Modeling Personal Transfers from the United States

By Rachel Soloveichik and Anne Flatness

Abstract

BEA currently estimates remittances using a model that combines detailed demographic data on the United States' immigrant population from the American Community Survey (ACS) with propensities to remit derived from BEA research and academic studies. In this paper, we test BEA's current model by comparing predicted remittances from BEA's model to remittances reported in the Current Population Survey (CPS). Based on the CPS data, we look at several possible modifications to BEA's model. First, we use different demographic characteristics, including married (spouse absent) and the presence of roommates, to predict remittance behavior. Second, we reallocate countries within the geographic remitting tiers. We show that the new demographic categories and geographic tiers do a much better job of predicting remittances in the CPS data.

The new model predicts an 8% drop in remittances from 2008 to 2010 – twice as large as the drop in remittances predicted by BEA's current model. The larger drop is caused by a decrease in the married (spouse absent) population from 2008 to 2010. In the new model, these immigrants remit much more than average, so a small drop in their population has a big effect on remittances. We believe that the decrease in married (spouse absent) is caused by immigrants returning to their country of birth to wait out the recession. Married (spouse absent) immigrants have fewer ties to the United States, so they are more likely to return to their country of birth temporarily.

We test our new model against two alternative datasets: the New Immigrant Survey (NIS) and the World Bank's remittance statistics. We find that the demographic characteristics have similar effects in the NIS as they do in the CPS. We also find that the new model matches the World Bank statistics better than BEA's current model. Based on all these results, we show that the changes we suggest provide a promising path for BEA to improve its model to predict remittances, which are a component of the U.S. international transactions accounts.

Introduction

Personal transfers in the U.S. international transactions accounts consist of all current transfers in cash or in kind made or received by resident households to or from nonresident households. [1] These transfers, which are also referred to as "remittances," are a component of private remittances and other transfers in the standard presentation of the U.S. international transactions accounts (ITAs).[2] Most personal transfers from the United States are sent by immigrants to family members in their country of birth.

Personal transfers are one of the hardest items to calculate in the ITAs. Virtually all personal transfers are small and fall below financial reporting thresholds. In addition, many transactions are in cash or sent through a variety of informal channels where there is no paper trail. Around the world, countries use a variety of methods to estimate transfers received and transfers sent. Adding up data from each country, we see that total transfers received are larger than total transfers sent. This suggests that some countries are underestimating transfers sent or overestimating transfers received.

Because it is difficult to collect data directly, BEA uses an economic model to calculate personal transfers based on population and income data from the American Community Survey (ACS). BEA's current model was introduced in 2005. That model classifies immigrants into 32 separate categories depending on their country of birth, family structure and length of time in the United States. For each category, BEA estimates the probability an immigrant will remit and the fraction of income sent if they do remit. The categories, probabilities and remittance rates are based on survey data,[3] academic studies and expert opinion. In the years since the BEA's current model was constructed, new survey

---

[1] *Balance of Payments and International Investment Position Manual,* 6th ed. (Washington, DC: International Monetary Fund, 2009). The Manual defines four increasingly broad measures of remittances starting with *personal transfers*, which is the narrowest and perhaps the most commonly understood measure; next is *personal remittances*, which includes personal transfers plus compensation of employees (income of non-residents working in the United States for less than one year) less their expenses in the United States including taxes, plus capital transfers between households; next is *total remittances*, which includes personal remittances plus social benefits payable under social security and pension funds; and finally *total remittances and transfers to nonprofit institutions serving households,* including donations in cash or kind, from government or the private sector to charitable organizations in another economy.

[2] For annual and quarterly data on "Private Remittances and Other Transfers" see Table 1, line 38 at http://www.bea.gov/iTable/index_ita.cfm

[3] The main survey used is the Legalized Population Survey, which tracked recently legalized immigrants in the late 1980's and early 1990's.

data on remittances has become available, most notably from the Current Population Survey (CPS). Using data from the CPS, this paper suggests changes to BEA's current model to better predict remittance behavior for 2008 forward.

We believe that the CPS data underestimates the aggregate amount of remittances sent in 2008. A few reasons for that underestimate will be discussed in section 1. Despite the underestimated levels, the CPS data still provide useful information about demographic factors affecting remittances. We will use those demographic factors to construct a new model of remittance behavior. We then apply that model to data from the ACS and calculate aggregate remittances from 2008 forward.

We calibrate our remittance model against BEA's current total for 2008. Accordingly, the level of remittances for 2008 does not change with the new model. However, growth rates for 2009 and 2010 change dramatically. BEA's current model reports a 3% drop in remittances in 2009 and a 1% decrease in 2010; the new model reports a 6% drop in 2009 and a 1% drop in 2010. The difference is caused by an 8% drop in the married (spouse absent) population from 2008 to 2010. BEA's current model assumes that married (spouse absent) immigrants remit at the same rate as other immigrants. In contrast, our new model assumes that married (spouse absent) immigrants remit three times as much as similar immigrants with a different marital status.

The paper is divided into five sections. Section 1 describes the primary survey data and BEA's existing model. Section 2 uses the new CPS data to test BEA's existing model and Section 3 suggests changes to improve the model's fit. We will show that the new model better fits the new survey data. Section 4 compares the revised models created in section 3 with data from another recent survey, the New Immigrant Survey. Section 5 compares the revised models created in section 3 with data from the World Bank Remittance statistics. Finally, Appendix A reports the population in each demographic category, Appendix B shows aggregate remittances for 2001-2010 under the current and alternative models and Appendix C shows the regressions discussed in the paper.

1. Current Population Survey Data and BEA's Existing Model

The primary survey data used in this paper is the Current Population Survey. In August of 2008, the CPS added a one-time module on remittances to the monthly survey. This module asked households three questions on money sent abroad:

a) Whether they'd given or sent money to relatives or friends abroad in the past year.
b) How many times they'd given or sent money abroad in the past year.
c) How much money they'd given or sent abroad in the past year.

In this study, we restrict the sample to households with at least one immigrant adult who answered question c.[4] Most models of remittance behavior consider country of birth to be a very important predictor of remittances - accordingly, it would be difficult to include households with only native-born individuals in our regressions.[5] Households without immigrants account for less than 10% of the remittances in the CPS data, so this restriction does not significantly impact the results.[6] Even if personal remittances are very low, native-born individuals may still send charitable donations, invest abroad or visit. These international transactions are tracked through other means and are not covered by this paper.

BEA's current model uses four main variables to calculate remittances by the foreign-born population to friends and family in their countries of origin. The four variables are:

- The foreign-born population
- The percentage of the foreign-born population that remits
- The income of the foreign-born population
- The percentage of income that is remitted by the foreign-born population that remits

[4] We treat persons from Puerto Rico, as well as Guam and other US territories, as non-immigrants. Under international guidelines, these areas are considered part of the United States' economic territory.
Both the current and modified remittance models are based on the American Community Survey, which tracks residents of the 50 U.S. states and D.C. The Puerto Rican Community Survey tracks similar demographic data for Puerto Rico. Aggregate remittances would increase by 0.23% if we included imputed remittances from immigrants in Puerto Rico in our totals. Country breakdowns for immigrants Puerto Rico are available upon request. We are also studying imputations for Guam, American Samoa and other US territories.
[5] BEA's current model and the suggested model both assume that remittances are sent to an immigrant's birth country. We cannot easily assign remittances sent by native-born citizens.
[6] BEA estimates the outward remittances of the native-born population to be a fixed portion of remittances received by U.S. residents.

Data on the foreign-born population and the income of the foreign-born population come from the U.S. Census Bureau's annual American Community Survey (ACS). The percentage of the foreign-born population that remits and the percentage of income remitted are BEA estimates based on various studies. The percentage of the population that remits and the percentage of income remitted vary according to demographic characteristics (gender, length of stay in the United States, country of origin, presence of children). For example:

- The longer someone is in the United States, the less likely they are to remit
- The presence of children decreases both the likelihood of remitting and the percentage of income remitted
- Immigrants from geographically close, low-income countries remit a larger percentage of their income than those from geographically far, high-income countries.

To calculate personal transfers, BEA first multiplies the foreign-born population by the percentage of the foreign-born population that remits in order to obtain the population of remitters. BEA then multiplies the average per-capita income of the foreign-born population by the percentage of income remitted by those who remit in order to obtain per-capita remittances. This calculation also takes into account characteristics like demographics and country of origin. Finally, BEA multiplies per-capita remittances by the population of remitters to obtain total personal transfers.

We can't compare the CPS survey data with BEA's estimates directly. Instead, the primary goal of this paper is to identify the demographic variables that influence remittances. For that analysis, the precise coefficients are less important than general comparisons. For the BEA estimate, we will scale the CPS remittance data so that aggregate remittances for 2008 match BEA's pre-existing aggregates for 2008. However, the new model will change aggregate remittances for 2009 forward. We will also use the new model to predict country-level remittances back to 2005. This country-level detail is not reported directly, but is used in other parts of the ITAs. Appendix B shows aggregate remittances by year for each of the models discussed in section 3.

The data collected on the CPS do not completely conform to the statistical definition of remittances in the Balance of Payments manual; therefore, estimates of remittances based on CPS data will not precisely conform to BEA's current estimates. In the balance of payments statistics, short-term visitors are considered residents of their country of birth. (Because they are not residents of the United States, all income earned by those workers is part of the category "income payments - compensation of

employees" (ITA Table 1, line 34); the portion of this income that is spent on goods and services in the United States is recorded as an export of services (table 1, line 10). The CPS does not distinguish between immigrants who plan to stay in the United States for at least one year and short-term visitors.

Furthermore, the CPS tracks a slightly different sample population than the data source to which BEA's current model is applied, the ACS. Unlike the ACS, the CPS is only conducted in English and Spanish. Accordingly, it may miss some immigrants who do not speak either language. In addition, the CPS was administered in August of 2008 – so it might get a different population if summer residents are not representative of year-round residents (the ACS is mailed in April, Census follows up with non-responders in the following months). In order to get a nationally representative sample, the CPS has produced household weights to adjust the raw data. We will use those weights in our regressions. Even with the weights, the CPS has a lower number of immigrants who are married (spouse absent) and living with roommates than the ACS.[7] The difference is similar when we exclude immigrants who might not speak English or Spanish or exclude households that are not in the CPS sample. Later in this paper we will show that immigrants who are married (spouse absent) and living with roommates remit much more than average. Accordingly, it seems likely that the CPS survey undersampled the highest remitting immigrants.

BEA's current model uses individual demographic data from the ACS. In contrast, the CPS survey collects data by household. In order to make them comparable, we use demographics, country of origin and time in the United States to predict individual remittances for each adult in the CPS sample. We then aggregate those individual remittances by household to predict total household remittances. Finally, we regress reported household remittances on predicted household remittances.[8] This procedure might incorrectly estimate individual remittances if one family member influences the others.[9]

BEA's current model uses individual income, family structure and time in the United States from the ACS to calculate remittances. Therefore, we need data on individual income, family structure and

[7] The averages are 5.3% married (spouse absent) in the ACS vs. 3.2% in the CPS and 7.3% with roommates in the ACS vs. 4.9% in the CPS. Compared to the ACS, the CPS has slightly fewer immigrants who entered before 16 and slightly fewer individuals born in Puerto Rico, Guam or US citizens born abroad. These individuals remit less than average.

[8] Each household is a single observation, so it might seem that immigrants in larger households have a lower representation. However, the regressions give a larger weight to bigger households.

[9] BEA is primarily interested in aggregate remittances by country. As long as household members all come from the same country, these errors cancel out.

time in the United States for each immigrant in the CPS to predict remittances using BEA's current model. The CPS contains similar data on family structure and time in the United States. However, the CPS does not ask for individual income. Instead, it asks for family income. Furthermore, about 15% of the households refuse to answer the family income question.[10] We use age and sex to impute individual income shares based on average earnings for that age and sex. For example, a household might consist of a 50-year-old woman and her 18-year-old son. We assume that the 50-year-old woman earns much more income than her son. We then multiply that income share by the family income to get individual incomes. If households do not report an income, we use age and sex to impute incomes. Results were similar if we use the ACS data to impute individual income.[11]

The remittance numbers reported in the CPS data are not normally distributed. Most immigrant households give little or nothing and a few households give very large amounts. H The few households that give large amounts account for a significant fraction of the total remittances. For example, mean remittances drop by 60% if we exclude the 175 households that sent $5,000 or more last year. The high remitting households have an enormous influence on the coefficients in the OLS regression. Accordingly, the coefficients are very sensitive to individual observations. However, the qualitative results do not change if we use different regression techniques.

