



Migrant Worker Remittance Payments: Targeting the Determinants of Resiliency¹

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Nearly 200 million people in the world live in a country where they were not born.² With increased globalization and improvements in technology, migration between nations has become more fluid. With the recent wave of outsourcing, off shoring, shifting labor trends, economic hardships in some developed nations, and the economic booms in developing economies, many individuals have found it prudent to locate jobs outside their home country. In leaving their country of residence, migrant workers make a sacrifice in order to support their family by remitting funds home for financial assistance. The IMF defines remittances as “goods and financial instruments transferred by migrants living and working in new economies to residents of economies in which the migrant formerly resided.”³ The World Bank estimates that the “remittances” by migrant workers in 2007 totaled more than \$318 billion in value.⁴

This paper analyzes the remittance market and builds a theoretical model that helps explain the effects of certain economic factors on remittances. Section 2 reviews the literature and summarizes the remittance payment market, while section 3 builds the theoretical and empirical models. Section 4 addresses the intricate issue of remittance data collection while section 5 presents the results of the analysis. Sections 6 and 7 discuss emerging aspects in the remittance market and make conclusions respectively.

I. Literature on Remittances and Remittance Payment Market

Remittance payments have grown to become an extremely large and dynamic industry in many respects. In 2006, ten developing nations depended on incoming remittances for more than 20%⁵ of their national gross domestic product. The World Bank’s 2007 projections of \$318+ billion⁶ are most likely underestimated, because the significant amount of black market transfers or alternative remittance systems that currently operate in the world’s developing nations are not counted in this figure. Noguchi (2004) states that alternative remittance systems “are usually shoestring operations that charge lower fees than bank wire transfers. They are often open 24 hours a day, seven days a week. In comparison with bank money transfers, which can take three to five days, these informal systems can move money across the globe in hours.”⁷ This is the core trinity of essential elements of a remittance payment: making it affordable, expedient, and dependable. This paper studies the emerging importance of remittance payments in order to understand economic factors influencing their behavior, as well as new payment solutions that cater to the remittance dependent populations of the world. A review of the literature pertaining to this area of study follows.

Acosta, Baerg, & Mandelman (2009) assess the relationship between remittance inflows and real exchange rate appreciation concluding that remittances can raise exchange rates in countries where remittances can be effectively channeled into new investments. They also conclude that remittance payments and gross domestic product are inter-related factors that can be seen as affecting one another in a direct relationship.

Carling (2008) analyzes the microeconomic determinants of remittances concluding that migrants can either be altruistic or selfish in their motives but that real importance should be placed on determining the reasons for disparity of remittances. He reviews literature and

identifies price-level ratios and purchasing power parity as main determinants of remittances stating that "...price-level ratios between remittance-sending and remittance-receiving countries could also influence motivations to remit. Migrants are often acutely aware that the money they spend in the country of residence would go a long way further if it were remitted and spent by family members in the community of origin. For Moldovans in Italy, for instance, the purchasing power of their earnings is more than three times greater if the money is remitted and spent in Moldova."⁸

Ruiz and Vargas-Silva (2009) review much of the literature currently available on remittances and conclude that there is significant evidence to justify several micro and macro-economic determinants of remittances including exchange rates, household consumption patterns, migration patterns, labor supply, GDP growth and poverty levels.

Van de Bunt (2008) and Noguchi (2004) provide insight into the world of black market remittances, suggesting that the alternative remittance systems that operate throughout the world account for a separate market of remittance which is estimated to be half the size of officially released remittance statistics. Black market remittances, also known collectively as "hawala" present remitters with a less regulated and sometimes cheaper way to remit funds, but are not officially regulated or recorded; thus adding a formidable question mark to the actual size of global remittance payments.

Ratha et al (2008 & 2009) compile official World Bank remittance figures and conclude that remittances will see an overall increase in size over the coming years, despite a possible decrease in growth in the interim. Mexico and India are estimated to remain in the top three of remittance receiving countries in 2008 with \$52 billion and \$26.3 billion respectively⁹. The resilience of remittances arises from the fact that while new migration flows have declined, the stock of migrants has been relatively unaffected by the crisis. Sources of risk to this outlook include uncertainty about the depth and duration of the current crisis, unpredictable movements in exchange rates, and the possibility that immigration controls may be tightened further in major destination countries.

Recent technological improvements have created a breadth of products that will help to facilitate, record, and secure remittance payments going into the future. These emerging payment methods, including the innovative world of mobile payments, are beginning to gain traction in specific target markets and are projected to reach huge global consumer adoption rates in the very near future. These new transfer methods are essential to migrant worker payments as their development is being catered to the remittance sending populations of the world, especially those in developing nations, who may not have a bank account, but are in possession of a mobile phone (illustrated in Figure 1).

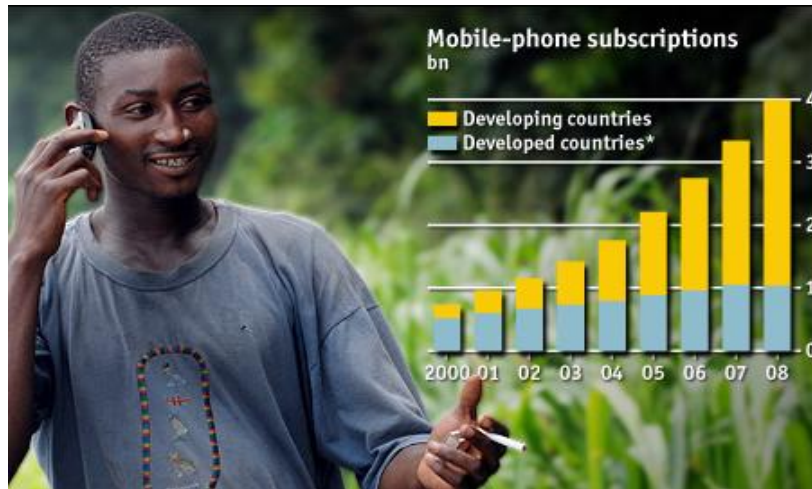


Figure 1
Access to Telecoms and the Internet in the Developing World
Source: <http://media.economist.com/images/na/2009w39/Phones2.jpg>

Chang (2009) comments that mobile payments will become significant by 2013¹⁰, which will have an effect on the marketing world citing data from recent market research studies on near field communication technology and mobile payment uptake estimates. Lunden (2009) gives insight into the actual uptake of mobile payment devices and a cross industry approach used to bring mobile payment services to all mobile phones and service providers throughout the world. Lunden also puts forth evidence from industry leaders that traditional plastic cards will soon be replaced by mobile phones.

