

Remittances and the Redistributive Policy in Ghana: A Computable General Equilibrium Approach

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Abstract: This paper numerically explores the distributive policy for improving both welfare and income inequality with increased remittances in Ghana within a computable general equilibrium (CGE) framework. Our simulation results show that the government can improve both welfare and inequality by using a government surplus generated by increased remittances without any additional revenue resources. If the government is concerned about inequality, then the surplus for more direct transfers to the rural household results in the best outcome. On the other hand, if the government is concerned only about welfare, then a policy to use the surplus for more government spending on education or health achieves the largest welfare gain through its direct demand effect. While the Ghanaian economy can enjoy the largest welfare gain as a whole when the surplus is used for more government spending on education or health, the increased welfare gain will be more distributed to the government sector in comparison with the case when the surplus is used for more direct transfers to the rural household.

Keywords: Ghana, Remittance, Welfare, Income inequality, Computable General Equilibrium (CGE) Model, Simulation

JEL Classifications: C68, D58, H20, and O15

1. Introduction

This paper explores the impact of several government policies on welfare and income inequality in Ghana with its increasing trend of international remittances within a static computable general equilibrium (CGE) framework with its latest Input-Output Table.

Remittances in Ghana keep increasing in accordance with an increase in the number of emigrants. The increasing trend of inflows of remittances has resulted in its relatively more importance and its growing impact on the whole Ghanaian economy. The World Bank (2015) forecasts that the global flows of remittances will again recover in year 2016 and 2017 in line with the expected global economic recovery. The increasing trend of remittances and an expectation of global economic recovery both imply that remittances will play a more important role as the Ghanaian economy stably grows in the future.

Dadson and Kato (2015) examined the impact of international remittances as well as the brain drain on the Ghanaian economy, and found out that the overall impact of both international remittances and the brain drain has resulted in poverty reduction but more income inequality in Ghana¹. Indeed income inequality has been becoming wider in Ghana recently, as Ghana Statistical Service (2014) reported in its latest survey². Furthermore, Dadson and Kato (2015) suggested a possibility of the current tax system of Ghana to induce more income inequality when more international remittances expand the Ghanaian economy through its strong impact on the demand side.

The purpose of this paper is to explore the impact of several government policies when more international remittances stimulate the Ghanaian economy. Since a stimulated economy pays more taxes through an expansion of taxable income and production, the Ghanaian government can obtain a surplus in its budget even if the current tax system remains unchanged. The impacts of government policy changes on welfare and income inequality are measured by the equivalent variation and the Gini index, respectively. The latest Input-Output Table is used to specify parameter values in our CGE model, and our benchmark model can perfectly capture the actual Ghanaian economy within the model.

In order to examine the impact of policies on income inequality, this paper explicitly considers several different inputs in production such as skilled labor, unskilled labor, capital for agriculture, general capital, and land. This paper also takes into account heterogeneity of households in the rural and urban areas, since Djiofack et al. (2013) pointed out for the Cameroon case that an increase in remittances would result in more income inequality due to the fact that a larger ratio of remittances will be sent to relatively richer households, which live in the urban area.

Our simulations show the following results. First of all, the government can improve both welfare and income inequality by using the surplus. Second, if the government is concerned more about the reduction of income inequality, then using the surplus for more direct transfers to the rural households results in the best outcome. Third, such a policy also results in the improvement in welfare. This is because increased direct transfers stimulate consumption of the rural household, and thus more income in all sectors. Welfare of not only rural but also urban households improves by such a policy through its strong stimulation effect on the demand side. As Agbola (2013) pointed out, our simulation result also indicates that the Ghanaian economy is driven by its strong effect on the demand side. Fourth, while the impact of a policy through the supply side of the economy is relatively smaller than that through the demand side, an introduction of subsidies to production of the 'Cocoa Beans' sector results in the best outcome for the improvement in welfare and income inequality among all supply side tax policies. Fifth, if the government is concerned only about welfare, then, a policy to use the surplus for more government spending on education or health sector achieves the largest welfare gain through its direct demand effect. Under such a policy, the positive impact on the reduction of income inequality is limited.

Finally, the distribution of welfare gain between the government and the private sectors differs between the case of more direct transfers to the rural household and the case of more government spending on education or health. While a policy to use the surplus for more government spending on education or health results in the best achievement in welfare, increased welfare gain will be

1 They also pointed out that international remittances to the rural household would work to reduce income inequality.

2 All survey data conducted in the past (Ghana Living Standards Survey (GLSS) round 3 (1991/1992), 4 (1998/1999), and 5 (2005/2006) showed the Gini index improved over time until GLSS 6 (2012/2013) was produced.

more distributed to the government sector through the increased tax revenue, in comparison with the case when the surplus is used for more direct transfers to the rural household. The current tax system of Ghana more absorbs increased welfare gain through an increase in the total tax revenue when the surplus is used for more government spending on education or health. On the other hand, a policy to provide the rural household with more direct transfers results in the case where welfare gain is more distributed to the private sector. This is because more direct transfers to the rural household simply improve welfare of the rural household, thus resulting in relatively more distribution of welfare gain to the private sector.

This paper is organized as follows. The next section reviews the literature on remittances, and then Section 3 explains the data and benchmark model. Section 4 simulates several scenarios with results and evaluations. Section 5 concludes this paper.

2. Literature Review

Rapoport et al. (2006) pointed out that the full impact of remittances on economic growth, capital accumulation, and income inequality is very complicated, and also that remittances have direct and indirect effects as well as different impact over time. Adams (2011) also surveyed the recent empirical literature. As both Rapoport et al. (2006) and Adams (2011) pointed out, the results are quite mixed while a number of research have been conducted.

