

# The impact of Covid-19 on the Senegalese Economy: From a gender perspective.



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**Authors** H el ene Maisonnave | Fran ois Cabral

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## Abstract

Senegal, like other African countries, has been hit by Covid-19 and has put in place measures to contain the epidemic. These measures impact men and women differently. To capture their effects on women's employment, we use a computable general equilibrium model, coupled with a micro-simulation module. The results show that the Senegalese economy suffers from these measures with a decrease in GDP by 5.38% in the moderate scenario. In terms of employment, the informal sector is more heavily affected than the formal sector, as some businesses benefit from the increase in foreign demand for certain agricultural products. Unskilled workers are the most affected group by the crisis. Although women are strongly affected, they are relatively less affected than men. This is due to the predominant presence of women in the agricultural sectors, which are positively impacted by the increase in foreign demand for agricultural products.

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## Authors

**Hélène Maisonnave**

EDEHN

University of Le Havre

Le Havre, France

[helene.maisonnave@univ-lehavre.fr](mailto:helene.maisonnave@univ-lehavre.fr)

**François Joseph Cabral**

LIND

Cheikh Anta Diop University

Dakar, Senegal

[joecabral7@gmail.com](mailto:joecabral7@gmail.com)

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## I. Introduction

The coronavirus pandemic (COVID-19) had devastating global health and economic impacts in 2020, and its effects are likely to be felt well into the future. It has had and will continue to have a major impact on the health and well-being of many vulnerable groups (OECD, 2020b). Women are particularly affected by crises. Indeed, the impacts of crises are never gender-neutral, and COVID-19 is no exception. In fact, women tend to earn less than men and work in less skilled jobs. Furthermore, they are burdened with unpaid care and domestic work, which forces them to withdraw from the labour market (Azcona et al, 2020; OECD, 2020a).

With the introduction of containment measures to combat Covid-19, 72% of domestic workers have lost their jobs, out of which 80% are women. Additionally, women are strongly represented in the sectors directly affected by the measures to limit the spread of the virus, such as the hotel and catering sector and the domestic work sector (Azcona et al, 2020, WTO, 2020). Due to their pivotal role in the family, women, to a greater extent than men, are the main victims of the measures taken to prevent the spread of the disease. It is mainly women who care for the children when the schools are closed, which increases significantly their domestic workloads. (Burki, 2020, OECD, 2020a, WANEP, 2020).

Past experiences of other pandemics such as Ebola have shown that women suffer more than men. For instance, during the Ebola crisis of 2014, restrictions on mobility severely affected the livelihoods of female traders in West Africa. According to Burki (2020), they were harder hit by unemployment and found it more challenging to return to the labour market once the crisis was over. Furthermore, their duties often include caring for the sick (Kapur, 2020 Casale and Posel 2020, Ba, 2020) as well as taking care of the household. Consequently, they turn away from productive work activities, which has consequences in terms of income.

In addition, girls may be compelled to reduce the time they spend on schooling compared to boys in order to help their mothers with household chores (collecting water for example). Moreover, in times of crises such as from the Ebola or Zika viruses, health services are overwhelmed and women have less access to pre- and post-natal care and contraceptives (Azcona et al, 2020). These and other non-economic effects could leave women in very precarious circumstances and have long-term repercussions on the vulnerability of women and

girls, thereby leaving them even further behind their male counterparts in terms of equality.

It is therefore essential to take the gender dimension into account when studying the effects of Covid-19 (Smith, 2019; Whenam et al, 2020), especially given that the gender dimension is often omitted in pandemic impact assessments. According to Criado Perez (2019), less than one percent of the 29 million scientific articles published concerning the impact of Zika and Ebola focused on the gender impacts.

Preliminary studies on the gender impacts of Covid 19 show that women are more affected than men in terms of employment (McKinsey Global Institute, 2020; ILO, 2020, Casale and Posel, 2020) and poverty (Chitiga et al, 2020; Escalante and Maisonnave, 2020). Indeed, the pandemic accentuates already existing inequalities and exposes vulnerabilities in both the health and labour market systems. In fact, many workers work in the informal sector and thus do not benefit from the safety net when their employment is terminated due to confinement. Here, women are over-represented among informal workers.

The above gender issues are well illustrated in Senegal. Indeed, informal employment is the main source of employment in Senegal, with 81.7% of the population working in the informal sector. However, this figure is much higher for women (88.8%) than for men (75.8%), which indicates that women are more vulnerable in the labour market (ANSD, 2017). Regarding paid employment, 67% of women work in the service sector, 26% in agriculture and only 5% in industry (World Bank, 2019). Furthermore, the data indicates that 72.7% of women work in vulnerable employment (World Bank, 2019). These are unpaid, family worker jobs as well as self-employment jobs. Due to their instability, these jobs expose women to more precariousness.

Along with other countries, Senegal has been affected by the Covid-19 pandemic. Up to the 28th of December 2020, 18728 cases have been detected, including 390 deaths. The fatality rate is 2.1%, which is far below that of Chad (7.2%) but higher than that observed in Burundi (0.2%). Two thirds of the cases detected are located in the Dakar region (COUS/MSAS, Covid 19 data, 2020). Senegal has taken steps to halt the transmission chain of the virus. A first set of measures have been taken to fight the pandemic.

To cope with the so-called imported cases, Air Senegal cancelled its regional and international flights on March 20th. Likewise, the following measures were taken by officials on the 14th of March 2020: closure of schools, prohibition of public demonstrations, and

cancellation of celebrations planned for the 60th anniversary of the country's independence. On the 23rd of March 2020, a state of emergency was declared for the entire country for the period 8pm-6am. This state of emergency was extended on the 4th of April for 30 days and then again until the 2nd of June 2020. The mandatory use of masks in public and private spaces, shops and transportation was decided on the 19th of April 2020. A second series of measures was adopted on the 11th of May 2020 with the aim of easing the provisions of the state of emergency. This involved rearranging the curfew hours from 9 p.m. to 5 a.m., reopening urban markets, weekly markets and places of worship, while respecting the social distancing measures.

