



WORKING PAPER

The Unfinished Business of Stabilisation Programmes: A CGE Model of Egypt

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Abstract

Several emerging economies have embarked on structural adjustment reform programmes to rectify economic imbalances. Most of these programmes have focussed more on short term oriented stabilisation reforms, which reduce the output gap. Yet longer-term structural policies can boost economic growth through shifting the potential GDP. This paper contributes to the literature in three ways. First, we contrast the effects of stabilisation and allocation policies and to what extent they complement or substitute each other. To do so, we run several alternative scenarios related to stabilisation policies (currency devaluation, subsidy removal and VAT tax) and others related to allocation policies (public spending on education and health and improving the competition policy). Second, we analyse how the effects of such policies can differ in the short and long term and with different market structures (perfect vs. imperfect competition). Third, using a recent social accounting matrix (SAM) of 2014/2015, we develop a CGE model for an economy, Egypt, that is under-researched in the CGE literature and that was subject to a recent reform programme developed with the IMF. Our main findings show that stabilisation reforms reduce economic growth by 2.5% in the short run. Yet they positively affect it over time, especially if they are accompanied by structural reforms. Indeed, the latter increase economic growth (of 8.6% in the long run). Furthermore, from a social perspective, stabilisation reform deteriorates household welfare in the short run, especially in urban areas. Finally, we find that negative effects of stabilisation and structural reforms are more pronounced under imperfect competition, pointing to the importance of an effective competition policy.

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1 INTRODUCTION

Several developing economies implemented stabilisation programmes with different international financial institutions in order to rectify economic imbalances. Most of these programmes focussed more on stabilisation reforms rather than structural or allocation reforms. There are two main differences between these reforms. The first difference is their time horizon. While stabilisation policy is a short-term policy, structural reform is considered as long term. The second difference is their policy implications. Whilst stabilisation policies stabilise the economy through reducing the output gap (difference between growth and its potential level), structural policies increase the GDP potential growth level through ensuring a more efficient allocation of economic resources (Gersbach, 2004; Ayadi et al., 2019), which in turn increase factor productivity and stimulate economic growth. Yet, Bailliu and Hajzler (2016) argue that sound stabilisation policies are a prerequisite for achieving successful structural reform. In addition, given that successful structural reforms expand the production capacity in the society, they increase the policy space for stabilisation reform without generating inflationary pressures (Pichelmann and Roeger, 2004). Thus, this article examines the impact of stabilisation vs. allocation policies using a computable general equilibrium model (CGE). Generally, whilst stabilisation reforms might have produced positive effects on economic growth, budget deficit and trade balance, they negatively affect total employment and household welfare, especially in rural areas in the short term. Thus, stabilisation reforms are not sufficient to address the root causes of development problems of developing countries, which explains to what extent they are rather perceived as an unfinished business.

Empirical studies investigating the impacts of stabilisation reform are quite rich. Yet three remarks are worthy of note. First, the literature examining the difference between structural and stabilisation reforms is scarce, especially studies focussing on the growth, employment and welfare effects of structural reforms. Second, most of the studies examining the impact of structural reforms utilise a partial-equilibrium framework (Babecky and Havranek, 2014; Brancaccio et al., 2018; Canton et al., 2014; McCulloch, 2003; and Youssef and Zaki, 2019). Obviously, this framework ignores the interrelations amongst different market players and portrays a limited picture of the impacts of structural reform (Sajedi, 2018). Finally, whilst a considerable number of these studies develop a CGE model for evaluating the economy-wide implications of taxes, subsidies and public spending reforms, most of these works used a static CGE, with much fewer studies adopting a dynamic approach.

This article focusses on the case of Egypt. The latter is of particular interest for several reasons. Indeed, in 2011, Egypt suffered from a political unrest that has led to several macroeconomic internal and external imbalances (rising budget and current account deficits, increasing internal and external public debt, increasing gap between

official and parallel exchange rates). These economic imbalances have alienated foreign direct investment and reduced international reserves to a critical level which, in turn, has hit economic growth. Thus, Egypt has embarked on a stabilisation programme with the International Monetary Fund (IMF) and the World Bank to rectify these chronic imbalances and stimulate sustained economic growth. Thus, in November 2016, the Egyptian government signed a three-year extended arrangement under the Extended Fund Facility (EFF) with the IMF. This reform programme mainly included the following measures: floating the currency, replacing the sales tax with a value added tax (VAT), removing subsidies and freezing public hiring. Furthermore, some structural measures have been implemented to improve the business environment, reducing the entry barriers, strengthening competition, increasing government spending on education and health, as well as eliminating price distortion policies.

Against this background, this paper contributes to the literature in three ways. First, we contrast the effects of stabilisation and allocation policies and to what extent they complement or substitute each other. To do so, we run several alternative scenarios related to stabilisation policies (currency devaluation, subsidy removal and VAT tax) and others related to allocation policies (public spending on education and health and improving the competition policy). Second, we analyse how the effects of such policies can differ in the short and long term and with different market structures (perfect vs. imperfect competition). Third, using a recent social accounting matrix (SAM) of 2014/2015, we develop a CGE model for an economy, Egypt, that is under-researched in the CGE literature and that was subject to a recent reform programme, developed with the IMF.

Our main findings show that stabilisation reforms reduce economic growth by 2.5% in the short term. Yet they positively affect it over time, especially if they are accompanied by structural reforms. Indeed, the latter increase economic growth (of 8.6% in the long run). Furthermore, from a social perspective, stabilisation reform deteriorates household welfare in the short term, especially in urban areas. Finally, we find that negative effects of stabilisation and structural reforms are more pronounced under imperfect competition, pointing to the importance of an effective competition policy.

The remainder of this paper is organised as follows: Section 2 reviews the CGE literature that investigates the economic impacts of structural adjustment programmes in emerging economies and in Egypt. Section 3 presents the main economic reforms that took place in Egypt. Section 4 describes our recursive dynamic model and the necessary modification needed to construct the oligopolistic version of the model. Section 5 analyses the results of our simulation experiments. Section 6 concludes and provides some policy recommendations.

2 LITERATURE REVIEW

The public policy literature that assesses the economy-wide impacts of reform programmes, whether stabilisation or structural, is rich (Hosoe et al., 2010; Tyle and Gurge, 2009; Ivus and Strong, 2007; Böhringer et al., 2011; Hosny, 2013). Piermartini and Teh (2005) critically review the advantages and drawbacks of partial and general equilibrium analysis of any policy shock. They find that general equilibrium models are more able to assess all backward and forward linkages amongst various economic agents in the society. In addition, Feltenstein et al. (2017) advocate the employment of a general equilibrium framework as a powerful *ex-ante* policy analysis tool that captures the complex interdependencies between different sectors and agents.

Most of the literature on economic reforms focusses on one dimension, such as trade liberalisation (Das 2014; Mahía et al., 2014; Furceri et al., 2018; Latorre, 2016 and Tchoffo et al., 2020), fiscal reforms (Maipita et al., 2010; Llambi et al., 2016; Choi et al., 2017 and Benczúr et al., 2018) with a special focus on energy subsidies reform (Manzoor et al., 2012 and Acosta Margain, 2013) or exchange rate reforms (Elbushra et al., 2010 and Woldie and Siddig, 2019). By contrast, fewer studies examine the simultaneous effects of different reform programmes in emerging economies. Moreover, whilst most of these studies concentrate their analysis on stabilisation policies, few empirical works examine the implications of structural and allocation reforms. For instance, Nahar and Siriwardana (2013) develop a CGE model to assess the short and long term poverty and distributional impacts of tariffs and fiscal reform policies in Bangladesh. They find that a 100% reduction of tariffs leads to a decrease in overall poverty in the long run, but rich households gain more from this reform than the poor. In the short run, poverty increases for urban unskilled labour and low-educated households in both rural and urban medium households. The distributional impact of trade liberalisation is negative in the short run and becomes more equitable over the longer term. They further find that using a consumption tax to compensate government revenue from tariff reduction leads to high economic costs.

As per structural reforms, a pioneer study by Latorre (2016) introduces multinational companies in a CGE model. This study aims to evaluate the implication of trade reforms through tariff reduction and removing entry barriers of multinational firms in business services in Tanzania. He finds that real wages increase across all worker categories. However, the increase in wages is relatively higher for males than for females due to the employment nature in this sector (i.e., business services use males more extensively than females). In other words, he finds that both males and females gain from FDI liberalisation in services. Other CGE models focus on eliminating price control to create a market-oriented price that reflects supply and demand dynamics. For example, Song and Cui (2016) use a dynamic CGE model for China to assess the economic impact of Chinese electricity market reform.

In the Egyptian case, many empirical studies investigate the economic effects of stabilisation reform and trade liberalisation using CGE models. Abouleinein et al. (2009) construct a static CGE to assess the impacts of fuel subsidies' removal. They find that the sudden elimination of all petroleum subsidies in Egypt increases the inflation rate by almost 37 percentage points and negatively affects both growth and welfare. In the same vein, Breisinger et al. (2019) confirm the same negative relationship, using a recursive dynamic CGE that analyses the economy-wide implications of the gradual elimination of energy subsidies in Egypt. Cockburn et al. (2018) go further and advocate that such reforms worsen poverty if they are implemented without providing a complementary social transfer scheme. For trade liberalisation, Hendy and Zaki (2013) merge a static CGE framework with a microsimulation analysis to evaluate the distributional impact of trade liberalisation policies in Egypt. They find that the effect of trade liberalisation policies depends on the characteristics of the individual and the sector where he works. Zaki (2013) also examines the effect of removing administrative barriers to trade and finds that trade facilitation yields a higher positive effect compared to tariff liberalisation.

Despite these different strands to the literature, economists agree on two fundamental issues. First, the implications of stabilisation policies reform vary, based on how the government reallocates its savings from this reform. Indeed, stabilisation reform programmes achieve only price stability, internal and external balances. Nevertheless, these countries failed to stimulate economic growth rates, enhance welfare and reduce unemployment and poverty, since they do not implement structural reforms that address the root cause of the problems. Second, there is a broad agreement on the importance of adopting more structural or allocation policies to enhance social welfare and economic growth (Roos and Adams, 2019; USAID, 2017 and Benfica et al., 2019).