On the impact of remittances on poverty reduction, however, it is rather more straightforward: Remittances seem to reduce poverty, and the reduction of the transaction cost of remittances is also suggested to reduce poverty (Adams and Page (2005), Acosta et al. (2008), Gupta et al. (2009), Adams and Cuecuecha (2010, 2013), and Mamun et al. (2015)). In particular, Adams and Cuecuecha (2013) studied the impact of remittances on investment and poverty in Ghana with 2005-6 Ghana Living Standard Survey (GLSS 5), and they concluded the positive impact on poverty reduction. They also found out that households in Ghana would spend more at the margin on three investment goods: education, housing, and health.

In terms of the impact of remittances on income inequality, results are really mixed (Lipton (1980), Stark et al. (1988), Taylor (1992), Barham and Boucher (1998), Faini (2007), McKenzie and Rapoport (2007), Acosta et al. (2008), and Adams (2009)). Many researches point out that the impact of remittances on income inequality depends on the size of an economy, and also that the impact differs over time.

Regarding the research on Ghana and Africa in terms of remittances, in addition to Gupta et al. (2009) and Adams and Cuecuecha (2013), Agbola (2013) and Djiofack et al. (2013) should be noted. Agbola (2013) empirically found out the positive impact of remittances on economic growth through its stimulation effect on the demand side, and also argued that the government spending should be shifted onto more production-enhancing sectors such as education and health related sectors. Djiofack et al. (2013) constructed a computable general equilibrium (CGE) model for Cameroon with parameter values estimated with the African country data set. They found out that the effect of remittances on poverty reduction is quite limited, and also that remittances would result in an expansion of income inequality due to the fact that the amount of remittances sent by skilled workers abroad is much larger than that by unskilled workers. Since households living in the urban area are richer than those in the rural area, remittances would further widen the income gap between the urban and rural areas.

3. Numerical Analysis

This paper uses the latest input-output table of Ghana within a general equilibrium framework, in order to make the simulation analysis realistic. By using the actual input-output table of Ghana, the paper has successfully realized the real economy within the model. This paper employs the conventional static computable general equilibrium (CGE) model with the actual input-output table of Ghana of year 2005. Note that all parameter values in the model are calculated by using the actual data, so that the calculated values of endogenous variables obtained within the model also become quite realistic.

3.1 Data

The latest input-output table of Ghana of year 2005 with 59 different intermediate sectors has been used in order to construct the social accounting matrix (SAM). The World Bank (2006) points out that the true size of international remittances flows through formal and informal channels may be much higher than the formal size by perhaps 50% or more. The Bank of Ghana reported that the total size of private transfers in year 2005 was 1549.76 million US dollars, and also that more than 80% of the amount of received remittances was sent privately and only 13% was carried out through banks or money transfer agencies.

In the latest input-output table of Ghana of year 2005, while there are items of official international remittances to rural and urban households through banks and money transfer agencies, the values of these items are relatively too small compared to the reported value by the Bank of Ghana. Private transfers from abroad are categorized in exports of sector 51 ('Other Services') in the input-output table of Ghana, and it is assumed that exports of sector 51 ('Other Services') are included in international remittances, in order to capture the true size of international remittances³. Table 1 shows the amount of international remittances obtained from the input-output table of Ghana of year 2005 after the modification of the treatment of exports of sector 51. While all available information for obtaining the amount of informal remittances in Ghana has been used, the amount in Table 1 might still be smaller, compared to the reported value by the Bank of Ghana. Thus, in the following simulation section, several cases with more remittances (10%, 20%, and 30% more remittances) are investigated.

As Table 1 on the next page shows, the amount of international remittances to the urban households is much higher than that to the rural households, and the total income per capita in the urban area is also much higher than that in the rural area, as shown in Table 2. This suggests, as Djiofack et al. (2013) pointed in the Cameroon case, that more international remittances would result in more income inequality, since the more amount of remittances would be sent to richer households in the urban area.

3 The total value of exports of sector 51 ('Other Services') was 7492.086 billion in GHC (old Ghana Cedis), which is equal to 173.21 million US dollars, in the original input-output table of year 2005. This size is relatively very large compared to the amount of exports of other sectors due to the fact that it contains private transfers from abroad. Then, this amount is assumed to be treated as informal remittances in the paper.

Table 1 International Remittances in year 2005 based on the IO Table year 2005

Unit: million USD

		Formal	Informal	Total
To	Rural households	45.11	168.35	213.46
	Urban households	175.73	655.78	831.51
	total	220.84	824.13	1044.97
		Per capita in million		
To	Rural households	3.27	12.20	15.47
	Urban households	20.92	78.07	98.99
	total	24.19	90.27	114.46

Source: Input-Output Table of Year 2005; The amount of informal remittances is obtained based on the assumption that the amount of exports in sector 51 is treated as informal international remittances.

Table 2 Income and Population in year 2005

Income: in million USD, and Population in million

	Population	Income
Rural households	13.8	5,054
Urban households	8.4	5,850
total	22.2	10,905
		Per capita in million
Rural households		366.26
Urban households		423.94
total		790.20

Source: Input-Output Table Year 2005 and GLSS 5

3.2 Benchmark Calibration

The general equilibrium model consists of 59 different production sectors, heterogeneous households, and the government. Each of 59 production sectors uses self-employed, unskilled labor, skilled labor, land, agriculture specific capital, general capital, land, and intermediate production goods in its production in order to maximize its profits. Each production sector optimally determines how much it exports its own good, how much it imports goods for its production, and how much it sells its own good domestically.

Households are heterogeneous, depending on the place where they live; the rural area household, and the urban area household. Each household maximizes its utility which is defined over 59 different goods produced by 59 different production sectors. Disposal income of rural and urban households consists of after tax labor and capital income, transfers from the government, and

remittances. Remittances include internal (from Ghana) and international (from abroad) remittances. The government imposes taxes and tariffs on and gives subsidies to 59 different production sectors. The government also imposes a labor income tax on the household in the rural and urban areas, and gives transfers to them. The total tax revenue is used for its expenditure. 59 different commodity markets, and factor markets are all fully competitive, so that all prices are determined at the fully competitive level. 59 different production sectors and the heterogeneous households take all prices, tax rates, and subsidy rates as given⁴.