On the 4th of June, the curfew was further relaxed and was set from 11pm to 5am and the ban on inter-city transport was lifted. The general objective of these measures was to limit the proliferation of the virus and to restrict the number of people getting sick, so as not to undermine the country's health services. These measures have reduced working hours, the mobility of individuals and slowed the flow of transactions and thus the pace of economic activity. To date there is no study evaluating the impact of these measures on the employment of Senegalese women.

The objective of this study is to evaluate the impact of Covid-19 on women so that gender-specific policies adapted to epidemics can be identified. To achieve this, we use a computable general equilibrium (CGE) model calibrated with data from 2017 that takes into account the distribution of employment across both the formal and informal sectors of the economy as well as the gender dimension. The remainder of the paper is organised as follows: section 2 presents the women's situation in the labour market, section 3 describes the methodology and data used, while section 4 presents the scenarios and the results before the conclusion in section 5.

## II. The situation of women in the labour market in Senegal

In Senegal, women make up a relatively large share of the working-age population. The share of the working-age population among women is estimated at 79.65% while for men it is 75.16% (ANSD, 2017). The participation rate reveals gender disparities in labour market participation. Although the female working-age population is greater than that of men, the activity rate for men (60.5%) is about 20% higher than that of women (39.6%) according to the ANSD (2017). Their marital status reduces the likelihood of them finding a job in the labour market (Adjamagbo et al., 2006).

Analysis of the employment rate shows that more than one third of the working-age population is in employment. It was estimated that 47.3% of the population was in employment during the fourth quarter of 2017, although this rate was estimated to be 38.5% for women and 58.3% for men (ANSD, 2017). Despite the efforts made within the framework of the objectives of the Plan for an Emerging Senegal to create 100,000 to 150,000 jobs each year through the promotion of labour-intensive public investments (HIMO) and improved monitoring of the labour market, unemployment remains high. The unemployment rate for those aged 15 or older is estimated to be nearly 16%. From a gender perspective, unemployment affects women more (22.5%) than men (9.8%) (ANSD, 2017).

Men are relatively more predominant in the workforce in most sectors of the economy. Indeed, as shown in Table 1, women predominate in some specific sectors, such as the manufacture of dairy products and ice cream (95.78% of the workforce is female) or the catering and drinking establishments sector, where 83.2% of the workforce is female. In all the other sectors, men predominate.

**Table 1: Distribution of male and female employees by sector, 2017 (%)**

Sectors	Female	Male	Total	Sectors	Female	Male	Total
1 Growing of Cereals	41,38	58,62	100	15 Manufacture of dairy products and ice cream	95,78	4,22	100
2 Growing of tubers and dry leguminous vegetables	55,52	44,48	100	16 Other food industries	54,97	45,03	100
3 Growing of fruits, plants and flowers, nurseries, beverage plants	24,08	75,92	100	17 Other non-food industries	22,22	77,78	100
4 Peanuts and other oilseed products (except cottonseeds)	48,43	51,57	100	18 Building construction, construction and civil engineering	1,32	98,68	100
5 Other agricultural crops and supporting activities	40,80	59,20	100	19 Wholesale and retail trade and repair	66,08	33,92	100
6 Breeding of cattle, sheep and goats	17,42	82,58	100	20 Road transport	1,40	98,60	100
7 Poultry farming	33,71	66,29	100	21 Air transport	0,00	100,00	100
8 Other livestock and livestock support activities	19,79	80,21	100	22 Other transport services	0,67	99,33	100
9 Fisheries and aquaculture	3,20	96,80	100	23 Hotel and accommodation	21,25	78,75	100
10 Extractive activities	37,51	62,49	100	24 Catering and drinking establishments	83,72	16,28	100
11 Slaughtering, processing and preserving of meat	50,49	49,51	100	25 Telecommunications	23,19	76,81	100
12 Manufacture of edible fats and oils	100,00	0,00	100	26 Other services	58,46	41,54	100
13 Grain processing	57,44	42,56	100	27 Non-market services	30,30	69,70	100
14 Canned fruit and vegetables	100,00	0,00	100	Average	45,52	54,48	100

Source: ANSD, 2017.



Female employment in the labour market is concentrated in three sectors. These are chiefly "Growing of Cereals ", "Trade and Repair" and "Other Services". This polarisation also occurs to a lesser extent in the sectors: "Growing of tubers and dry leguminous vegetables" and "Catering and drinking establishments", which also employ relatively more women. More than 80% of the women employed in the labour market are concentrated in these five sectors of the economy. The fact that more than 80% of them are concentrated in a relatively small number of sectors increases their labour market vulnerability. If we look at the distribution of the workforce — in terms of education, we can see that men systematically outnumber women, and that this gap widens progressively as the educational level increases. Some 47% of unskilled workers are women, while only 23% of them have a master's degree or a doctorate (the highly skilled).

**Table 2: Distribution according to gender and level of education (%)**

	Women	Men	Total
0 Without education	47	53	100
1 Certificate of Primary Education (CEPE)/ Primary School-leaving Certificate (CFEE)	44	56	100
2 Junior Secondary Education Certificate (BEPC)/ Junior Secondary Certificate (BEFM)/ Certificate of Professional Aptitude (CAP)/ Diploma of Occupational Studies (BEP)	36	64	100
3 Secondary School-leaving certificate (BAC)	30	70	100
4 General University Diploma (DEUG)/ University diploma in technology (DUT)/ Higher Technician Certificate (BTS)/ Undergraduate degree	23	77	100
5 Degree/Master's/Engineer/Doctorate	23	77	100
Overall	46	54	100

Source: ANSD, 2017.

In line with the strong trend observed in the Senegalese labour market, the female labour force is essentially made up of unskilled workers. Over 80% of women have no qualifications at all, and only 2.5% of women have a qualification equal to or superior to the baccalaureate.