In this paper, we use OLS regressions to test our remittance models. The OLS regression will give an unbiased estimate of total remittances, but it may have wider standard errors on the estimated coefficients than alternative econometric techniques. We welcome suggestions on the best analysis techniques to use.[12]

2. Testing BEA's Current Model

[10] The income is coded by category, so outliers are top-coded and do not affect results significantly.
[11] We imputed income by matching immigrants in the CPS with immigrants in the ACS who had the same family structure, time in the United States and geographical tier. Alternative imputations also produced similar results.
[12] Like all OLS regressions, our regressions only give correlation not causation. We cannot predict whether a policy that increased demographic factors associated with high remittances would actually change remittances. Furthermore, the coefficients reported in this paper may change over time due to immigration law changes, economic cycles or other factors.

To start, we test BEA's current model against the CPS data by regressing reported remittances from the CPS against predicted remittances from BEA's current model. We then test the current model's specific assumptions about the influence of demographic characteristics on remitting behavior against the CPS data. All of the regressions reported below examine one variable at a time. In order to keep the model simple, we assume that BEA's current model is correct for the unexamined variables. This approach is known as a partial regression. Appendix C summarizes the regressions in this section in a short table.

a) Testing BEA's current remittance model.

We tested BEA's model by regressing actual remittances on predicted remittances:

$$\text{Reported Remittances} = \alpha * \text{Predicted Remittances} + \varepsilon$$

We found that BEA's remittances are positively correlated with reported remittances, with an R^2 of 6.32%. The low R^2 is partially caused by the fact that remittances are not normally distributed. Even if the OLS gets average remittances right, it will have difficulty predicting the precise households which send very large remittances. The R^2 increases to 18.33% if we top-code remittances at $1,000 per year. Despite the problem of very high remittances, BEA's current model is statistically significant at the 0.1% level. The CPS is a one-time sample, so we cannot test whether BEA's current model predicts changes in remittances over time. We can only test whether households with high predicted remittances report high remittances on the CPS survey.

b) Immigrants who have been in the United States longer send lower remittances.

BEA's current model uses time in the United States to predict remittances. The assumption is that immigrants gradually shift focus from their birth country to the United States. The shift in focus is associated with lower remittances over time. The current model has four separate categories of years in the United States: "0 to 5", "6 to 15", "16 to 30" and "30 plus." [13] Holding family structure fixed,

[13] The cut-off at 16 years is consistent with young children being a major factor in remittance behavior. Once an immigrant has been in the US for 16 years, their children are probably grown-up and need less support.

immigrants remit 16% less when they are in time category "6 to 15," 31% less when they are in time category "16 to 30" and 47% less when they are in time category "30 plus."[14]

We measure the impact of time in the United States by calculating remittances for each immigrant **relative** to the remittances he or she would send if they had arrived in the United States in the past five years.[15] The predicted remittances for new immigrants depend on income, country of birth and the presence of children.[16] We call that variable "predicted remittances if new" (PredRemitNew). We then create four separate dummy variables for each time code and estimate the equation:

$$\text{Actual Remittances} = \alpha_1 * \text{PredRemitNew}_{0 \text{ to } 5} + \alpha_2 * \text{PredRemitNew}_{6 \text{ to } 15}$$

$$+ \alpha_3 * \text{PredRemitNew}_{16 \text{ to } 30} + \alpha_4 * \text{PredRemitNew}_{30 \text{ plus}} + \varepsilon$$

If BEA's current model is correct, then $\alpha_1 > \alpha_2 > \alpha_3 > \alpha_4$. In other words, immigrants send a lower share of income as they spend more time in the United States. In the CPS data, we estimate that α_1=0.55, α_2=0.35, α_3=0.13 and α_4=0.13. These results are reasonably consistent with BEA's current model. However, the similar coefficients for α_3 and α_4 suggest that immigrants might not change behavior much once they have been in the United States at least sixteen years.

c) Immigrants with children in the household send lower remittances.

BEA's current model assumes that immigrants send less money if they have children in their household.[17] Holding time in the United States fixed, immigrants with children are predicted to remit 56% less. The rationale for this assumption is that having children in the U.S. household changes the

[14] These are averages. The exact drop-off in remittance rates depends on the country of birth and children.
[15] We estimate relative remittances rather than absolute remittances because it needs fewer degrees of freedom.
[16] We could estimate separate regressions by country of birth and presence of children but that would be harder to analyze. It is possible that time in the United States has different effects on different geographic tiers.
[17] For women, we count them as having children if the woman is the head of household or spouse of the head. Women who are living in relatives' households or with roommates are not considered mothers. Children includes stepchildren and adopted children.
For men, we count them as having children **only if** they are married and their wife has children. About 9% of men with children are missed because they are separated, divorced, widowed or never-married. Furthermore, the matching procedure counts about 2% of childless men as having children because they are living in a household with another married couple that does have children.
BEA's current model uses complex rules to determine the presence of children. We have not been able to replicate those rules precisely, so we cannot match the CPS data to BEA's exact predictions. However, our predictions are very close to BEA's current model.

focus of the household to the United States and is an accepted reason for migrants to remit less. In particular, parents with young children in the U.S. household send less money than other immigrants.

We test this part of BEA's model by calculating remittances for each immigrant if they have no children in the household. The predicted remittances depend on income, country of birth and time in the United States. We call that variable "predicted remittance without children" (PredRemitNoChildren). We then create two dummy variables for no children/has children and estimate the equation:

$$\text{Actual Remittances} = \beta_1 * \text{PredRemitNoChildren}_{\text{No Children}} + \beta_2 * \text{PredRemitNoChildren}_{\text{With Children}} + \varepsilon$$

If BEA's current model is correct, then $\beta_1 > \beta_2$. In other words, immigrants without children remit more than immigrants with children. In the CPS data, we estimate that β_1=0.31 and β_2=0.18. The difference between immigrants with children and those without children is large and statistically significant. However, the CPS shows only a 42% drop in remittances, slightly less than the 56% drop predicted by BEA's current model.

d) Remittance rates depend on the immigrant's country of birth.

BEA's current model has four separate geographic tiers: low, middle, high and highest. The low tier contains wealthy countries like Canada, Germany and the United Kingdom. The middle tier contains middle-income countries like Poland, Thailand and Argentina. The high tier contains low-income countries around the world. The highest tier contains Latin American countries like Mexico, Haiti and Honduras, which are low-income and geographically close to the United States. These tiers are based on the notion that immigrants from poorer countries will send a higher share of their income as remittances because there is a greater need for "supportive" remittances to relatives in their country of birth. The precise difference between tiers depends on time in the United States and family structure. However, we can use the CPS survey data to get a general comparison of remittance rates by tier. Relative to the low category, immigrants from the middle category are predicted to remit a share of income 3.4 times higher, immigrants from the high category 7.1 times higher and immigrants from the highest category 12.4 times as higher.[18]

[18] This is an average. The exact ratio depends on family structure and time in the US.

We test the BEA's geographic tiers by predicting what remittances for each immigrant would be **if** they were from a country in the low tier. The predicted remittances depend on income, time in the United States and the presence of children. We call that variable "predicted remittance for low countries" (PredRemitLow). We then create four separate dummy variables for each time code and estimate the equation:

$$\text{Actual Remittances} = \gamma_1 * \text{PredRemLow}_{\text{Low tier}} + \gamma_2 * \text{PredRemitLow}_{\text{Middle Tier}}$$

$$+ \gamma_3 * \text{PredRemitLow}_{\text{High Tier}} + \gamma_4 * \text{PredRemitLow}_{\text{Highest Tier}} + \varepsilon$$

If BEA's current model is correct, then $\gamma_1 < \gamma_2 < \gamma_3 < \gamma_4$. In other words, immigrants from the low tier remit less than immigrants from the middle tier, etc. In the CPS data, we estimate that γ_1=0.75, γ_2=2.73, γ_3=2.29 and γ_4=3.75. This result indicates there is little difference in remittance behavior for immigrants in the middle two categories. These results strongly 's current tiers need updating. Perhaps some countries were once poor and have grown quickly. Alternatively, previous immigrants may have come from different demographic groups than the current immigrants.[19] Later in the paper we will suggest new tiers that better match the remittance behavior reported in the CPS.

3. Potential refinement to BEA's model

In this section, we keep the same general framework as the BEA's current model but using different demographic characteristics when calculating the percentage of the population that remits and the percentage of income remitted. We test these modifications by regressing reported household transfers on predicted transfers. In general, we consider models with a higher R^2 to be a better match for the CPS data.[20] In addition, models with fewer categories and easier to explain variables are also preferable. The precise Stata regressions are available upon request.

All of the regressions have the constant term suppressed. This is equivalent to assuming that transfers are a fixed percentage of income. In practice, the constant term is significant and positive in all

[19] It is also possible that the remittance tiers for certain countries were always wrong. We do not have enough data to determine if past models were correct

[20] The adjusted R^2 is one statistical technique to balance additional explanatory value of more variables against added complexity. However, we also prefer simpler models because they are easier to understand and implement in BEA's statistics. Accordingly, we have not tried to maximize adjusted R^2 by adding a large number of variables.

regressions. This could suggest that transfers are non-linear with income, and poor people give a higher fraction of their income. However, it is also consistent with a simple measurement error story. If income is measured with error, then true income is higher than reported income for "low" income people and true income is lower than reported income for "high" income people. In that case, "low" income people send a higher share of reported income even if the actual remittance rate does not change with income. Therefore, we are reluctant to accept a positive constant as evidence for transfers that are non-linear with income. In this paper, we will follow BEA's current model and assume that transfers are a fixed percentage of income. [21]

Preview of Results

Appendix B presents aggregate remittances for BEA's current model and each of the models discussed in this section for 2001 to 2010. The statistics for 2008 are the same for both models because, as discussed previously, the new model is calibrated to equal the 2008 published data. The most striking result of the new model is the 8% decrease in remittances from 2008 to 2010. This decrease is primarily caused by an 8% decrease in the married (spouse absent) population from 2008 to 2010. The most likely explanation is that married (spouse absent) immigrants chose to return to their country of birth and wait out the U.S. recession.

Appendix C presents the OLS regressions and the coefficients for every regression discussed in this paper. Readers can use that Appendix to easily compare the models and datasets. The same data is also provided in the paper with more discussion to give a useful context.

a) Child Immigrants and US Citizens Born Abroad Send No Money to their Country of Birth

About 3% of 'immigrants' are natural born US citizens whose parents lived abroad during their childhood. These US citizens born abroad are concentrated in a few countries like Panama or Germany with big military bases or other jobs for US citizens. Most of these 'immigrants' arrived in the US as children and have few ties to their country of birth. Even if they arrived as adults, they are less likely to

[21] It would be very difficult to incorporate a non-linear remittance rate in BEA's model. Over the past decade, nominal incomes have increased significantly. With a non-linear remittance rate, we would calculate falling average remittance rates. Alternatively, we could assume that non-linear remittance rates depend on real income. In that case, we would need to pick the correct price deflator for nominal income from 2001 to 2010.

have family members abroad who need support. In general, family members of immigrants who are born with US citizenship have US citizenship as well. Because the families are US citizens, the families can move to the US whenever they want. Furthermore, US citizens living in developing countries are typically much richer than average. Accordingly, these immigrants need not send money abroad to support their families.[22] Another 3% of immigrants were born in Puerto Rico or the US territories. These individuals are treated like native-born citizens in our model because the international transactions accounts treat remittances to these areas as domestic transactions.

Not counting US citizens born abroad, about 22% of the immigrants in the CPS survey came to the US before 16.[23] We assume that these child immigrants send zero remittances to their birth country and immigrants who came at 16 or above send the normal amount.[24] The argument for the change is three-fold: 1) Child immigrants are extremely unlikely to have a spouse or children to support in their birth country; 2) Most child immigrants come with their parents and siblings; therefore, they have fewer relatives in their birth country to send remittances to; 3) Some child immigrants were adopted and raised by US parents, these children generally have no connection to their biological family.

We test whether age at immigration and US citizens born abroad have different remittance propensities with the OLS regression:

$$\text{Remittances} = \alpha_1 * \text{Predicted Remittances}_{\text{Adult Immigrant}} + \alpha_2 * \text{Predicted Remittances}_{\text{Child Immigrants}} +$$

$$\alpha_3 * \text{Predicted Remittances}_{\text{US Citizen born abroad}} + \varepsilon$$

The coefficient for child immigrants, $\alpha_2 = 0.094$, less than one quarter of the coefficient for adult immigrants, $\alpha_1 = 0.385$. We can just barely reject the null hypothesis that α_2 is 0, but it is clearly much smaller than the normal remittance rate. The coefficient for citizens born abroad, $\alpha_3 = -.023$ and statistically indistinguishable from 0. Therefore, it seems reasonable to set both coefficients equal to zero. The R^2 for the regression with three variables decreases by only 0.08% (7.00% to 6.92%) when we set α_2 and α_3 equal to 0.

[22] It is possible that parents and siblings of the immigrants may choose to live abroad because they prefer their country of birth. However, the largest beneficiaries are minor children and retired parents. These groups are more willing to move than adults with careers in the country of birth.

