



***The World's Largest Open Access Agricultural & Applied Economics Digital Library***

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from AgEcon Search may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*



**Global Trade Analysis Project**  
<https://www.gtap.agecon.purdue.edu/>

This paper is from the  
GTAP Annual Conference on Global Economic Analysis  
<https://www.gtap.agecon.purdue.edu/events/conferences/default.asp>

# **Trade, Growth and Gender in Developing Countries: A Comparison of Ghana, Honduras, Senegal and Uganda**

**John Cockburn<sup>1</sup>, Bernard Decaluwé, Ismaël Fofana, Véronique Robichaud**

## **SUMMARY**

Developing countries are deeply engaged in trade negotiations at the bilateral, regional and international (WTO) levels. As imports, exports and tariff duties all occupy an important part of their economies, far-reaching impacts on production, labor and capital markets, household incomes and, perhaps most importantly, economic growth will indubitably ensue. As men and women occupy very different roles in these economies, particularly in terms of the import and export orientation of the sectors in which they work, they will be affected very differently by these reforms. To anticipate these changes, a dynamic economy-wide model is used to run trade policy simulations in three African (Ghana, Senegal and Uganda) countries and one Central American (Honduras) country. Whereas most similar existing studies consider the comparative static resource reallocation effects of trade reforms, ours is the first to focus on the growth effects (“dynamic gains from trade”), which are thought to be possibly much larger. In the African countries, trade liberalization is found to increase the gender wage gap in favor of men, especially among unskilled workers, as men are more active in export-oriented sectors such as cash crops and mining whereas women contribute more to import-competing sectors such as food crops. Furthermore, the ensuing growth effects further widen the gender wage gap, as the productivity gains from increased openness are greatest in female-intensive sectors in which imports rise markedly.

**Poverty and Economic Policy (PEP) Research Network and  
CIRPÉE (Université Laval)**

**March 18, 2008**

---

<sup>1</sup> Corresponding author: [jcoc@ecn.ulaval.ca](mailto:jcoc@ecn.ulaval.ca). Our thanks to André Martens for his review of the empirical literature on trade, FDI and growth, as well as Erwin Corong for excellent research assistance. We also thank Maurizio Busso, André Martens, Rafael de Hoyos, Will Martin and participants at the “Gender Aspects of the Trade and Poverty Nexus - A Macro-Micro Approach” workshop, Feb. 22, 2008, World Bank, Washington DC, for comments and suggestions. Thank you to Charles Ackah, Joseph Cabral, Fatou Cissé, Jann Lay, Hans Lofgren, Denis Medvedev, Emmanuel Mensah, Dino Moretto, Oscar Nunez and James Thurlow for help in obtaining country data and information. Funding for this study was provided by the World Bank-Netherlands Partnership Program (BNPP) and the Poverty and Economic Policy (PEP) research network, which is financed by the Australian Aid Agency, the Canadian International Development Agency and the International Development Research Centre.

## 1 Introduction

Developing countries are deeply engaged in trade negotiations at the bilateral, regional and international levels. As imports, exports and tariff duties all occupy an important part of their economies, far-reaching impacts on production, labor and capital markets, household incomes and, perhaps most importantly, economic growth will indubitably ensue. As men and women occupy very different roles in these economies, particularly in terms of the import and export orientation of the sectors in which they work, they will be affected very differently.

Most empirical studies find relatively small welfare and poverty impacts of trade liberalization. This result is not very surprising as a static framework is generally used in which welfare gains and poverty impacts result solely from a short term reallocation of resources. We contribute to this literature by integrating the growth effects of trade liberalization and the resulting long-run impacts on welfare and poverty. This analysis is based on an accompanying systematic review of the empirical literature on the impacts of trade on growth through increased productivity, efficiency and foreign direct investment (Martens, 2008a and b). A dynamic economy-wide model is then used to run trade policy simulations, focusing particularly on the gender differences in the direct and growth effects of trade liberalization.

We apply our framework to the specific case of a complete removal of import tariffs in three African (Ghana, Senegal and Uganda) countries and one Central American (Honduras) country. All four countries are members of the World Trade Organization (WTO) since 1995. They are all also members of regional trade blocs: ECOWAS (Ghana and Senegal), WAEMU (Senegal), COMESA (Uganda) and CAFTA (Honduras). Furthermore, they are engaged in negotiations with major trade partners: Honduras with the United States; Ghana, Uganda and Senegal with the European Union through Economic Partnership Agreements (EPAs). Finally, all four are engaged in unilateral trade reforms.

Existing research suggests that trade may favor women in industrial and semi-industrial economies, where women are more active in export-oriented sectors such as garments and light manufacturing. In contrast, in agricultural economies – and in agricultural sectors in (semi-)industrial economies – trade is found to favor men, as they are more likely to be engaged in the production of cash crops for export while women focus on import-competing food crops.

We contribute to this literature by introducing the above-mentioned growth effects from increased openness, which increases productivity particularly in the import-competing and, to a slightly lesser degree, export-oriented, sectors. Productivity gains translate into a reduction in the demand for labor, as less labor is required for a given level of production, in these sectors. To the extent that they are relatively more intensive in female workers, the growth effects of trade will favor men, and vice versa. These differences typically manifest themselves in terms of the gender wage gap, labor market participation, adjustments in the time devoted to domestic work and leisure, bargaining power and the intrahousehold allocation of resources, although we focus only on the wage channel in this analysis.

The remainder of this paper is as follows. First, we present a short review of the literature on the links between trade, growth, gender and poverty. In section two, we present the salient characteristics of our model. Section three presents the results of our simulations of the impacts of complete trade liberalization in the four countries. Section four concludes.

## 2 Literature review

This study touches on a number of emerging and important strands of literature: gender impacts of trade liberalization and growth; impacts of trade on growth and poverty; impacts of growth on poverty. Several excellent reviews of this literature have been published this decade. We briefly summarize the highlights.

### 2.1 Impacts of Growth on Poverty

Existing analysis of growth-poverty links consists primarily of ex post econometric analysis. Whereas it is apparent that the poverty impacts are likely to vary considerably according to the motors of growth, this literature tends to treat growth as a monolithic phenomenon. For example, Dollar and Kraay (2001) find that “growth is good for the poor”. Bhalla (2002) and Sala-i-Martin (2002), consider that data from household surveys underestimate poverty reduction, whereas others (e.g. Wade, 2004) argue that the estimations published by the World Bank are over-optimistic.

### 2.2 Impacts of Trade on Growth and Poverty

In two major studies, Winters (2004) and Winters et al (2004) have carried out an exhaustive review of the empirical evidence and highlight ongoing disagreement. In a study of the 1990s trade liberalization experience in seven African and Asian countries, Cockburn et al (2007) show that the transmission channels vary significantly between countries according to their initial tariff structure, the initial structure of their international trade, sectoral factorial intensities and household income sources and consumption patterns. Given our interest in trade-related motors of growth, we focus our discussion on two important mechanisms. First, trade is expected to encourage growth through productivity and efficiency effects. Second, it is argued that trade liberalization may lead to an increase in foreign investment, either directly or through a resulting increase in the returns to capital.

There is an extensive literature indicating that openness to international trade creates a more competitive environment, and stimulates the diffusion of new technologies, innovation, the adoption of new methods of production and an increase in the availability of imported inputs.<sup>2</sup> All of these factors are expected to lead to productivity and efficiency gains. In what might be called the “*new new*” trade theory, it is argued that in the presence of firm heterogeneity, increased trade will lead to a rationalisation of output toward the most productive firms<sup>3</sup>.

Second, considerable evidence suggests that increased openness also directly favors foreign direct investment<sup>4</sup>. While the standard Hecksher-Ohlin model argues that trade and foreign investment are substitutes that should lead to an international equalization of factor returns. However, this relation can be inversed when the hypotheses underlying the HO model are not respected: differential production functions, economies of scale, market imperfections, factor distortions, impediments to trade and factor intensity reversals<sup>5</sup>. Empirical evidence

---

<sup>2</sup> For a compact elaboration on these issues see Kim (2000), Keller (2000), and Winters (2004).

<sup>3</sup> For important contributions in this area see, among others, Melitz (2003), Bernard et al. (2003), Helpman et al. (2004), Baldwin (2005), Baldwin and Robert-Nicoud (2006), and Gustafsson and Segerstrom (2007).

<sup>4</sup> This discussion is based on Martens (2008a).

<sup>5</sup> See Markusen and Svensson (1985), Wong (1986), Markusen and Melvin (1988, p. 295-299), de Melo and Grether (1997, chap. 9)

indicates that trade and foreign investment are, indeed, complements<sup>6</sup>. While there is evidence that the relationship is two-way, the balance sways in favor of the causality running from trade to foreign investment. Evidence in favor of a separate impact on foreign investment of variations in the relative returns to capital was found to be scant<sup>7</sup>. We nevertheless test this channel.

### 2.3 Gender Impacts of Trade and Growth

Chapter 2 of this book by Fontana provides a full review of the literature on the gender impacts of trade liberalization. Here we outline the main points that are germane to our analysis and also discuss the gender impacts of trade-driven growth.

There has been a significant increase of female participation in the labor market over the last decade, corresponding to a period of liberalization in most developing countries. Studies show that the feminization of work is greater in industrial sectors and in semi-industrialized economies, where export industries employ more women, than in agricultural sectors and economies<sup>8</sup>. In semi-industrial economies, liberalization reduces the overall gap between men and women in terms of wage rates, labor market participation and income distribution.

In agricultural economies, trade liberalization may be more likely to benefit men more than women (*Gladwin 1991; Fontana et al 1998*). In the majority of African countries, female work constitutes the base of agricultural food production, which is generally import-competing and concentrated in small plots. In these economies, trade liberalization tends to favor male workers and owners of large landholdings, which are more conducive to cash crops for export, whereas female workers involved in food crop production face increased import competition (*Fontana et al. 1998*). In economies with large export-oriented mining sectors, which generally employ a far larger proportion of male workers, trade liberalization is also likely to be pro-male.

