The impacts of the Covid-19 pandemic on employment in Cameroon: A general equilibrium analysis

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Abstract
This paper presents a computable general equilibrium (CGE) model that assesses the impacts of the Covid-19 pandemic on different economic sectors in Cameroon. A special feature of the CGE model used in this study is that it accounts for the importance of the informal sector in Cameroon. Indeed, more than 80% of the employed work in the informal sector, which is characterized by the precariousness and instability of income and employment over time and space. Simulation results suggest that economic sectors such as construction, education, hotels and restaurants and commerce should receive special attention, as they have experienced the most severe employment losses. This calls for a differentiated support from the government to protect employment in these industries.

1 | INTRODUCTION

Like other economies, the coronavirus pandemic that started in China in December 2019 is negatively affecting Cameroon’s economy. With the support of the UN system in Cameroon, the National Institute of Statistics (NIS) conducted a survey between April and May 2020 on the socioeconomic impacts of Covid-19 as explained by Cameroon’s dependence on international trade. Although the survey did not capture the magnitude of the impacts on the different economic sectors, almost all of them experienced shocks, as suggested by the results (INS, 2020).

The objective of this paper is to provide a quantitative assessment of the effects of the Covid-19 on employment in various economic sectors in Cameroon. To this end, we used a computable general equilibrium model (CGEM) which considers the central part of an economy’s transactions.

In addition to the formal sector, the CGEM used in this study also integrated the informal sector that employs approximately 90% of Cameroonian workers (Fomba Kamga, 2012; OIT, 2017). The consideration of the informal sector in the model is of paramount importance, given its precariousness, income, and employment instability that often leaves workers among the most vulnerable people. Besides contributing to employment, the informal sector also significantly influences national GDP, income distribution, and leads to the satisfaction of demand by the population (Njifen, 2014). Therefore, considering it in a CGEM is essential for a better description of the economy.

1Evaluation of the socioeconomic effects of the coronavirus (Covid-19) in Cameroon—phase 1. Main results of the opinion survey conducted among 1,310 households and 770 businesses across the country and representative of the national economic fabrics.
2Fomba Kamga (2012) notes that 60% of informal workers are self-employed in Cameroon. Brixiova (2010) shows that self-employment in the informal sector is negatively related to skill acquisition; this explains low wages in this sector.
3Jones and Tarp (2015) find that salaried formal sector workers are consistently better off than informal workers. They also mention the possibility that informal nonagricultural workers earn more than formal workers.
To set up the baseline scenario, the model exploited employment data from the International Labor Organization (ILO) combined with business turnover growth, computed from the GICAM national business association survey (GICAM, 2020). The results suggested that economic sectors such as construction, education, commerce, hotels and restaurants experienced the most severe employment losses. For policy consideration, this calls for differentiated support from the government to protect employment in industries that have been the most hit by the pandemic.

This study mainly enriches the nascent literature on the socioeconomic impacts of Covid-19. Focusing on Cameroon, Djoumessi (2020) used the NIS survey to assess the effects of the current global health crisis on wages and found that two-thirds of workers incurred lower turnover, while one-third experienced temporary job suspensions and less than 10% lost their jobs. Some research attempted to assess the gender impact of Covid-19 in Cameroon and recognized that vulnerable groups such as women were likely and disproportionately affected by the pandemic (BUCREP and ONU Femmes, 2020). Other studies have focused on containment strategies in Cameroon (Kouakep et al., 2021). In particular, Kane et al. (2020) argue that the combination of containment measures followed by release measures could effectively prevent the spread of the Covid-19 pandemic. Beyond Cameroon, researchers have also investigated the social and economic factors influencing the spread of the coronavirus disease within a population (Stojkoski et al., 2020). Maliszewska et al. (2020) have used CGEM to study the potential impacts of Covid-19 on GDP and trade. Likewise, we use a CGEM to assess job losses in various economic sectors in Cameroon.