[23] We picked 16 because it has the highest R^2. We also tried a cut-off at 12, 14, 18 and 21. The CPS does not measure year of immigration precisely, so the real age could be 15 to 17.

[24] The real transition is likely to be smoother, but an abrupt cut-off is much easier to model.

In an earlier version of this paper, we estimated remittance propensities separately for US citizens and non-citizens. In that paper, we found that non-citizens send a higher share of their income abroad. Once we control for US citizens born abroad, the difference between naturalized citizens and non-citizens becomes smaller. Some of the difference between naturalized citizens and non-citizens may be a true effect. However, it could also be caused by misreporting on surveys and other data errors. Because it is so difficult to get accurate data on naturalization, we will not control for naturalized citizen status when we measure remittances. In contrast, data on US citizens born abroad is likely to be more reliable. Therefore, we do feel comfortable setting remittances equal to 0 for that group.

For most of this paper, we set remittances to child immigrants equal to 0. However, the lower remittances for child immigrants can be explained by family structure, time in the US and country of origin. Later in this section, we will change the remittance model to account for those factors directly. Once we change the model, we find that child immigrants remit only 35% less than similar adult immigrants. Accordingly, we set remittances for child immigrants equal to 0 in models a) –e). In model f), we set remittances for child immigrants the same as similar adult immigrants.

b) Change the family structure categories from Children/No Children to Married (spouse absent)/Other Marital

As discussed in the prior section, BEA's current model assumes that immigrants send less money if they have children in their household. However, the presence of children in the household is a relatively weak predictor of U.S. focus. Many immigrants without children in the household have no children abroad either. They may not have children, have grown children who've moved out or have young children living with an ex-spouse in the U.S. Conversely, some immigrants with children in the household also have children abroad.

In addition to the theoretical problems, 'presence of children' is often a difficult variable to measure. It is straightforward to measure parenthood if the family consists of a single adult or a husband and wife living together. In that case, the presence of children means that the adults are parents.[25] However, many families are more complex. For example, a family might consist of a grandparent, a child and a grandchild. The child is probably the parent of the grandchild. But it is

[25] BEA counts stepchildren and adopted children like biological children.

possible that they are an aunt or an uncle. When the recession began, the number of complex families increased dramatically. Accordingly, the aggregate bias from using 'presence of children' might change over time. Furthermore, BEA's current method of measuring 'presence of own children' introduces its own idiosyncrasies over time.[26]

We use married (spouse absent) rather than presence of children to measure U.S. focus. The CPS and ACS both have six marital status categories: i) Married (Spouse Present); ii) Married (Spouse Absent); iii) Separated; iv) Divorced; v) Widowed and vi) Never Married. It might seem that categories ii) and iii) are virtually the same. In fact, married (spouse absent) refers to married couples with a good relationship who can't live together because they have jobs in different countries, different cities or other outside factors. In contrast, separated refers to married couples with relationship problems who are living apart while they work through the problems or prepare for divorce. Immigrants appear to understand the distinction between the two categories reasonably well – many separated individuals have boyfriends or girlfriends living in their household, but no married (spouse absent) individuals do.[27] We argue that immigrants are likely to provide significant support to a spouse when they are married (spouse absent) – but not when they are separated or divorced. A few of the married (spouse absent) spouses may be living in the US, but it seems reasonable to assume that most immigrants who report married (spouse absent) provide support to their spouse abroad.[28]

We have also experimented with different remittances rates for married (spouse present), separated, divorced, widowed and never married. These regressions often increased the adjusted R^2 – but they made the model too complex to implement easily. Furthermore, many of the regression coefficients were not robust. For simplicity, we focus on the simple split of married (spouse absent) versus all other marital statuses

[26] BEA's variable is based off the ACS variable PAOC. PAOC is positive if there is a never-married child under 18 of the household head. Accordingly, it omits couples with married children and couples who are not the heads of household. BEA's coding methods also classify unmarried men as childless automatically. Furthermore, married men are occasionally classified as fathers if they live in a household with another couple that does have children.

[27] Some immigrants with new romantic partners may report separated even though their spouse in their birth country thinks they are married and planning to re-unite soon.

[28] A small percentage of married (spouse absent) immigrants have children living in the household. This small group has remittance behavior similar to people in the other marital status group. Nevertheless, it is simpler to keep the married (spouse absent) together. The group is small enough it has little effect.

BEA's current model has 32 separate remittance rates based on geographic tier, time in US code and children/no children code (4 * 4 *2).[29] In theory, we could run an OLS regression comparing the relative importance of presence of children and marital status for each of those 32 categories. However, that regression is very sensitive to outliers. As discussed in section 1, a few households account for the majority of total transfers. If one household happens to have a high value for variable n and also gives $10,000 – then the coefficient and standard error for variable n will be unreasonably high.

In order to reduce the importance of outliers, we will estimate only two variables. First, we use the model described in a) to estimate what the remittance rate for each immigrant would be if they didn't have children. This remittance rate depends on country of origin and time in the US, but not family structure. For example, immigrants from low remittance countries who arrived in the past five years are predicted to send 0.75% of their income to their country of birth. Next, we predict remittances with the formula:

Predicted Remittance without Children (aka PredRemitNoChildren) = (Remittance Rate)*(Imputed Income)

Following revision a), we set remittances for child immigrants and US citizens born abroad equal to 0. We then compare the model from b) with the new model by estimating two separate regressions:

$$\text{Remittances} = \alpha_1 * \text{PredRemitNoChildren}_{\text{No Children}} + \alpha_2 * \text{PredRemitNoChildren}_{\text{Has Children}} + \varepsilon$$

$$\text{Remittance} = \beta_1 * \text{PredRemitNoChildren}_{\text{Married (spouse absent)}} + \beta_2 * \text{PredRemitNoChildren}_{\text{Other Marital}} + \varepsilon$$

Consistent with BEA's current model, immigrants without children present remit more. The coefficient for α_1 is 0.370, about 50% larger than the 0.229 coefficient for α_2. However, the regression with α_1 and α_2 has an R^2 of only 7.13%. This is barely better than the 6.80% R^2 if we assume that immigrants with children remit at the same rate as immigrants without children.

However, married (spouse absent) without children is a much more powerful predictor of remittances. The coefficient for β_1 is 1.092, four times as large as the 0.257 coefficient for β_2. The regression also has more explanatory power, with an R^2 of 8.75%. Furthermore, different marital statuses can explain two thirds of the observed difference between households with children and those

[29] A few immigrants do not report the year of immigration. We put them in the 16 to 30 category.

without. In other words, the presence of children is associated with lower remittances partially because immigrants with children are less likely to be married (spouse absent) than immigrants without children.

c) Increase the family structure categories from 2 to 4

BEA's current model has two separate family categories: children vs. no children. In section b), we showed that BEA could increase the model's R^2 by switching to married (spouse absent) and other marital. We extend the results in section b) by adding a new category: living with a roommate vs. no roommates. In combination, there are four possible demographic codes: married (spouse absent) with roommates; married (spouse absent) without roommates; other marital statuses with roommates and other marital statuses without roommates.[30]

In the CPS survey, immigrants living with roommates send more than immigrants living in traditional families or alone. There are several reasons that immigrants living with roommates send more money. The most obvious reason is that roommates are a way to save money. Holding income constant, people sending large amounts of remittances to their country of birth have less money available to spend on housing. Therefore, they must live cheaper. Another reason is that roommates allow more housing flexibility than a standard apartment lease or mortgage payment. Immigrants who visit their country of birth frequently are likely to value that flexibility the most. Those same frequent visitors probably also send more remittances.

Young adults are much more likely to live with roommates than older adults. This is true for college students and non-students. Young adults are more willing to accept roommates because they are much less likely to be married or have children. In addition, young adults move frequently and have lower savings. Therefore, they value the flexibility of roommates more than average. For young adults, the presence of roommates is more likely related to these advantages than a desire to send more remittances. We will handle this issue by only counting adults over 25 in the roommate count. In other words, we assume young adults with roommates have the same remittance propensity as older adults without roommates.

[30] We also investigated using a further breakdown of marital status, as well as a number of other factors including gender, refugee status and the cost of sending remittances, but these factors had limited or no explanatory power when combined with the chosen variables.

To construct roommate codes, we use the relationship codes in the CPS. An individual immigrant is counted as a roommate if the relationship to head of the household is listed as roommate/housemate or roomer/boarder.[31] The relationship codes in the ACS are 1115 and 1241. We do **not** count unmarried romantic partners (code 1114) as roommates because those households have very different dynamics. In the CPS survey, the person filling out the survey is generally listed as the head of the household and his or her roommate is listed as a roommate. But the relationship codes would be reversed if the other person was interviewed. We will count every person as living with a roommate if one or more people over 25 have the relationship code roommate.

We measure the effect of roommates by estimating the regression:

$$\text{Remittances} = \gamma_1 * \text{PredRemit}_{\text{Married (spouse absent), with roommates}} + \gamma_2 * \text{PredRemit}_{\text{Other Marital, with roommates}}$$

$$\gamma_3 * \text{PredRemit}_{\text{Married (spouse absent), no roommates}} + \gamma_4 * \text{PredRemit}_{\text{Other Marital, no roommates}} + \varepsilon$$

We find that the presence of roommates is a very powerful predictor of remittances. The coefficient for γ_1 is 2.042, three times as high as the coefficient for γ_3, 0.652. In other words, married (spouse absent) people remit more if they are living with roommates and less if they are other housing arrangements. The relative effect of roommates on non-married (spouse absent) is similar. The coefficient for γ_2 is 0.830, almost four times as high as the coefficient for γ_4, 0.222. Furthermore, the R^2 increases from 8.75% in the first regression to 11.63% in the second regression. This large increase suggests that household structure is a very powerful predictor of remittances.

[31] In an earlier version of this paper, we split the sample on whether immigrants were living with relatives or non-relatives. We found that immigrants living with non-relatives or alone sent substantially more. However, when we drilled further, we found that immigrants living with distant relatives send the same as immigrants in normal family set-ups. Therefore, we switched to roommates/non-roommates split

Once we control for marital status and the presence of roommates, having children has no impact on remittances at all. Contrary to BEA's current model, the coefficient for having children is slightly positive, 0.008. The positive coefficient is not significantly different from zero, but we can clearly reject the hypothesis that having children in the US has a large negative effect on remittances. This does not mean that children don't influence remittances. However, very few people with children are married (spouse absent) or living with roommates. Therefore, the effect of children is fully captured by our four demographic categories.

d) Reduce the Number of Time Codes from 4 to 3

BEA's current model uses time in the US to predict remittances. Over time, immigrants shift their economic focus from their birth country to the U.S. The current model has four separate time categories: "0 to 5", "6 to 15", "16 to 30" and "30 plus". In this paper, we show that BEA can simplify the model to three categories: "0 to 5", "6 to 15" and "15 plus". The simplified categories were picked to match the CPS data. However, the result is not surprising. Many immigrants send money to their country of birth to support minor children that they could not bring to the U.S. After 15 years, their children are mostly adults and able to support themselves.[32]

We estimate the effect of time in the US with a two-step process. First, we estimate how much each immigrant would send if he or she arrived in the past five years. That variable is predicted remittances if new (PredRemitNew). BEA's current model predicts that immigrants will gradually send less as they spend more time in the US. Second, we create four separate dummy variables for each time code. We then estimate the equation:

$$\text{Remittances} = \alpha_1 * \text{PredRemitNew}_{0 \text{ to } 5} + \alpha_2 * \text{PredRemitNew}_{6 \text{ to } 15}$$

$$\alpha_3 * \text{PredRemitNew}_{16 \text{ to } 30} + \alpha_4 * \text{PredRemitNew}_{30 \text{ plus}} + \varepsilon$$

[32] Parents may also bring their teenage children to the US once they are old enough to stay home by themselves. The cut-off at 15 seems young, but that is only if parents leave right after their children are born. Also, young adults start work sooner in the developing world.

We found that the coefficient for immigrants who arrived 0 to 5 years ago, α_1, is 1.068. The coefficient for immigrants who arrived 6 to 15 years ago, α_2, is 0.920, only slightly smaller.[33] In contrast, the coefficient for immigrants who arrived 16 to 30 years ago, α_3, is 0.475 and the coefficient for immigrants who arrived 30 or more years ago, α_4, is 0.690. We cannot reject the hypothesis that $\alpha_1 = \alpha_2$ or $\alpha_2 = \alpha_4$. The apparent increase in remittance propensities for very long-term immigrants is a little puzzling. We tried controlling for sex, US citizenship, marital status, retirement status and unemployment rate in the year of entry. These variables are sometimes significant, but they never change the result of increasing remittances after 30 years. We found similar results in the New Immigrant Survey. It may be that immigrants plan to return to their country of birth once they retire and are sending money to prepare for retirement. It may also be that as they age, immigrants begin to remit out of savings rather than income. We are reluctant to allow remittance rates to increase when BEA's current model predicts a decrease. Therefore, it makes the most sense to reduce the time categories to three: 0 to 5 years, 6 to 15 years and 16 plus years.