While these results may hold broadly, trade liberalization creates both winners and losers among men and women in all countries. The distribution of gains from trade are closely related to factor endowments, particularly labor skills, sectoral factor intensities and mobility. In general, when export opportunities emerge, men benefit more than women because of the difficulties for women to access loans, assets, new technologies, education, etc. Also, Becker (1959) argues that trade liberalization creates competitive pressures that force employers to reduce gender discrimination. Even where women experience an increase in income, although their negotiating power within the household may increase, female welfare may not necessarily improve. The increase in household income may be accompanied by a reduction in the services they previously rendered through their domestic work. Yet, if increased labor market participation does not lead to a reduction in female domestic work, it will necessarily lead to a fall in their leisure time, which can also have deleterious effects on their welfare.

The growth effects of trade outlined above may also have differential gender effects. First, we assume that capital is more complementary to skilled labor, thus capital accumulation increases the relative demand for skilled labor, which is primarily male. Second, to the extent

---

<sup>6</sup> See, for example, Asiedu (2002), Kandiero and Chitiga (2003), Onyeinu and Shrestha (2004).

<sup>7</sup> See, for example, Agarwal (1980) and Lizondo (1990).

<sup>8</sup> E.g. *Elson and Pearson (1981)*, *Standing (1989)*, *Wood (1991)*, *Cagatay and Ozler (1995)*, *Joekes (1995 and 1999)* and *Ozler (2000 and 2001)*. Typical female labor intensive exported-oriented industries are textiles, garments, electronics, leather and agricultural processing industries.

that women are employed in sectors where openness increases, this can simultaneously attract investment and increase productivity. Whereas increased investment should increase labor demand to their benefit, increased productivity will have the opposite effect by reducing the amount of labor required for a given output. The relative strength of these channels will determine the net effect, which is an empirical question that we will explore in our analysis.

### **3 Trade policy in Ghana, Honduras, Senegal and Uganda**

Senegal is a member of the West African Economic and Monetary Union (WAEMU) and both Ghana and Senegal are members of the Economic Community of Western African States (ECOWAS), the latter aiming to create a free trade area among its states. In this context, their trade liberalization process accelerated after 1994, notably in preparation for the adoption of a common external tariff (CET) in 2000. Senegal has progressively eliminated quotas, which have been replaced by a surtax on basic goods. Tariff rates were also brought below 30 percent following the Uruguay round.

Ghana adopted a flexible exchange rate regime in 1991 after decades of economic reforms. Its trade liberalisation process over the last decade involved the abolition of import licensing, removal of quantitative restrictions, tariff cuts and the simplification and of the tariff system into four tariff rates ranging between five and 30 percent (EC, 2004). The elimination of constraints to international trade remains an important issue in the agenda of the country as presented in the Ghanaian Poverty Reduction Strategy (GPRS) II. Ghana and Senegal both benefit from preferential access to the European and North American markets. In 2003, ECOWAS and UEMOA began negotiating an economic partnership agreement (EPA) with the European Union.

Uganda is party to many bilateral and regional trade agreements, notably the Common Market for Eastern and Southern Africa (COMESA). It has implemented significant unilateral trade liberalisation over the last decade in an attempt to eliminate the trade deficit through increased export earnings (Blake, McKay, Morrissey, 2001). Uganda has converted many non-tariff restrictions (e.g. quotas, import bans) into tariff equivalents. Tariff rates of 0, 10, 20, 30 and 60 percent in 1995 were reduced to 0, 7 and 15 per cent in 2001 (Morrisey, Rudaheranwa and Moller, 2003). The country currently has the lowest tariffs in COMESA region with an average tariff of 12 per cent as compared to an average of 33 percent for the whole of COMESA.

Since the early 1990s, Honduras has carried out a series of trade reforms aiming at increased liberalization. Honduras applies no import quotas and only a few products are subject to licensing requirements. Although the country has lowered its tariffs to an unweighted average of 6 per cent in early 2003, tariffs show escalation and maximum rates of 40 to 55 per cent are still applied to certain products. Honduras has a trade openness ratio of 0.93 and is presented as the most open economy in Central America and among the most open in the world. Honduras has preferential access to the US market, by far its main trade partner, through the Caribbean Basin Initiative (CBI) and the recently ratified regional free trade agreement (CAFTA).

All four countries are members of the World Trade Organization (WTO) since 1995.

## 4 Methodology: A Gender-Disaggregated Dynamic Economy-Wide Model

Dynamic computable general equilibrium (CGE) models can be classified as intertemporal or sequential (recursive). Intertemporal dynamic models are based on optimal growth theory where the behavior of economic agents is characterized by perfect foresight. In a number of circumstances, and particularly in a developing country, it is hard to assume that agents have perfect foresight. For this reason we believe that it is more appropriate to develop a sequential dynamic CGE model. In this kind of dynamics agents have myopic behavior. A sequential dynamic model is basically a series of static CGE models that are linked between periods by behavioral equations for endogenous variables and by updating procedures for exogenous variables. Capital stock is updated endogenously with a capital accumulation equation, whereas population (and total labor supply) is updated exogenously between periods. It is also possible to add updating mechanisms for other variables such as public expenditure, transfers, technological change or debt accumulation. Below we present a description of the static and dynamic aspects of the model. We focus our discussion on the new characteristics of the model and those most relevant to the gender-trade-growth nexus, the rest being standard for most CGE models. A complete list of equations and variables is presented in the annex.

### 4.1 Activities

On the production side we assume that in each sector there is a representative firm that generates value added by combining labor and capital. We adopt a nested structure for production. Sectoral output  $XS_{i,t}$  is a Leontief function of value added  $VA_{i,t}$  and total intermediate consumption  $CI_{i,t}$ . Value added is in turn represented by a CES function of unskilled labor  $LNQ_{i,t}$  and a composite factor  $KLQ_{i,t}$ , which is in itself a CES function of capital  $KD_{i,t}$  and skilled labor  $LQ_{i,t}$ . We assume that the degree of substitutability is lower between capital and skilled labor than between the composite capital factor and unskilled workers. The basic intuition is that, for a given technology, any increase in capital intensity requires an almost proportionate increase in skilled labor. Thus, in this way, capital accumulation is “skilled biased”, increasing the demand for skilled versus unskilled labor. In this context, the lack of skilled labor could be one of the factors limiting the growth process (equation numbers refer to the full model specification provided in Annex 1):

$$XS_{i,t} = VA_{i,t} / v_i \quad (1)$$

$$CI_{i,t} = io_i \cdot XS_{i,t} \quad (2)$$

$$VA_{i,t} = A_i^{VA} \cdot \theta_{i,t} \cdot \left( \alpha_i^{VA} \cdot LNQ_{i,t}^{-\rho_i^{VA}} + (1 - \alpha_i^{VA}) \cdot KLQ_{i,t}^{-\rho_i^{VA}} \right)^{-1/\rho_i^{VA}} \quad (4)$$

$$KLQ_{i,t} = A_i^{KL} \cdot \left( \alpha_i^{KL} \cdot LQ_{i,t}^{-\rho_i^{KL}} + (1 - \alpha_i^{KL}) \cdot KD_{i,t}^{-\rho_i^{KL}} \right)^{-1/\rho_i^{KL}} \quad (9)$$

All variables have a sector index  $i$  and a time index  $t$ , as the model is solved recursively over the entire period of analysis.

### 4.2 Labor

We again follow a nested structure for the composition of the different types of labor. On a first level, among skilled workers ( $LQ_{i,t}$ ), we assume that there is imperfect substitutability

between urban ( $LDT_{UNQ,i,t}$ ) and rural workers ( $LDT_{RNQ,i,t}$ ). The same assumption is adopted for unskilled workers ( $LNQ_{i,t}$ ), which we assume to be composed of imperfectly substitutable urban ( $LDT_{UQ,i,t}$ ) and rural workers ( $LDT_{RQ,i,t}$ ):

$$LNQ_{i,t} = A_i^{LNQ} \cdot \left( \alpha_i^{LNQ} \cdot LDT_{UNQ,i,t}^{-\rho_i^{LNQ}} + (1 - \alpha_i^{LNQ}) \cdot LDT_{RNQ,i,t}^{-\rho_i^{LNQ}} \right)^{-1/\rho_i^{LNQ}} \quad (7)$$

$$LQ_{i,t} = A_i^{LQ} \cdot \left( \alpha_i^{LQ} \cdot LDT_{UQ,i,t}^{-\rho_i^{LQ}} + (1 - \alpha_i^{LQ}) \cdot LDT_{RQ,i,t}^{-\rho_i^{LQ}} \right)^{-1/\rho_i^{LQ}} \quad (11)$$

At a second level, among skilled and unskilled rural and urban workers, we assume that male  $MLDT_{l,i,t}$  and female workers  $FLDT_{l,i,t}$  are also imperfect substitutes.

$$LDT_{l,i,t} = A_{l,i}^{LG} \cdot \left( \alpha_{l,i}^{LG} \cdot FLDT_{l,i,t}^{-\rho_{l,i}^{LG}} + (1 - \alpha_{l,i}^{LG}) \cdot MLDT_{l,i,t}^{-\rho_{l,i}^{LG}} \right)^{-1/\rho_{l,i}^{LG}} \quad (13)$$

From these equations, we can derive the demand equations for each of the factors of production<sup>9</sup>. Finally, the market equilibrium conditions determine factor and product prices<sup>10</sup>. In particular, we assume that all labor markets clear:

$$\sum_H MLS_{h,l,t} = \sum_I MLDT_{l,i,t} \quad (63)$$

$$\sum_H FLS_{h,l,t} = \sum_I FLDT_{l,i,t} \quad (64)$$

where  $FLS_{h,l,t}$  ( $MLS_{h,l,t}$ ) is the household endowment in female (male) labor of type L. Total male and female labor supply are assumed to increase at the exogenous population growth rate. Data constraints prevented us from breaking down rural workers by skill level in Senegal. In Uganda, a rural/urban disaggregation was impossible, although the skill disaggregation distinguishes elementary workers, who are even less skilled than unskilled workers.

Some limits of the current analysis merit discussion. First, we assume that the unemployment rate is fixed and that labor market participation rates are fixed. Consequently, the main gender impact of trade liberalization is seen through wage effects. While this is a serious limitation to our analysis to be addressed in future research, as labor demand is driving all of these effects, the results would not change qualitatively. For example, where trade liberalization is found to be pro-female, we would expect to see an increase in female labor market participation and a fall in their unemployment rates, which would both moderate female wage gains. However, they would also likely further boost growth effects. Furthermore, we do not explore the impacts of changes in female income shares on their bargaining power and the resulting intra-household allocation of resources. Other gender impacts of trade identified in the literature would also merit exploration in future research: reduced gender wage discrimination in

---

<sup>9</sup> See equations 6, 8, 10, 12, 13, 14 in Appendix 1.

