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# The Evolution of Gender Wage Inequality in Senegal Following the Economic Partnership Agreements

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**Abstract:**

*There are considerable gender inequalities in the Senegalese labor market. As Senegal will open its trade with the European Union (EU) in the framework of the Economic Partnership Agreements (EPA), we can ask whether the new economic equilibrium will be associated with a rise or fall in labor-market gender inequality.*

*We here use the most recent data from the National Statistic and Demographic Agency of Senegal to analyze, in a prospective manner, the evolution of pay by gender following EPA trade opening. Our ex-ante analysis is based on a computable general equilibrium model that includes a gender dimension.*

*Our key finding is that, under the most likely hypothesis regarding the way in which lower Senegalese tariff revenues will be offset, trade opening will significantly increase population well-being, but at the same time increase the gender wage gap.*

**JEL classification:** C68, D58, D61, D63, D78, F13.

**Keywords:** Gender inequalities, Trade opening, CGEM, EPA, Senegal, Ex-ante evaluation, Public policy.

## 1. Introduction

In Senegal, the ratio of female to male wages is estimated to be between 0.50<sup>1</sup> and 0.70<sup>2</sup> for tasks requiring similar skills.

The International Labor Office (2011) suggests that gender wage inequality partly reflects professional segregation, which works against women who are mainly found in the informal sectors in Agriculture and Trade. For a similar level of skills, formal sector employers prefer men over women and, when the latter do find formal-sector employment, they are assigned to lower-paid lower-value jobs.

One potential reason for this segregation, as suggested by the World Bank (Banque Mondiale, 2007), is that it is harder for women to progress in the labor market as they are also responsible for an average of twenty hours of housework per week, compared to only four hours per week for men.

The Senegalese government demonstrated its political willingness to address this issue by complying with the guidelines for the Millennium Development Goals (MDG) and the Poverty Reduction Strategy Papers (PRSPs) and creating, on September 15<sup>th</sup> 2008,<sup>3</sup> the National Directorate of Equity and Gender Equality within the Ministry for the Family. The purpose of this Directorate is to legislate and implement policies dealing with gender equality, and to maintain a constructive dialogue with public and private stakeholders and society in general.

On the eve of Senegal's signature of the EPA with the EU, it seems timely to revisit the issue of gender wage inequality. The economic context will likely play a larger role in determining gender inequality than will the efforts already under way at the national level.

Senegal will over the next few years experiment with trade opening in the framework of the EPA. This contains the agreements that regulate trade relationships between the EU and ACP

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<sup>1</sup> The data come from Banque Mondiale (2007) and refer to the informal sector, which employs over ninety per cent of those in employment.

<sup>2</sup> These data are from World Economic Forum (2012).

<sup>3</sup> Decree No. 2008-1045.

countries. The negotiations on the ACP countries' side are divided up into six areas. Senegal belongs to the West Africa area, which includes the ECOWAS and Mauritania. According to the EU, the EPAs are required in order to comply with the rules of international trade. The previous agreement was deemed to be illegal as it transgressed the reciprocity rules.<sup>4</sup> Most ECOWAS countries have no incentive to conclude the agreement as their tariff barriers to enter the EU are already low. From this point of view, for them the agreement represents greater trade-opening without any EU compensation.<sup>5</sup> However, this opening seems to be unavoidable, given the forces in play.

The terms of this trade opening are a 75% drop in the tariff barriers on the trade of EU goods and services spread out over a 20-year period. This shift in the terms of trade will have a wide range of economic impacts. The Senegalese government will certainly react by offsetting the entailed loss of revenue via the choice of economic policies, households will change the composition of their shopping baskets, and firms will reallocate their resources and sectoral output. Overall, this opening will yield a new general equilibrium in the Senegalese economy, with likely repercussions on the labor market.

In view of the above, we can ask a key question: How will the EPA affect gender wage inequality in Senegal? At stake here is not only gender inequality itself but also the pathway for future growth in Senegal. Work on intrahousehold resource allocation has shown that positive shocks to women's income increase expenditure on children's goods (Bobonis, 2009; Lundberg, Pollak and Wales, 1997).

This central question not only requires us to set out the links between the degree of openness and workers' wages by gender, but also raises the issue of the direction of the change and the order of magnitude of the effects. The answers will be provided by the analysis of a computable general equilibrium model (CGEM).

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<sup>4</sup> Commission Européenne (2008).

<sup>5</sup> The ECOWAS area and Mauritania includes 13 Least Developed Countries that already enjoy free export access to EU markets through the Everything But Arms mechanism.

The literature which has addressed trade openness via CGEMs almost never considers gender (Section 2). Our work here therefore aims to fill the vacuum by analyzing the effect of the EPA opening on gender wage inequality in Senegal.

To carry out this analysis, we mainly use data provided by the National Agency of Statistics and Demography of Senegal, the World Bank and from the existing literature (see Section 3).

We use this data to construct a CGEM, the design and underlying hypotheses of which are set out in Section 4. We analyze two different cases. In the first scenario, the only public policy implemented is a cut in EU trade tariffs complying with the EPA's rules. In the second scenario, we assume that the loss of government revenue due to lower trade tariffs is offset by an increase in other indirect tax rates. We find that the rise in gender wage inequality is larger in the second scenario (see Section 5).

We discuss these results and those in the closest related literature in Section 6. Last, we conclude by drawing some lessons from the evidence that we have presented.

## **2. Related literature survey**

CGEM analyses of trade liberalization in Senegal generally conclude as to a positive effect from the opening of the economy (Annabi *et al.*, 2008; Calipel *et al.* (CERDI), 2006; Diagne *et al.*, 2007). The results in Fofana *et al.* (2006) are more mitigated, underlining that trade liberalization would be detrimental for rural households and would not reduce poverty in Senegal. Their explanation is that the Senegalese economy is dominated by the Agricultural sector, which is poorly positioned to benefit from cheaper imported inputs, and that imported consumer goods are only infrequently purchased by rural households.

Previous work has confirmed the usefulness of the CGEM in assessing the effect of trade opening but has mostly not considered gender, which is our central topic here. Cockburn *et al.* (2010), which will be described below, claim that they are the first to consider this question in Senegal with a CGEM. This lack of analysis is linked to the paucity of gender data over a long period in Senegal.

Considering this comparative dearth of literature, it is useful to enlarge the geographic scope to the work of Aguayo-Tellez *et al.* (2010) and Juhn *et al.* (2012), who analyze econometrically the change in gender inequality following the opening of trade in Mexico in the 1990s. Both find a beneficial effect of trade opening. As in Bussolo and De Hoyos (2009) and Doumbia and Meurs (2003), they cite Becker (1957) on the economics of discrimination. In this literature, the discrimination comes from the preferences of employers, who pay the preferred group more than its productivity.

