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The Impact of Liberalisation on Women's Economic Participation and the Incidence of Gender Equality on Morocco's Economy: A Gender-Sensitive CGE Model Analysis

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Abstract:

The labour market participation of Moroccan women remains significantly lower than that of men. This issue has sparked academic and political debates in recent years. Numerous studies suggest solutions, including evaluating the effects of trade liberalisation on female employment. Using a gender-sensitive computable general equilibrium (CGE) model calibrated to Morocco's 2019 Social Accounting Matrix (SAM), this study simulates the impact of trade liberalisation on women's employment and wages.

The results of this study show that full national liberalisation is pro-feminine in competitive and female labour-intensive sectors. However, it disadvantages women in less competitive and less female labour-intensive industries. This leads us to consider additional policies to stimulate women's employment in these latter sectors. Among these policies, the most effective are those targeting gender equality in social, legal, and financial aspects.

These policies yield favourable labour market outcomes: increased female labour supply in various sectors and a reduction in the gender wage gap. However, they have unfavourable macroeconomic consequences, such as production, exports, income, and investment declines. This is mainly due to the low productivity of Moroccan women compared to their male counterparts. This leads to the following conclusion: any policy aiming to increase women's participation in the labour market in Morocco must be accompanied by initiatives to improve their productivity.

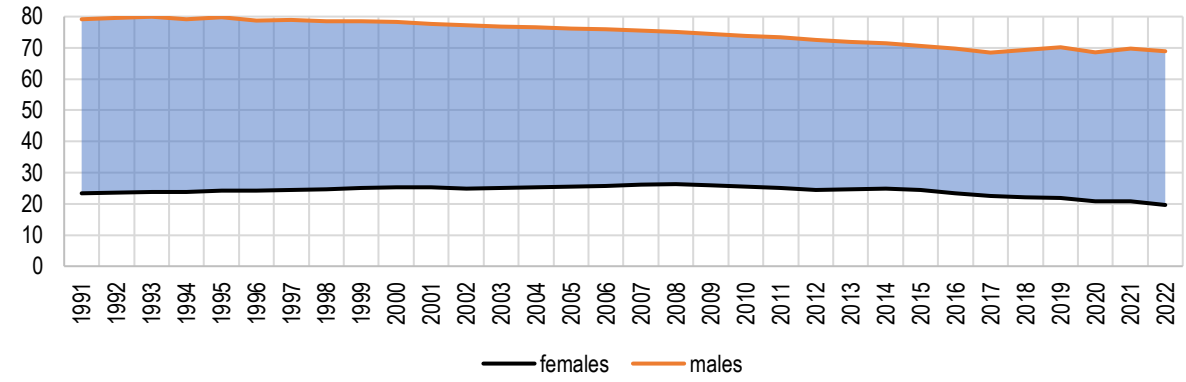
Keywords: gender-sensitive computable general equilibrium model (CGE), social accounting matrix; social equality; legal equality, market labour.

JEL Classification: J16, F10, F16, F17, F14, F66.

Introduction

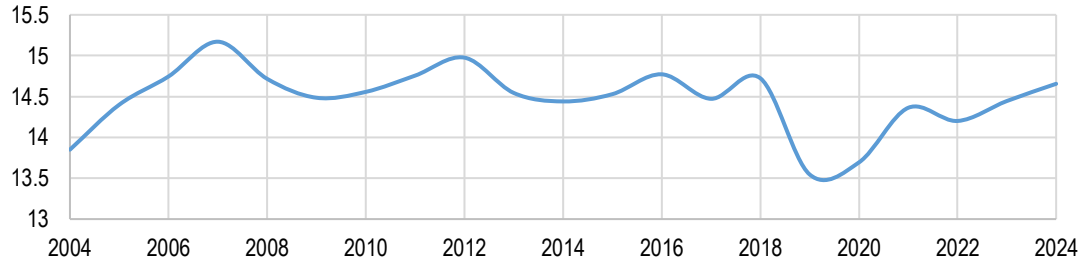
The participation of women in the labour market is a significant issue in Morocco's economic and social development. Despite progress in several areas, Moroccan women continue to face notable marginalization in the workforce regarding access to employment (Figure 1) and compensation (Figure 2). This well-documented situation raises questions about the underlying factors and mechanisms that could promote a more equitable integration of women into the national economy.

Figure 1: Labor force participation rate by gender in Morocco, 1990-2022



Source: ITC (International Training Centre)

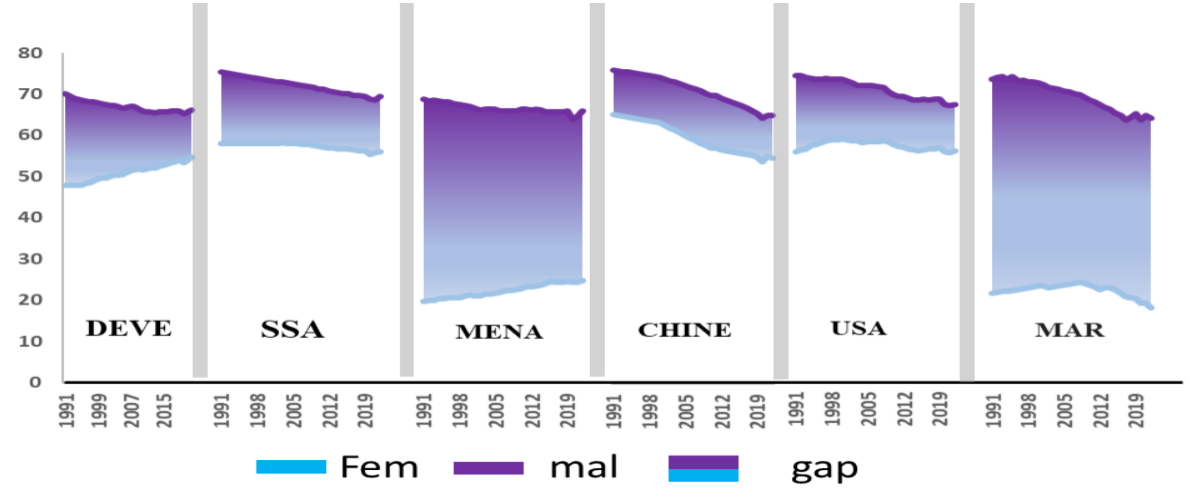
Figure 2: Gender income gap, in Morocco, 2004-2024 (%)



Source: ITC (international Training Centre)

Among the various dimensions to explore, the impact of trade liberalisation on women's economic participation emerges as a crucial subject. Trade liberalisation, often viewed as an opportunity to boost economic growth, can also have differentiated effects across genders, influencing employment structures, wages, and sectoral competitiveness. However, the scope and nature of these effects remain insufficiently explored, particularly in the Moroccan context, where gender inequalities in the labour market are still deep compared to other regions (see Figure 3).

Figure 3: Labour force participation rates by gender and region, 1990-2022



Source: ITC (International Training Centre)

Besides trade liberalisation, improved health outcomes are recognized as one of the critical factors driving economic growth. Improved health outcomes, in turn, foster a healthier and more productive labour force, enhancing human capital accumulation and promoting sustained economic growth (Levine & Renelt, 1992; Bhargava et al., 2001; Bloom et al., 2004; El Baouchari & Raouf, 2024).

Given the above, the present study examines the impact of trade liberalisation on women's participation in the context of Morocco using a gender-sensitive computable general equilibrium (CGE) model. The paper is structured as follows: After introduction, Section 1 provides a literature review; Section 2 outlines the methodology and data; Section 3 covers the results and discussion; and the last Section concludes the paper.

