

- Adams, Richard H., Jr and Alfredo Cuecuecha, "Remittances, Household Expenditure and Investment in Guatemala," *World Development* 38 (2010):1626–41.
- Amuedo-Dorantes, Catalina and Susan Pozo, "Workers' Remittances and the Real Exchange Rate: A Paradox of Gifts," *World Development* 32 (2004):1407–17.
- Amuedo-Dorantes, Catalina, Susan Pozo, and Tania Sainz, "Remittances and Healthcare Expenditure Patterns of Populations in Origin Communities: Evidence from Mexico," *Integration & Trade Journal* 27 (2007):159–184.
- Balke, Nathan and Mark Wynne. "The Relative Price Effects of Monetary Shocks," *Journal of Macroeconomics* 29 (2007):19–36.
- Barth, Marvin and Valerie Ramey, "The Cost Channel of Monetary Transmission," National Bureau of Economic Research working paper 7675 (2000).
- Betts, Caroline and Timothy Kehoe, "Real Exchange Rate Movements and the Relative Price of Non-traded Goods," National Bureau of Economic Research working paper 14437 (2008).
- Davis, Steven and John Haltiwanger, "Sectoral Job Creation and Destruction Responses to Oil Prices Changes," *Journal of Monetary Economics* 48 (2001):465–512.
- Golob, John and David Bishop, "Inflation and Relative Price Variability: Durables vs. Nondurables and Services," Federal Reserve Bank of Kansas City working paper 12 (1997).
- Lastrapes, William, "Inflation and the Distribution of Relative Prices: The Role of Productivity and Money supply Shocks," *Journal of Money, Credit and Banking* 38 (2006):2159–98.
- Nath, Hiranya, "Relative Importance of Sectoral and Aggregate Sources of Price Changes," *Applied Economics* 36 (2004):1781–96.
- Orozco, Manuel, "Remittances, the Rural Sector, and Policy Options in Latin America," USAID and BASIS Collaborative Research Support Program (CRSP) (2003).
- Ruiz, Isabel and Carlos Vargas-Silva, "To Send, or Not to Send: That is the Question. A Review of the Literature on Workers' Remittances," *Journal of Business Strategies* 26 (2009):65–90.
- Sims, Christopher, "Macroeconomics and Reality," *Econometrica* 48 (1980):1–49
- Sims, Christopher, James Stock, and Mark W. Watson, "Inference in Linear Time Series Models with some Unit Roots," *Econometrica* 58 (1990):113–44.
- Taylor, J. Edward and Jorge Mora, "Does Migration Reshape Expenditures in Rural Households? Evidence from Mexico," World Bank Policy Research working paper 3842 (2006).
- Vargas-Silva, Carlos, "The Tale of Three Amigos: Remittances, Exchange Rates and Money Demand in Mexico," *Review of Development Economics* 13 (2009):1–14.
- Zarate-Hoyos, German, "Consumption and Remittances in Migrant Households: Toward a Productive use of Remittances," *Contemporary Economic Policy* 22 (2004):555–65.

Notes

1. For a survey, see Ruiz and Vargas-Silva (2009).
2. Following Balke and Wynne (2007), we include these variables in levels. Sims(1980) and Sims, Stock and Watson (1990) are among the first to suggest that even if the variables are unit root processes, they should be included in levels. They argue that the goal of a VAR analysis is to determine the interrelationships among variables, not to determine the parameter estimates.
3. This paper focuses on the demand side effect of remittances on relative prices. However, if a portion of the remittances is used for investment they may also affect the supply side. By including industrial production in our VAR model, we indirectly consider the supply side of the market. But introducing a direct channel through which remittances may affect supply is outside the scope of the current study.
4. Balke and Wynne (2007), Barth and Ramey (2000) and Davis and Haltiwanger (2001) make a similar assumption about feedback in their papers.
5. The weights are percentage consumption shares in the market basket of a typical urban household in Mexico.