The Covid-response measures in Argentina: a CGE assessment over labour informality and gender gaps.

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Abstract

The COVID-19 pandemic has left no country untouched, causing significant economic disruptions worldwide. To counteract the negative effects of pandemic lockdowns, governments have implemented various economic policies. Despite facing macroeconomic constraints, the Argentinian government swiftly launched several assistance policy packages categorized into three types: "Workers and Businesses," "Social Assistance," and "Sector Specific." To evaluate the effectiveness of these policies, this paper develops a recursive-dynamic CGE model that considers the structural characteristics of the Argentinian economy - labour market informality and gender gaps - and is calibrated using an informality and gender-aware Social Accounting Matrix for Argentina in 2018. This model allows performing an ex-post evaluation of the policy measures and estimating their long-term effects. The results indicate that the policy packages were successful in mitigating the pandemic's adverse effects. However, the financing mechanisms used to implement these policies, such as inflationary tax or wealth tax, result in a slower recovery of the economy after 2020.

Keywords: COVID-19 pandemic; mitigation policy packages; CGE models; Labour market; Informality, Gender gaps.

JEL codes: C68, J46, J78

1. Introduction

The COVID-19 pandemic increased the socio-economic costs of sustainable development commitments, such as the UN Agenda 2030 and the ILO Centenary Declaration for the Future of Work. The pandemic has had a disproportionate impact on vulnerable populations, including youth, informal and low-skilled workers. Specifically, it has disproportionately affected women, amplifying existing gender inequalities, especially in service sectors where informality is prevalent. These sectors include

domestic services, health, education, and paid and unpaid care work, as reported by the International Labour Organization (ILO) in 2020. To mitigate the negative effects of the pandemic, countries have implemented various measures, some of which have been more effective than others.

This paper centers on Argentina, who despite severe economic challenges including a narrow fiscal space, limited access to international credit, low GDP growth, recession, and inflation, as well as rising social issues such as high poverty, unemployment rates and increasing inequalities, responded quickly to the economic and employment effects arising from the COVID-19 pandemic, positioning itself among the first Latin American nations to do so. The Argentinean government swiftly implemented a set of measures aimed at addressing the consequences of the crisis, with a particular focus on tackling issues related to labour informality and gender gaps, as highlighted by UN Women (2020) and the International Labour Organization (ILO) (2020).

The Argentinean government's response to the pandemic consists of four pillars of measures: (1) stimulus measures to the economy and employment (price control to retain inflation, active fiscal policy, flexible monetary policy and loans and financial aid to specific sectors, including the health one); (2) support for businesses, employment, and income; (3) protection of workers at working places, and (4) seeking solutions through social dialogue.

This paper examines the second pillar of measures in particular, which included, firstly, programs specifically designed to aid businesses and workers by implementing double severance payment, wage subsidies, and financial aid for small firms. Additionally, social programs consisted in monetary transfers targeting unemployed, independent workers and informal wage earners. Finally, sector specific policies for the tourist industry were also put in practice. This paper also considers the impact of these policies on the labour market, employment conditions, and social protection, with a particular focus on labour informality and gender gaps.

The aim of this paper is to develop and apply to the particular case of Argentina (but it could be extended to other developing economies), a comprehensive method for ex-post evaluation of the impact and effectiveness of different policies regarding the labour market, employment conditions and social protection in the context of a crisis, such as the COVID-19 pandemic, and seeking an inclusive recovery. We pay special attention to labour informality and gender gaps since these segments of the population are the most vulnerable against shocks. At the end of the day, the goal is to improve policy design to better protect vulnerable workers and firms against future crises, and to help them on the recovery from the crisis, such as the pandemic, with an upgrade to a formalized economy.

To accomplish this objective, we develop a multi-sector recursive-dynamic Computable General Equilibrium (CGE) model for Argentina that considers the structural features of the economy while also incorporating different labour market modelling assumptions. A gender and informality conscious Social Accounting Matrix (SAM) for Argentina in 2018, along with a Satellite Account of Employment, were built to calibrate this CGE model. The simulation of the multiple policy measures was carried out for the period between 2020 and 2030 to evaluate the short and long run effects of the implemented mitigation policies.

This paper comprises six sections. Section 2 provides a comprehensive review of the literature on the use of CGE modelling to evaluate the impacts of the COVID-19 pandemic. It also explores the various options for modelling the labour market within a CGE framework. Section 3 describes the methodology employed, including the key assumptions of the CGE model and its calibration. Section 4 outlines the features of baseline (without and with the COVID-19 pandemic and national lockdown) and the COVID-19 policy simulation scenarios in Argentina (pillar 2). Section 5 analyzes the primary outcomes in terms of GDP, household income and employment both at an aggregate and sectoral dimension. Finally, Section 6 concludes with some final considerations.

2. Literature Review

Several studies have investigated the impacts of the COVID-19 pandemic using computable general equilibrium (CGE) models. For instance, Djiofack et al. (2020) and Keogh-Brown et al. (2020) have analyzed the effects of various containment policies introduced by governments to mitigate the spread of the virus in Sub-Saharan African countries and the United Kingdom, respectively. These studies have mainly focused on macroeconomic variables, such as GDP, consumption, and investment, as well as epidemiological indicators, including incidence and mortality rates of the virus. A similar study by Cui et al. (2021), adopted a comparable approach, but concentrated exclusively on the transportation sector in China. Despite revealing compelling evidence on the negative association between the COVID-19 containment measures and the economy's short-term evolution, these studies have not considered the potential impact of economic relief policies implemented by the governments.

In contrast, the study conducted by Prosse et al. (2020) examines the impact of the government's fiscal measures aimed at mitigating the negative effects of the COVID-19 pandemic on the economy in Brazil. Their findings indicate that these measures have effectively helped to partially counteract the adverse effects of the pandemic on production and consumption. Similarly, Guo et al. (2021) estimate the impact of the VAT reduction policy on local fiscal pressure in China in light of the COVID-19 pandemic. However, it is noteworthy that these studies do not delve into labour market and income distribution effects which are crucial points in developing economies.