During recent months, economic strife has plagued the economies of the world. With that, worker remittance payments are bound to be affected by the interconnecting remittance corridors that entangle the global map much like a complex spider web. This paper assesses two different remittance receiving nations, Mexico and India, in order to determine what macroeconomic factors affect the resiliency of remittance payments. We observe remittance sending patterns to Mexico and India from the United States because both receiving countries are among the top recipients of remittance payments in the world and their respective economic climates have responded differently to recent financial turmoil.

In regards to Mexican remittances, Massey and Sana (2005) found “the cohesive patriarchal family ensures the flow of remittances as part of a household strategy of risk diversification.”¹¹ This recurring ideology of patriarchal dedication is confirmed by Durand & Massey (2004), which found almost 90% of migrant Mexican workers in the United States had previously worked in America in order to support their families.¹² Mexico was listed as the world’s third largest receiver of remittances in 2007 estimates, with an incoming value of \$25 billion¹³. However, with the United States as the main origination point for Mexican remittances, these payments have seen a recent decline. In March of 2009 the Latin American Herald Tribune¹⁴ presented data from the Mexican Central Bank which stated that remittances to Mexico have declined by 13.4% during the first nine months of 2009 compared to the same period in 2008. In addition they have also decreased by 11.5% from December 2008 to January

2009. These two figures present both a long term (nine month comparison) and short term (month to month comparison) views into how Mexican remittances are struggling to remain resilient. It is important to realize that Mexican remittance growth has not decreased for simply a month or two, but is facing an even longer term struggle to return to past performance levels. If we consider these declines, remittances to Mexico have seen a double digit percentage (13.4%) decrease over a two year span.¹⁵ If we consider just the two months spanning from December 2008 – January 2009, we also see a significant double digit (11.5%) decrease in remittances being sent to Mexico.¹⁶ Overall Mexico is still estimated to be in the top five remittance receiver countries moving forward. Despite the recent setback for Mexican remittances, there is still a resiliency factor if we consider that average value per transaction of remittances to Mexico from 2005-2008 has not changed, as shown by Figure 2.

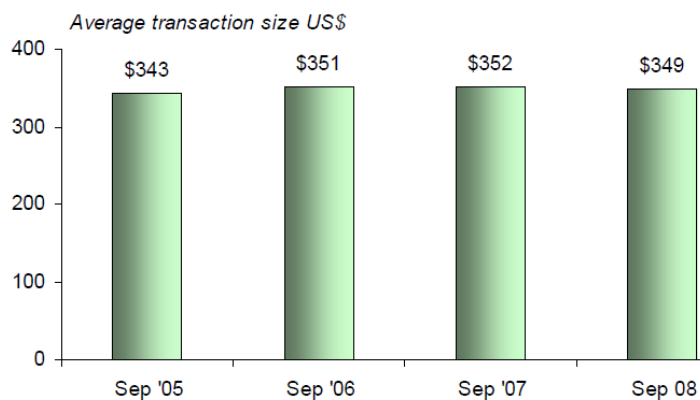


Figure 2
Average Value of Remittances per Transaction in Mexico
Source: Mohapatra, S., Ratha, D., & Xu, Z. (2008). 5.

Mexican migrants still found the financial means to remit home the necessary amount of money to family and friends even during the American financial crisis in late 2008. Despite the decreased projections for Mexican remittances in the future, the individual payments that are still being sent continue to occur on the market and remain on par with previous amounts.

Another country we are considering in the analysis is India, which is the world's largest receiver of remittance payments. The subcontinent received \$27 billion worth of remittances in 2007 and is estimated to have stayed atop all other nations in 2008 estimates with a flow value of \$30 billion.¹⁷ Laborers from India have flocked to nearby Saudi Arabia, United Arab Emirates, and Bangladesh to partake in a recent boom of the construction industry. Others look to the United Kingdom, Canada, or the United States for promising locations of opportunity. Each year, 4.2% of students in India who are educated at a collegiate or university level emigrate along with approximately 20,000 physicians.¹⁸ Unlike their counterparts from Mexico, remittances to India are actually on the rise despite the global economic downturn.

"In 2008, the remittances suddenly jumped in the month of October and November in search of safety," said Harpreet Singh, Head NRI and Wealth Advisory Services, HDFC Bank. "Also the dollar depreciation resulted into inflow of funds."¹⁹ With many currencies in the Gulf

Region pegged to the United States dollar, the recent depreciation of the dollar has given migrant workers from India an incentive to send funds home. In fact, the rupee recently crossed the 50 unit mark against the dollar for the first time in five years. A lucrative exchange rate, which dramatically increases the purchasing power of migrant workers' families, an increase in savings account interest rates, and the fear of financial instability, are among the factors which have forced these migrant workers to actually increase their remittance amounts as a means of financial prowess. The Economic Times (2009) quoted a leading representative from the UAE Exchange Centre, which claims to account for over 50% of the remittances to India from the Middle East²⁰ as saying that recent economic strife in the region has not affected remittance flows. "We still average over one million transactions a month to India...the layoff of a few thousand workers has not affected our share of inward remittances."²¹

As countries have been limping through difficult economic times, innovative and cost effective channels of executing remittance payments have begun to emerge. Remittance payments in and of themselves have an established evolutionary progression. Remittances began as black market money transfers, and with increases in technology, shifted to money transfer operators and other publicly established firms. Due to the fears of insecurity after September 11, 2001, along with an increase of government regulation, remittance payments are now entering a new phase and are being embraced by financial institutions and other emerging payment methods.