We then estimate the simplified regression with three time codes:

$$\text{Remittances} = \beta_1 * \text{PredRemitNew}_{\text{Time 0 to 5}} + \beta_2 * \text{PredRemitNew}_{\text{Time 6 to 15}} + \beta_2 * \text{PredRemitNew}_{\text{Time 16 plus}}$$

The coefficient for immigrants who arrived in the last 5 years, β_1, is 1.069. The coefficient for immigrants who arrived 6 to 15 years ago, β_2, is 0.918. Finally, the coefficient for immigrants who arrived 16 or more years ago, β_3, is 0.547. These three estimates match BEA's general model of decreasing remittance rates over time.

Because the CPS data is a single cross-section, there is no way to tell if immigrants who arrived in the last 15 years give more because they are recent **or** because immigrants who arrived 1993 to 2008 are different. For example, the housing bubble increased demand for construction workers. These immigrants might send more regardless of how long they've been in the US. Alternatively, the 1986 amnesty for illegal immigrants might have changed the remittance propensity for immigrants who got citizenship.[34] Unfortunately, we can't disentangle the date immigrants arrived in the US with the amount of time they've been in the US from a single year's data. We will follow BEA's current model

[33] These coefficients are different from the ones in 2a) because we are controlling for marital status and the presence of roommates here. In 2a), we controlled for the presence of children.

[34] In theory, the amnesty was restricted to immigrants who'd been in the US since 1982. However, it's not clear how that was monitored or enforced.

and assume that the differences in remittance propensities are all caused by time in the US and will persist going forward.

e) Change some countries from one geographic tier to another

BEA's current model has four separate geographic tiers: low, middle, high and highest. The low tier contains wealthy countries like Canada, Germany and the UK. The middle tier contains middle-income countries like Poland, Thailand and Argentina. The high tier contains low-income countries around the world. The highest tier contains Latin American and Caribbean countries like Mexico, Haiti and Honduras. We showed in Section 2 that these tiers do not match actual remittance behavior in the CPS survey. Immigrants from countries in the low tier give significantly less – but countries in the middle, high and highest tier all give about the same.

In this paper, we use a new classification of countries into geographic tiers. Our classifications are based on two immigration rules and two characteristics of the country of birth: i) whether the country of birth is oversubscribed by applications for legal permanent residence; ii) whether a country of birth has temporary protective status; iii) whether the country of birth is wealthy and iv) Government policy in the country of birth. We will explain why each criteria matters.

i) Oversubscribing

Why does oversubscribing matter? Congress awards legal permanent residence status (green cards) according to a complex formula. First, the total number of green cards available for each category is set by Congress.[35] Second, the total number of green cards available for each country is limited to 7% of the total available. This rule is designed to increase immigrant diversity. In practice, four big countries are limited by the 7% ceiling: Mexico, China, India and the Philippines. Immigrants from those countries face a much longer wait to bring their family members to the U.S. than similar immigrants from smaller countries. Accordingly, immigrants from those countries are more likely to be supporting family members abroad.

[35] A few categories, like spouses of US citizens are not limited.

ii) Temporary Protected Status

Why does temporary protected status matter? The Department of Homeland Security uses this category for legal and illegal immigrants who cannot return to their country of birth because the country is not safe. In 2008, El Salvador, Nicaragua, Honduras, Somalia and Sudan were the only countries with Temporary Protected Status. Since then, Haiti has been added to the list because of the 2010 earthquake. Immigrants in this category are allowed to stay in the US but they are not allowed to bring family members. Unlike most immigration categories, immigrants with temporary protected status are not allowed to sponsor relatives. Therefore immigrants from those countries are more likely to be supporting family members abroad.

iii) Whether the Country of Birth is Wealthy

Most immigrants to the US earn substantially more than their friends and family in their birth country. However, there is not much income difference between the US and wealthy countries like Canada and or the United Kingdom. In addition, wealthy countries have generous social security and welfare programs. Accordingly, very few immigrants from those countries have families who depend on them for living expenses. Based on those factors, BEA's current model assumes that immigrants from those countries only send money for gifts and occasional emergencies. We believe that this assumption is reasonable, so we will keep the current treatment.

Another reason for the low remittances is easy immigration. For a variety of reasons, US immigration law favors people from wealthy countries. Tourists from wealthy countries can generally get a short-term visa without much paperwork. Long-term visas are a little harder to get – but still not too difficult. Accordingly, most immigrants from Western Europe bring their spouses and children with them when they move to the US. Therefore, they have fewer family members to send money abroad to.

In this paper, we will not control for income per capita in the country of birth directly. Instead, we will use the treatment of temporary visitors as a proxy for wealth. For most countries, vacationers or business travelers can't get a short-term visa unless they prove they are not planning to stay long-term. In contrast, tourists from wealthy countries can get a short-term visa without much paperwork. The visa waiver program is very responsive to income changes. For example, Argentina's visa waiver program

was revoked during their financial crisis of 2002. And many Eastern European countries were recently granted visa waivers as they became wealthier.

In this analysis, we divide the countries into three separate categories based on their treatment of temporary visitors. First, there are 26 countries with active visa waivers before 2008.[36] Next, there are 10 countries which were added to the program in from 2008 to 2010 and 12 countries which are scheduled to be added in the near future. The visa waiver program is focused on countries where most visas are already granted without much hassle, so a planned extension is a proxy for easy visits now. Finally, we group the remaining countries together.[37]

iv) Government Policy in the Country of Birth

The World Bank produces a dataset describing government policy around the world for 213 economies.[38] For the convenience of researchers, the World Bank summarizes the hundreds of indicators into six dimensions of governance: 'Voice and Accountability', 'Political Stability and Absence of Violence', 'Government Effectiveness', 'Regulatory Quality', 'Rule of Law' and 'Control of Corruption'. Each of these variables is normed with a mean of 0 and a standard deviation of 1. That data is publicly available at http://info.worldbank.org/governance/wgi/index.asp.

In our paper, we will focus on two of World Bank's aggregate indicators: 'Government Effectiveness' and 'Regulatory Quality'. The first indicator, 'Government Effectiveness' measures the availability and quality of government services such as schools, hospitals and other social welfare programs. The second indicator, 'Regulatory Quality' measures the ability of private individuals to start businesses, hire workers and serve customers. In general, private goods and services are more available and higher quality in countries that score well on the 'Regulatory Quality' index.

We believe that these two indicators are a proxy for the value of remittances to friends and family in the country of birth. Holding everything else fixed, the family left behind is less likely to need money for basic living expenses if government services like schools, hospitals and welfare are freely

[36] Argentina and Uruguay once had visa waivers, but they were revoked during the financial crisis of 2002-2003.
[37] Within that group, countries with higher non-immigrant visa refusal rates have higher remittance rates. However, the relationship is somewhat non-linear. For simplicity, we will not adjust further.
[38] Most of these economies are independent countries, but they split regions like Hong Kong out as well.

available and high quality enough that the family can rely on them when necessary.[39] Holding everything else fixed, the family left behind is more likely to want remittances for additional spending on private goods and services if those goods and services are freely available and high quality. The **difference** between the government services available for free and the private goods and services that can be purchased with remittances is what matters. We combine these indicators into a single summary value:

'Value of Remittances' = 'Regulatory Quality' –'Government Effectiveness'

'Value of Remittances' is not just a proxy for GDP per capita. Wealthy countries typically have high scores on both 'Regulatory Quality' and 'Government Effectiveness', so the net effect of wealth on 'Value of Remittances' is ambiguous. We tried regressing the 'value of remittances' indicator on the other government quality indicators. We found that the indicator decreases when democracy and political stability is stronger. But neither of those indicators has much impact on remittances once we control for the 'value of remittances'. In our regressions, we use the five-year average of the World Bank Indicators for 2005 to 2009. This avoids many of the fluctuations caused by single years.

Because the 'value of remittances' variable is so novel, we ran many robustness checks. First, we tried removing individual countries from our regression:

Average Remittance Rate for Country i[40] = α*'Value of Remittances'$_i + \varepsilon_i$

We found that the regression produces qualitatively similar results when we remove a single big country like Mexico, the Philippines, India, China, El Salvador, Germany, Vietnam, Cuba, Canada or South Korea. The regression even holds if we remove all ten of the biggest immigrant source countries. Furthermore, the regression holds if we restrict the sample to immigrants from the Americas or immigrants from Asia.[41] Finally, we replicated the regression with World Bank statistics on remittances. We found that countries which increased their 'value of remittances' score saw a substantial increase in remittances received. This regression will be discussed in more detail in section 5a). Because of all

[39] Many countries demand bribes for schools, hospitals and other government services. In those countries, the value of remittances is higher because people need money to access what they should have for free. The World Bank has an indicator for 'control of corruption' that we could incorporate in our model. However, corrupt societies typically score very low on the government effectiveness score. So, bribes are implicitly counted already.
[40] This average is after adjusting for demographic factors like married (spouse absent).
[41] However, the regression does not hold for immigrants from Western Europe and other wealthy countries.

these checks, we believe that the result is real. Government policy in the birth country can influence remittances.

v) New Tiers for Countries

We translated those four factors mentioned above into new geographic tiers. First, we put all countries with an active visa waiver program in the 'low' tier. Next, we put all countries with future visa waiver programs in the "middle" tier. Finally, we used a point system to divide the remaining countries. All countries start with three points. A country gets one more point if it is oversubscribed or has temporary protected status. A country loses one point if its 'value of remittances' score is less than India (-.251) and gains one point if its 'value of remittances' score is greater than or equal to Mexico (0.264). Countries with two points are considered 'middle' remitters, three points are considered 'high' remitters and four or more points are considered 'highest' remitters.

The most important countries affected by the new system are India, Cuba, Vietnam and the Philippines. BEA's current model places India in the middle remitting category and the Philippines in the high remitting category. Based on the fact that both countries are oversubscribed and the one point each country gets on the 'value of remittances' score, we re-classify India and the Philippines into the highest category. BEA's current model places Cuba in the highest remitting category and Vietnam in the high category. Based on the fact that Cuba and Vietnam have low 'value of remittances' scores, we place them in the middle remitting category.

We test our model by estimating the equation:

$$\text{Actual Remittances} = \alpha_1 * \text{PredRemit}_{\text{Current geo tiers}} + \alpha_2 * \text{PredRemit}_{\text{New geo tiers}} + \varepsilon$$

If BEA's current tiers contain all the information necessary, then the coefficient for α_1 will be close to 1 and the coefficient for α_2 will be close to 0. In fact, the coefficient for BEA's current tiers, α_1, is .084 and the coefficient for the new geographic tiers, α_2, is 0.790. We cannot reject the null hypothesis that α_1 is equal to 0. The low coefficient for BEA's current tiers does not mean that BEA's current tiers are not informative. Rather, it means that BEA's current tiers contain no more information than the four factors described earlier. The R^2 only falls by 0.02% (14.32% to 14.30%) if we use only the

single variable $PredRemit_{New\ geo\ tiers}$. With a single variable, the coefficient for the new geographic tiers, α_2, is 0.848.

f) Re-Estimate Remittance Propensity by Demographics with the New Tiers

New Remittance Propensity by Country

According to BEA's current model, immigrants from low remitting countries send about 25% as much as immigrants from middle remitting countries, 13% as much as immigrants from high remitting countries and 7% as much as immigrants from the highest remitting countries.[42] In section e), we changed the tiers for many countries. With the new tiers, the relative remittance propensities for 'low', 'middle', 'high' and 'highest' income countries could change dramatically. In this section, we re-estimate the average remittance propensity for each tier.

First, we calculate how much each immigrant is predicted to remit under the tiers in section e). Next, we split that predicted remittances into four separate variables: predicted remittances in the low tier, predicted remittances in the middle tier, predicted remittances in the high tier and predicted remittances in the highest tier. We then estimate the equation:

$$\text{Actual Remittances} = \alpha_1 * PredRemit_{Low} + \alpha_2 * PredRemit_{Middle} + \alpha_3 * PredRemit_{High} + \alpha_4 * PredRemit_{Highest} + \varepsilon$$

If the current remittance rates are perfect, then all the α's would be the exactly the same.[43] We found that all α's are smaller with the new tiers. The estimate for α_1 is 2.448, the coefficient for α_2 is 0.699,[44] the coefficient for α_3 is 0.933 and the coefficient for α_4 is 1.034. Standard errors are very high for the 'low' and 'middle' tier, so we cannot reject the null hypothesis that all the α's are actually

[42] These proportions are for new immigrants with no children. The ratios are different for other groups.