The rise in competition following trade opening is to the advantage of firms that discriminate less, and discriminating firms cannot continue paying the extra cost to satisfy their preferences. An alternative explanation of gender wage differentials is that men and women have different comparative advantages. For example, men are stronger on average and are better paid in the building sector. Women, because of their average smaller body and hand sizes, have a comparative advantage in the production of tea (Qian, 2008). Aguayo-Tellez *et al.* (2010) and Juhn *et al.* (2012) distinguish between between-industry and within-industry effects in the change in the share of the wage bill allocated to women after trade opening. We believe that this is a useful method to establish the appropriate public policy to tackle gender inequality and will use it in our analysis below. The between-industry effect (the first term in the equation below) is the change in the share of the wage bill allocated to women due to the shift in production needs across sectors (the ratio of  $E_{it-1}$  to  $E_{t-1}$ ) that are more or less female-intensive (the first ratio in the equation), while the within-industry effect (the second term) is the change in the share of the overall wage bill allocated to women inside the sectors (the first ratio after the plus sign) weighted by the relative importance of the sectors (the ratio of  $E_{it}$  to  $E_t$ ).<sup>6</sup>

$$\text{Shift\_in\_Female\_Share} = \sum_i (E_{it-1}^f / E_{it-1}) \times [\Delta(E_{it} / E_t)] + \sum_i [\Delta(E_{it}^f / E_{it})] \times (E_{it} / E_t)$$

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<sup>6</sup> Note that there is an error in this equation. The subscript of the first ratio should be  $t$  while that of the fourth ratio should be  $t-1$ .

Focusing on the effects of trade opening in Senegal, and especially on women, the only contribution to our knowledge is Cockburn *et al.* (2010). They appeal to a CGEM with a 15-year spread horizon, with a microsimulation part to analyze poverty. They use a social-accounting matrix for 2004 and microsimulation data from the second Senegalese Household Survey (ESAM II, 2001-2002).

Their conclusion is that liberalization has a positive effect on growth, reducing poverty but increasing the gender wage gap. This latter result reflects the greater proportion of women in net importing sectors, which suffer from greater competition after trade opening, while net exporting sectors, which benefit from the stimulating effects of trade opening, are more male-labor intensive.

However, this work did not focus on the specific case of EPA opening, and so considered overall liberalization without distinguishing between EU and non-EU opening, which is not the case in our work here.

### **3. Database**

The modeling of the gender effects of the opening is carried out via a CGEM, which allows for comparative static analysis. A number of data resources are required as inputs into this model.

The social-accounting matrix comes from the Agence Nationale de la Statistique et de la Démographie (ANSD), which itself includes data from various national accountancy documents.<sup>7</sup> The reference year is 2005. We aggregate sectors in the latter matrix to reflect the sector groups in the ESSAM II survey (Direction de la Prévision et de la Statistique Sénégalaise, 2004), from which we take the workforce split by gender. We apply a sectoral growth rate taken from World Bank (2005) to the number of employees in each sector to reflect the three-year lag between our two data sources. We are equally able to distinguish between qualified and unqualified labor thanks to the data from the follow-up survey of poverty in Senegal (ANSD, 2005). We obtain the share of wages of each group (qualified

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<sup>7</sup> For more details on the documents used by ANSD see Sénégal (2011).



women, unqualified women, qualified men and unqualified men) from the data from the World Bank (2007). It was not possible to determine the value of the free parameters of the model due to the dearth of associated empirical work in Senegal. The lack of econometric work using the CET production function and CES consumption function in Senegal was underlined in Calipel *et al.* (2006) on the overall effect of the EPA in Senegal. We have thus adopted the figures in Diagne *et al.* (2007) on the basis of their analysis of the elasticities used by Decaluwé *et al.* (2001) for Senegal and Dorosh *et al.* (1996) for Niger. We also take the elasticity value (0.5) used by Fontana (2004) for the CES labor-demand functions for two Least-Developed Countries, Bangladesh and Zambia.

To separate trade-tariff revenue from other indirect tax revenues, we use data from the Senegalese Ministry of Finance made available by the African Development Bank (2010). The share of UE imports in total Senegalese imports is around 44%, according to UN comtrade (2014). EPA trade liberalization is not total, as 25% of the trade barrier can be kept. The choice of this residual tariff will be made at the regional level. We approximate these regional choices using recent data on the ECOWAS Common Exterior Tariff (De Roquefeuil, Plunkett and Ofei, 2014) to create a preference vector regarding tariffs. This vector was then used in the simulation part of our model in order to differentiate the trade shocks by sector.

Our data shows, in line with other work on the Senegalese labor market (Banque Mondiale, 2007; ILO, 2011) that the Agricultural sector dominates in terms of employment, representing over 57% of the working population. Home Trade and Administrative Services and Services to Individuals are also important sectors, with analogous figures of 15% and 8%.

Men are in the majority (55%) of the Senegalese workforce. There are strong gender differences across sectors. The Trade and Catering and Hotels sectors employ more women, whereas there are hardly any women in the Construction and Public Works, Extraction and Transport and Communication sectors.

We now consider the additional labor-market dimension of workers' wages. Obviously, taking wages into account exacerbates labor-market inequality in favor of men. This can be measured by the share of the wage bill captured by women. Women account for only

25.20% of the wage bill in the economy (Table 1). We will measure the change in gender wage inequality via this share. We note that the main source of women's revenues in absolute terms is the Trade sector, followed by Administrative Services and Service to Individuals and then Agriculture, even though their share of the wage bill is only 43.94%, 34.61% and 30.91% respectively in these sectors. Changes in these sectors could then potentially have large effects on women's revenues. Conversely, all else equal, shocks to the Extraction or Construction and Public Works sectors are not expected to have that much of an effect on women's revenues. Insofar as we look at trade-tariff shocks, we imagine that the gender wage inequality results will depend on the sectors' degree of openness. We will see below that the results actually reflect a more indirect logic.

#### **4. The general-equilibrium model**

The theoretical framework is Neoclassical Walrasian General Equilibrium. The model is built up from eight equation blocks: for production and intermediate consumption, income and savings, demand, foreign trade, prices, macro-equilibrium, utility and fictive maximization.

This model, implemented using GAMS, is inspired by the models in Decaluwé *et al.* (2001). We have to however adapt these to reflect our core question. As such, the labor account in the social-accounting matrix is disaggregated into four by worker gender and qualification. In addition, the tradeoffs for worker gender and qualifications are modeled via CES functions, as in Cockburn *et al.* (2010).