Commercial and wholesale banks are now looking to capitalize on this large industry, and by using remittance payments to penetrate this unscathed market banks can capture a percentage of the un-banked population of the world and transform them into banked customers. In trying to do so they will need to offer payment capabilities that provide a cost benefit, and a usability advantage over the traditional agent to agent cash disbursement model, examples of which are Western Union and MoneyGram. The evolution of pre-paid debit cards, online payment platforms, and the enthralling world of mobile phone payments will undoubtedly sustain and boost the resiliency of global remittance payments into the up swinging economic future.

Taking into consideration recent events and existing literature on migrant worker remittance payments, this paper hypothesizes the effects of major macroeconomic factors as determinants of the amount of remittances being sent from one country to another. Theoretical and empirical models follow in the next section.

II. Model

Economic research has been conducted in the field of remittances with a wide variety of results. Both micro and macroeconomic studies identify and explain the determinants of remittance payments. Many of micro factor studies, such as Carling (2008), explain how migrants are seen in a microeconomic scope as altruistic givers or remitters of self-interest, who are looking to acquire assets in their homeland or enhance their fiscal status. Carling (2008) references a Lucas and Stark (1985) study which yields that "one cannot probe whether the true motive is one of caring or more selfishly wishing to enhance prestige by being perceived as caring."²²

Although these micro factors are extremely important in creating an in depth look into the psyche of remittances, this paper assumes that for whatever the reason, migrant workers will indeed remit monetary funds back to family and friends. Be it with selflessness or selfishness, migrant worker remittance payments are transfers that are being made for a myriad of personal reasons. We concentrate on assessing the effects of macroeconomic factors on the dynamics of the remittance payments being sent by these migrant workers.

The Acosta, Baerg, and Mandelman (2009) model explores the use of foreign exchange rates as a remittance factor and also suggests the use of gross domestic product as a remittance sending determinant. To illustrate this, the Acosta, Baerg, and Mandelman (2009) study makes reference to a separate study by Lartey, Mandelman, and Acosta²³ which labels GDP as a determinant when it comes to remittance payments. As reviewed in Section 2, Ruiz and Vargas-Silva (2009) suggest a multitude of macro-economic determinants of remittances including: exchange rates, household consumption patterns, migration patterns, labor supply, GDP growth and poverty levels. Carling's (2008) research suggests that pricing levels between remittance countries is a main driver for remitters to send or not to send. His example of the Moldavian remitter increasing his/her purchasing power three times by remitting funds back to Moldova instead of keeping them in Italy is a perfect example of how purchasing power parity is highly influential to remitters.

Based on the evidence presented in these studies, we hypothesize that macroeconomic determinants for migrant workers sending remittance payments are: unemployment in the home country, population of the home country, gross domestic product based on purchasing power parity of the home country, and exchange rates between the home country and the US. As shown in the review of the literature section, Mexico and India are handling recent economic strife differently in terms of incoming remittances. We expect that our empirical model will yield different results for Mexico and India to account for the dynamic and varying conditions of each country's respective economy and migrant worker population.

We use multiple regression method to analyze the value of remittance payments (in billions of United States Dollars) sent from the United States to India and to Mexico. We are studying US originated remittances to determine the determinants of these payments. Our results are hypothesized to yield information that is relevant to the Mexican and Indian migrant populations in the US and their specific remittance sending behaviors compared to their fellow countrymen who may be working in other countries and remitting funds home.

Although cited as a major issue with remittance data, this model will not directly account for the black market payments that migrant workers transact. It is not the purpose of this paper to create a model to analyze or estimate these payments but rather to identify determinants based on the legitimate and sound data that exists for US-based remittances. In doing so however, this paper can serve the same purpose by highlighting the fact that models and research around estimating black market flows need to be created in order to effectively target remittance data worldwide.

As supported by Acosta, Baerg, and Mandelman (2009), Carling (2008), and Ruiz and Vargas-Silva (2009), the prevailing exchange rate between countries is a factor that seems to be threaded into many economic reviews of remittances. Ruiz and Vargas-Silva (2009) reference

the studies of Faini (1994) and Straubhaar (1986) which test remittances in Germany and Turkey respectively, finding that exchange rates are significant determinants.²⁴ Exchange rates are important because they affect the purchasing power of the beneficiary in the home country and also factor into the cost of sending a remittance payment. Due to the major significance that is placed on exchange rates we will include them as a factor as well as including gross domestic product based on purchasing power parity.

Gross Domestic Product based on purchasing power parity is an important indicator of the standard of living in a country in relation to other countries. As suggested by Carling (2008) it is also important to gauge the thought process of the migrant worker who must decide how large or small of a sum he/she must remit back to their families in order to make financial sense. The worker makes a direct reference to the importance of purchasing power as a determinant of remittances along with price levels. For example, if prices of bread and milk are rising in Mexico, *ceteris paribus*, the migrant worker must be cognizant that more money must be sent home to help the beneficiary keep up with changing times. Ruiz and Vargas-Silva (2009) Ruiz and Vargas-Silva (2009) note this trend in their study but do not specifically reference purchasing power parity.

Following the Acosta, Baerg, and Mandelman (2009) and Ruiz and Vargas-Silva (2009) conclusion that GDP figures have an effect on the remittance market, we use gross domestic product as a determinant of remittances. We employ the gross domestic product based on purchasing power parity to account for price levels within the country. We also included unemployment levels as one of the factors in the model. Ruiz and Vargas-Silva (2009) suggest that labor trends and migrations patterns are an important macroeconomic determinant of remittances. Unemployment figures in the beneficiary countries serve as an important factor that can be used to gauge the effect of labor events on remittances. In fact, these figures are a twofold factor of remittances. Firstly, unemployment in India or Mexico will suggest that natives must consider becoming migrant workers and traveling to other countries, (in our model, those who come to America) to find employment. Secondly, if the home family members of the migrant worker are unable to support themselves via employment, the migrant worker will be more likely to send larger and more frequent remittance payments to help support his/her loved ones, especially during economic downturn.²⁵

As a proxy for the migration pattern determinant referenced by Ruiz and Vargas-Silva (2009) we use population levels in the home country. We utilize official population data which is readily available and more dependable than migrant and migration statistics. Secondly, larger population levels at home may contribute to a rise in remittance amounts to serve a proportionally larger beneficiary base.