[43] The average α drops when we move countries to a higher tier and increases when we move countries to a lower tier. In section e), we moved more immigrants up than down. Accordingly, αneed not equal 1.
In a prior version of this paper, we inadvertently assigned Puerto Rico, Guam and American Samoa to the 'low' tier. In reality, these regions have a remittance rate of 0. This mistake decreased the estimated for α for countries in the 'low' tier significantly.

[44] With the new rates, immigrants from 'low' tier countries remit a similar share of income as immigrants from 'middle' tier countries. This needs more study.

identical. However, the new α's don't require any extra complexity and they increase the R^2 by 0.75% (14.30% to 15.05%). Therefore, we will use the new country tier numbers.

New Remittance Rates by Family Structure

In section c), we estimated remittance rates for four family structures: married (spouse absent) with roommates; married (spouse absent) without roommates; other marital with roommates and other marital without roommates.[45] In this section, we will re-estimate the remittance rates for each family structure. First, we calculate how much each immigrant is predicted to remit based on section e) (PredRemit). We then estimate the equation:

$$\text{Reported Remittances} = \beta_1 * \text{PredRemit}_{\text{Married (sa), with roommates}} + \beta_2 * \text{PredRemit}_{\text{Other Marital, with roommates}}$$

$$\beta_3 * \text{PredRemit}_{\text{Married (sa), no roommates}} + \beta_4 * \text{PredRemit}_{\text{Other Marital, no roommates}} + \varepsilon$$

If the remittance rates in c) are still good, then each β would be precisely 1. In fact, they are reasonably close. The coefficient for β_1 is 0.952, the coefficient for β_2 is 1.515, the coefficient for β_3 is 0.971 and coefficient for β_4 is 0.954. We can easily reject the null hypothesis that $\beta_1 = \beta_2$. However, we can't reject the null hypothesis that $\beta_1 = \beta_3$ or $\beta_1 = \beta_4$. Nevertheless, the four new β's don't require any extra complexity and they increase the R^2 by 0.30% (15.05% to 15.35%). Therefore, we will use the new family structure numbers.

New Remittance Propensities for Child Immigrants

In section 3a), we argued that child immigrants send much less than immigrants who arrived as adults. We then tested that theory with an OLS regression and found that child immigrants send 75% less than BEA's current model predicts. Based on that result, we set the remittance rate for all child immigrants at precisely 0. This change increased the R^2 relative to treating child immigrants like adults.

However, demographics explain much the different remittance rates between child immigrants and adult immigrants. Immigrants who arrived before age 16 are much less likely to be married (spouse absent) or living with roommates. Furthermore, immigrants who arrived before 16 are less likely to be

[45] A few married (spouse absent) people with children are classified as other marital.

from countries reclassified into the 'highest' geographic tier like India or the Philippines and more likely to be from countries reclassified into the 'middle' geographic tier like Vietnam. We will test whether child immigrants still send significantly less with the new remittance rates calculated in e)

First, we calculate how much each child immigrant would send if he or he had arrived as an adult. We also calculate remittances for the small group of US citizens born abroad. Based on those predicted remittances, we estimate the equation:

$$\text{Actual Remittances} = \alpha_1 * \text{PredRemit}_{\text{Adult Immigrant}} + \alpha_2 * \text{PredRemit}_{\text{Child Immigrant}} + \alpha_3 * \text{PredRemit}_{\text{Citizen born abroad}} + \varepsilon$$

We find that α_1 =0.983, α_2 =0.647 and α_3 =-.122. Once again, the negative point estimate for US citizens born abroad is surprising – but we cannot reject the null hypothesis that it is actually 0. Just as in 3a), we find that child immigrants remit less and the difference is statistically significant. However, child immigrants only remit 34% less than otherwise similar adult immigrants. In comparison, we found that child immigrants remit 75% less than otherwise similar adult immigrants in section a). The R^2 rises significantly by 0.23% (15.35% to 15.58% when we change our assumption from child immigrants remit 0 to child immigrants remit exactly like adult immigrants.[46] Furthermore, this change reduces the model complexity. We will continue to assume that US citizens born abroad remit precisely 0.

New Remittance Rates by Time in the US

In section d), we combined the time categories "16 to 30" and "30 plus" into a single time category. We also estimated new remittance rates for each of the three time categories. In this section, we will re-estimate the remittance rates for each time code. First, we calculate how much each immigrant is predicted to remit based on section e) (PredRemit). We then estimate the equation:

$$\text{Remittances} = \gamma_1 * \text{PredRemit}_{\text{0 to 5}} + \gamma_2 * \text{PredRemit}_{\text{6 to 15}} + \gamma_3 * \text{PredRemit}_{\text{15 plus}} + \varepsilon$$

If the remittance rates in e) are still good, then each γ would be precisely 1. In fact, they are quite different. The coefficient for γ_1 is 1.043, the coefficient for γ_2 is 0.957 and the coefficient for γ_3 is 0.830. We can easily reject the null hypothesis that γ_1 = 1 or γ_3 =1. In other words, immigrants decrease remittances over time more with the new tiers than the old tiers. The new γ's don't require any extra

[46] We could increase the R^2 to 15.38% if we allow different rates for adult immigrants and child immigrants, but that adds complexity.

complexity and they increase the R^2 by 0.08% (15.58% to 15.66%). Therefore, we will use the time code numbers.

New Remittances Rates by Category, re-iterated

Each of the four stages described earlier depend on the values estimated for the other two stages. For example, people who are married (spouse absent) generally arrived much more recently than the rest of the population. Therefore, the coefficient for married (spouse absent) changes when the coefficient for new arrivals changes. In order to get the best possible fit, we re-iterated the regressions described earlier until they converged to the best possible values. We do not repeat the regressions for child immigrants because we have chosen to give them precisely the same remittance rates as adult immigrants. The most important change with the re-iteration is a slight increase in remittances by countries in the low 'tier'. However, none of the changes are large enough to affect the general ideas of this paper. The new coefficients increase the R^2 by 0.12% (15.66% to 15.78%) with no extra complexity. Therefore, we will use the re-iterated coefficients in our final model.

g) Experimental Regressions with a Very Large Number of Explanatory Variables

Earlier in this section, we argued that the CPS data was too noisy to estimate more than a few coefficients reliably. In order to reduce the influence of noise, we ran each regression with a few pre-selected variables. As an experiment, we tried more complex regressions in this section. These results are presented for academic research only. We don't believe that they are reliable enough to include in the International Transaction Accounts published by BEA

Allowing Interactions Between Time Code, Geographic Tier and Family Structure

In sections a)-f), we assumed that each factor influences remittances multiplicatively. For example, the ratio of married (spouse absent) to other marital status is the same for immigrants from 'low' tier, 'middle' tier, 'high' tier and 'highest' tier countries. However, it is very possible that the

factors interact somehow. If we allow interaction, then there are 48 separate remittance rates to estimate, one for each family structure, geographic tier and time code category. As an experiment, we created 48 separate dummy variables for each category and then regressed reported remittances on our 48 dummies. This regression has an R^2 of 17.51 and an adjusted R^2 is 16.95%. The interaction terms are statistically significant at the 0.1% level and the adjusted R^2 is 1.17% higher than in f). Therefore, we can reject the null hypothesis that all 48 interaction terms are equal to 0. But the increased power from allowing interactions is relatively small.

The 48 separate remittance rates produce an aggregate estimate of remittances similar to the simpler model. According to the coefficients from model f), remittances fell by 4.3% from 2008 to 2010. According to the model just developed, remittances fell by 4.0%.[47] This is similar enough that we feel confident using the simpler model. Appendix B has data on how the complex model changes remittances over time.

Allowing a Separate Dummy for Each Country of Birth

In sections a)-f), we divided countries into four separate geographic tiers, 'low', 'middle', 'high' and 'highest'. Within each tier, immigrants are all assume to have the same remittance propensities. As an experiment, we created 142 separate dummies for each country code in the CPS.[48] We then regressed reported remittances on those 142 dummies to estimate separated remittance propensities for each country. In order to simplify the analysis, we use the time code and family structure estimates developed in section f).

We find that the 142 country dummies are jointly significant at the 0.1% level. The R^2 is 4.91% and the adjusted R^2 is 2.95%. However, many of the countries dummies are implausibly large or negative. For example, France has a remittance rate larger than Mexico. At the same time, the United Kingdom, Germany and other Western European countries have much lower remittance rates. Because

[47] The CPS has no immigrants in the categories: married (spouse absent) & living with roommates & from a low tier & in the US 6-15 years or 15 plus years. I assigned them the remittance rates for more recent immigrants with the same family structure and origin.

[48] This is less than the total number of countries because the CPS combines some small countries into region dummies. The CPS splits the United Kingdom into England, Wales, Scotland and Northern Ireland but I combined them into one dummy. Similarly, I combine Russia and the former Soviet Union.

of the high standard errors, we will not report coefficients for each individual country. However, we will use those coefficients to impute remittances in the ACS.

The 142 separate country dummies produce a slightly different time trend than the 4 geographic tiers used in model f). According to the coefficients from model f), remittances fell 4.3% from 2008 to 2010. In contrast, remittances fell only 2.9% with the 142 separate country remittance rate. The difference is caused by the recession affecting Mexicans differently than other immigrants. Mexican immigrants were much more likely to return to their birth country and wait out the recession than immigrants who have a longer journey to their birth country. In addition, Mexicans have a slightly lower remittance rate than other immigrant in the 'highest' geographic tier. Therefore, the average remittance rate for immigrants in the 'highest' tier is predicted to have risen slightly from 2008 to 2010. Accordingly, aggregate remittances fell less when we use 142 separate country dummies than when we use 4 geographic tiers with fixed remittance rates

4. Testing the Suggested Model against the New Immigrant Survey

The main alternative dataset to compare against the suggested model is the New Immigrant Survey (NIS). The NIS tracks a sample of immigrants who were recently given a legal permanent residence status.[49] Researchers who are interested can read more at nis.princeton.edu. The NIS is a very long survey with many different questions on the immigrant's family, migration experience, work experience and other topics of interest. In this analysis, we summarized the NIS data to make it more comparable to the CPS data.

The population in the NIS is very different from the immigrant population in the CPS. In the NIS, only 1.0% of respondents are married (spouse absent). In the CPS, 3.2% of immigrants are married (spouse absent). In the NIS, only 2.3% of immigrants are living with roommates who are over 25. In the CPS, 4.9% of immigrants are living with roommates. In Section 3, we showed that immigrants who are married (spouse absent) and living with roommates remit much more than average. Accordingly, the CPS population is predicted to send more remittances than average. On the other hand, the NIS appears to have a very high proportion of immigrants with children abroad.[50] It is possible that immigrants

[49] The main NIS focuses on immigrants over 18. We exclude children from a related NIS survey.
[50] We don't have any independent numbers on the true portion of immigrants with children abroad.

with children living abroad are more likely to apply for legal permanent residence status. For example, the legal status may make it easier to bring their children to the U.S. Persons with children abroad are more likely to remit, so the net difference in remittances is ambiguous.

Despite the different demographics, the NIS and the CPS gives roughly similar coefficients for each demographic variable included in our model. We tested each possible revision by re-running the regressions described in section 3. We will discuss each regression briefly

a) Child Immigrants and US Citizens Born Abroad Send No Money to their Birth Country

All of the individuals in the NIS survey are newly legalized permanent residents. Therefore, we cannot test whether US citizens born abroad remit differently. We will focus on testing whether child immigrants behave differently from adult immigrants. We re-ran the OLS regression in 3a):

$$\text{Remittances} = \alpha_1 * \text{Predicted Remittances}_{\text{Child Arrivals}} + \alpha_2 * \text{Predicted Remittances}_{\text{Adults Arrivals}} + \varepsilon$$

The coefficient for adult arrivals, α_2, is 0.337, more than twice the coefficient for child arrivals, α_1 =0.112. By comparison, the coefficients for α_2 and α_1 were 0.396 and 0.083 in the CPS. Based on the NIS data, we can easily reject the null hypothesis that adult immigrants send the same as child immigrants. Conversely, we cannot reject the null hypothesis that child immigrants send nothing. Therefore, we will assume that they send zero remittances.

Despite the regression results, the R^2 increases by only 0.06% (2.27% to 2.33%) when we set remittances from child immigrants equal to zero. This is much smaller than 0.65% increase (6.37% to 7.02%) from the same adjustment in the CPS. The difference is caused by the populations studied. A much smaller portion of the immigrants in the NIS arrived before 16. Therefore, changing their remittances has little impact on the overall prediction.

b) Change the family structure categories from Children/No Children to Married, Spouse Absent/Other Marital

Once again, we test the model by re-running the regression from 3b):

$$\text{Remittances} = \alpha_1 * \text{PredRemit}_{\text{No Children}} + \alpha_2 * \text{PredRemit}_{\text{Has Children}} + \varepsilon$$

$$\text{Remittances} = \beta_1 * \text{PredRemit}_{\text{Married (spouse absent)}} + \beta_2 * \text{PredRemit}_{\text{Other Marital}} + \varepsilon$$

Consistent with BEA's current model, immigrants without children present remit more. The coefficient for α_1 is 0.342, more than double the 0.144 coefficient for α_2. By comparison, the coefficients for α_1 and α_2 are 0.382 and 0.225 in the CPS sample.