Regarding this matter, Boukar et al. (2021), Nechifor et al. (2021), and Zang et al. (2022) have incorporated the aforementioned aspects into their analyses. Firstly, Boukar et al. (2021) examined the impact of the pandemic in Cameroon, with a particular focus on the informal labour market. The findings from the simulations indicated that informal employment losses were most severe in certain sectors, including construction, education, hotels and restaurants, and commerce. Secondly, Nechifor et al. (2021) use an economy-wide (DEMETRA CGE) model for Kenya integrated with a food security and nutrition microsimulation model. This methodological framework considers labour demand differentiation between temporary and permanent in agricultural sectors, labour and land immobility and households heterogeneity (rural/urban and by agro-ecological zones) to account for income distribution effects of the COVID-19 lockdown and policy scenarios. Their main results suggest that national income measures partially recover the food sector and food demand under the pandemic, since the most affected population, in terms of food security and nutrition, remain rural households. Finally, Zang et al. (2022) combined CGE analysis with microsimulations to assess the income distribution effects of COVID-19 outbreaks in China. Their research revealed that the pandemic has worsened income inequality in the country, with low-income households being particularly vulnerable to per capita income reductions.

Nonetheless, a common limitation of these studies is that they exclusively examine the short-term effects of the pandemic and disregard the long-term socioeconomic consequences of both the pandemic and the economic relief measures (and financing) introduced by governments. Therefore, it is pertinent to design a simulation tool that can assess the impact of diverse mitigation policies, while accounting for the structural features of developing economies to capture the effects on the labour market and different income groups of households.

Labour market studies in a computable general equilibrium (CGE) framework have a long tradition, with each study differing in its features and characteristics depending on the research question. Early studies on labour market modelling in CGE were conducted by Gelauff et al. (1991) and Dewatripont et al. (1991), who analyzed labour taxation and social security contributions in the Netherlands and Belgium, respectively. Hutton and Ruocco (1999) and Böhringer et al. (2005) examined changes in labour taxation with an aggregated labour market module.

Boeters and Savard (2011) assert that modeling the labour market entails taking into account several crucial aspects. These include the supply of labour by households, the heterogeneity of labour demand, and market coordination mechanisms.

In regards to labour supply by households, Boeters and Savard (2011) highlight that the simplest approach is to assume that a single representative household supplies labour in a fixed manner, as seen in the early work of Dervis et al. (1982). However, more sophisticated options exist, such as differentiating households based on skill type (Bovenberg et al., 2000; Sørensen, 1997), household composition (Bahan et al., 2005), occupation (Giesecke et al., 2011), sectoral employment (Decaluwé et al., 2010), and income (Kim & Kim, 2003; Arntz et al., 2008). The latter criterion is particularly useful for analyzing the distributional effects of different shocks.

In addition to the various options available for modeling labour supply, there are also several alternatives in the literature for incorporating labour demand heterogeneity. A potential one, similar to labour supply, is to differentiate labour demand according to skill type, as demonstrated in the work by Hertel et al. (2008). However, other alternatives exist, such as dividing labour according to occupation (Boeters and van Leeuwen, 2010), intensity (Hutton and Ruocco, 1999), region (Hendy and Zaki, 2010), formality (Agénor et al., 2007), and gender. In the latter case, Severini et al. (2019) developed a gender-aware CGE model based on the gender-aware social accounting matrix for the Italian economy to evaluate the impact of different fiscal policies aimed at reducing female labour costs and triggering female hiring in sectors with high gender disparity.

Finally, it is important to acknowledge the issues related to labour market coordination that complement the analysis of labour demand and supply. Boeters and Savard (2011) posit that the majority of CGE models operate under the assumption of market-clearing wages in a single labour market. However, this approach may oversimplify the intricacies of labour market dynamics. A more comprehensive modelling approach could incorporate endogenous unemployment resulting from wage rigidities, as evidenced in Baas & Brücker (2008), Dissou & Sun (2013), and Ramos & Chisari (2021). Alternatively, other modelling frameworks may incorporate search and matching dynamics (Pissarides, 1990) and collective wage bargaining (McDonald & Solow, 1991). Such modelling techniques provide a more nuanced understanding of labour market behaviour and outcomes.

The CGE literature concerning labour market issues presents a vast and diverse collection of works, with each modelling approach being tailored to address specific problems. Compared to other

essential components of CGE modelling, the labour market lacks a consensus or a dominant modelling framework. Consequently, selecting an appropriate modelling strategy is highly contingent on the particular country and policy shocks being analyzed as case study, as well as the output variables of interest.

In the following section we present the main assumptions of the CGE model that accounts for the main structural characteristics of the Argentinian economy while representing a dual economy for both formal/informal as well as male/female labour.

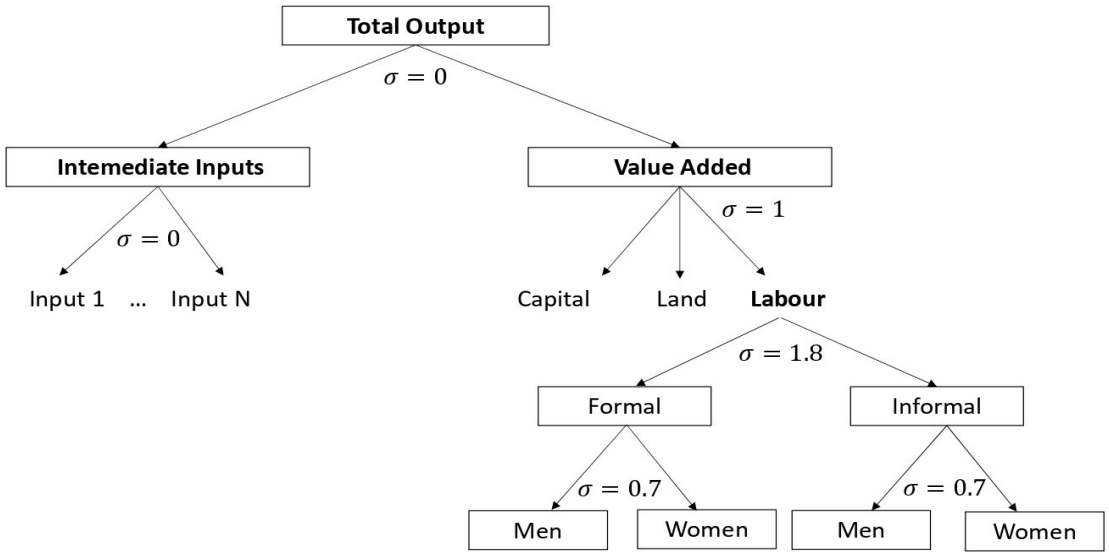
3. Methodology

3.1. The model

The recursive-dynamic CGE model used for Argentina's economy assumes that the country is a small open economy that interacts with the rest of the world (RoW) through trade, taking international commodity prices as given. It considers various agents such as firms, households, and the government, and assumes that these agents update their endowments each period based on investment, population growth, and technical change. However, decision-making in this model is made without intertemporal considerations. In other words, agents make decisions based on the current period's information alone, using adaptive expectations. This assumption is important to note, as it limits the model's ability to account for the use of assets such as bonds to smooth out shocks over time. Nevertheless, given the current situation of the Argentinean market and its relationship to the international bond market, this assumption may not be problematic.