In order for us to model labor-market behavior following trade shocks, we have to make assumptions about the functioning of the whole economy. CGEMs have two components: a microeconomic part, where agents act in order to maximize their utility, and a macroeconomic part, which sets out the macroeconomic constraints that have to hold (Suwa-Eisenmann, 1991). The way in which this macroeconomic part is set out is called macroeconomic closure. In neoclassical macroeconomic closure, labor supply for each labor category (by gender and by qualification) is considered to be fixed via the assumption of full employment. We consider this assumption unsuitable in the context of the Senegalese economy. The data sources we appeal to here indicate the presence of unemployment in Senegal. As such, we adopt Keynesian macroeconomic closure, as this allows for the

presence of unemployment. With unemployment being estimated to be around 10%, we set an upper bound on the potential rise in employment of 11%<sup>8</sup> for our ad hoc variable  $u$ , which represents a uniform potential rise in working hours in all labor markets compared to the reference period. Apart from this, the workforce can move from one sector to another, but workers cannot shift from one labor category to another. The other fundamental factor, namely capital, is sector-specific, so that it is fixed in our model.

The CFA Franc is the common currency of the eight countries in the West African Economic and Monetary Union (WAEMU). This currency is pegged to the Euro, which justifies our assumption of a fixed exchange rate in our model. We consequently are required to make the variable for savings from abroad endogenous in order to balance the current account.

In the base scenario, the different direct and indirect tax rates in the economy are fixed. However, insofar as Government revenue is exogenous in the second simulation, all indirect taxes other than tariff barriers are allowed to adjust by the same percentage in order to raise the required level of Government revenue. Government consumption and the transfers between economic agents are also fixed.

The central assumption, allowing us to compare the results from the GAMS program and the data for the reference year, is the hypothesis of general equilibrium in the economy for the reporting year of the Social Accounting Matrix.

Senegal is a small country, and we assume that its economy has no influence on world prices, which are hence considered exogenous. As the EU is Senegal's main trade partner, we may think that the EPA will improve Senegalese exports due to better access to the EU market. We do not take this effect into consideration, because Senegal is a Least-Developed Country and thereby already benefits from cheaper access to the EU market.<sup>9</sup> The EPA implementations are then equivalent to a unilateral extra-opening of the market to European production.

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<sup>8</sup> The potential increase is 11% when the unemployment rate is at 10%: 10% divided by 90% is about 11%.

<sup>9</sup> For more details, see the EU program Everything But Arms (EBA).

Regarding foreign trade, we adopt the Armington hypothesis of imperfect substitutability between similar goods from different places of origin (represented using a CES function in our model). Economic agents operate under this constraint and maximize their utility. The tradeoff between local goods and imported goods leads to the composition of total demand.

We also assume imperfect substitutability between the destination markets for production, i.e. the domestic and foreign markets, via the use of a CET function. Under this constraint, producers maximize their incomes taking relative prices into consideration for each good type.

We use a Leontief production function, and intermediate consumption is derived from the technical coefficients of the Leontief function. We use a Cobb-Douglas function for value added (VA).

$$VA(i) = A(i) * [LDC1NQ(i)^{\nu(i)} \times LDC2(i)^{(1-\nu(i))}]$$

The two factors in the Cobb-Douglas function are unqualified gender-compounded labor (LDC1NQ) and a composite factor of capital and qualified gender-compounded labor (LDC2).

Qualified and unqualified labor are calculated via a CES function in a first stage as a function of male (LDMQ if qualified, LDMNQ otherwise) and female (LDFQ if qualified, LDFNQ otherwise) workers.

$$LDC1NQ(i) = AGNQ(i) \times \{ [\delta gNQ(i) \times [LDFNQ(i)]^{\phi g(i)}] + [(1-\delta gNQ(i)) \times [LDMNQ(i)]^{\phi g(i)}] \}^{(1/\phi g(i))}$$

and

$$LDC1Q(i) = AGQ(i) \times \{ [\delta gQ(i) \times [LDFQ(i)]^{\phi g(i)}] + [(1-\delta gQ(i)) \times [LDMQ(i)]^{\phi g(i)}] \}^{(1/\phi g(i))}$$

Qualified gender-compounded labor is interacted with capital to produce a second CES factor.

$$LDC2(i) = AQ(i) \times \{ [\delta q(i) \times [LDC1Q(i)]^{\phi q(i)}] + [(1-\delta q(i)) \times [K(i)]^{\phi q(i)}] \}^{(1/\phi q(i))}$$

The other blocks of equations are similar to those in Decaluwé *et al.* (2001).

## 5. Use of the model and main results

We simulate two scenarios. In the first, we introduce the shock of an average 75% fall in tariff barriers on EU imports. In this simulation, EU tariff barriers are the only variable that changes, with all of the other exogenous variables remaining at their initial equilibrium levels.

The second scenario is inspired by the existing literature, which suggests that lower Government revenue from tariffs will be offset by an increase in other indirect goods taxes. We retain an average 75% fall in tariff barriers on EU imports, and in addition consider that Government revenue remains unchanged from its initial equilibrium level. We thus allow for flexible indirect tax rates.<sup>10</sup>

By definition, in the second simulation, Government revenue does not change. Conversely, in the first scenario, we cannot *a priori* predict the direction in which revenue changes. All else equal, this change depends on the relative size of the effects from the fall in tariff barriers and the potential rise in the import tax base, of which the EU component will become cheaper thus stimulating consumer demand. Another dimension to the problem comes from the fact that, in a CGEM, all other things do not remain equal with many effects, sometimes acting simultaneously in different directions, taking place. CGEMs are able to produce figures for these simultaneous effects, so that we can see which dominates.

In the first simulation, as expected, imports rise in a number of sectors: by 6.8% in the Banking and Insurance sector, 5.7% in Transport and Communication, and 5.4% in Food Processing, Beverages and Tobacco. This growth is of course led by European imports, the prices of which fall in a range from 0.1 % to 14.4%, depending on the sector.

We can also ask whether trade opening stimulates the other side of the trade balance, i.e. exports. This turns out to be the case with, for instance, exports in the Fishery, Food Processing, Beverages, Tobacco and Hotels and Restaurants sectors climbing by 7.9%, 7.4% and 4.1% respectively. These increases are explained by producers, who prefer to sell a

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<sup>10</sup> Indirect taxes become flexible by endogenizing the variable representing a homogeneous shift in indirect tax rates across the different sectors of the economy.

greater share of their goods to foreigners following the downturn in local prices (of 1.8%, 1.5% and 0.9% respectively). Meanwhile export prices, which depend on international market prices, remained unchanged. Even though exports as a whole rise, we note a fall in exports in the Banking and Insurance sector of 5.4%. This can be explained by the rise in local prices in this sector (of 2.4%), creating incentives for producers to reallocate a share of their output towards the local market.