Against this background, this paper contributes to the literature as follows\; First, we contrast the effects of stabilisation and allocation policies and to what extent they complement or substitute each other. Second, we analyse how the effects of such policies can differ in the short and long term and with different market structures. Third, using a recent SAM, we develop a CGE model for an economy, Egypt, that is under-researched in the CGE literature and that was subject to a recent reform programme developed with the IMF.

3 BACKGROUND OF ECONOMIC REFORMS IN EGYPT

3.1 Imbalances of the Egyptian Economy

Egypt has suffered from a chronic budget deficit that reached its peak after the revolution of 2011. According to the Ministry of Finance, the overall budget deficit increased significantly, from 8.1% of GDP in 2009/2010 to 13% in 2012/2013. This

increase can be explained by rapid growth in government expenditure - from nearly 30.3% of GDP in 2009/2010 to approximately 32% of GDP in 2012/2013. Simultaneously, budget revenues declined from 22.2% of GDP to 19%. This increase in government expenditure was due to the rise in wages, salaries and interest payments. Concerning the revenue side, tax revenue, which represented over 65% of total revenues in Egypt, slightly decreased from 14.1% in GDP to 13.6% during the same period. Moreover, non-tax revenues dropped from 8.1% of GDP in 2009/2010 to 5.4% in 2012/2013. In 2015/2016, whilst the budget revenue represented 18.1% of GDP, total expenditure was 30.2%. Consequently, the Egyptian economy was increasingly overburdened by debt (domestic and foreign) that hit 110% of GDP in 2015/2016. Indeed, the Egyptian gross debt (domestic and foreign) surged upwards from EGP 1.1 trillion in 2010 to almost EGP 3.2 trillion in 2015/2016.

At the external level, the Egyptian balance of trade has witnessed a chronic deficit that worsened after the 2011 revolution. The trade deficit increased from \$25.1 billion in 2009/2010 to nearly \$39 billion in 2015/2016, which represented 11.5% of GDP. The share of capital goods and raw materials in merchandise imports declined from 21% and 11% respectively in 2009/2010 to 16.8% and 9% in 2015/2016, respectively. The share of consumer goods slightly increased, whereas the share of fuel imports approximately doubled during the same period. On the export side, only 49% of Egyptian exports were accounted for in finished and semi-finished goods. Moreover, the share of high-tech exports as a percentage of manufacturing exports did not exceed 1%, whilst the share of medium tech exports represented 34% of manufacturing exports in 2017.

Egypt's main sources of foreign currency are exports, remittances, tourism, foreign direct investment (FDI) and the Suez Canal. All these sources have witnessed a severe fluctuation since the 2011 revolution due to security concerns. Tourism revenue declined significantly, from more than 6% of GDP in 2009/2010 to less than 1.5% in 2015/2016 (pre-reform). FDI inflow declined dramatically from 3.1% of GDP in 2009/2010 to 0.9% in 2010/2011 and 2.1% of GDP in 2015/2016. Furthermore, the current account balance witnessed a decrease in net services receipts leading to a current account deficit that widened from 2% of GDP in 2009/2010 to nearly 6% of GDP in 2015/16. These imbalances led to a depletion of international reserves. In June 2016, gross international reserves stood at \$17.1 billion, equivalent to 3.1 months of prospective imports compared to US\$ 35 billion, equivalent to 8.6 months in 2009/2010. Figure 1 summarises the Egyptian internal and external macroeconomic imbalances as a percentage of GDP. Thus, besides the sustained period of severely declining foreign reserves, political instability after the revolution reduced economic growth of real GDP at factor cost from 5.1% in 2009/2010 to 2.3% in 2015/2016.

[Figure 1 about here]

The shortage of foreign currencies created a parallel market where remittances were channelled, in order to benefit from a higher exchange rate. The official exchange

rate was L.E 8.8 per one dollar, whereas the rate in the parallel market was L.E 18. Figure 2 indicates that the parallel market premium widened to more than 30% in September 2016. Thus, the IMF (2017) argues that the official exchange rate was overvalued by about 25% in real effective terms. Thereby, the Central Bank of Egypt devaluated the official exchange rate on November 3, 2016. The Egyptian pound against USD depreciated from EGP 8.8, reaching 19.6 in December 2016.

[Figure 2 about here]

Against this backdrop, by the end of 2016, Egypt embarked on an ambitious structural adjustment economic reform programme supported by the IMF and the World Bank. This reform programme led to a rapid cut in the budget deficit, lowering inflation, accelerating real GDP growth, reducing the trade deficit and the rapid accumulation of foreign reserves. Despite social compensation efforts, poverty increased and income inequality worsened. The following section describes in detail the policies implemented within this programme.

3.2 The 2016 Economic Reform Programme

As mentioned previously, Egypt signed a three-year extended arrangement under the EFF with the IMF in November 2016, amounting to 12 billion USD. This ambitious adjustment reform included the following measures:

Internal Stabilisation Reforms

The reform programme has focussed on fiscal adjustments that are primarily aimed at reducing government expenditure. The Government of Egypt (GoE) took several measures on the expenditure side to generate a primary surplus, such as reducing employment and freezing wage adjustments in the public sector. It further eliminated fuel subsidies significantly, which were vital for supporting fiscal consolidation and encouraging efficient energy use. Moreover, the GoE committed to reach cost recovery prices for most fuel products by implementing automatic fuel price indexation (see IMF, 2017). Thus, the government launched a periodic pricing adjustment mechanism, called “Indexation Mechanism”. According to this mechanism, the government revises fuel prices every three months, with a cap of 10% to maintain prices at cost-recovery levels. The most significant increase in prices took place during 2019 when the government raised fuel prices, between 16% and 30%. Hence, the fuel subsidy bill dropped to only 0.3% of GDP in 2019/20 compared with 2% of GDP in 2015/2016 and 2.7% in 2017/18.

On the revenue side, a substantive tax reform has been implemented to increase tax revenues. In August 2016, the government replaced sales tax with a broad-based value added tax with limited exemptions mentioned in Law No. 67/2016. According to this law, all legal entities whose annual gross sales are equal or higher than EGP 500 000 are subject to pay 14% VAT. To encourage investment, this law imposed only 5%

VAT on machinery and equipment and applied the same VAT equally to imported and domestic goods. In 2019, Egypt introduced another tax reform by applying VAT tax cash refunds on capital investment goods. Recently, Egypt introduced another tax reform by adapting online filing and paying corporate income and value added tax, in order to facilitate dealings with the Tax Authority (World Bank, 2020). The Law exempted 57 goods and services from VAT, especially agricultural products. The share of indirect taxes from total budget revenue increased from 28.7% (5.2% of GDP) to 33.8% (5.7% of GDP). Yet, the contribution of direct income taxes to total budget revenues remained constant at 29.4% during this period.

External Stabilisation Reforms

To achieve external stabilisation, the adjustment reform that has been implemented in Egypt consisted of two key pillars: one stabilising, namely devaluating exchange rate and the other being structural (liberalising foreign trade through reducing tariffs on imports). Initially, in November 2016, the Central Bank of Egypt (CBE) devaluated the Egyptian pound by more than 80%. According to the CBE dataset, the exchange rate was devalued from EGP 8.8 in October 2016 to EGP 16.3 in November 2016. At that time, the CBE left the determination of the exchange rate to market forces, reaching a peak of EGP 18.7 in December 2016. This devaluation had six main objectives: eliminating the widened premium of the parallel market; enhancing the competitiveness of Egyptian exports; attracting foreign investment; strengthening the external balance; rebuilding international reserves; and achieving efficient allocation of economic resources.

Structural Reforms

Egypt has suffered from structural impediments to growth for decades (Zaki, 2017). The most common of these are the unfavourable business environment, excessive regulations, licensing requirements, trade barriers, rigid labour markets, access to finance and labour market problems. Consequently, economic growth fell to 2.7% on average during the period (2011–2016).

The Egyptian government attempted to implement a structural reform programme to address the obstructions to growth and employment in the medium term. For instance, the government introduced a wide range of industrial deregulation measures (e.g., relaxing industrial licensing and ownership rules) to attract foreign direct investments. It further encouraged the banking system to provide Small and Medium Enterprises with a greater access to finance and promoted different schemes that provide specialised training for young people and supported women's participation in the labour force. At the investment level, in 2017, Egypt introduced a new Investment Law to reduce entry barriers. A set of tax and non-tax incentives are currently under consideration to offer to foreign investors. This law additionally provides non-tax incentives, like bearing all or part of the utilities, land and technical training costs for certain strategic projects.

Yet, according to the recent study by the International Finance Corporation (IFC), enterprises are still complaining about poor logistics and high anti-competition practices from state owned enterprises, especially in agro-business, chemicals and building material production activities. Indeed, state owned enterprises receive inputs at low or no cost and receive certain tax fee exemptions for their finished products. Such anti-competitive practices reduce private sector incentives to invest and compete domestically and globally (IFC, 2020).

At the trade policy level, Egypt imposed high tariff rates on a wide range of products, based on the Presidential Decree No. 184/2013. Generally, one of the features of the Egyptian tariff schedule is the large gap between tariffs applied to agricultural products and those applied to non-agricultural ones. According to the last Trade Policy Review of the World Trade Organisation (2018), Egypt implemented many non-tariff measures to control the increasing trade deficit in 2016, like the "import licensing regime". Indeed, several products have been subject to quality control and "special conditions", in accordance with the Ministerial Decree No. 43/2016. In addition, the importation of certain products (e.g., wheat grain, corn used for the feed industry and soya bean seeds for oil extraction) are subject to specific administrative procedures need government approval (WTO, 2018). However, Egypt took measures to liberalise trade in 2018 when it began reaping the benefits of the economic reform programme. These measures were mainly tariff reductions. Indeed, the average tariffs applied on MFN declined for some products. The greatest decline was in the average tariff on imports of cereals and preparations, falling from 30% in 2017 to 15% in 2018, followed by non-electrical machinery and chemicals. Nevertheless, the average MFN tariff on fruit, vegetables and plants increased from 12.8% to 15.6% during the same period. Generally, the simple average tariff imposed on agricultural products increased from 51% in 2017 to 63% in 2018. Simultaneously, the simple average tariff imposed on non-agricultural products declined slightly from 13% to 11.8% (see Figure 3).

