

# **Do remittances have a flip side? A general equilibrium analysis of remittances, labor supply responses and policy options for Jamaica**

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## **Abstract:**

Econometric analysis has established a negative relationship between labor supply and remittances in Jamaica. We incorporate this ex-post evidence in a general equilibrium model to investigate economy-wide effects of increased remittance inflows. In this model, remittances reduce labor force participation by increasing the reservation wages of recipients. This exacerbates the real exchange rate appreciation, hurting Jamaica's export base and small manufacturing import-competing sector. Within the narrow margins of maneuver of a highly indebted government, we show that a revenue-neutral policy response of a simultaneous reduction in payroll taxes and increase in sales taxes can effectively counteract these potentially negative effects of remittances.

**The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the view of the World Bank, its Executive Directors, or the countries they represent.**

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## 1 Introduction

What is the role of international remittances in the economic development of recipient countries? This important question is not completely new, and some answers have already been provided by the large literature on aid effectiveness: the positive or negative effects of remittances on economic development depend on how they are used.<sup>1</sup> For example, remittances are likely to have small effects on development if they are used primarily for the consumption of imported consumer goods. When remittances do not increase savings, they have little or no impact on domestic investment and thus do little to enhance the longer-term economic growth and may even create dependency. In general, however, very little hard evidence and firm data exist on how remittances are used and no hypotheses have been proved or discarded. An additional issue that has received relatively little attention is whether recipients adjust their labor supply in response to international remittance inflows. More specifically, do remittances cause an increase in reservation wages and thus induce reductions in the labor supply?

This paper investigates the latter issue for the case of Jamaica, a country that during the 1990s witnessed, on the one hand, a combination of persistently high unemployment rate (around 20%) and rising real wages and, on the other hand, a remarkable increase in international remittance inflows, reaching almost 20% of GDP in 2003. Working with Jamaican household surveys for the 1995-2002 period, Kim (2006) finds an empirical negative link between increased remittances and labor supply decisions of Jamaican households. Based on this finding, a computable general equilibrium (CGE) model of Jamaica with an endogenous labor supply calibrated to the elasticity estimates of Kim (2006) is constructed here to analyze three main empirical and policy relevant questions. First, we assess the potential economy-wide repercussions of a labor supply reduction due to an increase in remittances; the CGE model measures the macro effects on aggregate GDP, consumption, investment and government budget, and also estimates which sector or group of households will more likely be affected. Second, by altering the relative prices of tradables and non-tradables increasing external inflows normally cause real exchange rate appreciation and Dutch disease effects. These effects are accounted in our model which actually highlights that an endogenous labor supply that responds negatively to rising remittances exacerbates the real exchange rate appreciation, mainly by increasing wages more than in a case with an inelastic labor supply. Third, and perhaps this is the most important question, a numerical model can be used to simulate potential corrective policies that the government could implement to deal with the negative effects. In particular, we simulate policies

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<sup>1</sup> See, for example, Burnside and Dollar (2002) and Collier and Dollar (2002).

that aim at stimulating labor demand by reducing labor costs. A reduction of payroll taxes is the most straightforward of such policies, however one can also think of other policies that increase labor market flexibility and ultimately support labor demand. The costs of such policies need to be taken into account, especially in the case of a very highly indebted country such as Jamaica, and in our simulation a compensatory increase in sales tax rates maintains the government balance unchanged. A major result of this paper is that a revenue-neutral policy that reduces labor costs can almost completely sterilize the negative labor supply effect of rising remittances—an encouraging outcome for a country struggling with high unemployment rates.

The paper is organized as follows. The next section provides some background information on the Jamaican labor markets, remittance flows and on the still sparse evidence on the links between these flows and labor supply provided by the recent literature. Section 3 briefly presents the analytical structure of our model and the basic dataset it utilizes. Section 4 describes the scenarios and the results, both at the aggregate and detailed sectoral level. Section 5 offers concluding remarks.

## 2 Labor markets and remittances in Jamaica

In the period between 1980 and 2000, Jamaica’s labor market performance has been mixed. The average urban unemployment rate has been around 20 percent, which is very high by both regional and global standards. In the same period, employment has grown at 1.6 percent per annum, at about the same pace as GDP, but with female participation lagging behind (see Table 1). However, real wages have grown decisively faster: between 1992 and 2002, their average yearly growth rate was 3.2 percent.

*Table 1: Latin America and Caribbean economic performance and labor indicators*

	GDP Growth 1980-2001	Employment Growth 1980 1999	Female Labor Force Participation Growth 1980- 1999	Average Urban Unempl. rate 1980-2000
Argentina	1.13	1.16	1.12	9.30
Brazil	2.49	2.72	2.11	5.62
Chile	4.81	2.63	2.17	10.09
Colombia	3.09	3.23	3.56	12.10
Peru	1.55	3.52	2.27	8.03
Uruguay	1.80	1.43	2.37	10.62
Barbados	1.17	1.28	1.30	15.77
<b>Jamaica</b>	<b>1.56</b>	<b>1.60</b>	<b>0.89</b>	<b>19.40</b>
Trinidad and Tobago	0.11	0.78	1.30	15.85
Average	1.97	2.04	1.90	

Source: Heckman and Pages (2003)

There are several potential reasons explaining why high unemployment rates do not seem to have had an effect on wage growth. First, workers may have strong bargaining power and were thus able to obtain nominal increases of their compensation above current inflation, particularly during the (historically) low inflation period of the late 1990s.<sup>2</sup> Another explanation may be that excessive labor market rigidity creates barriers to entry of new (or unemployed) individuals in the job market. Finally, it may be that a significant share of current unemployed may be waiting for better job offers given that their reservation wages are too high.

Labor market rigidity, which may be due to excessive workers bargaining power and or excessive regulations, does not seem to be a major issue for Jamaica, at least if one considers the available empirical evidence. Table 2 shows that, apart from relatively high firing costs, Jamaica's labor market seems fairly flexible. In particular, the 22.6 score on the collective relation index, puts Jamaica below the score of the US (25.8) and very close to that of the UK (18.5). The latter is the lowest value in the sample considered in Botero et al (2004), thus indicating that Jamaican collective relation laws are comparable to the UK ones, which allow high flexibility in settlements of collective dispute. Jamaican unionization rates have decreased to about 16% in the first half of the 1990s from just below 30% twenty years earlier.<sup>3</sup> As estimated by Heckman and Pages (2003), non-wage costs of labor market regulations are low in Jamaica relative to the rest of Latin America and Caribbean. For Barbados, Trinidad and Tobago, and Jamaica—the three Caribbean countries included in their survey of studies on Latin America—the authors conclude that “the effects of job security on employment are statistically insignificant and the signs are positive in some cases.”

Despite this evidence pointing towards a comparatively flexible labor market in Jamaica, some signs of regulatory issues can still be identified. In their study on labor markets and regulations in the Caribbean, Downes et al (2000) found for the case of Jamaica some negative effect on aggregate employment stemming from the imposition of minimum wages<sup>4</sup>. Additionally, recent IMF reports list further reform of the labor markets among the most urgent structural reforms the government should adopt (IMF 2004a, IMF 2004b). In particular, the reports cite that government spending on public wages exceeds 12% of GDP (in 2003), signaling very high public sector employment level; besides, high redundancy costs, according to private

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<sup>2</sup> The observed nominal wage growth during the 1990s suggests that workers have been setting their wage targets through backwards-looking expectations—nominal wage increases tend to be higher in the years following periods with high consumer price inflation.

<sup>3</sup> See Forteza and Rama (2001).

<sup>4</sup> The authors use aggregate employment and specify a coverage-weighted minimum wage index, so their aggregate data include many workers whose wage and employment are unlikely to be affected by changes in minimum wages.

sector representatives, “are a key remaining issue to be addressed in order to improve the labor regime” (IMF 2004b, p.16).

