

Macroeconomic Determinants of Worker Remittances to Latin American and the Caribbean Countries

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Student's Name: Sathiavane Veeramoothoo

Faculty Sponsor: Dr. Ramesh Mohan

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ABSTRACT

A regression analysis was performed to identify which macroeconomic factors influence the magnitude to worker remittances to over thirty Latin American and Caribbean countries. Age dependency ratio, land area, net migration, labor force, population and unemployment were found to be significant predictors of remittances. A time series exponential model was developed to forecast the level of remittances for the next ten years. The results suggest that remittances to Latin American and Caribbean countries will reach USD 190,810 million in 2018.

Based on the above findings, this paper will help scholars understand better what drives worker remittances in Latin American and Caribbean countries and provide an insight into unofficial capital flows from developed to developing countries in the global economy, now and in the next ten years. This forecast may be of further benefit to receiving countries in that it may help to develop economic policies that may promote both development and economic sovereignty. A comparison of money received as remittances and money received from foreign direct investment is also provided. The growing amount of remittances flowing from developed to developing countries needs to be properly accounted and budgeted for, to avoid economic loss in the future. The better remittances are understood and the greater the accuracy of official remittance figures, the better policies will be at regulating the situation.

INTRODUCTION

Worker remittances are unique in that they consist of individual independent transfers of an average of about USD100 to USD300 per month by migrants to their home countries. Economic migrants worldwide were estimated at 175 million in 2006 and, if put in one country alone, would constitute the sixth highest populous country in the world (Gables, 2006). The region, constituted by Latin American and Caribbean countries, is the highest remittance-receiving region in the world. A number of studies involving worker remittances have been conducted, revealing the effects of worker remittances on both host and home countries. Some of their results will be discussed in the next two sections.

This paper focuses on the following:

- The importance of worker remittances will be determined in terms of investment capital. Many developing countries rely on remittances as a safe and consistent source of income. This objective will later help with the comparison of the impact that worker remittances have, in terms of international capital inflows.
- It will be determined whether worker remittances vary positively, negatively or remain neutral with given changes in selected macroeconomic variables.
- The extent of variation in the level of worker remittances will be tested against variations in a number of macroeconomic variables. The corresponding changes in the magnitude of remittances with given changes in some macroeconomic variables will be investigated further. Different combinations of variables will be analyzed in order to determine which combination most accurately predicts worker remittances.
- A projection of remittance capital flow from developed countries to Latin American and Caribbean countries will be determined by forecasting the level of worker remittances based on past remittance data trends. This projection will help with long term development planning in Latin American and Caribbean countries and may also assist other analysts in determining future global money inflows and outflows.

Based on these four research objectives, this paper will help economists understand what drives worker remittance in Latin American and Caribbean countries. This will lead to a better

understanding of the investment and capital inflow to these countries. Also, based on these analyses, economists may be able to predict the flow of capital from the developed world to Latin American and Caribbean countries over the next ten years, given the past trends in worker remittances.

PAST TRENDS AND MOTIVES

According to the Ratha et al. (2003), worker remittances for developing countries, including Latin American and Caribbean countries, have increased from 2002 through 2007. Latin American and Caribbean countries received USD28 billion in remittances in 2002 and USD35 billion in 2003. This remittance figure increased steadily and by higher percentages, reaching USD49 billion by 2005. The overall change from 2002 to 2007 amounts to 114.29%. Actually, remittance inflows to Latin American and Caribbean countries increased at a rate of about 1.07 times faster than the rate at which remittance inflows to the world increased over the period under consideration.

Based on the figures in Table 1 on the next page, economists have projected that worker remittances are likely to continue to rise. In the year 2006, in seventeen out of thirty Latin American and Caribbean countries, the amount of remittance per capita received exceeded net foreign direct investment per capita. Three quarters of that amount came from the United States, and represents the largest unofficial flow of money from the developed to the developing world (EIU, 2007). According to Terry and de Vasconcelos, “[a]s people move ‘North’ by the millions, money moves ‘South’ by the billions” (Gables, 2006).

During this same period, it has been noted that remittances have been less volatile than other sources of external financing in many countries worldwide. Honduras, Guyana and Haiti rank among the top-remittance-recipient countries, when considering remittances as a percentage of Gross Domestic Product and Mexico ranks among the top ten remittance-recipient countries worldwide when remittances are evaluated in USD. Since remittance inflows have increased overall worldwide, there have been concerns over the long-term sustainability of remittance inflows.

Years	Remittance Inflows to LAC Countries*	% change per year (LAC)	Remittance Inflows to the World*	% change per year (world)	Ratio of % changes (LAC:World)
2002	28	-	116	-	-
2003	35	25%	144	24.14%	1.04:1
2004	41	17.14%	161	11.81%	1.45:1
2005	49	19.51%	191	18.63%	1.05:1
2006	57	16.33%	221	15.71%	1.04:1
2007	60	5.26%	240	8.60%	0.61:1

Table 1: Percent Changes for Remittance Inflows for LAC Countries and the World

* Figures used are in USD Billion

* LAC – Latin American and Caribbean countries

The motivations to remit have generally been divided into four categories, namely altruistic motives, family and ties, self-interest motives and other motives.

a) Altruism

Altruism as defined in the Cambridge University Press Dictionaries Online, is “willingness to do things which benefit other people, even if it results in disadvantage for yourself”. Altruism, in this context, is based on the idea that the utility of the migrants is related directly to the utility of their family members. Johnson and Whitelaw (1974) found that altruistic motives affect the level of remittances. Agarwal and Horowitz (2002) found supporting evidence linking the level of remittances with altruistic motivations over motives to diversify and share risks.

b) Family and Ties

Remittances also act as a way of maintaining ties with family members back in the home country (Hunte, 2004). Russel (1986) and Stark and Bloom (1985) have cited the family as key in most of the remittance theories. Stark (1991), Agarwal and Horowitz (2002) and Gubert (2002) concurred with Chami et al., (2005) that family members in the home country “provide [migrants] with protection against income shocks by diversifying the sources of income.”