At this stage, we should also underline that the changes in exports and imports do not only reflect producer behavior, following local and international prices. We also need to look at the changes in the amount produced across sectors to understand these movements.

Gross Domestic Product overall rises by 0.3%, led by a rise in output of 2.9% in Trade, 2.7% in Food Processing, Beverages and Tobacco, and 1.9% in Manufacturing. The change in relative prices (local versus export prices) therefore yields a split in the rise in output between exports and quantities destined for the local market, with a bias in favor of exports. These rises in production can be explained by the changes in the components of domestic demand. We in particular find that household consumption rises by 3.6% for Trade and 3.5% for both Manufacturing and Food Processing, Beverages and Tobacco. Intermediate demand rises by 3.3% for Food Processing, Beverages and Tobacco, 2.5% for Trade and 1.7% for Manufacturing. A mitigating factor, for the traded goods sectors in general, is that part of the consumption purchased contains relatively more imports and fewer domestic products. For example, while overall consumption in the Food Processing, Beverages and Tobacco sector rises by 3.3%, domestic consumption rises by only 2.4% but imports by 5.4%. This once again reflects the change in relative prices: in this sector, the prices of domestic products fall by 0.9% but those of imports fall by 2.5%. The rise in intermediate consumption of the same proportion in all sectors results from our use of a Leontief function to model production. The explanations of these changes in production bring us closer to the central issue of our paper.

The shifts in the labor market are mainly due to two phenomena. On the one hand, a general trend is that growing sectors take workers from the sectors that are doing less well. For example, the Building and Public Works sector is that which experiences the lowest growth following trade opening (0.1%), and consequently loses 8.8% of its qualified workforce.

Similarly, the Administrative Services and Services to Individuals sector, which registers only 1.6% growth, loses 10.7% of its qualified workforce. Conversely, the fastest-growing sectors, Fishing (5.6%) and Hotels and Restaurants (6.1%), increase their unqualified workforce by 10.2% and 12.6% respectively. On the other hand, as we chose Keynesian macro-closure, the unemployed are considered as potential labor-market entrants and the neo-classical full-employment assumption is relaxed. Our ad hoc variable  $\nu$  registers a rise of 6.6% of the workforce in all labor-market categories. This arrival of a considerable number of workers in the economy leads to a fall in wages for the different categories of labor: the wages of qualified men, qualified women, unqualified men and unqualified women fall by 0.4%, 0.5%, 4.2% and 4.9% respectively. Even though, by assumption, the change in employment is the same in workforce categories and the change in wages is similar for men and women within qualification category, we should bear in mind the initial level of wages by gender in the qualified and unqualified labor markets to assess the effect of these changes on the gender gap.

In the unqualified labor market, women initially receive 33.5% of the remuneration, while this figure is only 14.3% in the qualified labor market. Hence the relatively unfavorable shift in wages for unqualified workers, compared to those for qualified workers, increases the gender wage gap.

A fall of 1.15% in women's share of the wage bill is seen (Table 1) when we use the method adopted by Aguayo-Tellez *et al.* (2010) and Juhn *et al.* (2012)<sup>11</sup> presented above. We adapt this method to measure relative instead of absolute changes to reflect the way the changes in all the economic variables are measured in a CGEM. This fall of 1.15% is almost entirely due to a between-sector effect. The relative gain of the Other Market Services and Manufacturing sectors, at the expense of Trade and Administrative Services and Services to Individuals, reduces women's wage bill share, as the first two sectors are more in favor of men in this sense than are the latter two.

Breaking down the overall labor market into its qualified (Table 2) and unqualified (Table 3) components reveals the sources of this growing gender inequality.

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<sup>11</sup> For more details, see the related literature survey section above.

**Table 1:** The shift in women's share of the wage bill (Simulation 1/Whole Labor Market).

Period	Reference (1)			After Trade Opening (2)			% Change $[(2)-(1))/(1)$			Decomposition of change in women's share		
Sector	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Between Effect for Women	Within Effect for Women	Total Effect
Agriculture, Farming and Forestry	227	30.91%	10.33%	232	30.87%	10.17%	2.08%	-0.13%	-1.52%	-0.19%	-0.02%	-0.21%
Fishery	64	10.47%	2.91%	66	10.53%	2.91%	3.61%	0.50%	-0.05%	0.00%	0.01%	0.01%
Extraction	19	2.09%	0.87%	19	2.09%	0.84%	0.33%	0.16%	-3.21%	0.00%	0.00%	0.00%
Food Processing, Beverages, Tobacco	138	30.43%	6.26%	145	30.15%	6.37%	5.38%	-0.93%	1.66%	0.12%	-0.07%	0.05%
Manufacturing	188	7.51%	8.54%	201	7.45%	8.81%	6.87%	-0.76%	3.10%	0.08%	-0.02%	0.06%
Water, Electricity and Gas	18	7.14%	0.83%	19	7.12%	0.82%	2.42%	-0.34%	-1.19%	0.00%	0.00%	0.00%
Building and Public Works	97	1.14%	4.41%	90	1.15%	3.95%	-7.07%	1.15%	-10.35%	-0.02%	0.00%	-0.02%
Trade	482	43.94%	21.94%	489	43.80%	21.45%	1.34%	-0.32%	-2.24%	-0.85%	-0.12%	-0.98%
Hotels and Restaurants	32	45.68%	1.47%	34	46.08%	1.48%	4.00%	0.87%	0.33%	0.01%	0.02%	0.03%
Transport and Communication	279	2.65%	12.69%	282	2.66%	12.36%	0.92%	0.28%	-2.65%	-0.04%	0.00%	-0.03%
Banking and Insurance	54	18.63%	2.47%	55	18.59%	2.40%	0.78%	-0.26%	-2.77%	-0.05%	0.00%	-0.06%
Other Market Services	234	20.27%	10.64%	306	19.19%	13.41%	30.70%	-5.35%	26.09%	2.11%	-0.46%	1.66%
Administrative Services and Services to Individuals	366	34.61%	16.64%	343	35.51%	15.04%	-6.31%	2.60%	-9.62%	-2.25%	0.59%	-1.66%
<b>Total /Weighted share</b>	<b>2 198</b>	<b>25.20%</b>		<b>2 279</b>	<b>24.91%</b>		<b>3.66%</b>	<b>-1.15%</b>		<b>-1.09%</b>	<b>-0.06%</b>	<b>-1.15%</b>

Sources: Table constructed from the results of the CGEM.