1. Literature Review

Most studies acknowledge that women's participation in the labour market has increased worldwide over the past decade, coinciding with the period of liberalisation in developing countries. Several theories have been proposed to explain this correlation:

According to classical trade theory, a country exports goods that require more intensive use of a relatively abundant - and therefore relatively less expensive - factor and imports goods that require more intensive use of relatively scarce factors, based on its comparative advantage (Heckscher & Ohlin, 1991). Consequently, trade liberalisation leads to the expansion of sectors producing export-oriented goods and increases the relative demand - and relative returns - of the abundant production factor (Stolper, & Samuelson, 1941). Since developing countries generally have a more abundant labour force than capital, trade liberalisation should promote the growth of labour-intensive sectors, thereby boosting the relative demand for labour (employment) and labour returns (wages).

This aspect of skill levels can also be analysed. In developed countries where the labour force is often highly skilled, trade increases the relative returns of unskilled labour in developing countries. Given that classical trade theory assumes that most of the unskilled labour in developing countries is female, trade liberalisation further strengthens the demand for female labour compared to male labour, thus stimulating female employment. Consequently, women's wages should increase more rapidly compared to men's, leading to a reduction in the gender wage gap. This interpretation of classical trade theory suggests that trade liberalisation helps to mitigate gender inequalities in developing countries. Furthermore, revisiting Becker's discrimination theory (1957) in an open economy context, some scholars (Black & Brainerd, 2004) argue that liberalisation can exert competitive pressures that reduce employers' opportunities to engage in discrimination, including against women, thereby mitigating gender wage disparities.

Classical trade theory has evolved to create the "new trade theory." These new models consider aspects of product and labour markets that were previously overlooked, such as the heterogeneity of firms and workers, labour market frictions, informal employment, outsourcing, and offshoring. They show that the impacts of trade liberalisation on men and women are more complex and context-specific than previously thought (Aleman-Castilla, 2020). Among these, the technological change theory is the most renowned in this field. Suppose trade liberalisation promotes technological changes as a competitive strategy. In that case, manufacturing jobs will become less physically demanding (due to the introduction of technologies that reduce the need for physical labour), leading to a relative increase in women's productivity in production tasks. As a result, the demand for female labour and corresponding wages will rise relative to those of men, thereby reducing the gender wage gap for these tasks (Pieters, 2018).

Empirical research on the effects of trade on gender wage and employment gaps in developing countries primarily consists of country-specific studies that utilize macro-level data. The conclusions of these studies are generally mixed. Using data from Mexico, Aguayo-Tellez et al. (2014) observed an increase in the relative demand for female workers in skilled industries and groups following trade liberalisation policies. In contrast, research by Ghiara (1999) found no impact on women's wages between 1987 and 1993, despite adopting export-oriented strategies. Additionally, Katz & Correia (2001), based on data from 1997 and 1998, revealed a negative impact on women's wages. Juhn et al. (2014) noted that tariff reductions associated with the North American Free Trade Agreement (NAFTA) prompted new Mexican firms to modernize their technologies to capture export markets, replacing male workers with female workers.

In South Korea, Berik et al. (2004) identified an adverse effect of exports - measured by the share of production by sector - on women's wages, increasing the gender wage gap. Similarly, Guicheney (2015) examined the consequences of South Korea's export-oriented industrialization policy on women and concluded that the labour policies enacted by the government to promote the growth of the private sector hurt women's upward mobility opportunities, leaving them in a permanently inferior position compared to men.

In their study, Chen et al. (2013) observed that foreign participation and export orientation in the Chinese economy positively affect female employment and help reduce the gender wage gap. The authors also highlighted gender-based wage discrimination in private firms that do not engage in export activities. They concluded that globalization plays a significant role in promoting female employment and lessening gender discrimination.

Gaddis & Pieters (2012) analysed the consequences of trade liberalisation in Brazil between 1987 and 1994 on female labour force participation. Their findings indicate that tariff reductions were associated with increased female participation and employment after about two years. A recent study by Benguria & Ederington (2017) focused on the same country's increased exposure to Chinese imports and examined the impact of trade on wage inequality. They found a negative impact from the rise in imports, but male workers bore this wage decline entirely. Using Oaxaca-Blinder decompositions, the authors explained the wage reduction differences through the employment disparities between men and women. They also noted that trade led to an increase in the share of women in higher-paying occupations and an increase in the returns from primarily female professions.

The studies mentioned above do not utilize a comprehensive framework capable of evaluating the true impact of trade liberalisation on the overall economy and the interactions between various agents and markets. Indeed, in the context of a free trade agreement, the issues of trade policies are always very complex. To account for this complexity, it is necessary to use a tool that allows us to understand the economy at the microeconomic and global levels. Thus, the use of a general equilibrium model is essential because it enables the consideration of the economy as a whole, reconciling macroeconomic approaches (trade deficit, budgetary issues, employment levels), the aggregation of indices, and microeconomic approaches (household behaviours, constraints), all within a coherent framework. In the context of our issue, using a general equilibrium model is important because it will allow us to simultaneously analyse the impact of trade liberalisation on gender inequality in terms of employment, labour division, and wage gaps.

The numerous CGE models developed around 1970 have almost entirely overlooked the gender dimension. A previous special issue of World Development demonstrated how gender can be integrated into macroeconomic models, yet it did not tackle multi-sectoral microeconomic modelling. This oversight persisted until the early 2000s when a surge of empirical research utilizing CGE models in this field began to emerge (Lofgren & Cicowiez, 2024). Fofana et al. (2003) develop a gender-sensitive CGE model for the Nepali economy, which includes both formal and informal production sectors and unpaid domestic activities. They conclude that trade liberalisation tends to increase the demand for female labour in specific export sectors, leading to increased paid employment for women. However, despite this growth, women continue to bear a significant portion of the burden of unpaid domestic work. This can limit their ability to fully participate in the formal labour market unless accompanying policies are implemented to ease the burden of unpaid domestic work for women.

Recently, Fontana & Wood (2000), Fontana (2001, 2002), and then Raihan et al. (2010) developed CGE models for Bangladesh and Zambia to analyse the effects of trade policies on women's work in the labour market and at home. They explicitly integrate leisure time and household-produced goods as sectors that behave the same way as market sectors. In general, they found that trade liberalisation increases women's work and income and that this impact becomes more significant when accompanied by policies to alleviate women's unpaid domestic labour.

The study by Siddiqui (2009) uses a CGE model to analyse the impacts of trade liberalisation on women's well-being in Pakistan, focusing on changes in the labour market. It concludes that although trade liberalisation provides increased economic opportunities for women in Pakistan by raising their economic participation, specific policies are necessary to maximize these benefits and reduce inequalities. This involves improving women's access to education, vocational training, and decent jobs.

Other works conducted in this context highlight that trade liberalisation can improve economic opportunities for women. However, they also emphasize that complementary policies are necessary to maximize these benefits and reduce gender inequalities. (Terra et al., 2008; De Hoyos & Bussolo, 2009; Fox, 2008)

This study offers two significant contributions compared to previous research. First, it will be the first to use a gender-sensitive CGE model to assess the impact of trade liberalisation on the Moroccan economy, specifically focusing on its effects on women's employment. Second, it would be the first to highlight a sensitivity analysis to test the impact of specific complementary policies on improving the situation of sectors least affected by trade policy.

2. Research Methodology

The baseline model is derived from version 2.1 of the PEP-1-1 CGE model (Decaluwé et al., 2012). While we maintain its structure for analysing trade-related issues, we implement alternative specifications about the labour market to address gender-related concerns. Specifically, we introduce three modifications to the model: first, we disaggregate the demand for male and female labour (equation 1); second, we treat the supply of male and female labour as endogenous (equation 2); and third, we incorporate a reciprocal opening analysis into the model (equation 3).