Ilahi and Jafarey (1999) portrayed the “home family” as a bank for the migrant since family members took the migrants’ remittances and put them to ‘good’ use—as determined by the current and future needs of the family. Chami and Fisher (1996) also saw altruistic motives driving remittances. These motives proved to be an efficient means for finding business partners to share risks. Donald Terry, manager of the Multilateral Investment Fund, which is administered by the Inter-American Development Bank, stated that “most of these transfers are from poor people in the United States to very poor people in Latin America” (Fidler, 2001).

c) Self-Interest Motives

More recent theories have focused on the idea that there are self-interest motives for remitting. The decision to remit “may be linked to the desire for inheritance from parents; and thus members who increase the family’s wealth may be entitled to a future share” (Alleyne et al., 2008). Lucas and Stark (1985) suggested that migrants may need family members to take care of their investments in their home country. They therefore send money home in return for the family members’ taking care of these investments for the migrants. Sending remittances may also be a way to get family members to invest money into profitable positions for the migrant in the home country (Fidler, 2001).

d) Other Motives

Other studies have shown that there might be alternative motives to remit. Chami et al. (2003) think that the motivation to remit is closely linked to their impact on economic activity. Chami, et al. (2005) tested by using panel data, whether remittances were compensatory in nature and hence counter-cyclical for the first time. They found that remittances have a counter-cyclical nature and concluded that remittances are therefore motivated by economic forces in the home economy. There is also the possibility of having some implicit family contracts between migrants and their family in the home country (Lucas and Stark, 1985).

THEORY AND LITERATURE REVIEW

Different Types of Remittance

The literature on worker remittance differentiates remittances according to four main criteria. First, there is a distinction made between fixed and discretionary remittances. Second, remittances can be evaluated on two planes—human and monetary. Third, remittances have been classified according to their end uses, i.e., whether they will be used for immediate consumption or for investment purposes. And fourth, remittances differ when they are based on transitory income as compared to permanent income.

a) **Fixed and Discretionary Remittances**

Wahba (1991) divided remittances into two categories: fixed and discretionary. Fixed remittances refer to money remitted for supporting family members in their daily economic activities. They are influenced by the size of the family, the income level as well as other relevant characteristics (Chami et al., 2005). Discretionary remittances refer to investment flows and do not vary according to the needs of the migrant's family in the home country.

b) **The Monetary and the Human Plane**

Remittances have also been analyzed by Gobles (2006) on two planes—monetary and human. Gobles mentions that the flow of remittances is determined by a simple supply-demand model:

Prospective migrants in developing countries need more money
(supply) and cheap labor in prospective host countries (demand).

In the last 25 years, the rate of economic migration has “increased at four times the rate of world population growth” (Gobles 2006). This highlights the magnitude of migration's economic impact.

c) Use of Remittances

Remittances also vary according to whether they will be used to fund immediate consumption or be invested in long-term assets. Russel (1992) and Lipton (1980) concluded that worker remittances are used for immediate consumption. Others, such as Taylor (1992), however, concluded that remittances can also fund capital expenditure projects. Conway and Cohen (1998) and Hunte (2004) found that some workers sent remittances back to fund a local sewer system. Escobar and Martinez (1990) and Massey et al. (1987) concluded that “migradollars” (a term coined by Durand (1988) to refer to dollars sent back home by migrants) are mostly spent on consumption although some inevitably are used in production.

Ratha (2003) concluded that whether remittances are invested or not depends on the macroeconomic policies in place. The more effective the policies are at encouraging economic development, the more frequently remittances are directed towards investment purposes. Evidence has been found linking the level of remittances sent to the number of small businesses developed in the Caribbean (Diaz-Briquets and Weintraub, 1991; Hunte, 2004). Chami et al. (2005) noted that the use of remittance depends on the motivations to remit.

The Economic Intelligence Unit (EIU) (2006) stated that remittances that fund consumption stimulate domestic demand for goods and services, thus encouraging human capital accumulation through provisions for education and health care. They also found that, counter-intuitively, children aged 16 to 18 in migrant households have a lower level of schooling than those in non-migrant households. Interestingly, Buch and Kuckulenz (2004) found that the economic conditions of families not receiving remittances are worsened in the long run. Adams (1998) studied the propensity to save as a governing influence on consumption versus savings decisions. The propensity to invest as well as related incentives in the migrants’ home country influences the end use of remittances (Durand et al., 1996).

d) Long and Short Term Aspects of Remittances

Remittances also vary depending on whether they are based on transitory income or permanent income. Brown (1997) found evidence suggesting that the longer migrant workers stay abroad, the more money they remit to their family. Hunte (2004) found that as income of migrants' families increases, the less remittance the migrants send back to their families. If family members believe remittances are based on transitory income, they will be more inclined to save, thus leading to more investment expenditure (Friedman, 1957). On the other hand, if family members believe the flow of remittance is based on permanent income, they will not forego present consumption.

Endogenous Migration Approach versus the Portfolio Approach

The part of the literature concerning motivations for remitting is characterized by Elbadawi and Rocha (1992) the leading study that reviewed and analyzed most of the literature present on the incentives for immigrant remittances. These researchers divided the study into two main strands: endogenous migration and portfolio (exogenous) approaches. The endogenous migration approach is based on psycho-social factors such as length of stay in the host country, strength of family ties, and other family arrangements in the home country. The portfolio approach, on the other hand, isolates the decision to remit from the decision to migrate, and analyzes the allocation of the migrants' earnings between the host and home country. This approach focuses on a purely economic perspective, and disregards the human aspect. The portfolio approach also evaluates rates of return on the migrants' investments, if any.

Interdependency

Another interesting part of the literature deals with remittances and interdependency between host and home countries. Since remittance per capita exceeded foreign direct investment per capita in 17 out of 30 Latin American and Caribbean countries in 2006, there is a growing interest in seeing whether interdependence is occurring. The domestic economies of receiving countries can become vulnerable to the economic cycles of the host country, potentially leading to economic instability in the long run (EIU, 2006).

Microeconomic Determinants of Remittances

Microeconomic factors have been extensively used to determine the size of remittances sent.

Buch and Kuckulenz (2004) claimed that “microeconomic studies indicate that the education and income level of the migrant and his family are the main determinants of remittances.” Briere et al. (2002) and Buch and Kuckulenz (2004) discovered that other “factors determining the magnitude of remittances are the migrants’ destination, gender, and household composition.”

Other Factors and Combinations of Factors

Other studies have used macroeconomic factors to determine the magnitude of worker remittances. The presence of domestic banks and a black market for foreign exchange premiums in the host country directly influences the amount of money sent (El-Sakka and McNabb, 1999; Karafolas, 1998; Russel, 1992). Other factors such as the interest rate differential between home and host countries, government policies, wages, political risk factors in the host country and the rate of inflation also affect remittances (Buch and Kuckulenz, 2004). The same researchers also mentioned that there is no strong consensus in the literature regarding macroeconomic determinants of remittance volume.