**Table 2:** The shift in women's share of the wage bill (Simulation 1/Qualified Labor Market).

Period	Reference (1)			After Trade Opening (2)			% Change $[(2)-(1)]/(1)$			Decomposition of change in women's share		
Sector	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Between Effect for Women	Within Effect for Women	Total Effect
Agriculture, Farming and Forestry	25	19.84%	2.60%	25	19.83%	2.44%	-0.44%	-0.05%	-6.14%	-0.22%	0.00%	-0.22%
Fishery	19	5.92%	1.95%	18	5.92%	1.83%	-0.88%	-0.03%	-6.56%	-0.05%	0.00%	-0.05%
Extraction	10	1.02%	1.03%	10	1.01%	0.97%	-0.70%	-0.30%	-6.39%	0.00%	0.00%	0.00%
Food Processing, Beverages, Tobacco	63	18.56%	6.58%	67	18.55%	6.69%	7.85%	-0.05%	1.67%	0.14%	0.00%	0.14%
Manufacturing	109	6.06%	11.47%	119	6.05%	11.80%	9.10%	-0.06%	2.85%	0.14%	0.00%	0.14%
Water, Electricity and Gas	12	7.38%	1.28%	12	7.38%	1.20%	-0.43%	-0.01%	-6.14%	-0.04%	0.00%	-0.04%
Building and Public Works	59	0.68%	6.16%	53	0.68%	5.27%	-9.24%	-0.02%	-14.44%	-0.04%	0.00%	-0.04%
Trade	102	29.55%	10.75%	105	29.54%	10.45%	3.08%	-0.04%	-2.82%	-0.63%	-0.01%	-0.64%
Hotels and Restaurants	14	31.91%	1.48%	14	31.90%	1.39%	-0.49%	-0.04%	-6.19%	-0.20%	0.00%	-0.21%
Transport and Communication	157	1.85%	16.52%	156	1.85%	15.51%	-0.43%	-0.06%	-6.13%	-0.13%	0.00%	-0.13%
Banking and Insurance	40	19.40%	4.23%	40	19.39%	3.97%	-0.50%	-0.04%	-6.20%	-0.36%	0.00%	-0.36%
Other Market Services	130	15.52%	13.63%	200	15.51%	19.79%	54.08%	-0.05%	45.25%	6.68%	-0.01%	6.68%
Administrative Services and Services to Individuals	212	21.18%	22.31%	188	21.17%	18.70%	-11.09%	-0.05%	-16.18%	-5.34%	-0.02%	-5.36%
<b>Total /Weighted share</b>	<b>950</b>	<b>14.31%</b>		<b>1 008</b>	<b>14.30%</b>		<b>6.08%</b>	<b>-0.10%</b>		<b>-0.06%</b>	<b>-0.05%</b>	<b>-0.10%</b>

Sources: Table constructed from the results of the CGEM.

**Table 3: The shift in women's share of the wage bill (Simulation 1/Unqualified Labor Market).**

Period	Reference (1)			After Trade Opening (2)			% Change $[(2)-(1)]/(1)$			Decomposition of change in women's share		
Sector	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Between Effect for Women	Within Effect for Women	Total Effect
Agriculture, Farming and Forestry	202	32.26%	16.22%	207	32.18%	16.31%	2.39%	-0.25%	0.56%	0.09%	-0.04%	0.05%
Fishery	45	12.33%	3.64%	48	12.30%	3.77%	5.44%	-0.32%	3.56%	0.05%	0.00%	0.04%
Extraction	9	3.23%	0.75%	9	3.21%	0.74%	1.42%	-0.41%	-0.39%	0.00%	0.00%	0.00%
Food Processing, Beverages, Tobacco	75	40.29%	6.03%	78	40.21%	6.12%	3.32%	-0.22%	1.48%	0.11%	-0.02%	0.09%
Manufacturing	79	9.52%	6.31%	82	9.49%	6.44%	3.78%	-0.33%	1.93%	0.03%	-0.01%	0.03%
Water, Electricity and Gas	6	6.67%	0.48%	6	6.64%	0.51%	8.23%	-0.45%	6.30%	0.01%	0.00%	0.01%
Building and Public Works	38	1.82%	3.08%	37	1.82%	2.91%	-3.76%	-0.39%	-5.48%	-0.01%	0.00%	-0.01%
Trade	380	47.82%	30.45%	383	47.73%	30.17%	0.87%	-0.19%	-0.93%	-0.40%	-0.08%	-0.49%
Hotels and Restaurants	18	56.28%	1.47%	20	56.19%	1.55%	7.45%	-0.16%	5.54%	0.14%	0.00%	0.13%
Transport and Communication	122	3.69%	9.78%	125	3.68%	9.86%	2.64%	-0.34%	0.81%	0.01%	0.00%	0.01%
Banking and Insurance	14	16.43%	1.12%	15	16.38%	1.15%	4.46%	-0.31%	2.60%	0.01%	0.00%	0.01%
Other Market Services	104	26.17%	8.36%	106	26.10%	8.35%	1.68%	-0.27%	-0.14%	-0.01%	-0.02%	-0.03%
Administrative Services and Services to Individuals	154	53.12%	12.32%	154	53.03%	12.14%	0.28%	-0.17%	-1.51%	-0.29%	-0.03%	-0.33%
<b>Total /Weighted share</b>	<b>1 248</b>	<b>33.49%</b>		<b>1 271</b>	<b>33.33%</b>		<b>1.81%</b>	<b>-0.48%</b>		<b>-0.27%</b>	<b>-0.21%</b>	<b>-0.48%</b>

Sources: Table constructed from the results of the CGEM.

Tables 2 and 3 reveal that the between-sector effects described above are larger in size than the within-sector effects in the qualified labor market, although these between-sector effects tend to cancel each other out at the whole qualified labor-market level. The addition of small between and within effects in the various sectors of the unqualified labor market produces a significant total effect.

However, these tables do not provide the whole story of how the total change of -1.15% in women's share of the wage bill comes about. For this, we need to know how the relative weight of each category in the labor market changes and the initial women's wage-bill share gap between the qualified and unqualified labor markets.

The change in women's share of the wage bill is the difference in their share before (period 0) and after (period 1) the trade shock:

Let  $WRF_t$  be women's share of the wage bill in period  $t$ .

The change in this share is then 
$$DWRF = \frac{WRF_1 - WRF_0}{WRF_0}$$

Let  $WRF_{qt}$  and  $WRF_{nqt}$  be women's share of the wage bill in period  $t$  in the qualified and unqualified labor markets respectively. Let  $w_{qt}$  and  $w_{nqt}$  be the share of wages in period  $t$  of qualified and unqualified workers respectively, with  $(w_{qt} + w_{nqt}) = 1$ .