[Figure 3 about here]

Moreover, at the human capital level, being the most important determinant of growth (Mankiw et al., 1992), Egypt has allocated relatively low budget resources to education and health, compared to other countries in the Middle East and North Africa (MENA). Based on the UNESCO dataset, the share of public spending on education (percentage in GDP) in Egypt was less than 2% in 2016, compared with nearly 6%, 4% and 7% in Israel, Jordan and Tunisia, respectively. Similarly, current health expenditure as a percentage of GDP was 5% in Egypt, compared with nearly 7% in both Israel and Tunisia (World Development Indicator dataset).

Hence, there are many indispensable policies for eliminating the impediment to growth in Egypt, such as liberalising trade, eliminating entry barriers, price controls and unfair practices in the business environment. Furthermore, Egypt should increase

resources allocated to health and education activities in order to boost the human capital of the economy. In this paper, we examine the growth employment and welfare impacts of those necessary structural policies.

4 MODEL AND DATA

This section presents the key characteristics of our recursive dynamic computable general equilibrium (hereinafter EG_CGE) model for the Egyptian economy. This model is designed to assess the medium and long term effects of stabilisation and structural reform adopted since 2016. It further describes the modification implemented on the comparative static model to reflect oligopolistic behaviour of producers. The EG_CGE is constructed following the PEP1-t single-country recursive dynamic CGE, developed by Decaluwé et al. (2013) and calibrated to the 2014/2015 Egyptian SAM (see Appendices 1 and 2 for more details).

4.1 Model specification of EG_CGE

This model has a perfect competition framework; therefore, the profit maximisation condition necessitates the equality between the prices of production factors and their marginal productivities. This model includes three factors of production: capital, land and labour (that has three types: unskilled, semi-skilled, and skilled). All labour types are fully employed and mobile across sectors, leading to the same wage rate in all economic activities. However, capital remains sector specific. As a small open economy, producers in this model are price takers in both goods and factors' markets. At the production level, each activity exhibits a nested structure. The first production level is specified by a Leontief production function, composed of value added and intermediate consumption. Value added is specified by a constant elasticity of substitution (CES) function of composite labour and capital. Each composite input is a CES function of various factor types and each industry can produce multiple commodities, which are aggregated by a constant elasticity of transformation (CET) function. In addition, the quantities sold domestically and exported are specified by a CET function (see Appendix 3).

Since EG_CGE is a recursive sequential dynamic model, households have a myopic behaviour. In other words, households are perfectly foreseeing all prices (Cockburn et al., 2018). Their consumption of a commodity is a CES function of domestic and imported quantities. A representative household maximises its utility subject to its income constraint. It allocates its income from various sources between consumption and savings, represented by a linear-expenditure system (LES). The

latter implies that there is a minimal level of consumption that does not depend on commodity prices or consumer income.

There are four sources of government revenue in this model: 1) direct taxes on income of domestic non-governmental agents (households and firms); 2) indirect taxes on domestically produced or imported commodities; 3) custom duties on imports; and 4) transfers from domestic and foreign agents. These revenues are allocated amongst current expenditure, subsidising production process, social transfers and savings. Both government spending and transfers to other agents are exogenous in this model. Our model has three closure rules. First, total savings in the EG_CGE model determine the total investment as the PEP1-t model is a saving driven model. Second, public demand for commodities for investment represents a fixed fraction of total expenditure. Finally, current account balance determines the amount of foreign savings.

We introduce three main modifications to the PEP-1-t model to adequately consider the specific features of the Egyptian economy and to address our research questions. First, we introduce governmental subsidies to production activities in order to simulate petroleum subsidies removal. Second, we modify one of the original model closures, which uses the nominal exchange rate as the model's numeraire. Since we need to simulate the effects of devaluating the Egyptian pound by more than 100% from its level in the benchmark year (EGP 7.4 in 2014/2015) to EGP 18.3 in December 2016, we use world price as numeraire rather than the nominal exchange rate. Third, equivalent variation equation is modelled following Annabi et. al. (2004) and Zaki (2013) to examine the welfare impacts of each reform policy.

To capture the effect of competition policy reforms (being one of the structural policies), we develop an imperfect competition (oligopolistic) version of the comparative static PEP-1-1 model and compare it with the result of a perfect competition framework. Imperfect CGE literature introduces several methods in which imperfect competition can be modelled. We follow in this paper Tchoffo et al. (2020) that model fixed costs as a Cournot oligopoly with free-market entry. Thus, each domestic industry consists of identical firms, whose number is determined by the zero-profit condition. Any oligopolistic market structure represents two key distortions: a gap between average and marginal costs and the existence of producers' market power. Usually, the oligopolistic sector has a relatively higher capital labour ratio compared to competitive sectors (Kaempfer et al., 1997). We assume imperfect competition (oligopoly) in all activities, except in the agricultural, agro-processing, mining and beverages and tobacco sectors. Indeed, the oligopoly markup is as follows:

$$\frac{PD_i - MCD_i}{PD_i} = \frac{\Omega}{NU_i \varepsilon^d}$$
$$\frac{PE_{FOB_i} - MCE_i}{PE_{FOB_i}} = \frac{\Omega}{NU_i \varepsilon^e}$$

where PD_i and PE_{FOB_i} are the prices of local product i sold on the domestic market (including all taxes and margins) and FOB price of the exported commodities (in local currency), respectively. MCD_i is marginal cost of the product i sold on the domestic market, whilst MCE_i is the marginal cost of producing the exported product i . NU_i is the number of producing firms of product i . ε^d and ε^e are the price elasticity of demand of domestically sold and exported products, respectively. $\Omega = \Omega_i$ is the power of reaction of the branch i following a modification of the production of a certain firm (see Tchoffo et al., 2020). Imperfect competitive CGE literature argues the elasticity of demand is typically higher for exported products than for sales in domestic markets (see Böhringer et al., 2001). Thereby, it is expected that the degree of structural change is larger under oligopoly than under perfect competition specifications.

Under these different assumptions, we run different simulations to assess the macro and sectoral impacts of stabilisation and structural reforms, as presented in Table (1). We first examine the impact of stabilisation reform (VAT, subsidies and exchange rate) that were presented above, then introduce deeper allocation reforms (competition policy, education and health spending and tariff removal).

[Table 1 about here]

4.2 SAM and Other Data Sources

EG_CGE model is calibrated using the Egyptian Social Accounting Matrix (SAM) for the year 2014/2015. As shown in Appendix (1), this SAM consists of nineteen activities and nineteen commodities. However, since the SAM does not include all the parameters required for our model, some parameters and elasticities (such as the elasticity of substitution and transformation) are taken from other sources (Lofgren 2001 and Annabi et al. 2006). The elasticity of substitution between domestic and imported goods is ranging from 0.9 to 2.4. The elasticity of transformation between domestic and exported output is ranging from 1.5 to 3. In addition, labour-capital substitution varies across sectors from 0.2 to 0.9.

Moreover, labour supply is assumed to grow at the same rate as Egypt's total population in the year 2014/2015, as estimated by the Central Agency for Public Mobilisation and Statistics (CAPMAS). The nominal interest rate (11.8%) comes from the database of CBE. The source of the depreciation by activity is the Input Output Table for the year 2012-2013, issued by CAPMAS. For the oligopolistic version of the EG_CGE, fixed costs are assumed to be a fixed share (20%) of capital costs. Following the literature, we assume that the number of firms (Nu) is equal to 30 firms and that

the perceived price elasticity of demand for export is exogenous³. Also, the value of Ω is fixed, varying from 0 (perfect competition) to Nu (monopoly). We assign $\Omega = 0$ for agricultural, agro-processing, mining and beverages and tobacco activities, which brings us back to the situation of perfect competition. We assign $\Omega = 1$ corresponds to a Cournot conjecture to all other activities.

5 SIMULATION RESULTS

We use the competitive recursive dynamic EG_CGE model to simulate various policy scenarios to assess the short and long-term impacts of stabilisation reform and various possible allocation policies (see Table 1). To do so, three internal stabilisation scenarios are simulated: imposing 14% VAT on all products except agricultural ones (VAT), 100% gradual elimination of petroleum subsidies, 10% per annum for 10 years (GSUB) and 50% sudden reduction of petroleum subsidies in the first and second years (SSUB). At the external stabilisation level, two scenarios are simulated: 100% gradual devaluation of exchange rate with 10% per annum for 10 years (GDEV) and 100% sudden devaluation of exchange rate from year one (SDEV). At the allocation and structural level, three simulations are implemented: 10% increase in public spending on education (EDU), 10% increase in public spending on health (HLT) and full tariff liberalisation (TL). Finally, these different simulations are combined to examine the simultaneous impact of both stabilisation and allocation policies on the Egyptian economy.

The simulations are run for a horizon of ten years to examine the implications on production activities and household welfare by consumption quantiles and regions. Finally, we use the oligopolistic and competitive static CGE to simulate all the implemented policies and compare their effects under different market structures.

5.1 Stabilisation Reform Simulations

This section investigates the impacts of implementing stabilisation reform in Egypt. First, we assess the effects of various stabilisation reform through three main individual experiments (VAT, SSUB and GSUB). Second, we investigate the impacts of implementing full stabilisation policy reform (STABR).

³ We assign it for all activity a value of 20, as is the case of Tunisia (Tchoffo et al.,2020)

Imposing a Value Added Tax

Before examining the economic consequences of imposing a uniform value added tax (14%) on all products, except agricultural ones, we need to analyse the pre-shock indirect taxes by products. Figure 4 indicates that sales tax before this shock ranges between nearly zero % on agricultural products and 9% on textiles. Only beverages products are subject to a sales tax that is three times higher than the imposed VAT.

[Figure 4 about here]

Table (2) demonstrates the changes in macroeconomic variables due to different policy simulations. Imposing a value added tax of 14% increases total government income by approximately 45.1%, with an increase in government revenues from indirect taxes more than five times. Although total public investment rises by 6.5% in the short term, total investment expenditures fall by 19.3% due to the decline of total private investment by 21.9%. Thus, real GDP approximately declines by 6.2 % in the first year of the tax reform. This can be explained by the contractionary effects of indirect tax policy. Both total exports and imports significantly increase, but exports increase more than imports (6.0 and 2.7%, respectively). Over the ten-year period, total exports increase by approximately 9.5%.