Durand et al. (1996) analyzed remittance decisions by looking at the individual, household, community and macroeconomic levels and found that sometimes a combination of these also determine the actual amounts remitted. Alleyne et al. (2008) examined the macroeconomic factors influencing the flow of remittances to selected English-speaking Caribbean countries by using a balanced two-way fixed-effects model, a random-effects model and the adjusted fully-modified ordinary least-square model. They found the coefficient of interest rate differential to be significant. This prompted migrants to either consume now or forego current consumption for future consumption. They also found that the relationship between the “real effective exchange rate and remittances was negative and insignificant” (Alleyne et al., 2008).

COSTS AND BENEFITS OF REMITTING

- **Growing Gap between Those Receiving and Those Not Receiving Remittances**

Another focus concerns the costs and benefits of remitting. One of the main costs for the receiving country is what is known as the “Dutch Disease.” McCormick and Wahba (2000) emphasized that the economy of the home country can weaken as a result of receiving remittances. They also pointed out that the general welfare of the families not receiving remittances can deteriorate compared with those receiving remittances, and the gap between the two can broaden. Chami et al (2003) also argued that the impact of remittances on the receiving economy in the long run leads to negative economic growth. Constant remittance flows could lead to real exchange rate appreciation and reduced competition (EIU, 2006).

- **Risk-Sharing**

Another benefit of remitting is risk-sharing (Massey and Parrado, 1998). Agarwal and Horowitz (2002) found that although risk sharing is a clear benefit of remitting money to family members back home, it is not considered to be among the highest of benefits for migrants engaging in remitting. When put to good use, remittances have been found to encourage a diversified portfolio which can even lead to economic growth, if properly managed (Adelman & Taylor 1990).

- **Repaying Family Obligations**

Another purpose of remitting is to provide migrants with a means to repay family loans. In some families, elders are expected to pay for their children’s education and take out loans in their own names to finance either educational expenses or migration costs or both. It is then expected that, when these ‘children’ start working, they should repay the loans and other expenses family members have incurred on their behalf (Lucas and Stark, 1985). Poirine (1997), Brown (1997) and Glytsos (1988) reached the same conclusion. Others, like Agarwal and Horowitz (2002) and Gubert (2002), thought of remittances as returns on investment previously made for the migrants. Higher wages enable migrants

to gain more economic power and remitting provides a safe way to share this with family (Borjas, 1994).

- Remittances and Development

The topic of development has been controversial concerning whether it acts as a cost to remitting or as a benefit of remitting. Some of the literature suggests that remittances may actually slow economic growth. Chami et al. (2003) found that remittances do not act as capital for economic development and that they can even cause negative economic growth in the long term.

Other studies have shown that remittances do lead to development. According to EIU (2007), several studies show that remittances are becoming an “engine of growth” in Latin America since their use inevitably goes beyond the family’s day-to-day needs. These surveys also suggested that remittances go towards repaying home mortgages, financing the start of small businesses and opening bank savings accounts. Considering the multiplier effect of migradollars invested, all these small initiatives can go a long way. Durand et al. (1996) contended that with remittances, family constraints are eased and therefore demand for home goods and services increase. This leads to local producers manufacturing more to accommodate this increased demand.

Adelman and Taylor (1992) designed a Social Accounting Multiplier matrix to measure the economic impact of each additional migradollar on the receiving economy. Gables (2006) summarized this relationship between migrant remitters: “...as people move ‘North’ by the millions, money moves ‘South’ by the billions.” Some macroeconomic variables such as interest and exchange rates may help remittances to be invested, which in turn, finances economic development (El-Sakka and McNabb, 1999; Hunte, 2004). Chami et al. (2003) concluded that further research is needed in order to determine the economic impact of remittances in the receiving countries. The current study will address this gap in the literature by using data from thirty Latin American and Caribbean countries to test which macroeconomic variables influence the level of remittances the

most. An attempt will also be made to predict the level of remittances in the future, based on past trends.

- Brain Drain

Another cost, that has only recently become apparent, is associated with migration and sending remittances is brain drain. More and more of the well-educated members of the Latin American and Caribbean countries are choosing to pursue job opportunities abroad. More than 50% of university-educated Latin American and Caribbean citizens live abroad, mostly in the United States (EIU, 2006). This is because the United States typically offers higher wages than other developed countries, and its proximity to Latin American and Caribbean countries, make it readily accessible.

- Transaction Costs

Transaction costs are another cost involved in sending remittances home. Lapper (2004) noted that in “the past five years increasing competition among financial institutions has helped reduce the cost of sending remittances from an average of more than 15% to less than 8%. The Inter-American Development Bank projects transaction costs to decrease by another 50% by 2010. Over 100 money-transfer organizations exist today compared, to the existence of only 5 in 1995 (EIU, 2007).

- Laws

The current regulatory environment also influences the transfer of remittances. Improved monitoring by Central Banks has led to more remittances being sent home (Lapper, 2004). However other laws, such as those pertaining to money laundering, discourage United States banks from offering remittance services. Moreover, recently, there has been the introduction of more efficient ways to detect illegal immigrants and the latter are reluctant to remit money frequently for fear of being caught and deported (EIU, 2007).

DATA AND METHODOLOGY

Data

Most of the data in this study have been obtained from the World Bank publications. All figures are quoted in USD, except for the remittance figure which has been quoted in USD 100,000 and the GDP figure which has been quoted in the countries' local currency units. One of the main difficulties with the data is that some are missing for a couple of Latin American and Caribbean countries and this is why only 30 have been selected for this study (See Appendix A for a list of countries studied).

To compensate for the few missing data in the selected countries, especially figures for the year 2007, additional data were obtained from the CIA World Factbook. An average over 6 years, from 2002 to 2007, has been computed for each variable in each country.

As mentioned previously, the data consist of thirteen variables for thirty Latin American and Caribbean countries. It is quite impossible to determine the number of people who remit to Latin American and Caribbean countries since official figures are not available as evidence. However, the significance of remittances in the thirty countries under study can be determined. To do so, a ratio identified for this study as 'remittance per capita' has been developed. This ratio concerns the amount of money that each member of the population in each of the thirty countries will theoretically receive if everyone in each country received an equal amount.

Table 2, on the next page, shows the computation of remittances per capita for each of the countries selected, and gives some indication of the significance of worker remittances for the thirty countries in this study. In 29 out of the 30 countries, remittance per capita has been observed to range from \$5.23 to \$1393.51. Foreign direct investment was also divided by population to arrive at foreign direct investment per capita. This ratio was found to ease comparison with remittance per capita. In 17 out of the 30 countries, foreign direct investment per capita was less than remittance per capita, that is, on average, 57% of Latin American and

Caribbean countries get a higher capital inflow from remittances than they do from foreign direct investment.