Our theoretical model yields the following empirical remittance model:

$$(1) \quad REMIT = \alpha + (\beta_1 * UNEMP) + (\beta_2 * POP) + (\beta_3 * GDP) + (\beta_4 * FX) + e_i$$

where:

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<i>REMIT</i>	is the total value (in billions of United States Dollars) of remittance payments sent from the United States of America to a foreign country, in our case, Mexico or India;
<i>UNEMP</i>	is total unemployment in the beneficiary country;
<i>POP</i>	is the total population of the beneficiary country;
<i>GDP</i>	is the gross domestic product based on purchasing power parity in the beneficiary country;
<i>FX</i>	is the foreign exchange rate between the home country and the US, listed as home currency/ US dollar;
e_i	is the error term.

We hypothesize that increased levels of unemployment in the home country will lead to minor adverse effects on remittances. Ruiz and Vargas-Silva (2009) assert that there are many interrelated aspects to labor affecting remittances but that some factors are “conducive to growth, other impacts, such as decrease in labor supply, have adverse consequences.”²⁶ An increase in unemployment will account for this decrease in labor supply and because we are not accounting for the other labor factors we expect to find very minor coefficients that may be positive or negative given the certain country’s response to unemployment and migration to the US. We also expect to find positive results for population coefficients. If the population increase is in conjunction with an increase in unemployment then conditions may suggest that more workers will look for work outside of the home country. Also, if the population in the home country is increasing, migrant workers may need to send home more remittance payments to help support a larger population. As supported by review of the literature, increases in foreign exchange rates should increase the flow of remittances as senders look to increase home purchasing power and cut costs on sent payments. In addition to these exchange rates, an increase in purchasing power parity, as referenced by Carling (2008), which accounts for price levels, should yield a positive increase in remittances. We have employed this exchange rate factor along with GDP, which should also positively affect remittances as cited by Acosta, Baerg, and Mandelman (2009) and Lartey, Mandelman, and Acosta (2008).

We also hypothesize that the results for the two regressions will be different. Considering that India has a far larger population, gross domestic product based on purchasing power parity, and unemployment level compared to Mexico, we may see more robust results for India.²⁷ The Mexican economy is one that has been riddled with corruption and violence over the past several years, while India is seeing many international corporations outsource jobs to their information technology centers and other sectors. Overall, the Indian economy is one that differs from the Mexican economy and our results are not predicted to be the same.

III. Data

Data range that is comparable for both Mexico and India is the ten (10) year span from 1999-2008. Official data on US payments sent to Mexico dates back almost three decades but the case is not so for India, where data collection for this variable starts only in 1999. This is an obvious drawback and results might show more robustness if the time coverage is extended. Remittance data has been collected from the United States Bureau of Economic Analysis²⁸ as reported in a balance-of-payments for each country. Carling (2008) indicates that “Balance-of-payments statistics have the limitations that they only include registered flows, and that countries

differ in their ability to separate migrant remittances from other private transfers.”²⁹ In the absence of other official data on remittances, our remittance regression uses the Bureau of Economic Analysis data as a general proxy of the flow of remittance payments. The population and unemployment data for Mexico comes from the IMF Data and Statistics engine.³⁰ IMF data is used for Indian, population and unemployment figures. Both countries’ GDP based on PPP figures are located via IMF public data.³¹ Foreign exchange data for Mexico is obtained from Banco de Mexico³² and from the Federal Reserve Bank of St. Louis for India.³³

Table 1 presents summary statistics for variables used in the separate regressions for both countries. One can see the average value of remittances from the US to Mexico is much larger than the average value of remittances being sent from the US to India. As existing literature indicates we can attribute this to the fact that the US/Mexico corridor accounts for a majority of Mexican remittances. This is not the case however for India, as the Bangladesh/India corridor is almost three times as penetrated as the US/India corridor.³⁴ We divide the average unemployment level by the average population of our data range to produce an indicating percentage of unemployment for both Mexico and India. Based upon the figures found in Table 1, our data yields a result of 1.20% for Mexico and 3.67% for India. This expands our hypothesis in that we should expect a larger positive effect of Indian unemployment on remittances than Mexican unemployment due to the overall larger magnitude found in India. We can observe that the average GDP PPP in India is almost two times as large as that in Mexico. This observation helps us explain the results of our estimation.

In order to make sure there is no multicollinearity between explanatory variables we checked for correlation between them as presented in Table 2. Mexican correlation results yield figures that are largely positive while India’s correlation results are mainly negative. In order to test for autocorrelation we obtained the Durbin Watson Statistic for both remittances to Mexico and remittances to India. In the case of Mexico we obtained a DW stat of 0.0051 indicating a significant positive correlation of the error terms. India yielded an DW stat of 0.0133, also indicating a positive serial correlation. In order to correct for this autocorrelation, we employed Durbin’s Method of correction³⁵:

$$(Y_t - Y_{t-1}) = \alpha + \beta(X_t - \rho X_{t-1}) + \mu_t$$

By applying this method to our original data set, we compensate for the autocorrelation present in our previous set and yield a new data set that contains the correct data and which will be used in our regressions. Due to the nature of the Durbin method, the size of our data set decreases from ten (10) to nine (9).