*Table 2: Labor Market Rigidity Indicators*

Indicator	Jamaica	Region	OECD
Difficulty of Hiring Index	11.0	40.5	30.1
Rigidity of Hours Index	0.0	50.9	49.6
Difficulty of Firing Index	20.0	29.5	27.4
<i>Rigidity of Employment Index</i>	<i>10.0</i>	<i>40.3</i>	<i>35.8</i>
Hiring cost (% of salary)	11.5	15.9	20.7
Firing costs (weeks of wages)	60.2	62.9	35.1
Collective relation Index	22.6	46.5	46.2
Social Security Index	16.8	57.8	73.9

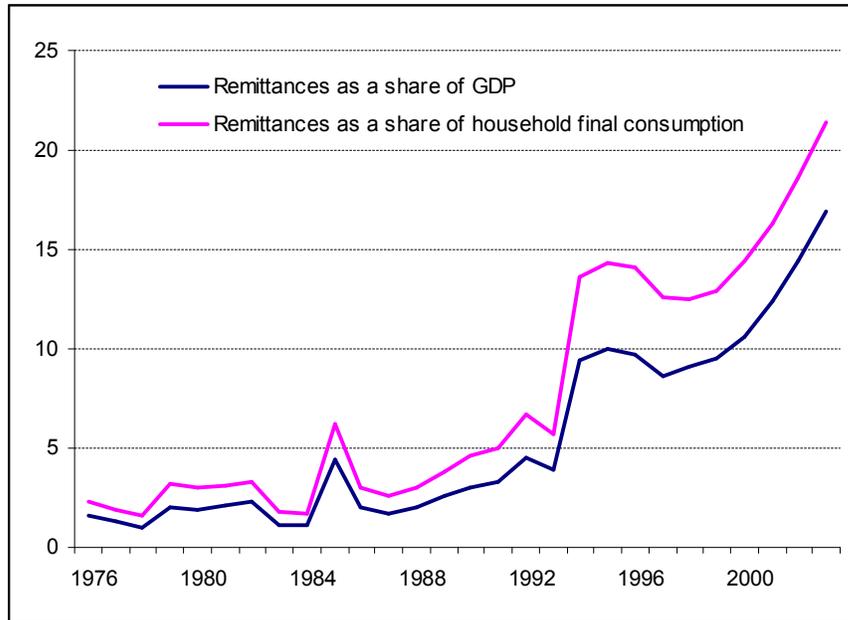
*Source:* For the first 6 rows the Doing Business (2006) website, for the bottom two rows Botero et al (2004).

*Note:* Four areas are subject to statutory regulation in all countries: employment, social security, industrial relations and occupational health and safety. Doing Business focuses on the regulation of employment. The *rigidity of employment index* (in italics in the table) is the average of three subindices: a *difficulty of hiring index*, a *rigidity of hours index* and a *difficulty of firing index*. All the subindices have several components, and all take values between 0 and 100, with higher values indicating more rigid regulation. The *hiring cost* indicator measures all social security payments and payroll taxes associated with hiring an employee. The cost is expressed as a percentage of the worker’s salary. The *firing cost indicator* measures the cost of advance notice requirements, severance payments and penalties due when dismissing a redundant worker, expressed in weekly wages. In Botero et al (2004), the *Collective relation index* combines information from two sub-areas of the collective action laws: (i) the power granted by the law to labor unions and (ii) the laws governing collective disputes. The sub-index of labor union power measures the power of labor unions over working conditions. The second sub-index measures protection of employees engaged in collective disputes. Higher values of the index are associated to higher workers’ protection. The *Social security index* considers coverage and generosity of pensions, sickness and healthcare insurance, and unemployment.

Even if it does not constitute a formal test, the previous evidence casts some doubts on the validity of the first two hypotheses— unbalanced labor bargaining power and excessive intervention in the labor market—on why high unemployment rates do not seem to exert downward pressure on wages. What about the third one? Is it possible that an ‘exogenous’ increase in non-labor income of households and individuals has resulted in rising reservation wages and thus higher unemployment rates? Remittance flows have shown tremendous growth in recent decades and, as shown in Kim (2006), there is some evidence that they have reduced labor supply through a positive and large income effect. In terms of their size, remittance receipts are not only an important source of income for Jamaican households, but are also a major source of financing for the economy as a whole. In 2002, remittances accounted for 14.3 percent of GDP and financed 19.8 percent of household consumption. In addition, workers’ remittances were approximately half of all financial inflows from the rest of the world and therefore contributed significantly to financing the current account gap. The importance of remittances for Jamaica has steadily grown over the last three decades: Figure 1 shows the receipts of worker’s remittances rising from less than two percent of GDP in 1976 to 17 percent of GDP in 2003. In real terms, the average annual growth over the period has been 7.8 percent. Even more striking is the growth over the last ten years, when the volume of remittances grew at an average annual rate of 18.2

percent. During the same time, the share of remittances in household consumption and GDP grew by 14 and 15 percent per year, respectively.

*Figure 1 Evolution of remittances in Jamaica*



There is little agreement in the literature on the economy-wide effects of increased remittance inflows. Connell and Brown (2005) argue that while “[some studies show that] consumption is of considerable importance, they also show that higher levels of consumption are a major welfare gain and contribute to meeting basic needs that are otherwise sometimes poorly satisfied. They also show that remittances have been increasingly important for both investment and savings [...] Remittances are also invested in economic activities, in human capital, and in the well being of others.” Focusing more specifically on the relationship between labor supply and remittances, there is very little scientific evidence to substantiate the common preconception that remittances elicit reductions in the labor force participation of recipient households. Controlling for endogeneity represents a major difficulty in empirical tests of this labor supply behavior. In analyses of cross section data, it is quite difficult to establish whether remittances cause lower labor supply or, conversely, remittances from relatives working abroad are a response to adverse conditions at home and support incomes of family members who have been unable to offer their labor services in the domestic market. Panel data offer better chances to establish exogeneity, but they are still rare for many developing countries.

Apart from the above direction-of-causality concerns, households who receive remittances normally self-select into this group by sending a working member of the household

abroad. Since this decision affects the labor supply choices of the entire household, labor supply could even increase in connection with remittance flows. As reported by Amuedo-Dorantes and Pozo (2005): “Remittances, on the one hand, may help lift budget constraints, raise reservation wages and, through an income effect, reduce the employment likelihood and hours of work of remittance-receiving individuals. On the other hand, these monetary inflows are usually preceded by the migration of a working-aged household member, which may induce other remaining family members to increase their labor supply to supplement for lost household income.”

Despite these difficulties, a few studies find a negative relationship between remittances and labor supply. Rodriguez and Tiongson (2001), who examine the labor force participation of households in Manila in 1991, estimate that having a migrant abroad reduces the probability of working by 9.4 percentage points for men and 18.1 percentage points for women. When remittances are increased from \$0 to \$40 per non-migrant family member, men decrease their labor force participation by a third of a percentage point, whereas women respond by reducing their labor force participation by only one-fifth of a percentage point. Funkhouser’s (1992) study of households in Nicaragua also concentrates on the responses of urban households. His probit estimates indicate that an increase in remittances from \$0 to \$100 decreases male and female labor force participation by 2 and 5 percentage points, respectively. However, Funkhouser also finds that self-employment hours increase by about 1 percent for both men and women. Hence, Funkhouser (1992) finds evidence of the work effort shifting across various types of employment on account of remittance receipt.

While not specifically addressing the impact of remittances on total work effort, Matshe and Young (2004) measure the responsiveness of rural households in Zimbabwe to overall non labor income. In particular, they assess how households’ decision with respect to supplying their labor to the off-farm labor market is affected by non-labor income flows. They find that these income flows reduce off-farm labor activity. Amuedo-Dorantes and Pozo (2005) carry out a preliminary analysis of the impact that remittances sent by Mexican migrants may have on the labor supply patterns of their working-age male and female family members back home. They find that remittance income sometimes reduces hours worked, whereas other times these monetary inflows increase work effort depending on the type of work, the gender of the recipient and the location of the household. For the specific case of Jamaica, Kim (2006) constructs a pseudo-panel data using household surveys covering the period 1995 to 2002 and finds a negative impact of remittances on labor market participation. This finding is used to inform the general equilibrium analysis carried out in this paper; in particular, Kim’s (2006) elasticities have been ‘borrowed’ to calibrate the endogenous labor supply function used in our model.