Countries	Remittances	Population	Remittance per capita
Argentina	349634000	38380057	9.11
Bahamas, The	445000000	319337	1393.51
Barbados	122280000	290866	420.40
Belize	41890000	282183	148.45
Bolivia	287920000	9008298	31.96
Brazil	3327768000	184300955	18.06
Chile	103000000	16115659	0.64
Colombia	3203946000	44303087	72.32
Costa Rica	364832000	4250470	85.83
Dominican Republic	2556880000	9324700	274.21
Ecuador	2058222000	12914446	159.37
El Salvador	2562078000	6576759	389.57
Grenada	23904000	105702	226.14
Guatemala	2599648000	12403541	209.59
Guyana	144416000	738289	195.61
Haiti	894816000	9151443	97.78
Honduras	1379700000	6704817	205.78
Jamaica	1602510000	2642337	606.47
Mexico	18232680000	102076691	178.62
Nicaragua	518100000	5393957	96.05
Panama	111540000	3175272	35.13
Paraguay	272660000	5789408	47.10
Peru	1196752000	26956776	44.40
St. Kitts and Nevis	3276000	47360	69.17
St. Lucia	2228000	162598	13.70
St. Vincent and the Grenadines	4488000	118490	37.88
Suriname	10620000	449483	23.63
Trinidad and Tobago	87560000	1319211	66.37
Uruguay	66762000	3306797	20.19
Venezuela, RB	136600000	26123784	5.23

Table 2: Computation of Remittances Per Capita for Each of the Countries Studied

Variables and Countries Studied

Worker remittances, which is used as a dependent variable in this paper, is defined as current transfers of money by migrants who are employed or intend to remain employed for more than a year in a country in which they do not have permanent residence, to their home countries. This analysis assumes that worker remittances also include migrants' transfers as well as the compensation that Latin American and Caribbean countries received from their citizens working abroad. Employee compensation is the income of migrants who have lived in the host country

for less than a year. Transfers are defined as remittances sent by workers who have been living in the host country for more than a year. The figures used in this paper are in USD, unless otherwise stated.

To predict the level of worker remittances received in Latin American and Caribbean countries, twelve variables have been considered: adjusted savings, age dependency ratio, birth rate, external debt, foreign direct investment, gross domestic product (constant LCU), rate of inflation, total labor force, land area, net migration, total population and unemployment. The above mentioned variables were selected due to the availability of data from 2002 to 2007 from thirty Latin American and Caribbean countries. Appendix B shows the respective abbreviation for each variable.

- Adjusted savings refers to net national savings (NNS) as a percent of gross national income. Net national savings is the difference between gross national savings (gross national income minus public and private consumption, plus net current transfers) and the value of consumption of fixed capital (replacement value of capital used up in the process of production).
- Another variable considered is the age dependency ratio (ADR). This is a fraction consisting of the number of dependents (those under 16 and those over 65) divided by the total population aged between 16 and 65.
- The crude birth rate (BR) is the average number of births in a year, expressed per 1000 persons in the population. This rate also provides a rough measure of fertility. The rate of birth has been investigated since it is quite interesting to see whether a higher birth rate leads to greater remittances as could be expected. This is because, the higher the birth rate, the fewer the jobs in the home country, and the highest the number of dependents for workers to support.

- External debt (ED), as it is used in this paper, is the portion of the public debt owed to foreign citizens, firms, institutions, and governments. External debt can be expected to vary negatively with remittances since it is likely that the more debt incurred, the less encouraged workers are to remit. This is because countries having numerous debts usually have a slow economy, since reinvestment does not occur. This, in turn, prevents the multiplier effect of money from taking place.
- Foreign direct investment (FDI) refers to the creation of new capital or the acquisition of existing capital in a particular nation by foreign corporations. This is the amount of money that developing countries officially receive from other countries. This amount is usually well reported, but the proceeds rarely go to families since foreign aid is usually awarded with restrictions that focus mostly on helping a developing country in the long term. In countries where corruption is prevalent, a high percentage of the amount of official money received from other countries never goes towards projects that benefit those most in need. Comparing the amount of foreign direct investment to the level of remittances received is revealing in that this study will show the extent of the impact of this unofficial international inflow.
- GDP (constant LCU) refers to the gross domestic product in constant local currency unit (LCU). It is the total market value of all final goods and services produced annually within the boundaries of one country, whether with the resources of that country or from resources of another country. We would expect the level of remittances to go down as gross domestic product in a country increases. This situation occurs mostly because citizens working abroad are less likely to remit, if family members in the home country can provide for themselves, and enjoy a decent quality of life.
- The rate of inflation (INF) is the percentage change in the general level of prices in a country's economy. The higher the rate of inflation and the faster the increase in the rate of inflation, the greater the drop in the quality of life. When family members at home are faced with such a situation, they usually rely more heavily on remittances to keep up with

their current standard of living. Therefore, remittances can be expected to increase with a rise in the rate of inflation.

- The total labor force (LF), as used in this paper, refers to all persons aged 16 or older, who are not in educational institutions and who are employed or employable, i.e. total labor force comprises all persons, both males and females, who provide or intend to provide the supply of labor for the production of economic goods and services. This definition also includes persons in paid-employment and self-employment, those in the armed forces as well as the unemployed. With a larger labor force, remittances are likely to fall as family members working in the home country may be able to sustain themselves as well as their dependents.
- Land area (LA) refers to a country's total area, excluding area under inland water bodies, national claims to the continental shelf, and exclusive economic zones. Often, the greater the land area of a country, the more natural resources that country has and, therefore, it is more likely that the country in question and its people are self-sustaining.
- Net migration (NM) is the difference between the number of immigrants and the number of emigrants relative to a country over a specific period of time. The number of emigrants is the number of people from one country who choose to move to another country and live there for more than a year. The number of immigrants refers to the number of people who come to a particular country and live there for more than a year.
- The total population (POP) variable refers to the overall number of men, women and children in the countries used in this study.
- The rate of unemployment (UNE) is the percentage of the labor force unemployed over the period considered in the countries selected for this paper. Unemployment is the failure to use all available economic resources to produce desired goods and services; it is the failure of the economy to fully employ its labor force. Rising UNE may lead to a

vicious circle of poverty for those affected by it. Those who have lost their jobs demand less goods and services, causing further loss of jobs elsewhere in the economy.