[Table 2 about here]

Meanwhile, imposing VAT increases the consumer price index by 12.7 percentage points which, in turn, reduces domestic demand. Private consumption represented 80% of GDP, based on the 2014/2015 SAM (see Table A2.1 Appendix 2). Imposing a VAT reduces private consumption between 1% (agricultural products) and 17% (other industries). The reduction of average household consumption by approximately 12% in the first year leads to a fall in average aggregate industrial output by 6.5% because of a lower demand. Thus, demand for labour and capital decline⁴. Our simulation results suggest that approximately 12 out of 18 non-agricultural sectors decrease their value added that range between 0.1% and 9.1%. However, some sectors like non-metal, metal, mechanical, vehicles and other industries experience increases of industrial value added by 5.4%, 4.4%, 6%, 38.4%, and 17.6%, respectively. Indeed, the increase in total production is combined with an increase in imported intermediate goods.

It is important to note that this policy does not only increase domestic prices but also the prices of imported goods by, on average, 11%. This, in turn, creates another wave of price increases of all products, except in labour-intensive sectors that benefit

⁴ Appendix 2.2 summarises the distribution of value added in benchmark year.

from the reduction in wage rates (tobacco and beverages, textiles, clothes, leather, educational and health services)⁵. Yet, imposing VAT pushed demand for composite labour down, leading to a decline in the wage rate of composite labour by 14.3%⁶. Consequently, the rental rate of composite capital decreases by 23.3% (except for capital-intensive sectors). In addition, firm income falls by more than 12.6% due to the reduction of its capital income.

National welfare deteriorates, since it decreases by 0.44% in the short term, although in a heterogeneous way for different households. Figure 5 shows that the richest quantile in both urban and rural areas witnesses the highest welfare loss compared with the poorest quantiles in the region. This can be explained by the source of income of both quantiles (see Figures A2.5 and Table A2.4 in Appendix 2). Indeed, transfers from firms to urban households represent 61% of their income compared to 41% of rural households. Imposing VAT reduces firm disposable income by 12.6%. Yet, the disposable income of the poorest rural households decreases less than the incomes of the poorest urban households, due to the higher rise in remuneration rates of production factors used in non-agricultural activities. Over time, the severity of welfare loss slows down in all household quantiles in both urban and rural areas. Indeed, the welfare of the poorest two quantiles decreases with lower rates compared to the welfare of the richest three quantiles in both urban and rural areas. Hence, this policy leads to a slight decrease in income inequality between urban and rural areas.

[Figure 5 about here]

Petroleum Subsidies Elimination

In this section, we examine the effects of gradual versus sudden elimination of petroleum subsidies (see Table 2). Sudden elimination of petroleum subsidies increases short term government income by 5.3% compared to 1.1% under the gradual elimination. Whilst phasing out petroleum subsidies has negative growth effects in the short term price under the two scenarios, it leads to long term positive impacts on real GDP, with sudden subsidies elimination leading to gains that are two times higher than the gradual scenario.

The initial effect of eliminating petroleum subsidies is an upwards shift in the cost curves of the petroleum sector and its output price. The rise in the prices of petroleum products causes successive waves of price hikes of other commodities that depend on them, especially intermediate goods. Thus, domestic supply adjusts to lower domestic demand through rising export supply that becomes more profitable. The simulation results show that total exports and imports increase by 0.3% in the short

⁵ See Tables A2.2 and A2.3 in Appendix 2 for more descriptive statistics from the SAM.

⁶ See Figures A2.1-A2.4 in Appendix 2 for more descriptive statistics from the SAM.

run, but export demand increases more rapidly (6.6%) than imports (1.2%) in the long run. At the sectoral level, economic activities are affected in different ways since vehicle, metal and other industries expand, whilst services, beverages and textiles total output declines. In other words, removing petroleum subsidies has a negative impact on many economic activities, especially the manufacturing sectors that witness a higher production cost. Thus, eleven sectors out of nineteen record negative value added in the first year, especially beverages activities (0.9%), whereas almost all sectors experience a positive increase in their value added in the long run (on average by 4.6%).

For households, the simulation results suggest that a higher petroleum price reduces household consumption by 1.2% in the short term. The highest reduction in private consumption is in petroleum products (3.6%), non-metals (1.7%), metals (1.7%) and vehicle and its parts (1.5%), activities that rely heavily on petroleum products. Indeed, producers switch away from petroleum intensive product commodities to more affordable ones. In the short term, the sole way to modify production is through reducing labour demand. The reduction of production and employment is more pronounced in energy intensive sectors, especially chemical and beverage industries. However, the effect on employment is different in the long term due to the inter-sectoral labour mobility. Thus, greater investment and reallocation of factors towards more efficient sectors in the long term increase both real GDP and employment by 3.5% and 0.4%, respectively.

The sudden elimination of petroleum subsidies has negative implications on national welfare in the short term with a lower negative effect in the long term. Indeed, household income drops by 4.3% in the first year of implementing this policy. This can be explained by the fall in wages by approximately the same rate. The richest urban households suffer from a higher income loss (11.7%) than rural ones (3.9%). As per welfare, all households experience welfare losses in both urban and rural areas in the short term (between 0.7 and 11.7% for urban poorest households and between 2.2 and 3.9% for rural ones). In the long run, urban household gains are higher than those of rural ones, since the welfare of urban and rural households increases by 23.9% and 21%, respectively. This can be explained by the difference in demand structure of urban households, compared to their rural counterparts. Furthermore, it is worth mentioning that the strong expansion of vehicle and mechanical industries increases the capital income of urban high-income households (see Figure A2.5). Yet over time, the poorest urban and rural households tend to benefit from petroleum subsidy elimination, thanks to a more efficient reallocation of factors.

Devaluation of Egyptian Pound

The third stabilisation scenario deals with currency devaluation. Indeed, the CBE devalued its currency by 100% in nominal terms at the end of 2016, to reflect the

real value of the Egyptian pound. In this section, we simulate the effects of gradual and sudden devaluation (see Table 2). Under sudden devaluation scenario (SDEV), exports increase seven times more than under the gradual devaluation scenario (GDEV). Nevertheless, in the long run, SDEV increases exports by 19.9% compared with 22.6% under GDEV. Imports fall at a stronger rate under the gradual devaluation GDEV scenario in the long run because manufacturing activities depend heavily on imported raw materials and capital goods. Unlike SDEV, GDEV gives them the required time to modify their production through switching to alternative domestic raw materials. However, SDEV increases government income and total investment by higher rates compared to the gradual scenario, which stimulates economic growth more than GDEV. GDP at the market price increases in the long run by 1.4% under the gradual devaluation scenario and 3.8% under sudden devaluation. This can be explained by the speed of achieving the efficient use of economic resources under the second scenario, since floating the Egyptian pound leads to a shift of economic resources from less efficient sectors to others that are more efficient.

Simulation results show that devaluation undoubtedly increases the inflation rate in the first year by 4.8% under the GDEV scenario and by 25.3% under SDEV simulation. Households suffer more from the marked increase in prices of final goods under the sudden devaluation scenario in the short term. Hence, total private consumption declines in both experiments in the short run, but the decline is five times higher under SDEV than under GDEV.

The greatest decline in private consumption is in chemical products (6.6%), mechanical (6.4%), and vehicle (6.4%). This can be explained by two main reasons: First, the increase in the basic price of industry output is not uniform across different sectors. They vary from only 29% for agricultural products to 77% for chemical products. Second, the fall in labour demand is stronger in chemical activities (down by 35%) and in agro-processing food (36%), which affects wages, household income and, thus, consumption.

Table 3 shows that the sectoral impacts of currency devaluation are heterogeneous, even if SDEV reduces the import volume of almost all products. Whilst the greatest decline takes place in imports of agricultural products (by 72.8%), the lowest fall in imports is that of chemical products (by 7%). Similarly, SDEV increases exports of all products. Whilst agricultural and agro-processing products witness the highest increase in their exports in the short term, the increase in exports of mechanical products exceeds the agro-processing exports in the long run, due to the adjustment of the economy.

[Table 3 about here]

Although devaluation leads to welfare loss in both rural (4.5%) and urban areas (4.9%) in the short run, it enhances the welfare of all household' quantiles in the long

run. Indeed, the change in the equivalent variation of the richest quantile in urban areas is three times higher than the richest in rural ones. This can be explained by labour characteristics in both geographic areas. In fact, the increase in the wages of unskilled labour is relatively lower than the average wage of skilled workers. Given that agricultural activities are intensive in unskilled labour, they benefit less from this shock.

Stabilisation Reform

In this section, we simulate the effects of simultaneously implementing all stabilisation reform policies (VAT, GSUB, SDEV). Simulation results show that stabilisation reform (STABR) has a negative effect on economic growth in both the short and medium terms (see Table 2). Over time, it boosts economic growth by 3.9%. The main explanation of this result is the reallocation of governmental savings to finance public investment, which increases by 21% in the short term.⁷ Concerning the trade effects of stabilisation reform, it increases total exports in the short term by 19.2% and 24.4% in the long run. Yet, it reduces total imports by 21.5% and 27.3% in the short and long terms. Over time, they adopt the opposite trend (see Table 2). Moreover, stabilisation reform leads to an increase in the consumer price index by 58% in the short run (due to lower subsidies, more taxes and a devaluated currency). This price increase pushes total private consumption down by 14.2%. The greatest decline in private consumption is in vehicle and metal products that fall by more than 19% in the first year of the reform. At the national level, stabilisation reform deteriorates welfare by 0.5% increasing by 0.28% in the medium and long term. Although VAT and GSUB have contractionary effects on macroeconomic variables (namely economic growth and employment) in the short run, STABR increases total value added and employment by 1% and 12%, respectively.

Figures 6a and 6b summarise the sectoral trade effects of stabilisation reform that significantly pushes import⁸ and export prices⁹ up. In the short run, domestic producers of most economic activities (especially agricultural and agro-processing food) redirect their production to the export market, which becomes more profitable than the domestic market thanks to the currency devaluation. Thus, the exports supply of agriculture, leather and agro-processing food increases in the short run by 39%, 32.8% and 24.8%, respectively. Over time, exports of all products significantly surge in the long run. Simultaneously, this reform reduces imports of almost all sectors, except for those that depend heavily on imported inputs, especially vehicle and mechanical industries. Development of such industries requires structural reform rather than

⁷ While we assume current public spending is fixed, public savings is not.