### 3 General equilibrium approach: advantages, model description, and key data

#### 3.1 Modeling economy-wide effects of increased remittance inflows

Increased remittance flows may raise reservation wages and reduce labor supply; they can also increase pressure on the real exchange rate and worsen export performance, and, under certain circumstances, they can affect saving and investment behavior and thus future growth. The sign and magnitude of these complex links depend on many direct and indirect effects and are largely determined by the structural features of the economy and the relevant elasticity values. Tracing these effects requires a general equilibrium model where endogenous labor supply decisions are explicitly incorporated and enough sectoral detail exists to allow for different degrees of tradability across goods.

The computable general equilibrium (CGE) model used in this study is based on a standard neoclassical general equilibrium model. The main features of this model are presented in Annex 7.2 and will be familiar to readers accustomed with the CGE literature. We solve the model in a comparative static mode, and our discussion of the results is based on a comparison between the before- and after- the shocks' equilibria.<sup>5</sup>

In order to isolate the specific channels transmitting remittance shocks through the economy, consider first a small open economy model with no leisure-consumption trade off. In this setup, an increase in remittances is equivalent to a (permanent) increase in incomes of the households. Assuming that non-tradables are normal goods, this positive income shock results in extra spending on both tradables and non-tradables. Since Jamaica is a price taker in international markets, a growing demand does not raise prices of tradables. However, since the prices of non-tradables are determined in the domestic economy, they increase due to additional demand (the so-called 'spending effect'). There is also a 'resource movement effect'. The relative price change between tradables and non-tradables makes production in the latter more profitable. Output growth in the non-tradable sectors will push up factor demands, especially for those factors used intensively in these sectors. Increased factor demand by the expanding sectors will be accommodated by factors released from other sectors (the resource movement effect) and, depending on the behavior of total supply of factor, will normally result in higher factor returns in the final equilibrium. The price shift and resource reallocation in favor of non-tradables erode the

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<sup>5</sup> We do not consider the length of time required for a shock to take place or for the policy response to be implemented. Although the dynamic adjustment mechanisms are very important, we choose instead to maintain the focus on the final aggregate and sectoral effects of policies in order to isolate the specific channels that transmit remittance shocks through the economy.

competitiveness of export oriented sectors and hurt import competing sectors. The final result of this real exchange rate appreciation is normally increased import flows and lower export sales.

In order to allow changes in remittance inflows to influence the household decision to supply labor, this simple model is modified by introducing a consumption-leisure trade-off in the household utility function, similar to the approach of Barzel and McDonald (1973), de Melo and Tarr (1992), and Annabi (2003). Consider a Stone-Geary utility function and a budget constraint of the following form:

$$u = \sum_{i=0}^N \mu_i \ln(C_i - \theta_i) \quad \text{s.t.} \quad \sum_{i=0}^N P_i C_i = Y = WT + y \quad (1)$$

In the utility function,  $C_i$  denotes the consumption of good  $i$  with leisure ( $C_0$ ) being a normal good,  $\theta_i$  are usually interpreted as consumption minima,<sup>6</sup> and the share parameters  $\mu_i$  (including  $\mu_0$ ) must sum to unity.  $T$  denotes the total time a household has available for work and leisure activities, and the amount of resources available for non-leisure consumption is limited by non-labor income ( $y$ ) and total wage income (ignoring saving and taxes for simplicity).<sup>7</sup> Constrained maximization gives rise to the familiar linear expenditure system (LES) demand functions:

$$C_i = \theta_i + \frac{\mu_i}{P_i} (Y - \sum_{i=0}^N P_i \theta_i) \quad (2)$$

The household labor supply is the difference between total time available and the time allocated to consumption of leisure, and substituting the budget constraint into the demand function yields:

$$LS = (1 - \mu_0)(T - \theta_0) - \frac{\mu_0}{W} (y - \sum_{i=1}^N P_i \theta_i) \quad (3)$$

Partially differentiating the labor supply equation with respect to disposable income and the wage rate yields the following elasticities:

$$\varepsilon_y = \frac{\partial LS}{\partial y} \frac{y}{LS} = -\frac{\mu_0}{W} \frac{y}{LS} < 0 \quad (4)$$

$$\varepsilon_W = \frac{\partial LS}{\partial W} \frac{W}{LS} = \frac{\mu_0}{W * LS} (y - \sum_{i=1}^N P_i \theta_i) \quad (5)$$

While the labor supply is decreasing in non-labor income, the sign of the wage elasticity depends on the ratio of non-labor income to the total “committed” consumption expenditures.<sup>8</sup>

Now, the “Dutch disease” effects of increased remittances can be exacerbated when labor supply responds to changes in remittance flows. With an increase in non-labor income, as is

<sup>6</sup> Note that there is no theoretical requirement for any of the  $\theta_i$  to be positive.

<sup>7</sup> Note that the price of leisure is the economy-wide wage rate  $W$  (i.e.  $P_0=W$ ).

<sup>8</sup> This sign ambiguity allows for a backward-bending labor supply curve.

the case with remittances, individuals can consume more of both goods and leisure (i.e. the income effect dominates) and thus their labor supply is reduced. In a general equilibrium setting, wages are set to clear the labor market and reduced labor supply implies raising wages. This triggers second order effects: higher wages raise the opportunity cost of leisure and the substitution effect can push individuals to increase their labor supply, up to the point where the income effect dominates again (the backward bending labor supply curve). Given the initial equilibrium values and our parameter choices (derived from Kim, 2006), shocks that directly increase the wages received by workers, such as a reduction in payroll taxes (when these have an incidence cost for employees), generate a positive supply response. Therefore, in the current model setup the introduction of an endogenous labor supply results in additional pressure on wages and exacerbates the effects of real exchange rate appreciation described earlier.

### **3.2 Jamaican economy in 2002: data sources and sectoral structure**

The initial benchmark equilibrium for the CGE model in our study is a 2002 Social Accounting Matrix (SAM), which was constructed specifically for this exercise.<sup>9</sup> This SAM has been assembled from various sources and includes 22 sectors, 22 commodities, 3 factors (skilled and unskilled labor and one composite capital), an aggregate household account,<sup>10</sup> and other accounts (government, savings and investment, and the Rest of the World). Macroeconomic and sectoral data come from various publications of the Statistical office of Jamaica (STATIN), while microeconomic data on sectoral employment, wages and household consumption are estimated from the 2002 Labor Force Survey and the 2002 Survey of Living Conditions. International trade data and tariff protection rates are obtained from the UN COMTRADE and TRAINS databases. The quality of the initial dataset represented by this SAM directly influences the quality of the model results. For this reason, particular attention has been devoted in estimating the value added (especially employment and average wages by skill and by sector), trade, and tariff components of the SAM.

The Jamaican economy is dominated by service sectors, which account for more than 80 percent of the GDP at factor cost.<sup>11</sup> Household consumption consists mainly of food products, where the processed foods and sugar sectors account for 30.5 percent of total. Services account for an additional 35 percent of household consumption, and the rest is spread fairly evenly across

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<sup>9</sup> For more details on the SAM, see the Annex 7.2.

<sup>10</sup> One version of the SAM has two separate household groups defined according to main income source of the household head—see Section 4.4.

<sup>11</sup> This figure includes public services in the definition. Private services represent 68 percent of GDP at factor cost (labor and capital value-added).

the agricultural and manufacturing sectors. Capital goods, chemical products, and refined oil dominate Jamaican imports, with these three sectors accounting for 58 percent of imports at world prices. In value terms, merchandise imports are more than three times the merchandise exports, but the overall trade balance is much less skewed due to large service exports, particularly in the tourism sector.<sup>12</sup> In fact, while service imports represent only 25 percent of overall imports, service exports are more than twice as large as exports of goods. Nonetheless, Jamaica has a current account deficit with the rest of the world, which is financed by large current and capital financial inflows. With only a few exceptions (processed sugar, beverages and tobacco), most sectors are clearly biased towards either exports or imports, making it easier to trace the effects of exchange rate shocks on domestic production and consumption.<sup>13</sup> In particular, import dependence is very high for most manufacturing sectors. Table 3 provides additional detail on the structure of the economy and the links between domestic production, exports, and imports.