On the supply side, the model postulates the existence of thirty representative firms, each representing a specific industry. These firms produce homogeneous goods under the assumption of constant returns to scale and operate within perfectly competitive markets. In the interest of brevity, this paper provides a succinct overview of the nesting structures of the inputs for production sectors in Figure 1.

Figure 1. Nesting structure of the production inputs of sectors.



Source: Own elaboration.

Based on the information presented in Figure 1, it can be observed that the production functions of firms combine intermediate inputs and value added in fixed proportions ($\sigma = 0$). Moreover, the inputs are combined in fixed proportions as well. The value added, which includes factors such as capital (both mobile and sunk across sectors), land (specific to agriculture and forestry activities) and labour (mobile across sectors), is combined using the Cobb-Douglas function ($\sigma = 1$). It is important to note that all productive factors, except labour, are assumed to be fully occupied.

As previously stated, one of the primary objectives of this study is to evaluate the impact of diverse policy packages on the Argentine labour market. To this end, multiple labour factors have been distinguished in subsequent nesting levels. As can be observed, the model incorporates a dual economy consisting of formal and informal sectors to measure informality. From a conceptual standpoint, an employee is classified as informal if they hold a salaried position but do not make any contributions towards social security. Moreover, a manager or independent worker is considered informal if their level of job qualification is "low"[1]. At the ultimate tier of nesting, a differentiation can be made between female and male labour in both formal and informal employment .

The selection of appropriate elasticities of substitution between formal and informal labour was a crucial aspect of the CGE modeling. To this end, the available literature was consulted to identify a calibration parameter that would be best suited to the Argentinean context. Drawing on Schramm's (2014) prior study on Mexico, an elasticity of substitution of 1.8 was chosen. Likewise, the elasticity of substitution between male and female employment was determined to be 0.7, in line with the findings of Severini et al. (2018) for Italy.

With regards to the demand side, companies may demand both domestic and imported goods and services, using them as complementary inputs for intermediate consumption. Furthermore, households, governments, and the RoW also demand these goods and services for their final usage, while maximizing their preferences subject to their budget constraints. The agents' income is derived from the remuneration received from their production factors and inter-agent transfers such as social transfers, remittances, loans through asset markets and tax collection for the government.

As far as households are concerned, our modeling approach includes five distinct categories of households, each classified based on their income per capita. In this way, it is possible to account for the impact of gender policies and informality on income distribution. Additionally, each household possesses a labour endowment comprising four categories: Male Formal, Female Formal, Male Informal, and Female Informal. Subsequently, these labour categories participate in the labour market, and their corresponding salaries are attributed to their respective households based on their labour endowments and corresponding salary rates.

Ultimately, the equilibrium state of the economy is attained when all markets - namely, goods, services, and factors - clear under the conditions of perfect competition and all agents optimize their decision-making subject to their respective constraints. As previously noted, the labour market (categorized by worker types) does not presuppose complete employment; rather, it accommodates the presence of unemployment via a closure rule, which dictates that real wages remain steady in line with the fluctuations of the consumer price index. The inclusion of partial indexation of nominal wages to the consumer price index could serve to account for the erosion of wage purchasing power amidst inflationary conditions. It is important to highlight the flexibility of the labour market closure assumption in the model, which permits the consideration of either a minimum nominal wage policy

[1] A "low" qualification level means that the worker performs operational or non-qualified tasks.

or a full employment hypothesis - a valuable feature for conducting sensitivity analyses under varying labour market scenarios.

The equilibrium of the economy is solved in a recursive way for each period of time (year). Given a capital to GDP ratio that characterizes the economy in the base year, the economy growth is driven by a capital accumulation mechanism (investment is saving-driven) by assuming a positive capital depreciation rate, a (total and active) population growth rate and the yearly Total Factor Productivity (TFP) improvement.

Take k_t as the capital endowment of the period t. The law of motion for capital is:

$$k_{t+1} = k_t(1 - \delta) + I_t$$

Where I_t is the investment performed in period t and δ is the depreciation rate. On the other hand, labour endowment updates according to the active population growth rate. Therefore, the law of motion for labour is:

$$L_{t+1} = L_t(1 + \gamma)$$

Where γ is the active population growth rate. In this regard, we assume that all types of labour evolve over time according to the same active population growth rate. Social transfers such as pensions, social subsidies, among others also evolves according to the change in population.

The calibration of the dynamic baseline (2018-2030) for the Argentine economy involves the utilization of Fouré et al. (2013) estimate to determine the parameters of the model. Specifically, the model takes into account the following dynamic parameters: capital depreciation rate (5.5% annually), capital to GDP ratio (2.43 for the base year), TFP growth rate (1.5% annually), and total and active population growth rate (1.09% annually).

Furthermore, the model incorporates an additional adjustment for the minimum real wage, which is based on 2.5% of the GDP growth in each period. However, it should be noted that this adjustment factor could be modified on an annual basis within the dynamic baseline to reflect the actual adjustment of wages to GDP from the calibration year to the current year.

3.2. Calibration data

To calibrate a CGE model, a substantial amount of information is required. Specifically, the base year is constructed by utilizing a Social Accounting Matrix (SAM), which is a statistical tool that summarizes the intersectoral flows occurring in a particular economy between its various productive sectors, agents, and institutions for a given year. Moreover, given the focus of this work on the labour market, the SAM must be supplemented with a Satellite Account of Employment (SAE), which provides both quantitative and qualitative information on sectoral job positions.