2.1. The Disaggregation of Male and Female Labour Demand

We begin by disaggregating the labour market into male and female components, which we consider imperfect substitutes in production. The substitution elasticities are specific to each activity. The value added of the activity is modelled by a constant elasticity substitution (CES) function at two levels. At the first level, male labour ($LD_{mal,j}$) and female labor ($LD_{fem,j}$) are aggregated into a composite labor (LDC_j).

$$LDCj = B_j^{LD}\left[\beta_{mal,j}^{LD} LD_{mal,j}^{-\rho_j^{LD}} + \beta_{femj}^{LD} LD_{fem,j}^{-\rho_j^{LD}}\right]^{-1/\rho_j^{LD}} \quad (1)$$

The firm chooses its labour composition in such a way as to minimize its labour costs, considering relative wage rates. The demand for each type of labour ($LD_{mal,j}$; $LD_{fem,j}$) arises from the first-order conditions of cost minimization by the representative firm, subject to the CES technology (equation 2):

$$LD_{l,j} = \left[\frac{\beta_{j,l}^{LD} WC_j}{WTI_{l,j}}\right]^{\sigma_j^{LD}} \left[B_j^{LD}\right]^{(\sigma j^{LD}-1)} LDC_j \quad (2)$$

As in the basic model, the activity's composite wage rate (minimized cost) differs depending on their respective mixes of male and female labour.

$$WC_j = \frac{WTI_{mal,j} LD_{mal,j} + WTI_{fem,j} LD_{fem,j}}{LDC_j} \quad (3)$$

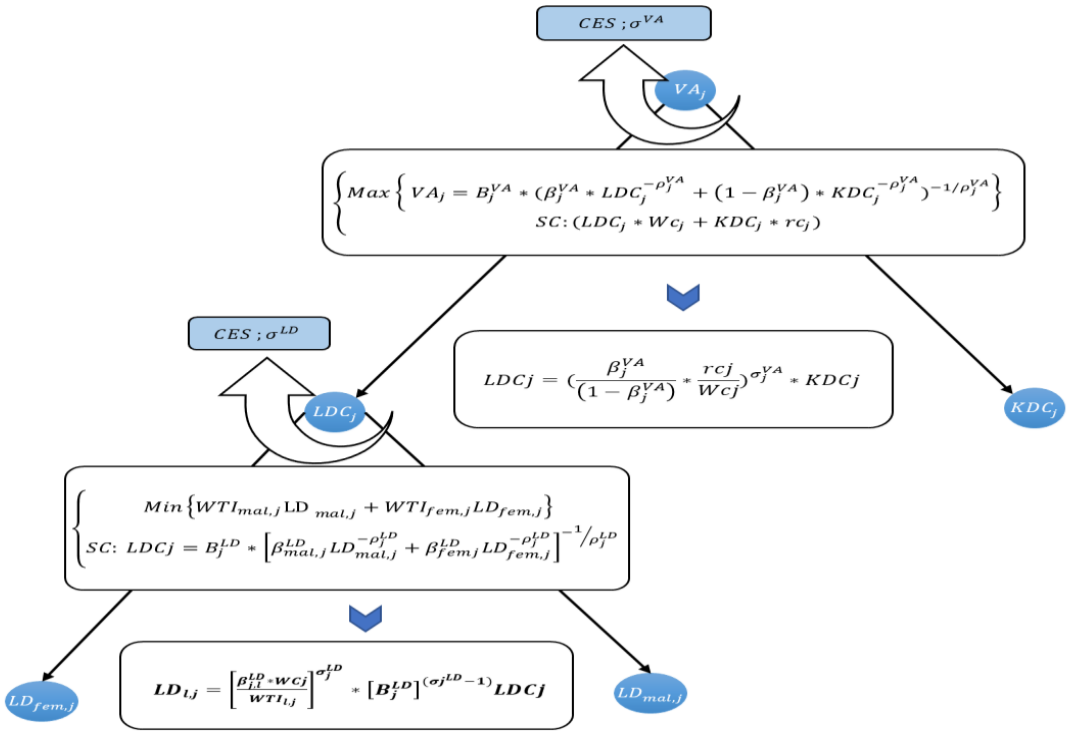
Each market is in equilibrium when the total labour supply (LS) equals the sum of the sectoral labour demands:

$$LS_{fem} = \sum_j LD_{fem,j} \quad (4)$$

$$LS_{mal} = \sum_j LD_{mal,j} \quad (5)$$

As in the basic model, labour and capital aggregates constitute the value added to the activity, and production is a fixed combination of value-added and intermediate consumption (Figure 4). The labour market is segmented into male and female components to highlight the wage inequalities observed in the Moroccan economy. Each market satisfies the neoclassical assumption of perfect competition.

Figure 4: Nested production structure



Source: Authors

Endogenization of Male and Female Labour Supply

To achieve our objective, we endogenize male and female labour supply by assuming it depends on real wages:

$$LS_{mal} = mL_{mal}\left[\frac{w_{mal}}{PIXGDP}\right]^{\varepsilon_{mal}} \quad (6)$$

$$LS_{fem} = mL_{fem}\left[\frac{w_{fem}}{PIXGDP}\right]^{\varepsilon_{fem}} \quad (7)$$

where: LS_{mal}: male labor supply, LS_{fem}: female labour supply, mL_l: scale parameter; ε_{mal}: elasticity of male labour supply with respect to real wages; ε_{fem}: elasticity of female labour supply with respect to real wages.

Integration of Reciprocal Analysis

To take advantage of a reciprocal analysis during trade liberalisation, we present the following two equations:

$$EXD_i = [EXD_i]^O\left[\frac{e * PWX_i(1+[tmMM_i]^0)}{(PE_i^{FOB})(1+tmMM_i)}\right]^{\sigma_i^{XD\_RM}} \quad (8)$$

$$TMM_i = (tmMM_i) * (PE_i^{FOB}) * EXD_i \quad (9)$$

where: EXD_i: world demand for exports of product i; $[EXD_i]^O$: export volume of product i demanded by the rest of the world, which is not affected by its relative export price, but by other factors (changes in tastes, increase in global population, etc.) (> 0); σ_i^{XD}: Price elasticity of world demand for exports of product i; PWX_i: world price of product i exported to the rest of the world; $tmMM_i$: tariff rate applied by the rest of the world on imports from Morocco.

3. Benchmark Data Set: Social Accounting Matrix (2019)

The first step in creating a model for a specific country is to construct a Social Accounting Matrix (SAM) that captures its economic and social structure. Our SAM, shown in Figure 5, provides a simplified overview of Morocco's Social Accounting Matrix for 2019.

Figure 5: Structure of the different accounts of the SAM

	Production factor	Agents	Production sectors	Products intended for the local market	Export to the rest of the world	accumulation		total
Production factor			Factor remuneration by sector					Rémunération de facteur
Agents	Remuneration of agents for their factor offers	Flow between agents	Taxes on production		export taxes			Total Agent Income
				Import taxes				
				Product tax				
			Taxes on factor remuneration					
				Import (CIF price)				
Production sectors				Les biens & services products by the branches of activity evaluated at factor costs.	Exports to the rest of the world (excluding Africa) Assessed at factor costs			Production at factor cost
Products intended for the local market		Final consumption of agents (households and State)	Intermediate consumption	margins	Margins on export	INV	V. of stock	Demand
Export to the rest of the world		Export to the rest of the world (FOB price)						Export to the rest of the world (at FOB price)
accumulation		*Agents' savings*						savings
total	Factor remuneration	Total agent expenses	Production at production factor cost	Demand for purchase price	Export to the rest of the world (at FOB price)	savings		

Source: Authors.

It focuses on three factors of production: female labour, male labour, and capital, and includes 22 sectors (see Appendix 2). Unlike many SAMs, this one does not differentiate between types of households (such as rural or urban, rich or poor) and includes only minimal information regarding the government, balance of payments, investment, and stock variation. Additionally, our SAM is based on the matrix Raouf et al. (2021) utilized to evaluate the impact of the African Continental Free Trade Area (AfCFTA) on the Moroccan economy, which primarily involves straightforward modifications to the labour market.

