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# The Effects of Outside Income on Household Behavior: The Case of Remittances in Jamaica

Andrew V. Stephenson  
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THE EFFECTS  
OF  
OUTSIDE INCOME  
ON  
HOUSEHOLD BEHAVIOR:  
THE CASE  
OF  
REMITTANCES  
IN  
JAMAICA

BY

ANDREW VALROY STEPHENSON

A Dissertation Submitted in Partial Fulfillment  
of the Requirements for the Degree  
of  
Doctor of Philosophy  
in the  
Andrew Young School of Policy Studies  
Of  
Georgia State University

GEORGIA STATE UNIVERSITY

2011

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## ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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## ABSTRACT

### THE EFFECTS OF OUTSIDE INCOME ON HOUSEHOLD BEHAVIOR: THE CASE OF REMITTANCES IN JAMAICA

By  
ANDREW VALROY STEPHENSON

DATE: NOVEMBER 11, 2011

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Remittances from individuals not residing in the home significantly affect recipient households' behavior. Using data from the Jamaican Survey of Living Conditions and the Jamaican Labor Force Survey for years 2001-2007, this dissertation aims to explore some of the most significant effects of remittances, namely effects on labor market participation and household expenditures. Jamaica's proximity to the United States and Canada coupled with Jamaica's diaspora of educated individuals shapes an economy largely dependent on remittances. The country, therefore, provides an interesting and exciting case study for examining the effects of remittances.

In the first essay, we investigate whether remittances alter the labor market behavior of married women (or those in long-term relationships) in remittance-receiving households located in Jamaica. As is often the case in labor supply studies, it is important to identify key variables that are likely endogenous in the model. For purposes of this research, endogenous variables include remittances, the wife's education, and wages. We instrument both when predicting labor market participation and hours worked. Unlike other studies which find the income effect of remittances on household behavior results in increased leisure, we find that after instrumenting for remittances, the outside income has no significant effect on the supply of labor, either in terms of hours worked or participation.

The second paper assesses the extent that remittances alter the consumption pattern of recipient households in Jamaica. Classical theory predicts that total income and not income sources affects household consumption decisions, but developments in behavioral economics suggest the contrary. The disaggregation of both income streams and consumption expenditures as reported in the Jamaica Survey of Living Conditions provide us with unique insight into household behavior and in particular, spending on items such as food, schooling, and vices. Using Engel curve estimation and the two-part fractional response models, we find that the source of the income significantly affects the shares of income spent in specific consumption categories. Recipients, for example, generally spend larger shares of their income on schooling and home production and less at the grocery store. These findings suggest important implications should government look to tax or restrict the flow of remittances.

## Dissertation Introduction

Remittances are a major part of many economies in the developing world. Hundreds of billions of dollars flow from developed to less developed countries, and in some instances, comprise as much as a third of total GDP in small countries such as Haiti. Although per capita receipt of remittances is smaller for large countries, India and China are among the largest recipients of gross remittances, with combined receipts exceeding \$100 billion (Ratha, Mohapatra, & Silwal, 2010). The significance of remittances is so great that a number of institutions are actively engaged in research on this flow of money.

The World Bank, for example, recently created the database, Remittance Prices Worldwide. In an effort to improve information about the costs of sending remittances to and from various countries, a group of researchers tracks the costs of sending money through the major channels in which formal remittances flow. Costs of sending remittances are high for a variety of reasons, and the World Bank estimates that a five percent reduction in these fees would place approximately \$16 billion more in the hands of recipients (<http://remittanceprices.worldbank.org/About-Us>, accessed on June 11, 2011).

As recently as 2009, there was a Global Forum on Remittances, where speakers included the chair of the G8 Global Remittances Working Group. The G8, in discussing remittances and the costs for migrant workers, has suggested that reducing the costs of sending remittances could encourage greater entrepreneurial efforts in the developing world.

There is little doubt as to the importance of remittances for developing countries, but much of the discussion on the larger stage has centered on macroeconomic factors and effects. In this dissertation, we look at the effects of remittances on household level decisions.

This dissertation consists of two chapters, each dealing with the effects of receiving remittances. The first essay studies the effect of remittances on labor market behavior, while the second essay analyzes the extent to which remittance income alters households' expense allocations. In both essays, endogeneity of remittances may be caused by either missing variables affecting both remittances and labor supply (and consumption patterns) or from reverse causality where labor (and consumption) decisions may affect remittance receipts. Identifying a suitable instrument for remittances was not an easy task. After experimenting with several possible instruments, examining first-stage results, and conducting additional post-estimation tests of the instrument, we concluded that district level average remittances for other households in the district is the strongest instrument. The idea behind this instrument is that district level remittances are not expected to have a direct effect on wife's labor market activities or on consumption patterns of the household.

To address our research questions of how remittances affect labor supply and household expenditure, we use data from two sources. First, the Jamaican Labor Force Survey (LFS) collects detailed labor market data on each member of the surveyed households. This survey is divided into three sections to accommodate three groups of respondents, the employed, the unemployed, and the discouraged workers or those opting not to participate in the labor market. For the employed, questions about wage and hours worked are most significant for the study at hand.

Additional variables are from the Jamaican Survey of Living Conditions (SLC), including annual receipt of remittances. Total remittances received is the key variable in the labor essay, while remittances as a share of total income is the focus in the second essay. Using share of total income is common in Engel curve analyses when the source of income is thought to be



important (Hawkins & Wallace, 2006; Levin, 1998). Results for both studies, labor and consumption, offer new insight into the remittance discussion.

With respect to the effect of remittances on the labor supply, we first analyze the decision of married women to participate in the labor market and their reported hours of work conditional on participation. We incorporate methods to account for selection and endogeneity, namely instrumental Tobit models for hours worked and instrumental probit models for participation. Previous research generally finds that remittances decrease labor participation while not having an effect on hours worked. I, however, conclude that the effects of remittances vary based on gender and marital status, and that for some groups, such as married women, remittances have no significant effect on labor market participation or hours worked. For single men, the receipt of remittances decreases labor force participation by almost eight percentage points. In the population as a whole, we might see the small decline in labor force participation, but this chapter emphasizes that this effect is not equally expected across all groups of people.

In the second chapter, we analyze the effect of remittances on allocation decisions of the household, specifically focusing on the budget shares spent on various consumption goods including education, food, and utilities, among others. For the regression analyses, we use a two-part fractional logit model with Tobit-like decomposition of the marginal effects (McDonald & Moffitt, 1980; Ramalho & Da Silva, 2009). We use an IV two-step procedure to account for the endogeneity of remittances, as described in Wooldridge (2010 p. 753). Then, we calculate total partial effects that combine information from the two parts. As was the case in the earlier paper, there is reason to suspect that remittances are endogenous, and therefore, we compare results when remittances are assumed as exogenous with those when remittances are treated as endogenous. For some budget shares, the treatment of remittances as endogenous does not

change significance or direction, but for others, there are significant changes when remittances are treated as endogenous.

Included in these models is a control for the households' total expenditures. When remittances significantly affect budget shares in the presence of this control, this suggests that remittances, as a source of income, matter and refutes claims of income fungibility across income types.

Regardless of how the model is specified, increases in remittances increase home production, an interesting finding in light of the lack of significance in the labor chapter. It might be the case that the receipt of remittances decreases labor market participation (at least for single males), and these individuals replace formal labor with farming and other household chores. Remittances are also expected to increase expenditures on luxury items, such as purchasing prepared food from restaurants and vendors and using professional salon services. When remittances are treated as exogenous, education expenditure is positively associated with remittances receipts. On the other hand, participation and conditional amounts spent on grocery store purchases and water bills are negatively related to remittance reliance.

The effect of remittances on one expenditure category changes significantly between the exogenous and endogenous models. When remittances are assumed exogenous, the effect on vices is generally negative. Once we treat remittances as endogenous, participation in this category (i.e. reporting a positive value) is now positively affected by remittances.

In conclusion, we find that receipt of remittances has a more significant effect on how households spend money, but a smaller effect on labor market decisions for most demographic groups. This is an important contribution to current literature for a variety of reasons. The G8

discusses the importance of remittances for entrepreneurial efforts, and while this cannot be proven with this data, there is some evidence worth further exploration. We find, for example, that single men in particular, are less likely to participate in the formal labor market. We also find increased home production. It could be that these individuals use remittances to help support small businesses such as farming that are captured in home production but not necessarily reported as formal employment.

The micro-level effect of remittances for the welfare of recipient households is not one we should ignore. Further research on remittances, continuing to break apart demographic groups, and additional exploration of the endogeneity of remittances are all steps for future research, important as international institutions continue to examine the costs and importance of this substantial flow of funding.

## Chapter One: Labor Market Effects Of Foreign Remittances

Labor supply and the way it responds to changes in variables such as income and taxation are among the most researched subjects in economics. This is not surprising given the central role which labor plays in Classical, Neoclassical, and Keynesian schools of thought. In this essay, we examine how the supply of labor of females in long-term relationships is affected by the receipt of remittances, where remittances refer to monetary transfers from migrants to relatives in their country of origin. Such transfers may be international, as in the case of remittance flows from Jamaicans in the United States to relatives residing in Jamaica, or internal, as in the case of a household member who has relocated to a major city in search of employment and regularly remits funds to family remaining in their hometown. Although previous research has examined the effect of remittances on labor supply in the developing country context (Acosta, 2006; Bussolo & Medvedev, 2007; Kim, 2007), this paper is among the few that examines multiple years of data for Jamaica and treats remittances as an endogenous variable.

This essay focuses specifically on the labor supply of women in long-term relationships, either married or in common-law unions, for several reasons. First, although not directly comparable to other studies on labor supply in Jamaica, the approach is similar to major labor supply studies in the United States. Secondly, married women or those in long-term relationships may be more likely to receive remittances from spouses living abroad. There is an element of sacrifice that occurs which differs from households receiving remittances from a cousin, friend, or anyone else outside of the long-term relationship. Results might differ, therefore, based on the sender of these remittances.

Remittances and immigration typically follow a straightforward pattern. Individuals move from less developed areas to places with greater economic opportunity, obtain

employment, and send remittances to their native communities. For Jamaica, the case presented in this essay, these two trends are extremely pronounced. The World Bank estimates that 80 percent of Jamaica's tertiary graduates reside abroad, and the country consistently ranks among the top five countries in per capita remittance receipts (Seaga, 2006).<sup>1</sup> The combination of high migration and high per capita remittances establishes Jamaica as a good case study for research on the effects of remittances on labor supply.

For many developing countries, remittances contribute significantly to foreign cash inflow. During prosperous times in the United States, United Kingdom, and Canada, such as the 2001-2004 time period included in this study, remittances remain on a growth trajectory. The current global economic downturn, however, may negatively affect remittances, and thus a better understanding of the relationship between remittances and labor supply in developing countries is important in understanding the total effect of drops in remittances to these already struggling economies.<sup>2</sup> To reiterate, this first study examines the relationship between remittances and labor supply in good economic times, but it would be a natural expansion of the current study to look at remittance effects during both boom and bust economic times once more recent data become available.

In order for Jamaica to advance economically, it must establish and maintain a well-functioning labor market that provides proper incentives for workers. If remittances are seen as an additional source of income, then this may increase reservation wages, providing a

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<sup>1</sup> In the Jamaican Gleaner article, dated January 8, 2006.

<sup>2</sup> For example, suppose remittances decrease labor supply. In a global recession, if remittances fall, there may be an increase in the labor supply in developing countries, thus increasing unemployment and further depressing wages.

disincentive to work in Jamaica and reduce the observed supply of labor in recipient countries (Ariola, 2008; Kim, 2007).

It is plausible that the receipt of remittances affects decisions in addition to labor supply. Other variables that might be affected by remittance receipts include but are not limited to consumption (Davies, Easaw, & Ghoshray, 2009), the focus in essay two of this dissertation, as well as the trade balance, schooling and human capital development, home production, economic development, poverty and income inequality. And while this paper uses a microeconomic lens to study remittances, the view of remittances as payments that flow across international borders also implies that these micro-economic behaviors may have implications on macro-economic outcomes (Abdih, Chami, Dagher, & Montiel, 2008; Acosta, Fajnzylber, & Lopez, 2007; Chami, Fullenkamp, & Jajah, 2003; Rapoport & Docquier, 2006).

The remainder of this paper is organized as follows. The next section provides background information on the flows of remittances as well as the motivations for this study and our major contributions. We present a review of the relevant literature in the next section, followed by a discussion of the theory of remittances and labor. Next, we present the methodology used and empirical issues encountered. We then give a summary and discussion of the data, followed by results and the conclusion.

## Background

Before presenting labor theory, it is important to first understand the context of remittances and Jamaica. One of the driving forces behind the trends of migration and remittances is the economic welfare of households. Persons leave or are encouraged to leave if the household thinks that this will increase overall welfare relative to the expected level had that

person instead participated in the local labor market. Differing economic conditions in urban and rural areas, as well as between developing and developed countries, are anecdotally behind the widescale migration of labor. This migration is often followed by remittances in the short and long-run, and circular migration<sup>3</sup> in the long-run. The revolving cycle of migration is expected to persist as long as regional economic disparities continue.

For developing countries, the benefits of this migration cycle are several fold. First, the remittances themselves add to the domestic economy. Second, migrants may return with new skills and financial resources which in time may benefit other local residents who either learn from these returning residents or gain employment by working with them. Finally, migration of some workers may increase the wages of those remaining in the developing country if the drop in the supply of labor in the home country is significant.<sup>4,5</sup>

While there are benefits to the developing countries from the migration and remittance cycle, developed countries, too, may benefit. For example, the introduction of immigrant workers adds to the diversity of the labor market and provides workers willing to accept lower wages than that required by residents. There may be some ambiguity as to whether immigrants suppress wages and employment opportunities for natives in the developed country, but empirical findings suggest the opposite is true – that immigrants may have a positive or no effect on natives' job prospects (Card, 2005).

---

<sup>3</sup> Circular migration refers to the return of migrants to their countries of origin with enhanced skills, experiences, and earnings garnered in the host countries. Although not a new concept, there is growing research in this area.

<sup>4</sup> The expected change in wages depends upon the elasticity of labor supply and migration relative to the remaining labor supply. For lower skilled jobs in Jamaica, migration may not have a significant effect, but given that 80 percent of Jamaicans with tertiary degrees move abroad, the effect on skilled wages may be more significant.

<sup>5</sup> The effect of increased wages for some workers could also be a positive or negative for the developing country. Wage increases may reduce poverty but could be negative in that they cause inflation, increase businesses' labor costs, and reduce the competitiveness of the country's firms in the global economy.

To better understand the migration and remittance cycle, specifically in Jamaica, a quick overview of the immigration process is necessary. Most individuals emigrating from Jamaica for the purpose of employment usually file for permanent residency or work visas in one of three countries, the United States, Canada, and the United Kingdom. When applying for permits, the burden of proof is on the applicant to assure the local Embassies (of the United States and Canada) and high commission (of the United Kingdom) that they have sufficient economic and social ties and will not be a burden to the host economy. This process can be lengthy and expensive, evidence that the perceived benefits are great.

In Jamaica, remittances are often sent through remittance transfer companies, namely, Western Union, Jamaica National Building Society, MoneyGram, Quick Cash, Victoria Mutual Building Society, Money Express and Sun Money. Together, these firms accounted for approximately 77 percent of remittance flows accounted for in 2005. Another 16 percent of remittances are sent via traditional commercial banks, a number likely the result of many Jamaicans lacking formal bank accounts. Only 2 percent of recipients report receiving remittances through the postal service, and a surprisingly low 4 percent report receipts via friends or relatives who traveled abroad (Focal Report, 2006). The last of these numbers, remittances through mail or travelling friends and family, may be the most understated, as there is no official record of these funds by the private or public sectors.

In addition to financial remittances, individuals abroad may send in-kind remittances consisting of clothing, house wares, and school supplies, among other items. The in-kind transfers are made either through shipment containers called barrels or friends and relatives who travel abroad.



A survey by the Canadian Foundation for the Americas (FOCAL) estimates the total value of cash and in-kind remittances in Jamaica in 2005. A sample of 766 survey respondents were asked to report the average amount of remittances typically received on a single occasion and the frequency with which they received remittances. FOCAL reports the modal category of cash remittances as 6,000-10,000 Jamaican dollars (or \$100-\$161 United States dollars), selected by thirty percent of respondents, and the modal frequency of receipts as once per month (twenty-four percent of respondents). Of the 766 respondents, 43 percent reported they had received at least one barrel of goods sent from abroad. When asked the value of the contents, almost forty percent did not know or could not recall. Of those who specified a range, most indicated the value exceeded 30,000 Jamaican or \$500 United States dollars

Remittances to Jamaica exceed government assistance, and the lack of government assistance may in some respects explain the significant flow of remittances. In the next section, we provide more background on Jamaica by briefly discussing the welfare system.

### *Welfare Programs in Jamaica*

A little background on the recent history of Jamaica is relevant to understand some of the current welfare programs in place. From the end of the Second World War through the 1960s, Jamaica was a booming country growing at a steady pace of 4 percent per year (Grosh, 1992). The 1970s brought a drastic change of fortunes, with per capita GDP declining 18 percent between 1972 and 1980, likely the result of oil price shocks, political upheavals, and social reforms. To help those in need, Jamaica initially provided food directly to households, but in 1984, the government replaced general food subsidies with the food stamp program. In 2001, the government overhauled the welfare system and implemented the Program of Advancement

through Health and Education (PATH). This replaced three existing income transfer programs, the Food Stamps Program, the Poor Relief Program, and the Public Assistance Program.<sup>6</sup> PATH intends to address poverty both currently through income transfers and in the future by encouraging poor households to invest in the education and health of their children (Levy & Ohls, 2007).

Potential PATH participants must register in order to be considered for involvement. In the selection process, all applicants are assigned scores based on need, and those with the lowest scores are accepted. Welfare recipients receive a check in the mail with continued receipt contingent upon proof the child is attending school and receiving regular wellness checks at health centers. This program, however, may still not be reaching the poorest households if they fail to register, which is possible given transportation costs and lack of information. Whether remittances flow to the same households receiving PATH, making the two complements, or to households not receiving PATH, making them substitutes, is an unanswered question. As of 2007, 285,000 persons registered for PATH funds, of which 180,000 received monthly aid (Levy & Ohls, 2007). The difference between the number receiving funds and those registered, coupled with the possibility that some needy households are not even registered, leaves a significant number of people in need of additional income sources such as remittances.

### *Motivation*

Relative to average earned income and government welfare in Jamaica, remittances are a significant component of income for a number of Jamaican households, motivating the importance of studying the effects of remittances on recipients' behavior. As seen in Figure 1, real remittances grew between 2001 and 2006 before leveling off through 2008 and falling

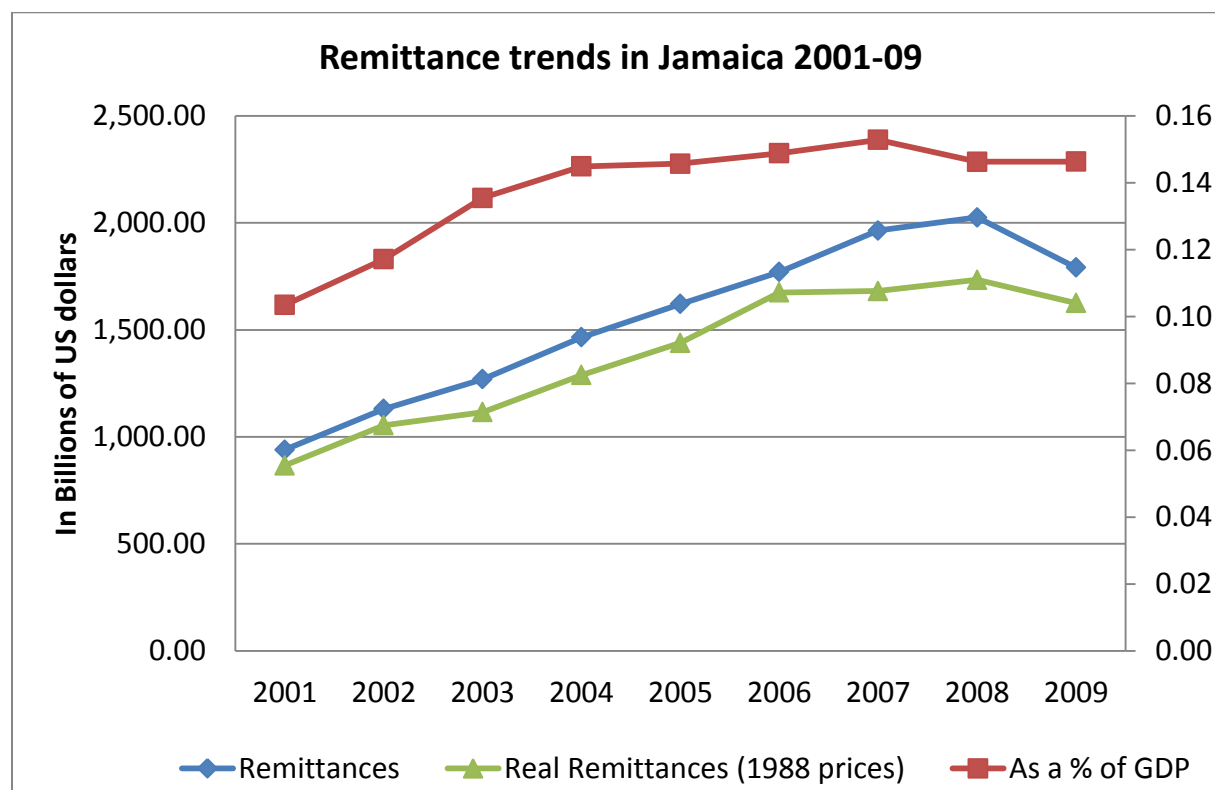
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<sup>6</sup> As of 2002 the Survey of Living Conditions was adjusted to reflect this change in the programs.

slightly in 2009, likely the result of the global recession. As a percentage of GDP, aggregated remittances consistently comprised more than 10 percent since 2001 and more than 14 percent for the last 5 years.

Figure 1

Remittance trends



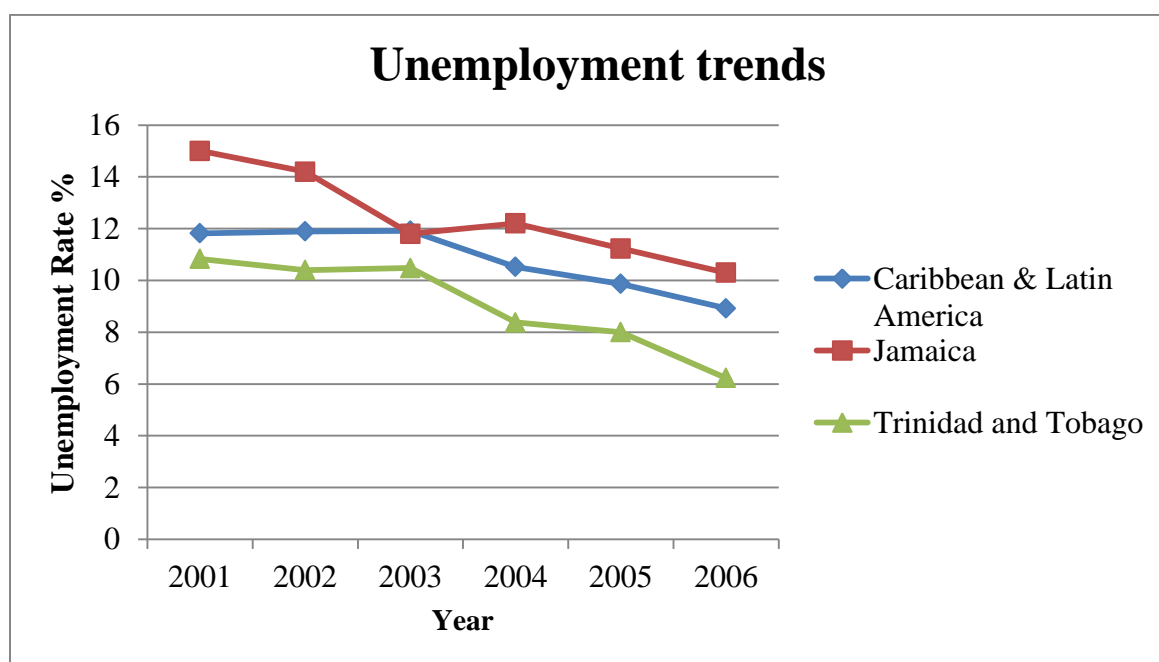
Source: Bank of Jamaica ([www.boj.gov.jm](http://www.boj.gov.jm), accessed on June 23, 2011)

This study is also motivated by the state of the labor market in Jamaica. As Figure 2 shows, Jamaica has one of the largest unemployment rates in the Caribbean region, with an urban unemployment rate of 19.4 percent for the period 1980-2000 (James Heckman & Pages, 2003). More recent data indicate that higher than average unemployment in Jamaica persists. Although the rate equaled the Caribbean and Latin American average in 2003, the decline

between 2003 and 2006 in Jamaica fell short of the region's decline, leaving Jamaica with a rate above ten percent while the rest of the region averaged nine percent. Jamaica receives greater remittances both in terms of absolute and per capita terms than other Caribbean countries, again suggesting a link between remittances and labor behavior.