In order to construct a SAM for Argentina in 2018, a comprehensive reconciliation of information from various data sources was undertaken. Specifically, the National Accounting System of Argentina was utilized to extract critical economic indicators such as Supply and Demand Tables (SUTs), Income Generation Accounts, and sectoral Gross Production Values. Additionally, disaggregation of household data was accomplished by employing the Household's income and expenditure surveys (for 2017/2018) and the Permanent Household Survey (for 2018). Furthermore, the Consolidated Argentinian Government Budget and the National Taxes Inventory (AFIP) were relied upon to gather relevant government income and expenditure information. Finally, the Balance of Payment for Argentina (for 2018) was used to portray the trade flows with the RoW.

According to Argentina's SAM for 2018, the countries' global demand and supply is equal to 609,109 millions of dollars. As for global supply, 86% of the overall value corresponds to the Gross Domestic Product (GDP) at market prices, whereas a meager 14% is attributed to imported commodities. Regarding global demand, 61% is attributable to household consumption, while 14% and 13% are associated with public consumption and investment, respectively. Finally, exports account for 12% of the total global demand. An aggregated structure of Argentina's SAM can be found in Table 6 of the Annex.

With regard to household income, the subsequent table illustrates the percentage of participation of each household group in total income and expenditure. It is notable that Household 5 accounts for almost 50% of both income and expenditure, while Household 1 represents a mere 5% and 8% of total income and expenditure respectively.

Table 1. Argentina 2018. Household income and expenditure participation.

Indicator	Household 1	Household 2	Household 3	Household 4	Household 5
Income	5%	10%	15%	22%	48%
Expenses	8%	12%	16%	22%	42%

Source: SAM Argentina 2018.

As for the SAE, it was created utilizing data sourced from the Income Generation Account for Argentina 2018 and the Permanente Household Survey for the same year. The findings reveal that the overall rate of informality in Argentina amounted to 43.2%. Furthermore, the results of the estimations indicate that the prevalence of informality is greater amongst males (43.3%) as compared to females (42.9%).

For the purpose of this study, several additional qualitative characteristics were formulated, which are succinctly presented in the ensuing table.

Table 2. Argentina 2018. Total employment structure. In percentages.

Categories		Percentage
Sex	Male	52%
	Female	48%
Age	Younger than 24 years	11%
	Older than 24 years	89%
Educational Background	Incomplete Secondary education or lower	35%
	Complete secondary education and incomplete university or tertiary	41%
	Complete university or tertiary education and more	24%
Occupational Hierarchy	Director	6%
	Independent	21%
	Boss	2%
	Salaried worker	71%
Occupational Technology	No machinery operations	63%
	Machinery and electromechanical operations	13%
	System operations	24%
Income	Below mínimum wage	32%
	Above mínimum wage	68%

Source: SAE Argentina 2018.

Given that the CGE model delineates 30 productive sectors, it follows that both the Social Accounting Matrix (SAM) and System of National Accounts (SAE) 2018 for Argentina necessitate such a sectoral breakdown. A comprehensive characterization of each productive sector is provided in Table 3. Notably, column 2 of the table illustrates the sectoral contribution of each sector to the overall Gross Value Added (at producer's prices). The Commerce and Real Estate activities are the most remarkable sectors, contributing 17.5% and 14.8%, respectively. Furthermore, Primary activities are also significant sectors in the Argentinian economy, accounting for a participation rate that ranges between 4.5% and 5.4%.

Regarding labour participation, the majority of job positions are concentrated in the service sectors of the economy, such as Commerce (17.3%) and Education (10.4%). Column 4 of Table 3 displays the sectoral formality rate. Extractive Activities, Food, beverages & Tobacco production, and Education, have minimal informal employment. Nevertheless, informality is pervasive in other sectors, including Residential Services, Construction, Wood & Wood Products, and Clothing manufacturing industries.

Finally, it is pertinent to note sectoral female participation. Labour force participation among women is high in sectors such as Residential Services and Education. However, Construction, Metal industries, Transport, Wood & Wood products, Food, beverages & tobacco production exhibit the lowest female participation rates.

Table 3. Argentina 2018. Sectoral Gross Value Added, Labour, Formality rate and Female Labour participation rate.

Sector	Gross Value Added (Percentage Participation)	Labour (Percentage Participation)	Formality rate	Female labour participation rate
Agriculture, cattle raising, silviculture & fishing	5.4%	6.7%	69%	12%
Extractive activities	4.5%	0.5%	100%	14%
Food, beverage, and tobacco	4.3%	0.4%	95%	11%
Food, beverage, and tobacco - SMEs	1.3%	2.2%	62%	30%
Textile products	0.3%	0.4%	75%	28%
Clothing making	0.4%	1.0%	41%	58%
Leather products	0.2%	0.4%	50%	28%
Wood & wood products	0.3%	0.3%	41%	7%
Paper products, edition, impression, & reproduction	1.0%	1.5%	87%	21%
Chemicals and plastics	3.3%	1.2%	91%	24%
Non-metallic minerals	0.7%	0.3%	82%	11%
Metals	1.2%	0.1%	91%	6%
Metallic products	0.8%	1.3%	67%	6%
Machinery & equipment	1.3%	0.5%	88%	17%
Vehicles & transport equipment	1.1%	0.6%	91%	10%
Rest of industry	0.6%	1.0%	43%	19%
Electricity, gas, & water	2.2%	0.6%	94%	17%
Construction	4.7%	8.3%	32%	4%
Commerce	17.5%	17.3%	51%	33%
Transport	3.5%	5.8%	61%	8%
Hotels	0.3%	0.3%	91%	51%
Restaurants	2.0%	3.0%	53%	38%
Financial and insurance services	4.1%	1.5%	88%	43%
Real estate, professional, & business services	14.8%	6.8%	76%	33%
Public administration	8.3%	7.7%	92%	40%
Education	6.2%	10.4%	95%	72%
Health	5.9%	6.3%	82%	61%
Sport, cultural, and entertainment services	1.3%	1.8%	68%	37%
Other services	1.8%	3.6%	45%	46%
Residential services	0.8%	8.1%	31%	96%
Total	**443,920 (in millions of USD)**	**20,573 (in thousand job positions)**		

Note: In the following section we will follow an aggregated classification of 8 sectors. The classification criteria is described as follows. **Primary**: Agriculture, cattle raising, silviculture and fishing & Extractive activities. **Light Industr**y: Food, beverage, and tobacco; Textile products; Clothing making; Leather products; Wood and wood products and Paper products, edition, impression, and reproduction. **Heavy Industry:** Chemicals and plastics; Non-metallic minerals; Metals; Metallic products; Machinery and equipment; Vehicles and transport equipment. **Rest of Industry**: Rest of Industry. **Construction**: Construction. **Transport**: Transport. **Hotels & Restaurants**: Hotels; Restaurants. **Rest of Services**: Financial and insurance services; Real estate, professional, and business services; Public administration; Education; Health; Sport, cultural, and entertainment services; Other services; Residential services.