The structure of the rest of the paper is as follows. Section 2 presents the situation of Covid-19 in Cameroon, Section 3 presents the CGEM, data, and simulations, and Section 4 concludes with some policy recommendations.

2 | SITUATION OF COVID-19 IN CAMEROON

The 2019 coronavirus disease (Covid-19) pandemic has gradually spread throughout Cameroon. On August 2, 2020, the cumulative total number of people who had contracted the disease reached 17,255 from 193 cases initially recorded on March 31 (Figure 1a). The disease has spread to all ten regions of the country, with a higher prevalence in urban areas, specifically in Yaounde and Douala. The household survey conducted by the NIS in May 2020 indicated that 94% of the participants had not been in contact with people infected by Covid-19. This result suggests that the prevalence of the disease in the Cameroonian population remains below 6%. Moreover, 5.4% of those interviewed affirmed that they or a loved one had had a medical test for the coronavirus.

Concerning active cases, the officials reported 193 cases on March 31, 2020. This figure progressively rose to 837 patients on April 30, then 1933 on May 29, and peaked at 3633 on June 13 (Figure 1a). The curve then began a downward trend to reach 1544 cases on July 29.

A dynamic analysis of the number of people infected from March 20, 2020 to August 2, 2020 highlighted a slowdown in the propagation of the pandemic. From March 20 to April 5, the daily growth rate was 2.6%. It rose to 25.8% from April 5 to April 19. This rate subsequently fell to 5% between April 19 and May 4 and decreased to 1.1% between July 3 and August 2.

3 | THE CGE MODEL, DATA AND SIMULATIONS

3.1 | General description

This study applied a modified version of the CGEM developed by MINEPAT and BIT (2019). The ILO–MINEPAT setting calculates informal employment as the difference between total employment, on the one hand, and formal employment determined by profit maximization, on the other hand. In the present setting, we computed informal employment as a share of total employment, which varies in proportion to the ratio of informal value added in total value added.

To build the model, we rely on an industrial classification with 19 products (industries/branches of economic activity). We assume that each branch has a formal as well as an informal sector. For simplicity, we further assume that, for each industry, goods produced by both the formal and informal sectors are homogenous.

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4 GICAM: Groupeement Inter-Patronal Du Cameroun.
5 BUCREP is the Central Bureau of Census and Population Studies in Cameroon.
• **Production function and value-added**

In each industry, production is a function of intermediate consumption and value-added (see Equation 1). Intermediate consumption is determined using Leontief coefficients with the total output of the branch (see Equation 6). Despite the homogeneity hypothesis of goods, the technology used in the formal sector differs from the informal. In effect, value-added from the formal sector depends on the constant elasticity of substitution (CES), a function of labor and capital (see Equation 3), while value-added of the informal sector is a derivative of the linear regression of labor (see Equation 4).

• **Labor supply and demand**

The labor demand for the formal sector is a derivative of profit maximization (see Equation 2). To obtain the informal labor demand, we multiply the ratio between its value-added and total value-added factors with overall employment (see Equation 5).

• **Net final demand**

The maximization of a Cobb–Douglas-type utility function with various consumer goods provides households’ final consumption (see Equation 7). Concerning trade volumes, we assumed that the economy exports a fixed proportion of the total production of goods (see Equation 11). On the other hand, import procurement depends on minimizing the total expenditure on a basket of goods comprising the imported goods and the locally produced goods; one can see from Equation 12 that imports depend on the relative domestic and imported prices. Given its highly extroverted nature, the mining sector receives special treatment in line with the explanation below.

• **Prices**

Under the assumption of a small economy, Cameroon is a price taker for exports and imports, Equations (21–24) described the prices. The output price of a product is a weighted average of the domestic market and export prices. If an industry solely exports, the weight of the domestic price is nil; rendering export price as the only determinant of producer price. Therefore, export price changes are passed-through to producer price; the intensity of this pass-through depends on the weight of exports in the total demand. Changes in the final consumer price ensure the adjustment of the market for goods and services. For a given product, the percentage change in price is the same for investment, intermediate, and final consumptions.