<sup>10</sup> See equations 37, 38, 39, 40, 41, 42 in Appendix 1.

the face of increased competition (Becker, 1959), skilled- (or gender-) biased technological progress, etc.

### 4.3 Households and government

Households earn their income ( $YH_{h,t}$ ) from the remuneration of their production factors: female and male labor income and their share of the total returns to capital. They also receive dividends ( $DIV_{h,t}$ ), government transfers ( $TG_{h,t}$ ) and remittances from abroad ( $TROW\_H_{h,t}$ ):

$$YH_{h,t} = \sum_L (wf_{l,t} \cdot FLS_{h,l,t} + wm_{l,t} \cdot MLS_{h,l,t}) + \left( \frac{KH_{h,t}}{KS_t} \right) \cdot \sum_I r_{i,t} \cdot KD_{i,t} + PINDEX_t \cdot TG_{h,t} + DIV_{h,t} + e_t \cdot TROW\_H_{h,t} \quad (16)$$

where  $wf_{l,t}$  ( $wm_{l,t}$ ) is the wage rate for female (male) workers of type L and  $r_{i,t}$  is the sectoral rate of returns to capital. Thus, we can see that the distributional impacts of trade and growth will channel in part through their impacts on factor returns and the relative endowments of each household category in these factors.

Household demand for goods and services is derived from a Cobb-Douglas utility function after deduction of savings and direct taxes to the government<sup>11</sup>. Household savings and capital accumulation are discussed below in the “Motors of growth” section.

The only “non-traditional” aspect of our modeling of government is the assumption that the government deficit (surplus) is a constant share of the GDP:

$$SG_t = \frac{SG^0}{GDP_t} \cdot GDP_t \quad (25)$$

### 4.4 Dynamics

In every period the sectoral capital stocks ( $KD_{i,t+1}$ ) is updated with a capital accumulation equation involving the rate of depreciation ( $\delta$ ) and investment by sector of destination  $IND_{i,t}$ . This equation describes the law of motion for the sectoral capital stock. It assumes that stocks are measured at the beginning of the period and that the flows are measured at the end of the period. New investments are allocated between the different sectors through an investment demand function that is similar to Bourguignon et al. (1989), and Jung and Thorbecke (2003)<sup>12</sup>. The capital accumulation rate – the ratio of investment to capital stock – is increasing with respect to the ratio of the rate of return to capital  $r_{i,t}$  and its user cost  $U_t$ . The user cost is equal to the dual price of investment ( $PK_t$ ) multiplied by the sum of the depreciation rate and the interest rate  $ir$ . The elasticity of the rate of investment with respect to the ratio of return to capital and its user

---

<sup>11</sup> See equations 17, 31 and 33 in Appendix 1.

<sup>12</sup> See for example the work by Lemelin and Decaluwe on investment demand equations. Abbink, Braber and Cohen (1995) use a sequential dynamic CGE model for Indonesia where total investment is distributed as a function of base year sectoral shares in total capital remuneration and sectoral profit rates.

cost is assumed to be equal to 2. The sum of investments by sector of destination is equal to total investment (IT), which is, in turn, determined by total savings.

$$KD_{i,t+1} = KD_{i,t}(1 - \delta) + IND_{i,t} \quad (68)$$

$$\frac{IND_{i,t}}{KD_{i,t}} = \phi_i \left[ \frac{r_{i,t}}{U_t} \right]^{\sigma_i^K} \quad (35)$$

$$U_t = PK_t \cdot (ir_t + \delta) \quad (53)$$

$$IT_i = PK_t \cdot \sum_I IND_{i,t} \quad (67)$$

All inter-agent transfers in the model increase at the exogenous population growth rate. The exogenous dynamic updating of the model includes variables like transfers and volumes like government expenditures or minimum consumption of household that are indexed to relevant price indices<sup>13</sup>. The model is formulated as a static model that is solved recursively over a 15-year time horizon<sup>14</sup>. The model is homogenous in prices and the exchange rate is the numéraire in each period.

## 4.5 Motors of growth

### a) Capital good prices

The most immediate motor of growth in our model is the reduction in the cost of imported investment goods and, through import competition, their domestically-produced counterparts. This brings down the investment good price index and, consequently, increases total investments (equation 4 above) and capital accumulation (equation 1), where the investment good price index is given by:

$$PK_t = \prod_i (PC_{i,t} / \mu_i)^{\mu_i} \quad (52)$$

### b) Differential household savings rates

A second channel in our core dynamic model stems from difference in the marginal propensities to save between household categories. If a shock leads to a redistribution of income towards household with high savings rates, this will increase capital accumulation and growth at the expense of current consumption. Of course, the opposite is true if redistribution favors the big spenders.

In addition to these “standard” motors of growth, we have introduced a number of other motors of growth that appear prominently in the econometric literature on growth.

### c) Technological progress and efficiency

The impacts of increased openness on technological progress and productive efficiency at the sectoral level are captured by a parameter ( $\theta_{i,t}$ ) in the value added function. This is, in turn, a function of the change in the degree of openness of the sector relative to the base year

---

<sup>13</sup> See equations 73 to 82 in the appendix 1

<sup>14</sup> The model is formulated as a system of non linear equations solved recursively as a constrained non-linear system (CNS) with GAMS/Conopt3 solver.

(superscript 0). We measure the degree of openness as the sum of sectoral imports ( $IM_{m,t}$ ) and exports ( $EX_{x,t}$ ) as a percentage of sectoral output  $XS_{i,t}$ <sup>15</sup>.

$$\theta_{i,t} = \left[ \frac{(IM_{i,t} + EX_{i,t})/VA_{i,t}}{(IM_i^0 + EX_i^0)/VA_i^0} \right]^{\sigma^{PT}} \quad \text{or} \quad \theta_{i,t} = 1 \quad \text{if} \quad EX_i^0 = IM_i^0 = 0 \quad (5)$$

Based on a review of the empirical literature commissioned in the context of this study, the elasticity of productivity with respect to openness ranges roughly between 0.34 and 0.74<sup>16</sup>. We have adopted an elasticity of 0.5.

Other formulations are possible. In the empirical literature, the focus is often solely on import penetration ratios, often restricted to imports from developed countries, as the principal channel of influence of trade on productivity. This will be the subject of further research.

#### d) Foreign investment

We assume that trade liberalization creates an environment that favors the investment of foreign savings in Senegal. First, foreign investors are more attracted by an open economic environment, which we capture by including an economy-wide openness index in the determination of the current account balance, which is equal to foreign savings invested in Senegal<sup>17</sup>. Second, to the extent that trade liberalization increases the returns to capital, this will further encourage foreign investment:

$$CAB_t = \frac{CAB^0}{GDP^0} \cdot \left[ \frac{rmoy_t / PINDEX_t}{rmoy^0 / PINDEX^0} \right]^{\sigma^{FSR}} \cdot \left[ \frac{(IM_t + EX_t) / GDP_t}{(IM^0 + EX^0) / GDP^0} \right]^{\sigma^{FSO}} \cdot GDP_t \quad (61)$$

As a percentage of GDP (the sum of sectoral value added), the current account deficit will increase with respect to its base value if the average rate of return on capital ( $rmoy_t / PINDEX_t$ ) or the economy-wide degree of openness ( $(IM + EX) / GDP$ ) increases.<sup>18</sup> Based on a review of the empirical literature commissioned for this study<sup>19</sup>, we adopt an estimate of 0.04 for the elasticity of substitution of foreign investment with respect to openness and 0.5 with respect to the rate of return to capital.

Note that several other formulations could be considered. First, the above relationship could be restricted to FDI alone, assuming that all other elements of the capital and financial accounts of the balance of payments are, for example, a fixed proportion of GDP. Second, it is likely that FDI (or all net foreign capital inflows) are, at least to some extent, sector-specific. It

---

<sup>15</sup> The index m (x) represents the subset of importable (exportable) sectors.

<sup>16</sup> See Martens (2008b). For empirical studies see, for example, Jonsson and Subramanian (2001) and Arora and Bhundia (2003), both focusing on South Africa.

<sup>17</sup> Note that the causality may also be inverted. As trade and foreign investment are determined simultaneously in a CGE model, what is important is that they are complements, rather than substitutes.

<sup>18</sup> See equations 50 and 51 in Appendix 1

<sup>19</sup> See Martens (2008a).

would be possible to apply the above equations at a sectoral level, where FDI in a given sector would depend on the sectoral returns to capital and the sectoral openness index.

**e) Endogenous household savings rates**

In static CGE models, the savings behavior of households is generally very simple. The saving rate is a simple parameter measuring either the average or the marginal saving rates of each household category<sup>20</sup>. We enrich this framework by assuming that household savings rates are sensitive with respect to changes in the real rate of returns to capital. More specifically we define the following equation:

$$SH_{h,t} = \psi_h \cdot \left[ \frac{rmoy_t / PINDEX_t}{rmoy^0 / PINDEX^0} \right]^{\sigma_h^{HS}} \cdot YDH_{h,t} \quad (18)$$

Over time, the relative capital endowments of each representative household change according to their savings. Households with a higher savings rate will have a faster growing capital stock and will consequently earn a growing share of total capital income generated in the economy. In particular, after depreciation, the capital stock belonging to household  $h$  will increase according to their savings:

$$KH_{h,t+1} = KH_{h,t} (1 - \delta) + \left( \frac{SH_{h,t}}{PK_t} \right) \quad (69)$$

where  $PK_t$  is the investment price index. All other agents accumulate capital in the same way:

$$- \text{ Firms: } KF_{t+1} = KF_t (1 - \delta) + \left[ \frac{SF_t}{PK_t} \right] \quad (70)$$

$$- \text{ Rest of world: } KROW_{t+1} = KROW_t (1 - \delta) + \left( \frac{CAB_t}{PK_t} \right) \quad (72)$$

$$- \text{ Government: } KG_{t+1} = KG_t (1 - \delta) + \left[ \frac{SG_t}{PK_t} \right] \quad (71)$$

and all agents receive a share of total returns to capital equal to their share in the capital stock.