Source: Own elaboration.

4. Simulation Design

As mentioned in the introduction, this paper centers in evaluating the second pillar of Argentina's government response to the pandemic. Thus, the purpose of this section is to present the main assumptions behind the different simulation scenarios considered.

4.1. Baseline scenario

Initially, a baseline scenario was executed, spanning from 2018 to 2030, utilizing the calibration parameters presented in the preceding sections. The underlying objective of this scenario was to assess the hypothetical trajectory of the Argentine economy in the absence of the COVID-19 pandemic. By doing so, the baseline scenario can be utilized as a reference point for measuring the repercussions of other exogenous shocks.

4.2. COVID-19 Pandemic without public policies

A second scenario was simulated to examine the impact of the COVID-19 lockdowns in Argentina without the implementation of any government policies. This simulation aimed to assess the potential consequences of the pandemic in the absence of economic policy measures.

Commencing on the 20th of March 2020, the lockdown measures implemented in Argentina prohibited individuals from leaving their residences, except for those employed in essential sectors such as healthcare and food and beverage production. The policy's stringent restrictions had a significant impact on production, employment, and people's welfare.

From a technical standpoint, the production halts brought about by this lockdown were introduced into the CGE model as negative efficiency shocks in productivity.

The scenario's most arduous aspect is its calibration, given the lack of data available for this specific simulation. Calibration entails determining the degree to which economic variables would have been affected if a lockdown had been imposed without any accompanying containment policies. Essentially, we must isolate the impact of the lockdown. This estimation is exceedingly challenging, as the available data is confounded by the effects of other policies.

To estimate the decline in productivity, April 2020 was utilized as the benchmark and compared to April 2019. This choice was made because, while the government had announced various mitigation packages, they were not implemented until May of 2020. Thus, this comparison serves as a proxy for the productivity shock that would have occurred due to the pandemic in the absence of public policy. The numerical estimate of the negative productivity shock was 25%.

4.3. COVID-19 Pandemic with public policies

One final simulation scenario consists in incorporating some of the various policy packages put in practice by the Argentinian government since the beginning of the COVID-19 lockdowns (March 2020). In general terms, this paper evaluates the effects of 8 different policies implemented between 2020 and 2022. Such policies can be categorized in 3 distinct groups.

Firstly, the "Workers and Business" initiatives aimed to aid enterprises severely affected by the lockdowns. To this end, various measures were introduced, starting with a prohibition on layoffs in

March 2020, which lasted until December 2021. The objective was to prevent businesses from terminating their workers. Simultaneously, a set of measures aimed at mitigating the economic burden on businesses were introduced. Such policies included complementary salaries, tax reductions, and various lines of credit, which were implemented between 2020 and 2022[2]. Collectively, the cost of these programs amounted to 2.96% of Argentina's GDP of the base year (2018).

The introduction of each of these policies within the CGE framework was dependent on its technical characteristics. Complimentary salaries, for instance, were modeled as subsidies to the formal labour component of the value-added in each sector. Tax reductions, on a similar note, were implemented as a percentage reduction in labour taxes. In contrast, the various lines of credit were modeled as a temporary subsidy to the entire value-added component of each sector, which had to be repaid in the following year with 0% interest rate.

Secondly, in 2020, "Social Assistance" programs were implemented as another measure. The most prominent program was the "Emergency Family Income," which provided fixed sums of money to various groups, such as unemployed and informal workers. The program's primary goal was to assist the lower-income groups and prevent a sudden surge in poverty. Overall, this program incurred a cost of 0.97% of GDP of the base year (2018). Technically, the policy was designed as a money transfer from the government to the two lowest household groups.

Thirdly, in addition to the "Workers and Business" and "Social Assistance" programs, "Sector-Specific" programs were implemented between 2020 and 2022. This paper focuses on the measures taken to assist the national tourist industry. The "Pre-viaje" program provided consumers with a subsidy equivalent to 50% of the cost of travel tickets, hotel reservations, and other services for specific time frames within the country. The government incurred a total cost of 0.29% of GDP of the base year (2018) for this measure. Technically, the simulation shock was introduced in the CGE model as a subsidy for each tourism sector.

A final comment must be made concerning the financing of this scenario. In all cases, the economic burden was assumed by the national government of Argentina. However, to properly portray the impacts of such policies both in the short and long run, financing mechanisms must be introduced for each policy. The assumptions made were that, in the period following the implementation of a given policy, the government would collect an inflationary tax. However, during those years other taxes were specifically implemented to fund the aforementioned policies. In concrete terms, at the end of 2020 an exceptional wealth tax was introduced so as to finance the complimentary salary programs of 2021. Thus, these phenomena were included as part of the simulations.

[2] The programs considered were: Emergency Assistance Program for Work and Production (ATP);Productive Reconversion Program (REPROII);Assistance to Independent workers (ATI);Financial support for MSMEs (credits) and Collective Labour Suspensions.

5. Results

Table 4 displays the percentage changes in GDP at market prices in relation to the baseline scenario from 2020 to 2030. The second row illustrates the projected outcomes for the Argentinian economy had no mitigation policies been implemented during the COVID-19 pandemic. Conversely, the third row presents the variations resulting from the pandemic and all the public policies programs enacted by the government and described in the previous section.