Welfare gain and income inequality are measured by the equivalent variation and the Gini index, respectively. The equivalent variation denoted by EV is used for measuring the welfare change, which is defined by:

$$EV_h = e_h(\tilde{p}_0, U_1) - e_h(\tilde{p}_0, U_0),$$

where $e_h(\tilde{p}, U)$ denotes the expenditure function. \tilde{p}_i and U_i denote the price vector and utility, respectively, and the index $i = 0, 1$ shows the benchmark situation and simulated situation, respectively. Note that the equivalent variation is calculated for rural ($h = a$) and urban ($h = b$) households, respectively, and it is expressed in the financial term. The Gini index denoted by G is calculated based on Table 2 and disposal income obtained in the model. Disposal income (I^h ; $h = a, b$) includes after-tax income, government transfers, and remittances. Using the disposal income of rural and urban households and the population of rural (n_a) and urban (n_b) households in Table 2, the average disposal income (μ) is calculated. The total population ($n = n_a + n_b$) is also obtained from Table 2. Since there are two types of households living in the rural or urban areas, the difference in the population size is taken into account, and the Gini index is defined such that:

$$G = \frac{|I^a n_a - I^b n_b|}{2n^2 \mu}$$

The Gini index in year 2005 in Ghana given in Ghana Statistical Service (2007) is 39.4. Then, the above defined G is calculated for the benchmark and simulated cases, respectively, and the change between two cases with the official value (39.4) is used for the Gini index for simulated cases.

4. Simulation Analysis

While the main purpose of this paper is to explore the impact of several government policies on welfare and income inequality when inflows of remittances increase, it is important to show the impact of more remittances on the Ghanaian economy. While all available information for obtaining the amount of informal remittances in Ghana has been used in Table 1, the amount in Table 1 might still be smaller. Thus, in this simulation section, several cases with more remittances (10%, 20%, and 30% more remittances) are presented⁵. As the following results show, while the magnitude of impacts differs depending on the size of increased remittances, the results in this paper do not depend on the size of remittances, so that all the results obtained in this paper would not change even when the true size of remittances would be higher than our assumption for Ghana.

Table 3 shows the impact of more remittances, depending on which households receive them; rural households or urban households. In the table, the welfare change for the rural and urban

4 Parameter values for the successful benchmark model are given upon request.

5 An anonymous reviewer kindly suggested this point, and we thank the reviewer.

households are separately measured by the equivalent variation (EV). The total impact on the whole economy is measured by GDP. As Table 3 shows, while more remittances to the rural households improve income inequality, the magnitude of the impact is rather limited. Thus, in the following simulations, only the case when the urban households receive more remittances is investigated.

Note that a surplus for the government is also generated by more remittances, since more remittances stimulate an economy. This is because taxable income and production increases in a stimulated economy, so that the total tax revenue increases without any increase in tax rates or any new tax revenue resources.

Before moving onto the next section, it should be noted that more remittances to the urban households result in an increase in welfare not only of the urban households but also of the rural households. This is because increased remittances to the urban households stimulate consumption of the urban households, and their expanded consumption stimulates production. The stimulated production then eventuates in more income of the rural households as well, and welfare of the rural households also increases. Such an impact can be captured only by a general equilibrium framework, and in the following simulations it is assumed that only urban households receive more international remittances.

4.1 The Direct Income Transfers (Simulation I)

The Ghanaian government provides both the rural and urban households with direct transfers. The total amount of direct transfers to the rural and urban households reaches 251.1135 million US dollars, and 272.4138 million US dollars in year 2005, respectively. In Simulation I, a surplus generated by the stimulation impact of more remittances is used to increase direct transfers to either the rural or urban households until the surplus vanishes. Note that an increase in direct transfers changes the optimal consumption schedule, thus resulting in changes in consumption, income, production, and tax revenue through different channels. Note also that tax revenue changes without any change in the tax rate, and also that the government consumption changes even when the surplus vanishes again. The general equilibrium framework can capture the overall impact of a policy change on the behavior of all economic agents.

Table 4 shows the results, which are summarized as follows: First, the government can increase direct transfers to each household when remittances to the urban households increase. Another result is that more direct transfers only to the rural households result in the improvement not only in income inequality, but also in welfare. This surprising result can be explained as follows: More direct transfers to the rural households strongly stimulate consumption of the rural households. This strong impact on the demand by the rural households results in stimulating production substantially, and then income of the urban households also increases. As Agbola (2013) pointed out, the impact through the demand side seems very strong in Ghana. Through its strong impact on the demand side, the direct transfers to the rural households result in a better outcome in terms of welfare, and such a policy is justified not only by the concern of the reduction of income inequality, but also by the welfare concern.

4.2 The Reduction of a Production Tax (Simulation II)

While the number of private sectors which pay a production (sales) tax is still limited in Ghana, the amount of a production tax paid is quite biased. Only the top three sectors ('Petroleum', 'Diesel', and 'Trade Services') consist of nearly 60% of all production tax revenue, and the average tax rate of a production tax applied to 'Petroleum', 'Diesel', and 'Trade Services' sectors reaches 62.968%, 57.321%, and 16.047%, respectively. The reduction of such very high and thus distortionary tax rates of these three sectors is simulated in this section (Simulation II).

The results are shown in Table 5, and the magnitude of the impact on welfare is very limited. Another result is that the magnitude of the impact on income inequality is also small, while the reduction of a production tax on all these three sectors result in a slight improvement in income inequality. These findings suggest that any tax policy to affect the supply side has relatively little impact on both welfare and income inequality in Ghana. Then, the next section is devoted to investigate another tax to affect the supply side.