⁸ Price of imported products (including all taxes and tariffs)

⁹ FOB price of exported commodities (in local currency)

stabilisation reform, in order to reduce the chronic trade deficit by producing their imported inputs domestically.

Overall, the stabilisation reform has long term positive effects on economic growth, budget deficit and trade balance. However, it negatively affects total employment and household welfare, especially in rural areas in the short term. Thus, the stabilisation reform is not enough to achieve industrial development, especially in manufacturing sectors that rely mainly on imported inputs, which explains to what extent stabilisation reforms are something of an unfinished business.

[Figures 6a and b about here]

5.2 Structural Reform Simulations

Structure or allocation policies are used to increase the potential level of economic growth and employment. This section investigates the short and long term impacts of structural reform policies by examining four main policy experiments. First, we examine the effects of gradual tariff liberalisation on all commodities (TL). In the second and third experiments, we assess the impacts of reallocating public expenditure to the investment in human capital, like education (EDU) and health (HLT). We undertake the last two experiments to narrow the expenditure gap between Egypt and other countries with emerging economies. Indeed, rising government expenditure on education and health shifts the GDP growth trend by enhancing human capital productivity and labour income. Finally, we study the effects of implementing all these structure policies simultaneously (STRUCR).

Trade Liberalisation Scenario

The simulation results suggest that 100% tariff reduction slightly enhances national welfare through reducing the domestic prices of imported goods and the consumer price index. Indeed, this shock has positive impacts on the economic growth path, especially in the long run. Table 4b describes the macroeconomic effects of tariff liberalisation. Real GDP slightly increases by 0.7% and household welfare by 0.1% in the long term. These small increases are chiefly explained by the initial low level of tariffs leading to a limited effect on the economy. Whilst private consumption slightly increases by less than 0.1% in the short run, it increases by 1.4% over the long term. Furthermore, tariff removal reduces both government income from import tariffs and indirect taxes¹⁰ which, in turn reduces total government income in both the short and long run by 0.5% and 6%, respectively. It is important to note that tariff elimination

¹⁰ Tariff rates appear in the equation of indirect taxes, hence declining tariff rates affect the government income from indirect tax.

reduces government savings, based on our closure choices¹¹. However, total investment increased by 3.2%, thanks to increasing private savings by 0.9% in the long term.

Assessing the impacts of this policy shock at the sectoral level reveals different results that vary based on the characteristics of different sectors and households. Indeed, gradual tariff liberalisation reduces import prices and switches expenditure from domestically produced goods to cheaper imports. The results show that total aggregate output in almost all economic activity amongst import-competing sectors declined, especially in chemical, mechanical and other manufacturing activities. This fall in total output can be explained by the reduction in demand for domestically produced goods in the short term. Consumption shifts towards imported goods due to the reduction in import prices ranging between 0.1% (other industries) to 3.1% (leather). Therefore, imports increase in almost all sectors by 0.5% and 4.7% in the short and long run, respectively. Table A4.2 in Appendix 4 provides a summary of the sectoral impacts of tariff liberalisation. As shown in Figure 7, most industrial commodities, especially leather and vehicles, are protected with high tariff rates (44% on leather and 34.2% on vehicles). Therefore, a 10% decline in import prices in the short run leads to a 2.7% and 2.5% increase in the quantity demanded of leather and vehicle imports in the short term, respectively and 35.6 and 30.6% in the long term.

[Figure 7 about here]

However, it is important to note that the exports market becomes more profitable than the domestic market. Therefore, domestic producers redirect some of their output towards the export market, leading to an increase in the exports supply of all economic activities on average by 0.8% in long run. Exports of vehicle parts, textiles and clothes increase by 6.8%, 3.4% and 2.3% in the long term, respectively. Yet, total aggregate output decreases in almost all production sectors in which producers are oriented more towards the domestic markets.

At the household level, simulation results suggest minimal positive change in the average household disposable income by 0.12%, with urban household income increasing slightly by 0.7% compared to 0.6% in rural areas. Indeed, there is a 0.12% increase in the equivalent variation for rural households in the short run compared with 0.15 in urban areas. Yet, urban households enjoy welfare gains that are 16% higher than rural ones over the long run.

¹¹We assume that transfer rates and government expenditure are fixed, hence the only adjustment tool to the reduction in government income is reducing government savings or increasing government deficit.

Doubling Government Expenditure on Education

This section simulates the impact of increasing government spending on education by 10% (EDU). Simulation results show that this allocation policy has a positive impact on overall economic growth and household welfare. Table (3) compares the macroeconomic effects of the EDU experiment. It shows that there is a positive effect of this structural policy on economic growth, as it increases GDP by 0.4% and 1.8% in the short and long term respectively.

Most economic activities (eleven out of nineteen) witness a positive increase in value added ranging between 0.1% (metal industries) and 6.4% (education activities) in the short run. On average, the value added of almost all activities increase by 0.5% and 4.7% over the short and long term, respectively. This policy leads to the better allocation of economic resources from unproductive areas to more productive ones, as shown in Table 4a which, in turn, boosts economic growth. Moreover, increasing public expenditure on education has positive implications on sectoral performances - especially beverages, agro-based and vehicles and their parts. At the household level, this policy slightly enhances national welfare in both the short and long term. All household quantiles have welfare gain - especially the richest urban quantiles of 2.5%, compared to 0.42% in the richest rural quantile. This reform increases demand for skilled labour. Bearing in mind that 72% of labour income in the richest urban quantile is from skilled labour, which represents nearly two times its counterpart in rural areas (see Table 6), this scenario is more pro-urban households.

Although this policy increases the consumer price index by 0.1% in the short run, total private consumption increases by 0.3% and 2.1% over the short and long term, thanks to a stronger income effect. Indeed, this simulation increases the composite wage rate of labour and capital in almost all economic activities, by 0.9% and 1.1%, respectively. However, it decreases the wage and capital rates in the agriculture sector by 0.2% and 3.6%, respectively. This can be explained by the high ratio of unskilled labour in agricultural activities.

[Tables 4-6 about here]

Doubling Government Expenditure on Health

Government expenditure on health (HLT) has less significant economic growth compared with education, as depicted in Table (3). Yet it has slightly positive impacts on economic growth in both the short and long run, of 0.1 and 0.3%, respectively due to its effects on investment and private consumption. Total investment expenditure increases by 0.2% in the short run and by 1% in the long run. This simulation exerts a positive effect on private consumption, especially in the long run. At the sectoral level, the reallocation of public consumption to health has a positive impact on the value

added for twelve out of nineteen activities (0.3%); especially health 2.4%. The result shows that value added in agricultural, public administration declined in the long run, by 2.3 and 0.03%, respectively. Indeed, growth in value added influences the composite capital rental and wage rates that increase by 0.34% and 0.16%, respectively. Yet agricultural labour receives lesser wages in both the short and long run, by 0.1% and 0.5%, respectively.

The Impacts of Structural Reforms

We now turn to the combined effect of all structural reforms (EDU, HLT, and TL). Simulation results show that structural reform (STRUCR) has a positive effect on economic growth in both the short and long term. Yet it boosts economic growth - more than three times higher in the long term compared to the short term. The main explanation of this result is due to the fact that reallocation policies shift the growth path of GDP.

Concerning the trade effects of structural reform, it has slightly negative effect on total exports in the short term, but it increases total exports by 1.7% in long run. Yet STRUCR reduces total imports in both the short and long run (see Table 4b). At the household level, structural reforms reduce the consumer price index in both the short and long run, by 0.2% and 1.5%, respectively. Simultaneously, they increase factor incomes, namely wages and capital rent, which is translated into a positive effect on both total private consumption and national welfare. Although all households witness positive welfare gain from STRUCR in both rural and urban areas, the welfare gains of urban households are more than double that of rural households. Concerning the employment effects of STRUCR, it increases labour demand in both the short and long term, by 0.6 and 3.7, respectively. This reform increases the value added of production activities that depend heavily on skilled labour, such as education, health, vehicles, clothes, textiles and beverages (see Table 5).

Overall, structural reform has long term positive effects on economic growth and household welfare. However, it is pro-urban, due to the skills characteristics of labour in rural and urban areas and the production activities located in both areas. This is why, from a policy perspective, it is important to accompany such a policy with social safety nets that protect rural households, which might be more vulnerable than urban ones¹².

¹² Table A4.2 in Appendix 4 provides a summary of the sectoral impacts of structural policies.

5.3 Combining stabilisation with structural reforms

In this section, we examine the macro and sectoral effects of stabilisation and structural reforms when they are combined together. To do so, we run three simulation experiments; First, we investigate the growth, employment and distributional implications of currency devaluation with a better allocation of economic resources, through gradual import tariff liberalization (SDEV+TL). Second, we assess the impacts of using public savings from petroleum subsidy elimination to finance increased public spending on education and health (GSUB+EDU+HLT). Finally, we investigate the full reform programme (FREF) that includes both stabilisation and structural reforms simultaneously.

Combining Currency Devaluation with Tariff Liberalization

This simulation experiment reveals that combining these two policies leads to expansionary effects in the long run. As shown in Table 7, whilst GDP declines in the short run by 2.3%, it surges up by 4.1% in the long run. At the household level, all income groups are better off in the longer term, after achieving better allocation of economic resources thanks to a better external position. At the national level, there is a welfare gain in both the short and long term by 0.3%. This welfare gain is three times higher compared to the “TL” scenario.

[Table 7 about here]

At the sectoral level, combining these two policies leads to a quiet similar export growth rate, as in the SDEV scenario in both the short and long term. Yet this policy combination leads to a reduction in imports that is slightly less than under the devaluation scenario, due to the positive effect of tariff elimination on imports. Table 7 illustrates the cumulative change in Egyptian foreign trade relative to the business-as-usual scenario during the period 2014/15-2024/25. Exports of all economic activities slightly increase in the short term and significantly surge over the long term once the economy adjusts. Overall, the agricultural sector is the main beneficiary of such a reform, with the highest growth rate in exports in the long run (38%).