Table 4. Impact on GDP at market prices - in percentage change compared to the baseline. 2020-2030

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
COVID-19 Pandemic **without public policies**	-20.0%	-10.4%	-9.4%	-8.3%	-7.3%	-6.3%	-5.2%	-4.2%	-3.0%	-2.0%	-0.8%
COVID-19 Pandemic **with public policies**	-9.3%	-9.5%	-11.3%	-9.8%	-8.8%	-7.8%	-6.8%	-5.7%	-4.5%	-3.5%	-2.3%

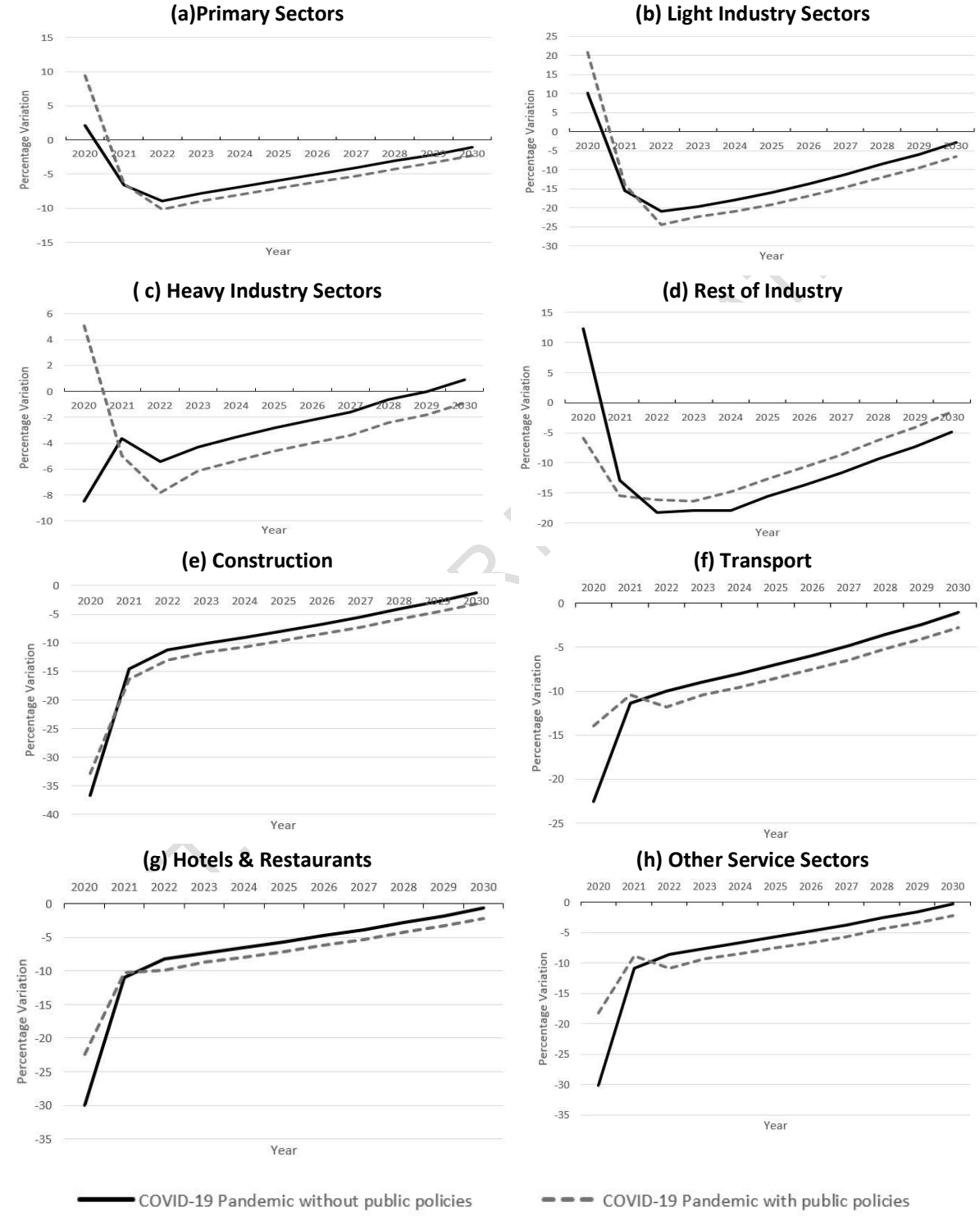
Source: Own elaboration.

The findings indicate that in the absence of any government intervention, the Argentinian economy would have suffered a 20% decline in GDP due to the pandemic (productivity loss). However, the simulations demonstrate that the implementation of various public programs mitigated the negative impact, resulting in a GDP reduction of only 9.3%[3] in 2020. Nevertheless, the GDP contractions observed in the subsequent years are more pronounced than those in the pandemic scenario, owing to the financing of each policy through an increase in inflationary tax in the subsequent period, leading to a contraction in the economy.

From a sectoral point of view, Figure 2 shows the evolution of the percentage change in value added for 8 main economic activities.

[3] As a reference, it should be noted that official data published by the National Institute of Statistics and Census from Argentina states that GDP fell by 11% in 2020.

Figure 2. Impact on Sectoral Value Added - in percentage change compared to the baseline. 2020-2030



Source: Own elaboration.

As can be observed, the COVID-19 lockdowns had a particularly adverse impact on the service sectors, with the Construction sector being the most severely affected (-37%). In contrast, the Primary and Light Industry sectors experienced a positive shock during the pandemic (2% and 10%, respectively). This can be attributed to the fact that these sectors produce tradable goods whose prices are fixed and subject to international variations. The government's policy programs had either mitigated the negative effects or enhanced the positive changes in all sectors during 2020. Nevertheless, similar to the aggregated case, the costs of these measures imply that all sectors will experience a slower recovery with respect to the pandemic scenario in the subsequent years following their implementation.

Another relevant issue pertaining to this paper is to evaluate the impact of said economic programs in the evolution of income for the different income deciles. For this reason, Table 5 shows the percentage variation of income with respect to the baseline scenario.

Table 5. Impact on the poorest (H1) and the richest (H5) households' income - in percentage change compared to the baseline. 2020-2030

		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Household 1	COVID-19 Pandemic **without public policies**	-29%	-10%	-7%	-6%	-5%	-5%	-4%	-3%	-2%	-1%	-1%
	COVID-19 Pandemic **with public policies**	-17%	-8%	-8%	-7%	-7%	-6%	-5%	-4%	-3%	-3%	-2%
Household 5	COVID-19 Pandemic **without public policies**	-37%	-13%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%
	COVID-19 Pandemic **with public policies**	-31%	-13%	-11%	-10%	-9%	-8%	-7%	-6%	-4%	-3%	-2%

Source: Own elaboration.