**Table 3: Level of education amongst women (%)**

	Women
0 Without education	86,2%
1 Certificate of Primary Education (CEPE)/ Primary School-leaving Certificate( CFEE)	7,4%
2 Junior Secondary Education Certificate (BEP)/ Junior Secondary Certificate (BEFM)/ Certificate of Professional Aptitude (CAP)/ Diploma of Occupational Studies (BEP)	3,7%
3 Secondary School-leaving certificate (BAC)	1,6%
4 General University Diploma (DEUG)/ University diploma in technology (DUT)/ Higher Technician Certificate (BTS)/ Undergraduate degree	0,6%
5 Degree/Master's/Engineer/Doctorate	0,5%
Overall	100%

Source: ANSD, 2017.

A similar observation is made in table 4 below. Slightly more than 60% of the women are either « self-employed non-agricultural workers » or « family carers ». Employment in both types of jobs requires few skills and therefore the level of income is low. Moreover, both types of employment are characterised by a high degree of insecurity.

**Table 4: Breakdown of employment activity by gender (%)**

Main employment activity	Male	Female
Senior executive, engineer and equivalent	1,3	0,6
Middle manager, supervisor	2,7	2,1
Employee, skilled worker	10,5	7,0
Employee, semi-skilled worker	8,0	6,6
Labourer	5,4	0,9
Business owner, employer	3,1	0,9
Self-employed farmer	16,7	8,4
Self-employed non-agricultural worker	20,0	31,2
Apprentice/trainee	9,5	3,4
Family carers	16,8	30,5
Other status	5,9	8,3
Total	100	100

Source: ANSD-ENES, 2017.

There are fewer women in senior management positions and as employers. Most of them are either family carers or self-employed non-agricultural workers. In addition, only 22% of permanent contracts and 32% of fixed-term contracts are held by women (Household Survey, 2011), further accentuating their precariousness in the labour market.

## III. Methodology and data

### 3.1. Methodology

#### 3.1.1. The Macro models

To evaluate the impacts of the lockdown brought about by COVID-19 on Senegalese women, we use a computable general equilibrium (CGE) model. The CGE models can represent the whole economy, including the different institutions and women. These models enable the different impacts of COVID-19 (international and national impacts) to be captured and are therefore appropriate tools that can be used in this context. They can indeed capture shocks from the rest of the world and transmit them to the national economy, capturing impacts on households, businesses, and governments.

Interestingly, these models consider existing inter-sectoral linkages, while also capturing the different transmission effects between sectors. Therefore, as previously mentioned, these models are the appropriate tools to also capture the direct and indirect impacts caused by the Covid-19 shock, as was the case for studies carried out by Maliszewska et al (2020) and Laborde et al (2020). Furthermore, these models have also been used to evaluate the impacts of previous pandemics (Beutel et al., 2009; Keogh-Brown et al., 2010; Fofana et al., 2015). A few studies using CGE models to assess the impacts of Covid 19 on women exist (Chitiga et al, 2020; Escalante and Maisonnave, 2020).

We use the PEP 1-1 model from Decaluwé et al (2013) that we have adapted for our study. In line with the Social Accounting Matrix (SAM), our model consists of 36 activities and 46 products. Each sector of production uses labour, capital and intermediate consumption to produce. Our model distinguishes 6 different types of labour force, broken down according to the level of skills (unskilled, semi-skilled and skilled) and gender (men, women). All activities use each of the different types of labour, but in varying proportions. For example, the formal highway sector uses relatively higher levels of unskilled male labour, while the informal crop sector uses relatively higher levels of unskilled female labour. The formal sectors combine labour with formal capital, while the informal sectors combine labour with informal capital.

Technically, the production function is a nested function with 5 levels. At the first level, output is a Leontief-type function between value added and intermediate consumption. The

value added is a CES-type function between composite labour and capital. At the third level, composite labour is disaggregated according to level of skills (skilled, medium-skilled, and unskilled). At the last level, each type of work is a CES-type function between men and women.

The model identifies four different institutions: households, businesses, government and the rest of the world. Households are broken down into thirty categories, according to their location and income decile share. Households derive their income from labour, capital, and transfers. They spend most of their income on final consumption, with the remainder allocated to paying direct taxes, transfers to other economic institutions and savings.

Firm's income is derived from capital income and transfers from other agents. They distribute dividends to other agents, pay corporate taxes and save the rest. The public authorities collect direct taxes from households and firms, indirect taxes (such as production taxes, consumption taxes and import duties) and receive transfers from other institutions (dividends, social contributions, etc.). The government uses its income mainly for non-market sector production (education, health, public administration) and makes transfers to other institutions (pensions and household subsidies). Public savings represents the difference between income and expenditure.

In order to link Senegal and the rest of the world, the traditional CGE modelling approach is used, where trade is modelled based on the assumption of imperfect substitutability of products given their origin (the Armington assumption). As far as exports are concerned, we assume that Senegalese producers can sell their production either on the local market or on the international market. However, we assume that they cannot export as extensively as they would like to and that if they want to increase their share of the global market, then they must be more competitive than the other international producers. Technically, this means that we assume a finite elasticity for the export demand that reflects the competitiveness of local producers on the international markets.

Senegal has a high unemployment rate, particularly for women. To take this into account for skilled and medium-skilled workers, we follow the model of Blanchflower and Oswald (1995). This modelling assumes that there is an inverse relationship between wages and the unemployment rate. We also assume that there is a segmentation of workers, between those who work in the public sector and those who do not. Indeed, public sector workers are guaranteed employment and are therefore not affected by labour market adjustments. We have

not introduced any segmentation between the formal and informal sectors of the economy. In fact, there is a certain porosity between these two types of sectors in the sense that if a worker in the formal sector lost his job, he would seek to work in any branch, formal or informal.

In terms of closures, we assume that the nominal exchange rate is the numeraire of the model. Furthermore, the "small country" hypothesis is retained for Senegal, and consequently, world prices are exogenous. We also assume that the current account balance is fixed. We assume that labour and capital are mobile across sectors.