The government is a relatively small part of the economy: it accounts for approximately 10 percent of employment and just over 13 percent of value added. The government derives approximately 46 percent of its revenues from direct taxes (income taxes and payroll taxes), and the rest from sales taxes, taxes on international trade, and production taxes. Tariff revenue is 27 percent of total tax receipts, and tariff rates are roughly uniform across various trading partners. Interest payments on both domestic and external debt are a large item in the public budgetary accounts; in fact, interest expenditure is one and a half times the public spending on wages and salaries. Therefore, the large interest obligations are a severe constraint on the Jamaican fiscal space and limit the fiscal policy options available to the government.

Another important constraint is related to the real exchange rate volatility. To achieve single digit inflation rates, Jamaican monetary authorities adopted a tight monetary policy consisting of maintaining a stable exchange rate to anchor inflation expectations. This policy has reached its objective and inflation has been reduced from levels well above 30% in the mid 1990s to less than 10% in recent years; however, for the period 1996-2001, the policy has also induced a cumulative 30% real exchange rate appreciation and real interest rates have on average been around 10%: this combination of loss of competitiveness and high interest rates has contributed to low growth rates.

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<sup>12</sup> The tourism sector is part of the “commerce” account in our SAM.

<sup>13</sup> Although the processed sugar sector has relatively similar export and import intensities, there is virtually no two-way trade in sugar in Jamaica—the exports are composed almost entirely of raw sugar, while the imports come from cane and beet sugar products and molasses.

*Table 3 Sectoral composition of production, exports, and imports*

	Contribution to domestic production	Exports as a share of domestic production	Imports as a share of domestic demand	Share of total value added		
				Unskilled Labor	Skilled Labor	Capital
Export Crops	2	19	5	57	24	19
Food Crops	2	5	34	53	19	28
Livestock	2	0	1	32	55	13
Forestry and Fishing	1	5	107	37	27	36
Mining	5	75	8	4	14	82
Food Products	9	3	21	9	30	62
Processed Sugar	1	40	54	30	59	11
Beverages and Tobacco	2	14	14	3	12	86
Textiles and Clothing	1	1	29	34	62	4
Wood Products	1	1	23	27	65	7
Paper and Print	1	1	94	5	65	30
Refined Oil	3	6	130	8	13	79
Chemicals	2	16	133	2	24	74
Capital Goods	1	24	1,284	9	27	64
Electricity and Water	3	0	0	3	19	78
Construction	12	0	0	33	28	39
Commerce	20	43	4	13	20	67
Transport	12	13	0	16	34	50
Financial and Insurance Services	4	5	26	3	24	72
Real Est. & Business Services	5	8	119	18	38	44
Government Services	8	0	0	18	81	1
Other Services	5	1	1	29	52	19

#### **4 Remittances, labor supply, and the Jamaican economy: a numerical analysis of their interdependence and an assessment of policy options**

Using the CGE model described earlier, this section offers, on the one hand, an empirical estimate of the economy-wide consequences of an exogenous increase in remittance inflows and, on the other hand, it assesses a specific policy response that the Jamaican government may consider to minimize the negative effects of remittances on the labor supply. The policy response consists of a contemporary reduction of payroll taxes and an increase in sales taxes, i.e. a partial switch from direct taxes to indirect taxes. Taxing remittances directly is not a viable policy option for, at least, two reasons: the income generating the remittances has already been taxed at the origin and the double taxation would increase the agents' incentives to transfer money through the black market; secondly, remittances are an important source of household income and taxing them could increase the vulnerability of households to income shocks. Alternatively, a reduction in payroll taxes is a better policy tool to limit the negative labor supply response following a remittance

shock. From the workers' point of view, lower payroll taxes directly provide greater incentives to work through higher wages. This policy also reduces the wages paid by the employers and thereby increases their labor demand.<sup>14</sup>

To counterbalance the loss of payroll tax revenues, a compensating increase in sales taxes is considered here. This switch of direct-to-indirect taxation can have relevant income distribution consequences which we take into consideration in a final set of simulations where we split households into two separate groups with different levels of income and different patterns of consumption, and where one group is the sole beneficiary of remittance flows.

The following discussion presents three sets of simulations that address the above issues in more detail. First, we implement a simulation with a 10 percent increase in the level of remittances (with respect to their 2002 value); then this is followed by 25 percent reduction in payroll taxes.<sup>15</sup> In order to identify more precisely the effects of higher remittances, the government budget balance in these simulations is flexible. This implies that new remittances are implicitly taxed at the initial (unchanged) direct tax rate, and other tax rates do not vary.<sup>16</sup> This passive behavior may result in some undesirable changes in the government budget balance, and we address this concern by implementing a third simulation where the effects on the budget deficit are neutralized through a compensating increase in sales tax rates.

#### **4.1 Increased remittance inflows**

We begin by analyzing the macroeconomic effects of the remittance shock, which are shown in the first column of Table 4. Since remittances represent approximately one-fifth of total household income, a 10 percent remittance shock raises total household income by 2 percent. The effect of higher remittances on labor income is comprised of two components: on the one hand, labor income falls because more non-labor income encourages households to consume more leisure, but on the other hand, reduced labor supply is accompanied by increased labor demand (given the increased demand for goods) and wages rise. The change in wages adds a set of second-order effects to the mentioned change in labor supply, since an increase in the wage rate raises the opportunity cost of leisure and, as long as the substitution effect dominates the income

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<sup>14</sup> This simulation should be considered as illustrative for any set of policies aiming at reducing the wedge between wages paid by the employers and those received by the workers. The current simulation assumes that the government is directly able to reduce this wedge by reducing a payroll tax; however the actual fiscal instruments at the government disposal may be less direct, and revenues from payroll taxes may not be easily substituted by revenues from other taxes.

<sup>15</sup> This increase in remittance inflows is not very large considering the rapid pace of remittance growth over the last decade (see section 2).

<sup>16</sup> In all simulations, the real level of government expenditure is held constant.

effect, encourages households to supply more labor.<sup>17</sup> Given that skilled and unskilled workers are employed with different intensities across sectors and that final demand does not increase equally for all goods and services, the general equilibrium effects will differ across the types of workers. In this specific simulation the relative wage of unskilled workers increases slightly. Overall, total labor supply declines by 8,000 workers, which represents less than one percent of the overall employment. Although the change is small in aggregate terms, consider that this reduction in employment, were it concentrated in a single sector, would be enough to completely eliminate, for example, mining, processed sugar, beverages and tobacco, paper and printing, or refined oil.

*Table 4 Macroeconomic results: flexible budget deficit*

	Remittance effect, percent change from initial equilibrium	Tax effect, percent change from remittance shock	Total effect, percent change from initial equilibrium
Remittances	10.00	0.00	10.00
Total household income	2.04	1.16	3.22
Household labor income	1.43	2.20	3.67
CPI	0.54	-0.03	0.50
Real exchange rate	0.88	-0.08	0.80
Real GDP	-0.37	0.10	-0.26
Private consumption	1.50	1.19	2.71
Investment	-0.06	-2.58	-2.63
Exports	-2.70	0.05	-2.66
Imports	0.81	-0.06	0.75
Government savings	-0.24	-7.79	-8.01
Unskilled labor supply	-0.76	0.55	-0.21
Skilled labor supply	-0.84	0.40	-0.45
Unskilled wage	2.31	2.08	4.45
Skilled wage	2.26	1.99	4.29
<i>Memo</i>			
Absolute change in unskilled labor supply	-3,822	2,761	-1,061
Absolute change in skilled labor supply	-4,563	2,139	-2,424

Greater household income generates more demand for consumption goods and services which is satisfied by a combination of increased domestic supply and import flows. International prices are not affected by this surge in Jamaican imports, whereas prices of the domestically produced goods rise in response to domestic market conditions. In a case of fixed fully employed factors, additional demand is translated into higher factor prices (and a sectoral reallocation towards non-tradables). In the current case, with an endogenous labor supply, the price increase is

<sup>17</sup> See equations (4) and (5) above.

exacerbated because labor supply is actually shrinking. This erosion of Jamaican competitiveness is summarized in a real exchange rate appreciation of almost 1 percent.