Meanwhile, standard of living and the quality of life decreases until it becomes difficult to finance necessities. This situation may translate into more pressure for those family members working abroad to remit money.

The variables that correlate positively with worker remittances are net national savings, age dependency ratio, birth rate, foreign direct investment, gross domestic product (constant LCU), labor force, land area, and total population. An increase in these variables leads to an increase in the level of remittances received in Latin American and Caribbean countries. The positive correlation of net national savings, foreign direct investment, gross domestic product and land area is counter-intuitive.

Variables that change negatively with remittances are external debt, inflation, net migration, and total unemployment. An increase in these variables leads to a decrease in the money being remitted and likely a decrease in these variables leads to an increase in the level of remittances sent home. Again, the negative correlation of inflation, net migration and unemployment is counter-intuitive.

Empirical Methodology and Results

A linear regression model has been developed to assess how changes in some macroeconomic factors can predict changes in remittances. The twelve variables studied have been tested against each other and individually against worker remittances to identify any instance of multicollinearity and to consider general correlation respectively. All data values have been standardized to compensate for unrealistic inter-variable discrepancy, resulting from some data figures being quoted in thousands and some in hundreds of thousands. Appendix C shows the statistical summary of all the twelve macroeconomic variables studied. These statistical summaries indicate the mean, standard deviation, variance, skewness and p-value as well as include a graph of the each variable.

The stepwise regression, as shown in table 3 on the next page, was used to determine which of the twelve variables would add significantly to the model. Age dependency ratio, labor force, land area, net migration, population and unemployment were retained for further analysis. It is not surprising that all of these variables, except for land area, refer closely to people since remittances are as much a social factor as they are economic. Interestingly, land area also was included mainly due to its high correlation of 0.951 with labor force. Usually, the larger a country, the more people will be living and working there. This can be assumed to be true in this case as well.

Alpha: 0.05	N = 30	Response on 12 predictors	
Step	1	2	3
Constant	0.00000000006438	0.00000000006467	0.00000000005074
NM	-0.966	-0.901	-0.659
T-value	-19.70	-18.07	-10.99
P-value	0.000	0.000	0.000
LA		0.138	0.986
T-value		2.77	5.75
P-value		0.010	0.000
POP			-0.78
T-value			-5.06
P-value			0.000
R-Sq	93.27	94.76	97.36

Table 3: Stepwise regression - First three most significant variables

Three additional variables that also contribute significantly to the determination of remittances were obtained from a best subsets analysis of the original twelve variables. Then, a regression analysis for the six variables retained by the stepwise regression was designed as follows:

$$WRC_t = \alpha + \beta_1 ADR_t + \beta_2 LF_t + \beta_3 LA_t + \beta_4 NM_t + \beta_5 POP_t + \beta_6 UNE_t \quad (1)$$

In the model above, α is used as a constant and β_n , where n ranges from one to six, refers to the coefficients of the six variables retained. The subscript t is used to show that worker remittance at any time t is determined by the values of the six macroeconomic variables at time t. The age dependency ratio, total population have a positive correlation, while the labor force, land area net migration and total unemployment have a negative correlation with worker remittance. This

correlation is shown in the regression model on the next page. A t-statistics for each variable is given in brackets.

$$\text{WRC}_t = 0.0447 \text{ ADR}_t - 0.329 \text{ LF}_t - .819 \text{ LA}_t - 0.608 \text{ NM}_t + 1.37 \text{ POP}_t - 0.0467 \text{ UNE}_t \quad (1)$$

(1.43) (-1.39) (-5.41) (-9.75) (4.70) (-1.47)

Table 4 shows the regression model in more details.

Source	Mean Sum	F-statistic	P-value	R-sq (adjusted)
Regression	4.7296	174.74	0.000	97.3%
Residual Error	0.0271			
Predictor	T-value	P-value	Significant	
ADR	1.43	0.167	yes	
LF	-1.39	0.179	yes	
LA	-5.41	0.000	yes	
NM	-9.75	0.000	yes	
POP	4.70	0.000	yes	
UNE	-1.47	0.156	yes	

Table 4: Regression Model

It is interesting to note that α is zero here, showing that the six variables above predict without the inclusion of any constants. This suggests that if all these variables were zero, remittances would also be zero. This is logical since after the standardization of all macroeconomic variables used, the mean is expected to be zero. Hence, the lack of a constant in the regression equation above.

With a one unit increase in the age dependency ratio and assuming that all other variables remain constant, worker remittance will increase by 0.0447 units. Similarly, if population were to grow by one unit and all other variables were to remain constant, worker remittance will increase by 1.37 units. A 20% significance level was used as a cut-off point in this study. While 0.2 is generally quite large for a p-value, due to the exploratory nature of this study, it was assumed that predicting remittances accurately 80% of the time is acceptable and desirable. Each of the six variables above is significant with a p-value of 0.167, 0.179, 0.0, 0.0, 0.0 and 1.156 respectively. The overall p-value for the study is 0.00, with an F statistic of 174.74 and a residual error of 0.0271. This p-value and F statistic show that the model can be used for

predictive purposes because it is likely that it will be forecasting remittances accurately with given changes in the macroeconomic variables. The adjusted coefficient of determination is a staggering 97.3% showing the high accuracy of the overall model.

The age dependency data for the Dominican Republic and El Salvador have large standardized residuals while the age dependency ratio was observed to give Brazil, Haiti and Mexico a large influence in the model. According to Buch and Kuckulenz (2004), macroeconomic determinants have no strong consensus in the literature. One of the variables that this model excluded, due to insignificance, is GDP. In 2004, Buch and Kuckulenz also noted that GDP per capita is often found to have an insignificant or slightly positive impact on worker remittance. Based on the general case of the majority of migrants, money is being remitted to poor people. These people's needs are unlikely to be related in any way to the GDP or the GDP per capita. So, the exclusion of GDP as a determinant of worker remittances is not a surprise.

Buch and Kuckulenz (2004) also mentioned that there is no clear-cut impact of inflation on remittances in the literature. Therefore, the exclusion of inflation based on the stepwise regression analyses conducted is also no surprise and correlates perfectly with the rest of the literature on remittances and inflation. Previous studies have found that, contrary to expectations, age dependency ratio and worker remittance correlate negatively. In this paper, it was found that the age dependency ratio does correlate positively with worker remittance for Latin American and Caribbean countries from 2002 through 2007. It is possible that this new positive relationship is due to the fact that prospective migrants are more comfortable leaving dependents at home and going abroad to become better able to provide for them.