4.3 The Reduction of an Export Tax (Simulation III)

Among all 59 different sectors, only the 'Cocoa Beans (Sector number = 18)' sector pays an export tax in Ghana. This is because the 'Cocoa Beans' sector has been very important for the Ghanaian government to obtain stable government revenue by imposing an export tax on its exports. Since an export tax is another distortionary tax and the 'Cocoa Beans' sector plays an important role in the Ghanaian economy, the reduction of the export tax rate is expected to improve welfare. If the government can maintain its stable revenue even after the reduction of the tax rate of the export tax, then the reduction of the tax rate could be justified.

Table 6 shows the results. First of all, when remittances to the urban households increase by 30%, then the government can reduce its rate from the current level of 14.196% to 11.3652%, which reduction rate from the current level corresponds to nearly 20%. Secondly the reduction of the export tax rate results in the improvement in not only GDP but also in Gini index. Finally, the magnitude of the positive impact on welfare and income inequality to the whole economy is larger than the case when any of production tax rate of the top three sectors is reduced. Note that the 'Cocoa Beans' sector has been playing an important role in Ghana, not only in its contribution to the government revenue, but also to income of households. Then, the following section investigates the impact of an introduction of subsidies to production, particularly to the sectors which contribute relatively more to income of the rural households, including the 'Cocoa Beans' sector.

4.4 An Introduction of Subsidies (Simulation IV)

The above result showed that the magnitude of the positive impact of the reduction of the export tax on the 'Cocoa Beans' sector on both welfare and income inequality is larger than the case when a very high and distortionary production tax is reduced. This implies that the price elasticities of these sectors such as the 'Petroleum', 'Diesel', and 'Trade Services' sectors are very small even though their tax rates are already very high. This finding suggests the reduction of a production tax rate of other sectors. Furthermore, if the government is trying to achieve the improvement in both welfare and inequality, the sectors should be selected particularly based on income of the rural households. The result of Simulation I also suggests that if income of the rural households increases by any policy change, then increased income of the rural households also result in an expansion of an economy by its strong stimulation impact on the demand side.

Then our SAM based on the latest Input-Output Table of Ghana of year 2005 indicates the following three sectors to be explored; 'Cocoa Beans', 'Vegetables', and 'Yams' sectors. These three sectors pay relatively more income to the rural households, and the rural households consume more these goods, compared to the urban households. However, any of these three sectors has not paid a production tax. Then in this section, subsidies to their production is introduced. Subsidies to production imply a negative tax rate of the production tax.

Table 7 shows the results. In Table 7, the amount of subsidies to each sector is shown when a surplus in the government budget is generated by more remittances to the urban households. First of all, an introduction of subsidies results in better outcome in welfare and income inequality, compared to the case of the reduction of a production tax rate of the top three sectors. This is because the price elasticities of the 'Cocoa Beans', 'Vegetables', and 'Yams' sectors are much higher.

Secondly, an introduction of subsidies to production of the 'Cocoa Beans' sector results in the best outcome out of these sectors, and such subsidies result in the substantial improvement in welfare and income inequality. In particular income inequality could be improved more by an introduction of subsidies. This is because subsidies to production positively work not only for exports but also for production of goods domestically consumed. The positive impact on goods domestically consumed induces the stimulation effect on the Ghanaian economy.

4.5 More Government Expenditure (Simulation V)

While the above result indicates that the 'Cocoa Beans' sector is one of the key sectors if the government tries to improve welfare and income inequality through its impact on the supply side, the results obtained in previous sections also show that the magnitude of the impact on the demand side is much larger. Agbola (2013) pointed out that the impact through the demand side is particularly strong in Ghana. He also mentioned that the government should spend more money on the sectors such as education and health to stimulate the Ghanaian economy. This final section then simulates the case when the government uses a surplus for its consumption of education and health.

Table 8 shows the simulation results. The benchmark levels of government expenditure on education and health are 289.2981 million US dollars and 56.7430 million US dollars in year 2005, respectively. Since the amount of government expenditure on health at the benchmark level is much smaller than education, an increase in government expenditure on health is much higher in each scenario. The first finding is that the impact on welfare and income inequality is quite similar in both education and health, while the amount of an increase in expenditure is quite different. Secondly, the impact on income equality in both cases is quite limited, and income inequality does not improve so much. Thirdly, however, the impact on welfare is quite large in both cases. Since more government expenditure directly stimulates the economy through the demand side effect, a big expansion of the Ghanaian economy is achieved. Finally, while the impact on welfare is quite large, the distribution of the benefits generated by the policy is different from other cases. While GDP expands, the improvement in welfare of both rural and urban households is limited. Furthermore, increases in the amount of taxes paid by the rural and urban households are much higher in this simulation. This implies that the improvement in welfare relatively more tributes to the government rather than an increase in income of households.

5. Concluding Remarks

This paper presents a static computable general equilibrium (CGE) framework to numerically examine the impact of several government policies on welfare and income inequality in Ghana.

The results show that the government can improve both welfare and income inequality by using the surplus generated by increased taxable income caused by more remittances. If the government is concerned more about the improvement in income inequality, then using the surplus for more direct transfers to the rural households results in the best outcome. On the other hand, if the government is concerned only about welfare, then a policy to use the surplus for more government spending on education or health sector achieves the largest welfare gain through its direct demand effect. Furthermore, the distribution of welfare gain between the government and the private sectors differs between the case of more direct transfers to the rural households and the case of more government spending on education or health. While a policy to use the surplus for more government spending on education or health results in the best achievement in welfare, increased welfare gain will be more distributed to the government sector through the increased tax revenue, in comparison with the case when the surplus is used for more direct transfers to the rural households.