Although GDP declines only marginally, larger variations are observed for sectoral variables. At the disaggregate level, the impact of the shock is determined by the different trade orientation of each sector (which can be more or less import competing, export oriented or non-traded) as well as by their different factor intensities (see Table 3). The first four columns of Table 5 show the disaggregate results—percentage changes in sectoral exports, imports, production, and private consumption—following the remittance shock. On the demand side, changes are driven by different income elasticities across goods: while food and agricultural products are necessities and therefore have income elasticities below one, the income elasticities of manufactured goods and services are higher. On the supply side, sectors that experience the greatest decline in production are either export intensive (e.g. mining, processed sugar, and commerce) or import competing (e.g. capital goods, business services, and refined oil). This response is a direct consequence of the Dutch disease effect observed at the aggregate level. Among sectors facing comparable import competition, those using labor more intensively than capital suffer more pronounced output losses. This is a consequence of the shrinking labor supply which makes capital relatively more abundant and thus less costly relative to labor.<sup>18</sup>

Other sectors with high shares of labor in total value added, such as livestock and textiles, are able to increase production in the face of higher labor costs. This result can be explained by two reasons. First, most of the production in these sectors is sold domestically and there is very little competition from imports. This situation ‘protects’ these sectors from the effects of the real exchange rate appreciation: due to the limited substitution across domestic and imported goods, the additional demand generated by the remittance shock is mainly satisfied through larger domestic supply, even if relative prices (of domestic varieties versus imported ones) worsen. A second reason explaining output expansion is the fact that although labor costs go up, non-labor costs go down. Production in sectors such as livestock and textiles requires a large amount of intermediate inputs that tend to be imported and thus become cheaper with a real exchange rate appreciation.<sup>19</sup>

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<sup>18</sup> These effects are shown in Table 5 where production in sectors that demand a lot of labor, such as export crops, food crops, and processed sugar, experiences larger declines.

<sup>19</sup> Labor is a large share of total value added and labor costs rise substantially: the price of the labor-capital bundle for livestock and textiles rises by 1.9 and 2.2 percent, respectively. However, due to the described savings on imported intermediaries, the increase in the total cost of production is less severe: producer prices increase by 0.9 and 0.6 percent.

Table 5 Sectoral results: flexible budget deficit

	Remittance effect, percent change from initial equilibrium				Tax effect, percent change from remittance shock				Total effect, percent change from initial equilibrium			
	X	M	P	C	X	M	P	C	X	M	P	C
Export Crops	-3.5	2.9	-0.5	1.1	1.3	0.9	1.1	1.1	-2.2	3.8	0.6	2.2
Food Crops	-4.9	3.5	-0.4	1.1	1.5	0.7	1.1	1.0	-3.5	4.2	0.6	2.1
Livestock	-2.7	3.3	0.6		1.2	0.7	0.9		-1.6	4.0	1.6	
Forestry and Fishing	-2.5	2.3	0.1	1.4	1.3	0.9	1.1	1.0	-1.3	3.3	1.2	2.5
Mining	-3.0	1.6	-2.3	1.3	-0.1	0.7	0.1	1.0	-3.0	2.3	-2.3	2.3
Food Products	-1.5	2.6	0.7	1.2	1.1	0.8	0.9	0.9	-0.5	3.5	1.7	2.1
Processed Sugar	-5.9	3.3	-2.8	1.4	1.7	0.9	1.4	1.3	-4.3	4.2	-1.4	2.7
Beverages and Tobacco	0.8	0.1	0.5	2.1	0.2	0.8	0.5	1.2	1.0	0.8	0.9	3.3
Textiles and Clothing	-1.3	2.8	1.1	1.7	1.3	1.1	1.2	1.3	0.1	4.0	2.3	2.9
Wood Products	-2.4	1.8	-0.1	1.7	0.1	-0.3	-0.1	1.3	-2.4	1.4	-0.2	3.0
Paper and Print	-3.1	1.5	-0.6	1.8	1.1	0.7	0.9	1.3	-2.0	2.2	0.3	3.1
Refined Oil	-1.9	0.0	-0.9	1.9	0.1	0.5	0.3	1.2	-1.8	0.5	-0.6	3.2
Chemicals	-1.8	1.5	-0.2	1.8	1.0	0.9	1.0	1.2	-0.9	2.5	0.7	3.0
Capital Goods	-3.0	0.2	-1.6	1.9	-1.0	-1.0	-1.0	1.2	-3.9	-0.9	-2.6	3.2
Electricity and Water	-0.2		0.2	1.9	0.5		0.6	1.2	0.3		0.8	3.2
Construction			-0.2				-1.9				-2.1	
Commerce	-2.6	1.8	-1.2	1.8	-0.3	-0.3	-0.3	1.5	-2.8	1.5	-1.4	3.4
Transport	-2.5		-0.3	1.7	0.7		0.6	1.4	-1.8		0.2	3.2
Financial and Insurance Services	-0.6	1.0	0.2	2.2	0.6	0.8	0.7	1.4	0.0	1.7	0.9	3.7
Real Est. & Business Services	-4.8	0.8	-1.9	2.0	0.6	0.1	0.3	1.5	-4.2	0.9	-1.6	3.5
Government Services			0.0	0.9			0.0	1.7			0.0	2.6
Other Services	-4.0	4.6	0.8	1.2	1.8	0.8	1.3	1.4	-2.3	5.5	2.1	2.7

Note: all changes are evaluated at initial equilibrium prices. X stands for exports, M for imports, P for total production, and C for private consumption

Overall, these results show that a 10 percent remittance shock can have some impact on the external sector, domestic labor supply, and the economy-wide wages. Even if the magnitude of the impacts is not striking, a 10 percent increase in remittances is itself a rather small shock representing approximately just half of the annual change in remittance inflows experienced by Jamaica over the last ten years.

#### 4.2 Public policies to neutralize labor supply reductions

The second simulation of a 25 percent cut in the payroll tax is implemented to investigate whether this is a viable policy response to sterilize the remittance-induced reduction in the labor supply. The starting point for this simulation is the equilibrium attained after the 10 percent remittance shock, and the results, as percentage changes from that previous simulation, are presented in the second column of Table 4. The third column of this table contains the cumulative change from the initial equilibrium (i.e. the total effect of the remittance shock *and* the policy response). In the current simulation real government savings are allowed to fall and the loss of revenues from the payroll tax are not yet compensated by increasing other taxes.

The reduction in payroll taxes increases after-tax wages. In this new situation, households choose to reduce their consumption of more expensive leisure and increase their labor supply. This increase does not fully neutralize the negative withdrawal due to the remittance shock, yet it significantly corrects its initial effect: 72 percent and 47 percent of the remittance-induced reduction in labor supply for unskilled and skilled labor is offset by the payroll tax change.

As a result of increased labor force participation and higher wages, household labor income rises by 2.2 percent, with a cumulative increase of 3.7 percent after both simulations. Household total income increases at a slower pace, because labor is not the only income source for the households. The reduction of payroll taxes benefits employers by reducing their labor costs. This counterbalances the remittance-induced appreciation of the real exchange rate by lowering domestic prices. Exports rise and imports fall, but the magnitude of these changes is small and does little to compensate the deterioration in the trade balance caused by the remittance shock.<sup>20</sup>

The largest effects of the policy response are registered for government savings and aggregate investment. Although private consumption rises slightly, additional revenues raised from this broader consumption tax base are not enough to counterbalance the losses of payroll tax revenues.<sup>21</sup> As a result, government income falls by more than 3 percent, and, since its expenditures remain largely unchanged, real government savings decline by almost 8 percent. This reduction in public savings is partly compensated by the 1.2 percent increase in private savings, but still causes total savings, and therefore investment, to decline by 2.6 percent.

The sectoral results of the tax cut and the cumulative effects of the first two simulations are summarized in the rightmost eight columns of Table 5. Due to higher income, the majority of goods and services register a cumulative total increase in consumption demand of 3 percent or more, with some variation due to different income elasticities. Production increases in virtually all the sectors; however, the more capital intensive sectors show smaller increases. This is due to the fact that capital, having become scarcer (following the increase in labor supply), demands higher rent. Although imports increase in most sectors, the fall in imports of capital goods (a heavily import-dependent sector) causes the total level of imports to decrease.