Figure 2

### Trends in Unemployment



**Source:** IMF International Financial Statistics<sup>7</sup> (2009)

A third reason for studying remittances in Jamaica is the “barrel children” phenomenon. The term describes families in which the parents migrate and remit goods for the children and other family members, often in large barrels through freight services. Items shipped are often

<sup>7</sup> Countries included are: Argentina, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, Trinidad and Tobago, Uruguay and Venezuela.

those unavailable in local markets or priced significantly higher in Jamaica than comparative costs in the parents' host countries. Many Jamaicans believe, however, that the migration of parents from Jamaica has resulted in detrimental side effects for Jamaica, with the absence of parents adversely affecting children's schooling and behavior. Anecdotal evidence suggests that this is not a far-fetched causal relationship, and some empirical research suggests negative effects on children (Lu & Treiman, 2005). This negative effect, however, disappears once positive amounts of remittances are received by those caring for the children. A better understanding of the labor impact of remittances may provide information that is useful in analyzing the barrel children issue in further research.

The final motivation for this research arises from an interest in studying non-labor income in a developing country, a topic often limited by the availability of data. Examples of non-labor income include interest on savings, capital gains, welfare payments from the government, and as discussed thus far, remittances. Arguably, it is welfare payments from the government that are most analogous to remittances. While substantial research exists on the effect of non-labor income on household labor supply in developed countries, less is known about this relationship for households in less developed countries such as Jamaica.

Overall, the issue of how remittances affect labor supply is important for any developing country to understand. Changes in policies that either ease or restrict the flow of remittances could have substantial effects on labor markets and expenditures in the recipient countries. Such changes could include taxing remittances similarly to income in an attempt to make the tax system more horizontally equitable.

### *Main Contributions*

The sheer magnitude of remittance flows to a small developing country such as Jamaica, combined with the availability of data, makes Jamaica a reasonable choice for the study of remittances, as demonstrated by its frequent selection by scholars (Alleyne, Kirton, McLeod, & Figueroa, 2008; Bussolo & Medvedev, 2007; Kim, 2007; Kirton, 2005). Although the country of Jamaica is not a unique choice, the theory applied and empirical methods selected in this essay, as described in more detail below, offer a new perspective on the relationship between remittances and labor supply.

The main contributions of this paper are to provide an update of the influence of remittances on the labor market in the context of a small developing country heavily reliant on remittances and to evaluate outcomes when we assume remittances are endogenous. If we believe that remittances are to some degree determined by the wages received of the recipient or other unobservable factors that contribute both to the level of remittances and the labor of the household (such as the local labor market condition), then neglecting to account for the endogeneity of remittances may result in biased estimates. Generally speaking, the lack of information on those individuals remitting funds has prevented other scholars from implementing more advanced empirical techniques (Bussolo & Medvedev, 2007; Kim, 2007). As most of the literature does not control for endogeneity, it is important to add to the evidence with a more appropriate methodology.

To suggest remittances are endogenous, however, is insufficient without further describing the existing literature and theory pertaining to this topic. In the following section, we delve more deeply into the previous literature, elaborating on the findings and methods, before presenting our own model and estimation.

## Review of the Literature

### *The Determinants and uses of Remittances*

Research on remittances tends to follow one of two paths – either the determinants of remittances (that is, why people send money from the host countries or urban centers to others) or the uses of remittances (how recipients choose to use the money in the developing country or rural area). Only one paper, Rapoport and Docquier (2006), attempt to provide a complete picture of the impact of remittances by looking at both their determinants and uses.

The determinants literature seeks to assess the various motivations and reasons for sending remittances. In one such paper, these reasons are grouped into two broad categories: individualistic and familial motivations (Rapoport & Docquier, 2006). The individualistic motives are essentially driven by self-interest, although there is some element of other-regarding preferences that come into play. This set of motives includes altruism and inheritance motives, where individual remitters have a vested interest in sending remittances. (Perhaps they wish to inherit property following a family member's death). The familial arrangements are either insurance or investments intended to reduce household income uncertainty or to expand total household income respectively, where some informal 'contract' is agreed upon prior to migration. Such agreements are potentially huge in Jamaica given that migration is expensive and may be subsidized by relatives with the explicit understanding of repayment in the future.

Another study by Stark and Lucas (1985) classifies the reasons for remittances into three categories rather than two, namely: pure altruism, pure self-interest, and tempered altruism / enlightened self-interest. In this case, the third is not merely a combination of the first and second but involves the formulation of an informal contract between the migrant and family in

the home country, similar to that in the familial arrangement motivation mentioned above. This contract may require the migrant to remit to the household in repayment of the household's investment in the migrant, whether in the form of funding migration costs or providing education for the migrant.

The determinants discussed above are microeconomic in nature, but some authors have suggested macroeconomic determinants such as exchange rates, interest rates and wage (or income) differences (Alleyne, et al., 2008). While interesting, we omit these macroeconomic determinants, given their lack of variability across individual recipients in the same nation. These variables affect how much the country receives in total remittances but may not explain person to person differences, our primary area of interest in this essay.

In addition to existing studies on the motivation behind remitting, a second literature examines the effects of remittances on recipients' behavior. Like other forms of transfers, the aim of remittances is expected to alleviate the economic hardships of recipients. Any resulting economic growth for the native country is of secondary concern to the donor and recipient. Therefore, we assess the impact of remittances at the microeconomic level, where we focus on the household units (Acosta, 2006; Adams, 2006).

### *The Microeconomic Effect of Remittances on Labor Supply*

Although there are several studies specifically on how the receipt of remittances influences labor, empirical results suggest a relatively large range of effects (Acosta, 2006; Bussolo & Medvedev, 2007; Kim, 2007). In this section, we will summarize existing work, compare the findings, and highlight factors that may explain why previous findings can be improved upon.



Remittance transfers ensuing from migration are expected to affect labor supply in two ways (Acosta, 2006; Kim, 2007). First, migration implies an immediate decline in the labor supply for the home country, often referred to “brain drain.” Legal migrants are not randomly selected (Borjas, 1987) and tend to be more educated than the average individual from a developing country. Better skilled individuals are able to more easily satisfy the requirements to work abroad and are therefore over represented in the migrant population. The selection process ensures that the most talented migrants are eligible for work permits. Because educated individuals in the developing country are also more likely than others to be employed if they remained in the developing country, albeit it at lower wages than if they relocated, their relocation significantly affects the quality and quantity of the labor force remaining.

Potentially negative changes in the labor supply of the developing country may be partially offset by the receipt of remittances and theoretically higher wages for those that remain, particularly those that are educated, if this group is disproportionately affected by a loss in labor market competition. Such flow of labor may also be advantageous to the developing countries, where shortages, such as those in nursing, may be filled by foreign-born individuals (Buerhaus, Staiger, & Auerbach, 2003). This movement of labor across countries is the main subject of the “new economics of migration,” a school of thought that focuses on mutually beneficial aspects of labor flows at both the microeconomic and macroeconomic levels (Massey et al., 1993).

Migration may also result in a second wave of decreased labor supply. Once the migrant is settled in the host country, she may then decide to send proceeds from her employment back to her home country in the form of remittances. When this money is received, it can be treated as any other non-labor income, with the usual income and substitution effects resulting in increased consumption and leisure (if leisure is treated as a normal good), and hence an unambiguous

decline in labor. Such theory, however, ignores the complexity of remittances, particularly if motivated by investment. Suppose that the remittances are used for investment and business expansion purposes by the recipient, in which case remittances could actually be associated with increased labor if the result is a larger, stronger entrepreneurial effort. A negative relationship between remittances and labor supply predicted by simple economic models is not a foregone conclusion, and many scholars have attempted to measure both the direction and magnitude of this relationship.

Ariola (2005) determines that like other sources of unearned income, remittances reduce total labor hours. He estimates income elasticity in the range  $-0.006$  to  $-0.03$ . Similarly, Kim (2006) finds a 3.6 percent reduction in hours worked due to remittances, and this remains robust to cross-sectional and panel data specifications. Bussolo and Medvedev (2007) use a general equilibrium model and also find an overall negative effect of remittances on labor force participation for Jamaica. Acosta (2006) concludes that there are negative effects of remittances on labor for females, but remittances are positively related to labor supply for middle-aged men, suggesting that remittances may be creating work opportunities in self-employment.

Kim (2007) separates the decision to enter the labor market from the decision of hours worked. Specific to Jamaica, a country with increasing real wages coupled with persistently high unemployment, Kim (2007) determines that hours per week conditional on working does not differ between households across remittance status, but that the receipt of remittances reduces the probability of entering the labor market, thereby reducing total hours worked for the country. This may reflect workers' inability to freely vary hours of work, often confined to non-optimal part-time or full-time hours. Kim (2006) claims in a previous paper that the receipt of remittances appears to increase the reservation wage, and recipients of remittances are therefore

less likely to work. Coupled with increased migration of skilled labor, increased remittances seem to exacerbate the phenomenon of high wages along with high unemployment, a symptom of a poorly functioning labor market (Kim 2006).

Kim (2007, 2006) and Bussolo and Medvedev (2007) each use Jamaica as a case study, making their findings most relevant to the current paper. Their findings, however, differ, perhaps a result of differences in methodology. Kim (2006, 2007), for example, does not adjust for the endogeneity between wages, non-earned income such as remittances, and hours worked. Failing to correct for this problem in OLS models could bias results (Heckman, 1974).

Several studies looked at additional effects of remittances on household behavior. Lu and Treiman (2007) find that benefits may accrue for black children in South Africa who are in households receiving remittances, controlling for expenditures on education. Specifically, the researchers find lower levels of child labor in households receiving remittances (Lu & Treiman, 2007). (They also find that children in households where a parent has migrated but has not remitted funds may be worse off than children in non-migrant households because of the negative effect of out-migration without the positive economic effect.) Overall, while remittances reduce labor supply, the finding that remittances reduce *child labor* is probably one instance in which a reduction in labor is a positive change.

The importance of understanding how remittances affect labor supply is essential for governments interested in changing policies that permit the flow of remittances. For example, if we link remittances to labor supply changes, then policies that either ease or restrict the flow of remittances could have substantial impacts on both households and the economy as a whole. In

the next section, we further elaborate on the role of remittances as a non-labor income source for households and the relevant research.

### *Remittance as a form of Income Transfer*

Remittances are often excluded from labor supply research because of their small effect on labor in developed countries. However, the receipt of remittances in developing countries is sometimes a major part of income and can affect the long term growth path of developing countries (Giuliano & Ruiz-Arranz, 2009) . While labor supply studies in developed countries understandably omit remittances, revision of theoretical and empirical approaches may be needed when looking at less developed countries.

In the case of Jamaica, evidence seems to suggest that there is a greater reliance on remittances than government aide. On average, government transfers are reported by eight to ten percent of households, and for these recipients, the transfers account for 59 percent of their total expenditure, according to data from the Survey of Living Conditions. On the other hand, approximately sixty percent of households receive remittances and for these recipients, remittances represent almost 30 percent of total expenditure.

Receipt of remittances is also distributed more equally across income groups than government assistance, as we would expect. In Table 1, the population is divided into quintiles based on annual expenditures. Receipt of government assistance, known in Jamaica as PATH, decreases with expenditures. Receipt of remittances, however, varies from 59.97 to 62.54 percent.

The failure of the welfare system in Jamaica to reach the neediest households has been documented by past research (Levy & Ohls, 2007). The hope is that the relatively new PATH

program will do a better job than its predecessors, but the data suggests that of the lowest income households, less than 20 percent receive funding, while a small fraction of the wealthiest households still do. This means remittances may remain as the key income source for some of these lower income households.

Table 1

Distribution of Welfare and Remittance Receipts by Expenditure Quintiles

	Expenditure Quintile				
	First	Second	Third	Fourth	Fifth
Path Recipients	17.89%	13.18%	11.52%	9.81%	4.74%
Remittance Recipients	61.19%	59.97%	62.54%	61.03%	61.48%

Source: Author's calculation from The Jamaica Survey of Living Condition.

### Theoretical Model of Labor Supply.

#### *Level of Decision Making*

One of the key considerations in labor market studies is the level of decision making. In the literature, we usually look at either a unitary utility function or a collective utility function (Chiappori, 1992). The unitary utility approach treats the household as one agent with one set of preferences. Collective utility, on the other hand, allows for different preferences within the household with each member relying on the other(s). Although the decisions to work and how much to work are influenced by the entire household, we still observe the agents individually. Since we are interested in the observed behavior rather than the actual decision process, it seems logical to use individual labor supply functions for each agent in the household, following the decision by at least one major labor supply study (Luethold, 1968). Interdependence between

household members is still factored into the model, however, by controlling for the spouse's income.

The household's problem is to:

$$\text{Max}U(C, L^i) \text{ subject to } N + W(T^i - L^i) = PC \text{ and } T^i = H^i + L^i \quad (1)$$

where,  $C$  is household consumption spending, the remittance benefit is included in  $N$ , non-labor income,  $W$  is the wage rate,  $T^i$  is the total non-sleep time endowment of person  $i$ ,  $L^i$  is person  $i$ 's leisure hours, and  $H^i$  is person  $i$ 's hours worked.

Assuming Cobb Douglas preferences, a well behaved utility function is given by:

$$U(C, L) = C^\alpha L^{1-\alpha} \quad (2)$$

Where,  $C$  is consumption of goods and services within a year, and  $L$  is leisure.

This is subject to time and financial constraints given by:

$$wL + pC = wT + (1 - t)R \quad (3)$$

where,  $wL$  is Leisure times its price and  $pC$  is Consumption times prices of goods and services.

On the income side,  $wT$  is wage times total time available to the household and includes the opportunity cost of working and  $(1-t)R$  is remittances net of transaction costs.

Solving for  $C$  and  $L$ , we set up the following Lagrangian function:

$$L = C^\alpha L^{1-\alpha} - \lambda[WL + PC - WT - (1 - t)R] \quad (4)$$

The first order conditions are given by:

$$\frac{\partial L}{\partial C} = \alpha C^{\alpha-1} L^{1-\alpha} - \lambda p \quad (5)$$

$$\frac{\partial L}{\partial L} = (1 - \alpha) C^\alpha L^{-\alpha} - \lambda w \quad (6)$$

With the third being the budget constraint.

Equating the  $\lambda$ s from (6) and (7) and substituting into (4) yields the following:

$$\frac{\alpha}{p} \left(\frac{L}{C}\right)^{1-\alpha} = \frac{(1-\alpha)}{w} \left(\frac{L}{C}\right)^{-\alpha} \quad (7)$$

$$\frac{L}{C} = \frac{(1-\alpha)}{\alpha w} P \quad (8)$$

$$L = \frac{(1-\alpha) p C}{\alpha w} \quad (9)$$

$$L = \frac{(1-\alpha)}{\alpha} \frac{(wT + (1-t)R - wL)}{w} \quad (10)$$

$$\alpha w L = (1-\alpha)(wT + (1-t)R - wL) \quad (11)$$

$$L^* = (1-\alpha)T + (1-\alpha)(1-t)\frac{R}{w} \quad (12)$$

and

$$C^* = \frac{W}{P} (1-\alpha)T + (1-\alpha)(1-t)\frac{R}{p} \quad (13)$$

The optimality conditions provide an idea of the determinants of optimal leisure and consumption. In the case of consumption, individuals increase consumption following increases in real income, regardless of whether from earned income (wages) or remittances. The extent to which the two income streams affect consumption, however, is analyzed in the following essay.

More relevant to the study at hand, however, is the optimality condition in Equation (12). It suggests optimal leisure is positively related to time endowments, as to be expected. Increases in wages, or the price of leisure, decreases leisure, and increases in remittances increase leisure, *ceteris paribus*. It is important to note that both remittances and wages need to be among the explanatory variables as it is their ratio that matters most. An individual receiving \$100 in remittances while facing a wage of \$5 per hour will choose the same amount of leisure as an individual with identical preferences receiving \$20 in remittances and earning a wage of \$1 per hour.

In the sections that follow, we develop an empirical approach that estimates the effects of remittances and wages (along with welfare payments not presented in the theoretical model) on labor, the difference between time endowments and leisure. Additional covariates including household composition and household head characteristics are included as controls and assumed to affect  $\alpha$ , the household's weighting of consumption versus leisure in its utility function. Before providing this model, however, we first detail our empirical approach and additional econometric problems addressed in this analysis.

### Empirical Issues

A number of problems arise when estimating labor market participation and hours worked. Selecting the appropriate method is possible only after considering the empirical issues



that might arise. As a result, this section is dedicated to discussing empirical issues, and the following section identifies methodologies which properly address these concerns.

### *Self-selection*

The first potential problem is self-selection. Self-selection bias arises from the use of either a truncated or a nonrandom sample of variables to estimate the treatment effect for the entire population. The self-selection in labor models is well documented (James Heckman, 1974; J. J. Heckman, 1979). Wages, the decision to work, and hours worked cannot be viewed as independent of one another.

### *Endogeneity of Key Variables*

A second problem is the potential endogeneity of some of the key explanatory variables. Firstly, wages are likely endogenous in the hours worked equation (Mroz, 1987). One source of this endogeneity is an omitted variable, such as ability, which is correlated with not just hours of work but also the potential wage rate of the individual. It is also possible that there is an element of reverse causality between wages and hours worked, if individuals willing to work full-time or over-time are rewarded with higher wages.

Second, remittance receipt is likely endogenous as well, also a result of omitted variables. For example, poor health by the recipient may encourage migrants to send remittances and cause the recipient to work fewer hours. The decrease in hours worked, however, is not strictly due to the remittances. The appropriate model will instrument for remittances and determine the extent that this potential source of endogeneity exists.

A third variable in our model of labor supply which may be endogenous is wife's education. This is because missing ability and aptitude may affect participation in the labor market as well as hours worked for those who do participate.

To effectively handle the endogeneity, we need variables which correlate with each of the endogenous variables but are not correlated with labor supply, except through other variables already in the regression. The criteria, while straight-forward, are not easy to satisfy, although we propose instruments for each of the endogenous variables in the Methodology section.

### The Methodology

The nature of the dependent variables, labor market participation and hours worked, combined with the problems outlined in the previous section, require careful selection of an econometric approach. We begin by adapting an older and often relied upon labor supply model (Mroz, 1987).

#### *Labor Force Participation*

Our first model begins with a simple linear probability model predicting the effects of select covariates on labor force participation. We then progress to a probit model, which more appropriately depicts the distribution of the dichotomous dependent variable. Finally, we introduce instruments for the endogenous variables discussed in the early section.

We then can define labor force participation (LFP) as:

$$LFP = \begin{cases} 0 & \text{if person } i \text{ is unemployed and is not seeking employment} \\ 1 & \text{if person } i \text{ is employed or unemployed but looking for a job} \end{cases} \quad (14)$$

The probability of being in the labor force is then given by:

$$\Pr(LFP = 1|X) = \frac{\text{EXP}(X\beta)}{1 + \text{EXP}(X\beta)} \quad (15)$$

where  $X$  includes wife's education, total remittances, property income, kids 5 years old and under as well as kids 6 and over, wife's age and wife's age squared and wife's work experience.

### *Hours of Work*

The second dependent variable is hours worked. The static hours worked equation can be given as:

$$H_i = \beta_0 + \beta_1 X_i + e_i \quad (16)$$

$$\ln(\text{wage}_i) = f(Z_i)$$

$$\text{Remit}_i = f(Z_i)$$

$$\text{WE}_i = f(Z_i)$$

where  $H_i$  is hours worked per week by the women in a long term relationship, and the vector  $X_i$  includes: total remittances, the natural log of the woman's wage, wife's education, kids 5 and under (separated into own child versus other); kids 6 and over (again separated into own child versus other), property income, wife's age and wife's age squared. The endogenous variables are logged wage, total remittances, and wife's education and are presented above in their reduced

form as a function of all exogenous variables,  $Z_i$ . The  $Z_i$  vector also includes two variables which are not included in  $X_i$ , namely: non-biological children in the home who are 5 and under and the number of non-biological children 6 and over, as well as the instrumental variables, average remittances to others in the enumeration district, husband's education, and participation in the job market 5 years ago. These variables serve as the exclusion restrictions.

The following section further discusses the usage of these instruments.

### *Instruments*

Although we have discussed possible endogeneity and briefly introduced the instruments we will use, this section is devoted to further elaboration on these instruments. For remittances, Acosta (2006) uses village level characteristics, such as the propensity of migration, to instrument for remittances (Acosta, 2006). Districts with a history of high migration are expected to be positively correlated with remittance receipts but not necessarily correlated with their dependent variable, in that case, child labor. Abdih, Chami et al (2008) estimate the causal relationship between home country institutions, such as the level corruption, and remittances (Abdih, et al., 2008). They use whether or not the area is located in the coastal regions. If yes, then this is expected to be positively correlated with remittances and not necessarily correlated with the level of corruption

For remittances, we use the sum of remittance receipts in the enumeration district, a geographic district created for political purposes. We then subtract the household's own remittances from that total, and average this value based on the number of other household's in the enumeration district. This value likely reflects the migration from an area. It may be correlated with a household's level of remittances received but not necessarily participation within the labor market.

Two additional variables are endogenous in the hours worked model. First, wage is endogenous, again a result of omitted variables. We include work experience in the labor market as an instrument for wage. The second endogenous variable is the wife's education, as a factor such as ability is likely correlated both with education and labor market participation. Therefore, we use husband's education as an instrument. Although not a perfect instrument (Wooldridge 2002), a preferable instrument is not available and using husband's education is a common solution.

Having briefly discussed the methods, we now introduce the available data, including the variables used and potential instruments, and present summary statistics for the sample.

### The Data

We use two data sources, namely the Survey of Living Conditions (SLC) and the Jamaican Labor Force Survey (LFS). The SLC in Jamaica began in 1988 as part of a larger study of living standards in developing countries, with a greater emphasis on evaluating immediate effects of public policy (Development Research Group 2002). The data collection and sampling frame of the SLC are based on the larger LFS. From the LFS, a smaller sample is randomly selected for inclusion in the more detailed Survey of Living Conditions. The Survey of Living Conditions is administered by the Statistical Institute of Jamaica, but the principal investigator is the Planning Institute of Jamaica, both governmental departments. Surveyors ask questions pertaining to education, crime, and health, but specific modules also focus on food and non-food expenditures as well as remittances.

Though the surveys are conducted quarterly (January, April, July and October) with the SLC conducted one month after each round of the LFS, the quarter that is considered most stable

is the April quarter. For this reason, the data used for the official labor force statistics and in our analysis are from the April quarter. Key to our analysis is that the Survey of Living Conditions collects information on remittances. Using data from 2001-2007, we can assess the characteristics of those households receiving remittances and look at differences in labor supply behavior between those families receiving remittances and those not receiving remittances. The household identification variable is used to link the Survey of Living Standards to the Jamaican Labor Force Survey.

The data are self-weighted, meaning that the means and other statistics from the sample in the survey can be taken to reflect the entire population without the need for sample weights. However, even the best of samples still suffers from missing data issues which affect this self-weighted attribute. This self-weighted feature remains true for all the years after using ‘raising factors’. These raising factors are made up of two sample weights: first, to account for non-response, an enumeration district weight (edwght) is used, and secondly in order to improve the parish representativeness, a parish weight (parwght) is used.

### *Data Cleaning*

Given that the data span several years, our task is complicated by changes in the survey over time. For instance, the Statistical Institute of Jamaica revised the labor force questionnaire in 2004, and thus, we readjust certain variables in the later years to make them compatible with 2001-2003 data. In some instances, the change amounts to a renaming of the variable. For example, some variables are named according to the question number, and when the survey adds or deletes questions, the names of these variables change. Specifically, the question: “What were you doing during the survey week?” is question 21a in 2004 but question 21 in previous years.

Similar adjustments are needed for almost all variable names when merging the 2001-03 and 2004-2007 data.

Other changes in the survey require more effort to address. Some variables changed types over the years, going from a categorical variable to a numerical (interval) response. One such question important in this paper's analysis is "How many hours did you work during last week?" Even though the question remains the same, it was recorded as a categorical variable (None, less than 9 hours, 9-16 hours, 17-24 hours, 25-32 hours, 33-40 hours, 41-49 hours, and over 49 hours) in 2001-2003, but as a numerical variable starting in 2004. For years 2001-2003, the following process is used.

Within each category, a normal distribution is assumed. Respondents are then randomly assigned a value within the category, with the largest probability that they receive the mean hours worked from the category indicated. The only exception to this procedure is the category 33-40 hours, where clustering likely occurs at 40 hours per week. As a result, we do not assume a normal distribution within this category and skew the distribution such that respondents have a near one probability of working 40 hours per week.