#### 4.6 Structure of the Social Accounting Matrices

The table below presents the main characteristics of the SAMs used in the study. The base years for these SAMs are all quite close: 2004 for Ghana, Honduras and Senegal, and 2005 for Uganda. There is little disaggregation of industries/commodities in the SAMs for Ghana and Honduras (13 and 18 accounts, respectively), whereas the SAMs for Senegal and Uganda are much more disaggregated (35 and 50, respectively). The level of disaggregation for other accounts, such as productive factors, institutional units and, tax is more uniform across countries.

---

<sup>20</sup> For a more sophisticated presentation of household behavior, see Lemelin and Decaluwe (?).

## Summary of the base SAMs

	Ghana	Honduras	Senegal	Uganda
<b>Source</b>	GSS and IFPRI (2006)	Cuesta (2004)	Fofana and Cabral (2007)	Zhu and Thurlow (2007)
<b>Year</b>	2004	2004	2004	2005
<b>Industry /Products</b>	13 (5 primary, 1 manufacturing, 7 services)	18 (8 primary, 6 manufacturing, 4 services)	35 (6 primary, 17 manufacturing, 12 services)	30 (11 primary, 6 manufacturing, 13 services)
<b>Institutional sectors</b>	5 (Urban and Rural RHGs)	7 (One RHG)	One RHG, Firms, Government, Rest of World	Urban/Rural RHGs, Firms, Government, Rest of World
<b>Labour categories</b>	9 (8 labour categories)	Male/female; unskilled/skilled/-semi-skilled	8 (6 labour categories)	9 (6 labour categories)
<b>Tax accounts</b>	4 (direct, sales, import, and export)	5 (direct, production, sales, import, and value added)	5 (direct, production, sales, subsidy, and import)	3 tax accounts (direct, sales, and import)

Note: RHG=Representative Household Group

## 5 Simulation Results

### 5.1 Simulation scenario

We simulate the complete elimination of import tariffs. While this is extreme and not likely to be observed in reality, it gives us an order of magnitude of the type of effects. Also, tariffs are eliminated in the first year of simulations, rather than gradually over time as we would expect in an actual implementation. While this will modify the transition path and overstate the first year impacts, it will have little impact on the long-term effects. More realistic scenarios could be developed in the case of analysis of specific trade agreements or trade policy reforms. Note that this scenario represents a case of unilateral trade liberalization. In the case of bilateral, regional or multilateral trade agreements, we would also want to capture changes in tariffs applied by trade partners and changes in world prices as they are reflected in import and export prices. These changes could have quite different impacts. For example, a rise in world food prices following the removal of agricultural subsidies in major developing countries would lead to an increase in import prices for countries that import food and an increase in export prices for those that export food.

In all simulations, the public deficit remains constant as a share of GDP through the introduction of an endogenous uniform sales tax. When tariffs are eliminated, this compensatory tax increases by between one (Honduras) and two (Ghana and Senegal) percentage points throughout the 15-year simulation period. We focus first on the short-term (first year) effects. All results are expressed as a variation with respect to the values observed in the “business-as-usual” scenario with no trade liberalization. To lighten the text we focus solely on the three main sectors – primary, industrial and services – although the actual models are much more disaggregated than this<sup>21</sup>.

<sup>21</sup> See, for example, the Senegalese results presented in chapter ?? of this book.

## 5.2 Import response

As we can see in Table 1, industry is initially much more protected than the primary sector in Senegal and Uganda, whereas it is the primary sector that is slightly more protected than industry in Ghana and Honduras<sup>22</sup>. There are no tariffs on the limited amount of service imports in all countries. The four countries also differ substantially in several other important ways. While Ghana's GDP (or value added) is almost equally shared between the primary, industry and service sectors, in the other three countries GDP is heavily concentrated in the service sector with much lower primary value added<sup>23</sup>. In all four countries, the majority of imports are industrial, although this share is particularly high in Ghana, Senegal and Uganda. The share of primary imports is particularly low in Ghana and Uganda.

The contrasts in the structure of exports is more dramatic. Ghana's exports are dominated by (and export intensities are highest in) the primary sector, in particular cocoa (35%), mining (20%) and forestry (10%). In contrast, over half of Honduras' exports are services, although this is misleading as Honduras lists exports from its maquila industries<sup>24</sup> as service exports. Honduras also has high export shares and intensities in its agricultural sector, especially for coffee and shellfish. In Senegal, over half of all exports are from the industrial sector, primarily petroleum products and phosphates, with a strong showing by tourism (15% of all exports). Uganda's export composition is similar to Senegal, although with a higher share of primary exports.

---

<sup>22</sup> Note that the food processing and textiles industries have higher protection rates (roughly 12 percent) in Honduras.

<sup>23</sup> This is primarily due to larger mining (10 percent of GDP) and forestry (5 percent) production in Ghana's primary sector, both of these sectors being strongly export-oriented.

<sup>24</sup> Maquilas are factories that import inputs exempt from tariffs in order to produce exports.

**Table 1: Initial shares, ratios and tariffs**

	Sectoral shares			Ratios			Initial Tariff
	Value added	Imports	Exports	Imports/ consumption	Exports/ Output	Value added/ Output	
<b>Ghana</b>							
Primary	34.1	4.3	70.4	6.8	39.2	63.2	8.2
Industrial	33.6	80.4	9.4	66.6	10.5	41.2	7.3
Services	32.3	15.3	20.3	17.3	14.7	44.0	0.0
<i>TOTAL</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>38.2</i>	<i>24.6</i>	<i>50.1</i>	<i>6.2</i>
<b>Honduras</b>							
Primary	12.5	21.6	31.8	35.3	31.2	19.7	6.7
Industrial	27.9	54.8	17.5	37.9	12.9	37.0	5.7
Services	59.6	23.6	50.7	25.4	31.8	68.6	0.0
<i>TOTAL</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>33.6</i>	<i>25.2</i>	<i>46.3</i>	<i>4.6</i>
<b>Senegal</b>							
Primary	14.9	19.0	9.4	26.2	8.8	64.5	7.1
Industrial	26.3	73.2	53.8	44.7	18.7	26.2	16.7
Services	58.8	7.7	36.7	8.4	18.4	57.8	0.0
<i>TOTAL</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>31.1</i>	<i>18.6</i>	<i>45.8</i>	<i>13.6</i>
<b>Uganda</b>							
Primary	25.6	4.3	22.6	3.7	8.6	77.6	5.2
Industrial	25.7	73.9	44.7	38.9	13.1	38.5	25.2
Services	48.7	21.9	32.7	12.7	8.2	56.5	0.0
<i>TOTAL</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>23.0</i>	<i>9.9</i>	<i>54.1</i>	<i>18.8</i>

Given the initial tariff structure, it is the industrial sectors in Senegal and Uganda that face the strongest first-year import competition - falling import prices and ensuing increase in import volumes - following the elimination of import tariffs (Table 2). However, it is important to note that the detailed sectoral results (not shown) indicate that most of this import competition is focused in industries such as food processing that require large quantities of inputs from the primary sector. In all four countries, the service sector is relatively unaffected, whereas the primary sectors and, in Ghana and Honduras, the industrial sectors, face moderate increases in import competition.

### 5.3 Output response

Overall, our simulation results indicate that the elimination of import tariffs would lead to a short-term (first year) expansion in output and GDP (value added) in all four countries, with Senegal posting the biggest gains (2.5 and 2.2 percent, respectively) and Honduras the smallest ones (1.4 and 0.9 percent; See the “Total” rows in the upper half of Table 2). This result is mainly driven by the productivity/efficiency gains from increased openness, as we assume that any increase in capital stock in the first year only becomes productive as of the second year. We will come back to this point in more detail in section 5.6. Trade liberalisation also leads to a first-year expansion in exports, as we assume that foreign savings (the current account deficit) is fixed and thus the increase in imports following tariff cuts leads to a real exchange devaluation<sup>25</sup>.

Despite the differences in import responses, it is the primary sector that posts the largest output increases in the first year in all four countries. In the cases of Ghana and Honduras, where

<sup>25</sup> Recall that the exchange rate is the numeraire of the models, and thus the real exchange devaluation is obtained through a fall in domestic prices.

the contrast with the other sectors is most dramatic, primary sector expansion is powered primarily by export growth as a result of the real exchange rate devaluation. Indeed, the primary sector is export intensive in both countries, with exports representing 31.2 (Honduras) and 39.2 (Ghana) percent of output. In contrast, expansion of the primary sector in Senegal and Uganda is motored by growth in local sales where it faces a much smaller increase in import competition than the highly protected industrial sector. Furthermore, in all countries but particularly in the case of Ghana and Uganda, import penetration rates are lower in the primary sector than in industry, which protects this sector more from import competition following tariff cuts. With the moderate exception of Honduras, the service sectors have the smallest increases in output and value added, despite the fact that they do not face any increase in import competition. As a result, the main impact of tariff cuts is a general equilibrium reduction in production costs in the service sector, which translates into a small to moderate rise in output and small output price reductions.

Given that we are interested in the gender-specific wage effects and poverty effects of trade liberalization and growth, it is price changes, particularly changes in value added prices that are the determining factor. In this regard, we first note that, in the first year, output prices fall more in the agricultural and industrial sectors than in the service sector, as the former are forced to cut their prices on the domestic market in the face of increased import competition. With the exception of Uganda, this dichotomy is accentuated when we consider value added prices, as input cost savings are less for the industrial and agricultural sectors, proportionately to their output prices. There is less divergence between the evolution of value added prices in the agricultural and industrial sectors although, with the exception of Ghana, they fall more in the primary sector, which we will see has important distributive and gender implications.