Finally, government expenditure is assumed to be fixed. It should be noted that this paper does not evaluate any set of fiscal policies aimed at mitigating the effects of COVID-19. In fact, we seek to evaluate how COVID-19 impacts women and therefore we are not evaluating any fiscal package that would mitigate the impacts of the pandemic on women.

### 3.1.2. The micro model

To get a clear view of the impact of Covid-19 on the employment of men and women in Senegal, we construct a micro-simulation model of jobs linked to the model (CGE). Indeed, using the National Employment Survey of Senegal from 2017 (ENES), employed individuals can be matched, according to their qualifications, to each segment of the labour market and each sector. This survey makes it possible to identify the main occupational sector of the individual. This model allows us to simulate the impact of the Covid-19 shock on the demand for manpower per skill category.

For each of the sectors, the workforce in the different segments of the labour market is given according to gender: skilled workers (bac + 4 years additional education and more), medium-skilled workers (bac + 2 years additional education and/or +3 years additional education, bac, BFEM/BEP, CFEE), and unskilled workers (uneducated and/or those who have not completed primary education). Each of the different segments of the labour market is then associated with the corresponding number of employees and sectors. For each market segment, we determine the number of employees involved. Thus, the microsimulation model includes a workforce of 3 712 719 employees. These employees are distributed across the different areas of activity, according to their level of qualification and gender.

Derived from the simulation results on labour demand per type of worker and obtained

using the CGE model, these weightings make it possible to assess the impact of the shock on labour demand for each type of job in the economy according to the sector, qualification, gender, and the nature of the sector (formal or informal). Consequently, from the simulation, we obtain the variations in employment volumes by sector and by category.

### **3.2. Data used**

The Social Accounting Matrix (SAM) for Senegal used in this study was developed by Cabral et al, (2020) using data from 2017. It highlights the duality of the Senegalese economy which is divided into formal and informal compartments. The choice of the year 2017 is justified by the fact that it is the last year for which consolidated national accounts data is available.

The SAM is composed of 36 sectors, divided into formal and informal activities, 46 goods/services, 8 production factors, 34 institutional categories and two accumulation accounts. Among the production factors, there are 6 types of labour and two types of capital. The categories of labour are classified according to educational levels, unskilled work (no education), medium-skilled (primary, intermediate secondary, baccalaureate (BAC), BAC +2&3 years additional education) and skilled work (master's degree and doctorate). We consider the gender dimension (male and female) for each level of education. Given the specificity of the SAM, there are two types of capital: formal capital (used by the branches of the formal sector) and informal capital, used by the branches of the informal sector.

There are four different types of institutions: households, firms, government and the rest of the world. Households are disaggregated according to their location (Dakar, other urban centres and rural) and by income deciles. As for firms, they are differentiated into formal and informal. The two accumulation accounts combine household and business savings, the budgetary balance and savings from the rest of the world. Gross fixed capital formation (GFCF) and changes in the economy's stocks are also recorded in this account.

### **3.3. Analysis of the Senegalese economy using the SAM**

#### **3.3.1. Production and value added**

Analysing the sectoral components of GDP reveals that tertiary activities are predominant in the Senegalese economy. Services account for almost half of the value added (57.66%). The contribution of informal market services (24.29%) to wealth creation in the market services sub-sector is relatively higher than that of formal market services (20.85%) as well as from non-market services (12.52%). As for industries, they contribute 25.71% to the creation of added value. The contribution of formal industries (14.20%) to the creation of value added in this sub-sector is relatively higher than that of informal industries (11.21%).

In contrast, agriculture's contribution to the creation of wealth is relatively modest (16.64%). Non-formal agriculture accounts for most of the value added in this sector (15.68%). Formal agriculture contributes only marginally (0.96%). Ironically, more than 56% of the working population is employed in agriculture. It is therefore important to point out that because of this modest contribution, income inequalities are still increasing significantly. The high rates of value added found in the agricultural (76.94%) and services (66.83%) sectors, are a reflection of the relatively high levels of wealth generation in these two sectors and as a result, their low use of intermediate consumption. Industries, which are large consumers of inputs, create relatively less wealth with an estimated value added rate of 36.99% (Table 5).



**Table 5: Contribution of the sectors to production and value added in the economy**

Sectors	Production	Value added		Value added rate
	Value (in millions of CFA francs)	Value (in millions of CFA francs)	Share (in %)	Value added/Production (%)
AGRICULTURE	2 372 548	1 825 424	16,64	76,94
Formal agriculture	195 999	104 827	0,96	53,48
Informal agriculture	2 176 549	1 720 597	15,68	79,05
INDUSTRIES	7 628 209	2 821 491	25,71	36,99
Formal industry	5 131 446	1 558 761	14,2	30,38
Informal industry	2 496 763	1 262 730	11,51	50,57
SERVICES	9 466 449	4 952 804	57,66	66,83
Formal market services	4 191 926	2 287 472	20,85	54,57
Informal market services	3 377 405	2 665 332	24,29	78,92
Non-market services	1 897 118	1 373 980	12,52	72,42
Total	19 467 206	10 973 699	100	56,37

Source: Calculations based on SAM data for Senegal, 2017.

One of the striking features of the Senegalese economy is the strongly dualistic nature of the production activities. The formal sector coexists with a large informal sector that consists of small family businesses and individual entrepreneurs. With an estimated contribution of 51.47% to the generation of GDP in 2017 and an estimated value-added rate of 70.16%, this sector plays an important role as regards economic activity and the improvement of the population's welfare. Given the relatively low stock of human capital in the Senegalese economy, this sector mainly consists of unskilled workers. Indeed, nearly 80% of the workforce has not completed primary school education (ADB, 2015).

Market services (29.24%) and agriculture (15.68%) account for the bulk of wealth creation in the informal sector, whose contribution to value added indicates a relatively large share of non-tradable goods and services in GDP. In the formal sector, wealth creation is mainly driven by market services and industry (Table 6).