Consistent with our new model, married (spouse absent) immigrants remit much more than other marital statuses. The coefficient for β_1 is 0.710, three times as large as the 0.244 coefficient for β_2. By comparison, the coefficients for β_1 and β_2 are 1.090 and 0.259 in the CPS sample.

The regression for children/no children has a higher R^2 (2.34% vs. 2.09%) in the NIS. In contrast, the regression with married (spouse absent)/other marital has a higher R^2 (7.20% vs. 8.83%) in the CPS sample. The difference is driven by the sample studied. The NIS has very few married (spouse absent) individuals – so changing their remittances has little impact on the overall prediction. However, the goal of this paper is to match remittances in the overall population, not just newly legalized immigrants.

c) Increase the family structure categories from 2 to 4

Once again, we test the model by running the same regression as we did with the CPS.

$$\text{Remittances} = \gamma_1 * \text{PredRemit}_{\text{Married (spouse absent), with roommates}} + \gamma_2 * \text{PredRemit}_{\text{Other Marital, with roommates}}$$

$$\gamma_3 * \text{PredRemit}_{\text{Married (spouse absent), no roommates}} + \gamma_4 * \text{PredRemit}_{\text{Other Marital, no roommates}} + \varepsilon$$

Consistent with our new model, we found that the presence of roommates is a very powerful predictor of remittances. The coefficient for γ_1 is 2.42, four times as high as the coefficient for γ_3, 0.658. The coefficient for γ_2 is 0.936, about four times as high as the coefficient for γ_4, 0.228. Just like the CPS sample, roommates are associated with much higher remittance rates. By comparison, the coefficients for γ_1, γ_3, γ_2 and γ_4 are 2.042, 0.830, 0.652, and 0.222 in the CPS sample.

With the four variable regression, the R^2 in the NIS sample increases by 0.39% (2.09% to 2.48%). This is clearly an improvement, but it is much smaller than the 2.82% improvement (8.83% to 11.65%) seen in the CPS sample. Once again, the difference is driven by the sample population. The NIS sample has less than half the number of immigrants living with roommates as the CPS sample. Accordingly, accounting for roommates has little impact on remittances.

However, one result is inconsistent with our new model. In the CPS sample, we found that the presence of children has little effect on remittances once we control for marital status and roommates.

In the NIS sample, the presence of children was still significant at the same level as it was before. We believe that this may be related to having children outside the country. In the NIS sample, 31% of men and 35% of women without children in the household have children outside the country. We have no data for the CPS sample, but the numbers for the NIS seem to be relatively high given the low percentage of married (spouse absent). It is also possible that the presence of children has different effects in 2003-2004, when the NIS survey was fielded and in 2008, when the CPS survey was fielded.

d) Reduce the Number of Time Codes from 4 to 3

We test this change with the same two-step process described earlier in 3e). First, we estimate how much each immigrant would send if he or she arrived in the past five years. We then estimate the equation:

$$\text{Remittances} = \alpha_1 * \text{PredRemitNew}_{\text{Time 0 to 5}} + \alpha_2 * \text{PredRemitNew}_{\text{Time 6 to 15}}$$

$$\alpha_3 * \text{PredRemitNew}_{\text{Time 16 to 30}} + \alpha_4 * \text{PredRemitNew}_{\text{Time 30 plus}} + \varepsilon$$

We found that the coefficient for immigrants who arrived 0 to 5 years ago, α_1, is 0.694. The coefficient for immigrants who arrived 6 to 15 years ago, α_2, is 1.121, slightly bigger. We can reject the null hypothesis that $\alpha_1 = \alpha_2$. The results for longer staying immigrants are even more puzzling. The coefficient for immigrants who arrived 16 to 30 years ago, α_3, is 0.939 and the coefficient for immigrants who arrived 30 or more years ago, α_4, is 2.154. We can easily reject the null hypothesis that $\alpha_3 = \alpha_4$. In other words, the NIS is clear that the newest immigrants give the least and the longest staying immigrants give the most. The most likely explanation for the puzzling results is sample selection, immigrants who've been in the US for 30 years and are just now getting legalized may be different from the average immigrant who's been in the US for 30 years.

The R^2 drops slightly (2.48% to 2.38%) when we use the new time multipliers estimated from the CPS instead of BEA's existing time multipliers. This reflects the fact that neither time multiplier matches the observed data very well. Because the NIS sample does not include all migrants, BEA should not use these results to change the suggested model.

e) Change some countries from one geographic tier to another

It is more difficult to test this part of our model than other parts. To re-iterate, our model argues that immigrants remit more if they come from an oversubscribed country or a country with temporary protected status, less if temporary visitors can get a waiver easily and more if the 'value of remittances' was higher in their country of birth. The NIS was conducted 2003 to 2004, so many of the variables are different than they were in 2008. We will use the average World Bank Governance Indicators for 2000 to 2005 to measure the 'value of remittances'. In 2003, the only countries that were oversubscribed were Mexico, India and the Philippines. At that time, Honduras, Nicaragua, El Salvador and Somalia were in the temporary protected status category, but Sudan had not yet been added.

We will test our general model, not the precise tiers calibrated to the CPS data. In order to do that, we will first predict remittances if each immigrant was from a low remitting country (PredRemitLow). We then multiply the predicted remittances by dummy variables for each of the factors studied.[51] We then test estimate the equation:

$$\text{Remittances} = \gamma_1 * \text{PredRemitLow}_{\text{Visa Waiver}} + \gamma_2 * \text{PredRemitLow}_{\text{NonVisa Waiver}} + \gamma_3 * \text{PredRemitLow}_{\text{Future Waiver}}$$

$$\gamma_4 * \text{PredRemitLow}_{\text{Oversubscribed}} + \gamma_5 * \text{PredRemitLow}_{\text{Value of Remittances}} + \gamma_6 * \text{PredRemitLow}_{\text{Temporary Protective Status}} + \varepsilon$$

The results for our model are mixed. The coefficient are $\gamma_1 = 0.993$; $\gamma_2 = 9.413$; $\gamma_3 = 1.316$; $\gamma_4 = -2.506$; $\gamma_5 = 2.972$ and $\gamma_6 = 11.730$. Consistent with our model, the typical immigrant from countries with a visa waiver sends much less than immigrants from countries without a visa waiver. In addition, immigrants from countries with temporary protected status send more. These two differences are statistically significant. Consistent with our model, immigrants from countries with a high 'value of remittances' send more. However, that difference is not statistically significant. Contrary to our model, immigrants from countries which will eventually get visa waivers sent slightly more and immigrants from oversubscribed countries send less. These two contrary results are not statistically significant.

The results for oversubscribed countries are puzzling. In the CPS survey, we found that immigrants from oversubscribed countries sent much more than average. In the NIS, those same countries sent slightly less than average. We believe that the results described above might be explained by the precise sample tracked in the NIS and the precise immigration law at the time the NIS was created. In 2000, Congress created a new visa to allow legal permanent residents to reunite with

[51] The current visa waiver program did not exist then, but there were similar programs.

their spouses and children if they had applied before December 2000 and had been waiting at least three years.[52] . The main beneficiaries of this program were immigrants from oversubscribed countries, who faced a much longer waiting list than average. Therefore, a relatively higher proportion of the immigrants from Mexico, the Philippines and India who came in 2003 are spouses and children reuniting with family who were already in the country.[53] It is not surprising that these immigrants send much less than average. However, their behavior is probably not representative of the overall population from these countries.

f) Re-Estimate Remittance Rates by Demographics with the New Tiers

In this section, we recalibrated our remittance rates for married (spouse absent), living with roommates and time in the US to match the new country codes. We test this recalibration by comparing the predicted remittances with the new country codes and the old remittances rates from section 3e) with the new predictions from section 3f). We found that the predictions from 3e) do about the same as 3f). But neither model matches the NIS sample very well for reasons discussed earlier.

g) Regressions with a Very Large Number of Explanatory Variables

We will not test the experimental regressions in 3g) against the NIS. The NIS has very few immigrants who are married (spouse absent) or living with roommates. Accordingly, many of the demographic cells estimated in 3g) have no observations. Because the data is so sparse, we will not test whether the 48 remittance rates by demographic category do better than the simplified remittance rates in 3f). In addition, the NIS gives much less country detail than the CPS. Accordingly, we cannot test the 142 country dummies estimated in 3g).

5. Testing the Suggested Model against the World Bank Remittance Statistics

The other alternative dataset to compare the suggested model with is the World Bank's remittance estimates. These statistics are available at http://data.worldbank.org/topic.[54] The World Bank data is aggregated from each country's reporting of statistical data to the IMF. The World Bank

[52] U.S. State Department, http://travel.state.gov/visa/immigrants/types/types_1493.html
[53] Many of them had come earlier, but were not legal until 2003.
[54] This is the general website. Search for remittances to get the actual time series.

remittance statistics might be incorrect if country's estimation techniques are flawed. Furthermore, the World Bank defines remittances as the sum of personal transfers, compensation of employees and migrants' transfers; our suggested model only estimates personal transfers. Even if we used precisely the same model and dataset as the World Bank, we could still show different numbers. Accordingly, a disagreement between our model and the alternative datasets does not necessarily prove that our model is wrong. Conversely, an agreement between our model and the alternative datasets do not necessarily prove that our model is right. However, the suggested model is more convincing if it matches the World Bank data.

a) Testing Whether Aggregate Remittances are Correlated with the 'Value of Remittances' from 3e)

In section 3e), we argued that average remittance rates for a country are determined by four separated factors: a) whether the country has a visa waiver program; b) whether the country is oversubscribed by potential immigrants; c) whether the country has temporary protected status and iv) the 'value of remittances' in that country. We do not believe that the visa waiver program is the main reason for immigrants from wealthy countries to send less. Even before the official program was introduced, visitors from wealthy countries had a much easier time getting visas than visitors from poor countries. We believe that oversubscription does matter, but the same countries are oversubscribed year after year. Therefore, we can't separate the impact of oversubscription from the country fixed effects.[55] Temporary protected status varies a little bit more, but the changes are correlated with big events like the Haiti earthquake or civil wars. Accordingly, it would be difficult to determine whether immigration policy has any direct impact on remittances. In this section, we will test whether the 'value of remittances' score matters.

We calculate the 'value of remittances' score for each year from the World Bank's Governance Indicators. Just like we did in 3e), we average the scores over five years to get a smoother number than if we took a single year's data.[56] We then used the World Bank's remittance estimates of aggregate remittances and aggregate emigrants to calculate remittances per emigrant for each year. [57] Our sample runs from 2000 to 2009 for most countries, but a few countries enter the sample later. In all the

[55]The extra wait for being oversubscribed may change over time. For example, the wait for spouses and children of legal permanent residents was limited to 3 years from 2000 to 2003. Since then, it has been creeping up. In a future paper, we might study that.

[56] The World Bank Scores are ever 2 years until 2002, so we average 1996, 1998, 2000, 2002 and 2003 to get 2000's score. Similarly, we average 1998, 2000, 2002, 2003 and 2004 to get 2001's score

[57] The number of emigrants is for 2010. We could not find annual data. We use the number of immigrants in the US to impute emigrants for each year. This method may be refined later.

regression, we control for year fixed effects and country fixed effects. The World Bank's remittance statistics are aggregate by country, so they include remittances from the US, Europe and the developing world. We will assume that immigrants in non-US countries respond to a higher 'value of remittances' score in the same way that US immigrants respond.

We found that one extra point on the 'value of remittances' scale raises remittances by $976 per emigrant. The mean remittance is $1,818 per emigrant, so this is a relatively large effect. If we weight by the emigrant population, the coefficient fall slightly to $639 per emigrant, but it remains statistically significant. As a robustness check, we tried removing Mexico, India, China and the Philippines from our sample. We found that results remained similar. We also tried splitting the sample by continent. We found that the 'value of remittances' was positive and significant for North America, Europe[58] and Africa. For Asia, it is positive and insignificant (p = .206) and negative and insignificant for South America. Because of these robustness checks, we believe that the 'value of remittances' scale has a real impact on remittance behavior.