In 2005, 2006, and 2007, the survey questions pertaining to remittances were also changed. Surveyors started asking respondents to provide more detail on the source of their remittance receipts. In addition, the 2006 survey included a module focused on remittance, and hence, additional questions were asked this year. The main difference, however, is that households were asked to distinguish between cash and in-kind transfers when answering each of the questions below. Relevant questions to calculating remittances are provided in Table 2.

Table 2

## Remittance Questions from the SLC by Year

2001-2004 Surveys	2005 and 2007 surveys	2006 Survey
Have you received income within the last 12 months from:		
Support for Children from parents who live elsewhere?	Support for Children from parents living in Jamaica?	Support for Children from parents living in Jamaica?
Other relatives and friends who live in Jamaica?	Support for children from parents living abroad	Support for children from parents living abroad
Other relatives and friends who live in abroad?	Spouse/Partner who lives in Jamaica?	Spouse/Partner who lives in Jamaica?
	Spouse/Partner who lives in abroad?	Spouse/Partner who lives in abroad?
	Children who live in Jamaica?	Children who live in Jamaica?
	Children who live abroad?	Children who live abroad?
	Other relatives and friends who live in Jamaica?	Other relatives who live in Jamaica?
	Other relatives and friends who live in abroad?	Other relatives who live in abroad?
		Friends who live in Jamaica?
		Friends who live in abroad?

*Outliers*

Although the frequency of outliers in this dataset is not common, a few outliers may skew the data, and as such, are removed from the sample. To do this, we use the following method, viewed by most as a conservative means to identify outliers. First, we estimate the regression



with all observations included. Then, we obtain the residuals from this model and eliminate the observations if the residuals prove to be outliers. In STATA, this is accomplished using the DFBETA command. Out of all observations used in this analysis, this method removes only 6 outlying observations.

### *Summary Statistics*

Before presenting results, it is important to first describe the data. Again, we are interested in the effects of remittances on labor market outcomes for women indicating non-single status. Some of these women are officially married, but common law marriages are also common in Jamaica, and thus, this study includes both set of women as those in long-term relationships.

The summary statistics are provided in Table 4, but first, we include a description of each variable in Table 3. Several of the variables do not take on the customary interpretations. For example, one only needs to be looking for work – and not necessarily looking for work – to be counted in the labor force participation. Second, previous work experience refers to whether or not the female participated in the labor force five years ago, either at the same job or a different job. It does not represent the number of years worked.

Table 3

## Variable Definitions

<b>Labor Force Participation</b>	Is 1 if respondents report that they are working or whether they are not working and looking for jobs. Based on variables q21, q21a and q24, on the labor force survey.
<b>Wife's Hours Worked per Week</b>	Is based on variable q33 in the LFS, the number of hours usually worked per week.
<b>Wife's Wage per Hour</b>	Is calculated by first converting total income (whether weekly, monthly or yearly) and then dividing by the hours worked last week (variable q35 in the LFS)
<b>Total Remittances (In 000's of USD)</b>	Is the sum of all remittances received by the household.
<b>HH's Kids 5 and under</b>	Is children of the Wife who are 5 years old and younger.
<b>HH's Kids 6 and over</b>	Is the number of children of the wife who are 6 years old and older.
<b>Other Kid's 5 and under</b>	Is the number of children 5 and under who are not the biological children of the household heads.
<b>Other Kid's 6 and Over</b>	Is the number of children 6 and over who are not the biological children of the household heads.
<b>Wife's Age</b>	Is the age of the wife.
<b>Wife's work experience (Previously worked=1)</b>	Is 0 if wives report having worked 3 or less months in current job, 1 if between 3 to 6 months, 2 if between 6 to 9 months, 3 if between 9 to 12 months, 5 if between 1 to 2 years, 8 if between 2 and 5 years and 12 if 5 years and over. This is based on q311 in the LFS.
<b>Wife's Education</b>	Is the highest degree earned by the wife based on variable q322 on the SLC. It is 0 if no form of certification, 1 if high school subjects passed is at the basic level, 2 if 1-2 Caribbean Examination Council exams (CXC's) are passed at the general level, 4 if 3 to 4 CXC's at the general level, 6 if 5 or more CXC's, 8 if 1-2 UK-based General Council Examinations (GCE), 9 if 3 or more GCE's and 12 if the respondent has a university degree.
<b>Property Income</b>	Is total family labor income minus the wife's labor income.

Table 4 describes the sample of all women in a serious, long-term relationship regardless of remittance receipt. Additional tables provide information specifically for remittance recipients and non-recipients.

From the summary statistics, we find that the reported average hours worked is one and a half hours less per week for recipients of remittances, and that conditional on having received remittances, the average amount is more than \$910 per year. There are, however, significantly more children, on average, in households receiving remittances. Remittance recipients are less educated and can expect lower wages in the labor market, on average. Recipients are generally older, have less in property income (family income less the wife's income), and report less in total household consumption.

Table 4  
Summary Statistics for Women in a Relationship

All Married Women or Women on Common	Obs	Mean	Std. Dev.	Min	Max
Law Unions					
Labor force Participation(=1)	5,574	0.58	0.49	0.00	1.00
Wife's weekly hours	3,254	40.31	9.64	3.00	60.00
Wife's wage	5,570	0.34	0.54	0.00	4.05
Total Remittances (In 000's of USD)	5,517	0.50	1.52	0.00	47.65
HH's Kids 5 and under	5,574	0.39	0.66	0.00	4.00
HH's Kids 6 and over	5,574	0.94	1.21	0.00	8.00
Other Kid's 5 and under	5,574	0.16	0.52	0.00	6.00
Other Kid's 6 and Over	5,574	0.30	0.79	0.00	9.00
Wife's Age	5,574	44.12	15.30	4.00	96.00
Wife's Education (Highest Degree)	5,574	0.58	2.22	0.00	12.00
Property Income	5,563	3.26	5.57	0.00	75.70
Instruments					
Wife's work experience	5,574	5.81	5.54	0.00	12.00
Average Remittances in District (in USD '000S)	5,517	0.73	0.95	0.00	10.40
Husband's Education (Highest Degree)	5,574	0.43	1.96	0.00	12.00

Table 5

Summary Statistics for Married Women who are Remittance Recipients

<b>Married Women who are recipients</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Labor force Participation(=1)</b>	3,028	0.54	0.50	0.00	1.00
<b>Wife's weekly hours</b>	1,653.00	39.69	10.11	3.00	60.00
<b>Wife's wage</b>	3,027	0.32	0.52	0.00	2.75
<b>Total Remittances (In 000's of USD)</b>	3,019	0.91	1.97	0.00	47.65
<b>HH's Kids 5 and under</b>	3,028	0.38	0.67	0.00	4.00
<b>HH's Kids 6 and over</b>	3,028	0.90	1.20	0.00	8.00
<b>Other Kid's 5 and under</b>	3,028	0.23	0.60	0.00	6.00
<b>Other Kid's 6 and Over</b>	3,028	0.42	0.92	0.00	9.00
<b>Wife's Age</b>	3,028	46.28	16.23	6.00	96.00
<b>Wife's Education (Highest Degree)</b>	3,028	0.45	1.94	0.00	12.00
<b>Property Income</b>	3,024	3.21	5.33	0.00	75.70
<b>Instruments</b>					
<b>Wife's work experience</b>	3,028	5.47	5.58	0.00	12.00
<b>Average Remittances in District (in USD '000S)</b>	3,019	0.81	1.03	0.00	8.16
<b>Husband's Education (Highest Degree)</b>	3,028	0.34	1.72	0.00	12.00

Table 6

Married Women who are not Recipients of Remittances

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Labor force Participation(=1)</b>	2,498	0.62	0.48	0.00	1.00
<b>Wife's weekly hours</b>	1,573	40.93	9.10	4.00	60.00
<b>Wife's wage</b>	2,495	0.36	0.57	0.00	4.05
<b>Total Remittances (In 000's of USD)</b>	2,498	0.00	0.00	0.00	0.00
<b>HH's Kids 5 and under</b>	2,498	0.40	0.65	0.00	4.00
<b>HH's Kids 6 and over</b>	2,498	1.00	1.23	0.00	7.00
<b>Other Kid's 5 and under</b>	2,498	0.08	0.37	0.00	6.00
<b>Other Kid's 6 and Over</b>	2,498	0.16	0.56	0.00	7.00
<b>Wife's Age</b>	2,498	41.57	13.66	4.00	89.00
<b>Wife's Education (Highest Degree)</b>	2,498	0.73	2.51	0.00	12.00
<b>Property Income</b>	2,491	3.35	5.86	0.00	69.18
<b>Wife's work experience</b>	2,498	6.24	5.48	0.00	12.00
<b>Average Remittances in District (in USD '000S)</b>	2,498	0.62	0.84	0.00	10.40
<b>Husband's Education (Highest Degree)</b>	2,498	0.53	2.23	0.00	12.00

As already indicated, the dependent variables in this analysis are hours worked and labor force participation and the primary variable of interest is the level of remittances received. Additional variables, however, are included in the model, and although presented in the tables above, have yet to be formally introduced. Such variables include age, education of the head of household, and other sources of income for the household. Household characteristics, including the number of children under age 5 and over age 6, and household consumption are also included in the model.

#### *Testing the Reliability of Reported Remittances*

We test the accuracy of the remittance data by extrapolating from the figure in the survey to a figure that would represent the population of Jamaica and compare this figure to those reported by the Bank of Jamaica and the International Monetary Fund. Both these institutions report the in-cash transfers of remittances based on the level of the financial flows reported by transfer agents.

To compare the remittance figure from the survey and Bank of Jamaica, we first multiply the average level of remittances received by households in the survey by the number of households in Jamaica as reported in the 2001 census. We then create a ratio of this figure to that of the Bank of Jamaica, where the higher the ratio indicates more accurate reporting of remittances.

Based on this calculation, the remittance figures from the household survey are underestimated between 25 and 80 percent. The upper limit of this range is close to the 77 percent underreporting of remittances found for Armenia (Roberts, 2004) and average of this

range is close to the more than fifty percent underreporting of remittances in Mexico (Acosta, 2006).<sup>8</sup>

Table 7 gives a summary of the total remittances from the survey data as well as from the Bank of Jamaica. As can be seen, the survey responses grossly underestimate the level of remittances calculated by the Bank of Jamaica. However, the Bank of Jamaica's figures include all types of transfers from migrants, including funds from migrants which are not necessarily intended for the recipient. For example, it is very common for migrants from Jamaica to remit money to build houses in their native country. Family members receive the transfer but use the money to pay for construction. This will not be recorded in the SLC because of the questions' wording. The money was not sent "for" the recipient. Instead, the SLC questions ask whether the respondent receives support through remittances. Depending on the level of transfers intended for investment on the sender's behalf, it could be the case that the Bank of Jamaica overstates the level of remittances received in any given year.

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<sup>8</sup> Reported by the IMF using international flow of funds.

Table 7

Remittances from Survey and the Bank of Jamaica

<b>Year</b>	<b>Sample mean</b>	<b>Number of hhs.</b>	<b>Total Population</b>	<b>Estimated Remittances (in US\$ mns)</b>	<b>Bank of Jamaica Figure (in US\$ mns)</b>	<b>As a % of BOJ figure</b>
<b>2001</b>	945	748,000	2,612,500	707	940	75.19%
<b>2002</b>	779	752,063	2,624,700	586	1,131	51.81%
<b>2003</b>	366	756,905	2,641,600	277	1,270	21.83%
<b>2004</b>	838	757,766	2,644,604	635	1,466	43.31%
<b>2005</b>	388	761,232	2,656,700	295	1,621	18.20%
<b>2006</b>	505	764,900	2,669,500	387	1,771	21.83%
<b>2007</b>	500	768,510	2,682,100	384	1,964	19.57%

Survey data on income (and by extension remittances) has been shown in to suffer from a variety of issues (Deaton, 1997). The main ones include recall bias, seasonality (where income questions requested over the course of a year while consumption questions are framed as daily or weekly) and long questionnaires which can lead to respondent's fatigue. Additionally, remittances are prone to underreporting because it requires knowledge of not just the cash portion but also in-kind transfers in the form of goods, something for which the recipients may not know the full value.

Because of the costs involved in ensuring that income and remittance data is accurate, there is reason to believe the problem of underreporting will persist, especially for poor countries. This creates a need to use certain adjustments to existing data in order to correct for

underreporting, something much of the previous research has failed to do (Grigorian, Melkonyan, & Shonkwiler, 2008).

Approximately 1000 respondents report receiving remittances when asked a yes or no question about outside income sources but later refused to provide a value for these remittances (or reported a value of zero). Assuming the first indication of remittances is true, we use a regression approach to predict the true value of remittances for these missing values. Positive remittance values are regressed on district level remittances, school expenditures as a share of total expenditures, age, and residing in an urban area. Predicted values for all households are generated. A new variable is then created, equal to reported remittances if the value is positive, zero if the household reported zero remittances and indicated no, they did not receive remittances, and the imputed value if the household reported no remittance amount but indicated yes, they received remittances. This method fails to account for general underreporting (for instance, reporting \$1,000 when the true receipt is \$5,000) and the possibility that some households reported receiving no remittances when they in fact did, but is still seen as a general improvement to using remittance amounts as reported during the survey. Interestingly, remittance as a share of GDP and income as a share of GDP are fairly close to the value of these two variables calculated using IMF statistics for Jamaica, indicating that the underreporting may uniformly affect both remittances and income. This finding gives some credibility to using the share of remittances to total expenditure as the key explanatory variable of interest, which we do in Chapter 2.



## Hypotheses

In this section, we build a set of testable hypotheses based on findings in previous research (Acosta, 2006; Moffitt, 2002; Mroz, 1987) and general intuition. First, we consider the theoretical effect of all of the variables in the outcome equations, labor force participation (Equation 15) and hours worked (Equation 16).

Given the research question, how do remittances affect labor market outcomes by women in relationships, the most important variable is remittances. Based on the literature review earlier in this paper, we expect remittances to negatively affect average hours worked. Receipt of remittances, *ceteris paribus*, generates an income effect, where recipients can consume more goods and more leisure with fewer hours worked. For individuals on the cusp of not working before remittances, receipt of remittances may generate enough of an income effect to make no hours worked (or non-participation in the labor market) their optimal choice. We expect that the larger the remittances received the lower the hours worked relative to those who do not receive remittances and the less likely someone is to participate in the labor force.

Additional variables are worth discussing. Having children five and under in the household may have an effect on labor force participation and hours worked, but the effect could be ambiguous. On the one hand, having children may increase the work effort in order to provide financially for them, but on the other hand, it may reduce work effort if the parent is forced to stay home and act as primary care giver. Here again, the gender of the household agent of interest may be important. Male heads of household may be more likely to work while female heads may be more likely to stay home and care for young children. Because this study looks exclusively at females, we expect the second effect, a decline in labor market participation to

dominate. For children over age five and thus in school, we expect that females have more time to enter the labor market, and thus, this variable is less ambiguous.

The indicator for having an older parent in the home may also be ambiguous for similar reasons. Depending on the health of the parent, an individual may be forced to stay home and care for the parent or work more to help provide basic necessities for the parent. If the parent is relatively healthy, it could also be the case that the parent is available to care for children and the home, thus freeing up the female to engage in more labor market activity. Of course, unlike children under 6, it is also possible that the parent has accumulated savings and is able to subsidize the household, although this is unlikely for most Jamaican households.

Lastly, education is expected to increase both hours worked and labor force participation. Individuals who invested in education in previous years likely did so with the expectation that they would be working and earning returns to their education investment in the current time period.

## Results

### *Labor Force Participation*

In this section, we present results from multiple estimations. We begin with estimation of the labor force participation equation. The results in Table 8 give a comparison of the estimates from the linear probability model, the logit model and the probit. Note that the first set of results does not account for potential endogeneity, and that these results are presented in the following table. These tables nonetheless give us a base with which to compare future, more econometrically sound approaches.

The first thing we observe is that the same variables are significant across all three models, even though as expected the coefficient estimates are different in magnitude.

Wooldridge (2002) uses the following ‘rough’ rule of thumb when comparing logit and probit estimates with parameters from a linear probability model: divide the logit estimates by 4 and the probit by 2.5 (Jeffrey M. Wooldridge, 2002). Alternatively we could compute the marginal effects from the logit and probit models.

In looking at the coefficient for remittances, both the sign and magnitude are worthy of discussion. Remittances negatively affect the participation rate, supporting the theory that recipients may be dependent on this source of income voluntarily or involuntarily. This negative effect could also be explained by the effect remittances could have on job search activity. Just as it is plausible for unemployment benefits to decrease the motivation to search for jobs, so too, could receipt of remittances for countries heavily dependent on this income source. Although this effect is negative, as hypothesized, the magnitude is extremely small. A one thousand dollar increase in remittances is expected to decrease the probability of working by 0.01 in all three cases (converting the probit and logit parameters to marginal effects). The average recipient reports just under \$1,000, so only those houses receiving very large amounts of remittances are expected to change their labor market participation significantly.

Other factors included in the model significantly affect labor market participation. Property income (calculated as family earned income minus the wife’s income) which proxies for household wealth, is significant and positive. This means that as other household members’ incomes increase, this increases the probability of the female participating in the labor market. This is somewhat counterintuitive as we expected a negative effect if leisure is a normal good. For Mroz (1987), this coefficient is negative in all specifications. Of course, the labor market in

Jamaica is quite different from the United States labor market, and differences are therefore expected. It could be the case that unobservable factors that affect the selection of partnerships – such as the ability to find and keep a job – could be confounding this result.

As expected, the wife's education is positively associated with labor force participation. If education is viewed as an investment, then those with greater investments are more likely to realize greater returns by participating in the labor force.

The greater the number of biological children 5 years old or less, the less likely it is for the wife to be in the labor force. Having biological children 6 and over has the opposite effect. The presence of children in the household who are not the biological children of the wife do not affect labor market participation. As expected, labor market participation of the wife increases with age but at a decreasing rate.

Table 8

Labor Force Participation (Parish and Year Control Variables Included)

<b>Dependent Variable is LFP</b>	<b>LPM</b>	<b>LOGIT</b>	<b>PROBIT</b>
Total Remittances (In 000's of USD)	-0.007* (0.004)	-0.041* (0.023)	-0.025* (0.013)
Property Income	0.002** (0.001)	0.011* (0.006)	0.007** (0.004)
HH's Kids 5 and under	-0.100*** (0.011)	-0.448*** (0.051)	-0.278*** (0.031)
HH's Kids 6 and over	0.021*** (0.006)	0.082*** (0.027)	0.054*** (0.016)
Other Kid's 5 and under	0.012 (0.013)	0.057 (0.061)	0.037 (0.037)
Other Kid's 6 and Over	-0.007 (0.009)	-0.018 (0.042)	-0.007 (0.025)
Wife's Age	0.013*** (0.002)	0.080*** (0.011)	0.039*** (0.005)
Wife's Age Squared	-0.000*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Wife's Education (Highest Degree)	0.034*** (0.003)	0.274*** (0.029)	0.144*** (0.013)

_cons	0.691*** (0.057)	0.193 (0.294)	0.325** (0.161)
Year and Parish Controls	YES	YES	YES
$R^2$	0.15	0.12	0.12
$N$	5,510	5,510	5,510

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$  (Std. Error in parentheses)

Next, we present results from a linear probability model and probit estimation, this time using instruments for the endogenous variables. In these models, two variables are treated as endogenous, remittances and the wife's education. For remittances, we use average district level remittance receipts to other households as the instrument. For the wife's education, we include the husband's education, as is often done in the existing literature.

Based on the results in Table 9, we now find that remittances have no statistically significant effect on labor force participation. This result is interesting, as it challenges findings from previous research that has failed to account for endogeneity. For example, Kim (2007) finds that remittances may not affect hours worked, but it still affects labor market participation. He does not control for endogeneity, however, suggesting why these results might be an improvement upon previous findings.

The wife's education is still positively associated with labor force participation, consistent with previous findings and theory. Other variables largely maintain their significance and signs compared to the estimation in Table 8. Property income, at least in the probit estimation, is still positively associated with increased labor force participation, although this effect is small. Younger children decrease participation, while older children increase the likelihood of a female working outside the home. Finally, increases in age are expected to increase the probability of participating in the labor market, although this effect still diminishes as age increases.

Following Table 9, we present additional tables demonstrating the strength of the selected instruments as well as the reduced forms of the endogenous variables.

Table 9

## Participation in the Labor Market-Instrumental Approaches

<b>Dependent Variable is LFP</b>	<b>IV LPM</b>	<b>IV PROBIT</b>
Total Remittances (In 000's of USD)	0.011 (0.013)	0.034 (0.044)
Wife's Education (Highest Degree)	0.051*** (0.011)	0.161*** (0.047)
Property Income	0.003** (0.001)	0.008** (0.004)
HH's Kids 5 and under	-0.106*** (0.012)	-0.302*** (0.038)
HH's Kids 6 and over	0.022*** (0.006)	0.055*** (0.020)
Wife's Age	0.013*** (0.002)	0.042*** (0.009)
Wife's Age Squared	-0.000*** (0.000)	-0.001*** (0.000)
_cons	0.621*** (0.068)	0.260 (0.210)
Year and Parish Controls	YES	YES
R2	0.07	
N	5,506	5,506

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

For the LFP regressions, we use average remittances received in the district by other households (excluding the respondent's reported remittances) as an instrument for the respondent's remittances and husband's education as an instrument for wife's education. As Table (10) shows, the instruments in the LFP equation perform quite well. First, for the under-identification and weak identification tests, the null hypothesis that the model is under-identified or weakly identified, respectively, are both rejected. Furthermore, the Sargan- Hansen statistic tests the null that all instruments are uncorrelated with  $u$ . We fail to reject this null hypothesis, suggesting

the equations are not over-identified. Results from the reduced form regressions are presented below in Table 11. These reduced form regressions show that the instruments significantly explain variability in the endogenous variables.

Table 10

## Check of the Instrumental Variables: IVREG2 Postestimation in Stata

Underidentification test (Kleibergen-Paap rk LM statistic):	75.15
Chi-sq(4) P-val = 0.0000	
Weak identification test (Kleibergen-Paap rk Wald F statistic):	22.312
Stock-Yogo weak ID test critical values: 5% maximal IV relative bias	11.04
10% maximal IV relative bias	7.56
20% maximal IV relative bias	5.57
30% maximal IV relative bias	4.73
10% maximal IV size	16.87
15% maximal IV size	9.93
20% maximal IV size	7.54
25% maximal IV size	6.28
Hansen J statistic (overidentification test of all instruments):	1.337
Chi-sq(2) P-val = 0.5124	

Table 11

Reduced-form Regressions of the Endogenous Variables on All Exogenous Variables

	<b>Dependent Variable:</b>	
	<b>Remittances</b>	<b>Wife's Education</b>
Average Other Remittances in District (in USD '000S) (Instrument for Remittances )	0.534*** (0.021)	0.011 (0.021)
Husband's Education (Highest Degree) (Instrument for Wife's Education)	-0.005 (0.010)	0.274*** (0.010)
Property Income	-0.001 (0.004)	0.004 (0.004)
HH's Kids 5 and under	0.063* (0.033)	0.069** (0.033)
HH's Kids 6 and over	0.011 (0.017)	-0.077*** (0.017)
Wife's Age	-0.003 (0.006)	-0.003 (0.005)
Wife's Age Squared	0.000** (0.000)	-0.000 (0.000)
_cons	-0.177 (0.172)	1.652*** (0.170)
Year and Parish Controls	YES	YES
$R^2$	0.15	0.36
$N$	5,506	5,506

\* p&lt;0.1; \*\* p&lt;0.05; \*\*\* p&lt;0.01 (Std. Error in parentheses)

*Hours Worked*

Having estimated the probability of participation in the labor market, we now turn our attention to the second outcome measure, hours worked. Participation in the labor market is coded identically whether someone works part-time, fulltime, or overtime, and while it is sufficient in helping us understand the effects of remittances on who joins the labor force, it omits detail as to how long individuals are actually working.

In this part of the essay, we regress hours worked on the value of remittances. A simple OLS model, however, will produce biased results since hours worked equals zero for all individuals not in the labor market. Therefore, we employ a Tobit model, designed to handle



selection and censoring. Table 12 presents results from a basic Tobit model when all variables are assumed exogenous.

We find that increases in the wife's wage is negatively associated with hours worked. This supports a theory of a backward-bending labor supply curve and that the income effect dominates the substitution effect. Remittances are also negatively associated with hours worked, although this effect is not statistically significant from zero. Increases in the wife's education are expected to increase hours worked, *ceteris paribus*, while the number and age of biological children in the household significantly affects weekly work schedules.