**Table 2: Trade and production responses**

	First year					Last year				
	Imports	Dom. sales	Exports	Output	Value added	Imports	Dom. sales	Exports	Output	Value added
<b>VOLUMES</b>										
<b>Ghana</b>										
Primary	7.1	0.6	4.3	2.1	1.9	10.5	0.9	8.4	4.0	3.7
Industrial	4.0	0.3	12.5	1.2	0.9	5.7	-0.1	8.1	0.6	0.7
Services	-0.8	0.7	5.0	1.1	0.7	0.4	1.4	4.8	1.8	1.3
TOTAL	3.5	0.6	5.2	1.5	1.3	5.2	0.8	7.6	2.3	2.2
<b>Honduras</b>										
Primary	5.0	-0.7	11.7	3.1	1.3	7.0	-0.4	26.2	8.7	3.6
Industrial	6.2	0.1	7.4	0.9	0.7	10.0	0.7	7.9	1.5	1.2
Services	-1.4	0.4	2.4	0.9	0.9	1.6	1.3	1.6	1.3	1.3
TOTAL	4.2	0.0	6.2	1.4	0.9	7.5	0.7	11.0	3.1	1.5
<b>Senegal</b>										
Primary	5.7	2.4	21.3	4.1	3.6	8.8	3.1	25.4	5.1	4.4
Industrial	13.6	0.3	16.0	2.6	3.2	16.7	0.8	24.2	4.6	5.9
Services	0.3	1.1	10.0	1.9	1.3	-0.1	2.9	14.2	4.0	3.2
TOTAL	11.2	0.9	13.8	2.5	2.2	14.1	2.2	20.5	4.4	4.0
<b>Uganda</b>										
Primary	6.6	2.6	14.3	3.6	3.7	5.7	3.7	26.0	5.7	5.5
Industrial	9.3	2.2	16.1	3.5	3.1	11.5	3.5	15.4	4.4	3.8
Services	-0.9	0.4	6.5	0.7	0.7	-0.3	2.2	11.5	2.7	2.7
TOTAL	7.6	1.4	12.4	2.1	2.0	9.4	2.9	16.4	3.8	3.6
<b>PRICES</b>										
<b>Ghana</b>										
Primary	-5.8	-2.4	0	-2.6	-3.2	-5.8	-1.2	0	-1.8	-2.2
Industrial	-5.1	-2.5	0	-3.8	-4.4	-5.2	-1.4	0	-2.9	-2.7
Services	1.9	0.3	0	-1.4	-1.1	1.9	0.9	0	-0.9	0.0
TOTAL	-4.2	-1.2	0	-2.4	-2.7	-4.2	-0.4	0	-1.7	-1.6
<b>Honduras</b>										
Primary	-4.9	-1.8	0	-2.2	-5.1	-4.9	-1.1	0	-1.6	-4.1
Industrial	-4.0	-1.7	0	-2.8	-3.6	-4.0	-0.8	0	-2.0	-2.2
Services	1.5	0.5	0	-0.7	-0.5	1.5	1.6	0	0.1	0.5
TOTAL	-3.0	-0.9	0	-1.8	-1.8	-3.0	0.1	0	-1.0	-0.7
<b>Senegal</b>										
Primary	-5.0	-8.2	0	-9.0	-11.6	-4.9	-6.7	0	-7.8	-9.7
Industrial	-13.3	-5.1	0	-5.7	-7.1	-13.2	-4.6	0	-5.4	-6.5
Services	1.6	-0.9	0	-2.5	-2.1	1.7	-1.0	0	-2.6	-2.1
TOTAL	-10.7	-3.5	0	-4.6	-4.9	-10.6	-3.2	0	-4.4	-4.5
<b>Uganda</b>										
Primary	-4.2	-3.5	0.0	-4.1	-4.3	-4.3	-2.1	0.0	-2.8	-2.3
Industrial	-9.2	-4.1	0.0	-4.4	-1.6	-9.3	-3.3	0.0	-3.7	-0.7
Services	1.2	-0.7	0.0	-1.8	-1.8	1.1	-0.4	0.0	-1.4	-1.4
TOTAL	-7.4	-2.4	0.0	-3.1	-2.4	-7.4	-1.7	0.0	-2.4	-1.5

NOTE: Import and domestic sale prices include the compensatory sales tax, whereas output and value added prices are net of this.

In conclusion, the primary sector benefits the most from trade liberalization in all four countries. In Ghana and Honduras, where the contrast is greatest, this is due primarily to the greater export orientation of the primary sector, whereas in Senegal and Uganda, it is the fact that the primary sector is much less affected by import competition given its much lower initial tariff rates. More importantly for our factor return analysis below, value added prices fall more in the primary sector in all but Ghana. It is this divergence in the behavior of value added prices that drives the impacts on factor returns, as we will now explore.

#### 5.4 Gender-Specific Factor Market Impacts

Let us now look at how the sectoral output effects of trade liberalization map into the first year variations in gender-specific factor returns. Note that the labor categories are slightly different in each country. In Ghana and Honduras, labor is distinguished by gender, location and skill level. In Senegal, rural labor is not broken down by skill level. In Uganda, labor is decomposed by gender and skill level only although a third, least skilled, category of worker – elementary – is distinguished<sup>26</sup>. It is also important to note that the overall consumer price index falls by between 1.4 (Honduras) and 7.6 (Senegal) percent (Table 3). Thus, although, factor returns fall, many increase in relative terms.

A major result in terms of factor markets is that, in the short term, as female wages fall more than male wages, **trade liberalization increases the average gender wage gap** in all African countries, whereas there is no significant difference in the evolution of average male and female wage rates in Honduras. This can be seen by comparing the “Total male” and “Total female” rows for each country in Table 3. The difference is particularly strong in Senegal, where female wage rates fall a full percentage point more than male wage rates: 4.2 versus 3.1 percent. The causes of these divergences are multiple and vary between countries: greater participation of rural men in export-oriented cocoa production in Ghana; greater participation of rural women in the inward-oriented agricultural sector in Senegal; etc.<sup>27</sup>

We also note that this gender bias in wage variations applies somewhat more to unskilled workers, with the exception of rural Honduran workers. For example, among urban workers in Senegal, the wages of unskilled female workers fall by 3.2 percent, as compared to 2.8 percent for their male counterparts, whereas the female skilled wages fall by less than their male counterparts: 1.9 versus 2.2 percent. There is no clear rural-urban difference in the gender bias of wage changes, the results varying from country to country.

More generally, we find that trade liberalization reduces rural wages relative to urban wages, with the exception of Honduran female workers. In particular, in rural Senegal, male and female wages fall by 5.5 and 7.7 percent, respectively, as compared to 2.4 and 2.3 percent reductions for their urban counterparts. This result reflects the greater reductions in primary sector value added prices noted in the preceding section. No rural-urban labor market analysis is possible in Uganda in the absence of the required data.

---

<sup>26</sup> This corresponds to ILO category 9 of workers: labourers, elementary service workers, etc.

<sup>27</sup> A rural-urban breakdown of workers is not available in the Ugandan data, although it is likely that rural workers are composed primarily of elementary workers.

**Table 3: Factor Market and Household Income Effects**

	Initial share in total income			Change in rates of returns to factors		Change in income by source					
				First period	Last Period	First period			Last Period		
GHANA	Urban	Rural	All	All	All	Urban	Rural	All	Urban	Rural	All
<b>Male labor</b>											
Rural											
- unskilled	0.0	26.5	12.8		-1.7	0.1	0.0	-0.5	-0.2	0.0	0.0
- skilled	0.0	25.5	12.3		-1.8	1.2	0.0	-0.5	-0.2	0.0	0.3
- Total					-1.8	0.6					
Urban											
- unskilled	6.0	0.0	3.1		-1.6	0.1	-0.1	0.0	-0.1	0.0	0.0
- skilled	23.1	0.0	12.0		-1.6	1.4	-0.4	0.0	-0.2	0.4	0.0
- Total					-1.6	1.1					
<b>Total Male</b>					<b>-1.7</b>	<b>0.8</b>					
<b>Female labor</b>											
Rural											
- unskilled	0.0	10.8	5.2		-2.0	-0.2	0.0	-0.2	-0.1	0.0	0.0
- skilled	0.0	3.7	1.8		-1.8	1.0	0.0	-0.1	0.0	0.0	0.0
- Total					-2.0	0.1					
Urban											
- unskilled	7.5	0.0	3.9		-1.9	-0.1	-0.1	0.0	-0.1	0.0	0.0
- skilled	9.3	0.0	4.8		-1.8	1.2	-0.2	0.0	-0.1	0.1	0.0
- Total					-1.9	0.6					
<b>Total Female</b>					<b>-1.9</b>	<b>0.4</b>					
Capital	28.9	24.8	26.9		-1.0	-1.4	-0.3	-0.3	-0.3	0.0	0.0
Non-factor income	25.2	8.6	17.2		-0.6	-0.4	-0.1	-0.1	-0.1	-0.1	-0.1
<b>Total household income</b>	100.0	100.0	100.0				<b>-1.2</b>	<b>-1.6</b>	<b>-1.4</b>	<b>0.3</b>	<b>0.3</b>
<b>Consumer price index</b>							<b>-2.4</b>	<b>-2.6</b>	<b>-2.5</b>	<b>-1.6</b>	<b>-1.8</b>
<b>Relative income</b>							<b>1.3</b>	<b>1.1</b>	<b>1.2</b>	<b>2.0</b>	<b>2.1</b>
Change in capital endowment							0.0	0.0	0.0	1.1	1.2
<b>HONDURAS</b>			All	All	All			All		All	
<b>Male labor</b>											
Rural											
- unskilled		9.0		-2.0	-0.1			-0.2			0.0
- skilled		2.4		-1.2	0.9			0.0			0.0
- Total				-1.9	0.1						
Urban											
- unskilled		12.0		-1.1	0.4			-0.1			0.1
- skilled		18.6		-0.9	1.4			-0.2			0.3
- Total				-1.0	1.0						
<b>Total male</b>				<b>-1.2</b>	<b>0.7</b>						
<b>Female labor</b>											
Rural											
- unskilled		2.6		-0.7	0.5			0.0			0.0
- skilled		1.1		-1.0	1.4			0.0			0.0
- Total				-0.8	0.8						
Urban											
- unskilled		5.6		-1.4	0.1			-0.1			0.0
- skilled		12.0		-1.1	1.3			-0.1			0.2
- Total				-1.2	0.9						
<b>Total female</b>				<b>-1.1</b>	<b>0.9</b>						
Capital		18.3		0.0	-0.9			0.0			0.1
Non-factor income		18.4		-0.1	0.0			0.0			0.0
<b>Total household income</b>		100.0		-0.7	1.1			<b>-0.7</b>			<b>0.7</b>
<b>Consumer price index</b>								<b>-1.4</b>			<b>-0.6</b>
<b>Relative income</b>								<b>0.7</b>			<b>1.3</b>
Change in capital endowment								0.0			1.1