• **How the model works**

Figure 2 shows how the CGEM works. Consider an increase in export prices. This increase leads to a higher producer price as well as a higher price of value-added. The increase in value-added prices induces a strong demand...
for labor by enterprises, which increases value-added created with labor and capital. By so doing, production increases. Higher production causes exports, the remuneration of production factors (i.e., labor remuneration and gross operating surplus (GOS)), and intermediate consumption to soar. Higher employee compensation leads to an increase in household final consumption; likewise, growth in gross domestic product (GDP) boosts corporate savings and overall investment. All these changes lead to an increase in aggregate supply and aggregate demand. If consumer prices achieve equilibrium between supply and demand then the algorithm ends. Otherwise, price initialization for other goods will occur.

### 3.2 Equations of the model

Five blocks make up the structure of the model: (i) production; (ii) demand for domestic intermediate and final goods; (iii) foreign trade; (iv) prices; and (v) market equilibrium. In what follows, the indices $i$ and $j$ refer to products and branches, respectively. Furthermore, we adopt the following convention: indices from 1 to 19 refer to formal branches,
while indices from 20 to 39 correspond to informal branches. Thus, for a given formal branch \( j \), branch \( j + 19 \) produces the same good but in an informal setting.

- **List of variables**

| Variable | Description |
|----------|-------------|
| \( Y_j \) | production of branch \( j \) |
| \( CIBR_j \) | intermediate consumption of branch \( j \) |
| \( VAVOL_j \) | added value in volume of branch \( j \) |
| \( L_j \) | employment in branch \( j \) |
| \( PV_{VA_j} \) | price of value-added of branch \( j \) |
| \( K_j \) | stock of capital of branch \( j \) |
| \( CFMEN_i \) | household final consumption of product \( i \) |
| \( CG_i \) | government final consumption in product \( i \) |
| \( REVMEN \) | household income |
| \( IVOL_i \) | volume of investment in product \( i \) |
| \( IVAL_i \) | value of investment in product \( i \) |
| \( REVGOV \) | government revenue |
| \( QE_i \) | volume of exported goods in product \( i \) |
| \( QM_i \) | volume of imported goods in product \( i \) |
| \( QDD_i \) | production sold locally |
| \( GOS \) | gross operating surplus |
| \( TRMEN \) | net transfer received by households |

- **Production**

\[
Y_j = CIBR_j + VAVOL_j
\]  
\[
\left( \frac{L_j}{VAVOL_j} \right)^{\gamma-1} = \frac{w_j}{PV_{VA_j}} \frac{C_j^{-\gamma}}{(1 - \delta_j) A^{\gamma}} \quad \text{(labor demand from formal activities)}
\]  
\[
VAVOL_j = A_j \left[ \delta_j (K_j)^{\beta} + (1 - \delta_j) (L_j)^{\beta} \right] \quad \text{(for formal activities)}
\]  
\[
VAVOL_j = \alpha_j L_j \quad \text{(for informal activities)}
\]  
\[
L_j = h_j \left( \frac{VAVOL_j}{VAVOL_j + VAVOL_{j-19}} \right) (L_j + L_{j-19}) \quad \text{(for informal activities)}
\]  
\[
CIBR_j = \sum_j a_j Y_j
\]  

As mentioned above, Equations (2) and (5) describe formal and informal employment respectively.