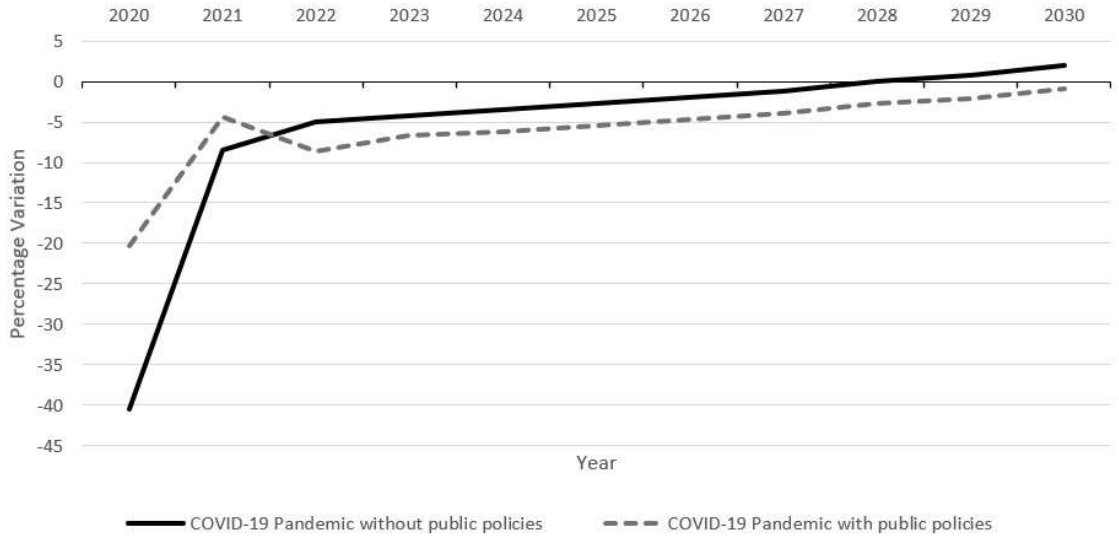
Results suggest that, in the absence of public policies, households with the lowest income would have faced a reduction of nearly 30% in their income. However, their income level would have gradually recovered after the initial shock of the pandemic in 2020. The implementation of public policies played a crucial role in mitigating the adverse impact on this income group during 2020 and 2021. The results indicate that the reduction in income for this group was limited to 17% in the first year. This difference can be attributed to the "Social Assistance" programs that were specifically aimed at the lower-income quintiles.

Conversely, households with the highest income would have experienced a more significant negative variation (-37%) in the absence of measures. However, due to the various programs implemented, the simulated income variations during 2020 were equal to -31%. Unlike lower-income households, the higher quintile primarily benefited from the "Workers and Business" and "Sector-Specific" programs. This is because the richer households owned businesses that received several economic benefits such as payment of salaries, tax reductions, and credit lines.

Overall, Table 5 illustrates a comparable trend to the earlier discussion: although public policies eased the pandemic's negative effects during 2020, their economic costs in the subsequent years meant that the recovery of income levels was slower in comparison to the hypothetical scenario where no public policies were implemented.

In relation to employment, Figure 3 displays the percentage development of this variable in contrast with the baseline scenario under the COVID-19 pandemic, both with and without policy scenarios. It is discernible that the implementation of 2020 lockdowns would have resulted in a drastic decline in total employment, equating to a decrease of 41%. Nevertheless, the presence of diverse programs mitigated such a contraction to 20%. Based on simulations over an extended period, it is anticipated that by 2030, employment will have regained its projected baseline growth rate.

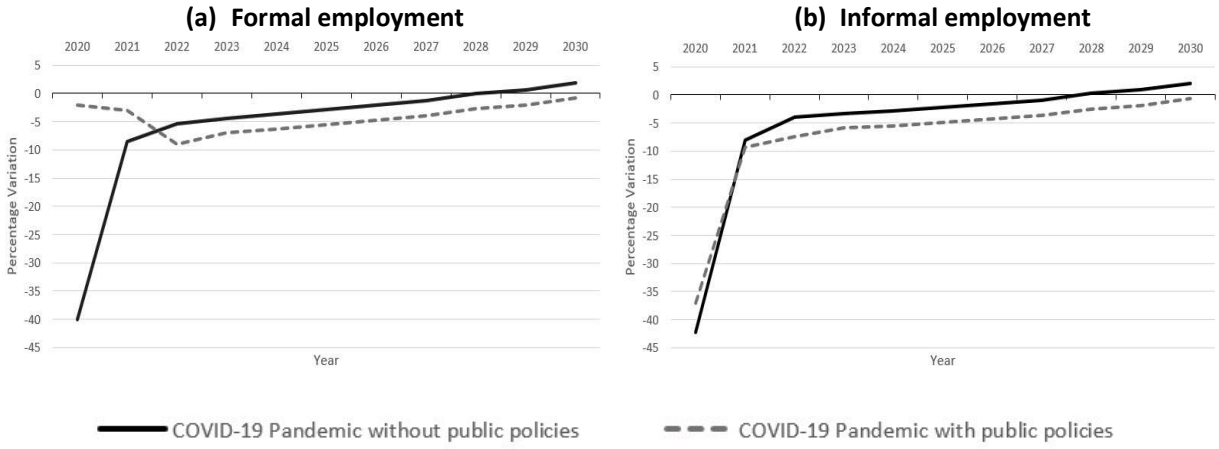
Figure 3. Impact on total employment - in percentage change compared to the baseline. 2020-2030



Source: Own elaboration.

Regarding formality in employment, Figure 4 presents a comparative analysis of the evolution of formal (a) and informal (b) labour. With regards to formal employment, government policies were exceedingly efficient in safeguarding this type of employment. More specifically, projections indicate that in the absence of interventions, the destruction of formal job positions in 2020 would have amounted to 40%. However, the implementation of the "Workers and Business" programs ensured the preservation of formal employment during this period, ultimately resulting in an estimated reduction of only 2% in the initial year. Notably, while the policy simulations were not explicitly intended to preserve informal employment, the results suggest that their implementation mitigated the initial decline in this form of labour.