**Table 3: Factor Market and Household Income Effects (continued)**

		Change in rate of return				Change in income by source								
		Initial share in total income		First period	Last period	First period			Last Period					
<b>SENEGAL</b>	Other				All		Other			Other				
	Dakar	urban	Rural	All	All	All	Dakar	urban	Rural	All	Dakar	urban	Rural	All
<b>Male labor</b>														
Rural	0.0	0.0	22.6	6.1	-5.5	-3.8	0.0	0.0	-1.2	-0.3	0.0	0.0	-0.8	-0.2
Urban														
- unskilled	5.9	10.4	0.0	5.3	-2.8	-1.4	-0.2	-0.3	0.0	-0.2	-0.1	-0.1	0.0	-0.1
- skilled	18.5	26.5	0.0	15.3	-2.2	2.9	-0.4	-0.6	0.0	-0.3	0.5	0.8	0.0	0.4
- Total					-2.4	1.8								
<b>Total male</b>					<b>-3.1</b>	<b>0.5</b>								
<b>Female labor</b>														
Rural	0.0	0.0	16.4	4.4	-7.7	-5.5	0.0	0.0	-1.3	-0.3	0.0	0.0	-0.9	-0.2
Urban														
- unskilled	2.9	6.1	0.0	2.8	-3.2	-1.6	-0.1	-0.2	0.0	-0.1	0.0	-0.1	0.0	0.0
- skilled	7.1	8.2	0.0	5.4	-1.9	3.3	-0.1	-0.2	0.0	-0.1	0.2	0.3	0.0	0.2
- Total					-2.3	1.6								
<b>Total female</b>					<b>-4.2</b>	<b>-0.9</b>								
Capital	26.7	10.9	2.2	16.5	-2.3	-4.7	-0.6	-0.3	-0.1	-0.4	-0.5	-0.1	-0.1	-0.3
Non-factor income	38.9	38.0	58.8	44.0	-5.4	-5	-1.8	-1.9	-3.9	-2.4	-1.7	-1.8	-3.5	-2.2
<b>Total household income</b>	100.0	100.0	100.0	100.0			<b>-3.2</b>	<b>-3.4</b>	<b>-6.4</b>	<b>-4.1</b>	<b>-1.5</b>	<b>-1.1</b>	<b>-5.4</b>	<b>-2.5</b>
<b>Consumer price index</b>							<b>-6.0</b>	<b>-8.1</b>	<b>-9.3</b>	<b>-7.6</b>	<b>-5.4</b>	<b>-7.4</b>	<b>-8.5</b>	<b>-6.9</b>
<b>Relative income</b>							<b>3.0</b>	<b>5.1</b>	<b>3.2</b>	<b>3.8</b>	<b>4.1</b>	<b>6.8</b>	<b>3.4</b>	<b>4.7</b>
Change in capital endowment							0.0	0.0	0.0	0.0	2.9	3.7	0.2	2.9
<b>UGANDA</b>		Urban	Rural All		All	All	Urban		Rural	All	Urban		Rural	All
<b>Male labor</b>														
- Elementary	5.6	3.5	4.3		0.3	1.1	0.0		0.0	0.0	0.1		0.0	0.0
- unskilled	6.3	16.6	13.0		0.1	0.7	0.0		0.0	0.0	0.0		0.1	0.1
- skilled	13.8	7.1	9.5		-0.2	3.2	0.0		0.0	0.0	0.4		0.2	0.3
<b>Total male</b>					<b>0.0</b>	<b>1.7</b>								
<b>Female labor</b>														
- Elementary	1.8	0.7	1.1		-2.0	-0.5	0.0		0.0	0.0	0.0		0.0	0.0
- unskilled	2.4	6.9	5.3		-1.3	0.4	0.0		-0.1	-0.1	0.0		0.0	0.0
- skilled	8.3	3.3	5.0		0.1	3.7	0.0		0.0	0.0	0.3		0.1	0.2
<b>Total female</b>					<b>-0.8</b>	<b>1.7</b>								
Capital	48.7	48.6	48.6		-0.7	-2.4	-0.3		-0.3	-0.3	1.0		1.0	1.0
Non-factor income	13.1	13.3	13.2		0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0
<b>Total household income</b>	100.0	100.0	100.0				-0.4		-0.4	-0.4	1.9		1.5	1.6
<b>Consumer price index</b>							-4.1		-4.2	-4.2	-2.7		-2.9	-2.9
<b>Relative income</b>							3.9		4.0	4.0	4.7		4.5	4.6
Change in capital endowment							0.0		0.0	0.0	4.6		4.5	4.5

In summary, trade liberalization is shown to accentuate existing gender, skill and rural-urban wage gaps, as male, skilled and urban workers are better able to take advantage of expanding export opportunities and less exposed to increased import competition.

Average returns to capital generally vary less than average wage rates, with the exception of Uganda. This is due primarily to the high share of capital income from the export-oriented mining industry and the non-tradeable construction sectors.

## 5.5 Household income

Household categories are slightly different in each country. In Honduras, only one category of household is distinguished whereas, in Ghana and Uganda, rural and urban households are separated. Finally, in Senegal, urban households are further broken down into those in the capital city of Dakar and those in other urban areas. As we mentioned in discussing factor returns, the changes in household income must be considered in a context where trade liberalization also leads to a reduction in consumer prices. Thus, despite a reduction in household incomes, their purchasing power may actually increase if consumer prices fall even more. These consumer price reductions, presented in Table 3, vary between household categories according to their respective consumption patterns as we will discuss below.

On average household incomes fall by roughly one percent in the first year, except in the case of Senegal where initial tariff rates were high and household incomes fall by 4.1 percent on average. Given the changes in factor returns discussed in the preceding section, the impacts of trade liberalization on the income of the different categories of households depends on their factor endowments, as well as their non-factor income shares. In both Ghana and Senegal, it is rural households who experience the largest average reductions in incomes, whereas in Uganda there is no significant difference in the short-term impacts on the incomes of rural and urban households. The anti-rural bias of the impacts on rural households in Ghana and Senegal can be traced primarily to the fact that the wages of rural workers, both male and female, fall more than their urban counterparts. In the decomposition of income changes presented in the right half of Table 3, we see that this explains a large share of the difference in total income changes, especially in the case of Ghana. In Senegal, rural households are also more reliant than urban households on non-factor income, in particular inter-household and government transfers, which are indexed to the falling (7.6 percent) consumer price index<sup>28</sup>. Among urban Senegalese households, there is little observable difference between those living in Dakar and those living in other urban areas. While Dakar households rely somewhat more on capital income and less on urban wage income, the variation in the rates of return to these two factors are similar.

While the price cuts emanating from trade liberalization lead to a fall in household income, they also imply a fall in the cost of living. In all four countries, average consumer prices fall significantly more – between 1.4 (Honduras) and 7.6 percent (Senegal) – than household incomes. This results in an increase in the average purchasing power (“relative income”) of households of 0.7 (Honduras) to 4.0 (Uganda) percent.

---

<sup>28</sup> Other non-factor incomes include transfers from abroad (e.g. remittances) and dividends. Transfers from abroad are constant, as they are indexed to the exchange rate, which is the model numeraire. Dividends are a fixed share of firm income, which essentially follows the variation in the average returns to capital.

Consumer price reductions are also slightly greater for rural households in all three African countries, for which results are distinguished by category of household. This is due to the fact that urban households consume relatively more services, for which prices fall least.

When we combine the income and consumer price effects, we see that the net effect (“relative income”) is positive for all countries, although the rural-urban bias varies from country to country. In Ghana, greater consumer price savings for rural households are insufficient to offset their greater income losses, such that their relative income increase less than for their urban counterparts. In Senegal, it is the “other urban” household categories that benefits most, through moderate income losses and strong consumer price reductions. In Uganda, as household incomes vary in the same proportion, it is the greater reduction in consumer prices for rural households that allows them to emerge as slightly bigger winners from trade liberalization.

## 5.6 Growth effects

In section 4.5 we outlined the various motors of growth that are present in our model. Very few applied general equilibrium studies have integrated these important channels. In this section we look in more detail at their impacts.

In general terms, after an initial burst in the first year, trade liberalization is shown to continue to contribute to a gradual increase in GDP relative to the BAU over the rest of the simulation period (Table 4). As the countries with the highest initial tariff rates, Senegal and Uganda are also the ones to benefit most from their elimination with increase in GDP that reach 4.0 and 3.8 percent respectively by the final year of simulations.

In all countries, growth is motored by increases in productivity/efficiency and investment. Productivity gains are the results of increased openness, which raises competition and leads to technology transfers. Increased investment is the result of a drop in the cost of capital goods and, driven by a rise in the returns to capital (relative to the price index) and openness, increased household and foreign savings.

In all countries, more than half of the increase in GDP is obtained in the first year of simulations. This reflects the fact that liberalization is not phased in and that the increases in the relative returns to capital and openness, and the reduction in the cost of capital goods, are primarily achieved immediately after liberalization. Indeed, the gains in relative returns to capital (RRC) relative to the BAU fall after the first year in all four countries. Openness (Open) continues to increase relative to the BAU after the first year in all countries except Uganda, but only modestly. Savings in terms of capital goods prices decline after the first year in Ghana and Honduras and increase only modestly in Senegal, although they increase more in Uganda.

Consequently, the long-term effects are not very different from the short-term effects. Long-term output increases (Table 2) are strongest in the sectors where openness increases most as a result of the resulting productivity/efficient gains and the long-term investment this attracts. In all but Senegal, these are the primary sectors as a result of much stronger export responses (Honduras and Uganda) or increased import competition (Ghana). Increased investments also raises the relative demand for skilled labor, which is complementary to capital in the production process. As a result, skilled wages rise dramatically in the long term (Table 3).