**Table 6: Contribution of the sectors to production and value added in the formal and informal segments**

Sectors	Production	Value added		Value added rate
	Value (in millions of CFA francs)	Value (in millions of CFA francs)	Share (in %)	Value added/Production (%)
FORMAL	11416489	5325040	48.53	46.64
Formal agriculture	195999	104827	0.96	53.48
Formal industry	5131446	1558761	14.2	30.38
Formal market services	4191926	2287472	20.85	54,57
Non-market services	1897118	1373980	12.52	72.42
INFORMAL	8050717	5648659	51.47	70.16
Informal agriculture	2176549	1720597	15.68	79.05
Informal industry	2496763	1262730	11.51	50.57
Informal market services	3377405	2665332	24.29	78.92
Total	19467206	10973699	100	56.37

Source: Calculations based on SAM data for Senegal, 2017.

### 3.3.2. The income of men and women

Men receive more earnings from labour than women, both in the formal sector (70% for men vs. 30% for women) and in the informal sector (73% for men vs. 27% for women). Income from the informal sectors has an important role in the livelihoods of both women and men. In fact, almost 56% of women earned income comes from the informal sector, compared to 44% from the formal sector.

**Table 7: Income share from formal and informal work according to gender in 2017 (in %)**

	Formal	Informal	Total
Men	41%	59%	100%
Women	44%	56%	100%

Source: SAM, 2017.

Wages across the economy are relatively higher in the informal sector, given the larger number of workers in this sector. They are somewhat higher for the agricultural and service sectors. Women's wages are relatively higher in the informal sectors associated with agriculture and market services.

**Table 8: Share of income from formal and informal work by gender and sector in 2017 (%)**

Agriculture	Formal	Informal	Total
Men	4,96%	95,04%	100%
Women	4,71%	95,29%	100%
Industry			
Men	45,08%	54,92%	100%
Women	42,21%	57,79%	100%
Market services			
Men	38,23%	61,77%	100%
Women	37,14%	62,86%	100%

Source: SAM, 2017.

Like the situation with the employment rate, labour income benefits men, especially urban men, more than women. In addition, women working in the formal sector in both urban and rural areas earn relatively more money from work than those working in the informal sector. It would appear that this income distribution is relatively more to the advantage of women residing in "other urban centres" than in "other areas".

**Table 9: Distribution of income from formal and informal employment by strata and gender in 2017 (%)**

	Income from Formal Employment		Income from Informal Employment		Total
	Men	Women	Men	Women	
Dk1	35%	6%	51%	8%	100%
Dk2	17%	25%	25%	32%	100%
Dk3	26%	16%	37%	21%	100%
Dk4	36%	5%	52%	7%	100%
Dk5	31%	11%	45%	13%	100%
Dk6	34%	7%	50%	9%	100%
Dk7	23%	19%	34%	24%	100%
Dk8	29%	13%	41%	17%	100%
Dk9	30%	12%	43%	15%	100%
Dk10	24%	18%	35%	23%	100%
OUC1	23%	20%	33%	25%	100%
OUC2	22%	20%	32%	26%	100%
OUC3	23%	19%	33%	24%	100%
OUC4	26%	16%	38%	20%	100%
OUC5	25%	17%	36%	22%	100%
OUC6	27%	14%	40%	18%	100%
OUC7	28%	14%	40%	18%	100%
OUC8	30%	11%	44%	14%	100%
OUC9	32%	10%	46%	12%	100%
OUC10	32%	10%	46%	12%	100%
RUR1	36%	5%	52%	7%	100%
RUR2	29%	12%	42%	16%	100%
RUR3	31%	10%	45%	13%	100%
RUR4	33%	8%	48%	11%	100%
RUR5	33%	9%	47%	11%	100%
RUR6	35%	6%	51%	8%	100%
RUR7	35%	7%	50%	8%	100%
RUR8	34%	8%	49%	10%	100%
RUR9	31%	11%	45%	14%	100%
RUR10	28%	14%	40%	18%	100%

Dk: Dakar; OUC: Other Urban Centers; RUR: Rural. Source: SAM 2017

### 3.3.3. Exchanges with the outside world

One of the transmission channels of the Covid-19 crisis stems from exchanges with the outside world. Consequently, we will outline the trade situation in Senegal.

The Senegalese economy is quite dependent on the international market. The import penetration rate is relatively higher than the export rate, and this contributes, largely, to the structural nature of the trade balance deficit. Indeed, while imported goods and services account for nearly 22% of the domestic market supply (local sales and imports), slightly less than 14% of the total local production is sold on the international market (Table 8). The secondary sector is the main exporter of goods and services (65.78% of total exports) and therefore has a relatively higher export share (23.42%).

Only a very modest 8.08% of total exports come from the agricultural sector. Industrial products, on the other hand, make up the majority of total imports (84.20%). An examination of the import penetration rate of industrial goods reveals that nearly 40% of the domestic market's supplies come from foreign producers.

**Table 10: International trade**

	Share of exports (%)	Share of imports (%)	Rate of export (%)	Penetration rate (%)
	EXi/EX	Mi/M	EXi/XSi	Mi/Qi
Agriculture	8,08	5,96	8,74	10,34
Industry	65,78	84,20	23,42	39,00
Market services	26,15	9,84	9,19	5,85
Non-market services	0,00	0,00	0,00	0,00
Total	100	100	13,72	20,61

Source: Calculations based on SAM data for Senegal, 2017.

Manufactured products, agro-food industry products, other extractive industrial products and refined petroleum represent respectively 17.65%, 14.97%, 14.7% and 9.08% of total exports. Agricultural products play a very modest role in terms of exports. Among the goods whose production is most oriented towards the international markets are zircon (82.18%), tobacco (65.18%) and oil (63.84%). In 2017, imports were comprised mainly of manufactured goods (43.21%), oil (11.18%) and products from other extractive industries (10%). The goods and services whose provision depends heavily on imports, are manufactured goods, oil, and products of other extractive industries, where 81.02%, 77.99% and 66.42% respectively come from foreign producers.