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<sup>20</sup> Compare the changes in exports of -2.70 percent in the first column of Table 4 with the -2.66 percent in the third column; or the 0.81 percent and 0.75 percent changes for imports.

<sup>21</sup> Since total imports fall, tariff revenues also decline slightly (by 0.1 percent), which contributes to the decrease in government income.

### 4.3 Revenue-neutral public policies to neutralize labor supply reductions

Overall, the reduction in payroll taxes appears to counteract many of the undesirable effects of increased remittance inflows: lower rates of labor force participation and reduced export competitiveness. However, a major effect of this policy is a sharp fall in public saving and a negative effect on investment. The decrease in government saving is a major cause for concern due to the heavy public debt burden. To neutralize the undesirable effects on public saving and investment, sales tax rates are allowed to vary so that the government savings are maintained at the initial equilibrium level. Sales taxes affect consumption choices and should be preferred to direct increases of income taxes, which could potentially deter future or even current flows of remittances. Increasing taxes on international trade is not recommendable, since protectionism is likely to reduce welfare at home.

*Table 6 Macroeconomic results: fixed budget deficit*

	Remittance effect, percent change from initial equilibrium	Tax effect, percent change from remittance shock	Total effect, percent change from initial equilibrium
Remittances	10.00	0.00	10.00
Total household income	2.05	1.40	3.48
Household labor income	1.44	2.63	4.12
CPI	0.54	0.13	0.67
Real exchange rate	0.89	0.14	1.04
Real GDP	-0.36	0.21	-0.16
Private consumption	1.50	1.27	2.79
Investment	0.03	0.14	0.17
Exports	-2.74	-1.14	-3.85
Imports	0.83	0.65	1.49
Government savings	0.00	0.00	0.00
Unskilled labor supply	-0.76	0.60	-0.16
Skilled labor supply	-0.84	0.47	-0.38
Unskilled wage	2.32	2.40	4.78
Skilled wage	2.27	2.32	4.64
<i>Memo</i>			
Absolute change in unskilled labor supply	-3,814	3,006	-808
Absolute change in skilled labor supply	-4,552	2,500	-2,052

The aggregate results of this third simulation are shown in Table 6. As before, the total effect of the simulation is decomposed into the remittance impact in the first column and the tax impact in the second column.<sup>22</sup> The macro results are very close to the previous simulation, although the labor supply response is slightly lower in the fixed government saving scenario. This

<sup>22</sup> The slight differences between the first column in Table 6 and the first column in Table 4 are due to the fact that sales tax rates are now allowed to vary to keep the budget deficit constant.

effect is due to the increased (due to higher indirect tax rate) prices of consumption goods which induce consumers to work slightly more. To maintain an unchanged government budget balance, the sales tax rate has to rise by 13 percent—not a very large change in absolute terms since initial sales taxes for most products are quite low. For example, the sales tax rate on food products increases from 1.3 percent to 1.5 percent. Since public saving remains unchanged and household saving rises due to higher labor income, investment also increases, which creates additional demand for goods.

#### **4.4 Sensitivity analysis: what if remittances are received by specific households and the labor markets are less flexible?**

Two basic assumptions are implicit in the analysis up to this point and deserve some further scrutiny. The first is the adoption of a single representative ‘average’ household and the second is that labor is fully mobile across sectors.

Assuming a single representative household has two important drawbacks: a) the same household decides how much skilled *and* unskilled labor to offer in the market, and b) remittances are distributed evenly across different households. In other words, adopting a single representative household implies that there are no biases in the distribution of remittances among recipient households, and that, contrary to the empirical evidence for Jamaica, remittances are not likely to be a more important source of income for poorer households who are also more likely to be endowed with unskilled labor when compared to richer households.

In order to better understand the distribution of remittance income across different groups of households, we have conducted some preliminary analysis using the combined data from the 2002 Labor Force Survey and the 2002 Survey of Living Conditions. The first observation is that remittance income is much more likely to be received by rural than urban households: 25 percent of rural households report remittance income compared to only 14 percent of their urban counterparts.<sup>23</sup> Households where the head is unemployed are 10 percent more likely to report remittance income, and households where the head is outside the labor force are 20 percent more likely to report remittance income (see Table 7). In both agriculture and services, one-fifth of households report remittance income, while for households where the head is employed in manufacturing that share is 16 percent.

Households with a more educated head are much less likely to receive remittances than households where the head has completed less than secondary school: 20 percent of households

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<sup>23</sup>We define urban areas as the following three parishes: Kingston, St. Andrew, and St. Catherine. The other 11 parishes are defined as rural. Under this definition, urban areas are home to 32 percent of all households in the survey.

with a less educated head report some remittance income, while only 13 percent of households with a more educated head do so. However, the difference is much less clear if occupation instead of education level is used as a proxy for human capital. Remittances are a key source of income: they represent on average 82 percent of total income for the group of households reporting receipts of these inflows. For this group, the distribution of remittances according to education level and sector of employment is shown in the bottom part of Table 7.

*Table 7 Distribution of remittance income*

<b>Number of households who receive remittances</b>				
	Recipients	All households	Share (%)	
Employed	707	3534	20	
Unemployed	78	338	23	
Inactive	323	1258	26	
<i>Total</i>	1,108	5,130	22	

<b>Distribution of households who report remittance income (percent)</b>				
Education / Sector of employment	Agriculture	Manufacturing	Services	Total
Completed primary	33.1	5.4	60.2	98.8
Completed secondary or higher	0.0	0.0	1.2	1.2
<i>Total</i>	33.1	5.4	61.5	100.0

The second important assumption to consider is the extent of labor mobility across sectors. As an alternative to full mobility, a plausible segmentation of the Jamaican labor market into agricultural and non-agricultural activities is tested by checking whether incomes in agriculture are below incomes in other sectors. The earnings equation takes into account the usual determinants: education, experience, gender, and employment-status variables such as self-employment. Additionally, to account for price differentials across space, geographical variables capturing differences among Jamaican regions are included in the wage estimation. Taking the largest non-agricultural sector of employment, “services”, as a reference group, regression analysis shows that agricultural individual labor incomes are significantly below this reference group (Table 8).

There can be a number of reasons for observing this income gap between agricultural and non-agricultural employment. One explanation may be that agricultural income, in particular from self-employment, is systematically underreported. However, we control for this by including a self-employed dummy, which in fact shows a negative sign in support of this hypothesis. Another explanation for the sectoral income differential may lie in positive externalities associated with agricultural employment. Examples of such externalities include food self-sufficiency and employment opportunities for other family members. Yet, one can also easily

think of negative externalities of agricultural employment, such as the exposure to weather shocks or hard physical work. These externalities are difficult if not impossible to quantify. If we accept the existence of an income differential between agriculture and non-agricultural sectors, the question then becomes why individuals do not respond to this differential by moving to the non-agricultural sector until incomes in both sectors equalize. A likely answer is that there must be barriers to mobility between agricultural and non-agricultural employment and that these barriers are relevant to the period under our analysis. A potentially important factor that may act as a barrier to mobility, although we do not test for this hypothesis, is represented by the specificity of human capital acquired in the agricultural sector.

*Table 8: Labor market segmentation estimation results*

Dep. Var: Labor income	Coefficient	Robust Std. Err.	P>t
<i>Individual characteristics</i>			
Years of schooling	0.196***	0.015	0.00
Experience	0.06***	0.006	0.00
Experience squared	-0.001***	0.000	0.00
Male	0.4***	0.052	0.00
Self-employed	0.122	0.126	0.33
<i>Geographic dummy variables</i>			
(Kingston)			
St. Andrew	1.014***	0.146	0.00
St. Thomas	0.4**	0.171	0.02
Portland	0.454***	0.145	0.00
St. Mary	0.177	0.129	0.17
St. Ann	0.248*	0.131	0.06
Trelawny	1.151***	0.229	0.00
St. James	1.609***	0.244	0.00
Hanover	0.366**	0.150	0.02
Westmoreland	0.856***	0.135	0.00
St. Elizabeth	0.525***	0.127	0.00
Manchester	0.238*	0.128	0.06
Clarendon	0.704***	0.155	0.00
St. Catherine	0.873***	0.122	0.00
<i>Sectoral dummy variables</i>			
(Services)			
Agriculture Sectors	-0.339***	0.094	0.00
Manufacturing	-0.134	0.082	0.10
<i>significance levels: *** 1%; ** 5%; * 10%; no stars insignificant</i>			
Number of obs	2461		
F( 20, 2440)	33.31		
Prob > F	0.00		
R-squared	0.21		
Root MSE	1.25		

To accommodate the above evidence of a) a bias in the distribution of remittances receipts towards unskilled headed households and b) the labor market segmentation, we

disaggregated the households in two groups: households receiving labor income exclusively from unskilled workers and household receiving labor income from skilled workers. Remittances are then received only by the first group. Other sources of income (from capital and other transfers) are disaggregated proportionally between the two groups. Since in reality, most households receive labor income from both types of workers, the described set up represents an extreme segmentation of income sources across household types and the results derived from it should be considered illustrative and should provide a useful contrast to those shown in the previous sections. Reflecting our findings from the analysis of wage determinants, we also segment the labor markets across agriculture and non-agriculture activities.