As was the case with labor market participation, young children are expected to decrease hours worked. For each biological child under age five, expected hours worked decreases by more than seven hours per week, even after adjusting for those not participating in the labor market. An additional biological child over the age of six actually increases the female's workload, although this may reflect additional assistance in caring for the house and younger children. Caring for other people's children in your home has no effect on hours worked, *ceteris paribus*. Age is expected to increase hours worked until age 31, at which point the negative effect on age square begins to dominate, and hours worked will decrease, *ceteris paribus*.

Table 12

Basic Tobit Model

<b>Dependent Variable: Wife's Hours worked</b>	
Log of Wife's Wage	-23.266*** (1.085)
Total Remittances (In 000's of USD)	-0.494 (0.319)
Property Income	0.404*** (0.084)
Wife's Education (Highest Degree)	2.860*** (0.154)
HH's Kids 5 and under	-7.050*** (1.146)
HH's Kids 6 and over	0.868** (0.356)
Other Kid's 5 and under	0.530 (0.736)
Other Kid's 6 and Over	-0.597 (0.581)
Wife's Age	1.131*** (0.279)
Wife's Age Squared	-0.018*** (0.003)
Cons	28.656*** (5.746)
Sigma_cons	29.188*** (0.324)
Year and Parish Controls	YES
<i>N</i>	5,510

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

The Tobit controls for the censoring at zero and labor market participation, but as previously mentioned, several variables in the model may be endogenous, and hence, the results are biased. In the next table, we instrument for remittances, wife's wages, and wife's education. Results are presented in Table 13.

We find that conditional on participating in the labor market, a one percent increase in the wife's wages decreases expected hours work by more than four hours per week. The effect of

remittances, once we instrument for this variable, is now much larger in magnitude than in the previous estimation, but it still lacks statistical significance. As expected, additional education increases hours worked substantially.

Table 13

## Instrumental Variable Estimation of the Tobit Model

<b>Dependent Variable: Wife's hours of work</b>	
Log of Wife's Wage	-437.034*** (42.558)
Total Remittances (In 000's of USD)	-3.768 (4.500)
Wife's Education (Highest Degree)	16.874*** (1.803)
Property Income	3.293*** (0.495)
HH's Kids 5 and under	-5.373* (2.839)
HH's Kids 6 and over	-1.337 (1.426)
Wife's Age	0.082 (0.431)
Wife's Age Squared	-0.006 (0.004)
_cons	31.204**
Year and Parish Controls	YES (13.540)
<i>N</i>	5,506

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$  (Std. Error in parentheses)

To demonstrate the suitability of the instruments, the first stage reduced-form estimates are presented in Table 14. All proposed instruments are significant for their respective endogenous variables.

Table 14

## First Stage Reduced-Form Estimates of the Endogenous Variables

	Dependent Variable		
	Wage	Remittance	Wife's Education
Wife's work experience	0.043*** (0.001)	-0.009*** (0.003)	0.060*** (0.005)
Average Remittances in District (in USD '000S)	0.006 (0.007)	0.533*** (0.073)	0.020 (0.038)
Husband's Education (Highest Degree)	0.010** (0.005)	0.001 (0.008)	0.481*** (0.035)
Other Kid's 5 and under	-0.033*** (0.013)	0.133*** (0.039)	-0.155*** (0.030)
Other Kid's 6 and Over	-0.028*** (0.008)	0.125*** (0.035)	-0.069*** (0.021)
Property Income	0.026*** (0.002)	-0.004 (0.004)	0.005 (0.007)
HH's Kids 5 and under	-0.018* (0.011)	0.067* (0.038)	-0.012 (0.045)
HH's Kids 6 and over	-0.007 (0.005)	0.019 (0.012)	-0.103*** (0.020)
Wife's Age	-0.004** (0.002)	-0.004 (0.005)	0.004 (0.006)
Wife's Age Squared	0.000 (0.000)	0.000** (0.000)	-0.000** (0.000)
_cons	0.153*** (0.054)	-0.081 (0.137)	0.168 (0.223)
Year and Parish Controls	Yes	YES	YES
$R^2$	0.32	0.15	0.27
$N$	5,506	5,506	5,506

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

## Robustness checks

The previous findings, that remittances, after controlling for endogeneity, do not affect labor force participation or hours worked, is interesting, and raises additional questions that should be addressed. First, remittances may be underestimated. If remittances truly have an effect, but a substantial number of households fail to report remittances accurately, then our estimated effects may be biased. Secondly, the effect of remittances may be nonlinear. In its current form, a change from \$500 to \$1,000 is expected to be identical to the case of increasing

remittances from \$2,000 to \$2,500. Once households have reached \$2,000, for example, they may have already changed their labor market behavior as much as possible (withdrawing from the market, for example) while those receiving \$1000 may reduce hours, but the level of remittances is still insufficient to completely leave the labor force. Thirdly, this essay has focused on the decisions of females in long-term relationships, but other heads-of-household may be affected by remittances. In this section, we briefly address each of these issues and present results for further discussion.

### Imputed Remittances

As mentioned previously in this essay, the value of remittances is likely underreported. A nontrivial number of households indicated they received remittances but then do not report positive values of remittances. As a result, we impute remittances for these households using current household remittances as a function of age of the household head, district level remittances (which is the instrumental variable) and other kids 6 and over who are not biological children of the head of household. These are the variables which yield significant and positive effects on remittances. We then use the coefficients from this regression to calculate household remittances for those who report that they receive some remittances but fail to give the amount. Results from this regression are in Table 15, followed by updated summary statistics when we include imputed values for those that report receiving remittances but do not indicate how much is received.

Table 15

## Predicting Remittances

Dependent variable: Current Household Remittances	Coefficient (Std. Error)
<b>Wife's Age</b>	0.007 (6.48)***
<b>Average Remittances in District (in USD '000S)</b>	0.810 (23.22)***
<b>Other Kid's 6 and Over</b>	0.133 (2.92)***
<b>R<sup>2</sup></b>	0.36
<b>N</b>	2,437

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Table 16

## Summary Statistics of Actual (from Survey) and Updated Remittances

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Remittances (In 000's of USD)	5,521	0.50	1.52	0.00	47.65
Updated Total Remittances (In 000's of USD)	5,521	0.57	1.52	0.00	47.65

After replacing zero with the predicted value from Table 15, average remittances increase by \$70.

The next step is to include the imputed remittances in our labor force participation and hours worked models. Again, remittances for those that report positive values remain unchanged. Remittances for those that report receiving no remittances and an amount of zero remain at zero. The change only occurs for those respondents who indicated they did receive remittances but failed to provide a positive amount. Results are located in Table 17.

As expected, our results are only strengthened by using the imputed results. In other words, the under-reporting of remittances biased results downward, as individuals who were

actually responding to the receipt of remittances were included in the group not receiving remittances.

Table 17  
Imputing Remittances

	IV OLS	IV PROBIT	IV TOBIT
<b>Dependent Variable:</b>	<b>Wife's LFP</b>	<b>Wife's LFP</b>	<b>Wife's Hours worked</b>
Log of Wife's Wage			-437.295*** (41.686)
Imputed Total Remittances (In 000's of USD)	0.009 (0.012)	0.036 (0.038)	-3.961 (3.259)
Wife's Education (Highest Degree)	0.029*** (0.005)	0.126*** (0.026)	16.830*** (2.126)
Property Income	0.003** (0.001)	0.008*** (0.003)	3.296*** (0.580)
HH's Kids 5 and under	-0.101*** (0.011)	-0.283*** (0.030)	-5.378** (2.437)
HH's Kids 6 and over	0.020*** (0.006)	0.050*** (0.016)	-1.315 (1.385)
Wife's Age	0.013*** (0.002)	0.040*** (0.007)	0.082 (0.316)
Wife's Age Squared	-0.000*** (0.000)	-0.001*** (0.000)	-0.006* (0.003)
_cons	0.638*** (0.065)	0.304* (0.167)	31.079*** (9.818)
Year and Parish Controls	YES	YES	YES
<i>N</i>	5,506	5,506	5,506
<i>R</i> <sup>2</sup>	0.14		

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

#### *Testing the Effect of Remittances on Other Demographic Groups*

The last point to address is identifying the effects of remittances for other demographic groups, including single females, married men, and single men. Again, the focus has been on women in long-term relationships, generally the group discussed in other labor research. The nature of remittances, however, is a bit different, as recipients are not targeted based on need or

education but instead are those with family members willing and able to find jobs elsewhere and remit funding. Recipients, therefore, are most likely to be female, but they could also be men, receiving money from children, parents, friends, or spouses who have had more luck finding employment elsewhere.

Table 18 evaluates the effect of remittances on women who report being single heads of the household. Still using the imputed values from earlier in this section, we find a reduction in the probability of working even after instrumenting for remittances. Note that without a husband present (and later without a wife present for single males), we use the educational attainment of the oldest child in the household as an instrument. Once controlling for endogeneity, a \$1000 increase in remittances decreases the probability of entering the labor market by 5.5 percent. Conditional on working however, remittances do not appear to affect hours worked. Combined with the earlier findings for women in a relationship, we would assert that the total effect of remittances on the decision to work for all women in Jamaica is small, and conditional on working, remittances do not affect the hours worked for females.



Table 18  
Single Women

	<b>LPM</b>	<b>IV OLS</b>	<b>IV PROBIT</b>	<b>TOBIT</b>	<b>IV TOBIT</b>
<b>Dependent Variable</b>	LFP	LFP	LFP	Hours of Work	Hours of Work
Imputed Total Remittances (In 000's of USD)	-0.010*** (0.002)	-0.017** (0.007)	-0.055** (0.023)	-0.534*** (0.202)	0.522 (1.789)
Property Income	0.010*** (0.001)	0.010*** (0.004)	0.067*** (0.008)	1.123*** (0.315)	4.185*** (0.836)
HH's Kids 5 and under	-0.095*** (0.014)	-0.092*** (0.015)	-0.291*** (0.044)	-8.404*** (0.831)	5.139 (3.177)
HH's Kids 6 and over	0.022*** (0.007)	0.022*** (0.007)	0.056** (0.028)	1.095** (0.459)	2.128 (2.014)
Other Kid's 5 and under	-0.006 (0.011)			-0.582 (1.075)	
Other Kid's 6 and Over	0.001 (0.007)			0.916** (0.436)	
Wife's Age	0.003** (0.001)	0.003 (0.002)	0.011 (0.007)	0.385*** (0.149)	-0.239 (0.339)
Wife's Age Squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.012*** (0.002)	0.000 (0.003)
Education Highest Degree Attained	0.024*** (0.003)	0.023* (0.014)	0.099 (0.070)	1.992*** (0.246)	15.327*** (3.878)
Log(Wage)				-22.201*** (2.743)	-339.701*** (39.323)
Sigma_cons				29.192*** (0.410)	
_cons	0.862*** (0.049)	0.862*** (0.056)	0.979*** (0.215)	39.504*** (4.671)	18.826* (9.708)
Year and Parish Fixed Effects	YES	YES	YES	YES	YES
R2	0.27	0.26			
N	4,889	4,886	4,886	4,889	4,886

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Results for the next group, married men, are presented in Table 19. We find that when instrumenting for remittances, the probability of entering the labor force decreases, but once the decision to work has been made, remittances positively increase hours work. This last point is particularly interesting since remittances were expected to significantly decrease hours worked prior to adjusting for potential endogeneity.

Once we remove factors that may affect both remittances and labor force participation, we find that increasing remittances by \$1000 only decreases the probability of entering the labor force by less than 0.04. Additionally, we find that a one thousand dollar increase in remittances is expected to increase hours worked by almost 5.5 hours per week. This counters the notion that remittances negatively affect labor supply and hence a country's productivity, as previously suggested. It may instead be the case that the influx of outside money to a community increases consumption and hence increases employment opportunities.

Table 19

## Married Men

	<b>LPM</b>	<b>IV OLS</b>	<b>IV PROBIT</b>	<b>TOBIT</b>	<b>IV TOBIT</b>
<b>Dependent Variable</b>	<b>LFP</b>	<b>LFP</b>	<b>LFP</b>	<b>Hours of Work</b>	<b>Hours of Work</b>
Imputed Total Remittances (In 000's of USD)	-0.008*** (0.002)	0.006 (0.006)	-0.037*** (0.013)	-0.632*** (0.162)	5.494* (3.158)
Property Income	0.001 (0.001)	0.001* (0.001)	0.017*** (0.003)	0.056 (0.062)	2.062* (1.139)
HH's Kids 5 and under	-0.010 (0.007)	-0.014*** (0.005)	-0.034* (0.020)	-0.910*** (0.285)	-7.915** (3.690)
HH's Kids 6 and over	0.018*** (0.004)	0.016*** (0.003)	-0.101*** (0.012)	0.908*** (0.184)	-1.156 (1.957)
Other Kid's 5 and under	0.037*** (0.009)			2.194*** (0.560)	
Other Kid's 6 and Over	0.020*** (0.006)			1.170*** (0.384)	
Wife's Age	0.012*** (0.001)	0.012*** (0.002)	0.120*** (0.007)	0.844*** (0.135)	2.338*** (0.614)
Wife's Age Squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.001*** (0.000)	-0.015*** (0.001)	-0.038*** (0.006)
Education Highest Degree Attained	0.009*** (0.002)	0.003 (0.004)	0.116*** (0.018)	0.320*** (0.089)	19.674*** (4.524)
Log(Wage)				-3.392*** (0.465)	-456.977*** (95.210)
Sigma_cons				30.082*** (3.584)	
_cons	0.796*** (0.040)	0.815*** (0.057)	-2.172*** (0.143)	18.046*** (0.291)	37.121* (20.059)
Year and Parish Fixed Effect	YES	YES	YES	YES	YES

R2	0.31	0.30			
N	5,537	5,533	18,246	5,537	5,533

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Finally, we examine the effects of remittances on the labor market behavior of single men. For this group, remittances have the largest effect on labor force participation. A \$1,000 increase in remittances, after instrumenting with the average remittances received by other households in the enumeration district, decreases the probability of working in the IV probit model by 0.109 (that is  $0.272/2.5$ ). Comparing two similar single men, one receiving \$2,000 in remittances is 20 percent less likely to work as one not receiving remittances. Conditional on working, the level of remittances once again does not significantly affect the hours worked.

Table 20  
Single Males

<b>Model used</b>	<b>LPM</b>	<b>IV OLS</b>	<b>IV PROBIT</b>	<b>TOBIT</b>	<b>IV TOBIT</b>
<b>Dependent Variable</b>	<b>LFP</b>	<b>LFP</b>	<b>LFP</b>	<b>Hours of Work</b>	<b>Hours of Work</b>
Imputed Total Remittances (In 000's of USD)	-0.011*** (0.003)	-0.066*** (0.020)	-0.272*** (0.088)	-0.482 (0.517)	-7.951 (7.681)
Property Income	0.006** (0.003)	0.003 (0.003)	0.018 (0.017)	0.577*** (0.115)	2.965** (1.258)
HH's Kids 5 and under	-0.025 (0.032)	-0.019 (0.030)	-0.156 (0.245)	-1.866 (1.348)	-3.224 (16.513)
HH's Kids 6 and over	0.062*** (0.012)	0.068*** (0.010)	0.519*** (0.097)	4.466*** (0.489)	15.217*** (3.911)
Other Kid's 5 and under	-0.051** (0.021)			-3.555*** (0.928)	
Other Kid's 6 and Over	-0.036*** (0.013)			-0.693 (0.855)	
Wife's Age	0.006*** (0.001)	0.006*** (0.002)	0.012* (0.006)	0.363*** (0.137)	-0.895** (0.369)
Wife's Age Squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.009*** (0.001)	0.001 (0.003)
Education Highest Degree Attained	0.008** (0.004)	0.062 (0.049)	0.210 (0.203)	0.629*** (0.226)	21.593 (16.997)
Log(Wage)				-6.714*** (0.750)	-338.486*** (59.380)
Sigma_cons				32.036*** (2.863)	
_cons	0.812*** (0.042)	0.817*** (0.056)	1.130*** (0.199)	21.449*** (0.329)	56.121*** (14.467)
Year and Parish Controls	YES	YES	YES	YES	YES
R2	0.24	0.13			
N	3,552	3,550	3,550	3,552	3,550

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

### *Nonlinear Effect of Remittances*

Imputation of remittances has failed to significantly change the results, but perhaps this is due to a nonlinear effect of remittances. In this section, we take the natural log of remittances, and again estimate instrumented versions of the linear probability and probit models for labor force participation and tobit for hours worked. Results are located in Table 21.

Even after changing the functional form of remittances, we still find that the variable does not significantly affect labor market behavior of women in long-term relationships. This holds true when we look at labor force participation and hours worked and whether we instrument for remittances and not. Although this suggests that this particular transformation of remittances does not reveal any additional information, it cannot rule out the possibility of other nonlinear effects.

Table 21

## Nonlinear Effects of Remittances

<b>Model Used</b>	<b>LPM</b>	<b>IV OLS</b>	<b>IV PROBIT</b>	<b>TOBIT</b>	<b>IV TOBIT</b>
<b>Dependent Variable</b>	<b>LFP</b>	<b>LFP</b>	<b>LFP</b>	<b>Hours of Work</b>	<b>Hours of Work</b>
Log of Wife's Wage				-23.314***	-436.115***
Log of Imputed Total Remittances (In 000's of USD)	-0.007	-0.001	-0.005	(1.103) 0.082	(37.987) 2.801
Property Income	(0.006) 0.002**	(0.007) 0.003**	(0.021) 0.008**	(0.492) 0.406***	(1.740) 3.271***
Wife's Education (Highest Degree)	(0.001) 0.034***	(0.001) 0.028***	(0.004) 0.125***	(0.081) 2.860***	(0.475) 16.869***
HH's Kids 5 and under	(0.003) -0.101***	(0.005) -0.101***	(0.027) -0.283***	(0.134) -7.073***	(1.973) -5.426*
HH's Kids 6 and over	(0.011) 0.021***	(0.011) 0.021***	(0.029) 0.052***	(0.680) 0.862**	(2.818) -1.427
Other Kid's 5 and under	(0.006) 0.011	(0.006)	(0.015)	(0.403) 0.465	(1.468)
Other Kid's 6 and Over	(0.013) -0.007			(0.686) -0.670	
Wife's Age	(0.009) 0.013***	0.013***	0.040***	(0.603) 1.133***	0.093
Wife's Age Squared	(0.002) -0.000***	(0.002) -0.000***	(0.009) -0.001***	(0.229) -0.018***	(0.452) -0.007
Sigma_cons	(0.000)	(0.000)	(0.000)	(0.002) 29.195***	(0.005)
_cons	0.564***	0.638***	0.308	(0.312) 5.776	32.547**

	(0.056)	(0.066)	(0.216)	(5.728)	(13.677)
Year and Parish	YES	YES	YES	YES	YES
Controls					
R2	0.15	0.15			
N	5,510	5,510	5,510	5,510	5,510

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

### Conclusion

We began this essay interested in the effects of remittances on labor supply of married women (or those in long-term relationships) in developing countries such as Jamaica. Reliance on remittances, particularly in a small country such as Jamaica with significant emigration to the United States, Canada, and the United Kingdom., can comprise a significant share of a household's income, thus affecting decisions such as labor market participation and hours worked. To the extent that a relationship between labor market outcomes and remittances exists, it is important to understand the direction of this relationship and whether it could create greater implications for economic growth in developing countries.

Surprisingly, in the models instrumenting for remittances, we find that remittances do not significantly affect participation in the labor market for females in relationships. That is, there is no difference in the probability of working based on the level of remittances received by a female in a long-term relationship, *ceteris paribus*. When we consider this effect for other demographic groups, we find that there is a small negative effect for married men and single females, but the effect for single men is by far the most surprising. It could be that these men are



more likely working in informal jobs that they fail to report or engage in home production (farming), and thus we see greater effects of remittances for this demographic group.

Conditional on working, remittances either have no statistically significant or a small positive effect on hours worked, challenging earlier findings. This suggests that remittances are likely correlated with health or labor market conditions that are also correlated with hours worked. Once we include the appropriate instruments that remove these effects from our estimation, we find that remittances no longer cause a reduction in hours worked.

Findings in this paper are an improvement over results in previous studies for several reasons. First, we consider both the decision to work (labor force participation) and hours worked separately. Second, we recognize the endogeneity of remittances in labor market outcomes, and thus choose models that account for this endogeneity. Although we use a relatively simple model, we believe this essay contributes substance to the discussion of remittances by focusing specifically on the labor market decisions of females in relationships and then introducing other demographic groups separately.

This essay offers clear insight into the research question, but at the same time, introduces new related research questions. For example, why do remittances not affect labor market participation for many of the demographic groups? What would happen in communities if there was an exogenous drop in remittance flows? Remittances are treated linearly in this essay with the exception of one set of regressions in which they are logged, but is there perhaps a different nonlinear relationship that should further be explored? More specifically, is there some threshold effect, at which point households change behavior after reaching this threshold but do not change behavior before. Although answering a different question, researchers may be

interested in the effects of remittances on the labor supply of those sending remittances as opposed to those receiving the money. That is, are migrants remitting money more likely to work overtime or moonlight with a second job compared to migrants not remitting funds? How does this affect the host country if the remittance senders reside abroad? Remittance senders may also reside in major urban areas in Jamaica. Are work efforts in the urban centers increased at the expense of productivity in the outskirts?

Given the significance of remittances to the Jamaican economy, related studies in the future may consider the effects of direct taxation of remittances. This research documents the effects of remittances on labor supply, but wages earned while working in Jamaica are subject to income tax. Individuals receiving remittances from abroad in lieu of formal labor, however, do not pay similar taxes, thus creating an element of horizontal inequality in the labor market. Taxing remittances, however, is not straightforward. Individuals working and sending remittances from within Jamaica may already be paying income taxes. Secondly, even those remittances from abroad may be used for investment. They can also be used on consumption purchases that generate sales tax for the government. The key issue is whether remittances increase consumption above that level possible had there been less remittances but greater labor supply and earned income.

The relationship between remittances and labor supply is an important one, but as this essay demonstrates, the most notable effect may be that there is none, at least for the group of women in long-term relationships. If remittances do not affect labor behavior for most heads of household, the next question is, do they have any effect on other household decisions. In the next chapter, we further explore the effects of remittances, this time analyzing the effect of remittances on household consumption and budget allocation.

## Chapter Two: Consumption Effects Of Foreign Remittances

Economists have long used measures such as GDP per capita to gauge the economic growth of a country. Household income is a similar concept, intended to measure the standard of living for a family. While income levels enable researchers to better understand the consumption bundles available to households, alone, it fails to describe exactly how households allocate their income and what they choose to consume.

We study consumption because consumption can predict future growth. Public finance economists are interested in consumption for another reason – because consumption serves as the base for sales tax revenues, a large contributor to government revenues in many countries. These qualities establish consumption as an important concept, worthy of analysis in this paper.

In predicting or analyzing consumption, classical economic theory suggested that it was total income – and not the source of income – that mattered. Recent research, discussed later in this paper, presents evidence that the source of income does affect consumption decisions. In this paper, we further develop the idea that the source of income matters and ask the question, how does the receipt of remittances or other outside income affect expense decisions by recipient households?

In the first paper, the level of remittances was highlighted. In this paper, we follow previous research (Adams, 2006; Hawkins & Wallace, 2006) and examine the effect that the share of total income received from outside of the household has on household consumption. Remittances may come from family members working in other parts of Jamaica or abroad and could be sent to support children or for the household in general. Approximately 60 percent of Jamaican households report receiving remittances from at least one source, averaging \$452 per household.

Remittances are a significant source of income for households in many developing countries, but for Jamaica, an English-speaking, developing country located close to the United States, dependence on remittances is particularly strong. The country ranks among the top five in terms of per capita remittance flows and in the top ten in terms of remittances as a percentage of GDP.<sup>9</sup> The reliance may result from the emigration of Jamaica's college educated citizens. Four out of five college-educated Jamaicans live abroad.<sup>10</sup> With considerable migration and remittance flows (coupled with the availability of data), Jamaica is a reasonable choice for study of how remittances affect consumption decisions by households. For a description of remittance trends in Jamaica, see Figure 1 in the Motivation section of Chapter 1, Labor Market Effects of Foreign Remittances.

Understanding the effect of remittances on consumption is important for the following reason. If remittances are found to significantly alter the expenditure patterns of recipient households, we might assess whether or not changes are favorable for future income growth. For example, do we find that households receiving remittances spend more on education, or are they spending greater shares of income on luxury expenditures such as eating out or vices like tobacco and gambling?

It is plausible that the receipt of remittances affects household decisions in addition to consumption, but from a microeconomic perspective, the two topics addressed in this dissertation – consumption and labor supply (in the previous essay) – are arguably the most important. To analyze the effect of remittances on consumption, this paper is organized as follows. First, we briefly describe the context of Jamaica. Greater detail was presented in the first essay, but brief

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<sup>9</sup> (<http://www.migrationinformation.org/feature/display.cfm?ID=137#3>, accessed on June 8, 2011.)