### 3.3.4. The agents

#### 3.3.4.1. The households

Households are classified according to their income decile and whether they reside in Dakar, in Other Urban Centres (OUC) or in rural areas.

The main sources of income are wages, capital income, private transfers, public transfers and transfers from the rest of the world. Remuneration of the production factors is the primary source of household income. This represents almost two thirds of the total income of the average Senegalese household, i.e. 66.95%. This is followed by private transfers and transfers from the rest of the world.

Wages make up 43.25% of household income. Wages account for 47.80%, 38.42% and 42.39% of household income in Dakar, OUC and rural areas, respectively. Capital income makes up 23.7% of total household income. It accounts for 28.36% of household income in Dakar, 31.58% of income in OUC households and 8.47% of income in rural households (Table 8). It can be noted that transfers from the rest of the world account for more than 14% of household income in rural and urban areas with Dakar being the exception. That is an element to keep in mind given that one of the shocks will involve this variable.

**Table 11: Household income by source (%)**

Households	Labour	Capital	Dakar	Other Urban Centers	Rural	Firms	Gouvernement	Rest of the world	Total
Dakar	47,80	28,36	7,26	5,67	2,34	3,40	0,53	4,65	100
OUC	38,42	31,58	4,56	3,99	3,06	3,89	0,44	14,06	100
Rural	42,39	8,47	12,99	8,43	9,20	1,14	2,71	14,67	100
Senegal	43,25	23,7	8,031	5,92	4,53	2,909	1,124	10,53	100

Source: Calculations based on SAM data for Senegal, 2017.

Overall, household expenditure is composed of final consumption and transfers (Table 10). The consumption basket of urban households (Dakar and other urban centres) is essentially composed of industrial products and market services. The final consumption basket of rural households is overloaded with industrial and agricultural products. The allocation of revenue for the payment of transfers and direct taxes is relatively higher among households in Dakar.

**Table 12: Use of household income (in %)**

	Dakar	Other Urban Centers	Rural
Transfers	25,37	22,19	19,04
Dakar	7,26	6,95	3,22
Other urban centres	3,71	3,99	3,43
Rural	9,44	7,53	9,20
Firms	0,91	0,47	0,50
Government	0	0	0
Rest of the world	4,05	3,25	2,70
Consumption	58,82	60,56	68,45
Agricultural products	8,71	10,37	17,30
Industrial products	30,05	32,63	39,22
Market services	20,05	17,57	11,92
Non-market services	0	0	0
Direct taxes	3,07	1,59	1,67
Savings	12,75	15,66	10,83
Total	100	100	100

Source: Calculations based on SAM data for Senegal, 2017.

### 3.3.4.2. The Government

Transactions, which form the most productive tax base, account for 32.95% of total revenues in 2017 (Table 13). Revenues from foreign trade account for almost 12% of total state revenues. Taxes and duties on income and wealth provide 23.60% of government income while the tax burden is borne more by employees (11.38%) than by companies (10.91%). Approximately 20% of the government's revenue comes from property and capital income. Public consumption (73.12%) and transfers (19.29%) account for the majority of government expenditure (Table 14).

**Table 13: Government Revenue Structure, 2017 (%)**

Revenues	
Taxes and duties on income and wealth	23,60
Firms	10,91
Households including	11,36
- Dakar	6,25
- Other urban centres	2,64
- Rural	2,48
Government	1,33
Taxes and duties related to production	1,98
Export tax	0,11
Import tax	11,91
Indirect tax	32,95
Transfers received	8,95
Property, capital and factor income	20,51
Total revenue	100,00

Source: Calculations based on SAM data for Senegal, 2017.



**Table 14: Structure of government expenditure (%)**

Transfers made	19,29
Public consumption	73,12
Taxes and duties on income and wealth	1,33
Savings	6,26
Total	100,00

Source: Calculations based on SAM data for Senegal, 2017.

## IV. Scenarios and simulation results

### 4.1. The identified channels

The Covid-19 pandemic affects Senegal through different channels: from external channels and channels specific to the Senegalese economy. On the one hand, the country will be affected given the reduced economic activity of its main partners. A decline in Senegalese exports is therefore expected, given the decline in economic activity, especially in China. However, given that Senegal's main trading partners are the countries of the sub-region, this decline is relatively moderate.

Looking at the year-on-year change in exports between October 2019 and October 2020 (latest available data), export demand declines for some products while it increases for others (see Table 15). The products most affected are hospitality, telecommunications services and fishery products (ANSD, 2020). Moreover, if we look at the changes in world prices over the same period, it can be seen that price changes have been relatively limited and specific to certain products (agri-foodstuffs, manufactured products and peanut oil).

Furthermore, a third external channel through which the Senegalese economy will be affected is through remittances. In fact, Senegalese households receive remittances from family members living outside the country. These remittances accounted for 10% of GDP in 2018. Most of these come from France, Italy and Spain. These countries are struggling economically due to the Covid-19 pandemic. The Central Bank of West African States (BCEAO) believes that these remittances may decline by 30% in 2020.

Alongside these external shocks, the fact that the Senegalese government has also taken measures to restrict the movement of people, close businesses and borders has also affected the Senegalese economy. Therefore, these restrictions will affect all the sectors of the economy, but to different extents. Indeed, a representative study carried out on the industrial sector reveals that 92.5% of companies have been affected by Covid-19 (ANSD, 2020). For most businesses, the health crisis has resulted in a decline in production by more than 25%. While 15% of them believe that their productive activity has declined by more than 75%. Business leaders claim that government-imposed restrictions on worker mobility due to curfews, significantly reduces worker productivity (ANSD, 2020).

The sectors most affected are the tourism sectors (hotels and restaurants), due to the suspension of international flights and the cancellation of cultural events such as the Dakar Biennale, and the transport sectors, due to the measures restricting the movement of the people and curfews. According to the business leaders interviewed, this temporary cessation of business activity was mainly due to the closure of borders, the closure of markets and indeed the closure of schools and universities, requiring parents to stay at home (ANSD, 2020).