The 'value of remittances' score might explain the puzzle of remittances to Mexico. According to Mexico's Central Bank, remittances from the US to Mexico rose from $9 billion per year in 2001 to $24 billion per year in 2007 – a 200% increase. Based on the immigrant population in the US, their average earnings and their family structure, BEA's current model predicts a 50% increase in remittances from 2001 to 2007. Our revised models also predict a 50% increase if the geographic tier for Mexico is held fixed. However, the 'value of remittances' score rose significantly from 2001 to 2005. This increase might have increased the remittance propensity for Mexican immigrants over the same time period. However, this result is very preliminary.

b) Average Remittances Rates, Our Models vs. the World Bank Statistics

In this section, we keep the geographic tiers for each country fixed over time. We then test whether countries that are predicted to send more on average actually send more in the World Bank Statistics. There is a very high correlation between average remittances in one year and average remittances in the next, so we only use the 2008 remittance data. Results are similar if we cluster the standard errors by country.

[58] Earlier in the paper, we argued that value of remittances score doesn't matter for wealthy countries in the visa waiver program. In the World Bank data, the relationship holds even if we focus on the visa waiver countries.

The World Bank statistics give the total remittances for each country. This includes remittances from immigrants in the US **and** remittances from immigrants elsewhere. In order to make the sample more comparable, we will focus on 13 countries which send more than half of their immigrants to the US: Belize, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Guyana, Honduras, Japan, Jamaica, Laos, Mexico, Panama and Trinidad & Tobago. This list misses many important sending countries like India, China and the Philippines because they send emigrants to other countries as well. It also misses some countries that send most of their immigrants to the US, but don't have remittance data in the World Bank statistics. In particular, Cuba is missing – so we can't test our hypothesis that Cubans actually remit less than BEA's current model predicts.

The number of immigrants is the most powerful predictor of remittances for BEA's current model, our revised model and the World Bank statistics. Accordingly, all of the remittance numbers are very highly correlated. In order to test our model better, we will divide the remittances by the number of the immigrants and regress World Bank's estimates of remittances per person on predicted remittances per person.

Unlike our earlier regressions, we include a constant in each regression. We do this because I'm estimating an absolute number of dollars remitted, not a remittance rate.

$$\text{Reported Remittances}_{\text{WorldBank}} = \alpha_{\text{Current}} + \beta_{\text{Current}} * (\text{Predicted Remittances}_{\text{Current Model}}) + \varepsilon$$

$$\text{Reported Remittances}_{\text{WorldBank}} = \alpha_{\text{Model a)}} + \beta_{\text{Model a)}} * (\text{Predicted Remittances}_{\text{Model a)}}) + \varepsilon$$

….

$$\text{Reported Remittances}_{\text{WorldBank}} = \alpha_{\text{Model f)}} + \beta_{\text{Model f)}} * (\text{Predicted Remittances}_{\text{Model a)}}) + \varepsilon$$

The results from this regression provide mixed support for the suggested changes. Predicted remittances are not significantly correlated with the World Bank statistics for BEA's current model. The t-statistic rises when we move to model a), but the correlation is still insignificant. Model b) is correlated with the World Bank data at the 10% level and models c) and d) are correlated with the World Bank data the 5% level. However, the t-statistic drops for model f) and model g)1. Finally, model g)2 gets the highest t-statistic.

At first glance, the results in this section argue against the new tiers developed in 3e). However, the new tiers were calibrated to produce the best results for the full sample of immigrants to the US.

The 13 countries tracked in this regression are mainly from Latin America. It is entirely possible that BEA's existing tiers did very well for Latin America – but less adequately for the complete sample. The overall effect of switching to the new tiers might be an improved fit even if Latin American countries are less precisely estimated. The highest t-statistic comes from model g)2. In that model, we estimated a separate dummy variable for each country in the CPS survey. Because each country is estimated separately, there is no trade-off between fitting Latin American countries and the rest of the world.

c) Changes in Annual Remittance Rates, Our Models vs. the World Bank Statistics

In this section, we test whether predicted changes in remittance rates are correlated with changes in the World Bank statistics. For this regression, we assume that the new tiers in section 3e) remain fixed throughout the time period. The data used and the sample used is the same as in section b). In the new regression, we include a year-fixed effect for each year from 2001 to 2009 and a country fixed effect for each of the 13 countries. Therefore, our regressions are a difference in difference estimate.

The results from these regressions are more encouraging. Predicted changes are positively correlated with actual changes. The correlation is statistically significant at the 5% level for BEA's current model. Model a) does better, with significant results at the 1% level. Models b) to f) do even better, with significant results at the 0.1% level.

Conclusion

BEA currently uses a demographic model to predict how much immigrants in the United States send abroad. In this paper, we tested BEA's current model by comparing remittance statistics produced by the model to remittance data reported on the CPS. We showed that the BEA's assumptions about family structure and time in the US match remittances reported to the CPS survey, but there are more powerful demographic characteristics that can be used instead. We also showed the country tiers in BEA's current model do not match behavior very well. In particular, we show that immigrants from current middle, high and highest tier countries all appear to remit the same percentage of their income.

We suggest several modifications to improve BEA's model. First, we use different demographic characteristics, marital status and presence of roommates, to predict remittance behavior. The new demographic characteristics do a better job of predicting remittances than the presence of children or precise time in the US. Second, we change some countries from one geographic tier to another. We show that the new geographic tiers do a better job of predicting remittance rates as a percentage of income.

The new model uses coefficients that ensure that the aggregate level of personal transfers at the global level in 2008 equals the level produced by BEA's current model for that year. We do this because the shortcomings in the CPS preclude us from concluding that BEA's current model either overstates or understates the true level of personal transfers. Although the aggregate level of transfers in 2008 is unchanged, the modifications improve the current model in two respects: 1) the geographic distribution of transfers will be more in line with the breakdown suggested by behavior in the CPS. 2) The year-to-year changes in transfers from 2008 forward produced by the new model should be more reliable than changes produced by the current model.

Finally, we tested our modifications against two alternative datasets, the New Immigrant Survey and World Bank remittance statistics. We found that the demographic characteristics have similar effects in the NIS as they do in the CPS. We also tested the suggested model against the World Bank statistics. We found that the suggested model matches the World Bank statistics better than BEA's current model – but neither is perfect. Based on all these results, we think these results provide a promising path for BEA to improve its estimates.

Bibliography

Grieco, Elizabeth M. et al (2010)., "Who in the United States Sends and Receives Remittances?" http://www.census.gov/population/www/documentation/twps0087/twps0087.html

Kaufmann, Daniel et al., (2010). "The Worldwide Governance Indicators : A Summary of Methodology, Data and Analytical Issues". World Bank Policy Research Working Paper No. 5430 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130

Jasso, Guillermina, Douglas S. Massey, Mark R. Rosenzweig and James P. Smith. "The New Immigrant Survey 2003 Round 1 (NIS-2003-1) Public Release Data." March 2006. Retrieved {September 2011}. Funded by NIH HD33843, NSF, USCIS, ASPE & Pew. Available at http://nis.princeton.edu

Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. *Integrated Public Use Microdata Series: Version 5.0* [Machine-readable database]. Minneapolis: University of Minnesota, 2010.

Soloveichik, Rachel (2007) "Family Transfers in Rural Mexico: An Application to Risk Sharing and Labor Supply Elasticity" working paper available upon request

U.S. Department of Commerce, Bureau of the Census. *Current Population Survey: August 2008 Immigration/Emigration Module,* . Washington, DC: U.S. Department of Commerce, Bureau of the Census [Producer], 2008. Cambridge, MA: Available at https://bls.census.gov/cps_ftp.html

United States Government Accountability Office, "International Remittances, Differences in Estimation Methodologies Produce Different Results" 2006: Available at www.gao.gov/new.items/d06210.pd

World Bank data was downloaded from http://data.worldbank.org

and http://govindicators.org

Appendix A: % of Immigrant Population in Each Category

Current Model: % of Immigrant Adults in Each Category for 2008

		Time Since Arrival in the US			
Geographic Tier	Has Children?[59]	0 to 5 years	6 to 15 years	16 to 30 years	30 plus years
Low	No	1.37%	1.59%	2.98%	6.72%
Low	Yes	0.58%	1.10%	1.46%	1.43%
Middle	No	1.55%	1.98%	2.24%	1.95%
Middle	Yes	0.59%	1.60%	1.42%	0.39%
High	No	2.86%	4.98%	5.50%	2.85%
High	Yes	1.14%	3.20%	3.52%	0.69%
Highest	No	5.09%	8.11%	8.29%	6.00%
Highest	Yes	1.88%	7.13%	8.09%	1.77%

Revised Model f): % of Immigrant Adults in Each Category for 2008

Geographic Tier	Married (spouse absent)	Has Roommmates?	Arrived Before 16?	0 to 5 years	6 to 15 years	16 to 30 years	30 plus years
Low	No	No	No	1.23%	1.63%	3.27%	1.54%
Low	Yes	No	No	0.05%	0.06%	0.03%	0.03%
Low	No	Yes	No	0.12%	0.10%	0.05%	0.08%
Low	Yes	Yes	No	0.01%	0.01%	0.01%	0.01%
Middle	No	No	No	2.04%	3.76%	4.25%	2.18%
Middle	Yes	No	No	0.13%	0.07%	0.15%	0.07%
Middle	No	Yes	No	0.21%	0.09%	0.16%	0.20%
Middle	Yes	Yes	No	0.03%	0.03%	0.02%	0.02%
High	No	No	No	2.42%	4.88%	4.61%	1.99%
High	Yes	No	No	0.19%	0.30%	0.20%	0.08%
High	No	Yes	No	0.26%	0.27%	0.19%	0.08%
High	Yes	Yes	No	0.06%	0.08%	0.05%	0.02%
Highest	No	No	No	5.88%	11.91%	10.86%	3.86%
Highest	Yes	No	No	0.60%	0.70%	0.51%	0.16%
Highest	No	Yes	No	1.10%	1.08%	0.56%	0.14%
Highest	Yes	Yes	No	0.33%	0.27%	0.15%	0.03%
All tiers	Both	Both	Yes	0.40%	4.37%	10.05%	9.66%

[59] This variable is calculated directly from the ACS data. The numbers would be slightly different if we used BEA's current methodology.

Revised Model f): % of Immigrant Adults in Each Category by Year 2004-2010

Year	Married (spouse absent)	Has Roommates?	Arrived Before 16?	All Arrival Dates	0 to 5 years	6 to 15 years	16 to 30 years	30 plus years
2004	No	No	No	68.55%	15.11%	22.54%	19.91%	10.99%
2005	No	No	No	68.39%	14.61%	22.63%	20.39%	10.76%
2006	No	No	No	66.11%	12.74%	22.21%	20.46%	10.70%
2007	No	No	No	65.33%	11.96%	22.21%	20.46%	10.70%
2008	No	No	No	66.32%	11.57%	22.09%	21.36%	11.30%
2009	No	No	No	65.39%	11.26%	20.97%	21.97%	11.19%
2010	No	No	No	66.11%	11.19%	21.86%	20.97%	12.09%
2004	Yes	No	No	3.00%	1.06%	1.04%	0.62%	0.28%
2005	Yes	No	No	3.21%	1.20%	0.98%	0.75%	0.28%
2006	Yes	No	No	3.56%	1.24%	1.18%	0.83%	0.31%
2007	Yes	No	No	3.40%	1.08%	1.16%	0.85%	0.31%
2008	Yes	No	No	3.46%	0.97%	1.22%	0.90%	0.37%
2009	Yes	No	No	3.02%	0.88%	1.06%	0.78%	0.30%
2010	Yes	No	No	2.99%	0.80%	1.03%	0.83%	0.33%
2004	No	Yes	No	3.58%	1.60%	1.20%	0.57%	0.21%
2005	No	Yes	No	3.70%	1.65%	1.21%	0.65%	0.19%
2006	No	Yes	No	4.69%	1.74%	1.66%	0.88%	0.41%
2007	No	Yes	No	4.77%	1.78%	1.73%	0.87%	0.39%
2008	No	Yes	No	4.68%	1.69%	1.63%	0.96%	0.40%
2009	No	Yes	No	4.81%	1.64%	1.75%	0.97%	0.45%
2010	No	Yes	No	5.02%	1.78%	1.77%	1.05%	0.42%
2004	Yes	Yes	No	0.77%	0.43%	0.21%	0.10%	0.03%
2005	Yes	Yes	No	0.85%	0.49%	0.22%	0.11%	0.03%
2006	Yes	Yes	No	1.25%	0.58%	0.37%	0.22%	0.08%
2007	Yes	Yes	No	1.26%	0.56%	0.39%	0.23%	0.08%
2008	Yes	Yes	No	1.13%	0.43%	0.39%	0.23%	0.08%
2009	Yes	Yes	No	1.09%	0.43%	0.34%	0.22%	0.10%
2010	Yes	Yes	No	1.02%	0.37%	0.36%	0.22%	0.07%
2004	Both	Both	Yes	24.21%	0.58%	4.79%	9.56%	9.28%
2005	Both	Both	Yes	23.83%	0.47%	4.54%	9.68%	9.14%
2006	Both	Both	Yes	24.28%	0.44%	4.49%	9.91%	9.44%
2007	Both	Both	Yes	24.24%	0.39%	4.39%	10.03%	9.43%
2008	Both	Both	Yes	24.48%	0.40%	4.37%	10.05%	9.66%
2009	Both	Both	Yes	24.72%	0.36%	4.36%	10.13%	9.87%
2010	Both	Both	Yes	24.75%	0.39%	4.56%	9.97%	9.83%