This model considers the macroeconomic determinants that are likely to affect worker remittance the most. Future studies could expand on this model to include social and psychological factors. These inclusions would sharpen predictions of worker remittances with given changes in all variables. The six macroeconomic variables that have been found to be significant predictors of remittances at the 20% level of significance are: the age dependency ratio, land area, labor force, net migration, population and unemployment. The overall model has an F-statistic of 174.74,

with a corresponding p-value of 0.000 (very significant) and a very high adjusted coefficient of determination of 97.3%.

TREND ANALYSIS

In this section, a new set of data consisting of the level of remittances over 30 years, ranging from 1979 to 2008, for the combined Latin American and Caribbean region has been collected (See Appendix D). The goal is to determine whether future remittances are more closely predicted using macroeconomic variables (as was evaluated in the previous section) or by past remittance trends (as will be investigated in this section). The data collected will be used as a time series (defined as a set of observations on a variable measured at successive points in time or over successive periods of time) and will help with the forecasting the level of worker remittances, given past trends.

To arrive at better results, the four usual components of time series were closely examined: the trend, the cyclical, the seasonal and the irregular. The weighted moving average method was used to smooth out the random fluctuations caused by any existing irregular components within the time series. The goal is to find an estimate for the trend component, which would help make predictions possible. The moving averages suggested that there are no irregular components in these data. Moving averages have been calculated in groups of three years, and a line graph was created as shown in Figure 1.

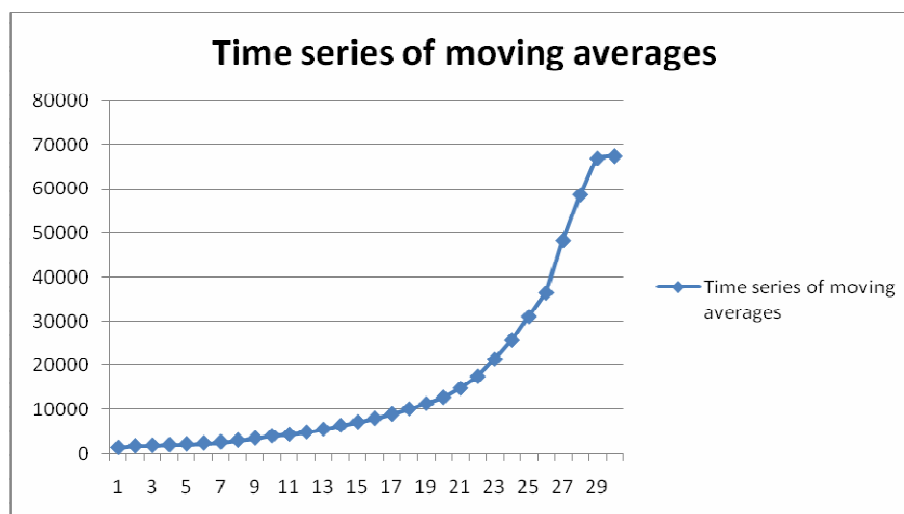


Figure 1: Time Series of Moving Averages

Figure 1 shows that remittances have been increasing over the thirty-year period, between 1979 and 2008—sometimes at a faster rate, and at other times, a slower rate. Then, a careful examination of seasonal indices was conducted. These data do not appear to have a seasonal component.

The new time series regression model format will be one of the following:

$$\begin{aligned}
 \text{Remittances}_t = \text{WRC}_t &= \beta_0 + \beta_1 t \dots \dots \dots \text{Linear Model} \\
 \text{Remittances}_t = \text{WRC}_t &= \beta_0 + \beta_1 t + \beta_2 t^2 \dots \dots \dots \text{Quadratic Model} \\
 \text{Remittances}_t = \text{WRC}_t &= \beta_0 * \beta_1^t \dots \dots \dots \text{Exponential Model} \quad (2)
 \end{aligned}$$

WRC_t is the trend value for the level of remittances to Latin American and Caribbean countries in period t. β_0 is the intercept of the trend line and β_1 is the slope of the trend line. Among all the models run, the exponential model seems to provide the most accurate fit for the data as shown by figure 2.

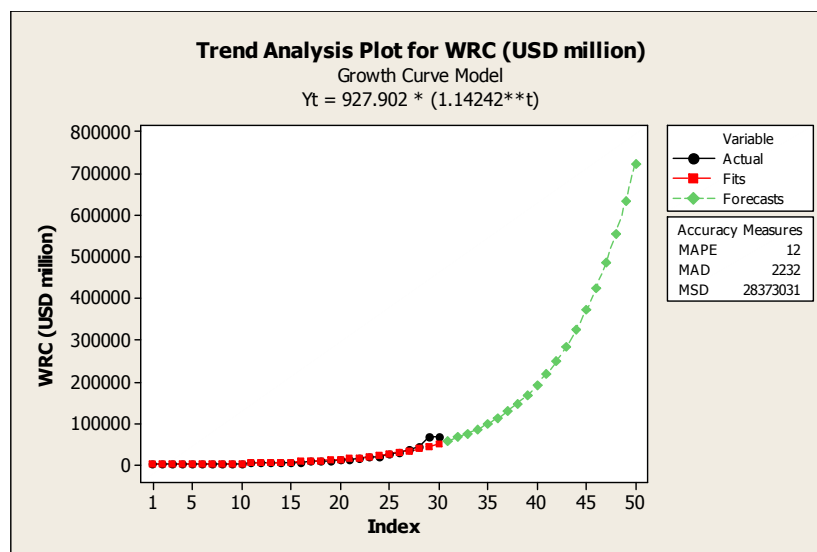


Figure 2: Trend Analysis Plot for Worker Remittances

Table 5 shows the trend analysis and a ten-year projection for worker remittances. Based on past trends and despite the apparent leveling off effect of the last two years, it can be predicted that remittances will continue to increase at a constant rate of about 14.24% (correct to two decimal places). According to the past trends, the leveling off effect is merely a short term irregular component and is not likely to persist. Therefore, it can be concluded that remittances will continue to increase exponentially.

Fitted Trend Equation	
$WRC_t = 927.902 \wedge (1.14242^t)$	
Period	Forecast
31	57564
32	65763
33	75129
34	85829
35	98054
36	112019
37	127973
38	146200
39	167022
40	190810

Table 5: Trend Analysis and 10-year Projection for Worker Remittances (USD million)

It is however unrealistic to assume that remittances will increase indefinitely. When the macroeconomic factors, that determine the level of remittances received, change, it is likely that we will see a change in the long term trend of worker remittances, probably a slowing down of the rate of increase in the level of remittances received. This is based on the assumption that, as more and more money is received in the home country, more people will be better off and will have standards of living somewhat comparable to those in the nations from whence the remittances originate.