- **Final demand**

\[
CFMEN_i = \frac{\theta_i REVMEN}{PD_i}
\]  
\[
CG_i = \frac{\beta_i REVGOV}{PD_i}
\]
IVOL_i = \frac{\gamma_i IVAL_i}{PD_i} \tag{9}

IVAL_i = z_i IVAL \tag{10}

• Foreign trade

We considered the maximization of local producer income (local sales plus exports) under constraints of the production equation to account for the reality of Cameroon. That is, a Constant Elasticity of Transformation (CET) of quantities sold locally and exported (this is a deviation from the usual practice in traditional CGE models). This maximization program gives an export function dependent on the relative prices of products exported and sold locally. Of course, this is not valid for Cameroon, where there is no real domestic market for products such as crude oil and cocoa. As such, it would not make sense to consider that the quantities exported depend on the relationship between export prices and local prices. Therefore, this paper models exports as a fixed proportion of production.

As usual, the import function is a derivative of the reduction in expenses by importers under the constraint that the demand for composite goods in the domestic market is a “Constant Elasticity of Substitution” function of the imports and the products sold locally.

a- Exports

\[ QE_i = \beta_i Y_i \] \tag{11}

b- Imports\footnote{\text{min } PM_i(1 + \tau_i)QM_i + PD_i QDD_i \text{ under constraint } QO_i = a_i \gamma_i (1 + \delta_i)QM_i + (1 - \delta_i)QDD_i} \tag{12}

• Income

\[ GOS = \sum_j PVA_j VAVOL_j - \sum_i PD_i a_{ij} Y_j \] \tag{13}

\[ REVMEN = \sum_j w_j L_j + \sum_j \mu_j GOS_j + TRMEN + PREST + REVMEN \] \tag{14}

\[ REVENT = \sum_j \phi_j GOS_j + TRANSETAT - PRESENT + REVPETAT \] \tag{15}

\[ REGOV = \sum_i PM_i QM_i(1 + \tau_i) + \sum_i P_i Y_i(1 + \tau_i) + aREVMEN + bREVENT + TRANSETAT + REVPETAT + CS \] \tag{16}

• Agent savings

\[ SMEN = REVMEN - PD_i CFMEN_i \] \tag{17}

\[ SGOV = REGOV - PD_i CG_i \] \tag{18}

\[ SENT = REVENT \] \tag{19}

\[ SRM = \sum_i PM_i QM_i - \sum_i PE_i QE_i \] \tag{20}

• Prices

\[ P_i(1 + \tau_i) = PD_i \nu_i PE_i^{(1 - \nu_i)} \] \tag{21}

\[ PVA_j VAVOL_j = PB_j Y_j - \sum_i PD_i a_{ij} Y_j \] \tag{22}
\[ PB_{j+19} = PB_j \]  
\[ PB_i = p_i \] (23)  
(24)

- **Markets equilibrium**

\[ QDD_i = Y_i - QE_i \] (25)  
\[ QM_i + Y_i = CI_i + CMEN_i + CG_i + IVOL_i + QE_i \] (26)  
\[ IVAL = SMEN + SGOV + SENT + SRM \] (27)  
\[ CHOM = \frac{\sum_{j} L_j}{POP_{2014}} \] (28)

### 3.3 Data on the labor market

The labor market matches job seekers and job providers. Labor supply comprises individuals who are of working age and who are active in the labor market. Active individuals in the labor market are those looking for a job or those already employed. Enterprises in different sectors of the economy trigger labor demand. The evaluation of imbalances in the labor market considers gaps between labor supply and demand.

- **Labor supply**

Table 1 describes the legal working-age population; according to ILO, this includes people aged 15 and above. In 2020, approximately 15.3 million people constituted this population, of which 7.6 million were men and 7.7 million women. In 2014, the activity rate of the working-age population was 72.1%. During this period, the male activity rate was 77.5%, at 10% above the female rate (67.2%). Further education and domestic work among women add to the factors responsible for the difference in activity rate between men and women in the labor market (Table 2).