Additional Variables

The volumes of male labour ($LD_{mal,j}$) and female labor ($LD_{fem,j}$) by sector; They are obtained by disaggregating the total labour demand in each sector. The disaggregation structure is derived from the Employment Satellite Account data, 2014[1].

Table 1: Disaggregation of total labour demand

	Effective			%	
	Mal	Fem	Total	Mal	Fem
A00	2,387,842	1,769,920	4,157,762	57%	43%
A05	56,646	2,149	58,795	96%	4%
B00	34,957	1,693	36,650	95%	5%
CA0	182,289	88,963	271,252	67%	33%
CB0	181,949	180,399	362,348	50%	50%
CC0	52,567	5,979	58,546	90%	10%
CED	19,914	6,496	26,410	75%	25%
CF0	5,750	4,210	9,960	58%	42%
CGM	300,896	68,451	369,347	81%	19%
DE0	58,487	6,603	65,090	90%	10%
F00	773,536	42,622	816,158	95%	5%
G00	1,539,168	197,559	1,736,727	89%	11%
H00	283,119	20,495	303,614	93%	7%
I00	235,768	70,457	306,225	77%	23%
J00	41,731	19,520	61,251	68%	32%
K00	37,782	27,653	65,435	58%	42%
L68	19,942	3,760	23,702	84%	16%
MN0	262,636	111,079	373,715	70%	30%
O84	407,573	184,043	591,616	69%	31%
PQ8	273,586	260,310	533,896	51%	49%
RS0	309,057	83,882	392,939	79%	21%
A00	2,387,842	1,769,920	4,157,762	57%	43%

Source: Authors after the Employment Satellite Account data, HCP, 2014

The female workforce is predominantly concentrated in sectors such as agriculture (A00: 49%), textiles (CB0: 50%), pharmaceuticals (CF0: 42%), financial and insurance activities (K00: 42%), as well as education and human health (PQ8: 49%). Conversely, women are underrepresented in industrial sectors that demand more

[1] https://www.hcp.ma/Compte-satellite-de-l-emploi-2014_a3714.html

physical labor, accounting for only 4% to 20% of employment, and their presence in services is moderate, ranging from 20% to 30%.

- The wage of men and women (W_{mal} and W_{fem})

Like the other prices in the model, the female wage is set as a reference and normalized to 1 for the base year. According to ENSEM 2019 from the HCP, the male wage represents 1.3 times the female wage.

- The volume of labour supplied in each market (LS_{mal} and LS_{fem})

The labour supply of men (resp, women) is obtained by summing the male (resp, female) labour demand in each sector:

$$\begin{cases} LS^0_{mal} = \sum_j LD^0_{mal,j} \\ LS^0_{fem} = \sum_j LS^0_{fem,j} \end{cases}$$

Other Parameters

- The elasticity of male and female labour supply with respect to real wages (ε_l)

In this analysis, the labour supply elasticity of males and females regarding real wages is treated as free parameters. We assume a high elasticity for male labour supply and a low elasticity for female labour supply[2] :

$$\begin{cases} \varepsilon_{fem} = 0.8 \\ \varepsilon_{mal} = 1000 \end{cases}$$

- The elasticity of substitution between male and female labour by sector (σ_j^{LD})

To address labour market rigidity for both men and women across different sectors, we have selected substitution elasticity values between worker categories that are comparatively low relative to the typical standards found in computable general equilibrium models. All production sectors have established these elasticities at 0.5 (Fontana, 2004).

- The parameter related to sectoral substitution elasticity (ρ_j^{LD})

The parameter related to sectoral substitution elasticity is obtained using the following formula:

$$\rho_j^{LD} = \frac{1 - \sigma_j^{LD}}{\sigma_j^{LD}}$$

where: σ_j^{LD} is the elasticity of substitution of the labour factor in sector j and ρ_j^{LD} is the parameter related to the substitution elasticity.

- The relative share of female labour in each sector ($\beta_{j,l}^{LD}$)

The relative share of labour by each gender in each sector is calibrated from the equation (2):

$$\beta_{l,j}^{LD} = \frac{RTI^O_{l,j} * \left(LD^O_{l,j}\right)^{\left(\rho_j^{LD}+1\right)}}{\sum_{lj} RTI^O_{lj,j} * \left(LD^O_{lj,j}\right)^{\left(\rho_j^{LD}+1\right)}}$$

- The scale parameter of the composite labour demand function (B_j^{LD}):

[2] In the section dedicated to sensitivity analysis, different elasticity values are used to assess the sensitivity of the model to this parameter.

The scale parameter of the composite labour demand function (B_j^{LD}) is calibrated from the equation (1).

$$B_j^{LD} = \frac{LDCj}{\left[\beta_{mal,j}^{LD}[LD^O]_{mal,j}^{-\rho_j^{LD}} + \beta_{femj}^{LD}[LD^O]_{fem,j}^{-\rho_j^{LD}}\right]^{-1/\rho_j^{LD}}}$$

- The scale parameter of the labour supply function (mL_l)

The scale parameter of the labour supply function is calibrated from the equation (6-7):

$$mL_{mal} = \frac{LS_{mal}^0}{\left[\frac{w_{mal}}{PIXGDP}\right]^{\varepsilon_{mal}}} \quad \text{and} \quad mL_{fem} = \frac{LS_{fem}^0}{\left[\frac{w_{fem}}{PIXGDP}\right]^{\varepsilon_{fem}}}$$

4. Simulation and Results

4.1. Analysis of the Complete Liberalisation of International Trade

Production decreased in several sectors, notably in agriculture and forestry (-0.68%), public administration and social security (-0.82%), as well as in education and human health (-0.67%), which are considered the least competitive activities compared to the reference year. For sectors intensive in female labour, only the food sector, information and communication, and research and development (as well as the agricultural sector and the education and health sector) saw a remarkable decline (-0.30%, -0.21%, and -0.07%, respectively). For the agricultural, food, and research development sectors, this decline is mainly due to the drop in domestic demand in these sectors (-0.91%, -0.79%, and -0.13%, respectively), while for the information and communication sector and the education and health sector, the drop in both domestic and external demand occurred (domestic demand: 0.16% and -0.13%; external demand -0.20% and -0.71%, respectively).

Table 2: Simulation results of some variables (% base year).

	Export variation in %	Import variation in %	Male labour demand variation	Female labour demand variation	Capital factor variation	Capital intensity	Total production variation	Demand variation	Import variation	Export variation
A00	0,47	5,29	-0,61	-0,58	-0,69	1094,47	-0,68	-0,91	5,29	0,47
A05	-0,21	1,03	-0,39	-0,36	-0,50	69,73	-0,42	-0,06	1,03	-0,21
B00	2,69	2,02	0,95	0,98	0,84	197,86	0,89	-0,04	2,02	2,69
CA0	0,96	9,73	-0,23	-0,20	-0,32	425,68	-0,30	-0,79	9,73	0,96
CB0	3,18	7,09	0,66	0,69	0,58	235,02	0,61	-2,10	7,09	3,18
CC0	13,57	1,20	1,91	1,94	1,81	319,84	1,84	0,22	1,20	13,57
CED	2,06	0,59	2,06	2,09	1,96	464,11	1,99	0,26	0,59	2,06
CF0	7,03	1,52	1,97	2,00	1,88	231,73	1,91	0,01	1,52	7,03
CGM	0,52	1,37	-0,08	-0,05	-0,17	248,06	-0,14	-0,91	1,37	0,52
DE0	0,29	2,08	0,25	0,28	0,15	296,88	0,18	0,14	2,08	0,29
F00	2,32	-0,08	0,39	0,42	0,28	99,39	0,35	0,24	-0,08	2,32
G00	0,46	23,22	0,24	0,27	0,13	280,85	0,17	0,48	23,22	0,46
H00	2,06	0,99	1,20	1,23	1,09	175,33	1,14	0,37	0,99	2,06
I00	0,62	1,52	0,42	0,45	0,32	331,62	0,35	0,30	1,52	0,62
J00	-0,20	1,65	-0,15	-0,12	-0,24	222,71	-0,21	-0,16	1,65	-0,20
K00	0,33	1,96	0,13	0,16	0,04	201,73	0,08	0,05	1,96	0,33
L68	-0,43	1,99	0,08	0,11	-0,02	5472,34	-0,02	0,02	1,99	-0,43