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Table 3 The Impact of Remittances (Source: Dadson and Kato, 2015)

Unit: a million USD except Gini Coefficient	benchmark	increase in remittances to the RURAL household only				increase in remittances to the URBAN household only			
		5% increase	10% increase	20% increase	30% increase	5% increase	10% increase	20% increase	30% increase
Tax Revenue									
income tax from rural household	88.7185	88.8055	88.9522	89.3304	89.7158	89.3113	90.0713	91.6599	93.2540
income tax from urban household	261.2955	261.7172	262.2794	263.5564	264.8426	263.4530	265.9488	271.1136	276.2775
production tax	1133.3940	1133.6839	1134.0920	1135.0740	1136.0685	1135.0481	1137.0312	1141.1597	1145.2923
export tax	119.8080	119.8080	119.8080	120.1122	120.4451	120.0792	120.7297	122.0764	123.4359
import tariff	387.6275	387.8899	388.4274	389.7278	391.0437	389.6774	392.2899	397.7353	403.1822
Government Deficits		-0.7378	-1.8884	-4.8383	-7.8391	-4.6771	-10.5896	-22.8809	-35.1880
Savings									
rural household	231.8894	232.0986	232.4515	233.3609	234.2878	233.3150	235.1426	238.9627	242.7960
urban household	138.6556	138.8329	139.0692	139.6059	140.1466	139.5625	140.6115	142.7824	144.9529
Welfare (Equivalent Variation)									
rural household	0.0000	0.0225	0.0479	0.1007	0.1497	0.0430	0.0968	0.2050	0.3092
urban household	0.0000	0.0077	0.0189	0.0439	0.0686	0.0820	0.1625	0.3084	0.4376
GDP	11429.3131	11443.1396	11461.8917	11507.2452	11553.1977	11504.2694	11594.1791	11781.1238	11968.3522
Gini Coefficient	39.40	38.88	38.31	37.06	35.82	41.55	43.45	47.10	50.58
% increase from the benchmark value									
		5% increase	10% increase	20% increase	30% increase	5% increase	10% increase	20% increase	30% increase
Tax Revenue									
income tax from rural household		0.0980%	0.2635%	0.6897%	1.1242%	0.6682%	1.5249%	3.3154%	5.1122%
income tax from urban household		0.1614%	0.3765%	0.8653%	1.3575%	0.8257%	1.7808%	3.7575%	5.7337%
production tax		0.0256%	0.0616%	0.1482%	0.2360%	0.1459%	0.3209%	0.6852%	1.0498%
export tax		0.0000%	0.0000%	0.2539%	0.5318%	0.2263%	0.7694%	1.8934%	3.0281%
import tariff		0.0677%	0.2063%	0.5418%	0.8813%	0.5288%	1.2028%	2.6076%	4.0128%
Savings									
rural household		0.0902%	0.2424%	0.6346%	1.0343%	0.6148%	1.4029%	3.0503%	4.7034%
urban household		0.1278%	0.2983%	0.6854%	1.0753%	0.6540%	1.4106%	2.9763%	4.5416%
GDP		0.1210%	0.2850%	0.6819%	1.0839%	0.6558%	1.4425%	3.0781%	4.7163%
Gini Coefficient		-1.3250%	-2.7760%	-5.9338%	-9.0825%	5.4444%	10.2910%	19.5457%	28.3720%

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Table 4 The Impact of Direct Transfers to either Rural or Urban Households with Remittances to Urban Households (Simulation I)

Unit: a million USD except Gini Coefficient	benchmark	increase in remittances to the URBAN household only			increase in remittances to the URBAN household with income transfers to the RURAL household			increase in remittances to the URBAN household with income transfers to the URBAN household		
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue										
income tax from rural household	88.7185	90.0713	91.6599	93.2540	89.5331	90.3726	90.8048	89.2546	89.7535	90.2357
income tax from urban household	261.2955	265.9488	271.1136	276.2775	263.6450	266.1053	267.4438	262.9630	264.4442	265.8912
production tax	1133.3940	1137.0312	1141.1597	1145.2923	1135.5497	1137.7874	1138.9848	1134.8842	1136.2667	1137.5914
export tax	119.8080	120.7297	122.0764	123.4359	120.5830	121.2923	121.4528	120.1939	120.5388	120.9737
import tariff	387.6275	392.2899	397.7353	403.1822	391.7956	396.0886	398.4428	390.6957	393.2311	395.7142
Government Deficits		-10.5896	-22.8809	-35.1880	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Income Transfers to the RURAL Households	251.1135				261.3767	272.0493	277.2575			
Income Transfers to the URBAN Households	272.4138							279.4328	285.6610	291.8654
Savings										
rural household	231.8894	235.1426	238.9627	242.7960	234.3349	236.8594	238.1456	233.1785	234.3784	235.5378
urban household	138.6556	140.6115	142.7824	144.9529	139.6432	140.6773	141.2399	139.5284	140.3035	141.0636
Welfare (Equivalent Variation)										
rural household	0.0000	0.0968	0.2050	0.3092	0.0798	0.1615	0.2028	0.0437	0.0837	0.1223
urban household	0.0000	0.1625	0.3084	0.4376	0.0542	0.1103	0.1405	0.0468	0.0877	0.1275
GDP	11429.3131	11594.1791	11781.1238	11968.3522	11521.2568	11616.6176	11667.1330	11492.5049	11549.2833	11604.7332
Gini Coefficient	39.40	43.45	47.10	50.58	38.47	37.56	37.17	39.60	39.71	39.84
% increase from the benchmark value										
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue										
income tax from rural household		1.5249%	3.3154%	5.1122%	0.9182%	1.8644%	2.3516%	0.6042%	1.1666%	1.7101%
income tax from urban household		1.7808%	3.7575%	5.7337%	0.8992%	1.8407%	2.3530%	0.6381%	1.2050%	1.7588%
production tax		0.3209%	0.6852%	1.0498%	0.1902%	0.3876%	0.4933%	0.1315%	0.2535%	0.3703%
export tax		0.7694%	1.8934%	3.0281%	0.6468%	1.2389%	1.3728%	0.3221%	0.6099%	0.9729%
import tariff		1.2028%	2.6076%	4.0128%	1.0753%	2.1828%	2.7901%	0.7915%	1.4456%	2.0862%
Income Transfers to the RURAL Households					4.0871%	8.3372%	10.4112%			
Income Transfers to the URBAN Households								2.5766%	4.8629%	7.1404%
Savings										
rural household		1.4029%	3.0503%	4.7034%	1.0546%	2.1433%	2.6979%	0.5559%	1.0733%	1.5733%
urban household		1.4106%	2.9763%	4.5416%	0.7122%	1.4580%	1.8638%	0.6294%	1.1884%	1.7366%
GDP		1.4425%	3.0781%	4.7163%	0.8045%	1.6388%	2.0808%	0.5529%	1.0497%	1.5348%
Gini Coefficient		10.2910%	19.5457%	28.3720%	-2.3544%	-4.6684%	-5.6554%	0.5072%	0.7899%	1.1151%