Hence, 
$$DWRF = (w_{q1} \times \frac{WRF_{q1}}{WRF_0} + w_{nq1} \times \frac{WRF_{nq1}}{WRF_0}) - (w_{q0} \times \frac{WRF_{q0}}{WRF_0} + w_{nq0} \times \frac{WRF_{nq0}}{WRF_0})$$

Let  $DWRF_{q1}$  and  $DWRF_{nq1}$  be the analogous changes in women's share of the wage bill between periods 0 and 1 in the qualified and unqualified labor markets respectively.

Then, 
$$DWRF = (w_{q1} \times \frac{DWRF_{q1}}{WRF_0} + w_{nq1} \times \frac{DWRF_{nq1}}{WRF_0}) + (w_{q1} - w_{q0}) \times \frac{WRF_{q0}}{WRF_0} + (w_{nq1} - w_{nq0}) \times \frac{WRF_{nq0}}{WRF_0}$$

Here  $(w_{q1} - w_{q0})$  and  $(w_{nq1} - w_{nq0})$  are the changes in the share of the wage bill captured by qualified and unqualified workers respectively. As  $(w_{qt} + w_{nqt}) = 1$ , we are in a zero-sum game situation, so that  $(w_{q1} - w_{q0}) = - (w_{nq1} - w_{nq0})$ . Let this difference be equal to  $\alpha$ .

We conclude that 
$$DWRF = (w_{q1} \times \frac{DWRF_{q1}}{WRF_{q0}} \times \frac{WRF_{q0}}{WRF_0} + w_{nq1} \times \frac{DWRF_{nq1}}{WRF_{nq0}} \times \frac{WRF_{nq0}}{WRF_0}) + \alpha \left( \frac{WRF_{q0} - WRF_{nq0}}{WRF_0} \right)$$

The change in women's share of the wage bill then consists of, first, the change in this share in the qualified and unqualified labor markets weighted by the product of the relative share of these markets in period 1 and 0 and, second, by the change in the relative weights of the qualified labor market ( $\alpha$ ) times the initial gap between the qualified and unqualified labor markets in terms of women's share of the wage bill.

Replacing the various terms in the equation by the corresponding figures from the CGEM, we obtain:

$$-1.15\% = (-0.03\% + -0.36\%) + 1.01\% \times (-76.11\%)$$

This demonstrates what we observed and described in the first part of our comments regarding the gender ratio: the change in the gender wage-bill gap is mainly due to the exacerbation of the initial gender wage gap by the rise in the share of the wage bill going to the qualified labor market where there are marked gender discrepancies (-0.77%). Even though there is a significant unqualified labor market effect from the summation of small between and within effects from various sectors and, the unqualified labor market is larger than the qualified labor market, this still plays only a secondary role (-0.36%).

In the second simulation, as a result of a higher growth, we obtain a rise of 11% in the workforce in all labor-market categories. As a considerable number of workers arrive on the labor market, the wage rates of the different categories of labor fall: by 1.1%, 0.5%, 7.2% and 11.2% respectively for qualified men, qualified women, unqualified men and unqualified women. For the same reasons as those noted in simulation 1, the unfavorable shift in wages for unqualified work in favor of qualified work increases the wage gap between men and women. In this second scenario, women's share of the overall wage bill is reduced by 3.46% (Table 4).

**Table 4:** The shift in women's share of the wage bill (Simulation 2/Whole Labor Market).

Period	Reference (1)			After Trade Opening (2)			% Change $[(2)-(1)]/(1)$			Decomposition of change in women's share		
Sector	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Between Effect for Women	Within Effect for Women	Total Effect
Agriculture, Farming and Forestry	227	30.91%	10.33%	243	30.59%	10.52%	7.02%	-1.04%	1.81%	0.23%	-0.13%	0.10%
Fishery	64	10.47%	2.91%	70	10.49%	3.05%	10.01%	0.18%	4.65%	0.06%	0.00%	0.06%
Extraction	19	2.09%	0.87%	21	2.16%	0.90%	8.92%	3.52%	3.62%	0.00%	0.00%	0.01%
Food Processing, Beverages, Tobacco	138	30.43%	6.26%	159	29.59%	6.87%	15.25%	-2.77%	9.64%	0.71%	-0.21%	0.50%
Manufacturing	188	7.51%	8.54%	206	7.39%	8.91%	9.63%	-1.62%	4.30%	0.11%	-0.04%	0.07%
Water, Electricity and Gas	18	7.14%	0.83%	19	7.10%	0.83%	4.80%	-0.55%	-0.30%	0.00%	0.00%	0.00%
Building and Public Works	97	1.14%	4.41%	86	1.15%	3.73%	-11.07%	0.90%	-15.40%	-0.03%	0.00%	-0.03%
Trade	482	43.94%	21.94%	456	43.35%	19.72%	-5.49%	-1.35%	-10.09%	-3.81%	-0.52%	-4.33%
Hotels and Restaurants	32	45.68%	1.47%	34	46.01%	1.48%	5.37%	0.73%	0.24%	0.01%	0.02%	0.03%
Transport and Communication	279	2.65%	12.69%	310	2.57%	13.41%	11.03%	-3.29%	5.62%	0.07%	-0.04%	0.03%
Banking and Insurance	54	18.63%	2.47%	55	18.55%	2.37%	0.86%	-0.47%	-4.05%	-0.07%	-0.01%	-0.08%
Other Market Services	234	20.27%	10.64%	237	20.24%	10.26%	1.37%	-0.15%	-3.56%	-0.30%	-0.01%	-0.32%
Administrative Services and Services to Individuals	366	34.61%	16.64%	415	32.77%	17.97%	13.53%	-5.31%	8.00%	1.73%	-1.21%	0.52%
<b>Total /Weighted share</b>	<b>2 198</b>	<b>25.20%</b>		<b>2 311</b>	<b>24.33%</b>		<b>5.12%</b>	<b>-3.46%</b>		<b>-1.30%</b>	<b>-2.15%</b>	<b>-3.46%</b>

Sources: Table constructed from the results of the CGEM.

This change mainly reflects within-sector movements (2.15% out of 3.46%). It is the Trade and Administrative Services and Services to Individuals sectors that have seen their evolution accompanied by a slower fall and a faster rise in the wage bill for men than for women.

There is also a significant between-sector effect (1.30% out of 3.46%), which is explained by two contradictory shifts. One is for Trade, which declines and consequently loses 10.09% in the relative weighting of the sectors. As Trade is a sector where remuneration is relatively equal (women's share of the wage bill is 44%), its decline reduces women's share of the wage bill (by 3.81%). Fortunately, this effect is partly counter-balanced by the rise of the Administrative Services and Services to Individuals (1.73%) and Food Processing, Beverages and Tobacco (0.71%) sectors, where women's share of the wage bill is above average.