<sup>10</sup> (<http://www.iom.int/jahia/Jahia/jamaica>, accessed on June 8, 2011.)

discussion in this essay is still warranted. Then, we describe existing research on remittances and consumption and provide ways in which our own research might advance the field. Having discussed the existing literature, we use previous research and our own a priori beliefs to construct a theoretical model explaining the possible effects of remittance receipts on utility and consumption. In this section, we also describe our hypotheses as to what might affect remittances and consumption. Our methodological approach is outlined, and then data is presented and summarized. Finally, we present results, summarize findings, and discuss the implications.

### Background on Jamaica

A lengthy discussion in the first essay described the immigration and remittance process in the country of Jamaica. In this essay, we focus more on those topics most pertinent in a discussion of remittances and consumption.

Jamaica may seem like an easy choice as a case study given the availability of data, but aside from this reason, this small developing country is a strong candidate for analysis. Remittances comprise a significant portion of GDP (almost one-fifth), and the country ranks 10<sup>th</sup> in terms of remittances to GDP.<sup>11</sup> Also, it consistently ranks among the top five in terms of remittances per capita. Once known for its attractiveness to tourists and abundant natural resources, remittances now exceed tourism revenues and the value of bauxite exportation combined.

We often assume that most remittances are financial, and while this may be the case, the value of in-kind remittances should not be ignored. Unfortunately, the value of in-kind remittances may be harder to measure. Recipients do not recall everything they received, do not

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<sup>11</sup> (<http://www.migrationinformation.org/feature/display.cfm?ID=137#3>, accessed on June 8, 2011.)

want to report everything, or cannot accurately determine the values of gifts received. Earlier versions of the Survey of Living Conditions (SLC) did not ask respondents to provide much detail on remittances, but due to efforts by faculty at the University of the West Indies, the SLC was modified in 2006 to include a special module on remittances. In addition to the usual question of how much is received in total from cash and in-kind transfers, this special module explicitly breaks down remittances by cash and in-kind on the survey questionnaire. If a household receives in-kind gifts, such as food items or clothing, this will likely affect a household's allocation of expenses (no longer needing to spend as much on food or clothing, for example). Such gifts also affect GCT (General Consumption Tax) revenues. When someone abroad sends a pair of shoes and they are not taxed by Jamaica's government, GCT is lower than if the same person abroad had sent money for the purchase of shoes from a tax-paying retailer in Jamaica. One study places the mode of cash remittances over \$300 (USD) and the mode of in-kind goods between \$60 and \$100 (USD) (Dade, 2006).

Remittances are not the only source of non-wage income in Jamaica. Two programs, the Program of Advancement through Health and Education (PATH) and the National Insurance Scheme (NIS), also provide unearned income to Jamaican households. PATH is available to the neediest Jamaican households and is contingent upon parents sending their children to school and getting proper medical attention for all household members. The National Insurance Scheme is similar to social security in the United States. Both programs are described in detail in the first essay.

We mention the above programs because they, too, could have significant effects on households' expense allocations. As a result, income from these sources will be included as additional controls in all estimations. Before we present the model and results, however, it is

important to review existing research on the determinants of household consumption and specifically, the effects of outside or unearned income.

### *Expenditures in Jamaica*

Thus far, the context of Jamaica has been discussed on the remittances and income side, but additional information on the expenditures and culture in Jamaica is also important. Unlike in the United States, in which public school is available to students free of charge through age 18, Jamaica's educational system is significantly different. Early childhood and primary school (through age 12) is free to students, although students must wear specific uniforms purchased by the household. Transportation is also an issue for many students. At the early childhood level, most students can walk to school, weather permitting. In poor weather or in case of un-walkable distances, students must secure their own transportation to schools. After age 12, public schools charge tuition, uniforms are still required, students generally require transportation to attend larger schools further from home, and students are required to buy textbooks. All of these expenses increase the cost of attending school in Jamaica. Attending school is still required by law, but little is done to enforce this law. The expense of school may explain why of the adult population (ages 15 and above), the literacy rate is only 86 percent overall and 80 percent for males, according to World Health Organization estimates.<sup>12</sup>

Jamaica's Human Development Index as of 2007 was 0.766, and the Human Poverty Index Rank for Developing Countries was 10.9. Total expenditures on health account for just over five percent of GDP, while health expenditures comprise only 2.6 percent of the general government expenditures. Ninety-three percent of the population has sustainable access to drinking water, although only eighty-three percent live with access to improved sanitation.

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<sup>12</sup> (<http://www.who.int/en/>, accessed on November 14, 2008)

On average, Jamaicans 15 and older consume over four liters of pure alcohol annually, mostly in the form of spirits. Alcohol disorders account for just under three percent of male deaths per year. In 1992, the most recent year for which the country reported figures on BMI, the prevalence of overweight and obesity in the older population (ages 60 and above) was more than 30 percent, and it is likely that that number has increased in the last twenty years. In 2000, five percent of females between 15 and 49 indicated in a survey that they had been diagnosed by a health professional as suffering from diabetes. Again, it is likely that the true rate of incidence is much higher. In the United States, where obesity is also a health concern, 5 percent of individuals between 45 and 49 self-report diabetes, but the rate is much lower for those in the younger age brackets (15-44).

Tobacco use is also a concern in Jamaica. Although the statistics on the World Health Organization's website are only for youth ages 13-15, the numbers for 2006 are staggering. Twenty-two percent of children in this range report being current users of tobacco products, and over a third have used tobacco products in the past. Males are more likely than females, with 43 percent of males between the ages of 13 and 15 reporting previous use of tobacco products. To put this in perspective, of individuals between 18 and 24 in the United States, 24 percent are current users of tobacco products. These numbers do not include drug use, either, where Jamaica is known for its production of substances such as marijuana.

The health statistics for Jamaica help paint a picture of Jamaican life and potential expenditures. With the amount of smoking, for example, we expect relatively higher expenditures on tobacco than we would in a country where inhabitants do not engage in smoking. At the same time, the expenditures should be less than a country where smoking has become an epidemic. Does money from abroad encourage such a habit, with negative effects on



long-term health and economic productivity? Similarly, the availability of drinking water likely relates to the household's expenses on water, and health concerns affect expenditures on health care.

Understanding the overall health, education, and culture of Jamaica aids in the interpretation of estimations of expenditure shares, and specifically, the effect of remittances on such decisions. In the next section, we examine previous research on consumption, and begin to formulate hypotheses as to how remittances affect household allocation of resources.

### Consumption Studies

Studies and commentary on consumption date as far back as the discipline itself. Adam Smith, in his chapter on the division of stock, classifies immediate consumption as part of the “first division” of resources (Smith, 1979). Consumption, again, was a prominent feature of research immediately after the great depression and forms one of the key components of the aggregate demand analysis, popularized by John Maynard Keynes. Building on Keynes' analysis, researchers developed a number of consumption theories, namely, the life cycle theorem (Modigliani & Ando, 1957; Modigliani & Brumberg, 1954), permanent income hypothesis (Friedman, 1957) and more recently, the behavioral life cycle theory (Shefrin & Thaler, 1988).

Consumption, even in microeconomics, is usually aggregated over many different goods and over households as opposed to individuals. Not only is consumption usually aggregated, but so, too, is income. Several scholars have pointed out the need to use income by source for macroeconomic studies (Kaldor, 1955; Taylor, 1971), but this sentiment is rarely repeated for consumption research, at least in macroeconomics. In microeconomic research, the need to disaggregate consumption occasionally emerges. In fact, several authors have pointed out that

there are differences in the propensity to save across different types of goods (Davies, et al., 2009; Hawkins & Wallace, 2006; Levin, 1998).

Levin (1998) uses different asset types to measure the lifecycle behavior of consumption in a household-level study. He uses data from the Longitudinal Retirement History Survey (RHS) to create 8 different expenditure categories and 5 different asset classes. His results support the behavioral life-cycle<sup>13</sup> model of consumption as opposed to the standard life-cycle theory even after accounting for liquidity constraints. Davies et al (2009) also disaggregates both consumption and income into multiple categories (Davies, et al., 2009). They find results similar to Levin; that MPC varies across income sources and also across different types of consumption goods. Another paper by Hawkins and Wallace (2006) considers separate income sources and consumption types and finds that the prices of commodities are affected by the production costs, psychic costs, and transaction costs associated with the income source.

### *Fungibility of Income*

The papers mentioned above not only created consumption categories but also asset categories. This work deviates from classical economic theory which suggests that only permanent income affects consumption decisions by the household, a result of classical and neoclassical foundations. Transitory income, such as welfare payments and monetary gifts, including remittances, do not affect the allocation of households' income (Hall, 1978). Income is assumed fungible, and the level of income, not the source of income, determines what households consume. Such assertions may have been acceptable historically, but now with the

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<sup>13</sup> Life-cycle theory claims that individuals base their consumption on their life-time income. Behavioral life-cycle theory goes further by claiming that not all income are treated the same and because of mental account individuals base consumption on whether or not the income source is safe or risky.

rise of behavioral economics, more economists are thinking about the psychic component of income sources (Shefrin & Thaler, 1988; Thaler, 1990).

A number of articles (Carriker, Langemeier, Schroeder, & Featherstone, 1993; Davies, et al., 2009; Hawkins & Wallace, 2006; Levine, 1998; Thaler, 1990; Whitaker, 2009) tackled the idea of income fungibility within households. Thaler (1990) takes a theoretical approach while the remaining studies used survey data to conduct rigorous empirical investigations. Thus far, it seems unanimous that the fungibility hypothesis is partially rejected. In most cases the trade-off elasticities are not equal to one, suggesting that some but not all income shifts with the introduction of income from an outside source.

Of all the relevant papers, Davies et al (2009) is perhaps the most relevant to this study. The authors focus on remittances and the effect this income has on consumption decisions. They collect income and expenditure data in Malawi and analyze the effects that remittances have on expenditures, noting significant differences in expenses based on the level of remittances received. While the study is interesting, there may be an empirical flaw that we cannot ignore. The authors, like most others in this line of research, treat remittances as exogenous. It is possible, however, that remittances are endogenous. Suppose remittances are sent for specific purposes in an amount that exceeds what is normally spent on a particular category of goods. For example, money may be sent to take a sick child to the doctor. We observe different levels of medical spending in households based on remittances, when it was some unobserved factor that caused both the remittances and expenses in that category to increase. Failure to consider the endogeneity of remittances in an empirical model could produce biased results, but more importantly, it affects predictions of how future remittance streams might be allocated within households.

From both a theoretical and empirical perspective, recent developments suggest that income is not as fungible as we once thought, and we need to look at the different sources of income when trying to explain household behavior. In other words, if a household receives a payment designated for food expenditures, older theories would suggest that the effects on consumption are equivalent to an equal increase in take-home pay. Even classifying all earned income together may not be ideal, as some researchers have documented differences based on which member of the household earns the income (Martin Browning, Bourguignon, Chiappori, & Lechene, 1994). To be fair, classical economics developed during a time when there was less outside income and only one individual in the household earned much of the household's income.

Changes in household income composition and advancements in economic theory have led scholars interested in consumption decisions to consider differential impacts of multiple income sources including welfare payments (Carriker, et al., 1993; Whitaker, 2009), labor income, retirement and non-retirement income, and capital income (Hawkins & Wallace, 2006), bonuses and windfalls (Thaler, 1990), tax rebates (Shapiro & Slemrod, 2003) and remittances (Davies, et al., 2009). Most of these studies conclude, or at least imply, that the households' marginal propensity to consume and their specific spending decisions vary according to the source of income.

More recent behavioral life cycle models incorporate risk and uncertainty, which serve to differentiate the various sources of income. For instance, the marginal propensity to save may be high (and marginal propensity to consume low) for income from windfall profits if the recipient perceives that the probability of again receiving this income is near zero. This argument easily

extends to recipients of remittances if they believe the flow of money will continue or if there was a one time (or infrequent) influx of remittance funds.

If the source of income affects the marginal propensity to consume, we can also question whether it affects what we purchase. Economists frequently treat consumption as a bundle of goods and services, lumping together all purchases into one basket. However, a second possibility is to consider whether marginal propensities to consume differ across consumption categories, in which case scholars examine a disaggregated consumption measure. In other words, not only do we expect marginal propensities to consume to vary for different sources of income, but they may also vary for different categories of goods (Davies, et al., 2009; Hawkins & Wallace, 2006; Levin, 1998).

The consumption bundle selected by a household is important, as some bundles may be more conducive to a country's economic growth than others. For example, is the household sending children to school or spending money on unnecessary items? We know that food expenditures are important, too. Using data from the Bangladesh National Survey (1981-1982), scholars find a link between expenditures on food, total caloric intake, and productivity (Pitt, Rosenweig, & Hassan, 1990) with greater implications for economic development. If individuals receiving remittances spend this money on food, this could produce more positive outcomes for the country than expenditures on other items.

For individuals sending remittances, we might think that their intent is to fund expenses with more positive outcomes, such as food, health, or education. If this is the case, then not only might we expect to see differences in expenditures by income source, but to see more "positive" expenditures for those receiving remittances relative to those not receiving some form of

remittances. On the other hand, it is possible that households are more careless with funds they do not have to earn by working. They could use this money disproportionately for alcohol or tobacco, expenditures that would lower productivity over time. Fortunately, we hypothesize that, on average, the positive expenses are more likely to occur as senders of remittances are likely to monitor the expenses habits or recipients and punish family members for misallocating funds.

### *Individuals versus Families—Sharing Rules*

The idea that some types of expenses are more desirable than others is one reason to study a disaggregated consumption, but other reasons are also important. Probably one of the most important reasons why we should look at disaggregated consumption is because preferences for different goods vary even among family members. For example, some members of the household may think education is extremely important, thus generating greater school expenses, while other members of household think properly maintaining the house or vehicles is a priority. Similarly, discount rates may vary among family members, affecting the balance of durable and non-durable purchases. Research by Chiappori, Bourguignon and Browning (1994, 1998) suggests ways to analyze individual preferences when the data is only available for the household (Martin Browning, et al., 1994; M. Browning & Chiappori, 1998). This involves viewing the household utility maximization decision as efficient, meaning the household can achieve no greater welfare than that reached with the current choices of consumption (and leisure) bundles. We could further expect Kaldor-Hicks efficiency within the household, where members are compensated when a purchase is not their preference or bargaining occurs between household members.

In the following section, we incorporate knowledge of sharing rules along with advances in the previously discussed literature to develop a behavior life-cycle model for remittances and consumption.

## Theoretical Model

### *Behavioral Life-cycle Model*

There are at least three theories that economists have developed to explain the relationship between consumption and income—the life-cycle theory (Modigliani & Ando, 1957; Modigliani & Brumberg, 1954), the permanent income hypothesis (Friedman, 1957), and the newest addition, the behavioral life-cycle model (Shefrin & Thaler, 1988; Thaler, 1990). The life-cycle theory is defined as a process where individuals are assumed to choose the optimal amount of consumption and savings by solving a multi-period dynamic programming problem. This leads to the concept of consumption smoothing, where individuals, anticipating increases or decreases to income in the future, spend more or less to essentially smooth their yearly consumption over their lives. For example, middle aged individuals consume less now to save for retirement in the future. College students accumulate student loans and credit card debt under the assumption that they will earn more in the future. Instead of focusing on current income, individuals use projections of their life-time earnings when making expense decisions. Included in this theory is the idea that households behave on expectations of total income and do not care about the particular source of income.

The permanent income hypothesis is a simplified version of the life-cycle theory, where the focus is taken off of retirement saving decisions and placed on permanent income. Here permanent income is the average long-term income of infinitely lived households as opposed to

life-time income.<sup>14</sup> Therefore, instead of saying the marginal propensity to consume is higher for poor (usually younger) individuals, we say the marginal propensity to consume is higher for individuals with low permanent income (ignoring transitory or temporary windfall income). In essence, both theories of consumption arrive at identical predictions with the permanent income hypothesis being more generally applicable. Both theories predict that the MPC is the same for the same individual over all time. They also predict that the MPC is the same regardless of the source of income. That is they predict that income is fungible.

Several authors who support the life-cycle view have made changes to the initial framework to explain empirical findings not supportive of the traditional life-cycle and permanent income hypotheses. This includes assumptions on the borrowing limit or liquidity constraints faced by consumers, relaxing the assumption that they can borrow infinitely from the future. Other changes in the assumptions of the framework are uncertainty of future employment, income and life expectancy.

Other scholars are less sympathetic to the traditional models of consumption and point to flaws in the theory (Shefrin & Thaler, 1988; Thaler, 1990). Firstly, they point to bounded rationality and the inability of people to make perfectly rational decisions. People lack information and improperly discount the future, implying that individual agents are not sophisticated enough to behave as rationally as the traditional life cycle theories predict. Second, the same set of scholars suggests that most consumers do not exhibit the patience and self-control necessary to save for periods with expected lower incomes, thus failing to smooth

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<sup>14</sup> For the life-cycle theory the household is finite-lived and saves for retirement. The permanent income hypothesis assumes households live infinitely by leaving bequests for children.



consumption over the life cycle. To accommodate these inconsistencies, the behavioral life-cycle theory was introduced.

The behavioral life-cycle theory allows for mental accounting and framing by the consumers. Consumers are allowed to incorporate psychic costs into their spending decisions. They are also allowed to be impatient, letting the savings rate fluctuate over time and across income types. The theory assumes that people consider three things when making consumption and savings decisions – current income, current assets, and future income (Shefrin & Thaler, 1988). Current income provides the greatest incentive to spend. Current assets are valuable but less liquid, and future income is plagued by uncertainty.

An income source like remittances probably contributes to current income, and thus we are likely to see more of it spent than saved. Money is not automatically withheld for savings, although a significant portion of remittances are already lost to the sender and recipient via fees charged by transfer agents such as Western Union. While it is possible that recipients view remittances differently from other income because it came at a sacrifice – the absence of the family member who is working elsewhere – it is likely the case that money is used to meet immediate needs rather than savings. The decision to even send someone away to work is possibly motivated by immediate need, and as is the case in more developed countries, lower income populations are unlikely to earn (or receive) enough to comfortably place remittances into any type of savings or retirement plans. At the same time, it is possible that some people work in developed countries and send money to their home country for investment purposes, such as the construction of a house. This form of monetary flow may explain why remittance figures from the Bank of Jamaica are so great, but because this money is intended as an

investment on the behalf of the sender, the respondent fails to report it as remittances available to the recipient's household.

If we assume that respondents are only reporting receipt of income that is available for them to spend and the assumption that recipients are determined by immediate need, the household's problem is:

$$V_t = E_t \sum_{\tau=t}^{\infty} \rho^{\tau-t} U(C_\tau, L_\tau) \quad (17)$$

subject to  $p_1 c_1 + \frac{p_2 c_2}{1+r} + (1-t)WL = T(1-t)W + N$

where  $E_t$  is the expectations operator at time  $t$ ,  $\rho$  is the constant discount factor,  $C_\tau$  is consumption of goods and services at  $\tau$ , and  $L_\tau$  is leisure at  $\tau$ . In the budget constraint  $p_1$  and  $p_2$  are the first and second period prices,  $r$  is the interest rate,  $t$  is the income tax rate,  $W$  is the wage rate,  $T$  is the amount of time available to the head of household for labor or leisure, and  $N$  is all non-labor income, including remittances.

The Lagrangian is given as

$$L = E_t \sum_{\tau=t}^{\infty} \rho^{\tau-t} U(C_\tau, L_\tau) - \lambda [T(1-t)W + N - p_1 c_1 - \frac{p_2 c_2}{1+r} - (1-t)WL] \quad (18)$$

The first order conditions from (1) are:

$$\frac{\partial U}{\partial c_1} - \lambda p_1 = 0 \quad (19)$$

$$\frac{\partial U}{\partial c_2} - \frac{\lambda p_2}{1+r} = 0 \quad (20)$$

$$\frac{\partial U}{\partial L} - \lambda(1-t)W = 0 \quad (21)$$

$$p_1 c_1 + \frac{p_2 c_2}{1+r} + (1-t)WL = T(1-t)W + N \quad (22)$$

These yield the following equilibrium conditions:

Static

$$\frac{\delta U / \delta L}{\delta U / \delta C_1} = \frac{(1-t)W}{p_1} \quad (23)$$

Euler  
Consumption  
equation

$$\frac{\delta U / \delta C_2}{\delta U / \delta C_1} = \frac{p_2}{p_1(1+r)} \quad (24)$$

The static equation states that agents maximize utility when the ratio of their marginal utility of leisure to the marginal utility of consumption equals their real purchasing power (the ratio of after-tax income to the price level). If wage increases, for example, the right hand side of the static equation increases. The left hand side must also increase, suggesting that either the marginal utility of leisure increases (consume less leisure) or the marginal utility of consumption decreases (consume more), assuming both are normal goods and subject to diminishing marginal utility. If wages increase, not changing current consumption or leisure and saving all additional income for future consumption is not maximizing utility.

The Euler equation provides a solution for the intertemporal model. It suggests that there exists an optimal path on which an individual cannot increase utility further by forgoing

consumption in the current time period, investing the money in an account that pays interest rate  $r$ , and using the money in the future (Mankiw, Rotemberg, & Summers, 1986). Substituting (19) and (20) into the budget constraint yields the solved out consumption function, which can be represented as (Carriker, 1993):

$$C_t = \beta_0 + \beta_1 \sum_{s=1}^z Y_{st} + \beta_2 C_{t-1} + \beta_3 W_t \quad (25)$$

where,  $C$  is consumption,  $Y_{st}$  is income in time  $t$  from income source  $s$ ,  $W$  is a measure of wealth and  $\beta_1$  is short-run marginal propensity to consume from all sources. The long-run MPC<sup>15</sup> is given by:

$$LMPC_s = \frac{\beta_1 + \beta_3 \frac{\partial W_t}{\partial Y_{st}}}{1 - \frac{\beta_2}{1+g}} \approx \frac{\beta_1 + \beta_3 \bar{w}_s}{1 - \frac{\beta_2}{1+g}} \quad (26)$$

where  $\bar{w}_s$  is average ratio of wealth to income from source  $s$  (Carriker, et al., 1993).

At least one scholar has suggested that the concept of a “long-run MPC” might not be fundamentally valid (Carroll, et al., 2006) because in the long-run, the amount of wealth or income is endogenous in the consumption equation. Like claimed in Carroll et al (2006), what we call long-run MPC is really the dynamics of consumption over a few short years (2001-2004), hence it is more a medium term phenomenon and more likely to be “constant”.

Equation in (25) does not account for income from multiple sources, thus a more appropriate model is:

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<sup>15</sup> Alternative formulas for the calculation of the long-run MPC exists, such as in (Carroll, Otsuka, Slacalek, & National Bureau of Economic, 2006)

$$\lambda_S C_t = \beta_{0s} + \beta_{1s} Y_{st} + \beta_{2s} \lambda_S C_{t-1} + \beta_3 W_t \text{ for} \quad (27)$$

each  $s=1, \dots, Z$ .

where  $\lambda_s$  is the share of total consumption that is purchased using income from source  $S$ . The sum of the lambdas over  $s$  is equal to one. There are  $Z$  such individual equations for each source of income. As Carriker et al (1993) points out, empirical estimation of each of these equations is not possible since the lambdas are unknown. One way to proceed is to sum over the different income sources, which leads to the following estimable equation:

$$C_t = \beta_0^* + \sum_{s=1}^Z (\beta_{1s} Y_{st}) + \beta_2^* C_{t-1} + \beta_3^* W_t \quad (28)$$

where,  $\beta_0^* = \sum_{s=1}^Z \beta_{0s}$ ,  $\beta_2^* = \sum_{s=1}^Z (\beta_{2s} \lambda_s)$  and  $\beta_3^* = \sum_{s=1}^Z \beta_{3s}$

Equation (28) forms the basis of the models we run in later sections.

### *Budget Shares*

An alternative representation of the consumption function in (28) is using budget shares (Deaton & Muellbauer, 1991; Hawkins & Wallace, 2006) from which Engel equations can be derived to test the differences in the MPC across goods.

The empirical approach is fully parametric as we use a standard Engel curve which has expenditure on various goods as a function of total income while controlling for demographic and other characteristics of the household. While there are different possible functional forms that can be used, we opt to use the most commonly used linear function of Working (1943)

(Working, 1943). There are some advantages to using this approach, one of which is that it is consistent with the adding up restriction in demand analysis. That is,

$$w_i = \alpha_i + \beta_i \ln(Y/n) \quad (29)$$

where,  $\sum w_i = 1$ ,  $\sum \alpha_i = 1$  and  $\sum \beta_i = 0$ ,  $\sum \alpha_i = 1$ , and  $\sum \beta_i = 0$ .