Table 5 The Impact of the Reduction of a Production Tax with Remittances to Urban Households (Simulation II)

Unit: a million USD except Gini Coefficient and Tax Rates	benchmark	increase in remittances to the URBAN household only			increase in remittances to the URBAN household with the reduction of the production tax on Sector 40 (Petroleum)			increase in remittances to the URBAN household with the reduction of the production tax on Sector 41(Diesel)			increase in remittances to the URBAN household with the reduction of the production tax on Sector 50 (Trade Services)			
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	
Tax Revenue														
income tax from rural household	88.7185	90.0713	91.6599	93.2540	89.3371	89.9183	90.0265	89.3395	89.9300	90.0518	89.3826	90.0341	90.1405	
income tax from urban household	261.2955	265.9488	271.1136	276.2775	263.2043	265.0430	265.4585	263.2126	265.0844	265.5451	263.3506	265.4370	265.8329	
production tax	1133.3940	1137.0312	1141.1597	1145.2923	1126.9823	1121.1204	1119.8141	1126.9716	1121.0850	1119.6979	1126.7594	1120.2657	1118.8903	
export tax	119.8080	120.7297	122.0764	123.4359	120.3851	120.8580	120.7703	120.3852	120.8588	120.7769	120.3948	120.8412	120.7791	
import tariff	387.6275	392.2899	397.7353	403.1822	390.9129	393.9682	394.8066	390.9242	394.0373	394.9328	391.0071	394.3685	395.0836	
Government Deficits		-10.5896	-22.8809	-35.1880	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Prduction Tax Rate on Sector 40 (Petroleum)	62.9687%				61.1097%	59.3998%	59.0268%							
Prduction Tax Rate on Sector 41(Diesel)	57.3219%							54.9834%	52.8213%	52.3180%				
Prduction Tax Rate on Sector 50 (Trade Services)	16.0479%										15.2879%	14.5486%	14.3982%	
Savings														
rural household	231.8894	235.1426	238.9627	242.7960	233.3770	234.7746	235.0349	233.3828	234.8028	235.0956	233.4864	235.0533	235.3090	
urban household	138.6556	140.6115	142.7824	144.9529	139.4579	140.2308	140.4054	139.4614	140.2482	140.4418	139.5194	140.3964	140.5628	
Welfare (Equivalent Variation)														
rural household	0.0000	0.0968	0.2050	0.3092	0.0510	0.0993	0.1087	0.0506	0.0993	0.1097	0.0536	0.1066	0.1156	
urban household	0.0000	0.1625	0.3084	0.4376	0.0464	0.0909	0.1011	0.0450	0.0890	0.0998	0.0475	0.0954	0.1047	
GDP	11429.3131	11594.1791	11781.1238	11968.3522	11493.5902	11554.5792	11567.4602	11493.8660	11555.9727	11570.2553	11498.3350	11567.2589	11579.2264	
Gini Coefficient	39.40	43.45	47.10	50.58	39.23	39.11	39.15	39.23	39.11	39.15	39.22	39.11	39.13	
% increase from the benchmark value														
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	
Tax Revenue														
income tax from rural household		1.5249%	3.3154%	5.1122%	0.6972%	1.3523%	1.4744%	0.7000%	1.3656%	1.5028%	0.7485%	1.4830%	1.6029%	
income tax from urban household		1.7808%	3.7575%	5.7337%	0.7305%	1.4342%	1.5932%	0.7337%	1.4500%	1.6264%	0.7865%	1.5850%	1.7365%	
production tax		0.3209%	0.6852%	1.0498%	-0.5657%	-1.0829%	-1.1982%	-0.5667%	-1.0860%	-1.2084%	-0.5854%	-1.1583%	-1.2797%	
export tax		0.7694%	1.8934%	3.0281%	0.4817%	0.8764%	0.8032%	0.4818%	0.8771%	0.8087%	0.4898%	0.8624%	0.8106%	
import tariff		1.2028%	2.6076%	4.0128%	0.8476%	1.6358%	1.8521%	0.8505%	1.6536%	1.8846%	0.8718%	1.7390%	1.9235%	
Prduction Tax Rate on Sector 40 (Petroleum)					-2.9522%	-5.6677%	-6.2600%							
Prduction Tax Rate on Sector 41(Diesel)								-4.0795%	-7.8514%	-8.7296%				
Prduction Tax Rate on Sector 50 (Trade Services)											-4.7359%	-9.3427%	-10.2799%	
Savings														
rural household		1.4029%	3.0503%	4.7034%	0.6415%	1.2442%	1.3565%	0.6440%	1.2564%	1.3826%	0.6887%	1.3644%	1.4747%	
urban household		1.4106%	2.9763%	4.5416%	0.5786%	1.1360%	1.2620%	0.5811%	1.1486%	1.2882%	0.6230%	1.2555%	1.3755%	
GDP		1.4425%	3.0781%	4.7163%	0.5624%	1.0960%	1.2087%	0.5648%	1.1082%	1.2332%	0.6039%	1.2069%	1.3117%	
Gini Coefficient		10.2910%	19.5457%	28.3720%	-0.4336%	-0.7417%	-0.6472%	-0.4334%	-0.7393%	-0.6464%	-0.4529%	-0.7459%	-0.6787%	