Table 1: Summary Statistics

Mexico					
Variable	Symbol	Source	Average	Standard Deviation	Available Observations
Remittances (USD Millions)	REMIT	Bureau of Economic Analysis	10008.1	2048.6	23
Unemployment (Thousands of persons)	UNEMP	International Monetary Fund	1229.39	361.12	19
Total Population (Millions of persons)	POP	International Monetary Fund	102.46	3.17	29
Gross domestic product based on purchasing-power-parity (USD Billions)	GDP	International Monetary Fund	1229.06	192.88	29
Foreign Exchange Rate (Pesos/Dollar)	FX	Banco de México	1.80	4.85	32
India					
Variable	Symbol	Source	Average	Standard Deviation	Available Observations
Remittances (USD Millions)	REMIT	Bureau of Economic Analysis	1622.8	561.14	10
Unemployment (Thousands of persons)	UNEMP	International Monetary Fund	40775.6	778.13	19
Total Population (Millions of persons)	POP	International Monetary Fund	1112.21	50.32	25
Gross domestic product based on purchasing-power-parity (USD Billions)	GDP	International Monetary Fund	2158.07	620.98	29
Foreign Exchange Rate (Rupees/Dollar)	FX	Federal Reserve Bank of St. Louis	44.96	2.17	19

IV. Results

Two regressions were run for this paper, one for remittances to Mexico and one for remittances to India. It is important to note that these two regressions were run completely isolated from one another and so data for one country does not influence the data of the other. The results of two regressions – for Mexico and for India – are presented in Table 3 and Table 4. Along with the remittance factor coefficients, we also report R-squared, standard error, observations, and t-statistic figures. After correcting for autocorrelation, the results of the

remittance regression analysis became more viable with a R-squared value of 0.71 and 0.83 for Mexico and India respectively.

Table 2: Correlation Statistics for Remittance Factors

Mexico				
	Mexican Unemployment (Thousands of Persons)	Mexican Population (Millions)	GDP PPP (USD Billions)	Mexican Exchange Rates (Pesos per Dollar)
Mexican Unemployment (Thousands of Persons)	1			
Mexican Population (Millions)	0.787	1		
GDP PPP	0.933	0.923	1	
Mexican Exchange Rates (Pesos per Dollar)	-0.224	0.0661	-0.1481	1
India				
	Indian Unemployment (Thousands of Persons)	Indian Population (Millions)	GDP PPP (USD Billions)	Indian Exchange Rate (Rupees per Dollar)
Indian Unemployment (Thousands of Persons)	1			
Indian Population (Millions)	-0.441	1		
GDP PPP	-0.469	0.974	1	
Indian Exchange Rate (Rupees per Dollar)	0.703	-0.414	-0.549	1

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Our regression coefficients are assessed at a 95% confidence level and so a number of the coefficients turned out to be statistically significant in our regression. As hypothesized, and supported by Ruiz and Vargas-Silva (2009), our regression yields a small coefficient for unemployment variable. Our significant results for Mexico suggest that a 1.00% increase in Mexican unemployment will decrease the amount of US sent remittances to Mexico by of \$1.54 million. We may consider that recent security fears regarding Mexican migration to the US over the past 10 years have decreased Mexican mobility to the US and so higher unemployment in Mexico would mean fewer individuals could make it to the US to remit funds back to Mexico. India's results are not significant but their positive correlation of a 0.02 unit increase is interesting, only because it is positive. India is not viewed with the same fear as Mexico from a US perspective, and its skilled labor is actually welcomed in the US. Workers from India enter the US via regulated customs channels as opposed to many Mexican migrants who enter the US illegally. The Indian worker's legitimate ability to migrate to find work and remit funds home may explain the positive percentage.

Table 3: Summary of Regression Results – Remittances to Mexico

	Mexico
R-Square	0.71
Standard Error	259.85
Observations	9.00
Intercepts	
UNEMP	-1.54
<i>t-stat</i>	-1.47
POP	-493.979
<i>t-stat</i>	-1.78
GDP	0.97
<i>t-stat</i>	.28
FX	-28.26
<i>t-stat</i>	-1.67

Population coefficients for Mexico yielded a \$493 million decrease in remittances, while India's regression yielded a \$75 million increase in remittances from the US. As predicted, we see very different results for both Mexico and India. Supporting the research of Ruiz and Vargas-Silva (2009), we assert that migration patterns (our proxy for this is population) act as positive determinants of remittances. Mexico's result may be skewed somewhat and using actual migration statistics as opposed to general population statistics may yield more robust results.

Table 4: Summary of Regression Results – Remittances to India

India	
R-Square	0.83
Standard Error	51.25
Observations	9.00
Intercepts	
UNEMP	0.02
<i>t-stat</i>	<i>0.93</i>
POP	75.54
<i>t-stat</i>	<i>0.48</i>
GDP	0.84
<i>t-stat</i>	<i>1.61</i>
FX	-17.31
<i>t-stat</i>	<i>-1.38</i>

Ruiz and Vargas-Silva (2009), Faini (1994), and Straubhaar (1986) provide evidence that exchange rates positively affect the sending of remittances. Our regression outcome suggests the opposite occurs in terms of exchange rates. This is the one variable that both of the regressions yielded significant data. With a 1% increase in foreign exchange rates, Mexico and India would see remittance value decreases of \$28 million and \$17 million respectively. This contradicts the findings in the literature, but we feel confident that a possible reason for our results lies within the non-economic determinants that are not being addressed, such as altruism and selfishness. As a hypothetical example: One US dollar provides ten rupees in period one, which can purchase one widget. In period two, one US dollar exchanges at 20 rupees which can now buy two widgets. If the remittance beneficiary only needs enough funds for one widget, than the migrant remitter may choose to send an equal or lesser amount even though the home currency is beneficially appreciating. This scenario addresses the issues faced by migrant workers in the US who may consider holding onto more US dollars if their financial status is weakened due to the economy, while still being able to provide a consistent remittance amount due to the currency exchange rates. Our hypothesis for foreign exchange rate which is in line with Ruiz and Vargas-Silva (2009), Faini (1994), and Straubhaar (1986) and suggests that exchange rates (and the inherent price fluctuations of sending a remittance) are a major determinant of remittances.