ANALYSIS AND COMPARISON OF MODELS

The first regression model forecasts remittances based on given changes in some macroeconomic variables. The time series model forecasts remittances based on past data trends. Now, a comparative analysis will be conducted to find out which model predicts worker remittances the best. Considering the previously-discussed cut-off points and residual errors, it is clear that the exponential time series model is the more accurate predictor of remittances. Figure 2, which shows exponential past and future trend of worker remittances, is a good graphical representation of how close the plotted data points are to the recorded data points and therefore, gives a good insight into the accuracy of the predictions. Based on these figures, worker remittances are likely to continue on this exponentially increasing path in the near future. How long worker remittances will increase before reaching saturation (if there is such a point) is unknown. Since this information falls outside of the scope of this paper, the topic has not been investigated further. Future studies may find it interesting to investigate this particular question.

POLICY IMPLICATIONS AND CONCLUSION

Based on the above findings, this paper will help scholars to better understand what drives worker remittances in Latin American and Caribbean countries and will provide insight into unofficial capital flows from developed to developing countries in the global economy, now and in the next ten years. Instead of ignoring these capital flows, governments of both remittance-supplying and remittance-receiving countries should pay more attention to this form of unofficial capital flow. Making the remittance process easier for migrants may be a first step in

understanding the full impact of these transactions on domestic economies as well as on the global economy. Also, governments in developing countries may find it useful to put these flows to work in the economy by providing more financial engineering options to receiving families. This could lead to a multiplier effect of money taking place and this effect may provide consistent stimulus to the receiving economy. A better understanding of remittances and “unstigmatizing” the act of sending remittances home to family members will support host countries in terms of implementing economic measures to improve the performance of their economies.

In this study, we have found that net national savings, age dependency ratio, birth rate, foreign direct investment, gross domestic product, labor force, land area and population vary positively with worker remittances, while external debt, inflation, net migration and unemployment have been observed to vary negatively with worker remittances. Out of the 30 countries studied, 17 have higher values for remittance per capita compared to foreign direct investment per capita. The 30 countries have remittance per capita ranging from USD 5.23 to USD 1393.51.

The analysis of various regression models has shown that the macroeconomic variables which predict worker remittances most accurately are net migration, population, land area, labor force, age dependency ratio and unemployment. The model based on these variables was significant for predictive purposes since the model’s F ratio had a p-value of 0.000. The p-values of the individual variables were also significant. The coefficient of determination for the model, R-sq, was remarkably high at 97.9%.

Moreover, since remittances have historically grown exponentially, it has been determined that remittances are likely to continue to increase in this exponential fashion over the next ten years. It is forecasted that remittances to Latin American and Caribbean countries will reach USD 190,810 million in 2018. The growing amount of remittances flowing from developed to developing countries needs to be properly accounted and budgeted for, to avoid economic loss in the future. The better remittances are understood and the greater the accuracy of official remittance figures, the better policies will be at regulating the situation.

APPENDICES

Appendix A – The Thirty Latin American and Caribbean Countries Studied

Argentina	Ecuador	Panama
The Bahamas	El Salvador	Paraguay
Barbados	Grenada	Peru
Belize	Guatemala	St. Kitts and Nevis
Bolivia	Guyana	St. Lucia
Brazil	Haiti	St. Vincent and the Grenadines
Chile	Honduras	Suriname
Columbia	Jamaica	Trinidad and Tobago
Costa Rica	Mexico	Uruguay
Dominican Republic	Nicaragua	Venezuela

Appendix B - Abbreviation for the Variables Used In the Regression Analyses

Number	Variables	Variable Abbreviation
1	Adjusted savings: net national savings (% of GNI)	NNS
2	Age dependency ratio (dependents to working-age population)	ADR
3	Birth rate, crude (per 1,000 people)	BR
4	External debt, total (% of GNI)	ED
5	Foreign direct investment, net (BoP, current UNITED STATES\$)	FDI
6	GDP (constant LCU)	GDP
7	Inflation, consumer prices (annual %)	INF
8	Labor force, total	LF
9	Land area (sq. km)	LA
10	Net migration	NM
11	Population, total	POP
12	Unemployment, total (% of total labor force)	UNE
13	Workers' remittances and compensation of employees, received (UNITED STATES\$)	WRC*
14	GDP per capita (constant LCU)	GDPC
15	GDP per capita growth (annual %)	GDPCG

* This variable is the dependent variable in this study.

Macroeconomic Determinants of Remittances for Latin American and Caribbean Countries