- **Labor demand**

From 2014 to 2020, the number of people employed increased from 9.4 to 11.2 million in Cameroon. This increase corresponds to an average annual growth of 3%. In Table 3, “agricultural, forestry and fishing activities” is the only branch of activity whose employment growth rate was below the total employment growth rate (1.2%). The combination of real estate, commercial and administrative activities experienced the highest growth, at 6.9%.

Employment growth in the latter sector as well as in construction (4.6%) and transport, storage and communication (5.1%) probably results from Cameroon’s 10-year massive public investment program for infrastructural development through public–private partnerships (PPPs).

| TABLE 1  | Population of legal working age (in thousands) |
|-----------|------------------------------------------------|
| **Working age population in thousands** | **Activity rates** |
| 2001 | 2014 | 2020 | 2001 | 2005 | 2007 | 2010 | 2014 |
| 15 years and older | 8872 | 10,936 | 12,127 | 15,380 | 70.7 | 71.5 | 82.8 | 76.2 | 72.1 |
| **Men** | 4206 | 5235 | 5771 | 7645 | 76.4 | 74.8 | 86.2 | 82.3 | 77.5 |
| **Women** | 4667 | 5701 | 6356 | 7735 | 65.5 | 68.3 | 79.5 | 70.7 | 67.2 |
| 15–24 | 3204 | 3790 | 3997 | 5276 | 49.3 | | | | |
| **Men** | 1518 | 1751 | 1931 | 2650 | 51.6 | | | | |
| **Women** | 1686 | 2039 | 2067 | 2626 | 47.2 | | | | |

*Source: ILO stat.*
TABLE 2  Employment by industry, 2014 and 2020

| Branches of activity                        | Number of jobs in thousands | Growth rates 2014–2020 (%) | Share (%) |
|---------------------------------------------|-----------------------------|----------------------------|-----------|
| Agriculture, forestry and fisheries        | 4499.3                      | 1.2                        | 47.6      |
| Extractive activities                      | 55.8                        | 4.4                        | 0.6       |
| Manufacturing activities                   | 971.5                       | 4.0                        | 10.3      |
| Utilities/water and electricity            | 35.0                        | 5.2                        | 0.4       |
| Construction                               | 267.4                       | 4.6                        | 2.8       |
| Wholesale and retail trade; repairs        | 1423.2                      | 4.3                        | 15.1      |
| Transport; storage and communication       | 540.6                       | 5.1                        | 5.7       |
| Accommodation and catering activities      | 380.8                       | 5.9                        | 4.0       |
| Financial and insurance activities         | 56.7                        | 4.9                        | 0.6       |
| Real estate; commercial and administrative activities | 125.7                       | 6.9                        | 1.3       |
| Public administration and defense; compulsory social security | 175.8                       | 2.7                        | 1.9       |
| Education                                  | 333.6                       | 3.9                        | 3.5       |
| Health and social action activities        | 149.3                       | 4.5                        | 1.6       |
| Other services                             | 434.7                       | 4.3                        | 4.6       |
| Total                                      | 9449.3                      | 3.0                        | 100.0     |

Source: ILO stat.

From a structural point of view, there is a dense concentration of jobs in agricultural activities, which in 2020 accounted for 42.9% of all jobs. However, this proportion is lower than in 2014, when it was 47.6%. Commercial activities are important employment niches. The share of these activities in total employment rose from 15.1% to 16.3% between 2014 and 2016. Industrial activities accounted for 10.9% of employment in 2020. The extractive industries are proving to provide very little employment despite their strong contribution to public finances. Their jobs represent only 0.6% of total employment. The same is true of so-called utility activities, specialized in electricity and water services, which only represent 0.4%.