Gross domestic product based on purchasing power parity, cited by Carling (2008) and Acosta, Baerg, and Mandelman (2009) as remittance determinants, yielded somewhat significant results in our Indian regression. Considering a 1% increase in home country GDP PPP, India's results yield an \$890,000 increase in remittances. These outcomes suggest that one of our hypotheses is correct: purchasing power parity and the home country GDP climate are significant factors for migrant workers sending remittances home. Although not as significant, Mexico's GDP PPP coefficient was equal to 0.97 compared to India's 0.82. Contradicting our hypothesis based on data averages, the Mexico GDP PPP coefficient was larger than India's, which can be attributed to the fact that Mexico's GDP based on current prices outpaced India's for much of our regression's time span, as indicated in Figure 3.

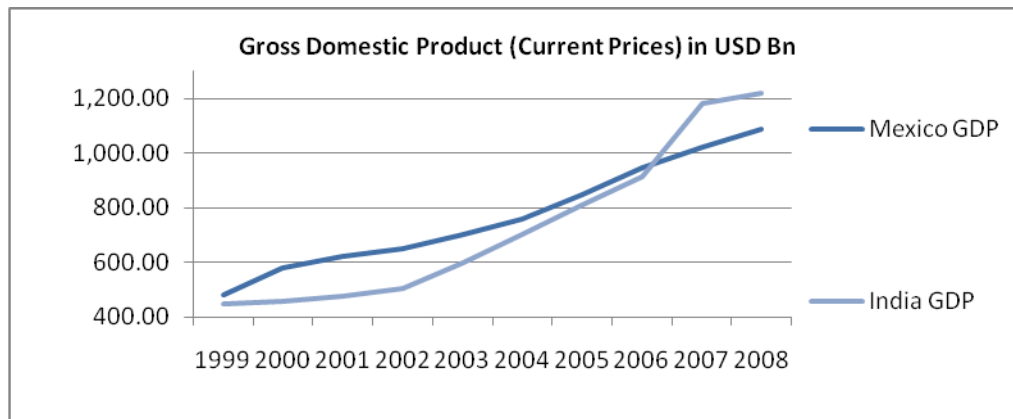


Figure 3

Gross Domestic Product by Country in Current Prices

Source: [http://www.google.com/publicdata?ds=wb-](http://www.google.com/publicdata?ds=wb-wdi&met=ny_gdp_mktp_cd&idim=country:IND&q=indian+gdp#met=ny_gdp_mktp_cd&i)

wdi&met=ny_gdp_mktp_cd&idim=country:IND&q=indian+gdp#met=ny_gdp_mktp_cd&i
dim=country:IND:MEX

Regression results produce evidence that an econometric modeling can help to identify some of the significant factors that may affect certain remittance driven nations of the world. However, as remittances are so dynamic and dependent upon the behaviors, psyche, and motivations of a human being, statistics cannot predict or account for everything in the remittance world. The following section will discuss these missing factors and examples of how remittance payments will advance in the future.

V. Alternative Remittance Systems and Emerging Payment Methods

Remittance payments are an important medium of financial support for families in developing nations around the world. Underlying this importance is the elusive world of black market remittances. Noguchi (2004) makes reference to “alternative remittance systems” also known as *hawala* or black market remittances. These networks allow for informal transfers of money and/or goods. It is important to note the existence of these unregulated remittance channels because Van de Bunt (2008) states that “It is estimated that the informal remittance sector represents at least 50 per cent of the size of the formal sector.”³⁶ If we take this estimation and the 2007 global remittance value estimate of \$318 billion³⁷, we can calculate that approximately \$159 billion in remittance funds were channeled throughout the world via hawala systems in 2007. This figure is quite significant because it exposes the Achilles’ heel of those who study and project remittance payments. If we consider these black market (\$159bn) estimates in comparison to the combined estimates of regulated and unregulated remittances (\$477bn) than we can assert that any remittance model based on official data, only accounts for 67% of the actual market. If researchers only use official data to formulate remittance theories, than their conclusions do not account 33% of remittances being sent, which are occurring on the black market. Trends, determinants, factors, and the overall impact of remittances might very well be drastically different if hawala remittances were officially reported.

Maimbo and Ratha (2005) define remittances as “pro-poor and cyclically stable, compared to other capital flows.”³⁸ Given the results of our regression model we can assert that changes in economic factors: purchasing power parity fluctuations, unemployment increases, and home population spikes along with home country GDP will help to keep remittance payments resilient even during the worst of times. Our data only accounts for remittances originating from the United States and that it only spans the years 1999-2008. During this time period one can only observe two periods of recession in the United States (as stated by the Federal Reserve Bank of St. Louis³⁹): March, 2001 – November, 2001 and December, 2007 – July 2009. These two periods have been highlighted in Figures 3A and 3B to show how remittances to Mexico and India actually start their drastic increase during the 2001 recession period and have continued to persevere through recent financial crisis.