Within qualified workers (Table 5), we find, surprisingly, a slight positive total effect of trade opening on the gender gap (+0.53%). This comes from the sum of small between-sector and within-sector effects. The within-sector effect (+0.24%) is due to the sum of small changes (when considered individually) in a number of sectors. The between effect (+0.28%) reflects the fall in the relative share for women due to the lower growth in the Trade and Other Market Services sectors (-3.67%), being offset by the positive movements in the Administrative Services and Services to Individuals and Food Processing, Beverages and Tobacco sectors (+5.15%). A number of other sectors also contribute in a small way.

**Table 5: The shift in women's share of the wage bill (Simulation 2/Qualified Labor Market).**

Period	Reference (1)			After Trade Opening (2)			% Change $[(2)-(1)]/(1)$			Decomposition of change in women's share		
Sector	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Between Effect for Women	Within Effect for Women	Total Effect
Agriculture, Farming and Forestry	25	19.84%	2.60%	24	19.89%	2.34%	-1.17%	0.24%	-10.05%	-0.36%	0.01%	-0.35%
Fishery	19	5.92%	1.95%	18	5.94%	1.76%	-1.09%	0.27%	-9.98%	-0.08%	0.00%	-0.08%
Extraction	10	1.02%	1.03%	10	1.02%	0.93%	-1.28%	0.29%	-10.15%	-0.01%	0.00%	-0.01%
Food Processing, Beverages, Tobacco	63	18.56%	6.58%	76	18.61%	7.31%	22.17%	0.25%	11.19%	0.96%	0.02%	0.98%
Manufacturing	109	6.06%	11.47%	123	6.07%	11.77%	12.73%	0.29%	2.60%	0.13%	0.01%	0.14%
Water, Electricity and Gas	12	7.38%	1.28%	13	7.40%	1.20%	2.67%	0.32%	-6.55%	-0.04%	0.00%	-0.04%
Building and Public Works	59	0.68%	6.16%	50	0.69%	4.80%	-14.32%	0.38%	-22.02%	-0.07%	0.00%	-0.06%
Trade	102	29.55%	10.75%	101	29.61%	9.69%	-1.01%	0.22%	-9.91%	-2.20%	0.05%	-2.16%
Hotels and Restaurants	14	31.91%	1.48%	14	31.98%	1.34%	-0.84%	0.20%	-9.75%	-0.32%	0.01%	-0.32%
Transport and Communication	157	1.85%	16.52%	184	1.85%	17.65%	17.39%	0.31%	6.84%	0.15%	0.01%	0.15%
Banking and Insurance	40	19.40%	4.23%	40	19.45%	3.81%	-1.04%	0.25%	-9.93%	-0.57%	0.01%	-0.56%
Other Market Services	130	15.52%	13.63%	128	15.56%	12.27%	-1.06%	0.26%	-9.95%	-1.47%	0.04%	-1.44%
Administrative Services and Services to Individuals	212	21.18%	22.31%	262	21.23%	25.13%	23.77%	0.24%	12.65%	4.19%	0.08%	4.27%
<b>Total /Weighted share</b>	<b>950</b>	<b>14.31%</b>		<b>1 044</b>	<b>14.39%</b>		<b>9.87%</b>	<b>0.53%</b>		<b>0.28%</b>	<b>0.24%</b>	<b>0.53%</b>

Sources: Table constructed from the results of the CGEM.

**Table 6: The shift in women's share of the wage bill (Simulation 2/Unqualified Labor Market).**

Period	Reference (1)			After Trade Opening (2)			% Change $[(2)-(1)]/(1)$			Decomposition of change in women's share		
Sector	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Total Remuneration (10 <sup>9</sup> FCFA)	Women's Share (%)	Sector Weight	Between Effect for Women	Within Effect for Women	Total Effect
Agriculture, Farming and Forestry	202	32.26%	16.22%	219	31.79%	17.26%	8.02%	-1.48%	6.43%	0.99%	-0.23%	0.76%
Fishery	45	12.33%	3.64%	52	12.10%	4.11%	14.55%	-1.90%	12.86%	0.17%	-0.03%	0.14%
Extraction	9	3.23%	0.75%	11	3.16%	0.88%	19.70%	-1.98%	17.94%	0.01%	0.00%	0.01%
Food Processing, Beverages, Tobacco	75	40.29%	6.03%	82	39.77%	6.50%	9.49%	-1.30%	7.88%	0.56%	-0.09%	0.47%
Manufacturing	79	9.52%	6.31%	83	9.33%	6.55%	5.35%	-1.96%	3.79%	0.07%	-0.04%	0.03%
Water, Electricity and Gas	6	6.67%	0.48%	7	6.54%	0.52%	9.15%	-1.97%	7.54%	0.01%	0.00%	0.01%
Building and Public Works	38	1.82%	3.08%	36	1.78%	2.85%	-6.11%	-2.17%	-7.49%	-0.01%	0.00%	-0.02%
Trade	380	47.82%	30.45%	355	47.27%	27.99%	-6.69%	-1.14%	-8.07%	-3.47%	-0.50%	-3.96%
Hotels and Restaurants	18	56.28%	1.47%	20	55.74%	1.59%	10.15%	-0.96%	8.53%	0.21%	-0.02%	0.18%
Transport and Communication	122	3.69%	9.78%	125	3.61%	9.91%	2.84%	-2.09%	1.32%	0.01%	-0.02%	-0.01%
Banking and Insurance	14	16.43%	1.12%	15	16.13%	1.18%	6.34%	-1.83%	4.77%	0.03%	-0.01%	0.02%
Other Market Services	104	26.17%	8.36%	109	25.75%	8.60%	4.38%	-1.61%	2.85%	0.18%	-0.10%	0.08%
Administrative Services and Services to Individuals	154	53.12%	12.32%	153	52.58%	12.07%	-0.59%	-1.03%	-2.05%	-0.40%	-0.20%	-0.60%
<b>Total /Weighted share</b>	<b>1 248</b>	<b>33.49%</b>		<b>1 267</b>	<b>32.52%</b>		<b>1.50%</b>	<b>-2.89%</b>		<b>-1.64%</b>	<b>-1.25%</b>	<b>-2.89%</b>

Sources: Table constructed from the results of the CGEM.



A larger part of the total change in women's share of the wage bill comes from the unqualified labor market. The fall in women's share of the wage bill here is close to 3% (Table 6). The between-sector effect accounts for the largest part (-1.64% out of -2.89%), with the losses being related to the fall in the weight of the Trade and Administrative Services and Services to Individuals sectors. As women's share of the wage bill in these sectors is above average (at figures of 48% and 53% respectively), their decline reduces women's share of the wage bill (by 3.47% and 0.40% respectively).