[Table 7 about here]

Reallocating Spending to Subsidise Education and Health Spending

This experiment simulates the growth and welfare impacts of using savings from eliminating petroleum subsidies to finance government expenditure on education and health (EDU+HLT+GSUB). The results show that reinvesting the amounts generated from subsidy removal can compensate household welfare loss due to lower subsidies.

It further significantly increases total investment in expenditure in both the short and long run, by 2.6% and 24.1%, respectively, leading to economic growth that reaches 3.9% in the long run, as shown in Table 7. As per national welfare impacts, this policy experiment leads to welfare gain in the long run by 0.2%. This can be explained by the increase of factor income (composite wage rates up by 0.9% and rental rates by 1.3%) with the highest rise in factor income in the education and health sectors. Thus, we find that stabilisation policies can have a stronger positive employment effect if they are accompanied by a better allocation of public resources that are invested in human capital.

Implementing Stabilisation and Structural Reforms

Simulation results show that combining structural reform with stabilisation reforms yields positive economic growth, by 5.5% in the short term and 8.6% over the long term. These figures are higher, compared to the stabilisation scenario of only (3.9%). Yet, in both scenarios total consumption falls with lower decreased reduction under the FREF experiment, as presented in Table 7, due to a smaller increase in the consumer price index. Concerning the welfare effect when stabilisation and structural reforms are combined, the results suggest welfare improvement in both short and long run. In fact, the FREF scenario reduces the welfare loss under STABR in the short term and yields welfare gains over the long term. Moreover, the FREF leads to a lower inflation rate compared to STABR. Therefore, the former reform reduces the contractionary effects of the stabilisation reform.

Despite combining the two types of policies, our simulation results show that some segments of the economy will always bear the cost of the reform. For example, tariff liberalisation and currency devaluation do not yield the desired impact, because most non-agricultural activities depend heavily on imported raw materials. Furthermore, our results show that there is a need for geographical targeting rather than general reform, especially for vulnerable groups in rural areas.

It is important to note that the assumption of perfect competition in all markets is not a realistic one. Indeed, there are many entry barriers in different markets, especially in the industrial sector. In the following section, we examine the existence of such entry barriers and compare the impacts of eliminating these barriers on the effectiveness of those reforms.

5.4 Imperfect Competition Approach

In this section, we examine the argument that the macroeconomic effects of structural adjustment reform, implemented in Egypt in 2016, vary based on the market structure. Thus, we develop an oligopolistic version of the PEP1-1 single-country static

CGE and run four simulation experiments to compare them with the perfect competition model. Initially, we simulate the effects of stabilisation reforms. In this experiment, we examine the impacts of eliminating 10% of petroleum subsidies, imposing 14% VAT, and devaluing the Egyptian pound from EGP 8.8 to EGP 16.3. Next, we evaluate the effects of structural reform policies, in which we simulate removing import tariffs by 10% and increasing government expenditure on education and health by 10%. Then, we investigate the effects of combining stabilisation reform with structural reform. Finally, we assess changes on the simulation results, in case of eliminating entry barriers through the increasing number of producing firms by 100%.

To do so, we simulate the implications of economic reform assuming perfect competition in all markets (C). Next, we simulate these effects under a imperfectly competitive or oligopoly market (IC) in all product markets - except in agriculture, agro-processing food, mining and beverages and tobacco.

Table 8 summarises these simulation results. It reveals that both stabilisation and structural reform are associated with a higher negative impact under imperfect competition than under perfect competition. In fact, stabilisation reform under imperfect competition leads to a greater fall in economic growth, higher inflation rate, more decline in private consumption and less expansion of total exports, compared to the perfect competition scenario. STABR increases inflation rates under both market structures. Yet it leads to 6-percentage points higher under imperfect competition (IC). Therefore, the fall in private consumption is larger under imperfect competition (17.8%) compared to perfect competition (15.2%). However, national welfare impacts of stabilisation reform are much improved under imperfect competition, because this reform increases wages at more rapid rates under the IC market structure. At the household level, the poorest quantiles in both rural and urban areas suffer relatively more than the richest quantiles under the imperfect competition scenario. Thus, imperfect competition increases income inequality. Sectoral output increases in manufacturing sectors, especially the vehicles and mechanical sectors where benefits of market imperfection, such as increasing returns to scale and product differentiation, exist. On the contrary, agricultural output could not expand due to capacity constraints, like inadequate supply of arable land. Hence, agricultural output declines by 7.1% due to stabilisation reform under imperfect competition.

Unlike perfect competition, structural reform yields a negative effect on growth under imperfect competition. Moreover, it worsens income distribution between urban and rural areas. The welfare of the poorest quantiles in rural areas deteriorates by 19.7% under imperfect competition, compared to 16.8% under perfect competition. To correctly interpret the simulation result, we need to investigate its impacts on consumer price index, factor incomes and household disposable incomes. Structural reform leads to an increase in the consumer price index under the imperfect competition market by 0.9% versus a decline 0.2% under the perfect competition case

which, in turn, reduces private consumption by 2.2%. Consequently, the STRUR reform programme loses its effectiveness under the oligopolistic scenario.

FREF under perfect competition addresses the chronic economic imbalances of the Egyptian economy as it yields positive economic growth, reducing the trade and budget deficits. Yet imperfect competition adversely affects economic growth and worsens the effectiveness of the reform programme in dealing with the prior mentioned economic imbalances. In addition, imperfect competition negatively affects both governmental income and total investment expenditure in almost all policy scenarios. Therefore, we simulate the reduction of entry barriers by increasing the number of producing companies. We find that reducing entry barriers reduces fixed entry costs and lowers price markups. Thus, this simulation yields results closer to perfect competition market structure. This result confirms the importance of competition policy as an important allocation or structural reform that improves the investment climate and changes the level of potential GDP.

6 CONCLUSION

This paper contributes to the literature in three ways: First, we contrast the effects of stabilisation and allocation policies and to what extent they complement or substitute each other. To do so, we run several alternative scenarios related to stabilisation policies (currency devaluation, subsidy removal and VAT tax) and others related to allocation (public spending on education and health and improving the competition policy). Second, we analyse how the effects of such policies can differ in the short and long term and with different market structures (perfect vs. imperfect competition). Third, using a recent social accounting matrix (SAM) of 2014/2015, we develop a CGE model for an economy, Egypt, that is under-researched in the CGE literature and that was subject to a recent reform programme developed with the IMF.

We conclude that stabilisation reform has a long term positive effect on economic growth, budget deficit and trade balance. However, it negatively affects economic growth, total employment and household welfare, especially in rural areas in the short run. Moreover, this reform is not enough to achieve industrial development - especially in manufacturing sectors that rely mainly on imported inputs. Concerning structural reform, simulation results reveal a positive effect on economic growth in both the short and long term. Yet it boosts economic growth by more than three times in the long term, compared to the short term, thanks to reallocation policies that shift the growth path of GDP. Furthermore, it has a positive effect on household welfare. However, it is pro-urban, due to the skills characteristics of labour and the nature of activities located in both areas. Combining individual structure policy, like tariff

removal, with a single stabilisation policy, like currency devaluation, leads to a decline in imports in almost all commodities relative to the baseline. Finally, assuming perfect competition in all product markets is not a realistic assumption. Indeed, many entry barriers reduce the effectiveness of these reforms. Stabilisation reform under imperfect competition leads to a greater decrease in economic growth, higher inflation rates, more decline in private consumption and less expansion of total exports compared to the perfect competition scenario. At the household level, the poorest quantiles in both rural and urban areas suffer relatively more than the richest quantiles under the imperfect competition scenario. Thus, imperfect competition increases income inequality. Unlike perfect competition, structural reforms yield a negative effect on growth under an imperfect competition framework. Moreover, it worsens income distribution between urban and rural areas.

Thus, from a policy perspective, our results highlight to what extent stabilisation policies can be characterised by being an unfinished business. Such policies always have to be accompanied by structural policies that lead to a better allocation of resources and improve the productivity of certain factors of production (through investing in education and health, for instance). Moreover, and especially in the case of Egypt, more sector-specific structural reforms are needed in order to improve their competitiveness. Furthermore, there is a need for geographical targeting, rather than general structural reform policies to protect vulnerable people in rural areas. Indeed, despite the efforts taken to improve the business environment under the reform programme, making the competition policy law more effective is necessary, in order to reduce the entry barriers, promote private investment and increase productivity.

7 REFERENCES

1. Acosta Margain, J. (2013). VAT Reform in a Developing Country. A CGE Model with an Informal Sector (Doctoral dissertation).
2. Elbushra, A. A., Elsheikh, O. E., and Salih, A. A. (2010). Impact of exchange rate reforms on Sudan's economy: Applied general equilibrium analysis. *African Journal of Agricultural Research*, 5(6), 442-448.
3. Ayadi, R., Selim, R., and Zaki, C. 2019. More Stabilisation or Better Allocation: Do Macroeconomic Policies Matter for Employment?
4. Babecky, J., and Havranek, T. (2014). Structural reforms and growth in transition: A meta-analysis. *Economics of Transition*, 22(1), 13-42.