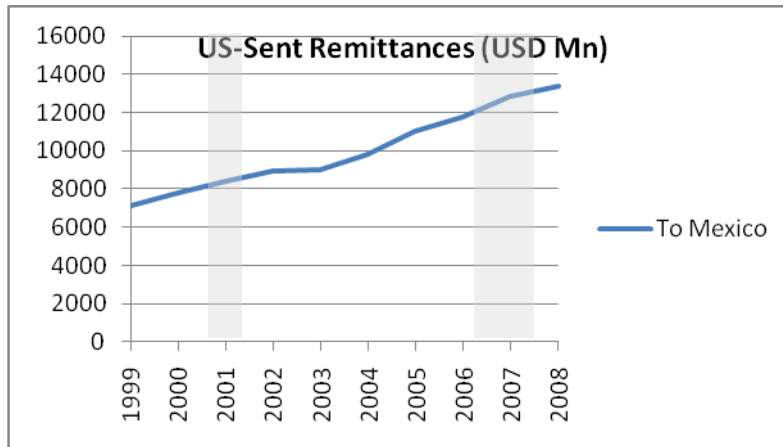


Figure 3.A. US-Sent Remittances to Mexico

Source:http://www.bea.gov/international/bp_web/list.cfm?anon=71®istered=0

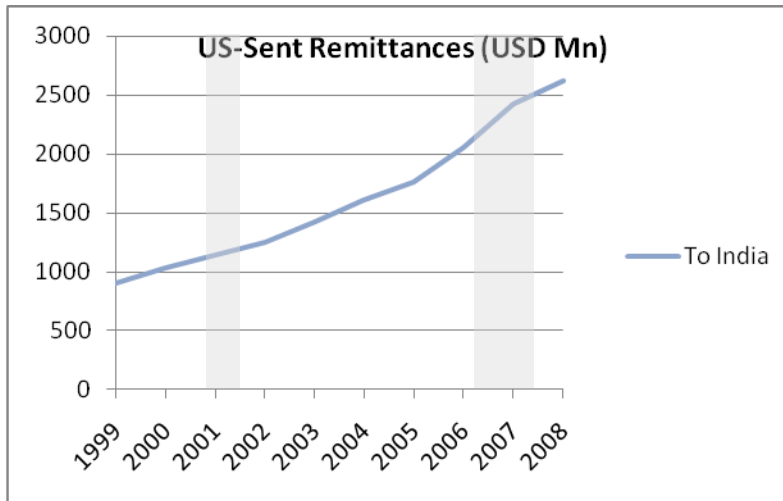


Figure 3.B. US-Sent Remittances to India

Source:http://www.bea.gov/international/bp_web/list.cfm?anon=71®istered=0

Given this resiliency and global fears about payment safety and identity security, emerging payment methods will only help to facilitate and increase the number of remittance payments made around the world. In this respect, the most logical, imminent, and innovative payment solution to make its way towards market adoption has been the mobile payment. A mobile payment is the use of a mobile phone device to conduct normal financial transactions. This includes everything from mobile banking and top up capabilities to point of sale purchases and person to person money transfers. The general evolution of alternative payment methods has transitioned from cash options to cheques, cheques to debit & credit cards, and cards to internet payment wallets such as PayPal. Industry heads have already acknowledged that the segue to mobile payments is forthcoming and will receive exponentially market uptake. Dan Salmons, director of payment innovations at Barclaycard, the UK-based payment business of Barclays Group states that “The mobile phone will eventually replace plastic. By 2012 it will be normal to pay with the phone, and in five to 10 years, it is completely reasonable to think plastic will be relegated to a secondary function.”⁴⁰ Once the switch to mobile phones is made, the impact will be quite substantial. Chang (2009) states that “...research predicts that 123 million NFC-enabled handsets, equivalent to 46% of today's U.S. wireless subscribers, will come online in North America by 2013...global mobile payment transactions are expected to reach \$110.1 billion in 2013, at a 105% compound annual growth rate, according to Dublin-based Research and Markets.”⁴¹ If remittances via mobile phone account for only 1% of all mobile payments in the world, that will still mean over \$1.1 billion in support payments will be generated through the use of mobile devices. To illustrate the flow and logic of mobile payments, Garlan (2009) illustrates in Figure 4 how a mobile payment system can employ a government-to-person model in order to provide timely and convenient delivery of public sector benefit payments. This is an actual model being implemented in the UK and so that is our reasoning for its use. Mobile payment models for remittances would work in similar ways for countries like India and Mexico with specialized product offerings tailored to market needs.

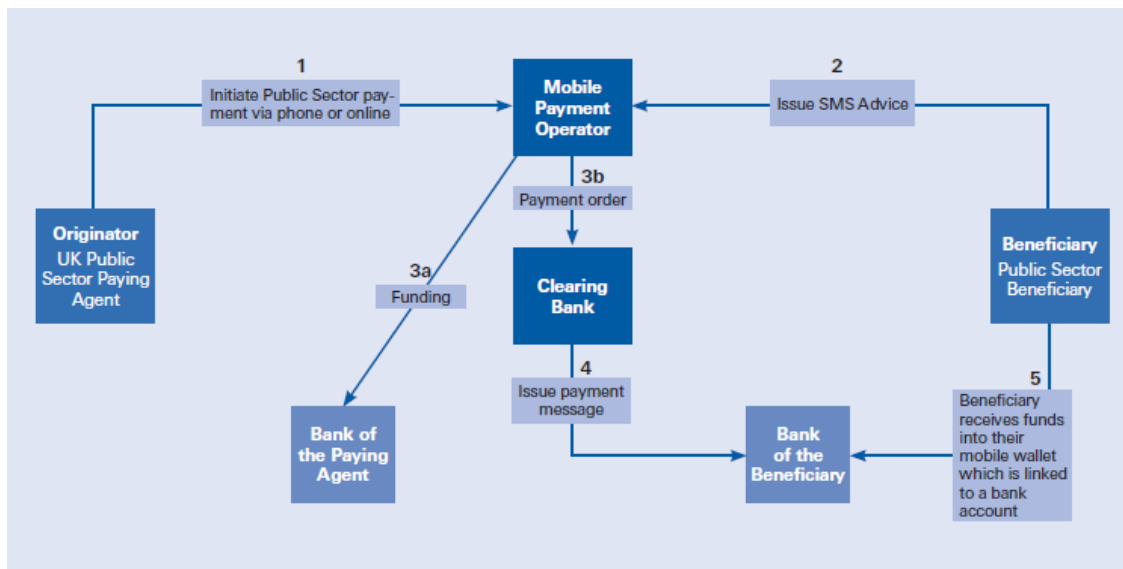


Figure 4. Mobile Public Sector Payments in the UK Flow Chart
Source: Garlan, K. (2009). 12.

In this scenario, the UK government would provide public service payments (unemployment allowances, bereavement benefits, pension credits, disability reimbursements, possibly even remittances automatically deducted from paychecks, etc.) to entitled beneficiaries via the mobile phone. Currently, these payments are executed via cheque and in many cases, must be picked up by the beneficiary at a public sector office. Employing the model above, the UK government would be able to send a payment message to a clearing bank, with instructions to deposit funds into the mobile wallet of a beneficiary. The beneficiary would not have to leave his or her home and would have instant notification of deposited funds and could then retrieve those funds from their local bank or make purchases at local merchants and points of sale who accept mobile payment options. Figure 5 goes on to illustrate the penetration of mobile phones and financial services in select nations.