In order to take into account this decline in production brought about by the closure of stores/companies as well as by the decline in the number of hours actually worked, we suppose the loss of productivity will vary from sector to sector depending on the degree to which they are impacted. We have distinguished three categories of sectors: those which are highly affected such as tourism and transport; those which are moderately affected and finally those which are not affected at all, such as the agro-food industry.

It must be acknowledged that it is rather difficult to quantify the impacts of closures

and declining labour productivity. We suggest an evaluation using two scenarios: a "moderate" scenario and a "severe" scenario. These two scenarios differ in their level of severity. The first "moderate" scenario assumes that the Senegalese economy returns to a pre-Covid situation relatively quickly, and that the sectors are not overly impacted by the decline in productivity. The "severe" scenario assumes that the social distancing and "work at home" measures will have a greater impact on the productivity of the sectors. Moreover, we assume that remittances from migrants decrease more in the second scenario than in the first one.

**Table 15: Simulated scenarios**

	Moderate Scenario	Severe Scenario
International channels		
Decline in exports	Fishing and aquaculture production: - 52.5%. Agro-food production: - 8.4%. Petroleum refinery products -15%. Chemical products: -22.9%. Telecommunications services (-59%), Air transport services (-30%), Hospitality services (-78%) and Catering services (-20%)	Fishing and aquaculture production: - 52.5%. Agro-food production: - 8.4%. Petroleum refinery products - 15%. Chemical products: -22.9%. Telecommunications services (-59%), Air transport services (-30%), Hospitality services (-78%) and Catering services (-20%)
Increase in exports	Agricultural and associated products (+6.2%) Livestock products (+92.6%) Extractive industry products (+5%) Manufacturing industry products (+32.4%)	Agricultural and associated products (+6.2%) Livestock products (+92.6%) Extractive industry products (+5%) Manufacturing industry products (+32.4%)
Lower international prices	Peanut oil (-8.2%) Agri-food products (-2.6%) Non-food industry products (-2.6%)	Peanut oil (-8.2%) Agri-food products (-2.6%) Non-food industry products (-2.6%)
Decline in migrant remittances		
Domestic channel		
Declining productivity of sectors	-10%	-15%
	-2% for highly affected sectors	- 3% for highly affected sectors
	-1% for moderately affected sectors	-2% for moderately affected sectors

The amplitudes of the shocks presented in Table 15 for the variations in exports and international prices are derived from ANSD data (2020). The remittance hypothesis is based on weak assumptions by the BCEAO and the World Bank. The decline in sectoral productivity is not based on any estimates, as precise data is not available. Our objective is to provide a reasonable estimate. Increasing the magnitude of the decline in productivity is likely to produce more severe results.

## 4.2. The results

### 4.2.1. Impact on macroeconomic variables

The macroeconomic impacts of the COVID-19 pandemic are considerable, with the economy being affected on both the demand and supply sides simultaneously, as mentioned above. This combined effect leads to a 5.38% reduction in gross domestic product (GDP) for the moderate scenario and a 6.54% reduction in GDP in the severe scenario (Table 16). On the supply side, because workers are less productive, due to the fact that they cannot work properly from home or because they waste time in complying with social distancing and health rules, as well as the fact that capital is less used, production is declining in most sectors.

The decline in total production also leads to a decline in the total demand for labour in each firm, which increases the unemployment rates for each labour category. The total labour demand for men declines by 0.84% while women's labour demand declines by 0.66%. Increasing unemployment rates and declining household wage rates leads to a decrease in incomes and consumption.

**Table 16: Impact on macroeconomic variables (% change)**

	Moderate	Severe
Real consumption of households located in Dakar	-2.67	-3.96
Real consumption of households located in other urban centres	-3,19	-4.86
Real consumption of households located in rural areas	-3,33	-5,12
Real GDP	-5.38	-6.54
Consumer Price Index	-2.94	-3.05
Total investment	-6.97	-8.80
Total male employment	-0.84	-1.04
Total female employment	-0.66	-0.84

Source: CGE model results.

#### 4.2.2. Sectoral impacts

Most sectors face a decline in production caused by declining factor productivity while some sectors face a decline in external demand. Consequently, the impacts on production are not homogeneous across sectors. Indeed, impacts on sectors differ, depending on whether or not they have been classified as being highly affected by the lockdown and social distancing measures and whether they are export-oriented sectors or not. For example, in the hotel and catering sector, which faces a decline in productivity, together with a very strong decline in international demand, production falls sharply (-32.23% in the moderate scenario and -33.17% in the severe scenario). This production sector will therefore make redundancies (-31.46% reduction in labour demand). Since this sector employs a relatively high proportion of unskilled female labour, this category of workers will be affected by these redundancies. Given the decline in activity, this sector will also reduce its intermediate consumption, which will have indirect impacts on the other sectors. The same mechanism applies to all sectors facing both a decline in worker productivity and a decline in the international demand for their products. It was also mentioned earlier that real household consumption declines which also contributes to the contraction of product supply.

For other sectors, such as the construction sector, the decline in production is induced partly by the drop in productivity, but mainly by the decline in the total investment budget. In fact, this sector sees its production decrease by 28.29% in the moderate scenario and by 31.46% in the severe scenario.

Finally, some sectors such as the agro-food industry enjoy an increase in production, driven notably by the export demand. In fact, there is increased foreign demand for agricultural and livestock products (see Table 15). For example, there is increasing foreign demand for products such as cereals and fruit and vegetables from the crop sector. This stimulates production. For the industry to produce more, it will recruit workers. Recruitment will be cheaper as the availability of workers made redundant from the other sectors increases.

### 4.2.3 Impact on male and female employment

On the whole, the effect on employment is negative. The decline in employment is more significant for men (-0.84%) than for women (-0.66%), irrespective of the scenario. Looking at the impacts by employment type, it can be seen that skilled women are relatively more affected than skilled men, with an unemployment rate that increases by 2.7% for women compared to 2.6% for men in the moderate scenario and by 3.65% and 3.45% for women and men respectively in the severe scenario.