5. Bailliu, J., and Hajzler, C. (2016). Structural Reforms and Economic Growth in Emerging-Market Economies. *Bank of Canada Review*, 2016(Autumn), 47-60.
6. Benfica, R., Cunguara, B., and Thurlow, J. (2019). Linking agricultural investments to growth and poverty: An economy-wide approach applied to Mozambique. *Agricultural Systems*, 172, 91-100.
7. Benczúr, P., Kátay, G., and Kiss, Á. (2018). Assessing the economic and social impact of tax and benefit reforms: A general-equilibrium microsimulation approach applied to Hungary. *Economic Modelling*, 75, 441-457.
8. Brancaccio, E., Garbellini, N., and Giammetti, R. (2018). Structural labour market reforms, GDP growth and the functional distribution of income. *Structural Change and Economic Dynamics*, 44, 34-45.
9. Böhringer, C., Rutherford, T. and W. Wiegard(2011). *Computable General Equilibrium Analysis: Opening a Black Box*. Centre for European Economic Research. Discussion Paper No. 03-56.
10. Canton, E., Grilo, I., Monteagudo, J., Pierini, F., and Turrini, A. (2014). The role of structural reform for adjustment and growth. *ECFIN Economic Brief*, 34.
11. Choi, Y., Liu, Y., and Lee, H. (2017). The economy impacts of Korean ETS with an emphasis on sectoral coverage based on a CGE approach. *Energy Policy*, 109, 835-844.
12. Decaluwé, B., Lemelin, A., Maisonnave, H., and Robichaud, V. (2010). The PEP Standard Computable General Equilibrium Model Single-Country, Recursive Dynamic Version: PEP-1-t. Partnership for Economic Policy (PEP) Research Network. www.pep-net.org/programmes/mpia/pep-standard-cge-models/pep-1-t-single-country-recursive-dynamic-version.
13. Feltenstein, A., Mejia-Mantilla, C., Newhouse, D., and Sedrakyan, G. (2017). The poverty implications of alternative tax reforms: Results from a numerical application to Pakistan. The World Bank.
14. Gersbach, H. (2004). Structural reforms and the macroeconomy: The role of general equilibrium effects. In *Structural Reform and Economic Policy* (pp. 9-22). Palgrave Macmillan, London.

15. Haile, F. (2019). The Exchange Rate: Why it Matters for Structural Transformation and Growth in Ethiopia. The World Bank.
16. Hendy, R., and Zaki, C. (2013). Assessing the effects of trade liberalisation on wage inequalities in Egypt: a microsimulation analysis. *The International Trade Journal*, 27(1), 63-104.
17. Hertel, T. W., and Winters, L. A. (2005). Poverty Impacts of a WTO Agreement.
18. Hosny, A. S. (2013). Survey of recent literature on CGE trade models: with special reference to the case of Egypt. *Journal of World Economic Research*, 2(1), 9-19.
19. Hosoe, N., Gasawa, K., and Hashimoto, H. (2010). Textbook of computable general equilibrium modelling: programming and simulations. Springer.
20. International Finance Corporation (2020). Creating Markets in Egypt: Realizing the full potential of a productive private sector. December. Pennsylvania Avenue, N.W. Washington, D.C.
21. IMF (2019). The Fifth Review Under the Extended Arrangement Under the Extended Fund Facility. IMF Country Report No. 19/311.
22. IMF (2017). The First Review Under the Extended Arrangement Under the Extended Fund Facility. IMF Country Report No. 17/17.
23. IMF (2018). Review under the Extended Arrangement under the Extended Fund Facility. IMF Country Report No. 18/213, July.
24. Ivus, O., and Strong, A. (2007). Modelling approaches to the analysis of trade policy: computable general equilibrium and gravity models. *Handbook on International Trade Policy*, 44.
25. Latorre, M. C. (2016). A CGE Analysis of the Impact of Foreign Direct Investment and Tariff Reform on Female and Male Workers in Tanzania. *World Development*, 77, 346-366.
26. Lledo, V. D. (2005). Tax systems under fiscal adjustment: a dynamic CGE analysis of the Brazilian tax reform (No. 5-142). International Monetary Fund.

27. Llambi, C., Laens, S., and Perera, M. (2016). Assessing the Impacts of a Major Tax Reform: a CGE-microsimulation analysis for Uruguay. *International Journal of Microsimulation*, 9(1), 134-166.
28. Lofgren, H., and Robinson, S. (2008). Public spending, growth and poverty alleviation in Sub-Saharan Africa: a dynamic general-equilibrium analysis. *Public expenditures, growth and poverty: lessons from developing countries*.
29. Mahía Casado, R., Arce Borda, R. D., and Queijeiro, V. (2014). Trade liberalisation and poverty reduction in Africa: Computable general equilibrium models' approach. *Literature Review. International Journal of Political Science and Development*.
30. Maipita, I., Jantan, M. D., and Razak, N. A. A. (2010). The impact of fiscal policy towards economic performance and poverty rate in Indonesia. *Bulletin of Monetary Economics and Banking*, 391.
31. Manzoor, D., Shahmoradi, A., and Haqiqi, I. (2012). An analysis of energy price reform: a CGE approach. *OPEC Energy Review*, 36(1), 35-54.
32. McCulloch, N. (2003). *The Impact of Structural Reforms on Poverty: a simple methodology with extensions*. The World Bank.
33. Nahar, B., and Siriwardana, M. (2013). Trade Opening, Fiscal Reforms, Poverty, and Inequality: A CGE Analysis for Bangladesh. *The Developing Economies*, 51(2), 145-185.
34. Piermartini, R., and Teh, R. (2005). *Demystifying modelling methods for trade policy* (No. 10). WTO Discussion Paper.
35. Roos, E., and Adams, P. (2019). *The Economy-Wide Impact of Subsidy Reform: A CGE Analysis*.
36. Sajedi, R. (2018). Fiscal consequences of structural reform under constrained monetary policy. *Journal of Economic Dynamics and Control*, 93, 22-38.

37. Song, M. L., and Cui, L. B. (2016). Economic evaluation of Chinese electricity price marketisation based on dynamic computational general equilibrium model. *Computers and Industrial Engineering*, 101, 614-628.
38. Tchoffo, R., Ngouhouo, I., and Nkemgha, G. (2020). Trade Liberalisation and Macroeconomic Performance in Cameroon: An Imperfect Competition Approach.
39. Tyler, W., and Gurgel, A. C. (2009). Brazilian trade policies: some observed and estimated effects of the 1990s liberalisation. *Estudos Econômicos (São Paulo)*, 39(1), 59-88.
40. USAID (2017). *Accelerating Economic Growth through Structural Reform*.
41. Woldie, G. A., and Siddig, K. (2019). Macroeconomic and distributional impacts of exchange rate devaluation in Ethiopia: A computable general equilibrium approach. *Heliyon*, 5(12), e02984.
42. Youssef, J., and Zaki, C. (2019, August). Between Stabilisation and Allocation in the MENA Region: Are Competition Laws Helping? In *Economic Research Forum Working Papers (No. 1319)*.

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Table 1: Simulations Summary

The simulation	The simulation	The shock
Internal stabilisation reform (I.STABR)	VAT	- Imposing 14% VAT on all products except agricultural ones
	GSUB	- 100% gradual elimination of petroleum subsidies, 10% per annum for 10 years
	SSUB	- 50% sudden reduction of petroleum subsidies in the first and second years
External stabilisation (E.STABR)	GDEV	- 100% gradual devaluation of exchange rate , 10% per annum for 10 years
	SDEV	- 100% sudden devaluation of exchange rate from year one
Structural reform (STRUCR)	EDU	- 100% increase in public spending on education
	HLT	- 100% increase in public spending on health
	TL	- Full tariff liberalisation
Combined stabilisation & structural reforms (STABR+STRUCR)	EHGS	- Using public savings from gradual petroleum subsidies' elimination to finance public spending on education and health
	FREF	- Imposing 14% VAT - Gradual petroleum subsidies' elimination - 100% depreciation in exchange rate - Full tariff liberalisation - 100% increase in public spending on education and health
Comparing the effects of all reforms under perfect competition (C) market structure	STABR	- Imposing 14% VAT - 10% petroleum subsidies' elimination - 100% depreciation in exchange rate
	STRUCR	- 10% tariff liberalisation - 10% increase in public spending on education and health
	(FREF)	- Imposing 14% VAT - 10% petroleum subsidies' elimination - 100% depreciation in exchange rate - 10% tariff liberalisation - 10% increase in public spending on education and health

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Comparing the effects of all reforms under imperfect competition (IC) market structure	STABR	- Imposing 14% VAT - 10% petroleum subsidies' elimination - 100% depreciation in exchange rate
	STRUCR	- 10% tariff liberalisation - 10% increase in public spending on education and health
	(FREF)	- Imposing 14% VAT - 10% petroleum subsidies' elimination - 100% depreciation in exchange rate - 10% tariff liberalisation - 10% increase in public spending on education and health
	2NU	- We simulate 100% increase in number of firms compared with benchmark number (we assume number of firms =30 in benchmark year)

Table 2: Key Macroeconomic Impacts of Stabilisation Reforms (%)

Variable	time	GDEV			SDEV			VAT		
		t	t+5	t+10	t	t+5	t+10	t	t+5	t+10
Real GDP at market prices		-0.5	-0.7	1.4	-2.3	0.1	3.8	-6.2	-3.5	2.5
Total consumption		-0.5	-2.4	-4.9	-2.5	-0.7	2.2	-11.9	-7.0	0.7
Inflation rate		4.8	3.4	2.8	25.3	9.4	6.2	12.7	11.3	6.9
Total Export		3.5	14.2	22.6	24.6	22.3	19.9	6.0	22.0	9.5
Total Imports		-4.0	-14.5	-22.2	-20.8	-6.7	-5.1	2.7	4.4	7.5
Total investment expenditure		4.5	22.7	45.0	46.9	47.0	47.3	-19.3	-19.2	-18.2
Wages		4.8	24.1	47.0	47.7	49.2	49.5	-14.3	-18.2	-20.3
Capital rent		5.6	29.3	59.9	57.8	61.0	63.7	-23.3	-24.3	-34.3
User cost of capital (private)		6.8	34.5	69.9	67.0	70.3	73.1	-32.3	-42.4	-51.5
HH Income		5.3	26.4	51.2	52.7	53.4	53.0	-11.9	-14.0	-15.1
National Welfare		0.04	0.18	0.30	0.29	0.29	0.31	-0.44	-0.37	-0.29
Firm Income		5.6	27.4	53.1	55.2	55.3	54.4	-12.6	-12.8	-12.1
Government Income		6.0	29.8	58.4	59.9	60.3	59.7	45.1	50.3	55.8