A major area of concern with mobile payments is merchant adoption rates. In order for mobile payments to reach the critical mass that credit and debit cards currently hold, mobile payments will have to be accepted at all the points of sale which are currently saturated by card payments. This means that beyond the person to person sending of money, mobile payments will have to be adopted in a person to business scenario as well, allowing consumers to pay for train tickets, groceries, clothing items, and the like. Mallat and Tuunainen (2008) illustrate a number of these drivers and barriers that will affect mobile payments ability to reach a merchant adoption level that will enable market proliferation in Figure 6.

With this emergence of convenient and highly adaptable technology, sending remittances will become easier than ever, and will allow individuals to safely and securely send much needed funding to family members in both developed, but more significantly, in underdeveloped nations.

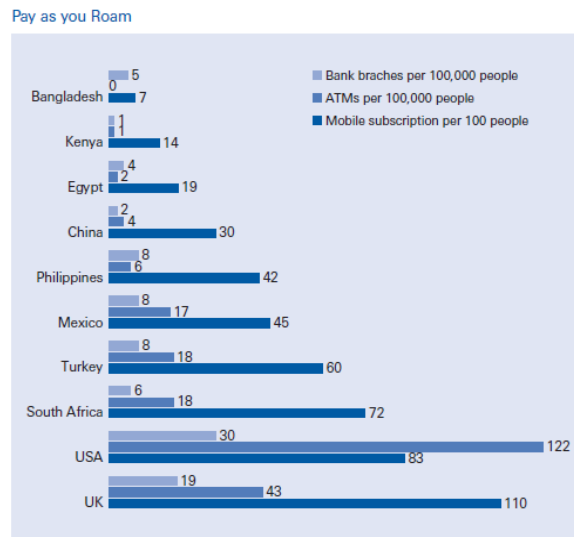


Figure 5. Pay as you Roam
Source: Garlan, K. (2009). 5.

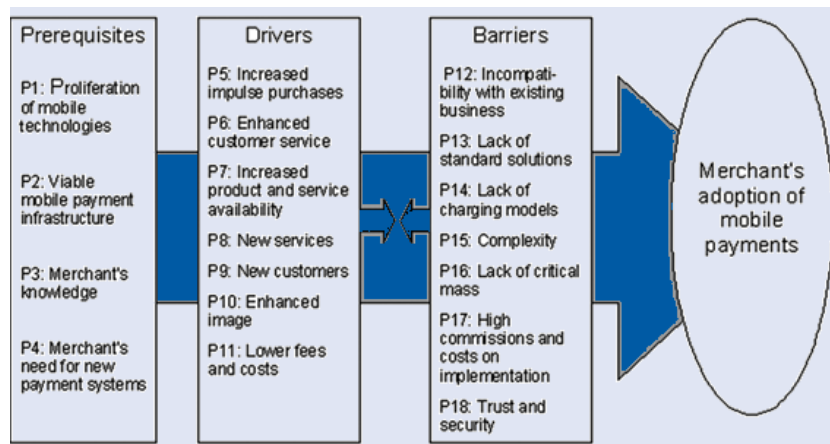


Figure 6. Merchant Adoption of Mobile Payments
Source: Mallat, N., & Tuunainen, V.. (2008). 48.

VI. Conclusions

This paper analyzes remittance payment flows from the United States to Mexico and India to determine macroeconomic factors affecting these payments and a damaging effect of economic crisis on those payments. Through the use of a regression model which encompassed a period of 10 years (1999-2008), gross domestic product based on purchasing power parity was found to be a significant determinant of sent remittances from the United States to the respective home countries. We accept our hypothesis that unemployment levels will yield minor effects on remittances while population levels will affect remittances in a more significant way. Our hypothesis, which states that the amount of remittances being sent would be different for each country, is also found to be correct. Our results also coincide with the conclusions of Faini (1994) and Straubhaar (1986) who found exchange rates as affecting remittances positively. Our results indicate some correlation to the conclusions of Carling (2008) and Acosta, Baerg, and Mandelman (2009) in identifying gross domestic product based on purchasing power parity as a positive remittance determinant, and despite using a proxy, we also share a mild consensus with Ruiz and Vargas-Silva (2009) that migration patterns and population are factors affecting remittances directly.

Thus, this paper contributes the following findings to the literature on remittances:

- Foreign exchange rates are a significant remittance determinant;
- Individual countries and specific remittance corridor cases are different, so the study of individual countries and corridors is necessary; we studied two cases, Mexico and India;
- Our study does not consider all the remittance payments being sent to a receiving nation; rather we focus on US originated remittance payments. Migrant workers are dispersed throughout many countries, and our study explores the importance of locating the determinants of one originating nation, as migrants in other originating nations may behave differently.

The limitations of our study are:

- The availability of data, as we could not locate official statistics for all intended regression factors;
- The time horizon of ten years, which could have been expanded to approximately 20 years given the number of available observations for our factors but the data on remittances to India, constrained our model.

Future research can enhance the findings of our study in many ways. We suggest the following avenues:

- Expand the timeframe beyond ten years by locating the data on Indian remittance payments;
- Analyze different origination sources for remittance payments to a certain country;
- Analyze different countries (other than Mexico and India), which will enhance our understanding of global remittance markets;
- Account for black market and unreported remittance data and create a model to estimate these figures more accurately.

As we move from underneath the rock of global economic crisis, emerging technology, along with specific motivating economic factors, are sure to influence the resiliency of remittances payments. The drive for convenient and innovative payment mechanisms, such as mobile payments, will also help to convert the billions of dollars in black market remittance flows around the globe into formal channels of transfer. Regardless of the method, remittances have proven to be a resilient form of financial support for both the working migrant families and the developing nations of the world, which so desperately rely on the receipt of these simple, repetitive, low value payments.

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Notes

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