	Export variation in %	Import variation in %	Male labour demand variation	Female labour demand variation	Capital factor variation	Capital intensity	Total production variation	Demand variation	Import variation	Export variation
MN0	0,51	1,18	-0,04	-0,01	-0,13	88,17	-0,07	-0,13	1,18	0,51
O84	-0,71	0,89	-0,82	-0,79	-0,91	26,31	-0,82	-0,80	0,89	-0,71
PQ8	-0,71	1,15	-0,68	-0,65	-0,76	15,57	-0,67	-0,65	1,15	-0,71
RS0	-0,32	1,75	0,08	0,11	-0,01	141,15	0,04	0,13	1,75	-0,32

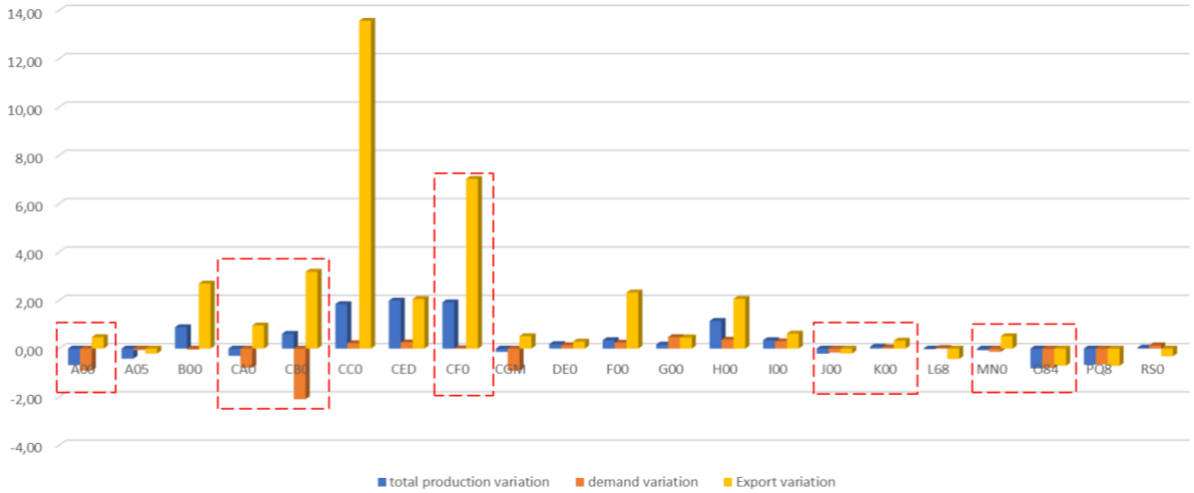
Source: Author's calculation

Conversely, increased production has been noted in more competitive sectors, such as extraction, textile manufacturing, wood and paper products, the chemical industry, pharmaceutical production, transportation and storage, and financial activities. Among these sectors, CB0, CF0, and K00, characterized by a high intensity of female labour, experienced growth rates of 0.61%, 1.91%, and 0.08%, respectively. This growth can be attributed primarily to a rise in exports (+3.18%) for the first sector and increased internal and external demand for the other two sectors (internal demand: Res.p 0.013% and 0.051%; exports: Res.p 7.03% and 0.33%).

The significant declines in activity within the agricultural, food, information and communication, research and development, education, and health sectors - areas that are predominantly female labour-intensive - result in a substantial release of female labour. The percentages of female labour changes in these sectors are as follows: A00: -0.58%, CA0: -0.20%, J00: -0.12%, MN0: +0.01%, and PQ8: -0.65%. The textile sector absorbs this released labour (CB0: +0.69%), pharmaceuticals (CF0: +2%), and the financial sector (K00: +0.16%). It is important to note that a similar movement of capital factors accompanies the high mobility of female labour between sectors. This supports the theory of technological change, which posits that the significant physical strength disparity between women and men in the workforce can be compensated by integrating technology into capital.

Generally, at the employment supply level, the situation is unfavourable for both genders, with a more significant decline in male employment supply (-0.34%) compared to female employment supply (-0.047%), despite the significant decrease in real female wages (-0.059%) compared to male wages (-0.003%). This is mainly due to the high elasticity of male employment supply concerning real wages. This simulation revealed that national-scale liberalisation benefits women in competitive, labour-intensive sectors like textiles, finance, and pharmaceuticals. However, it poses challenges for women in less competitive sectors such as agriculture, communication, education, and health. This supports the theory of comparative advantage, indicating that government policies should focus on enhancing competitiveness in these sectors to boost female employment in Morocco's economy.

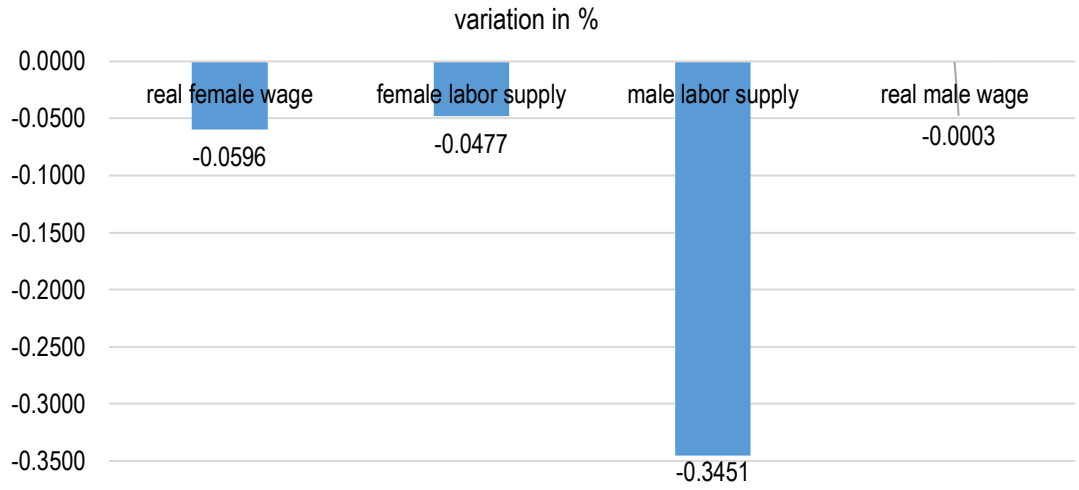
Figure 6: Allocation of the nested structure of production by sector (% base year)



Source: Author's calculation

The government employs various instruments to promote female employment, with gender equality initiatives being the most widely adopted worldwide. This strategy has significantly increased the female labour supply in developed and developing countries. The following section will examine these initiatives and their impact on Morocco's female employment and economy.

Figure 7: Simulation results of some variables (% base year)



Source: Author's calculation

4.2. Sensitivity Analysis

This subsection aims to analyse the effect of gender equality on the simulation results. Three analyses have been conducted as follows:

- Legal Equality: Equal treatment between genders, an increase in the elasticity of substitution between male and female labour across different production sectors.

Increasing the elasticity of substitution between male and female labour in the production sectors (from 0.5 to 10) leads to a rise in the demand for female[3] labour from businesses. Consequently, this increase stimulates a rise in real wages for female workers, resulting in a convergence of wages for both men and women. However, the overall domestic and export production becomes less attractive compared to the initial simulation. This decline can be attributed to the lower productivity of female labour (see Appendix 3-1).