When the individual expenditures are transformed into budget shares and total income is transformed to its log, the joint density is approximately normal, which means the regression function can be treated as linear. The simple Working Engle curve can be extended to include various household characteristics as control variables, as well as indicators of the various income sources of interest.

$$w_i = \alpha_i + \beta_i \ln(Y/n) + \sum \gamma_j d_{ij} + \eta_i \ln(n) + \mu_i X_i + u_i \quad (30)$$

where,  $w_i$  is the share of budget spent of good  $i$ ;  $Y$  is total disposable income;  $d_{ij}$  represents dummy variables for non-labor income sources;  $n$  is household size;  $X_i$  includes age (of the head of the household), age squared, urban area, and household size and  $u_i$  is the error term.

#### *Theoretical Relationships between Budget Shares and Remittances*

Thus far, we have presented arguments as to why remittances as an outside income might affect consumption, but we have not been specific as to how specific categories of expenditures might be affected by remittances. In this section, we hypothesize about the effect of remittances on categories of spending reported in the surveys used and explain our rationale.

The first expenditure category is education related expenses, and the effect of remittances on the share of budget spent on school expenditure is expected to be positive. This is because of

conditions usually attached to remittances, which may informally state that the money must be spent towards a child's education.

Home maintenance is a similar type expense. Money may be requested for repairs and improvements, and thus we expect a positive relationship between reliance on remittances and the share of expenses devoted to this category. Households requesting funds from relatives abroad for specific purposes may be held accountable if remittances are used for other items. As such, an increase in the share of income received from remittances is expected to increase the share of expenses in each of these categories, *ceteris paribus*.

Other categories may be negatively affected as dependence on remittances increases. For example, individuals sending remittances may not want to support bad habits (vices) such as smoking and gambling, or luxury expenses, such as eating out or salon services. As such, even when controlling for total income, increased reliance on remittances decreases the share of expenses on these items. Total spending in these areas may increase with an increase in income, but the rate of the increase in spending on these categories is less than the increase in expenditures, and thus the budget shares fall.

Other categories, such as grocery store purchases, water, or electricity, could exhibit positive or negative effects between remittances and budget shares. Controlling for income, it could be the case that remittances are sent specifically for these purposes, and thus we would anticipate a positive relationship between the share of remittance income and budget shares for these items. However, these items could also be considered necessities, in which case the source of income is irrelevant. Controlling for income, expenses on water remain the same regardless

of whether the income is earned or remitted. This hypothesis follows the older life-cycle hypothesis.

The effect of income on budget shares provides a slightly different set of hypotheses. Expenditures on items such as education, health, luxuries like eating out, and vices such as smoking and gambling, are all expected to increase with income, *ceteris paribus*. Other expenses may increase or decrease, but at a slower rate than income, resulting in negative relationships between income and budget shares. For example, expenses on water may reach an optimal level, at which point no increase in income would increase water level further. The same could be said for electricity. In the case of food, increases in income may result in more eating out, less home production, and less grocery store purchases. Of course, it is also possible that grocery store purchases increase as home production slows, so even this effect is a bit ambiguous.

A full list of the expected effects of remittance share of income and total income on the budget shares is given in Table 22.

Table 22

Expected Signed of Key Parameters on Budget Shares

	School	Eating out	Home production of food	Grocery store purchases	Water	Electricity	Home maintenance	Vices	Health
Share of Remittance in total income	+	-	+	?	?	?	+	-	+
Total Income	+	+	-	-	-	-	+	+	+



## The Methodology

Traditionally, the estimation of Engel curve equations uses OLS regressions of budget shares on the log of total expenditures (Deaton, 1997; Deaton & Muellbauer, 1991; Subramanian & Deaton, 1996). While this is acceptable for food expenditures in which few households report zero spending, it may not be appropriate for other budget shares with a disproportionate number of zeros. The fractional nature of the data also cannot be ignored if we want to predict values for the dependent variable (Papke & Wooldridge, 1996, 2008). Ramalho and Da Silva (2009) suggest the use of a two-part model able to handle extreme bunching at the endpoints (0 or 1) within the fractional response models of Papke and Wooldridge (Ramalho & Da Silva, 2009). This approach is applicable given the budget shares we consider. The following serves as an explanation of the method and how we implement this approach.

We begin with the basic conditional function,

$$E(Y/X) = X\beta \tag{31}$$

where, Y is the budget share of the various expenditure types given in Table (26), and the regression equivalent to Equation (30). If OLS is used, there is no guarantee that predictions of  $E(Y/X)$  will fall within the (0,1) interval. Furthermore, the large number of zeros means that Equation (31) may be misspecified.<sup>16</sup> One possible representation is the Tobit specification of (31) which is given by,

$$E(Y/X) = \Phi(X\beta/\sigma)X\beta + \sigma\phi(X\beta/\sigma) \tag{32}$$

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<sup>16</sup> Even though all models have some form of misspecification as a rule, researchers aim to reduce these misspecification as much as possible.

where  $\Phi(\cdot)$  is the normal distribution function and  $\phi(\cdot)$  is the normal density.  $\sigma$  is the standard deviation of the error from a latent variable equation ( $Y^*$ ) (not shown) from which (32) is derived. This econometric approach was previously used by (McDonald & Moffitt, 1980) for demand analysis, but the Tobit still does not guarantee that the dependent variable will be bounded between 0 and 1.

On the other hand, the log-odds transformation of  $Y$  guarantees that the dependent variable is between 0 and 1. Each  $Y$  is transformed to  $\log(Y/1-Y)$  and we have as the condition mean

This equation is then estimated using OLS. The appeal of this transformation is that the distribution of the transformed variables resembles a normal distribution, which makes OLS regression appropriate. However, the transformation is ad-hoc and not defined if  $Y$  is either zero or one.

These issues contributed to the development of the fractional response models proposed by Papke and Wooldridge.

#### *Fractional Response Modeling (FRM)*

The method proposed by Papke and Wooldridge (1996) uses a generalized least squares method with no transformation needed for the dependent variable. The conditional mean takes the form

$$E(Y/X)=G(X\beta) \tag{33}$$

where  $G$  is a non-linear function.

### *Two-part Fractional Response Model*

We use the two-part fractional response model proposed by Ramalho and Da Silva (2009) to fully account for the large number of zeros observed in the budget shares data. The first part of this model deals with the participation decision:

$$Y^* = \begin{cases} 0 & \text{for } Y = 0 \\ 1 & \text{for } Y \in (0,1] \end{cases} \quad (34)$$

where  $Y^*$  is 0 without participation and 1 otherwise.

Next, we estimate  $\Pr(Y^* = 1|X)$  as a logit model, which in this case, is more appropriate than a probit model.

$$\Pr(Y^* = 1|X) = \Pr(Y \in (0,1]|X) = F(X\theta) \quad (35)$$

where  $F(\cdot)$  is the cumulative logistic function and  $\theta$  is a vector of parameters.

This logit model can be estimated using maximum likelihood estimation on data for the entire sample (J.S. Ramalho & da Silva, 2009).

The second part of the model deals with positive amounts of budget shares once a decision to participate is made:

$$E(Y|X, Y \in (0,1]) = G(X\gamma) \quad (36)$$

where  $G(\cdot)$  can be any non-linear function, is identical to the  $G(\cdot)$  in the FRM model in (33), and is estimated using the quasi-MLE method.

$E(Y|X)$  can be divided into two parts to reflect 0 and positive budget shares separately:

$$E(Y|X) = E(Y|X, Y = 0) \times \Pr(Y = 0|X) + E(Y|X, Y \in (0,1]) \times \Pr(Y \in (0,1]|X) \quad (37)$$

where, the first term on the right hand side drops out because it is equal to zero. From (35) and (36), we now have

$$E(Y|X) = G(X\gamma) \cdot F(X\theta) \quad (38)$$

Importantly these two components can be estimated separately since  $\gamma$  and  $\theta$  are not required to be the same. We assume a logistic function<sup>17</sup> for both models as in (Ramalho & Da Silva, 2009).

This means:

$$E(Y|X) = \frac{e^{X(\gamma+\theta)}}{(1+e^{X\gamma})(1+e^{X\theta})} \quad (39)$$

For the participation equation, the marginal effect of  $X_j$  is given by:

$$\frac{\partial Pr(Y^*=1|X)}{\partial X_j} = \theta_j \frac{e^{X\theta}}{(1+e^{X\theta})^2} \quad (40)$$

Conditional on whether a household spends some positive amount on remittances, the marginal effect of  $X_j$  is given by:

$$\frac{\partial E(Y|X, Y \in (0,1])}{\partial X_j} = \gamma_j \frac{e^{X\gamma}}{(1+e^{X\gamma})^2} \quad (41)$$

For the marginal effect on all budget shares (whether 0 or positive):

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<sup>17</sup> The logistic assumption for  $G(\cdot)$  and  $F(\cdot)$  is tested using the *linktest* command in Stata.

$$\begin{aligned} \frac{\partial E(Y/X)}{\partial X_j} &= \frac{\partial G(X\gamma)}{\partial X_j} F(X\theta) + \frac{\partial F(X\theta)}{\partial X_j} G(X\gamma) \\ &= \gamma_j \frac{e^{X\gamma}}{(1+e^{X\gamma})^2} \frac{e^{X\theta}}{(1+e^{X\theta})} + \theta_j \frac{e^{X\theta}}{(1+e^{X\theta})^2} \frac{e^{X\gamma}}{(1+e^{X\gamma})} \end{aligned} \quad (42)$$

The total effect is therefore disaggregated into (i) the marginal effect on budget share for households who report positive amounts of spending, weighted by the probability of participating in that expenditure type; and (ii) the marginal effect on probability of participation in each expenditure type weighted by the average budget share for those who have positive spending on that expenditure type.

#### *Accounting for Endogeneity of Remittances*

Remittance receipt may be endogenous in the consumption equations. Maybe the most important reason is that omitted variables from the budget share equations may be correlated with remittances. This is the omitted variables problem. One such variable which is unobserved is the recipients' view of remittances. Is the stream of outside income likely to remain stable or is it volatile. The same way consumption is expected to vary depending on whether income is a windfall, so, too, might consumption depend on whether money is a one time or repeated gift. Higher remittances may correspond to rarer occurrences, and thus the omitted factor is correlated to both the level of remittances and expenditure patterns.

Authors have used a variety of instruments based on the availability of data. In looking at remittances and child labor, Acosta (2006) uses village level characteristics to estimate the likelihood of receiving remittances (Acosta 2006). Abdih, Chami Dagher, & Montiel (2008) estimate the causal relationship between home country institutions, such as the level corruption (Abdih, et al., 2008). They also use an IV procedure, where the instrumental variable is whether or not the individual lives in a coastal area. This variable is correlated with remittances through

its positive effect on migration, and any effect on corruption would be through variables such as per capita income, which are already in the model.

In a country as geographically small as Jamaica (less than 150 miles long and 50 miles wide – slightly smaller than the state of New Jersey), geographical distinctions may be difficult to find without some other parameter helping to differentiate areas. Thus, we adopt the following strategy. First, we use data from 2003, a year excluded from earlier analysis due to problems on missing data with employment and earned income. Fortunately, information on reported remittances is still available. By district (a geographic concept determined in part by geography and part by population density), we calculate average household remittance receipts. If the average household in the district receives a high level of remittances relative to other districts across the country, then all households residing in the district are tagged as being located in an area with high migration. This tag is then tested as an instrument in the following models.

The two part model discussed above is extended to account for this potential endogeneity. In the participation equation, this is achieved by using an instrumental variable probit model (IVPROBIT in Stata), a slight departure from the earlier discussion. Using an IV procedure with logit would be preferred given that it would not require the normal distribution assumption, but its calculation is much more difficult and is not preferred in empirical research. Initial findings (not presented) from the logit and probit estimations of Equation (35) yield similar parameters, suggesting that in this application, interchanging from logit to probit should not significantly affect results.

For the second part of the model, we adjust for endogeneity using the two-step IV procedure for fractional response models (J.M. Wooldridge, 2010). In the first step, we estimate

an OLS regression of remittance share on the instrumental variable and all exogenous variables in the model, and save the residuals( $\hat{v}$ ). In the second step, we rerun Equation (36), but this time, we include the saved residuals from the first step as one of the exogenous variables. If the coefficient on  $\hat{v}$  is significant, then we can reject the null that remittances are exogenous.

### The Data

Given the interest in the effects of remittances on household consumption, we use two data sources, the Survey of Living Conditions (SLC) and the Jamaican Labor Force Survey (LFS) to construct a dataset. These sources are the same as those used in the previous essay, and thus discussion of the surveys and their sampling techniques are located in the last chapter. Questions about consumption and non-labor income (including remittances) are asked in the SLC. Data on labor income is the only variable from the LFS necessary for our model, and data from the two datasets are merged using unique household identification numbers.

Using data from 2001-2007, we assess the characteristics of those households receiving non-labor income and look at differences in consumption behavior between those families receiving and not receiving remittances. We begin with a general description of households in the sample in Table 23. Note that the first two variables should not be interpreted as shares, given that maximum values exceed one and their sum is greater than one. Instead, these variables represent the ratio of remittances or wages to expenditures. When combined, we see that on average, wages and remittances exceed total expenditures by approximately six percent. Increases in these values, however, could still be interpreted as increased reliance on remittances or earned income.

In the next sections, we discuss the issue of outliers and further elaborate on variables used in this essay.



Table 23

Descriptive Statistics (Explanatory Variables)

	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Remittances to Total Expenditure Ratio</b>	18,100	0.13	0.26	0.00	1.65
<b>Labor Income to Total Expenditure Ratio</b>	15,369	0.93	1.37	0.00	8.70
<b>Age of Head of Household</b>	24,003	48.74	17.05	0.00	98.00
<b>Household size</b>	24,003	2.30	2.35	0.00	28.00
<b>Number of Kids 5yo and Under</b>	21,084	0.20	0.51	0.00	4.00
<b>Number of Kids 6yo and Over</b>	21,084	0.57	1.02	0.00	8.00
<b>Male</b>	21,084	0.56	0.50	0.00	1.00
<b>Married(=1)</b>	23,968	0.33	0.47	0.00	2.00

Note that the first two variables are the ratios of income streams to total expenses, and hence, if saving occurs, it is possible for each of these streams and/or their total to exceed one.

### *Outliers*

Even though there is not a high frequency of outliers in the budget shares, those with a z-score of over 3 or below -3, are removed from the sample. This is a less conservative approach than we used in our first essay, but the z-scores indicate more outliers in the consumption chapter variables. The disadvantage of this approach is an important observation may be deleted from the data set. For this reason, in Table 45 (found in the Appendix), we present a summary of the number of observations before and after these outliers are dropped.

### *Discussion of Variables*

One reason for using expenses rather than income as a divisor arises from the under-reporting of income. It is often the case that the sum of remittances and wages exceed reported total income. Total expenses are often less than the sum of income streams, but greater than reported total income. In other words, reported expenses exceed reported incomes. Because income is often underreported, total expenditures are used as a proxy of total disposable income, thus producing the ratios of income streams to expenditures rather than using shares of total income. This practice, although common when working with survey data such as that in this paper, has been criticized as being inadequate (Haddad & Bouis, 1991; Subramanian & Deaton, 1996). Unfortunately, a preferable solution is not available. The significance of remittances for Jamaicans, however, at least offers the opportunity to more adequately control for income sources, with remittances and other non-labor income available through the SLC and labor income available from the LFS.

Part of the problem in this particular dataset may arise from inconsistencies in the survey or the ability of households to recall all income and expenditures. The survey instrument often requests data spanning different time periods. For example, respondents are asked how much

they spent at the salon in the last 7 days but how much they spent on education over the last 12 months. Similarly, respondents can choose to report income as weekly, biweekly, monthly, or annually, but are asked to provide remittances received over the last year. For ease of comparison purposes, all figures are converted to their annual equivalents, although we recognize that even this process does not create perfect estimates of expenses or incomes.

It is also important to emphasize that all income and expenditure categories are aggregated for members within the same household. For example, remittances received by members of the household are summed. So, too, are expenses on items such as daily food purchases. Specific categories of expenses are created based on the section heading in the SLC. For instance, *school* spending includes expenses on school supplies, money for school lunch, and tuition; *eating out*, refers to purchase of meals intended for immediate consumption with the main item in this category being restaurant expenses; *luxury* refers to *eating out* plus visits to hair *salon*; *home production* refers to home production of meals, including growing food as well as preparing meals with those food items, while *grocery store food* refers to purchases of food items other than those under the previous two categories, namely grocery store expenses. *Water* and *electric* refer to household spending on water and electricity and *home maintenance* refers to spending on household supplies, ranging from repairing household items to buying kitchen equipment. *Vices* refer to the sum of tobacco, gambling and alcohol expenditure; *health* is expenditure on visits to the doctor or hospital and on medication and *donation* represents amounts given as gifts by the household. The complete list of expenditure types as well as their descriptive statistics is given in Table 26 below.

Finally, it is worth mentioning that Jamaica uses a General Consumption Tax that is automatically included in the price tag (as opposed to being added in at the register as is done in

the United States). As a result, many, but not all, of the expense categories above include taxes paid. The level of taxes, therefore, could be different based on the service offered, the size of the black market in providing services, or simply not applicable, as in the case of home production. Because we are estimating marginal effects, this should not affect our results. Other forms of taxes, including income taxes and education taxes, exist, but data in the survey on these taxes is not reliable.

In the 2002 SLC, respondents were asked two other important questions. First, they were asked what they considered as their primary source of income. Second, respondents were asked how they viewed their financial situation.

Table 24 provides a different look at the information from the summary statistics in Table 23. Overall, remittances account for an average of 15 percent of income or 13 percent of expenses, given that expenses exceed reported total income. For recipients, remittances accounted for an average of 30 percent of household income. In Table 24, we find that almost 17 percent of households respond that remittances are their primary means of support.

Table 24

Households' Reported Main Means of Support

<b>Main means of support in 2002</b>	<b>Freq.</b>	<b>Percent</b>
<b>Salaries, wages, earnings of members</b>	5,349	76.68
<b>Remittance from family/friend abroad</b>	550	<b>7.88</b>
<b>Support received for children living in the household (remittances)</b>	160	<b>2.29</b>
<b>Help from family/friend domestically (remittances)</b>	461	<b>6.61</b>
<b>Welfare support from the Government</b>	154	2.21
<b>Welfare support from the church/NGO</b>	20	0.29
<b>Other</b>	269	3.86
<b>N/A</b>	13	0.19
<b>Total</b>	6,976	100

Source: Author's calculation from Jamaica Survey of living conditions.

When asked about their financial situation, the overwhelming number of households indicated they are doing poorly or barely getting by. While unfortunate, this set of results, detailed in Table 25, may provide more reason that using total expenditures as a proxy of total income is acceptable, essentially ignoring savings. Households that are barely getting by are unlikely to designate significant shares of their income towards savings. Although we showed an average of six percent savings in the previous table (the excess of wages and remittances to expenditures), this number is likely skewed by a handful of outliers, in which case the combined ratio is much closer to one for the vast majority of survey respondents.

Table 25

## Self-reported Financial Health of the Household

<b>Economic status of the household in 2002</b>	<b>Freq.</b>	<b>Percent</b>
<b>Very Poor/unable to manage</b>	1,740	24.94
<b>Just getting by</b>	3,764	53.96
<b>Doing okay</b>	1,288	18.46
<b>Doing well</b>	169	2.42
<b>No Response</b>	15	0.22
<b>Total</b>	6,976	100

Although not shown in the tables, thirty percent of respondents receive remittances from someone within Jamaica, and 31 percent receive remittances from abroad. These groups may not be mutually exclusive, as it is possible for one household to receive remittances from both someone within Jamaica and someone working internationally. Twenty-one percent of households report receiving remittances specifically intended for the care of children, further strengthening the hypothesis of a positive relationship between reliance on remittances and education expenses.

Table 18 provides more detailed descriptive statistics on average expenditures by households. The first part of the table presents the share of household expenditures reported in each of these categories. The second part of the table reports the proportion of households that report positive (or non-zero) values for expenses in each one of these areas. Overall, grocery store purchases comprise the largest expenditure category, and ninety-nine percent of households report positive expenditures in this category. Interestingly, vices, including tobacco, alcohol, and gambling, comprise only two percent of expenditures, on average, but over one third of households report positive expenditures in this area.

Table 26

Descriptive Statistics (Expenditure variables) – All Household Heads

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Total Expenditure</b>	18,277	3,477.17	2,323.07	0.00	14,001.24
<b>Budget Shares</b>					
<b>School Share</b>	18,329	0.09	0.13	0.00	0.58
<b>Vices Share</b>	12,006	0.02	0.04	0.00	0.18
<b>Luxury Share</b>	18,029	0.14	0.14	0.00	0.58
<b>Home Production Share</b>	17,842	0.05	0.07	0.00	0.32
<b>Grocery Store Purchases Share</b>	18,426	0.51	0.19	0.00	1.00
<b>Water Share</b>	18,072	0.02	0.03	0.00	0.14
<b>Electricity Share</b>	18,022	0.08	0.07	0.00	0.30
<b>Home Maintenance Share</b>	17,732	0.01	0.03	0.00	0.18
<b>Health Share</b>	14,001	0.02	0.04	0.00	0.24
<b>Donation Share</b>	12,272	0.01	0.02	0.00	0.10
<b>Participation ( 0 or 1)</b>					
<b>School Participation</b>	18,329	0.45	0.50	0.00	1.00
<b>Vices Participation</b>	12,006	0.36	0.48	0.00	1.00
<b>Luxury Participation</b>	18,029	0.77	0.42	0.00	1.00
<b>Home Production Participation</b>	17,842	0.66	0.47	0.00	1.00
<b>Grocery Store Purchases Participation</b>	18,426	0.99	0.10	0.00	1.00
<b>Water Participation</b>	18,072	0.47	0.50	0.00	1.00
<b>Electricity Participation</b>	18,022	0.77	0.42	0.00	1.00
<b>Home Maintenance Participation</b>	17,732	0.19	0.39	0.00	1.00
<b>Health Participation</b>	14,001	0.21	0.41	0.00	1.00
<b>Donation Participation</b>	12,272	0.38	0.49	0.00	1.00

Table 27

Descriptive Statistics (Expenditure variables) – By Recipient Status

Variable	Recipients			Non-recipients		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
<b>Total Expenditure</b>	9,159	3,513.63	2,353.50	9,118	3,440.53	2,291.63
<b>Budget Shares</b>						
<b>School Share</b>	9,174	0.10	0.13	9,155	0.08	0.12
<b>Vices Share</b>	5,570	0.02	0.04	6,436	0.02	0.04
<b>Luxury Share</b>	9,054	0.14	0.13	8,975	0.14	0.14
<b>Home Production Share</b>	8,864	0.06	0.07	8,978	0.05	0.07
<b>Grocery Store Purchases Share</b>	9,226	0.50	0.19	9,200	0.51	0.19
<b>Water Share</b>	9,074	0.02	0.03	8,998	0.02	0.03
<b>Electricity Share</b>	9,037	0.07	0.06	8,985	0.08	0.07
<b>Home Maintenance Share</b>	8,958	0.01	0.03	8,774	0.01	0.03
<b>Health Share</b>	6,953	0.02	0.04	7,048	0.01	0.04
<b>Donation Share</b>	5,668	0.01	0.02	6,604	0.01	0.02
<b>Participation ( 0 or 1)</b>						
<b>School Participation</b>	9,174	0.50	0.50	9,155	0.40	0.49
<b>Vices Participation</b>	5,570	0.35	0.48	6,436	0.36	0.48
<b>Luxury Participation</b>	9,054	0.78	0.42	8,975	0.76	0.43
<b>Home Production Participation</b>	8,864	0.73	0.44	8,978	0.59	0.49
<b>Grocery Store Purchases Part.</b>	9,226	0.99	0.10	9,200	0.99	0.10
<b>Water Participation</b>	9,074	0.45	0.50	8,998	0.50	0.50
<b>Electricity Participation</b>	9,037	0.76	0.43	8,985	0.78	0.42
<b>Home Maintenance Part.</b>	8,958	0.19	0.39	8,774	0.20	0.40
<b>Health Participation</b>	6,953	0.25	0.43	7,048	0.17	0.37
<b>Donation Participation</b>	5,668	0.46	0.50	6,604	0.31	0.46



Rather than focusing on the data in Table 26, however, we turn our attention to the data in Table 27, where the first relevant distinction is made between remittance recipients and other households. For example, the summary statistics suggest that households receiving remittances allocate slightly more money to school, education, and home production, while decreasing the shares of expenditures allocated to grocery store purchases and electricity. While summary statistics help to tell the story, they are insufficient in explaining everything. For example, families without children are unlikely to report education expenses. At the same time, almost one third of households report receiving remittances for children. It is not surprising, therefore, that fifty percent of households receiving remittances report spending money on school, while only forty percent of households not receiving remittances report positive values for school expenses. The participation data also reveal that households receiving remittances are significantly more likely to report positive values of home production, donations, and health expenses prior to the survey.

Thinking about the mean expenditure shares and participation in an expense category jointly also adds an additional level of insight. For example, consider the expense category of donations. In terms of average levels donated, both recipients and non-recipients donate an average of one percent of their income. However, recipients of remittances are much more likely to report positive donations. With fewer donors proportionately, this suggests that the donations made by non-recipients who do donate must be larger as a share of expenses than the donations made by households receiving remittances. This differs from an expense category like vices, where average expenditures and participation rates are almost identical.