**Table 4: Growth (average increase relative to BAU)**

Year	Variation in GDP relative to BAU					Full scenario			Variation in GDP relative to BAU					Full scenario			
	Full	NoPE	NoFS	NoHS	NoPK	RRC	Open	PK	Full	NoPE	NoFS	NoHS	NoPK	RRC	Open	PK	
<b>GHANA</b>															<b>HONDURAS</b>		
1	1.3	0.0	1.3	1.3	1.3	1.6	2.8	-2.6	0.9	0.0	0.9	0.9	0.9	1.4	4.0	-2.2	
2	1.4	0.0	1.4	1.4	1.3	1.4	2.9	-2.5	1.0	0.0	1	1	0.9	1.1	4.6	-2.2	
3	1.5	0.1	1.5	1.4	1.3	1.2	3.0	-2.5	1.0	0.0	1	1	1	0.9	4.7	-2.1	
4	1.6	0.1	1.5	1.5	1.4	1.1	3.1	-2.5	1.1	0.1	1.1	1.1	1	0.7	4.9	-2.1	
5	1.6	0.1	1.6	1.6	1.4	1.0	3.2	-2.4	1.1	0.1	1.1	1.1	1	0.5	5.1	-2.1	
6	1.7	0.2	1.7	1.6	1.4	0.9	3.3	-2.4	1.2	0.1	1.2	1.1	1	0.4	5.3	-2.1	
7	1.8	0.2	1.8	1.7	1.5	0.8	3.4	-2.4	1.2	0.1	1.2	1.2	1.1	0.3	5.5	-2.0	
8	1.9	0.2	1.8	1.7	1.5	0.7	3.4	-2.4	1.3	0.1	1.2	1.2	1.1	0.2	5.7	-2.0	
9	1.9	0.2	1.9	1.8	1.5	0.6	3.5	-2.4	1.3	0.1	1.3	1.3	1.1	0.1	6.0	-2.0	
10	2.0	0.3	1.9	1.8	1.6	0.6	3.6	-2.4	1.3	0.1	1.3	1.3	1.1	0.0	6.2	-2.0	
11	2.0	0.3	2.0	1.8	1.6	0.5	3.6	-2.3	1.4	0.1	1.4	1.3	1.2	-0.1	6.4	-1.9	
12	2.1	0.3	2.0	1.8	1.6	0.5	3.7	-2.3	1.4	0.1	1.4	1.4	1.2	-0.2	6.6	-1.9	
13	2.1	0.3	2.1	1.8	1.6	0.4	3.7	-2.3	1.4	0.2	1.4	1.4	1.2	-0.2	6.8	-1.9	
14	2.2	0.3	2.1	1.9	1.6	0.4	3.7	-2.3	1.5	0.2	1.5	1.4	1.2	-0.2	7.0	-1.9	
15	2.2	0.3	2.2	1.9	1.7	0.4	3.8	-2.3	1.5	0.2	1.5	1.5	1.2	-0.3	7.2	-1.9	
<b>SENEGAL</b>															<b>UGANDA</b>		
1	2.2	0.0	2.2	2.2	2.2	5.7	9.6	-4.2	2.0	0.0	2.0	2.0	2.0	3.6	2.0	-2.3	
2	2.4	0.1	2.4	2.3	2.2	5.2	9.8	-4.3	2.2	0.1	2.2	2.1	2.1	3.2	1.9	-2.8	
3	2.6	0.2	2.5	2.5	2.3	4.8	10.0	-4.5	2.4	0.2	2.3	2.2	2.2	2.9	1.8	-3.1	
4	2.8	0.2	2.7	2.6	2.3	4.5	10.2	-4.5	2.5	0.3	2.5	2.3	2.2	2.6	1.7	-3.4	
5	2.9	0.3	2.8	2.7	2.4	4.2	10.4	-4.6	2.7	0.4	2.7	2.4	2.3	2.3	1.7	-3.7	
6	3.1	0.4	3.0	2.9	2.4	3.9	10.6	-4.6	2.9	0.5	2.9	2.5	2.3	2.1	1.6	-3.9	
7	3.2	0.4	3.1	3.0	2.4	3.7	10.7	-4.7	3.0	0.6	3.0	2.6	2.4	1.8	1.5	-4.1	
8	3.3	0.5	3.2	3.1	2.5	3.5	10.9	-4.7	3.2	0.7	3.2	2.7	2.4	1.5	1.4	-4.3	
9	3.5	0.5	3.3	3.2	2.5	3.3	11.0	-4.7	3.3	0.8	3.3	2.8	2.4	1.3	1.3	-4.4	
10	3.6	0.6	3.4	3.3	2.5	3.1	11.1	-4.7	3.4	0.9	3.4	2.9	2.4	1.0	1.2	-4.5	
11	3.7	0.6	3.5	3.4	2.5	2.9	11.2	-4.7	3.5	1.0	3.5	3.0	2.4	0.7	1.1	-4.7	
12	3.8	0.7	3.6	3.4	2.5	2.7	11.3	-4.7	3.6	1.1	3.6	3.1	2.4	0.5	1.0	-4.8	
13	3.9	0.7	3.7	3.5	2.5	2.6	11.4	-4.7	3.7	1.2	3.7	3.1	2.4	0.2	0.9	-4.9	
14	3.9	0.7	3.8	3.6	2.5	2.5	11.5	-4.7	3.8	1.3	3.7	3.2	2.3	-0.1	0.8	-4.9	
15	4.0	0.8	3.8	3.6	2.5	2.4	11.6	-4.7	3.8	1.4	3.8	3.2	2.3	-0.3	0.7	-5.0	

**Notes:** BAU = Business as usual; Full: Core simulation (all growth channels); NoPE = No openness-productivity/efficiency channel; NoFS = No capital returns/openness-foreign savings channel; NoHS = No capital returns-household savings channel; NoPK = No liberalization-capital good price effect; RRC-returns to capital deflated by the economy-wide value added price index; Open-Openness ratio; PK-Capital good price

In order to distinguish the relevant importance of these different growth motors, we rerun the simulations cancelling one of the channels each time. For example, to examine the impact of the productivity/efficiency channel, we set the elasticity of productivity with respect to openness equal to zero in equation 5 (section 4.6). The resulting simulation results (NoPE; No productivity/efficiency channel) indicate that the increase in GDP following liberalization would be much smaller in the absence of this channel. In contrast, removing the foreign savings channel (NoFS) is found to have almost no impact on the GDP gains, and removing the household saving channel (NoHS) has only a very limited impact. This is not surprising, as real returns to capital only rise marginally in the long-term and actually fall slightly in the case of Honduras<sup>29</sup> and foreign savings only represent a small share – less than 20 percent – of total savings in all four countries. Finally, removing the capital good prices channel (NoPK) has a more substantial impact, especially in the long-term, although nowhere near as strong an impact as the productivity/efficiency channel.

In the full simulation scenario, we noted earlier that female wage rates fall relative to male wage rates, in all but Honduras where they rise only marginally. The strongest impact was in Senegal, where relative female wage rates fall by more than one percent. While the causes vary from country to country, all share the common basis that female workers participate less in the export-oriented sectors and more in the import-competing sectors.

When we now cancel the various growth channels, once again it is only the productivity/efficiency channel that has a substantial effect on the gender wage gap (Table 5). The productivity gains imply that output can be maintained – and actually even increased here – with less factor inputs including labor. In all but Ghana, this channel is shown to be to the detriment of female workers, as the gender wage gap evolves more favorably in its absence. Indeed, female workers derive a larger share of their wages from sectors where openness increases most under trade liberalization, either due to high initial tariff rates or a strong export response. For example, rural female workers in Senegal derive almost 80 percent of their wages from the agricultural subsectors<sup>30</sup>, which are initially much more protected than the other primary sectors and thus experience substantial increases in both exports and imports following trade liberalization. In contrast, their male counterparts rely relatively more on the practically non-tradable construction and service sectors.

However, this gender bias in the productivity effect is far from monolithic. For example, in urban Senegal, it is the male workers, particularly those who are unskilled, who suffer most. Here, female workers are overwhelmingly employed in the trading sector, where there is practically no productivity gains through increased openness, whereas their male counterparts rely more heavily on income where openness and productivity increase most. In Ghana and Honduras, the situation is inverted with female workers suffering most from the impacts of productivity gains in urban areas and males suffering most in rural areas.

---

<sup>29</sup> This can be seen by comparing the changes in the rates of returns to capital to changes in consumer prices in the last period in Table 3.

<sup>30</sup> See chapter ?? for Senegalese results at the subsectoral level.

When we consider the results according to worker skill level, where available, unskilled workers are generally affected more, although the direction of this impact varies from country to country and between rural and urban areas within any given country.

**Table 5: Gender gap effects (average increase in female wage gap relative to BAU)**

	Full		NoPE		NoFS		NoHS		NoPK	
	First	Last								
<b>GHANA</b>										
<b>Rural</b>	<b>0.2</b>	<b>0.5</b>	<b>0.3</b>	<b>0.6</b>	<b>0.2</b>	<b>0.5</b>	<b>0.2</b>	<b>0.4</b>	<b>0.2</b>	<b>0.4</b>
Unskilled	0.3	0.3	0.5	0.6	0.3	0.3	0.3	0.3	0.3	0.4
Skilled	0	0.1	0.1	0.4	0	0.1	0	0.1	0	0.2
<b>Urban</b>	<b>0.2</b>	<b>0.5</b>	<b>0.2</b>	<b>0.4</b>	<b>0.2</b>	<b>0.5</b>	<b>0.2</b>	<b>0.4</b>	<b>0.2</b>	<b>0.3</b>
Unskilled	0.3	0.2	0.5	0.3	0.3	0.2	0.3	0.2	0.3	0.2
Skilled	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2
<b>All</b>	<b>0.2</b>	<b>0.4</b>	<b>0.3</b>	<b>0.5</b>	<b>0.2</b>	<b>0.4</b>	<b>0.2</b>	<b>0.3</b>	<b>0.2</b>	<b>0.3</b>
<b>HONDURAS</b>										
<b>Rural</b>	<b>-1.1</b>	<b>-0.7</b>	<b>-0.8</b>	<b>-0.3</b>	<b>-1.1</b>	<b>-0.7</b>	<b>-1.1</b>	<b>-0.7</b>	<b>-1.1</b>	<b>-0.6</b>
Unskilled	-1.3	-0.6	-1	-0.2	-1.3	-0.6	-1.4	-0.7	-1.3	-0.5
Skilled	-0.2	-0.5	-0.2	-0.4	-0.3	-0.5	-0.2	-0.6	-0.2	-0.5
<b>Urban</b>	<b>0.2</b>	<b>0.1</b>	<b>0</b>	<b>-0.1</b>	<b>0.2</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.2</b>	<b>0.2</b>
Unskilled	0.3	0.3	0	0.1	0.3	0.3	0.2	0.3	0.3	0.3
Skilled	0.2	0.1	0	0	0.1	0.1	0.1	0.1	0.2	0.1
<b>All</b>	<b>-0.1</b>	<b>-0.2</b>	<b>-0.2</b>	<b>-0.2</b>	<b>-0.1</b>	<b>-0.2</b>	<b>-0.2</b>	<b>-0.1</b>	<b>-0.1</b>	<b>0</b>
<b>SENEGAL</b>										
<b>Rural</b>	<b>2.3</b>	<b>1.8</b>	<b>1.3</b>	<b>1.4</b>	<b>2.2</b>	<b>1.9</b>	<b>2.2</b>	<b>1.8</b>	<b>2.3</b>	<b>1.8</b>
<b>Urban</b>	<b>-0.1</b>	<b>0.2</b>	<b>0.4</b>	<b>0.4</b>	<b>0</b>	<b>0.2</b>	<b>-0.1</b>	<b>0.1</b>	<b>-0.1</b>	<b>-0.1</b>
Unskilled	0.4	0.2	1.5	0.7	0.2	0.2	0.2	0.2	0.4	0.2
Skilled	-0.3	-0.4	-0.1	0	-0.4	-0.4	-0.3	-0.4	-0.3	-0.3
<b>All</b>	<b>1.1</b>	<b>1.4</b>	<b>0.9</b>	<b>1.1</b>	<b>1</b>	<b>1.3</b>	<b>1</b>	<b>1.3</b>	<b>1.1</b>	<b>0.9</b>
<b>UGANDA</b>										
Elementary	2.3	1.6	-0.2	-0.1	2.4	1.6	1.5	1.5	2.3	1.6
Unskilled	1.4	0.3	-0.1	-0.1	1.4	0.3	0.7	0.4	1.4	0.3
Skilled	-0.3	-0.5	0	-0.2	-0.2	-0.5	-0.3	-0.4	-0.3	-0.4
<b>All</b>	<b>0.8</b>	<b>0</b>	<b>0</b>	<b>-0.3</b>	<b>0.8</b>	<b>0</b>	<b>0.3</b>	<b>0</b>	<b>0.8</b>	<b>0.1</b>