*Table 9 Macroeconomic results: revenue-neutral decrease in payroll taxes with 2 types of households*

	Remittance effect, percent change from initial equilibrium	Tax effect, percent change from remittance shock	Total effect, percent change from initial equilibrium
Remittances to unskilled headed hh	10.00	0.00	10.00
Remittances to skilled headed hh	0.00	0.00	0.00
<i>Total income</i>			
Unskilled headed household	4.52	0.97	5.53
Skilled headed household	-0.14	1.65	1.65
<i>Household labor income</i>			
Unskilled headed household	2.69	2.45	5.21
Skilled headed household	0.10	2.83	2.94
CPI	0.46	0.14	0.61
Real exchange rate	0.64	0.18	0.82
Real GDP	-0.24	0.19	-0.04
Private consumption	1.44	1.27	2.74
Investment	-0.08	0.17	0.09
Exports	-2.29	-1.19	-3.45
Imports	0.77	0.66	1.43
Government savings	0.00	0.00	0.00
Unskilled labor supply	-2.19	0.86	-1.35
Skilled labor supply	0.34	0.25	0.59
Unskilled wage	5.16	1.76	7.01
Skilled wage	-0.24	2.72	2.48
<i>Memo</i>			
Absolute change in unskilled labor supply	-11,048	4,258	-6,790
Absolute change in skilled labor supply	1,848	1,353	3,200

The macroeconomic results of a revenue-neutral decrease in payroll taxes under the setup described in the previous paragraph are shown in Table 9. The main point here is that remittances increase non labor incomes for households with unskilled worker heads and as a

consequence this group reduces the supply of unskilled labor. The increase in costs due to higher unskilled worker wages generates resource reallocations and changes in other factor prices. Due to the slight decrease in capital incomes, households with skilled worker heads suffer income losses.<sup>24</sup> To compensate for this loss, these households increase supply of skilled labor which then causes the reduction in the wages recorded in Table 9. However this permits producers to reduce their costs by substituting the now scarcer and (relatively) more expensive unskilled labor with skilled labor.

The concentration of remittances in the single group of unskilled households exacerbates the initial labor loss: in this case 11,000 unskilled workers decide to wait for a better paid job. As before, the reaction of the government to reduce payroll taxes partly compensates the labor withdrawal, although it is less effective than in the previous setting.

## 5 Conclusions

In this paper, we investigate the economy-wide effects of rising remittances for Jamaica using a general equilibrium model with an endogenous labor supply that responds negatively to increases in non-wage income. Our numerical estimations are based on a recent (2002) Social Accounting Matrix for Jamaica and on the household survey evidence of the negative relationship between labor supply and remittances (Kim, 2006). The data included in the SAM are derived from heterogeneous sources, some of which are quite dated. Although we use sophisticated ‘data-updating’ statistical procedures, the final result could be improved once new data are collected and made available. Similarly, the econometric evidence on the negative labor supply – remittances relationship is not very strong. These limitations, common to most numerical simulation exercises, highlight the fact that our results should be considered as just a coherent and informed illustration of the direction and magnitude of the effects of rising remittances on the Jamaican economy. They should not be taken as a forecast of what will happen in the country.

Nonetheless, some interesting lessons can still be learned from this exercise. Firstly, a small positive shock to remittance inflows can have relevant economy-wide repercussions. By reducing labor participation and thus increasing wages, this shock exacerbates the appreciation of the real exchange rate, reducing the country’s competitiveness and damaging its export base and its small manufacturing import-competing sector. Second, within the narrow margins of maneuver of a highly indebted government, a revenue-neutral policy response that reduces labor

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<sup>24</sup> Capital income decreases due to the reallocation of resources set in motion by the real exchange rate appreciation. Importable sectors are especially capital intensive and increased flows of imports cause these sector to shrink and to release capital. Thus, rental rates have to go down so that idle capital can be employed in other sectors.

costs—via a reduction in payroll taxes and a compensating increase in sales tax rates—can effectively counteract the negative effects of remittance inflows. We also show that considering the identities of the beneficiaries of remittances matters for the final results. In a simulation where remittances go only to unskilled headed households, as seems to be the case by looking at micro data, the labor market effects are more complex and the corrective policy less effective. This clearly signals the need for additional research aimed at better understanding these distributional effects.

The above results come with an important set of caveats. First, one should note that although remittances have some undesirable effects on Jamaica's competitiveness and labor force participation, they are not themselves undesirable. In fact, remittances represent an important channel of external financing for the economy as a whole, and they also account for a large share of the income of unskilled and unemployed/inactive individuals, who are more likely to be poor. Similarly, while the reduction in labor supply by the remittance recipients has some negative consequences, the decision itself is utility-maximizing. Therefore, the optimal policy response should focus on minimizing the negative indirect impacts rather than minimizing remittances themselves (for example, by taxing them directly). It should also be acknowledged that a move towards more indirect taxation may have some adverse consequences by shifting the tax burden on the poorer households. Although the changes in tax structure implied by our results are mild and the policy is beneficial for the economy as a whole, there may be a need for actions to smooth the transition for the most vulnerable parts of the population.

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## 7 Annex

### 7.1 Initial benchmark data: the 2002 Jamaica SAM

The 2002 SAM has been assembled from various sources and includes 22 sectors, 22 commodities, 3 factors (skilled and unskilled labor and composite capital), an aggregate household account, government, savings-investment, taxes, tariffs, and the rest of the world (see Table 10). In order to construct this SAM, we relied on published STATIN data (national accounts and disaggregated GDP by sector), a 2000 SAM for Jamaica constructed by International Food Policy Research Institute (IFPRI), the 2002 Labor Force Survey, the 2002 Survey of Living Conditions, and the UN COMTRADE and TRAINS databases.

*Table 10: List of accounts for Jamaica SAM (2002)*

<i>Production sectors and Commodities</i>	<i>Factors of Production</i>
1 Export Crops	23 Skilled Labor
2 Food Crops	24 Unskilled Labor
3 Livestock	25 Capital and Land
4 Forestry Fishing	
5 Mining	
6 Food Products	<i>Institutions and other accounts</i>
7 Processed Sugar	26 Household
8 Beverages and Tobacco	27 Government
9 Textiles and Clothing	28 Investment and Savings
10 Wood Products	29 Indirect taxes
11 Paper and Print	30 Tariffs
12 Refined Oil	31 USA
13 Chemicals	32 European Union
14 Capital Goods	33 Rest of the World
15 Electricity and Water	34 Balance of Payment
16 Construction	
17 Commerce	
18 Transport	
19 Financial and Insurance Services	
20 Real Est. & Business Services	
21 Government Services	
22 Other Services	

Macro SAM. In order to build the macroeconomic SAM, we relied mainly on the national accounts data from STATIN. We have followed this sectoral detail with one exception: we have aggregated “other manufacturing”—a very small sector—with “metal products and machinery.” Since the value-added taxes are applied equally to domestically produced goods and imports, we impose the VAT on commodities rather than activities for simplicity. STATIN data combines taxes on international trade (tariffs) with other indirect taxes, and therefore we need additional information to separate indirect taxes from tariffs. We collect these data from UN COMTRADE and TRAINS databases. We use COMTRADE for trade flows (imports and exports) at a disaggregated level, and TRAINS for applied tariff rates in the same commodity groups. This allows us to calculate the overall tariff revenue, and subtract it from other taxes.