TABLE 3  Growth assumptions for major export products

| Products         | Elasticity^a | 2020 growth rate (%) |
|------------------|--------------|-----------------------|
|                  |              | Pessimistic | Less pessimistic | Optimistic |
| Agriculture      |              | –15.13      | –8.73            | –1.45      |
| Raw cocoa beans  | 3.62         | –18.82      | –10.86           | –1.81      |
| Raw cotton       | 3.09         | –16.05      | –9.26            | –1.54      |
| Raw rubber       | 0.00         | 0.00        | 0.00             | 0.00       |
| Fresh bananas    | 1.48         | –7.67       | –4.43            | –0.74      |
| Robusta coffee   | 0.00         | 0.00        | 0.00             | 0.00       |
| Wood             |              | –5.92       | –3.41            | –0.57      |
| Wood logs        | 1.29         | –6.70       | –3.86            | –0.64      |
| Sawn timber      | 1.02         | –5.31       | –3.07            | –0.51      |
| Crude oil        | 8.18         | –42.52      | –24.53           | –4.09      |

^aRatio between the price of the product and the world growth rate.
Source: Authors’ calculations.
3.4 Simulation

The simulations attempt to assess the impact of the coronavirus pandemic on employment by considering hypotheses on price shocks for exported products, as well as supply-side shocks.

The simulations considered two groups of assumptions. First, on export prices and, secondly, on the shock of value-added of enterprises. The assumption on the shock of value-added does not vary from one simulation to another. However, the assumptions made on the prices of exported products reflect three scenarios of the international environment—the pessimistic scenario, the less pessimistic scenario, and the optimistic scenario.

- **Assumptions**

  - **Prices of exported products**

    We assumed that prices of exported products depend on world growth through an elasticity estimated from the year 2018 onwards and that strong growth corresponds to a demand tension that pushes up prices. In general, the elasticities should be positive or 0. Therefore, negative elasticities are assumed to be 0. Three situations of global economic growth are considered:

    - The first corresponds to the IMF’s forecasts, which anticipated a growth rate of −3% in 2020.
    - The second corresponds to the forecasts of the World Bank, which projected a growth rate of −5.3% in 2020.
    - The third, more optimistic hypothesis corresponds to an ad-hoc growth rate of −0.5%.

    The CGEM uses an aggregated nomenclature. The primary sector distinguishes goods from agriculture, livestock, forestry and fisheries. The major agricultural products considered to assess the level of exogenous export shocks have a significant weight in terms of overall export value. Table 3 presents the assumptions under the pessimistic, less pessimistic and optimistic scenarios.

    In the pessimistic scenario, agricultural products fell by 15.13% in 2020. The decline was 8.73% in the less pessimistic and 1.45% in the optimistic scenarios. Forestry products decreased by 5.92% in the pessimistic scenario, 3.41% in the less pessimistic scenario and 0.57% in the optimistic scenario. As for crude oil, it decreased by 42.52% in the pessimistic scenario, 24.53% in the less pessimistic scenario and 4.09 in the optimistic scenario.

  - **Exogenous shocks on added value**

    Studies by GICAM and the NIS have shown that the coronavirus pandemic led to a sharp drop in companies’ turnover. The data in Table 4, taken from the GICAM study, allow us to assess, with a few additional hypotheses, the extent of this decrease for the month of March 2020, year-on-year, for companies that have experienced a decline. It appears that the drop in turnover is 15.5% for industrial companies and 15.9% for service companies. Table 4 shows that the decline affects 68% of industrial companies and 81% of service companies. Therefore, the decline in turnover growth in industrial companies is estimated at −10.54% and −12.89% in service companies.

    The calculation of the fall in turnover only concerns the month of March 2020 year-on-year. Therefore, additional assumptions are essential for the other months of the year to have annual information that accurately fits exogenous

| Indicators                                      | Type of business |
|------------------------------------------------|------------------|
| Percentage of firms experiencing a decline (%) | 68               | 81               |
| Turnover growth as a percentage in affected companies (%) | −15.5           | −15.9            |
| Estimated growth in turnover as a percentage in all companies (%) | −10.54           | −12.89           |