Table 6 The Impact of the Reduction of an Export Tax on Sector 18 (Cocoa Beans) with Remittances to Urban Households (Simulation III)

Unit: a million USD except Gini Coefficient and Tax Rate	benchmark	increase in remittances to the URBAN household only			increase in remittances to the URBAN household with the reduction of the export tax on Sector 18 (Cocoa Beans)		
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue							
income tax from rural household	88.7185	90.0713	91.6599	93.2540	89.4310	90.1123	90.7934
income tax from urban household	261.2955	265.9488	271.1136	276.2775	263.5379	265.7792	267.9839
production tax	1133.3940	1137.0312	1141.1597	1145.2923	1135.2942	1137.1667	1139.0217
export tax	119.8080	120.7297	122.0764	123.4359	111.2654	102.4609	94.0670
import tariff	387.6275	392.2899	397.7353	403.1822	391.4423	395.2670	398.9672
Government Deficits		-10.5896	-22.8809	-35.1880	0.0000	0.0000	0.0000
Export Tax Rate on Sector 18 (Cocoa Beans)	14.1960%				13.2586%	12.3017%	11.3652%
Savings							
rural household	231.8894	235.1426	238.9627	242.7960	233.6027	235.2412	236.8791
urban household	138.6556	140.6115	142.7824	144.9529	139.5981	140.5402	141.4669
Welfare (Equivalent Variation)							
rural household	0.0000	0.0968	0.2050	0.3092	0.0581	0.1140	0.1690
urban household	0.0000	0.1625	0.3084	0.4376	0.0521	0.1039	0.1539
GDP	11429.3131	11594.1791	11781.1238	11968.3522	11504.0823	11576.9380	11649.5320
Gini Coefficient	39.40	43.45	47.10	50.58	39.24	39.17	39.07
		% increase from the benchmark value			% increase from the benchmark value		
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue							
income tax from rural household		1.5249%	3.3154%	5.1122%	0.8031%	1.5711%	2.3388%
income tax from urban household		1.7808%	3.7575%	5.7337%	0.8582%	1.7159%	2.5597%
production tax		0.3209%	0.6852%	1.0498%	0.1677%	0.3329%	0.4965%
export tax		0.7694%	1.8934%	3.0281%	-7.1303%	-14.4790%	-21.4852%
import tariff		1.2028%	2.6076%	4.0128%	0.9841%	1.9708%	2.9254%
Export Tax Rate on Sector 18 (Cocoa Beans)					-6.6037%	-13.3441%	-19.9408%
Savings							
rural household		1.4029%	3.0503%	4.7034%	0.7388%	1.4454%	2.1517%
urban household		1.4106%	2.9763%	4.5416%	0.6797%	1.3592%	2.0275%
GDP		1.4425%	3.0781%	4.7163%	0.6542%	1.2916%	1.9268%
Gini Coefficient		10.2910%	19.5457%	28.3720%	-0.4072%	-0.5902%	-0.8443%

Table 7 The Impact of Subsidies with Remittances to Urban Households (Simulation IV)

Unit: a million USD except Gini Coefficient	benchmark	increase in remittances to the URBAN household only			increase in remittances to the URBAN household with subsidies to Sector 6 (Yams)			increase in remittances to the URBAN household with subsidies to Sector 15 (Vegetables)			increase in remittances to the URBAN household with subsidies to Sector 18 (Cocoa Beans)		
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue													
income tax from rural household	88.7185	90.0713	91.6599	93.2540	89.5463	90.1461	90.7211	89.6273	90.4109	90.6351	89.7742	90.4395	91.1204
income tax from urban household	261.2955	265.9488	271.1136	276.2775	263.4093	264.9993	266.4847	263.6936	265.8055	266.4493	264.1600	265.9741	267.8192
production tax	1133.3940	1137.0312	1141.1597	1145.2923	1126.1481	1121.0282	1116.0779	1125.1366	1118.2074	1116.2247	1123.9816	1118.0508	1111.7904
export tax	119.8080	120.7297	122.0764	123.4359	120.3745	120.6786	121.0719	120.5208	120.9949	121.0453	120.4805	120.9499	121.4983
import tariff	387.6275	392.2899	397.7353	403.1822	391.2612	393.9717	396.4643	391.7811	395.3811	396.5300	392.4143	395.5123	398.5738
Government Deficits		-10.5896	-22.8809	-35.1880	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Subsidies to Sector 6 (Yams)	0.0000				9.2003	15.7610	22.0942						
Subsidies to Sector 15 (Vegetables)	0.0000							10.4444	19.2804	21.8305			
Subsidies to Sector 18 (Cocoa Beans)	0.0000										11.9283	19.4463	27.3223
Savings													
rural household	231.8894	235.1426	238.9627	242.7960	233.8802	235.3224	236.7053	234.0748	235.9593	236.4984	234.4281	236.0279	237.6654
urban household	138.6556	140.6115	142.7824	144.9529	139.5441	140.2124	140.8368	139.6636	140.5513	140.8219	139.8596	140.6221	141.3977
Welfare (Equivalent Variation)													
rural household	0.0000	0.0968	0.2050	0.3092	0.0661	0.1141	0.1594	0.0748	0.1385	0.1570	0.0842	0.1372	0.1908
urban household	0.0000	0.1625	0.3084	0.4376	0.0491	0.0859	0.1197	0.0562	0.1052	0.1201	0.0657	0.1068	0.1484
GDP	11429.3131	11594.1791	11781.1238	11968.3522	11507.7232	11565.4101	11620.0806	11516.5079	11592.5535	11615.0599	11532.0217	11597.1955	11663.2448
Gini Coefficient	39.40	43.45	47.10	50.58	38.81	38.43	38.05	38.82	38.36	38.26	38.79	38.41	38.03
% increase from the benchmark value													
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue													
income tax from rural household		1.5249%	3.3154%	5.1122%	0.9331%	1.6091%	2.2573%	1.0243%	1.9076%	2.1603%	1.1900%	1.9398%	2.7074%
income tax from urban household		1.7808%	3.7575%	5.7337%	0.8090%	1.4175%	1.9860%	0.9178%	1.7260%	1.9724%	1.0962%	1.7905%	2.4967%
production tax		0.3209%	0.6852%	1.0498%	-0.6393%	-1.0910%	-1.5278%	-0.7286%	-1.3399%	-1.5149%	-0.8305%	-1.3537%	-1.9061%
export tax		0.7694%	1.8934%	3.0281%	0.4728%	0.7267%	1.0549%	0.5949%	0.9907%	1.0327%	0.5613%	0.9531%	1.4108%
import tariff		1.2028%	2.6076%	4.0128%	0.9374%	1.6367%	2.2797%	1.0715%	2.0003%	2.2967%	1.2349%	2.0341%	2.8239%
Savings													
rural household		1.4029%	3.0503%	4.7034%	0.8585%	1.4804%	2.0768%	0.9424%	1.7551%	1.9876%	1.0948%	1.7847%	2.4908%
urban household		1.4106%	2.9763%	4.5416%	0.6408%	1.1228%	1.5731%	0.7270%	1.3672%	1.5623%	0.8683%	1.4183%	1.9776%
GDP		1.4425%	3.0781%	4.7163%	0.6860%	1.1908%	1.6691%	0.7629%	1.4283%	1.6252%	0.8986%	1.4689%	2.0468%
Gini Coefficient		10.2910%	19.5457%	28.3720%	-1.4995%	-2.4493%	-3.4315%	-1.4826%	-2.6499%	-2.8984%	-1.5560%	-2.5021%	-3.4824%