In summary, higher sectoral elasticities of substitution between male and female labour are likely to worsen Morocco's macroeconomic performance, reducing total production, domestic demand, and exports compared to baseline conditions.

- Social Equality: Removing constraints (domestic work and childcare responsibilities) for women, increasing the elasticity of female labour supply with respect to real wages from 0.8 to 1000.

Increasing the elasticity of female labour supply relative to real wages (from 0.8 to 1000), we observe a rise in female[4] labour supply accompanied by an increase in their real wages, in contrast to male real wages, which decrease (male and female wages tend to equalize). This impact directly propagates from the labour market to production and its components (exports and domestic demand), which are less favourable than the initial simulation. Household income, GDP, and other macroeconomic variables are not spared from this unfavourable scenario (see Appendix 3-2). In summary, women's departure from the household and integration into the labour market contributes to men's marginalization due to women's lower wages. This has severe consequences for the national economy, stemming from the lower productivity of this shift.

[3] Now more easily substitutable for their male counterparts

[4] The main concern of women (household work and taking care of children) has been abandoned.

- Financial Equality: The reduction of gender wage gaps and its impact on the initial simulation.

Increasing women's wages to equalize them with men's (from w_{fem}= 1 to w_{fem} =1.3), we observe a decrease in the demand for female labor compared to male labor. This results in a predominance of men in most production sectors, positively affecting production and its components (exports and domestic demand). This change also leads to improvements in household income, GDP, and other macroeconomic variables (see Appendix 4)[5]. In summary, efforts to achieve gender wage parity, whether by adjusting men's or women's wages, may lead to a perceived advantage for men due to assumptions about productivity. However, this could boost economic growth through increased efficiency and fairness.

Conclusion and Recommendations

The matter is ongoing, and numerous empirical and economic studies have been introduced to develop concrete solutions. One such solution is the liberalisation of sectors that promote women's participation, which has proven effective in various developed and developing countries. In this light, this article applies these studies to the Moroccan context, employing a gender-sensitive computable general equilibrium model.

The results of this study highlight that complete liberalisation at the national level favours women in competitive sectors characterized by a high concentration of female labour, such as the textile, financial, and pharmaceutical sectors. However, it disadvantages women in sectors such as agriculture, food, information, and communication, as well as in research and development, education, and health, where competitiveness is lower and female labour is less intensive. This leads us to consider other policies aimed at achieving gender equality in legal, social, and financial terms as additional solutions to address sectors that do not benefit from trade policies. As expected, the outcome is favourable, with a significant increase in female labour supply in almost all sectors and a remarkable reduction in the gender wage gap. Unfortunately, while these results positively impact the overall economy (due to their direct effects on production costs), they have unfavourable consequences on almost all macroeconomic indicators due to the lower productivity of women compared to their male counterparts. These results lead us to several proposals to increase women's productivity to maximize their benefits:

- Improve girls' access to and the quality of education.
- Promote gender diversity in the workplace.
- Provide training and professional development opportunities specifically tailored to women's needs.
- Encourage women's participation in leadership and decision-making roles.
- Invest in technology and infrastructure that facilitate women's work.
- Establish mentoring and sponsorship programs to support women's career advancement.
- Encourage flexible working hours to meet women's individual needs while ensuring operational continuity.

Credit Authorship Contribution Statement

All authors contributed to the design and conception of the study (conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing-original draft preparation, writing-review and editing).

Conflict of Interest Statement

The authors declare that they have no financial or personal conflicts of interest that could influence the results or interpretations presented in this article. No external funding sources were received for the conduct of this research.

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[5] Although the non-significant impact remains favorable.

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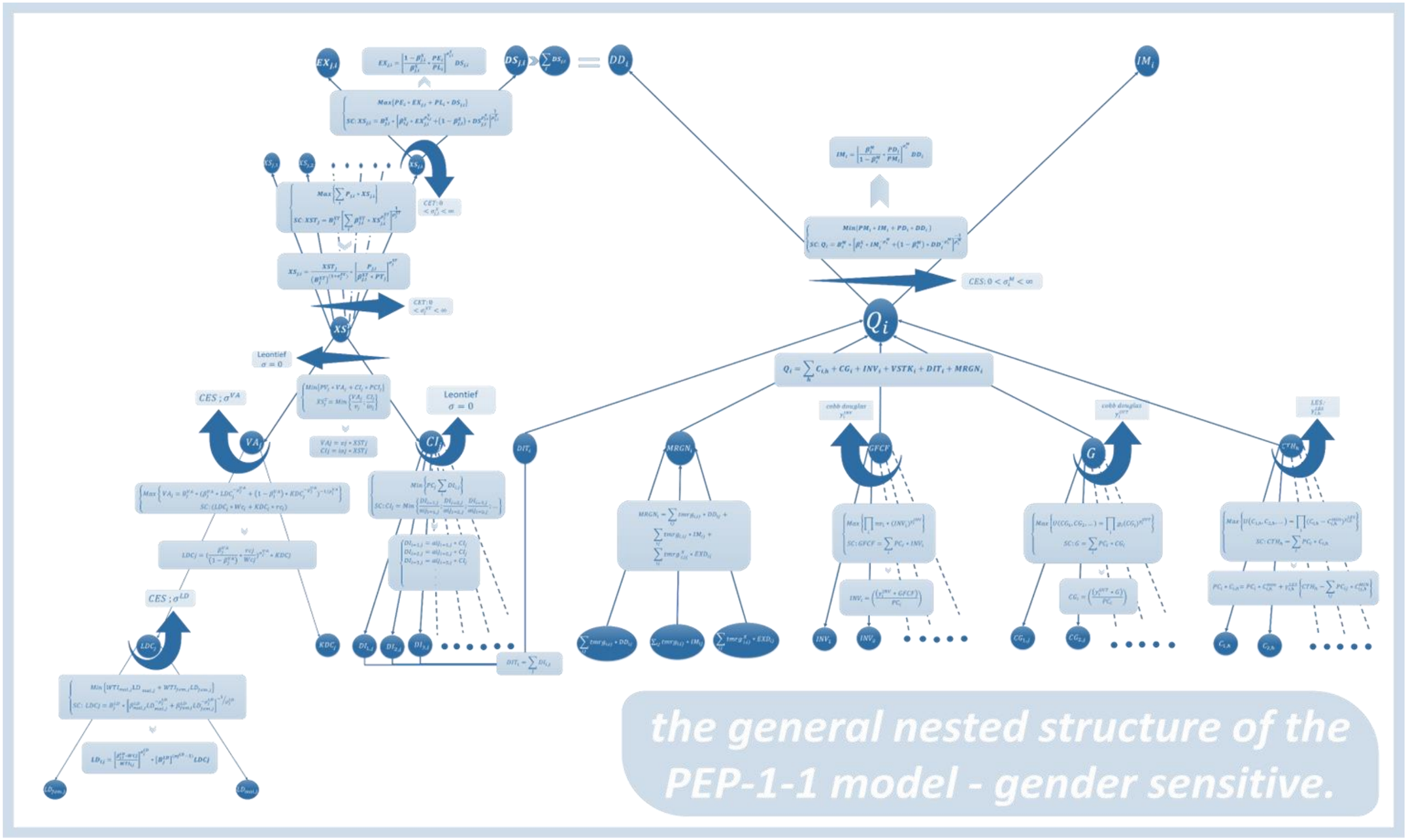
APPENDIX:

Appendix 1: The general nested structure of the gender-sensitive PEP-1-1 model



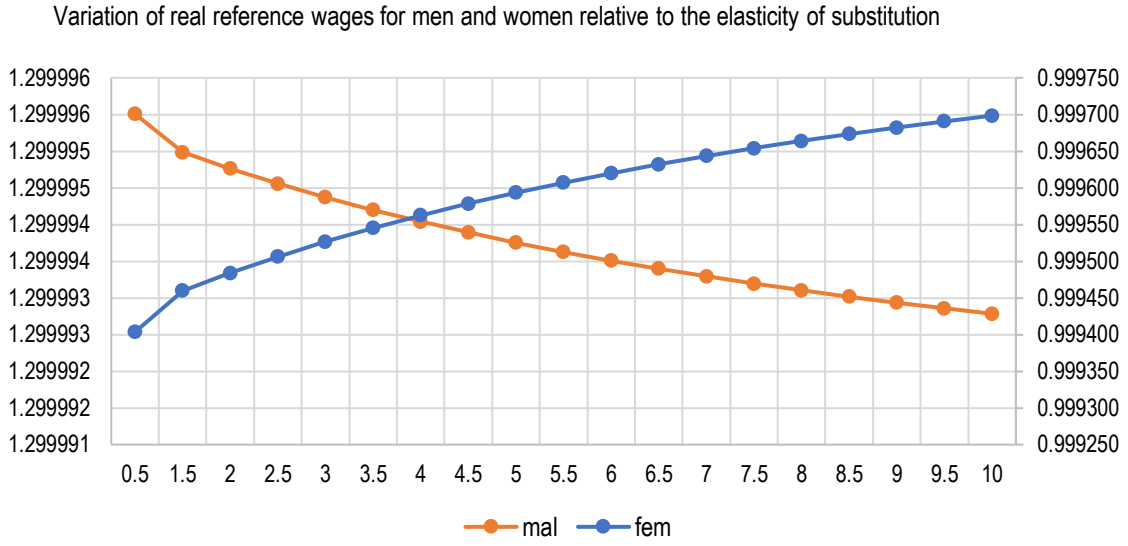
Appendix 2: Sectors used in SAM-2019

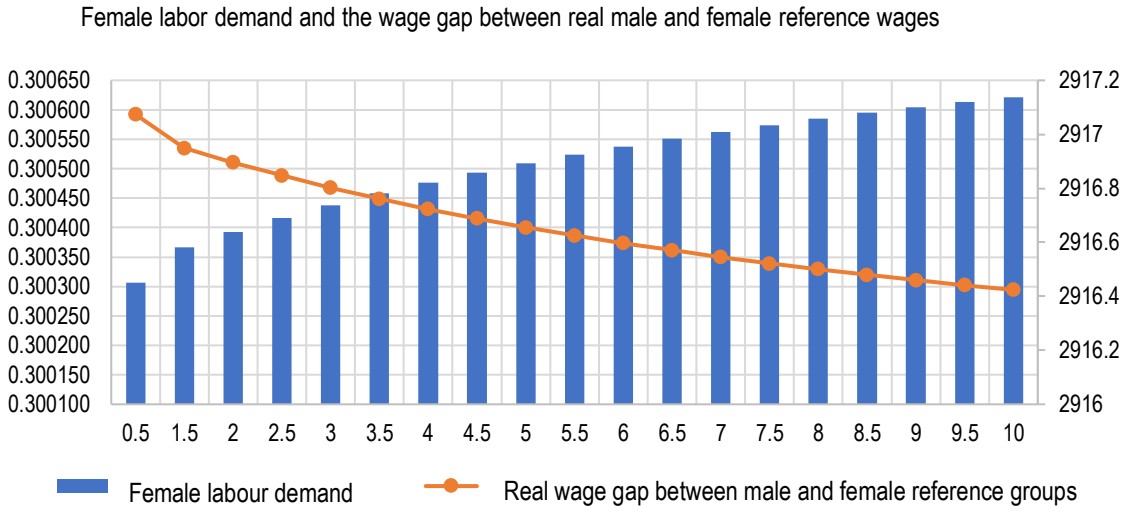
Code	Sector Description
A00	Agriculture and Forestry
A05	Fishing and Aquaculture
B00	Extraction
CA0	Manufacture of Food Products and Beverages
CB0	Manufacture of Textiles, Apparel Articles
CC0	Manufacture of Wood and Paper Products
CED	Chemical Industry
CF0	Manufacture of Basic Pharmaceutical Products
CGM	Mechanical and Electrical Industry
DE0	Electricity and Gas Distribution - Water Distribution
F00	Construction
G00	Wholesale and Retail Trade; Repair of Motor Vehicles
H00	Transportation and Storage
I00	Accommodation and Food Services
J00	Information and Communication
K00	Financial and Insurance Activities
L68	Real Estate Activities
MN0	Research and Development and Business Services
O84	Public Administration; Mandatory Social Security
PQ8	Education, Human Health, and Social Work Activities
RS0	Other Services

Source: National Accounts Nomenclatures (NMA 2014), HCP

Appendix 3-1: Results of the first simulation: Legal Equality

Figure 8: Impact of the variation in the elasticity of substitution on real wage





Source: authors, by GAMS

Table. 1: Deterioration of the Moroccan economic situation (comparison between initial situation and case where $\sigma_j^{LD} = 10$)

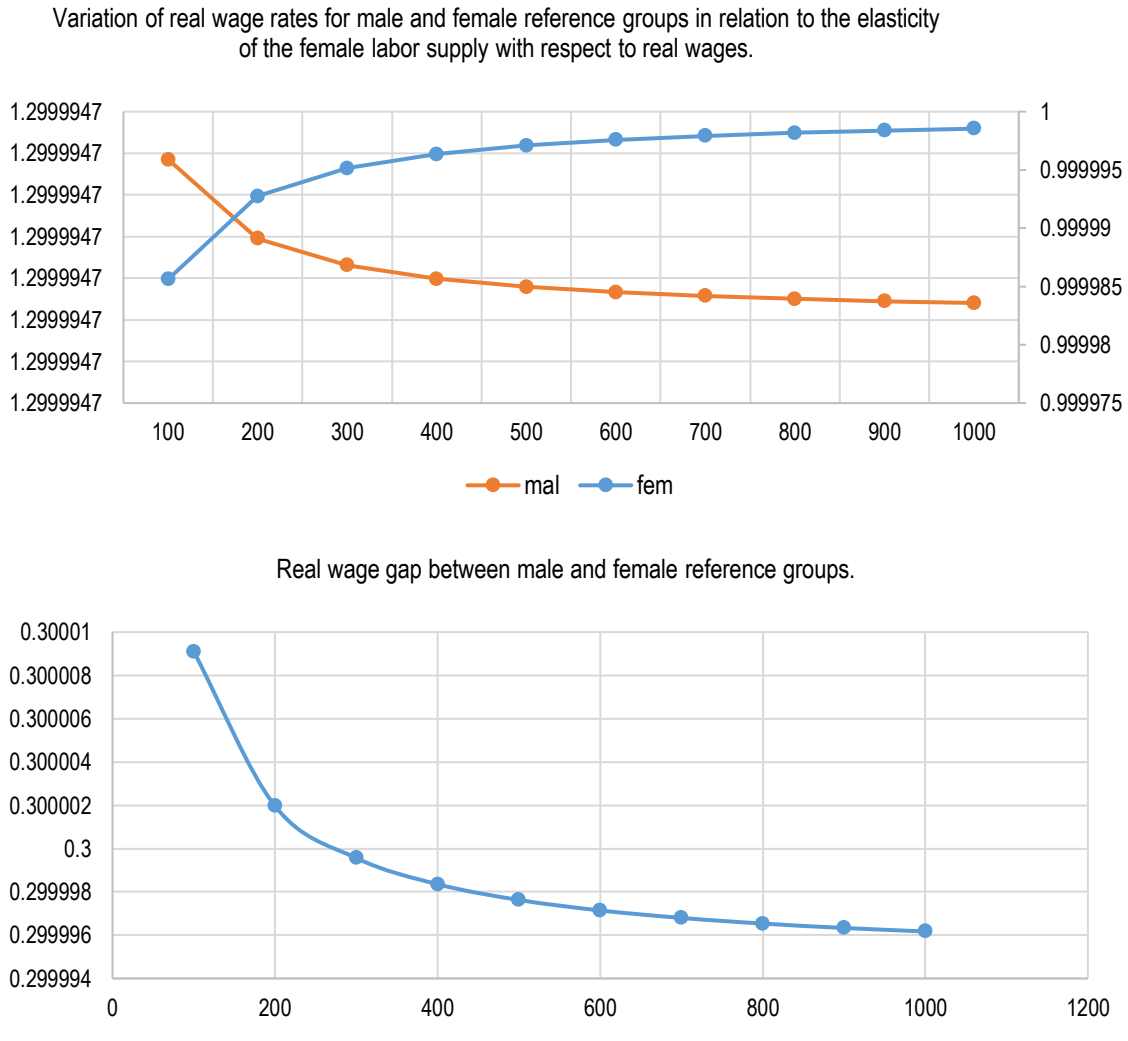
	Variation in Demand		Variation in Total Production		Variation in Exports	
	$\sigma_j^{LD} = 0{,}5$	$\sigma_j^{LD} = 10$	$\sigma_j^{LD} = 0{,}5$	$\sigma_j^{LD} = 10$	$\sigma_j^{LD} = 0{,}5$	$\sigma_j^{LD} = 10$
A00	-0,91	-0,92	-0,68	-0,69	0,47	0,47
A05	-0,06	-0,07	-0,42	-0,44	-0,21	-0,23
B00	-0,04	-0,06	0,89	0,86	2,69	2,67
CA0	-0,79	-0,80	-0,30	-0,31	0,96	0,94
CB0	-2,10	-2,11	0,61	0,60	3,18	3,17
CC0	0,22	0,20	1,84	1,82	13,57	13,55
CED	0,26	0,24	1,99	1,97	2,06	2,04
CF0	0,01	-0,01	1,91	1,90	7,03	7,01