In order to better determine the extent that reliance on remittances affects household consumption behavior, the next section of this paper presents results from several empirical techniques.

## Results

We begin with the most basic of models and progress to more advanced models in an attempt to provide consistent parameter estimates. These models include a basic OLS model, a fractional response model, and a fractional response model instrumenting for remittances.

Whenever appropriate, marginal effects are also computed.

### *OLS Regression on all Household Heads*

The first set of results is presented in Table 28. The results show Engel curve estimations (OLS) of the various budget shares. The variable of primary interest is the ratio of remittances to total expenditures. For this term to be significant, it means that even after controlling for total expenditures, a proxy for total income, the reliance on remittances relative to other forms of income has a separate effect on the budget share.

Although the expected effects are not large, this model suggests that for many expenditure categories, increases in reliance on remittances affect consumption behavior. For example, a 10 percent increase in the remittance ratio increases the budget share on schooling by almost 0.2 percentage points. Similar, positive relationships are also found between reliance on remittances and expenditures on home production of food, health expenditures, and donations. In the case of home production, it could be the case that increased reliance on remittances replaces earned income, and therefore the household has more time to spend working in personal gardens and farms. For other expense categories, it may be more likely that remittances are sent

for specific causes (such as an illness) or with particular intentions such as sharing (as with donations).

Interestingly, while home production increased with remittances, this did not come at the expense of eating out (part of luxury), but instead seems to decrease grocery store purchases. In other words, people are cooking with home-grown food rather than purchasing produce but still enjoying the occasional meal away from home. It is also possible that households where individuals rely on remittances understate to their community the level of outside support received, and receive more gifts-in-kind in the form of food items from neighbors, thus reducing grocery expenditures.

When the share of some expense categories increases, it is necessarily the case that others decrease. In this case, increased reliance on remittances for expenditures decreases the budget shares for water, electricity, vices, and grocery store purchases, as already mentioned. It might be the case that these items are normal goods, and an increase in income increases consumption, but the change in consumption is less than the change in income, making these items income inelastic.

For luxury spending and home maintenance, households appear to spend the same percentage of their budgets on these items, regardless of the source of income.

Other variables are worth noting at this time. First, increases in total expenditure (hence total income) increase almost all expenditure categories except home production and grocery store purchases, implying these options are inferior to eating out (luxury spending). Increases in income also have no statistically significant effect on vices, implying vices such as tobacco, alcohol, or gambling are income inelastic.

We also find that household size positively affects schooling and health care expenditures, *ceteris paribus*, but interestingly, are associated with decreased shares of water, electricity, and household maintenance. Instead, these households spend more on home production and food, reinforcing the idea that most families in Jamaica are barely getting by, as suggested in the Data section.

As the number of children over age five increases, school expenditures increase significantly (5.8 percent for each child), which grocery store spending declines. This likely reflects the purchase of school lunches, included in school spending. Families with younger children, however, spend more on groceries and health, *ceteris paribus*. Households headed by males spend notably less than female headed households on education and purchases from grocery stores while spending significantly more on luxuries (including eating out), vices, and home maintenance. Finally, married heads of household spend significantly more on groceries and less on luxuries, *ceteris paribus*.

Although these results are interesting, we find that similar patterns emerge in many specifications. For this reason, the remainder of this section focuses on the effect of the remittance ratio rather than the effects of additional control variables.

Table 28

## OLS Regression of Budget Shares–Basic Engle Curve

Dependent Variable	School	Vices	Luxury	Home Production	Grocery Store Purchases	Water	Electricity	Home Maintenance	Health	Donation
Log of Total Expenditure	0.032*** (0.001)	0.001 (0.001)	0.057*** (0.002)	-0.029*** (0.001)	-0.081*** (0.002)	0.005*** (0.000)	0.009*** (0.001)	0.010*** (0.000)	0.006*** (0.001)	0.002*** (0.000)
Remittances Ratio	0.018*** (0.003)	- (0.001)	-0.001 (0.004)	0.014*** (0.002)	-0.019*** (0.006)	- (0.001)	-0.008*** (0.002)	0.000 (0.001)	0.003* (0.002)	0.002*** (0.001)
Age of Head of Household	0.000** (0.000)	- (0.000)	- (0.000)	0.000*** (0.000)	-0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Household size	0.014*** (0.001)	- (0.000)	-0.001 (0.001)	0.002*** (0.000)	0.002** (0.001)	- (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	0.001*** (0.000)	-0.001*** (0.000)
Number of Kids 5yo and Under	- (0.002)	- (0.001)	- (0.002)	0.003*** (0.001)	0.039*** (0.003)	- (0.001)	-0.007*** (0.001)	0.001** (0.000)	0.002** (0.001)	-0.001** (0.000)
Number of Kids 6yo and Over	0.058*** (0.001)	- (0.000)	- (0.001)	0.003*** (0.001)	-0.027*** (0.002)	- (0.000)	-0.009*** (0.001)	-0.002*** (0.000)	- (0.000)	-0.001*** (0.000)
Male	0.024*** (0.002)	0.014*** (0.001)	0.019*** (0.002)	0.012*** (0.001)	-0.021*** (0.003)	- (0.001)	-0.012*** (0.001)	0.004*** (0.000)	- (0.001)	-0.002*** (0.000)
Married(=1)	- (0.007***)	- (0.005***)	- (0.015***)	-0.001 (0.001)	0.029*** (0.003)	0.003*** (0.001)	0.016*** (0.001)	-0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.000)

_cons	-	0.021***	-	0.226***	1.230***	-	-0.012	-0.070***	-	-0.014***
	0.193***	(0.006)	0.192***	(0.008)	(0.020)	0.017***	(0.007)	(0.003)	0.058***	(0.002)
Year and Parish Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
$R^2$	0.43	0.06	0.20	0.17	0.15	0.08	0.07	0.07	0.06	0.05
$N$	15,045	9,236	14,797	14,688	15,118	14,826	14,812	14,577	11,454	9,449

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Although many of the OLS results follow our expectations, the OLS results are tentative given that remittance share may be endogenous and the dependent variables are proportions. The next set of results accounts for the large number of zeros in most of the budget shares as well as the fractional nature of the dependent variable.

#### *Two-part Model Assuming Exogeneity of RHS*

As explained in the methodology section, the two-part fractional response model is appropriate in this application. The results in Table (29) represent the probability that any expenditure takes place for each of the different expenditure types, part one of the two part model. Increases in total expenses, a proxy for total income, increase the probability of positive expenses in all categories except home production of food, suggesting that as income rises, people prefer to purchase food from stores or eat out, an expected finding. More interesting, however, is the significance on reliance on remittances relative to other income. Remittances are associated with increased probability of reporting positive expenses on schooling, home production of food, home maintenance, health care, and donations, *ceteris paribus*. Again, it could be the case that households with children are more likely to receive remittances, but the regression controls for children in the household. The household may also report positive values for food production because the receipt of remittances allows the household member to stay home and farm. Finally, remittances may be sent for specific home repairs or purchases of durable goods, so again, we see the expected, positive relationship.

Interestingly, households reporting receipt of remittances were less likely to report positive expenses for vices and water, an interesting combination. It may be the case that family members abroad do not send money to family members who they fear will misuse the money.

Table 29

## Logit Regression-Likelihood of Spending (0 to 1) – First Part

Dependent Variable	School	Vices	Luxury	Home Production	Grocery Store Purchases	Water	Electricity	Home Maintenance	Health	Donation
Log of Total Expenditure	1.342***	0.468***	1.599***	-0.198***	1.044***	1.282***	1.678***	1.138***	0.554***	0.723***
	(0.050)	(0.039)	(0.043)	(0.032)	(0.112)	(0.035)	(0.042)	(0.043)	(0.042)	(0.041)
Remittances Ratio	0.491***	-0.336***	0.066	0.657***	-0.096	-0.246***	-0.129	0.223**	0.301***	0.652***
	(0.106)	(0.091)	(0.092)	(0.089)	(0.318)	(0.079)	(0.089)	(0.097)	(0.096)	(0.087)
Age of Head of Household	0.007***	-0.014***	-0.035***	0.009***	0.007	0.003**	0.006***	0.005***	0.025***	0.021***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.005)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Household size	0.805***	-0.023	0.085***	0.084***	0.067	-0.188***	-0.134***	-0.235***	0.086***	-0.013
	(0.026)	(0.016)	(0.019)	(0.013)	(0.099)	(0.013)	(0.016)	(0.017)	(0.016)	(0.016)
Number of Kids 5yo and Under	-0.011	-0.151***	-0.190***	0.090**	0.477	-0.147***	-0.229***	0.026	0.227***	-0.146***
	(0.058)	(0.049)	(0.053)	(0.041)	(0.363)	(0.040)	(0.045)	(0.051)	(0.048)	(0.051)
Number of Kids 6yo and Over	2.513***	-0.094***	-0.122***	0.086***	0.069	-0.247***	-0.248***	-0.207***	-0.066**	-0.048*
	(0.063)	(0.025)	(0.029)	(0.021)	(0.168)	(0.021)	(0.025)	(0.027)	(0.026)	(0.026)
Male	-	0.740***	0.008	0.138***	-0.604***	-0.267***	-0.341***	0.129***	-0.407***	-0.506***
	0.786***									
Married(=	(0.058)	(0.051)	(0.051)	(0.041)	(0.213)	(0.040)	(0.050)	(0.049)	(0.054)	(0.051)
	-0.037	-0.195***	-0.189***	0.093**	1.085***	0.148***	0.485***	-0.147***	0.295***	0.565***



1)										
_cons	(0.061) - 11.988** *	(0.053) -3.922***	(0.056) -9.474***	(0.044) 0.405	(0.313) -3.949***	(0.043) -9.883***	(0.055) -13.021***	(0.053) -9.881***	(0.057) -7.190***	(0.054) -7.997***
Year and Parish Controls	(0.435) YES	(0.328) YES	(0.349) YES	(0.266) YES	(0.987) YES	(0.303) YES	(0.360) YES	(0.359) YES	(0.383) YES	(0.360) YES
<i>N</i>	15,045	9,236	14,797	14,688	14,587	14,826	14,812	14,577	11,454	9,449

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Table 30

## Fractional Response Model – Second Part

Dependent Variable	School	Vices	Luxury	Home Production	Grocery Store Purchases Share	Water	Electricity	Home Maintenance	Health	Donation
Log of Total Expenditure	-0.035** (0.018)	-0.311*** (0.024)	0.167*** (0.015)	-0.521*** (0.016)	-0.379*** (0.011)	-0.427*** (0.014)	-0.330*** (0.011)	0.588*** (0.045)	-0.042 (0.030)	-0.158*** (0.030)
Remittances Share	0.122*** (0.035)	-0.174*** (0.060)	-0.046 (0.035)	0.066* (0.036)	-0.084*** (0.024)	-0.109*** (0.032)	-0.091*** (0.026)	-0.074 (0.120)	-0.024 (0.073)	-0.116** (0.057)
Age of Head of Household	0.003*** (0.001)	0.000 (0.001)	-0.011*** (0.001)	0.004*** (0.001)	-0.000 (0.000)	0.004*** (0.000)	0.003*** (0.000)	0.009*** (0.002)	0.005*** (0.001)	0.004*** (0.001)
Household size	0.012** (0.005)	-0.041*** (0.010)	-0.016*** (0.005)	0.018*** (0.006)	0.013*** (0.004)	0.013** (0.005)	-0.007* (0.004)	-0.244*** (0.022)	-0.026** (0.011)	-0.064*** (0.012)
Number of Kids 5yo and Under	-0.089*** (0.015)	-0.068** (0.033)	-0.161*** (0.015)	0.037* (0.020)	0.153*** (0.011)	-0.051*** (0.018)	-0.078*** (0.013)	0.081 (0.068)	-0.054 (0.037)	-0.041 (0.042)
Number of Kids 6yo and Over	0.187*** (0.008)	-0.060*** (0.017)	-0.080*** (0.008)	0.021** (0.011)	-0.109*** (0.006)	-0.042*** (0.010)	-0.077*** (0.007)	-0.162*** (0.036)	-0.070*** (0.020)	-0.077*** (0.019)
Male	-0.031 (0.019)	0.184*** (0.033)	0.150*** (0.016)	0.176*** (0.021)	-0.073*** (0.012)	-0.047*** (0.016)	-0.073*** (0.012)	0.413*** (0.057)	0.031 (0.039)	0.039 (0.038)
Married(=1)	-0.139*** (0.019)	-0.016 (0.033)	-0.089*** (0.017)	-0.028 (0.022)	0.102*** (0.013)	0.073*** (0.017)	0.124*** (0.013)	-0.239*** (0.060)	-0.035 (0.041)	0.121*** (0.038)
_cons	-1.362***	-0.233	-2.281***	0.958***	3.199***	0.190	0.214**	-8.187***	-2.661***	-2.617***

Year and Parish Controls	(0.156) YES	(0.203) YES	(0.131) YES	(0.143) YES	(0.093) YES	(0.117) YES	(0.091) YES	(0.380) YES	(0.281) YES	(0.268) YES
<i>N</i>	7,003	3,392	11,576	9,702	14,988	7,009	11,480	2,771	2,388	3,608

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

The second part of this analysis evaluates the effect reliance on remittances has on budget shares conditional on positive spending in the given stream. The results for this analysis are much more interesting. Considering that estimations are only for those households reporting positive expenditures, increased reliance on remittances is associated with greater spending on school and home production but lower budget shares for vices, grocery store purchases, water, electricity, and donations.

The nature of the dependent variables in the above tables limits our ability to directly interpret coefficients, and thus, the tables that follow present marginal effects from the above regressions. Based on Table 31, we find that a one unit increase in the remittance ratio ( a relatively large change equivalent to going from no remittances to all remittances) increases the expected probability of reporting positive school expenses by 0.11, *ceteris paribus*, while the probability of reporting positive home production values increases by 0.14 and the probability of reporting a donation was made increases by almost 0.15. The largest decrease in probability due to an increase in remittance reliance occurs for vices, with a 0.07 decline in the probability of reporting positive spending.

The marginal effects for the conditional component in part two of the process are located immediately below in Table (32) and although some are statistically significant (as described above), the magnitudes suggest less importance. Instead, we turn to the results in the third table, the total effects, calculated using Equation (41). This effect takes into account both the probability of spending, average spending, and spending conditional on receiving remittances.

Two expenses categories stand out, schooling and grocery store purchases, although there are small effects in other categories. Increases in remittances are expected to increase the share

of expenses allocated to budget by two percent, while decreases grocery store expenses by roughly the same amount.









### *Two-part Model with Endogenous Remittances*

As discussed earlier in the paper, there are valid reasons to question the assumption that remittances are exogenous. Specifically, is it the case that households receive remittances and then decide how to spend this income, or is it the case that expenses arise – such as home repair or health needs – and someone outside of the household sends money for these purposes. For this reason, this section introduces an instrument for remittances. Remittances are summed at the district level, and this value is then used as an instrument for reliance on remittances at the household level. Table 34 contains the results of the OLS first stage regression of the endogenous variable (remittances ratio) on the exogenous variables and this instrument, district level remittances. Recall that only the remittance ratio is assumed endogenous in the consumption chapter, but there are different columns for each equation because of missing observations for some budget shares.

The following set of tables present results from the two part estimation with the ratio of remittances instrumented by district-level remittances. In Table 35, we find that reliance on remittances positively affects the probability a household spends on vices, luxury, home production, electricity, and donations. Interestingly, this is the first instance in which the probability of spending on schooling does not increase. Looking at the marginal effect in Table 39, however, we see that the expected effect of reliance on remittances on school spending is larger than all but two of the other effects, although this variable lacks statistical significance.

In the second step, we find that conditional on reporting positive levels of spending, increased reliance on remittances is associated with increased shares of luxury items and home production and decreased shares of grocery store purchases and electricity. Interestingly, when

instrumenting, reliance on remittances increases the probability of spending on electricity, but conditional on spending, decreases the share of electricity relative to total expenses. Other categories, including spending and health, do not vary with reliance on remittances once we instrument.

Below the two-part model with the endogenous remittance ratio are three additional tables presenting the marginal effects.

Table 34

First-Stage Regression of Remittance Share on the Exogenous variables

<b>Endogenous variable is remittance as a ratio of total expenditure</b>										
Equation:	School	Vices	Luxury	Home Production	Grocery Store Purchases Share	Water	Electricity	Home Maintenan ce	Health	Donation
Log of Total Expenditur e	-0.046*** (0.003)	-0.054*** (0.004)	-0.047*** (0.003)	-0.042*** (0.003)	-0.044*** (0.003)	-0.045*** (0.003)	-0.047*** (0.003)	-0.046*** (0.003)	-0.049*** (0.004)	-0.055*** (0.004)
Age of Head of Household	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Household size	0.003** (0.001)	0.004** (0.002)	0.003** (0.001)	0.003*** (0.001)	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)	0.001 (0.002)	0.005*** (0.002)
Number of Kids 5yo and Under	0.016*** (0.004)	0.024*** (0.006)	0.016*** (0.004)	0.015*** (0.004)	0.016*** (0.004)	0.016*** (0.004)	0.017*** (0.004)	0.016*** (0.004)	0.019*** (0.005)	0.024*** (0.006)
Number of Kids 6yo and Over	-0.001 (0.002)	-0.000 (0.003)	-0.001 (0.002)	-0.002 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	0.001 (0.002)	0.000 (0.003)
Male	-0.058*** (0.004)	-0.079*** (0.006)	-0.058*** (0.004)	-0.056*** (0.004)	-0.058*** (0.004)	-0.059*** (0.004)	-0.060*** (0.004)	-0.058*** (0.004)	-0.068*** (0.005)	-0.083*** (0.006)
Married(=1 )	-0.031*** (0.004)	-0.044*** (0.006)	-0.031*** (0.005)	-0.033*** (0.004)	-0.032*** (0.005)	-0.031*** (0.005)	-0.030*** (0.005)	-0.032*** (0.005)	-0.031*** (0.005)	-0.041*** (0.006)

District Level Remittances (in 1000s)	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
_cons	(0.000) 0.460*** (0.028)	(0.000) 0.483*** (0.038)	(0.000) 0.492*** (0.027)	(0.000) 0.417*** (0.027)	(0.000) 0.451*** (0.028)	(0.000) 0.454*** (0.028)	(0.000) 0.462*** (0.028)	(0.000) 0.443*** (0.027)	(0.000) 0.488*** (0.032)	(0.000) 0.484*** (0.037)
athrho	-0.060	-0.212***	-0.367***	-0.410***	-0.199	-0.021	-0.139*	0.000	-0.074	-0.098
Year and Parish Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
lnsigma	(0.081)	(0.067)	(0.075)	(0.064)	(0.217)	(0.060)	(0.073)	(0.071)	(0.083)	(0.069)
_cons	-1.466*** (0.006) 15,045	-1.347*** (0.007) 9,236	-1.463*** (0.006) 14,797	-1.484*** (0.006) 14,688	-1.465*** (0.006) 14,587	-1.468*** (0.006) 14,826	-1.467*** (0.006) 14,812	-1.468*** (0.006) 14,577	-1.430*** (0.007) 11,454	-1.356*** (0.007) 9,449

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Table 35

## IV Probit—First-part of the Two-part Model

Dependent Variable	School	Vices	Luxury	Home Production	Grocery Store Purchases Share	Water	Electricity	Home Maintenance	Health	Donation
Log of Total Expenditure	0.786***	0.318***	0.916***	-0.044**	0.459***	0.776***	0.973***	0.626***	0.331***	0.451***
	(0.029)	(0.024)	(0.024)	(0.022)	(0.052)	(0.023)	(0.023)	(0.027)	(0.027)	(0.026)
Remittances Ratio	0.521	0.572**	1.510***	2.013***	0.765	-0.062	0.511*	0.126	0.476	0.756***
	(0.342)	(0.246)	(0.280)	(0.229)	(0.899)	(0.257)	(0.308)	(0.303)	(0.339)	(0.259)
Age of Head of Household	0.003***	-0.009***	-0.020***	0.003***	0.001	0.002**	0.003***	0.003***	0.014***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Household size	0.417***	-0.017*	0.034***	0.040***	0.007	-0.113***	-0.077***	-0.126***	0.052***	-0.009
	(0.013)	(0.010)	(0.010)	(0.008)	(0.034)	(0.007)	(0.009)	(0.009)	(0.009)	(0.010)
Number of Kids 5yo and Under	0.001	-0.106***	-0.123***	0.026	0.151	-0.090***	-0.134***	0.012	0.123***	-0.096***
	(0.033)	(0.029)	(0.028)	(0.024)	(0.122)	(0.024)	(0.026)	(0.029)	(0.029)	(0.031)
Number of Kids 6yo and Over	1.264***	-0.056***	-0.060***	0.052***	0.015	-0.149***	-0.137***	-0.116***	-0.040***	-0.030*
	(0.030)	(0.015)	(0.015)	(0.012)	(0.058)	(0.013)	(0.014)	(0.015)	(0.015)	(0.015)
Male	-0.439***	0.499***	0.090***	0.173***	-0.205**	-0.157***	-0.153***	0.073**	-0.212***	-0.274***
	(0.039)	(0.033)	(0.032)	(0.026)	(0.103)	(0.029)	(0.034)	(0.033)	(0.040)	(0.039)

Married(=	0.012	-0.074**	-0.041	0.108***	0.432***	0.092***	0.291***	-0.084***	0.175***	0.356***
1)	(0.035)	(0.034)	(0.032)	(0.026)	(0.109)	(0.027)	(0.031)	(0.031)	(0.034)	(0.033)
_cons	-	-2.729***	-5.721***	-0.495***	-1.525***	-5.989***	-7.618***	-5.513***	-4.285***	-4.970***
	6.972***									
	(0.268)	(0.214)	(0.185)	(0.187)	(0.554)	(0.207)	(0.208)	(0.238)	(0.256)	(0.230)
	15,045	9,236	14,797	14,688	14,587	14,826	14,812	14,577	11,454	9,449

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Table 36

## Fractional Response Model – With Endogenous Remittances

Dependent Variable	School	Vices	Luxury	Home Production	Grocery Store Purchases	Water	Electricity	Home Maintenance	Health	Donation
<i>vhat</i> <sup>18</sup>	0.206	0.065	-	-0.279	0.527***	0.051	0.548***	0.796	-0.410	0.196
	(0.183)	(0.328)	0.933***	(0.192)	(0.120)	(0.171)	(0.139)	(0.657)	(0.408)	(0.418)
Log of Total Expenditure	-	-	0.206***	-	-0.401***	-0.430***	-0.353***	0.553***	-0.025	-0.166***
	0.044**	0.313**		0.509***						
	(0.019)	(0.027)	(0.017)	(0.018)	(0.012)	(0.016)	(0.012)	(0.053)	(0.034)	(0.035)
Remittances Ratio	-0.075	-0.236	0.849***	0.336*	-0.594***	-0.158	-0.620***	-0.845	0.376	-0.307
	(0.178)	(0.320)	(0.156)	(0.189)	(0.117)	(0.170)	(0.137)	(0.650)	(0.402)	(0.411)
Age of Head of Household	0.003**	0.000	-	0.003***	0.000	0.004***	0.004***	0.010***	0.004***	0.004***
	*		0.012***							
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.002)	(0.001)	(0.001)
Household size	0.012**	-	-	0.017***	0.014***	0.013**	-0.006	-0.241***	-0.027**	-0.063***
		0.040**	0.018***							
	(0.005)	(0.010)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.022)	(0.011)	(0.012)
Number of Kids 5yo and Under	-	-0.067**	-	0.033	0.161***	-0.051***	-0.069***	0.092	-0.060	-0.038
	0.086**		0.176***							
	*									
	(0.015)	(0.033)	(0.016)	(0.020)	(0.011)	(0.018)	(0.013)	(0.069)	(0.038)	(0.042)
Number of Kids 6yo	0.187**	-	-	0.022**	-0.110***	-0.042***	-0.077***	-0.162***	-0.070***	-0.077***
	*	0.060**	0.079***							

<sup>18</sup> What is the residual from the regression of the endogenous variable on all the exogenous variables including the instrumental variable.

and Over		*								
Male	(0.008) -0.042*	(0.017) 0.180**	(0.008) 0.205***	(0.011) 0.192***	(0.006) -0.104***	(0.010) -0.050***	(0.007) -0.105***	(0.036) 0.368***	(0.020) 0.055	(0.019) 0.027
Married(=1)	(0.022) - 0.145**	(0.037) -0.018	(0.019) - 0.061***	(0.024) -0.020	(0.014) 0.086***	(0.019) 0.071***	(0.015) 0.107***	(0.068) -0.262***	(0.046) -0.023	(0.045) 0.115***
_cons	(0.020) - 1.273**	(0.035) -0.204	(0.018) - 2.702***	(0.023) 0.835***	(0.013) 3.432***	(0.018) 0.214	(0.014) 0.457***	(0.063) -7.823***	(0.042) -2.840***	(0.040) -2.534***
Year and Parish Controls	(0.173) YES	(0.245) YES	(0.150) YES	(0.166) YES	(0.108) YES	(0.145) YES	(0.109) YES	(0.483) YES	(0.329) YES	(0.324) YES
N	7,003	3,392	11,576	9,702	14,988	7,009	11,480	2,771	2,388	3,608

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses), what is the residuals from the first stage regression.