*Source: Authors’ calculations based on the GICAM survey.*
### Table 5: Sales growth assumptions for the year 2020

| Types of business and their value index | January | February | March | April | May | June | July | August | September | October | November | December | Total | Growth 2010–2020 (%) |
|----------------------------------------|---------|----------|-------|-------|-----|------|------|--------|-----------|---------|-----------|-----------|-------|----------------------|
| Values in 2019                         | 100     | 100      | 100   | 100   | 100 | 100  | 100  | 100    | 100       | 100     | 100       | 100       | 1200  |                      |
| Values in 2020, industrial companies   | 100     | 100      | 89.5  | 93    | 96  | 100  | 100  | 100    | 100       | 100     | 100       | 100       | 1179  | −1.8                 |
| Values in 2020, service companies      | 100     | 100      | 87.1  | 91.4  | 96  | 100  | 100  | 100    | 100       | 100     | 100       | 100       | 1174  | −2.1                 |

*Source: Authors’ calculations.*
This is possible when considering that the year-on-year monthly growth of an imaginary series is worth 100 for each month of 2019. For industrial and service companies, the fall in turnover in March 2020 implied a corresponding fall in the index. Assuming that activities gradually returned to normalcy in June 2020, directly translates to the fact that the index returned to the value of 100 and linearly between March and June. All these hypotheses suggest that all industrial companies experienced an annual downward shock of 1.8%. Service companies experienced a decline of 2.1% (Table 5).

## 4 | RESULTS

Performing simulations require stating several hypotheses about the export prices of agricultural, forestry, and mining products, the variation in the number of jobs in the “health” branch, and exogenous shocks on the value-added of the formal and informal sectors. A summary of these assumptions is in Table 6.

The simulation results show a decline in employment following the Covid-19 shocks. All scenarios considered expressed this decline. In the pessimistic scenario, employment declined by 4.5%, then 2.9% in the less pessimistic scenario and 1.2% in the optimistic scenario. For each of the three scenarios, the decline in employment was more severe in the formal than in the informal sector. In the pessimistic scenario, the decline in formal employment was 8.2% compared to 4.2% in informal employment. In the less pessimistic scenario, the decline was 5.9% against 2.7% in the informal sector. In the optimistic scenario, a decline of 2.9% against 1% for informal employment occurred. The branches most affected by the drop in employment were construction, education, commerce, hotels, and restaurants, and so forth. The less pessimistic scenario showed a decline of 5.9% against 2.7% in informal employment (Table 7).

## 5 | CONCLUSION AND POLICY IMPLICATIONS

The objective of this study was to assess the impact of the Covid-19 pandemic on employment in Cameroon, using a modified CGEM. The analysis of the international environment estimated the effects of the pandemic on agricultural export and oil prices.

We used three simulation scenarios: pessimistic, less pessimistic, and optimistic. The three scenarios confirmed the negative effects of the pandemic on employment, revealing greater severity in the formal sector. The number of unemployed increased by 124% in the pessimistic scenario, 78.4% in the less pessimistic scenario, and 31.6% in the optimistic scenario.

The state should institutionalize support programs for companies that have experienced significant losses to sustain employment. To this end, branches such as construction, education, commerce, hotels, and restaurants require special

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7 This involves assigning numerical values to the intervals. “Less than 5%” corresponds to a decrease of 2.5%, “Between 5% and 10%” corresponds to a decrease of 7.5%. “Between 10% and 20%” corresponds to a decrease of 15.5%. “More than 20%” corresponds to a decrease of 20%.
### Table 7  Simulations on employment