Appendix B: Remittances for 2001-2010 based on the ACS

Year	Number Adult Immigrants (millions)[60]	Average Income Per Immigrant	Remittances per $1,000 if income							Total Remittances (Billions of $'s)	
			Current Model[61]	Model a	Model b	Model c	Model d	Model e	Model f	Current Model	Model f
2001	30.6	$25,633	$31.33	$31.62	$31.60	$30.76	$31.02	$31.10	$31.08	26.5	27.1
2002	32.2	$25,981	$31.92	$32.22	$31.69	$30.84	$30.96	$30.94	$30.94	27.7	27.4
2003	32.8	$26,180	$31.74	$32.07	$31.74	$31.00	$31.11	$30.87	$31.67	28.0	27.5
2004	33.4	$27,256	$31.62	$31.90	$31.57	$30.60	$30.68	$30.86	$31.75	30.4	30.1
2005	34.9	$28,012	$32.88	$32.17	$32.23	$31.25	$31.28	$31.45	$31.33	31.3	30.9
2006	36.2	$28,453	$32.63	$32.75	$33.24	$33.22	$33.11	$33.10	$33.40	34.3	35.3
2007	36.8	$30,163	$32.46	$32.63	$32.67	$32.95	$32.62	$32.72	$32.83	36.9	37.1
2008	37.1	$31,536	$31.96	$31.96	$31.96	$31.96	$31.96	$31.96	$31.96	38.5	38.5
2009	37.6	$30,585	$31.86	$31.73	$31.00	$30.99	$30.65	$31.08	$30.76	37.4	36.1
2010	39.1	$29,668	$32.04	$31.82	$31.03	$31.29	$30.97	$31.61	$30.98	37.1	35.6

We do not show models g)1 and g)2 because they are so experimental. Those results are available upon request.

[60] Before 2006, the ACS does not track individuals in group homes like prisons or college dormitories. In order to avoid a trend break, we imputed remittances for that group. The group is relatively small and has low earnings, so they have little impact on the numbers.

[61] These numbers do not automatically match BEA's published totals for several reasons:

1) In my paper, I use microdata from Ipums.org. BEA's published data uses a larger sample that gives more detail. Because of sampling error, the averages might not match precisely.
2) BEA's published numbers for 2010 include a special adjustment for Haiti because of the earthquake.
3) BEA's published numbers are checked carefully for errors or outlying observations. My numbers are not adjusted for outliers in the same way.
4) BEA's published numbers are based on ACS data at the time. Since then, the ACS may have changed their online data or person weights. I use data downloaded in September 2011 for all the years.

In order to avoid confusion, I calibrated all of these numbers to BEA's precise totals. The uncalibrated results are qualitatively similar.

Appendix C: Regression Results Summarized

Section 2: Testing BEA's Existing Model

Subsection	Description of Test	OLS Equation	Coefficients	R^2
2a)	Does BEA's general model predict remittances?	Actual Remittances = α*Predicted Remittances +ε	$\alpha = 0.32$	6.32%
2b)	Do Remittance Rates Decrease As Immigrants Spend More time in the US?	Actual Remittances = α_1*PredRemitNew $_{0 \text{ to } 5}$ + α_2*PredRemitNew$_{6 \text{ to } 15}$ α_3*PredRemitNew$_{16 \text{ to } 30}$ + α_4*PredRemitNew$_{30 \text{ plus}}$ +ε	α_1=0.55, α_2=0.35, α_3=0.13 and α_4=0.13	6.97%
2c)	Do Immigrants with Children Remit Less?	Actual Remittances = β_1*PredRemitNoChildren$_{\text{No Children}}$ + β_2*PredRemitNoChildren$_{\text{With Children}}$ +ε	β_1=0.31 and β_2=0.18	6.46%
2d)	Remittance Rates depend on the Geographic Tier for the Immigrant's Country of Birth	Actual Remittances = γ_1*PredRemLow$_{\text{Low tier}}$ + γ_2*PredRemitLow $_{\text{Mid Tier}}$ γ_3*PredRemitLow$_{\text{High Tier}}$ + γ_4*PredRemitLow$_{\text{Highest Tier}}$ +ε	γ_1=0.75, γ_2=2.73, γ_3=2.29 and γ_4=3.75	6.97%

Section 3: Testing BEA's Existing Model

Subsection	Description of Test	OLS Equation	Coefficients	R^2
3a)	Child Immigrants and US Citizens Born Abroad Send Nothing	$Remittances = \alpha_1 * PredRem_{Adult\ Immigrant} + \alpha_2 * PredRem_{Child\ Immigrants} + \alpha_3 * PredRem_{US\ Citizen\ born\ abroad} + \varepsilon$	$\alpha_1 = 0.385$, $\alpha_2 = 0.094$ $\alpha_3 = -.023$,	7.00%
3b)	Replace "Has Children" with Married (spouse absent)	$Remittances = \alpha_1 * PredRemitNoChildren_{No\ Children} + \alpha_2 * PredRemitNoChildren_{Has\ Children} + \varepsilon$ $Remittance = \beta_1 * PredRemitNoChildren_{Married\ (sa)} + \beta_2 * PredRemitNoChildren_{Other\ Marital} + \varepsilon$	α_1=0.370, α_2=0.229, β_1=1.092 and β_4=0.257	From 7.13% to 8.75%
3c)	Add the variable "Living with Roommates"	$Remittances = \gamma_1 * PredRemit_{Married\ (sa),\ with\ roommates} + \gamma_2 * PredRemit_{Other,\ with\ roommates} + \gamma_3 * PredRemit_{Married\ (sa),\ no\ roommates} + \gamma_4 * PredRemit_{Other,\ no\ roommates} + \varepsilon$	γ_1=2.042, γ_2=0.830, γ_3=0.652 and γ_4=0.222	11.63%
3d)	Reduce the time-codes from 4 to 3 and re-estimate them	$Remittances = \delta_1 * PredRemitNew_{Time\ 0\ to\ 5} + \delta_2 * PredRemitNew_{Time\ 6\ to\ 15} + \delta_2 * PredRemitNew_{Time\ 16\ plus}$	δ_1=1.069, δ_2=0.918, δ_3=0.547	11.86%
3e)	Change countries from one geographic tier to another	$Actual\ Remittances = \phi_1 * PredRemit_{Current\ geo\ tiers} + \phi_2 * PredRemit_{New\ geo\ tiers} + \varepsilon$	ϕ_1=0.084, ϕ_2=0.790	14.32%
3f)	Re-calibrate the coefficients estimated earlier for the new geographic tiers	Multiple Equations that are too long to show here. We also reverse the assumption in 3a) that child immigrants remit nothing. However, US citizens born abroad are still assumed to send 0.		15.78% final
3g)1	Estimate 48 separate remittances rates for each interaction category	Too Long to Show Here		17.51%
3g)2	Estimate 142 remittance rates for each country of birth dummy	Too Long to Show Here		19.92%

Section 4: Testing the Suggested Models In the New Immigrant Survey

Subsection	Description of Test	OLS Equation	Coefficients	R^2
3a)	Child Immigrants Send Nothing	$Remittances = \alpha_1 * PredRem_{Adults\ Arrivals} + \alpha_2 * PredRem_{Child\ Arrivals} + \varepsilon$	$\alpha_1 = 0.337$ $\alpha_2 = 0.112$	2.33%
3b)	Replace "Has Children" with Married (spouse absent)	$Remittances = \alpha_1 * PredRemitNoChildren_{No\ Children} + \alpha_2 * PredRemitNoChildren_{Has\ Children} + \varepsilon$ $Remittance = \beta_1 * PredRemitNoChildren_{Married\ (sa)} + \beta_2 * PredRemitNoChildren_{Other\ Marital} + \varepsilon$	α_1=0.342, α_2=0.144, β_1=0.710 and β_4=0.244	From 2.34% to 2.09%
3c)	Add the variable "Living with Roommates"	$Remittances = \gamma_1 * PredRemit_{Married\ (sa),\ with\ roommates} + \gamma_2 * PredRemit_{Other,\ with\ roommates}$ $\gamma_3 * PredRemit_{Married\ (sa),\ no\ roommates} + \gamma_4 * PredRemit_{Other,\ no\ roommates} + \varepsilon$	γ_1=2.42, γ_2=0.936, γ_3=0.658 and γ_4=0.228	2.48%
3d)	Do Remittance Rates Decrease Over Time?	$Remittances = \delta_1 * PredRemitNew_{Time\ 0\ to\ 5} + \delta_2 * PredRemitNew_{Time\ 6\ to\ 15}$ $\delta_3 * PredRemitNew_{Time\ 16\ to\ 30} + \delta_4 * PredRemitNew_{Time\ 30\ plus} + \varepsilon$	δ_1=0.694, δ_2=1.121, δ_3=0.939 δ_3=2.154	2.38% with CPS time multiplier
3e)	Change countries from one geographic tier to another	$Remittances = \gamma_1 * PredRemitLow_{Wealthy} + \gamma_2 * PredRemitLow_{FMiddle\ Income} + \gamma_3 * PredRemitLow_{Rest\ of\ World} + \gamma_4 * PredRemitLow_{Oversubscribed} + \gamma_5 * PredRemitLow_{Value\ of\ Remittances} + \gamma_6 * PredRemitLow_{Temporary\ Protective\ Status} + \varepsilon$	γ_1=0.993, γ_2=1.316, γ_3=9.413, γ_4=-2.506 γ_5=2.972,γ_g=11.730	The new tiers have a lower R^2 than the current tiers

Section 5: Testing the Suggested Models Against the World Bank Remittance Statistics

Sub.	Description of Test	OLS Equation	Coefficients	t-statistic
3a)	Do Remittances Increase When the 'Value of Remittances' Score is High?	$Remittances_{it} = \alpha$*'Value of Remittances'$_{it}$ +Country Fixed Effects+ Year Fixed Effects +ε_{it}	α =$976 per emigrant for complete sample α =$692 for North America α =negative and insignificant for South America α =$2,143 for Europe α = positive and insignificant for Asia α =$2,472 for Africa	
3b)	Are Predicted Remittances Correlated from the Models Correlated with Reported Remitances in the World Bank Data (Restricted to 13 countries in 2008)	Remittances Per Emigrant = α+ $\beta_{Current\ Model)}$*Remittances Per Person Predicted$_{Current\ Model}$ + ε Remittances Per Emigrant = α+ $\beta_{Model\ a)}$*Remittances Per Person Predicted$_{Current\ Model}$ + ε	$\beta_{Current\ Model)}$ = 1.184 $\beta_{Model\ a)}$ = 2.701 $\beta_{Model\ b)}$ = 7.816 $\beta_{Model\ c)}$ = 8.727 $\beta_{Model\ d)}$ = 9.314 $\beta_{Model\ e)}$ = 6.082 $\beta_{Model\ f)}$ = 3.886 $\beta_{Model\ g)1}$ = 5.733 $\beta_{Model\ g)2}$ = 2.344	Current Mod: 0.80 Model a): 1.47 Model b): 1.83 Model c): 2.59 Model d): 2.86 Model e): 1.61 Model f): 1.29 Model g)1: 1.39 Model g)2: 3.35
3c)	Are Changes in Predicted Remittances Correlated from the Models Correlated with Reported Changes Remitances in the World Bank Data (Restricted to 13 countries in 2001-2009)	Remittances Per Emigrant = α+Year and Country Fixed Effects $\gamma_{Current\ Model)}$*Remittances Per Person Predicted$_{Current\ Model}$ + ε Remittances Per Emigrant = α+ Year and Country Fixed Effects $\gamma_{Model\ a)}$*Remittances Per Person Predicted$_{Current\ Model}$ + ε	$\gamma_{Current\ Model)}$ = 1.809 $\gamma_{Model\ a)}$ = 2.294 $\gamma_{Model\ b)}$ = 7.378 $\gamma_{Model\ c)}$ = 7.179 $\gamma_{Model\ d)}$ = 7.185 $\gamma_{Model\ e)}$ = 8.043 $\gamma_{Model\ f)}$ = 6.962 $\gamma_{Model\ g)1}$ = 3.547 $\gamma_{Model\ g)2}$ = 2.612	Current Mod: 2.53 Model a): 2.73 Model b): 3.44 Model c): 3.89 Model d): 3.81 Model e): 3.74 Model f): 3.56 Model g)1: 2.29 Model g)2: 3.66