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Table 8 The Impact of More Government Expenditure with Remittances to Urban Households (Simulation V)

Unit: a million USD except Gini Coefficient	benchmark	increase in remittances to the URBAN household only			increase in remittances to the URBAN household with more government expenditure on Sector 58 (Education)			increase in remittances to the URBAN household with more government expenditure on Sector 59 (Health)		
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue										
income tax from rural household	88.7185	90.0713	91.6599	93.2540	89.4066	90.0790	90.7480	89.4168	90.0899	90.7636
income tax from urban household	261.2955	265.9488	271.1136	276.2775	263.5339	265.8026	268.0321	263.5667	265.8316	268.0696
production tax	1133.3940	1137.0312	1141.1597	1145.2923	1135.2034	1137.0044	1138.7883	1135.2319	1137.0299	1138.8231
export tax	119.8080	120.7297	122.0764	123.4359	120.3963	120.8268	121.3369	120.3964	120.8285	121.3385
import tariff	387.6275	392.2899	397.7353	403.1822	391.1983	394.6623	398.0663	391.2515	394.7137	398.1427
Government Deficits		-10.5896	-22.8809	-35.1880	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Government Expenditure on Sector 58 (Education)	289.2981				295.4315	301.6168	307.6272			
Government Expenditure on Sector 59 (Health)	56.7430							62.9180	69.1021	75.1224
Savings										
rural household	231.8894	235.1426	238.9627	242.7960	233.5440	235.1612	236.7699	233.5687	235.1873	236.8074
urban household	138.6556	140.6115	142.7824	144.9529	139.5965	140.5501	141.4872	139.6103	140.5622	141.5029
Welfare (Equivalent Variation)										
rural household	0.0000	0.0968	0.2050	0.3092	0.0555	0.1098	0.1630	0.0555	0.1089	0.1615
urban household	0.0000	0.1625	0.3084	0.4376	0.0510	0.1024	0.1521	0.0512	0.1019	0.1513
GDP	11429.3131	11594.1791	11781.1238	11968.3522	11511.6902	11593.2405	11674.0463	11512.8987	11594.4071	11675.6473
Gini Coefficient	39.40	43.45	47.10	50.58	39.30	39.28	39.23	39.30	39.27	39.22
		% increase from the benchmark value			% increase from the benchmark value			% increase from the benchmark value		
		10% increase	20% increase	30% increase	10% increase	20% increase	30% increase	10% increase	20% increase	30% increase
Tax Revenue										
income tax from rural household		1.5249%	3.3154%	5.1122%	0.7756%	1.5336%	2.2876%	0.7871%	1.5458%	2.3052%
income tax from urban household		1.7808%	3.7575%	5.7337%	0.8567%	1.7249%	2.5782%	0.8692%	1.7360%	2.5925%
production tax		0.3209%	0.6852%	1.0498%	0.1596%	0.3185%	0.4759%	0.1622%	0.3208%	0.4790%
export tax		0.7694%	1.8934%	3.0281%	0.4911%	0.8504%	1.2761%	0.4911%	0.8518%	1.2775%
import tariff		1.2028%	2.6076%	4.0128%	0.9212%	1.8148%	2.6930%	0.9349%	1.8281%	2.7127%
Government Expenditure on Sector 58 (Education)					2.1201%	4.2581%	6.3357%			
Government Expenditure on Sector 59 (Health)								10.8825%	21.7809%	32.3906%
Savings										
rural household		1.4029%	3.0503%	4.7034%	0.7135%	1.4109%	2.1046%	0.7242%	1.4222%	2.1208%
urban household		1.4106%	2.9763%	4.5416%	0.6786%	1.3663%	2.0421%	0.6885%	1.3751%	2.0535%
GDP		1.4425%	3.0781%	4.7163%	0.7208%	1.4343%	2.1413%	0.7313%	1.4445%	2.1553%
Gini Coefficient		10.2910%	19.5457%	28.3720%	-0.2411%	-0.3054%	-0.4249%	-0.2458%	-0.3224%	-0.4577%