Senior Capstone Project for Sathivane Veeramoothoo

Appendix C - Graphical Summaries of the 12 Macroeconomic Variables Studied

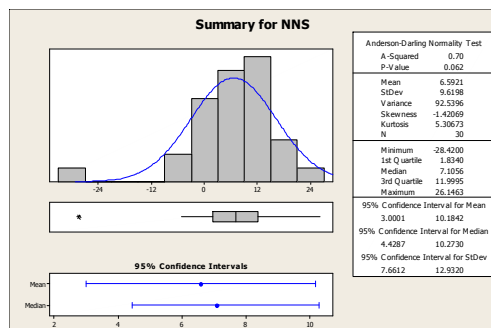


Figure A

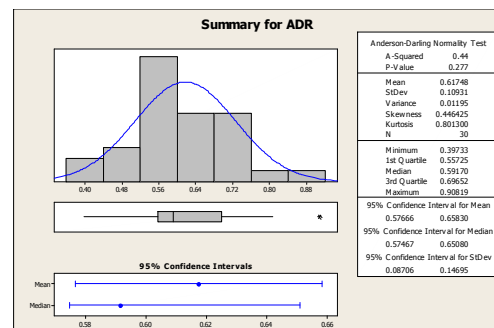


Figure B

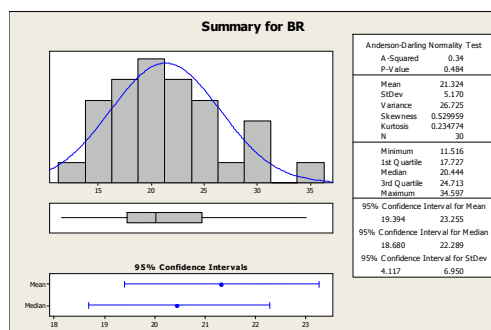


Figure C

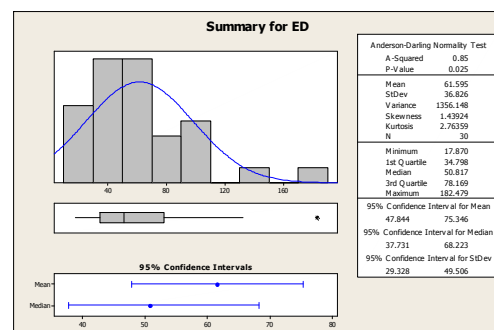


Figure D

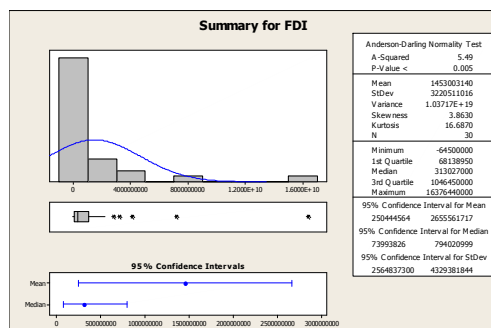


Figure E

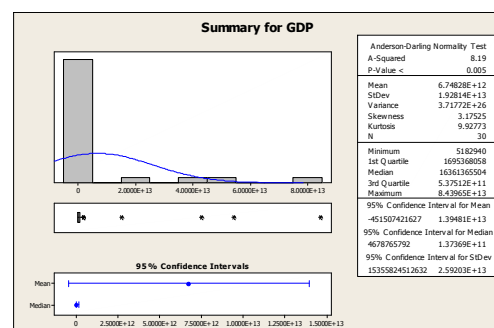


Figure F

Macroeconomic Determinants of Remittances for Latin American and Caribbean Countries

Senior Capstone Project for Sathivane Veeramoothoo

Appendix C - Graphical Summaries of the 12 Macroeconomic Variables Studied (Continued)

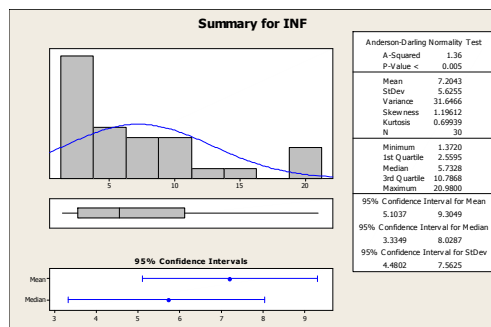


Figure G

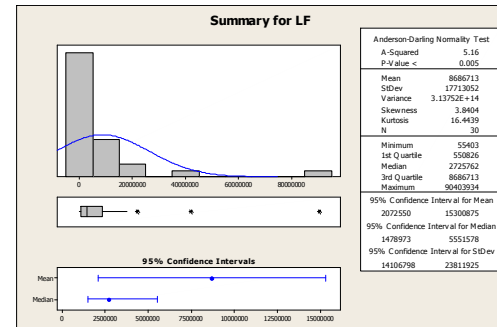


Figure H

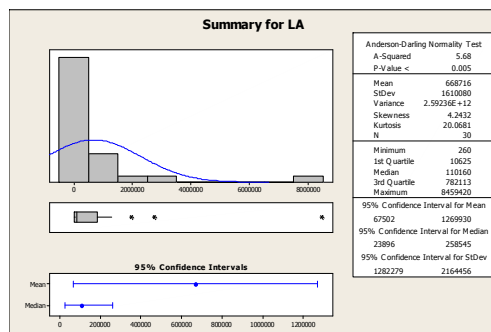


Figure I

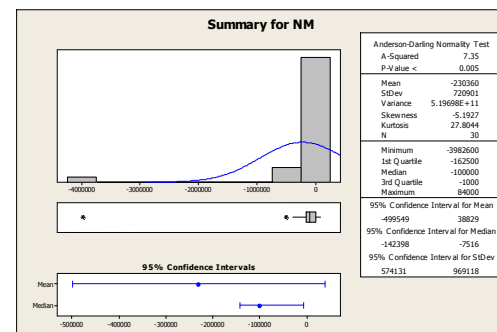


Figure J

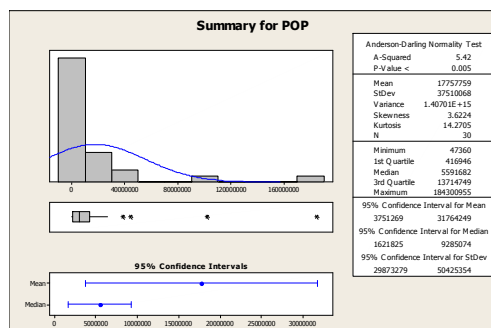


Figure K

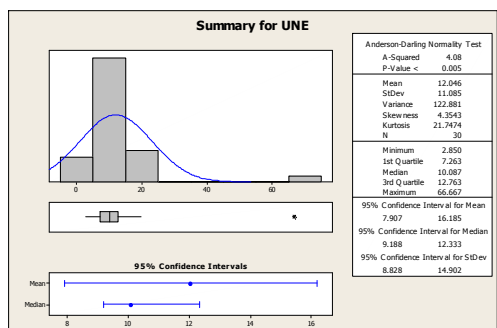


Figure L

Appendix D - Annual WRC from 1979 through 2008

Year	Time Period	Weights	WRC (USD million)
1979	1	1 / 465	813
1980	2	2 / 465	1601
1981	3	3 / 465	1832
1982	4	4 / 465	1859
1983	5	5 / 465	1993
1984	6	6 / 465	2225
1985	7	7 / 465	2414
1986	8	8 / 465	2598
1987	9	9 / 465	2969
1988	10	10 / 465	3566
1989	11	11 / 465	4063
1990	12	12 / 465	4533
1991	13	13 / 465	4581
1992	14	14 / 465	5600
1993	15	15 / 465	6413
1994	16	16 / 465	7134
1995	17	17 / 465	7969
1996	18	18 / 465	8879
1997	19	19 / 465	9993
1998	20	20 / 465	11609
1999	21	21 / 465	12385
2000	22	22 / 465	14310
2001	23	23 / 465	17790
2002	24	24 / 465	20438
2003	25	25 / 465	25988
2004	26	26 / 465	30864
2005	27	27 / 465	36312
2006	28	28 / 465	42127
2007	29	29 / 465	66500
2008	30	30 / 465	67500

* The remittance figure for 2008 is an estimate from the World Bank

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