This effect is partly offset by the growth in the Agriculture, Farming and Forestry (+0.99%) and Food Processing, Beverages and Tobacco (+0.56) sectors, in which women's share of the wage bill is above average (32% and 40% respectively).

The within effects (1.25% out of 2.89%) are mainly found in three sectors: Trade, Agriculture, Farming and Forestry and Administrative Services and Services to Individuals. In Trade and Administrative Services and Services to Individuals, the wage bill for women falls more than that for men following trade opening, whereas in the other sectors the wage bill for women rises more slowly than that for men. This results in within effects of -0.50%, -0.23% and -0.20% respectively.

To take into account the weight of each effect in the overall effect, we consider the equation set out above:

$$DWRF = (wq_1 \times \frac{DWRF_{q1}}{WRF_{q0}} \times \frac{WRF_{q0}}{WRF_0} + wnq_1 \times \frac{WRF_{nq1}}{WRF_{nq0}} \times \frac{WRF_{nq0}}{WRF_0}) + \alpha \times (\frac{WRF_{q0} - WRF_{nq0}}{WRF_0})$$

Replacing the terms by their corresponding figures, we obtain:

$$-3.46\% = (0.14\% + -2.10\%) + 1.96\% \times (-76.11\%)$$

The gender wage bill gap thus mainly results from the change in women's share of the wage bill in the unqualified labor market, weighted by the relative share of these markets in periods 0 and 1 (-2.10%). There remains a significant exacerbating effect of the differential in the initial gender wage gaps on the rise in the share of the wage bill going to the qualified labor market, where there are marked gender discrepancies (-1.49%).

## 6. Discussion

Comparing the results from the two simulations, the change in the aggregate variables is larger in simulation 2 than in simulation 1. The offsetting of the loss of Government revenue via adjustments in indirect product taxes magnifies the effect of trade opening.

By whatever criteria we consider, the economic situation in simulation 2 is better than that in simulation 1. Gross Domestic Product rises by 1% in the first simulation, but by 2.2% in the second, with the analogous figures for household well-being being 2.7% and 3.3%. At the same time, the need for funds from abroad for the current-account deficit rises in simulation 1 (+4.1%), but falls in simulation 2 (-1.1%).

However, regarding the gender gap, it is simulation 1 which dominates. The fall in women's share of the wage bill is 1.2% in the first simulation but 3.5% in the second.

Although our work here differs from its closest counterpart (Cockburn *et al.*, 2010), due to the differences cited in Section 2, the results as far as simulation 2 is concerned are quite similar. The authors conclude that trade opening in Senegal leads to a slight increase in the gender wage gap as it is the male-intensive export sectors that benefit from this opening, while the female-intensive import sectors face tougher competition from foreign imports. Cockburn *et al.* include an offset for the loss of Government revenue via an indirect goods tax in their simulation (as in our simulation 2). Furthermore, although the results of the two studies are similar, the way in which the results are explained differs somewhat. In simulation 2, the sector that suffers the most is Home Trade, in which there is nearly neither exports nor imports, and the sector that expands the most is Administrative Services and Services to Individuals, which is not the most male labor-intensive in the economy.

The results of our model here are actually driven by another mechanism: the within-sector effect (2.15% out of the 3.46% fall in women's share of the overall wage bill). The Trade and Administrative Services and Services to Individuals sectors have both strongly evolved and exhibited a slower fall and a faster rise respectively in the wage bill of men relative to women.

The between-sector effect is complementary but smaller (1.30% out of 3.46%). This is the main difference from the explanations given in Cockburn *et al.* (2010), which are essentially based on a between-sector effect. Our model equally revealed the preponderant role of growing inequality in the unqualified labor market and the role of the initial gap between women in the qualified and unqualified labor markets.

Our results are not in line with Becker (1957) on the positive effect of opening on discrimination through fiercer competition. This could reflect that the fundamental sources of gender wage inequality are based upon gender comparative advantage (Qian, 2008) in favor of men, as far as the requirements of the different sectors of the Senegalese economy are concerned. Another possibility is the burden of non-market work that women shoulder. Employers are aware of this burden and may be afraid of its impact on women's productivity. Trade opening will not affect this; or at least this is not taken into account in our model.

On the basis of these results showing the pre-eminence of within over between effects, the gender wage mostly results from the trade-off of employers when they evaluate (i) the cost of a female worker compared to (ii) their evaluation of women's productivity. While the latter may only change slowly, the former can be shifted in the short run via the introduction of a small temporary subsidy for employers who increase the female share of the wage bill in the first years after the opening of trade. One caveat should be added regarding our results here. This is linked to the usual criticism of computable general equilibrium models, the results of which are deemed to depend heavily on the modeling choices made, the elasticities used in the equations, and the type of macro-closure adopted. In the current paper, we justified our choices in the section introducing the data. It was, however, not possible to compare our results here to those in many other contributions as, to our knowledge, research on this topic in Senegal is only rare.

## **7. Conclusion**

There are sharp gender wage inequalities in Senegal. Any change in the economy may help improve this situation, by affecting the economy's general equilibrium. Equally, any change

may also make the situation worse. The opening of the economy to trade is a striking example of how a shock can move the economy to a new equilibrium.

The literature on gender inequalities in Senegal is scarce. Our purpose here was to help fill this void. We did so by analyzing the dynamics induced by EPA trade opening via general-equilibrium modeling. We tested two scenarios, both of which include an average cut in tariff barriers on European imports of 75%. The second scenario is distinguished by the offsetting of the Government's subsequent revenue loss via an indirect goods tax.

There are increases in GDP, well-being and gender inequality in both scenarios. The latter comes about from within and between-sector effects. These economic results were notably more pronounced in the second simulation. This could provide support for the complementary reform after trade opening consisting in offsetting lower Government revenues by indirect goods taxes.

Distinguishing the within and between effects behind the gender wage gap, we conclude that this is mainly due to the trade-off producers make when they compare (i) the cost of female workers to (ii) their estimate of female productivity. This latter is hard to change in the short-run, whereas the former can be shifted by introducing a small temporary subsidy for employers who increase women's share of the wage bill in the first years following trade opening.

We also note that the rise in inequality is an indirect result of trade opening in the sense that it is driven by the change in activity in the sectors that are the most directly affected by the trade opening, which movements were unfavorable for women's share of the wage bill. The largest effects on gender wage inequalities are often concentrated in one or two sectors.

As a result, policy tackling gender inequality may take on an unexpected form: economic policy to support the key sectors that are harmed by trade opening (the Trade sector in particular) may protect the labor market from the indirect effects on gender inequalities. The optimal way in which to implement this policy is a subject for further research.

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