We conclude that taking into account the productivity effects of increased openness can strongly influence our prediction concerning the wage impacts and, in particular, the gender wage gap effects. However, these impacts vary substantially between and within countries according to the relative participation of male and female workers in the sectors that experience the largest increases in openness.

## 6 Conclusion

Trade liberalization has far-reaching and complex impacts on small, open developing economies such as the four we consider here: Ghana, Honduras, Senegal, Uganda. The originality of this study is twofold. First, our analysis distinguishes male and female workers, in most cases by skill category and area (rural vs. urban), in order to bring out important gender differences in the impacts of trade liberalization. Second, we explicitly model the principal dynamic impacts of trade liberalization, which are widely held to outweigh the more traditional resource allocation effects generally examined, and trace out their differential effects on male and female workers. A sequential dynamic computable general equilibrium model is constructed for each country as the

only tool capable of capturing and allowing us to analyze the multiple and inter-connected mechanisms set in motion by a substantial trade policy reform.

While many further extensions to the modeling framework, more data work and more realistic trade policy scenarios for specific trade reforms are required before drawing any policy lessons, our analysis does suggest a number of important conclusions. First, trade liberalization is shown to deepen existing gender wage gaps in all three African countries, especially among unskilled workers, whereas it has a small but negative impact on the gender wage gap in Honduras. This reflects the fact that the African countries are more agricultural and, as outlined in the literature review, in agricultural economies female workers are more involved in import-competing activities such as food crops, whereas male workers are better able to take advantage of expanding export opportunities (e.g. cocoa, mining, etc.). In contrast, female workers are relatively more involved in export activities in the semi-industrial Honduran economy. Related to this is an increase in the wage premium to urban and skilled workers. To the extent that the poor are more likely to be female, rural and unskilled, these results raise concerns that trade liberalization may hurt the most vulnerable or disproportionately benefit the least vulnerable.

Second, the dynamic gains from trade drive the growth effects, primarily by the productivity/efficiency gains from increased openness, although a fall in capital good prices also makes a substantial contribution. Increased household and foreign savings, resulting from an increase in the returns to capital and, in the case of foreign savings, increased openness, play only a negligible role. Third, productivity/efficiency gains are found to generally increase the gender wage gap, as female workers derive a larger share of their wages from sectors where openness increases most under trade liberalization, either due to high initial tariff rates or a strong export response. However, these impacts vary substantially between and within (rural vs. urban) countries, underscoring the importance of country-level analysis.

## 7 References

Agarwal, J.P. (1980): "Determinants of Foreign Direct Investment: A Survey", *Weltwirtschaftliches Archiv* 116: 739-773

Arora V. and A. Bhundia (2003): Potential Output and Total Factor Productivity Growth in Post-Apartheid South Africa, WP/03/178, IMF, Washington DC

Asiedu, E. (2002): "On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?", *World Development* 30 (1): 107-119

Baldwin, R.E. (2005). 'Heterogeneous firms and trade: testable and untestable properties of the Melitz model', *NBER Working Paper 11471*, 1-25

Baldwin, R.E. and F. Robert-Nicoud (2006). 'Trade and growth with heterogeneous firms', *CEP Discussion Paper No 727*, 1-22.

Becker, G. S. (1959). "Union Restrictions on Entry". In P. D. Bradley, ed., *The Public Stake in Union Power*. Charlottesville: University of Virginia Press.

Bernard, A., J. Eaton, J. Jensen and S. Kortum (2003). 'Plants and productivity in international trade', *American Economic Review* 93, 1268-90.

Bhalla, S. (2002), "Imagine there's no country: poverty, inequality and growth in the era of globalization", Washington DC, Institute of International Economics.

Blake, A., A. McKay and O. Morrissey; (2001); "The Impact on Uganda of Agricultural Trade Liberalisation", CREDIT Research Paper No. 01/07.

Cockburn, J., B. Decaluwe and V. Robichaud (2007), "Trade Liberalization and Poverty - Lessons from Africa and Asia" in Trade and Investment Division (United Nations Economic Commission for Asia and the Pacific (UNESCAP)), Future Trade Research Areas That Matter To Developing Country Policymakers, Studies in Trade and Investment 61, UNESCAP. <http://www.unescap.org/publications/detail.asp?id=1254>

Cuesta (2004), "The 1997 Social Accounting Matrix (SAM) for Honduras", Institute of Social Studies, Netherlands.

de Melo, J. et J.-M. Grether (1997): *Commerce international – Théories et applications*, De Boeck Université, Bruxelles et Paris

Dollar, D. and A. Kraay (2001), "Growth Is Good for the Poor," World Bank Policy Research Department Working Paper No. 2587, Washington.

European Commission (EC, 2004), "EU market access opportunities for Ghana and position for EPA negotiations", Capacity building in support of preparation of Economic Partnership Agreement - 8 ACP TPS 110 / Project #043 ; Final Report

Fofana I. and F. Cabral (2007), "La Matrice de Comptabilité Sociale du Sénégal pour l'Année 2004", mimeo, PEP and CIRPEE, Université Laval.

Ghana Statistical Services (GSS) and IFPRI (2006), "A 2004 Social Accounting Matrix (SAM) for Ghana".

Gustafsson, P. and P. Segerstrom (2007). 'Trade liberalization and productivity growth', *CEPR Discussion Paper No 5894*, 1-36.

Helpman, E., M. Melitz and S.R. Yeaple (2004). 'Export versus FDI with heterogeneous firms', *American Economic Review* 94, 300-17.

Jonsson G. and A. Subramanian (2001): "Dynamic Gains from Trade: Evidence from South Africa", IMF Staff Papers 48 (1): 197-224

Kandiero, T. and M. Chitiga (2003): *Trade Openness and Foreign Direct Investment in Africa*, paper prepared for the Economic Society of Southern Africa 2003 Annual Conference, Cape Town. Published in *SAJEMS NS* 9 (2006), 3: 335-370

Keller, W. (2000). 'Do trade patterns and technology flows affect productivity growth?', *The World Bank Economic Review*, 14(1), 117-47.

Kim, E. (2000). 'Trade liberalization and productivity growth in Korean manufacturing industries: price protection, market power, and scale efficiency', *Journal of Development Economics* 61, 55-83.

Lizondo, J.S. (1990): *Foreign Direct Investment*, WP/90/63, Research Department, IMF, Washington, DC

Markusen, J.R. and L.E.O. Svensson (1985): "Trade in Goods and Factors with International Differences in Technology", *International Economic Review* 26: 175-192

Markusen, J.R. and J.R. Melvin (1988): *The Theory of International Trade*, Harper and Row, New York, NY

Martens, A. (2008a): "Trade Liberalization and Foreign Direct Investment (FDI) in Emerging Countries: An Empirical Survey", mimeo, Université de Montréal, Canada (forthcoming as a MPIA working paper at [www.pep-net.org](http://www.pep-net.org)).

Martens, A. (2008b): "Elasticity of Total Factor Productivity with Respect to Trade Openness in the Case of Emerging Countries: A Survey of Estimates", mimeo, Université de Montréal, Canada (forthcoming as a MPIA working paper at [www.pep-net.org](http://www.pep-net.org)).

Melitz, M. (2003). 'The impact of trade on intra-industry reallocations and aggregate industry productivity', *Econometrica* 71(6), 1695-1726.

Sala-i-Martin, X. (2002), "15 Years of New Growth Economics: What Have We Learnt?", Discussion Paper 0102-47, Department of Economics, Columbia University, New York, US.

Wade, R., 2004. "Is Globalization Reducing Poverty and Inequality?", *World Development*, Elsevier, vol. 32(4), pages 567-589, April.

Winters, A. (2004). 'Trade liberalization and economic performance: an overview', *The Economic Journal* 114, F4-F21.

Winters, A., N. McCulloch and A. McKay (2004), "Trade Liberalization and Poverty: the Evidence So Far", *Journal of Economic Literature*, XLII, p. 72-115.

Wong, K. (1986): "Are International Trade and Factor Mobility Substitutes?", *Journal of International Economics* 21 (1-2): 25-44.

Zhu, E. and J. Thurlow (2007). "A 2005 Social Accounting Matrix for Uganda", International Food Policy Research Institute, Washington DC.