The unemployment rate for medium-skilled workers, on the other hand, increases by 2.14% for men, compared to 1.83% for women and by 2.92% and 2.54% for men and women respectively in the severe scenario. Women are relatively less affected than men in the labour market because the sectors that are recruiting, given the increase in external demand, tend to be relatively more female labour-intensive. This applies, for example, to the dairy and agricultural products industries.

The declining demand for labour in the market sectors has an impact on the wages of those working in them. Indeed, given the general slowdown in activity, sectors are reducing the number of employees and wage rates are declining. Thus, the wage rate for skilled men declines by 4.29% compared to 3.92% for women, with the rate for medium-skilled men declining by 4.41% and by 3.87% for women, while the wage rate for unskilled workers is the most affected, declining by 5.85% for men and by 5.17% for women. Moreover, the general decline in activity leads to a decrease in the return on capital by about 5.86% in the moderate scenario and by 7% in the severe scenario.

The results given above provide percentage changes in employment. Using a microsimulation model, we can determine the changes to the workforce, in order to get a more accurate picture of the changes occurring in the labour market. The Covid-19 shock leads to the destruction of 54,355 jobs in the moderate scenario compared to 66,242 jobs in the severe scenario.

The destruction of jobs in both scenarios is much more pronounced in the informal sector than in the formal one. In fact, there are four times more job losses occurring in the informal sector for the moderate scenario (Table 17). This can be explained by the fact that the formal sectors enjoy the benefit of an increase in foreign demand which

offsets for the negative effects of Covid-19. The informal sectors do not benefit from this lever, and therefore incur the full negative effects of Covid-19.

**Table 17: Change in the number of employees per segment of the economy  
(No. of workers)**

	Moderate	Severe
Formal sector	-9 866	-11 960
Informal sector	-44 489	-54 282
Total	-54 355	-66 242

Source: results of the micro model

On closer inspection, the sectors that make the most redundancies are "accommodation and catering" (-30593 jobs), "other non-food industries" (-17250 jobs) and "trade and repair" (-15051 jobs).

Men, as indicated earlier, experience more job losses. Under the moderate scenario, there is a loss of 26379 female jobs and 27976 male jobs. However, the disparity increases in the severe scenario, with the loss of 28803 female jobs compared to 37440 male jobs.

Such job losses are mainly recorded amongst the unskilled worker category, which sees a loss of 53615 jobs in the severe scenario and 43840 jobs in the moderate scenario. Skilled workers (both men and women) are relatively unaffected by job losses compared to the other two categories of workers. In the moderate scenario, the decline of employment experienced by women is roughly of the same magnitude as that experienced by men. Unskilled men, on the other hand, experience a relatively larger decline in employment (-30170) compared to women (-23445) under the severe scenario.



**Table 18: Change in workforce numbers by labour market segment (No. of workers)**

	Moderate	Severe
Medium-skilled work	-10 123	-12 102
Women	-4 891	-5 226
Men	-5 232	-6 876
Unskilled work	-43 840	-53 615
Women	-21 378	-23 445
Men	-22 463	-30 170
Skilled work	-391	-525
Women	-111	-132
Men	-281	-393
Total	-54 355	-66 242

Source: Results of the micro model

#### 4.2.4 Impact on agents

Therefore, all households experience a decrease in their revenue, on average by 6% in the moderate scenario and by 7.5% in the severe scenario. The loss of income is not homogeneous among the different categories of households. This is because households face a decline in factor remuneration (capital and labour), as well as a decrease in remittances from abroad. From Table 11, it can be seen that migrant remittances account for up to 14% of the total income of rural households and households outside Dakar. Consequently, these two types of households will be most affected by the decline in remittances. With declining incomes, households consume less, reduce their savings and pay less in terms of direct taxes to the government.

Formal and informal business income, which is mainly derived from capital income, decreases by 5.27% and 4.78% respectively in the moderate scenario and by 6.22% and 5.77% in the severe scenario. The relatively poorer performance of firms in the formal sector is explained by the stricter enforcement of the distancing measures, leading to lower productivity. The decline in business revenues leads to a decrease in their savings and direct taxes paid.

Public administration revenues also decline as a result of lower direct taxes paid by households and businesses, and lower indirect tax revenues. In total, public administration revenues decline by 5.00% in the moderate scenario and by 6.22% in the severe scenario. This decline in government revenues and fixed expenditures leads to a massive increase in the government's current account deficit (-72.48% for the moderate scenario and -92.72% for the severe one). The decline in the income and savings of all agents, leads to a decrease in the total investment budget (see Table 16), impacting in particular the construction and machinery sectors.

## **V. Conclusion and policy recommendations**

This study provides information on the impact of Covid-19 on the Senegalese economy with a special focus on women's employment. In order to capture the different impacts of Covid-19 (national and international), a CGE model was used, along with a microsimulation module in order to obtain a more detailed picture of the employment figures. We find that the Senegalese economy suffers from the measures taken to contain the Covid-19 epidemic, with a 5.38% decrease in GDP under the moderate scenario. While most sectors of the economy are affected, only those with increasing external demand have fared better.

In terms of employment, the informal sector is more affected than the formal sector, where some companies benefit from increased international demand. The unskilled workers are the most impacted group. Women, although strongly impacted, tend to be less affected than their male counterparts. This is due to the predominant presence of women in the agricultural sectors, which are positively impacted by the increase in international demand for agricultural products.

It is however necessary to be cautious when interpreting the results obtained in this study. This is because we do not take into consideration the domestic work carried out by women and men, even though we know that women carry this workload more than men. Including this

hypothesis in our model would very likely cause the welfare of women to deteriorate further. Furthermore, as the Covid-19 epidemic is not yet over, there is a great deal of uncertainty concerning the data, the magnitude of the shocks and the evolution of the disease. Nevertheless, given the very negative impact of the epidemic on the informal sector, special consideration should be given by the government to the workers in this sector.

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