	Variation in Demand		Variation in Total Production		Variation in Exports	
	$\sigma_j^{LD} = 0,5$	$\sigma_j^{LD} = 10$	$\sigma_j^{LD} = 0,5$	$\sigma_j^{LD} = 10$	$\sigma_j^{LD} = 0,5$	$\sigma_j^{LD} = 10$
CGM	-0,91	-0,93	-0,14	-0,15	0,52	0,50
DE0	0,14	0,13	0,18	0,17	0,29	0,27
F00	0,24	0,23	0,35	0,34	2,32	2,30
G00	0,48	0,46	0,17	0,16	0,46	0,45
H00	0,37	0,34	1,14	1,12	2,06	2,04
I00	0,30	0,29	0,35	0,34	0,62	0,61
J00	-0,16	-0,18	-0,21	-0,23	-0,20	-0,22
K00	0,05	0,04	0,08	0,06	0,33	0,31
L68	0,02	0,01	-0,02	-0,03	-0,43	-0,44
MN0	-0,13	-0,16	-0,07	-0,10	0,51	0,48
O84	-0,80	-0,82	-0,82	-0,84	-0,71	-0,74
PQ8	-0,65	-0,67	-0,67	-0,70	-0,71	-0,75
RS0	0,13	0,12	0,04	0,02	-0,32	-0,34

Source: authors, by GAMS

Appendix 3-2: Results of the 2nd simulation: Legal equality

Figure 9: Impact of the variation in the elasticity of female labor supply relative to real wages on the real wage gap



Source: Authors, by GAMS

Table 4: Deterioration of Moroccan economic situation (comparison between initial situation and the case where ε_{fem}=1000)

	Variation in Demand		Variation in Total Production		Variation in Exports	
	ε_{fem}=0,8	ε_{fem}=1000	ε_{fem}=0,8	ε_{fem}=1000	ε_{fem}=0,8	ε_{fem}=1000
A00	-0,68	-0,70	-0,91	-0,93	0,47	0,46
A05	-0,42	-0,46	-0,06	-0,09	-0,21	-0,26
B00	0,89	0,84	-0,04	-0,09	2,69	2,64
CA0	-0,30	-0,32	-0,79	-0,82	0,96	0,93
CB0	0,61	0,58	-2,10	-2,13	3,18	3,15
CC0	1,84	1,80	0,22	0,18	13,57	13,53
CED	1,99	1,96	0,26	0,22	2,06	2,03
CF0	1,91	1,88	0,01	-0,02	7,03	6,99
CGM	-0,14	-0,17	-0,91	-0,95	0,52	0,49
DE0	0,18	0,16	0,14	0,11	0,29	0,26
F00	0,35	0,32	0,24	0,22	2,32	2,29
G00	0,17	0,14	0,48	0,45	0,46	0,43
H00	1,14	1,09	0,37	0,32	2,06	2,01
I00	0,35	0,32	0,30	0,27	0,62	0,59
J00	-0,21	-0,25	-0,16	-0,20	-0,20	-0,24
K00	0,08	0,05	0,05	0,02	0,33	0,29
L68	-0,02	-0,04	0,02	0,01	-0,43	-0,45
MN0	-0,07	-0,12	-0,13	-0,18	0,51	0,45
O84	-0,82	-0,87	-0,80	-0,85	-0,71	-0,78
PQ8	-0,67	-0,72	-0,65	-0,70	-0,71	-0,78
RS0	0,04	0,01	0,13	0,10	-0,32	-0,36

Source: Authors, by GAMS

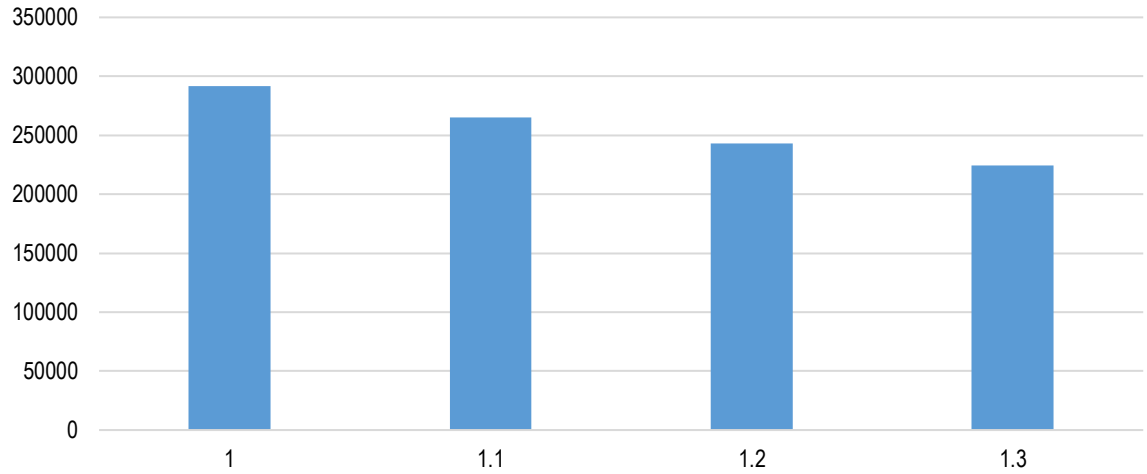
Table 5: Deterioration of some Moroccan macroeconomic indicators: comparison between initial situation and case where ε_{fem}=1000

	Var% household income	Var % of GDP	Var % of FBCF	Var % of tax revenue	Var % of government revenue
ε_{fem}=1000	0,831	0,171	0,115	-6,816	-1,903
ε_{fem}=0,8	0,833	0,174	0,116	-6,807	-1,900

Source: authors, by GAMS

Appendix 4: The impact of equalizing wages between the two genders on the demand for female labour

Figure 10: The impact of equalizing wages between the two genders on the demand for female labor



Source: autours, by GAMS