Value added. The disaggregation of total value added by sector is available from STATIN. We combine this information with the earlier IFPRI SAM to disaggregate total value added into capital, labor, and indirect tax components. We also take advantage of the information in the Labor Force survey to ensure that the labor value added by sector is consistent with the aggregate survey results. In order to ensure that all of these constraints are satisfied, we use the RAS technique to estimate the shares of labor, capital, and indirect taxes.

Taxes. We use the VAT tax rates reported in the IFPRI SAM and apply them to the value added calculated in the previous step. We then adjust tax collection by sector to get the VAT total consistent with the macro SAM. Payroll taxes are not explicitly identified in the SAM—they are calculated within the model using a universal the payroll tax rate.

Intermediate and final demand. We use the shares of intermediate consumption to total value added from the IFPRI SAM to obtain a table of input coefficients, which are then applied to our data. Household consumption shares by commodity are calculated from the Survey of Living Conditions, and are quite close to those reported in the IFPRI SAM. We assume that the government consumes only its own services. Aggregate investment (net of stock changes) is split into sectoral investment using coefficients from the IFPRI SAM.

International trade. Data on merchandise imports, exports, and tariffs is obtained from UN COMTRADE and UN TRAINS. In order to impute service imports and exports (which include tourism), we use the IFPRI SAM to disaggregate total service exports and imports.

The resulting social accounting matrix is quite unbalanced, although the imbalances are limited to the commodity rows and columns. We balance this SAM using a cross-entropy approach which allows only the input-output coefficients to move (the input-output coefficients from the IFPRI SAM serve as a starting point). This implies that we trust our final demand estimates (which come from the survey and COMTRADE data) and allow the production structure to change slightly.

## 7.2 A brief description of the CGE model

Production. Output results from nested CES (Constant Elasticity of Substitution) functions that, at the top level, combine intermediate and value added aggregates. At the second level, the intermediate aggregates are obtained combining all products in fixed proportions (Leontief structure), and total value added is obtained by aggregating the primary factors. The full structure of production nests is shown in Figure 2.

Income Distribution and Absorption. Labor income and capital revenues are allocated to households according to a fixed coefficient distribution matrix derived from the original SAM. Private consumption demand, as well as labor supply decisions, is obtained through maximization of household specific utility function following the Linear Expenditure System (LES). Household utility is a function of consumption of different goods and leisure. Once total value of private consumption is determined, government and investment demand are disaggregated into sectoral demands according to fixed coefficient functions.

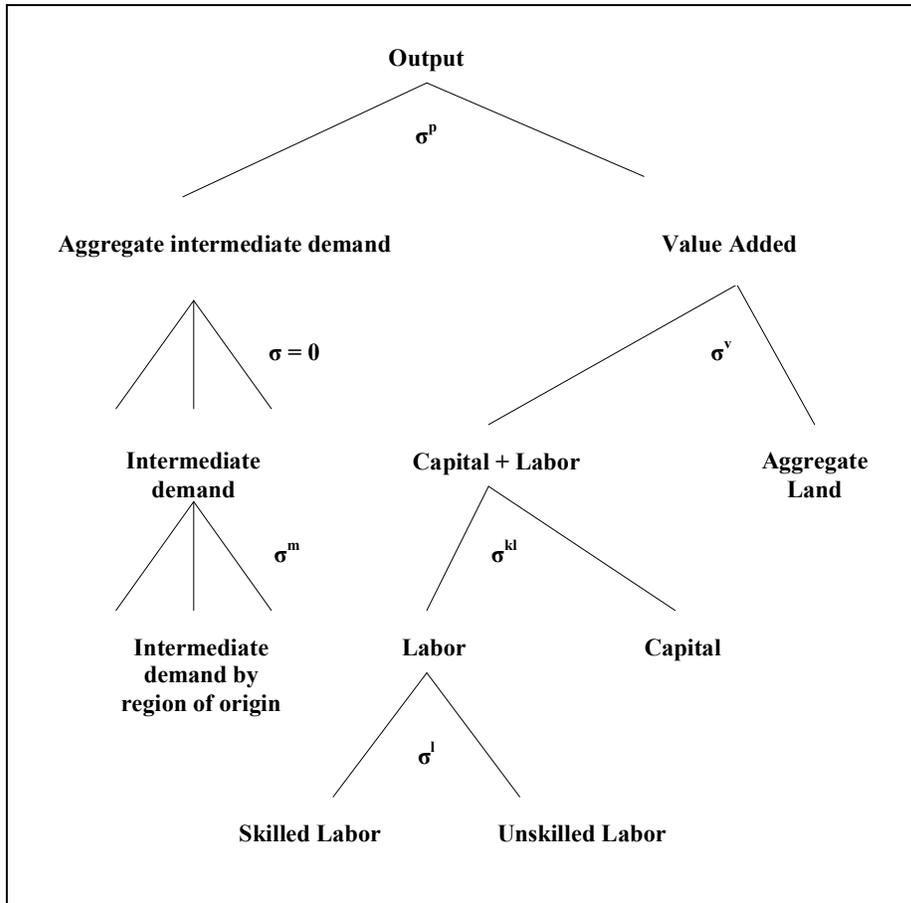
International Trade. The model assumes imperfect substitution among goods originating in different geographical areas.<sup>25</sup> Import demand results from a CES aggregation function of domestic and imported goods. Export supply is symmetrically modeled as a Constant Elasticity of Transformation (CET) function. Producers allocate their output to domestic or foreign markets according to relative prices. Under the small country assumption, Jamaica is unable to influence world prices and its imports and exports prices are treated as exogenous. Assumptions of imperfect substitution and imperfect transformability grant a certain degree of autonomy of domestic prices with respect to foreign prices and prevent the model from generating corner solutions. Furthermore, they permit cross-hauling—a feature normally observed in real economies. The balance of payments equilibrium is determined by the equality of foreign savings (which are exogenous) to the value of the current account. With fixed world prices and capital inflows, all adjustments are accommodated by changes in the real exchange rates: increased import demand, due, for instance, to trade liberalization, must be financed by increased exports, and these can expand due to improved resource allocation. Import price decreases drive resources

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<sup>25</sup> See Armington (1969) for details.

towards export sectors and contribute to falling domestic resource costs (or real exchange rate depreciation).

Figure 2: Production structure of the Jamaica CGE model



Note: Although the model allows substitution between Land and the other primary factors, given that the data for separating land and other factors contributions to value added was not available, the nesting structure actually active in the current model does not include Land as a separate factor.

*Factor Markets.* Labor is divided into two categories: skilled and unskilled. These categories are considered imperfectly substitutable inputs in the production process. The labor market skill segmentation<sup>26</sup> has become a standard assumption in CGE modeling and it is easily justifiable for the case of Jamaica, where inequalities in educational endowments and access to education support this assumption. Skilled and unskilled labor types are then aggregated into a composite labor bundle which is then combined with composite capital (see production nest in Figure 2). In the standard version, composite capital and labor types are fully mobile across sectors; however, in a variant version, we assume that labor markets are segmented between agriculture and non-agriculture, with labor fully mobile within each of the two broad sectors, but fully immobile across them. The restrictive conditions of this second version are imposed on the modeling framework so that it mimics more closely the behavior of the economy in the short-term when factors are less mobile across sectors. Capital supply is fixed. Labor supply, for both the skilled and unskilled categories, is derived, as shown above, from utility maximization where individuals

<sup>26</sup> See Taubman and Wachter (1986) for a general discussion of labor market segmentation.

chose the optimal consumption level for both commodities and leisure time under their budget constraint.

Model Closures. The equilibrium condition on the balance of payments is combined with other closure conditions so that the model can be solved. First, aggregate government expenditures are fixed at the base year value. Government surplus is exogenous and the household income tax schedule shifts in order to achieve this predetermined net government position. Second, aggregate investment is set equal to aggregate savings. The volume of available savings is determined by a fixed level of foreign saving, exogenous government saving, and households who save a fixed share of their post-tax income (i.e. the marginal propensity to save is fixed).