| Economic sectors                                | Initial employment | Simulated employment growth rates by scenario (%) |
|------------------------------------------------|--------------------|--------------------------------------------------|
|                                                |                    | Pessimistic | Less pessimistic | Optimistic        |
| **Formal**                                     |                    |             |                  |                   |
| Agriculture                                    | 29,420             | −8.1        | −5.4             | −2.5              |
| Breeding and hunting                           | 8302               | −9.5        | −7.1             | −4.5              |
| Forestry                                       | 5360               | −6.6        | −4.6             | −2.5              |
| Fishing and fish farming                       | 0                  | −          | −                | −                 |
| Mines                                          | 704                | 0.0         | 0.0              | 0.0               |
| Agri-food industries                           | 58,010             | −3.5        | −2.0             | −0.5              |
| Low technology industries                      | 49,925             | −9.1        | −6.0             | −2.8              |
| Medium and high technology industries          | 47,879             | −8.5        | −5.9             | −3.4              |
| Electricity, water and energy                  | 7675               | −6.8        | −4.8             | −2.7              |
| Construction                                   | 40,933             | −29.7       | −19.9            | −9.6              |
| Commerce                                       | 46,395             | −11.1       | −7.5             | −3.8              |
| Hotels and restaurants                         | 49,887             | −14.6       | −11.2            | −7.4              |
| Transport                                      | 46,049             | −5.6        | −4.0             | −2.3              |
| Real estate services                           | 5168               | −7.6        | −5.1             | −2.6              |
| Other market services                          | 360,721            | −7.6        | −5.3             | −3.1              |
| Administration                                 | 205,943            | 0.0         | 0.0              | 0.0               |
| Education                                      | 205,943            | −18.1       | −11.7            | −4.4              |
| Health                                         | 47,329             | 0.0         | 0.4              | 0.4               |
| Territorial correction                         | 0                  | −          | −                | −                 |
| **Informal**                                   |                    |             |                  |                   |
| Agriculture                                    | 5,268,826          | −4.2        | −2.8             | −1.3              |
| Breeding and hunting                           | 194,431            | 0.4         | 0.4              | 0.3               |
| Forestry                                       | 75,470             | −6.6        | −4.6             | −2.5              |
| Fishing and fish farming                       | 34,537             | 0.0         | 0.0              | 0.0               |
| Mines                                          | 20,466             | 0.0         | 0.0              | 0.0               |
| Agri-food industries                           | 1,190,008          | −3.3        | −2.8             | −2.2              |
| Low technology industries                      | 466,890            | −4.6        | −3.8             | −3.0              |
| Medium and high technology industries          | 112,092            | −3.0        | −2.9             | −2.9              |
| Electricity, water and energy                  | 2,413,759          | −3.7        | −2.6             | −1.5              |
| Construction                                   | 553,873            | −19.2       | −13.0            | −7.2              |
| Commerce                                       | 1,597,660          | −11.1       | −7.5             | −3.8              |
| Hotels and restaurants                         | 487,357            | 1.2         | 2.0              | 2.7               |
| Transport                                      | 313,392            | 2.4         | 2.5              | 2.6               |
| Real estate services                           | 3,793,964          | −2.7        | −1.1             | 0.6               |
| Other market services                          | 805,866            | 1.9         | 2.6              | 3.2               |
| Administration                                 | 0                  | −          | −                | −                 |
| Education                                      | 38                 | 0.0         | 0.0              | 0.0               |
| Health                                         | 47,329             | 0.0         | 0.4              | 0.4               |
| Territorial correction                         | 0                  | −          | −                | −                 |

(Continues)
attention. For policy consideration, there is a need for differentiated support from the government to protect jobs in industries most affected by the pandemic. To strengthen the knowledge learned from the pandemic, we recommend high-level specific studies to analyze job losses in major sectors, including business support mechanisms.

Putting in place strategies to support people who have lost jobs necessitates a pilot study for identifying the population concerned, especially in the formal sector, to ease monitoring and reintegration into the economy.

The Covid-19 crisis shows that health shocks can severely hamper the search for sustainable development. The structural transformation of the economy should therefore continue. Intensifying emphasis on the pharmaceutical and manufacturing industries will pay off in the fight against pandemics. Developing and implementing strategies to build up food stocks to cope with possible waves of new infections are also essential.

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