Table 39

Total Partial Effect with Endogenous Remittances

	School	Vices	Luxury	Home Produc tion	Grocer y Store Purcha ses	Water	Electri city	Home Mainte nance	Health	Donati on
<b>Log of Total Expenditure</b>	<b><u>0.0598</u></b>	<b><u>0.0006</u></b>	<b><u>0.0708</u></b>	<b><u>-0.0246</u></b>	<b><u>-0.0970</u></b>	<b><u>0.0051</u></b>	<b><u>-0.0001</u></b>	<b><u>0.0088</u></b>	<b><u>0.0065</u></b>	<b><u>0.0021</u></b>
<b>Remittances Share</b>	0.0355	<b><u>0.0071</u></b>	<b><u>0.1802</u></b>	<b><u>0.0704</u></b>	<b><u>-0.1430</u></b>	-0.0041	<b><u>-0.0309</u></b>	-0.0038	0.0148	<b><u>0.0033</u></b>
<b>Age of Head of Household</b>	<b><u>0.0005</u></b>	<b><u>-0.0002</u></b>	<b><u>-0.0025</u></b>	<b><u>0.0003</u></b>	0.0001	<b><u>0.0001</u></b>	<b><u>0.0003</u></b>	<b><u>0.0001</u></b>	<b><u>0.0003</u></b>	<b><u>0.0001</u></b>
<b>Household size</b>	<b><u>0.0349</u></b>	<b><u>-0.0011</u></b>	<b><u>-0.0006</u></b>	<b><u>0.0019</u></b>	0.0036	<b><u>-0.0017</u></b>	<b><u>-0.0024</u></b>	<b><u>-0.0025</u></b>	<b><u>0.0007</u></b>	<b><u>-0.0005</u></b>
<b>Number of Kids 5yo and Under</b>	<b><u>-0.0075</u></b>	<b><u>-0.0033</u></b>	<b><u>-0.0279</u></b>	0.0022	<b><u>0.0411</u></b>	<b><u>-0.0025</u></b>	<b><u>-0.0084</u></b>	0.0006	<b><u>0.0017</u></b>	<b><u>-0.0009</u></b>
<b>Number of Kids 6yo and Over</b>	<b><u>0.1189</u></b>	<b><u>-0.0022</u></b>	<b><u>-0.0128</u></b>	<b><u>0.0024</u></b>	<b><u>-0.0272</u></b>	<b><u>-0.0034</u></b>	<b><u>-0.0090</u></b>	<b><u>-0.0020</u></b>	<b><u>-0.0018</u></b>	<b><u>-0.0007</u></b>
<b>Male</b>	<b><u>-0.0389</u></b>	<b><u>0.0130</u></b>	<b><u>0.0298</u></b>	<b><u>0.0135</u></b>	<b><u>-0.0270</u></b>	<b><u>-0.0037</u></b>	<b><u>-0.0114</u></b>	<b><u>0.0027</u></b>	<b><u>-0.0037</u></b>	<b><u>-0.0018</u></b>
<b>Married(=1)</b>	<b><u>-0.0119</u></b>	<b><u>-0.0018</u></b>	<b><u>-0.0096</u></b>	<b><u>0.0021</u></b>	<b><u>0.0240</u></b>	<b><u>0.0030</u></b>	<b><u>0.0151</u></b>	<b><u>-0.0023</u></b>	<b><u>0.0033</u></b>	<b><u>0.0033</u></b>
<b>Year and Parish Controls</b>	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

- Bolded coefficients represent those variables that are significant in the first and/or the second part of the fractional response model

The calculated values for the total partial effects in Table (37) show which of the two components of the condition mean in Equation (41) exerts the stronger influence. For luxury, home production, and health, both components are positive, meaning reliance on remittances not only increases the likelihood of spending on these items, but it also increases the amount spent. A one percentage point increase in the remittance to expenses ratio leads to a 0.18 percentage point increase in luxury goods' budget share, a 0.07 percentage point increase in home production budget share, and a 0.01 percentage point increase in the share of health spending in the budget.

Only for water do we see remittance reliance negatively impacting the likelihood of purchase and spending simultaneously. One possible explanation is metered versus non-metered water sources. Metered water access in Jamaica is restricted to major urban areas, with a significant amount of rural residents relying on large tanks which they may pay to have filled only once or twice for the year. These tanks are able to collect rainwater, reducing the amount households pay for water during rainy seasons. Even though parish is controlled for in all the regressions, it is still possible that poorer residents in any parish, who are themselves more likely to be heavily reliant on remittances, would be more likely to have these tanks.

Of the remaining budget shares-school, vices, donation, grocery, electric and home maintenance – only grocery purchases and electricity are negative and statistically significant in the second part of the response model and either positive or insignificant in the first step. The negative effect when estimating the conditional mean has the more dominant role in estimating the total effect, and therefore, we find that increased reliance on remittances significantly decreases the total share of expenditures comprised of electricity and grocery store purchases.

Finally, the budget shares for school, vices and donation are negative but not statistically different from zero in part two of the model, estimating the conditional mean. The most surprising of these is the coefficient on school, which was consistently positive in previous models. Although positive in the participation estimation in step one, it still lacks significance. This finding suggests that while controlling for the number of children in the household and potential endogeneity of remittances, that increased reliance on remittances may not affect school spending as the previous results suggested.

#### *Discussion and Conclusion*

Three empirical strategies are presented above, an OLS model, a fractional response model assuming exogeneity of remittances, and a two-part fractional response model instrumenting for the ratio of remittances to expenses. Table 38 summarizes the signs of significant coefficients in each of these approaches.

A couple categories stand out as being remarkable consistent across the models. First, home production – regardless of whether we are talking about participation or budget share, and whether we treat the remittance ratio as exogenous or endogenous – increases with an increased reliance on remittances. It is possible that remittances are picking up an observed factor such as how far the household is from an area with economic opportunity. The regressions each control for parish fixed effects, but even like counties in the United States, various towns within an area may be further away from areas with concentrated employment opportunities. It is also possible, as the theory from the previous essay suggest, that recipients of remittances opt to work fewer hours in the formal labor market, and instead, these households are spending more time cultivating crops for personal use. Again, we would find a positive relationship between reliance on remittances and household production.

As recipients of remittances devote more energy to home production, this increase comes at the expense of grocery store purchases, as opposed to a luxury such as eating away from home. The results consistently show that increased reliance on remittances decreases the share of expenses on grocery store items.

Expenses on schooling are positively affected by reliance on remittances, controlling for the number of children in the household. Although not as consistent as household production, in all three models, we find that the total effect of reliance on remittance positively affects spending on education. The magnitude of this effect is also relatively large across all models. This may result from the expectations of the senders rather than differences in preferences by the recipient household. Unfortunately, the current data does not allow us to make that distinction.

Other variables are less consistent across models. As already mentioned, electricity is generally negatively affected by reliance on remittances, but in one participation equation, we find that reliance on remittances increases the likelihood of reporting an electrical expense.

Luxury spending is another interesting category. It is not significant in either of the first two models, but is highly significant when we treat remittances as endogenous. Whether or not it is the intention of the sender, it appears that the receipt of un-earned income such as remittances positively affects a household's willingness to spend on luxuries such as eating out and visiting a salon, *ceteris paribus*.

In the earlier models, the share of spending on vices such as tobacco and alcohol were negatively related to reliance on remittances. When we consider the total effect of reliance on remittances in the two part model in which remittances is exogenous, we find the magnitude of this effect to be extremely small. In the two-part model in which remittances is endogenous, we

actually find that the probability of spending money on any included vice increases with reliance on remittances, a surprising finding.

The last category we will discuss is health. Surprisingly, the results on whether reliance on remittances affects health expenditures were positive but weak. It may be the case that, even when controlling for income, remittances have a small effect on increasing health expenditures, but it appears more likely that households spend on health when they feel it is necessary, regardless of how the income was earned.

Table 40

## Significant Effects across Models

		School	Vices	Luxury	Home Production	Grocery Store Purchases	Water	Electricity	Home Maintenance	Health	Donation
OLS		+	-		+	-	-	-		+	+
Two-Part Fractional Response	Participation	+	-		+		-		+	+	+
	Conditional	+	-		+	-	-	-			-
	Total (absolute value > .01)	+			+	-					
Two-Part Fractional Response- Endogenous	Participation		+	+	+			+			+
	Conditional			+	+	-		-			
	Total (absolute value >.01)	+		+	+	-	+	-		+	



Given the effects of remittances on expense allocation, changes in the costs of transferring funds produce important policy implications. Discussions of policy changes involving remittances often follow two different paths. Scholars with organizations such as the World Bank are often searching for means of transferring money that would reduce the cost of transfers, thus providing the recipient with a larger portion of what the sender remits. Policy-makers in recipient countries, however, may look to tax remittances as a means of increasing revenue, thereby reducing the amount that recipients would receive, *ceteris paribus*. The effects of remittances on labor supply and consumption decisions, therefore, are important for inclusion in this increasingly important debate.

In the first essay, we conclude that remittances negatively affect labor participation for some groups while positively affect hours worked for others, although most of these effects are small. Policies that reduce a household's net remittances, therefore, may increase labor force participation for some while simultaneously reducing the hours worked of others. In the second essay, we find that certain expense categories, such as schooling and health-related expenses, are positively but weakly affected by increased reliance on remittances. Policies that increase the net remittances received, such as those aimed at decreasing costs charged by transferring agencies (usually by increasing information about the costs of each transferring firm), may increase household expenditures on items that will improve a developing country's long-run economic prospects. Of course, reliance on remittances also increases home production, which may negatively affect economic growth, so the picture painted by the expenditure findings is not clear cut.

Overall, many of the findings, while significant, are small in magnitude, and thus policy recommendations are not always obvious. Individuals interested in changing such policies,

therefore, are urged to conduct additional research and consider country-specific effects that may differ from those in this paper. Most apparent from this research, however, is that policy-makers must consider both the effects of remittances on the labor market and household consumption before making major changes that regulate or affect this financial flow.

There are important implications for this research as well. It appears remittances are used for education (when we consider the magnitude of the total effect in the instrumental approach) and to support subsistence farming, two facets with different implications for a developing economy. The fact that remittances may increase spending on education, *ceteris paribus*, is a positive sign. Domestic policies in Jamaica may not want to restrict or decrease the flow of funds by trying to tax this income stream. There is a greater chance that this money is used for educational purposes than an earned wage. At the same time, remittances seem to subsidize home production. We cannot determine, however, whether home production arises out of a need from a lack of jobs or is seen as a preferred career path with fewer hours worked and no boss to whom one must report. It could be the case, however, that the subsidizing of subsistence farming is reducing work effort, hence moving the country away from its potential GDP.

Regardless of whether one views the net effect of reliance on remittances as a positive or negative for a household in a developing country, one important fact emerges that ties this paper together. The source of income matters. The earlier part of this paper compared the traditional life cycle hypothesis to more recent developments in behavioral life cycle theory. Whether the result of expectations by the sender or different preferences by the recipient, we find that even when controlling for total expenditures, reliance on remittances appears to have a moderate effect on household allocation. We cannot dismiss the idea that preferences are identical because

of stipulations set by senders, but this essay nonetheless provides evidence as to the behavioral differences that exist in the spending of earned versus unearned income.

### Appendix

Table 41

#### Married Males First-stage Results

	Wage	Remittance	Husband's Education
Work Experience	-0.006*** (0.001)	-0.022*** (0.006)	0.017*** (0.004)
Average Remittances in District (in USD '000S)	0.008 (0.006)	0.713*** (0.111)	0.023 (0.033)
Wife's Education (Highest Degree)	0.017*** (0.002)	-0.011 (0.008)	0.390*** (0.032)
Other Kid's 5 and under	-0.009 (0.011)	0.129*** (0.044)	-0.081*** (0.031)
Other Kid's 6 and Over	0.010 (0.007)	0.160*** (0.048)	-0.020 (0.021)
Property Income	0.005** (0.002)	-0.001 (0.003)	0.007 (0.006)
HH's Kids 5 and under	-0.015* (0.009)	0.048 (0.041)	0.029 (0.043)
HH's Kids 6 and over	-0.006 (0.004)	0.025 (0.015)	-0.074*** (0.018)
Wife's Age	0.005*** (0.002)	-0.004 (0.006)	0.001 (0.006)
Wife's Age Squared	-0.000*** (0.000)	0.000* (0.000)	-0.000 (0.000)
_cons	-0.053 (0.048)	-0.028 (0.231)	0.179 (0.201)
Year and Parish Control	YES	YES	YES
$R^2$	0.08	0.14	0.24
$N$	5,533	5,533	5,533

\*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$  (Std. Error in parentheses)

Table 42

## Single Women First-stage

	Wage	Remittance	Female's Education
Work Experience	-0.010*** (0.001)	-0.017*** (0.006)	0.043*** (0.005)
Average Remittances in District (in USD '000S)	0.007* (0.004)	0.807*** (0.061)	0.070** (0.030)
Oldest Child's Education (Highest Degree)	0.004** (0.002)	-0.001 (0.011)	0.206*** (0.027)
Other Kid's 5 and under	-0.023*** (0.008)	0.024 (0.042)	-0.154*** (0.033)
Other Kid's 6 and Over	-0.018*** (0.005)	0.138*** (0.028)	-0.088*** (0.019)
Property Income	0.014*** (0.002)	-0.005 (0.004)	0.037*** (0.014)
HH's Kids 5 and under	0.007 (0.007)	0.206*** (0.073)	-0.135*** (0.048)
HH's Kids 6 and over	-0.006 (0.004)	0.045* (0.026)	-0.180*** (0.023)
Wife's Age	-0.000 (0.001)	-0.001 (0.007)	-0.015* (0.008)
Wife's Age Squared	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
_cons	0.043 (0.027)	0.054 (0.237)	1.049*** (0.258)
Year and Parish Control	YES	YES	YES
R <sup>2</sup>	0.11	0.13	0.13
N	6,297	6,297	6,297

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Table 43

## Single Males- First-stage Results

	Wage	Remittance	Male's Education
Work Experience	-0.009*** (0.001)	-0.022*** (0.005)	0.010** (0.005)
Average Remittances in District (in USD '000S)	0.001 (0.007)	0.329*** (0.045)	0.089* (0.046)
Oldest Child's Education (Highest Degree)	0.008** (0.004)	0.068 (0.073)	0.158*** (0.058)
Other Kid's 5 and under	0.021 (0.026)	0.126 (0.123)	-0.112 (0.080)
Other Kid's 6 and Over	-0.020 (0.024)	0.447*** (0.085)	0.073 (0.049)
Property Income	0.008*** (0.003)	0.011 (0.015)	0.018 (0.020)
HH's Kids 5 and under	-0.010 (0.059)	-0.021 (0.096)	-0.106 (0.118)
HH's Kids 6 and over	0.036*** (0.013)	0.152** (0.062)	-0.041 (0.045)
Wife's Age	-0.003*** (0.001)	-0.003 (0.004)	-0.007** (0.003)
Wife's Age Squared	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
_cons	0.116*** (0.037)	0.345** (0.166)	0.776*** (0.204)
Year and Parish Control	YES	YES	YES
$R^2$	0.09	0.06	0.06
$N$	3,550	3,550	3,550

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01 (Std. Error in parentheses)

Table 44

Contents of STATIN's Consumption Aggregate Dataset (Slightly Modified)

<b>VARIABLE NAME</b>	<b>DESCRIPTION</b>
<b>SERIAL</b>	Household Identification
<b>PARISH</b>	Parish Number
<b>CONST</b>	Constituency Number
<b>DISTRICT</b>	Enumeration District Number
<b>EDWGHT</b>	Non-Response Weight For Ed
<b>DWELLING</b>	Dwelling Number
<b>HH</b>	Household Number in Dwelling
<b>SCHOOL</b>	Annual Education Spending
<b>HEALTH</b>	Annual Spending On Health Care And Medicines
<b>TOBACCO</b>	Annual Spending On Tobacco Related Products
<b>GAMBLING</b>	Annual Gambling Spending
<b>DONATION</b>	Annual Amounts Donated
<b>SALON</b>	Annual Amounts Spent On Hair Salon Visits And Hair Products
<b>GROCERY</b>	Annual Value Of Purchased Food Expenses
<b>T_MEAL</b>	Annual Purchased Meal Expenditure
<b>TOT_WAT</b>	Annual Water Bill
<b>ELECTRIC</b>	Annual Electricity Bill
<b>TOT_TELE</b>	Annual Telephone Bill
<b>HOMEPROD</b>	Annual Value Of Home Produced And Gift Food
<b>UTILITY</b>	Annual Utility Bill (Tot_Wat + Electric + Tot_Tele)
<b>HHEXP</b>	Household Operational Expenditures
<b>HOUSING</b>	Annual Housing Expenditure (Rent+Tot_Mort+Tot_Tax+Utility+HHEXP)
<b>TOT_FOOD</b>	Annual Food Expenditure (Grocery+ T_Meal + Homeprod)
<b>TOT_EXPENDITURE</b>	School+Tot_Food+Tot_Wat+Electric+Hhexp+Health+Tobacco+Gambling+Donation+Salon

Table 45

## Items in Consumption Categories for the Second Essay

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 Grocery Store Purchases:

Fresh or frozen beef  
 Fresh or frozen pork  
 Fresh or frozen mutton  
 Offal – heart, kidney, liver, tripe, etc.  
 Oxtail, trotters, cow's foot, hocks  
 Salted, cured, or canned meat (e.g. pigtail)  
 Fresh or frozen fish  
 Salted codfish  
 Canned mackerel, sardines, herring  
 Other salted or canned fish and shellfish  
 Fresh or frozen whole chicken or parts  
 Chicken neck or back  
 Other poultry – fresh, frozen salted, cured, or canned  
 Rice  
 Cornmeal  
 Dried peas and beans  
 Breakfast cereals  
 Yams  
 Irish potatoes  
 Cassava, coco, sweet potatoes, dasheen  
 Plantains, green bananas, breadfruit  
 Fresh vegetables  
 Frozen, canned, and dried vegetables  
 Ackee  
 Fruit and vegetable juices (fresh or frozen)  
 Fresh fruit  
 Canned and dried fruits  
 Sugar  
 Honey, sweeteners, jams, jellies  
 Soups  
 Prepared meats and fish  
 Dry, packaged foods  
 Powders, flavoring and extracts  
 Sauces and relishes  
 Condiments  
 Nuts  
 Baby Food

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Other food (chips, snacks, etc.)

Breakfast drinks

Non-alcoholic beverages

Alcoholic beverages

School expenses:

Exam Fees

Tuition Fees

Other School Fees

Extra Lessons / Tutorials

Transportation

School Lunches

Uniforms

Books

Other Supplies

Boarding

#### Daily Food

Meat, poultry, or fish meals bought away from home (including gifts)

Sandwiches, Burgers, and Patties

Dairy Products (e.g. milk, Supligen, Nutrament, etc.)

Breakfast beverages (e.g. tea, coffee, milo, etc.)

Fruits, juices, and vegetables

Drinks- boxes, bottles, etc.

Others- eg. Soups, vegetarian meals, etc.

#### Non-food Consumption:

Soap, toothpaste/brushes, shaving cream, razors and blades

Cosmetics

Hair and body care

Laundry supplies

Polishes, waxes, air fresheners, insect repellants

Kitchen supplies

Toilet supplies

Other household supplies

Home help services

Laundry and dry cleaning services

Rental of equipment

Cooking gas

Furniture indoor

Furniture, outdoor

Other furnishings

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Dinnerware  
Cookware  
Other small kitchen appliances  
Large kitchen appliances  
Radio, TV, VC, DVD, CD player, component set, computer, printer, and fax  
Other small household equipment  
Repairs on furniture of household equipment  
Medicines  
Medical services  
Health insurance  
Shoes and sandals for adults  
Shoes and sandals for children  
Clothing material for adults  
Adult clothing  
Children's clothing  
Making and repair of clothes  
Accessories  
Reading materials  
Stationary and writing equipment  
Sporting activities (e.g. club membership)  
Other recreational activities  
Purchased transportation (taxi, bus, car)  
Gasoline, motor oil, diesel  
Car/ motor cycle repair, tires, motor parts  
Car, motor cycle, insurance  
Vehicle taxes, duties  
Purchase of car, motor cycles for personal use  
Other transport expenses  
Vacation expenses  
Gardening and horticulture  
Telephone  
Other consumption expenditures  
Purchases for special occasions.

Non consumption expenditures:

Life and general insurance  
Horse racing  
Other gambling  
Weddings, funerals  
Donations / gifts  
Loan repayment  
Support of children living elsewhere

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Support of other relatives living elsewhere  
National housing trust  
National insurance scheme  
Pension contributions  
Other non-consumption expenditures  
Direct taxes

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Table 46

Checking the Performance of the Instrument

<b>Variable</b>	<b>Correlation with district level remittances</b>
<b>Remittance Share (Endogenous?)</b>	Yes
<b>School</b>	None
<b>Vices</b>	None
<b>Water</b>	None
<b>Health</b>	None
<b>Donation</b>	None
<b>Luxury</b>	Yes
<b>Home Production</b>	Yes
<b>Grocery Store Purchases Share</b>	Yes
<b>Electricity</b>	Yes
<b>Home Maintenance</b>	Yes

Table 47

## Outliers in the Consumption Chapter

Variable	Obs	Mean	Std. Dev.	Min	Max	% Dropped
After outliers are dropped						
School	18,329	0.09	0.13	0.00	0.58	-0.53%
Vices*	12,006	0.02	0.04	0.00	0.18	-4.53%
Luxury*	18,029	0.14	0.14	0.00	0.58	-2.15%
Home Production	17,842	0.05	0.07	0.00	0.32	-3.17%
All other foods	18,426	0.51	0.19	0.00	1.00	0.00%
Water	18,072	0.02	0.03	0.00	0.14	-1.92%
Electricity	18,022	0.08	0.07	0.00	0.30	-2.19%
Home Maintenance	17,732	0.01	0.03	0.00	0.18	-3.77%
Health	14001	0.01565	0.04139	0	0.2433002	-3.01%
Donation	12,272	0.01	0.02	0.00	0.10	-2.42%
Total Expenditure	18,277	3,477.17	2,323.07	0.00	14,001.24	-0.83%
Remittances Share	17,952	0.13	0.26	0.00	1.65	-1.81%
Labor Share	15,369	0.93	1.37	0.00	8.70	-0.90%
Before outliers are dropped						
School	18,426	0.10	0.14	0.00	1.00	
Vices*	12,576	0.03	0.07	0.00	0.91	
Luxury*	18,426	0.16	0.16	0.00	1.00	
Home Production	18,426	0.07	0.11	0.00	1.00	
All other foods	18,426	0.51	0.19	0.00	1.00	
Water	18,426	0.03	0.04	0.00	0.71	

Electricity	18,426	0.08	0.08	0.00	1.00	
Home Maintenance	18,426	0.02	0.07	0.00	1.00	
Health	14,436	0.03	0.08	0.00	0.92	
Donation	12,576	0.01	0.04	0.00	1.00	
Total Expenditure	18,430	3,609.25	2,927.98	0.00	143,836.30	
Remittances Share	18,282	0.18	0.60	0.00	22.82	
Labor Share	15,509	1.07	2.45	0.00	136.71	

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### Vita

Andrew Stephenson is a 2011 graduate from the Andrew Young School of Policy Studies, earning his Ph.D. in the field of Economics. Andrew specialized in Public Finance and Econometrics with additional interests in Labor and International Economics. He has published in *Public Budgeting and Finance* and co-authored a chapter on local tax options in *Municipal Revenues and Land Policies*. Throughout Andrew's education at the AYSPS, Andrew worked as a research assistant and later a research associate for the Fiscal Research Center, assisting in data analysis for several fiscal reports used to educate and inform the state legislature about the likely effects of fiscal proposals. Andrew also taught several quarters at a local junior college. Finally, Andrew was active in student organizations, serving as president of the Graduate Student Association for one term in 2008.

Prior to his doctoral studies, Andrew served as an Economist and Researcher at the Ministry of Finance in Jamaica. At the Ministry of Finance, he was quite effective in his role within the Taxation Policy Division, co-directing an island-wide survey of the personal income tax in Jamaica as well as developing a micro-simulation model from the ensuing data.

His early academic training started with a Bachelor's in Economics and Statistics and a Master's in Economics, both from the University of the West Indies in Kingston, Jamaica.