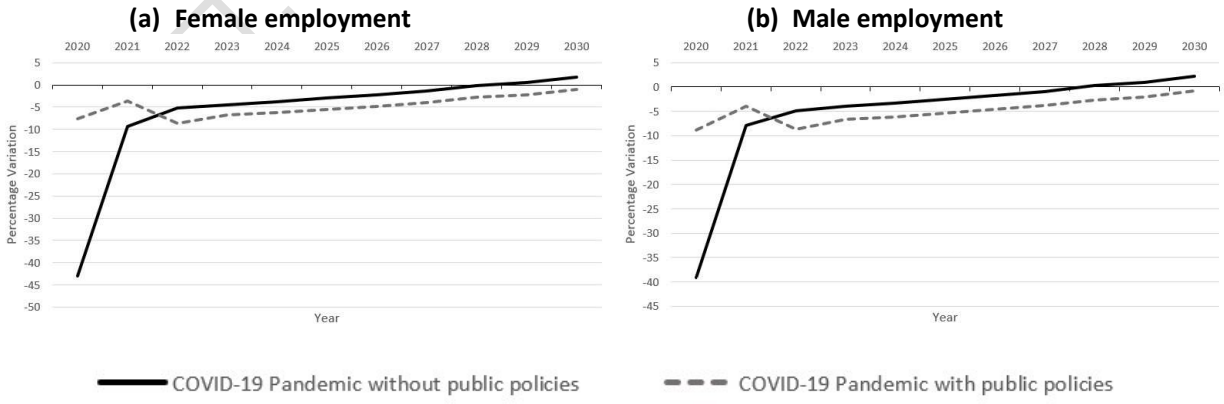
Figure 4. Impact on formal and informal employment - in percentage change compared to the baseline. 2020-2030



Source: Own elaboration.

A final remark is pertinent in relation to the evolution of labour by gender. Figure 5 also provides a comparative analysis of the evolution of job positions for both female and male workers. Results suggest that, in both cases, a similar recovery dynamic is expected towards 2030. However, in terms of magnitude, the absence of government measures would have resulted in a 43% reduction in female job positions in 2020. Conversely, the implementation of simulated policies limited such reduction to 8%. Regarding male employment, simulation results indicate that the COVID-19 lockdowns without government policies would have resulted in a potential reduction of 39% in male employment in 2020. However, by incorporating the various policy programs into the analysis, this reduction was mitigated to 9%. These figures indicate that, in the short run, the measures implemented were effective in protecting female employment.

Figure 5. Impact on female and male employment - in percentage change compared to the baseline. 2020-2030



Source: Own elaboration.

6. Conclusions

The COVID-19 pandemic has had a significant negative impact on global economies, prompting countries worldwide to implement measures to safeguard their economies, employment, and income distribution. Despite Argentina's existing macroeconomic constraints, the country acted promptly in response to the pandemic by implementing a series of policy packages aimed at mitigating its effects. These measures included, among others, programs directed towards workers and businesses, social assistance measures and sector-specific policies. By promptly implementing these policies, Argentina demonstrated its commitment to minimizing the economic and social consequences of the pandemic, even in the face of preexisting challenges.

The present paper has formulated a recursive-dynamic multi-sector CGE model for Argentina in 2018, taking into account its structural characteristics, and presenting a detailed structure of the labour market by formality and gender. By adopting this approach, it was feasible to evaluate both the short and long run effects of the country's COVID-19 policy response on the macroeconomy and the labour market.

The findings indicate that the policy packages enacted by the Argentinian government were effective in mitigating the adverse impacts of COVID-19 lockdowns in 2020 across all variables. Specifically, the "Workers and Business" and "Sector specific" initiatives succeeded in maintaining income levels among the richest households and formal employment. The "Social assistance" programs primarily helped to maintain income levels among the lowest income quintile. The overall results suggest that these policy packages were designed with a gender perspective, as they helped to prevent a greater decline in female employment.

However, when assessing the long-term implications of these measures, it becomes clear that the path to GDP, income, and employment recovery could be impeded as a result of the government's policies. This outcome is directly linked to the assumptions regarding the funding mechanisms of each policy scenario. In all cases, it was assumed that the government would collect an inflationary tax or a wealth tax in the year following the implementation of the programs. Consequently, the policy scenarios show a contraction of the economy after 2020 with respect to the no policy scenario.

A potential limitation of the approach presented in this paper can be associated with the calibration parameters chosen to model labour demand. As it was previously mentioned, such values were extracted from previous studies carried out in Mexico and Italy. Even though there is not much evidence of alternative calibration parameters in the existing literature, the analysis presented could be complimented with a sensitivity analysis to evaluate the robustness of the results.

Acknowledgement

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Annex

Table 6. Argentina 2018. Aggregated Social Accounting Matrix (Macro SAM). In millions of US dollars.

Macro SAM Argentina 2018		Sectors	Factors						Taxes	Households	Government	Investment	RW	Total
			LHF	LMF	LHI	LMI	GMI	K						
Sectors		352.073								359.606	82.907	57.987	**74.293**	**926.866**
	LHF	68.706												**68.706**
	LMF	46.217												**46.217**
	LHI	40.928												**40.928**
	LMI	19.904												**19.904**
	GMI	51.794												**51.794**
	K	156.783												**156.783**
Taxes	Imports	1.808								606		1.399		**3.813**
	VAT	37.497								1.266				**38.764**
	Royalties	2.226												**2.226**
	Fuels	4.141												**4.141**
	Exports	4.061												**4.061**
	Other	42.679												**42.679**
	Subsidies	-15.045												**-15.045**
	T_L	31.273												**31.273**
	T_GMI	1.916												**1.916**
	T_K	26.399												**26.399**
	Direct									233				**233**
Households			68.666	46.177	40.928	19.904	51.794	136.798			74.327			**438.594**
Government								2.764	140.461					**143.224**
Investment										68.806	11.195	0	**0**	**80.001**
RW		53.505	40	40				17.221		10.430	0	20.615	**0**	**101.850**
BNI										-2.353	-25.205	0	**27.558**	**0**
Total		**926.866**	**68.706**	**46.217**	**40.928**	**19.904**	**51.794**	**156.783**	**140.461**	**438.594**	**143.224**	**80.001**	**101.850**	**0**

Note: LHF: Formal labour men; LMF: Formal labour women; LHI: Informal labour men; LMI: Informal labour women; GMI: Gross mixed income; K: capital; VAT: Value added tax; T_L: Labour tax; T_GMI: Gross mixed income tax; T_K: Capital tax; RW: Rest of the world; BNI: National bond (financial result).

Source: Own elaboration.