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Variable	time	SSUB			GSUB			STABR		
		t	t+5	t+10	t	t+5	t+10	t	t+5	t+10
Real GDP at market prices		-0.9	1.4	3.5	-0.2	-1.0	1.8	-2.5	-1.0	3.9
Total consumption		-1.2	-1.3	0.31	-0.7	-0.9	-1.0	-14.2	-9.1	14.4
Inflation rate		2.5	2.9	1.4	0.6	1.8	2.4	58	9.8	5.8
Total Export		0.3	3.0	6.6	0.06	1.0	3.7	19.2	25.5	24.4
Total Imports		0.27	0.76	1.2	0.06	0.34	0.89	-21.5	-24.3	-27.3
Total investment expenditure		-6.4	-10.1	-9.2	-1.4	-5.6	-9.6	44.9	38.9	33.2
Wages		-4.5	-7.2	-6.1	-1.0	-3.9	-6.7	46.3	43.0	38.8
Capital rent		-6.2	-8.1	-5.5	-1.4	-4.9	-7.7	55.7	53.1	50.7
User cost of capital		-3.2	-3.6	-1.8	-0.7	-2.3	-3.2	65.8	66.8	67.5
HH Income		-4.3	-6.8	-6.1	-1.0	-3.8	-6.5	51.3	47.7	42.9
Welfare		-0.04	-0.05	-0.02	-0.01	-0.02	-0.02	-0.45	0.28	0.27
Firm Income		-4.7	-7.4	-6.9	-1.0	-4.1	-7.2	53.6	49.1	43.4
Government Income		5.3	11.3	12.3	1.1	5.8	11.8	61.9	70.1	79.2

Source: Authors' calculation based on simulation results

Table 3: The Trade Impacts of combining Sudden Devaluation with Tariff Liberalisation

	Imports		Exports	
	short	long	short	long
Agricultural activities	-72.7	-63.9	67.1	38.9
Agro-processing	-22.4	-21.3	37.5	31.6
Tobacco and beverage	-21.5	-12.6	31.1	27.0
Chemicals	-6.9	-7.6	13.2	17.6
Clothes	-18.7	-10.6	21.4	20.3
Leather and its products	-17.6	5.8	25.0	22.2
Mechanical industries	-26.2	-22.3	28.1	35.0
Metal industries	-13.2	-8.9	20.4	18.0
Mining	-13.7	-16.7	15.9	17.4
Non-Metal	-17.9	-11.0	22.4	16.6
Other Industries	-22.3	-20.1	23.1	15.0
Other Services	-17.6	-17.5	23.8	18.2
Public Administrative	-20.8	-19.3	28.1	24.9
Petroleum products	-16.1	-17.3	19.2	16.2
Textiles	-7.2	-2.4	23.9	26.0
Vehicles and parts thereof	-20.1	0.8	15.2	16.5
Wood and articles thereof	-12.7	-11.7	18.0	14.4

Source: Authors' calculations based on simulation results

Table 4 (a) : Key Macroeconomic Impacts of allocation Policies %

Variable	time	EDU			HLT		
		t	t+5	t+10	t	t+5	t+10
Real GDP at market prices		0.4	1.2	1.8	0.1	0.2	0.3
Total consumption		0.3	1.04	1.62	0.05	0.14	0.19
Inflation rate		0.06	0.14	0.14	0.02	0.02	-0.02
Total Export		-0.2	-0.8	-0.9	-0.03	-0.10	-0.08
Total Imports		-0.03	-0.13	-0.16	0.00	-0.02	-0.02
Total investment		0.9	3.2	5.4	0.2	0.7	1.0
Wages		0.9	3.3	5.2	0.16	0.49	0.66
Capital rent		1.15	3.5	3.9	0.34	0.93	1.04
User cost of capital		-0.1	-1.04	-2.6	0.01	-0.17	-0.44
HH Income		0.35	1.17	1.67	0.07	0.16	0.14
National Welfare		0.0	0.1	0.2	0.02	0.07	0.2
Firm Income		0.11	0.20	0.18	0.04	0.07	0.04
Government Income		0.5	2.0	3.2	0.1	0.5	0.7

Table 4 (b) : Key Macroeconomic Impacts of allocation Policies %

Variable	time	TL			STRUCR		
		t	t+5	t+10	t	t+5	t+10
Real GDP at market prices		0.0	0.2	0.7	0.7	1.4	2.5
Total consumption		0.1	0.5	1.4	0.3	1.3	2.2
Inflation rate		0.0	-0.1	-0.7	-0.2	-1.1	-1.5
Total Export		-0.07	0.0	0.83	-0.04	0.51	1.68
Total Imports		0.45	2.27	4.7	-0.3	-0.2	-0.1
Total investment expenditure		0.4	1.7	3.2	0.2	-1.3	-5.0
Wages		0.14	0.49	0.60	0.8	1.95	2.1

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Capital rent	0.2	0.6	0.2	1.2	2.26	1.0
User cost of capital	-0.14	-1.1	-3.0	-0.2	-1.1	-2.1
HH Income	0.12	0.45	0.67	0.19	-0.11	-1.2
National Welfare	0.01	0.1	0.1	0.01	0.06	0.14
Firm Income	0.1	0.5	0.9	-0.1	-1.1	-2.7
Government Income	-0.5	-2.6	-6.0	-0.1	-2.2	-6.0

Source: Authors' calculations based on simulation results.

Table 5: Factor Demand Effects of Doubling Public Spending on Education

	Composite labour		Composite capital	
	short run	long run	short run	long run
Agricultural activities	-5.1	-28.5	-0.2	-5.5
Agro-processing	3.3	10.8	0.2	5.2
Tobacco and beverage	4.2	25.6	0.4	10.5
Chemicals	-2.3	-11.0	0.0	1.0
Clothes	0.7	6.2	0.1	2.1
Education services	8.2	44.7	0.9	24.3
Health services	-0.2	-4.2	0.3	6.0
Leather and its products	1.0	5.2	0.1	1.8
Mechanical industries	-0.3	0.7	0.0	1.2
Metal industries	0.3	2.3	0.0	1.5
Mining	-1.9	-8.4	0.0	1.6
Non-Metal	0.1	1.4	0.1	2.2
Other Industries	0.4	-0.5	0.2	3.0
Other Services	-2.0	-9.5	0.0	0.1
Public Administrative	0.0	-0.1	-	-

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Petroleum products	-0.6	-10.8	0.2	1.8
Textiles	1.1	6.5	0.1	3.3
Vehicles and parts thereof	1.0	5.3	0.1	3.0
Wood and articles thereof	0.5	2.5	0.1	2.9

Source: Authors' calculations based on simulation results

Table 6: Household Labour Income Shares

	Unskilled Labour	Semi-Skilled Labour	Skilled Labour	Total
hhd-r1	57.9	32.8	9.3	100
hhd-r2	46.1	38.0	15.9	100
hhd-r3	36.1	40.4	23.5	100
hhd-r4	31.6	38.5	29.9	100
hhd-r5	22.9	38.7	38.5	100
hhd-u1	53.9	34.0	12.1	100
hhd-u2	40.2	41.1	18.7	100
hhd-u3	31.0	38.9	30.1	100
hhd-u4	23.4	36.1	40.5	100
hhd-u5	8.6	19.3	72.1	100

Source: Authors' calculations based on 2014/2015 SAM.

Table 7: Key Macroeconomic Impacts of Mixing Allocation with Stabilisation Policies %

Variable	SDEV+TL		EDU+HLT+GSUB		FREF		
	time	short run	long run	short run	long run	short run	long run
Real GDP at market prices		-2.3	4.1	0.4	3.9	5.5	8.6
Total consumption		-2.4	3.6	0.8	0.8	-11.9	7.6
Inflation rate		20.1	4.9	0.14	-0.94	32.5	4.8
Total Export		24.5	20.7	-0.19	2.8	17.7	29.7
Total Imports		-20.4	-18.3	0.21	0.67	-19.5	-24.0
Total investment expenditure		47.5	52.1	2.6	24.1	38.2	29.0
Wages		47.9	50.8	0.9	2.7	39.1	29.1
Capital rent		58.0	64.6	1.3	-0.2	46.3	39.0
User cost of capital		66.7	68.2	-1.0	-13.8	50.5	38.4
HH Income		52.9	54.3	0.2	-0.3	49.5	41.1
National Welfare		0.29	0.31	0.00	0.15	-0.1	0.24
Firm Income		55.3	55.9	-0.1	-1.6	50.8	42.9
Government Income		59.2	50.3	2.7	23.2	55.6	69.8

Source: Authors' calculations based on simulation results

Table (8): Macroeconomic Impacts of Stabilisation and Structural Reform Policies in Egypt under Different Model Specifications

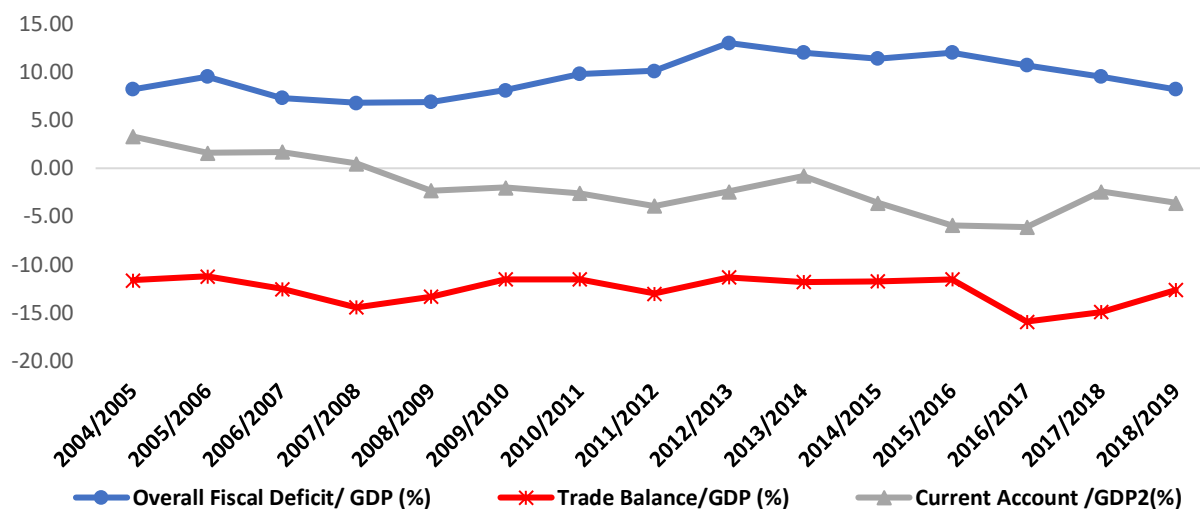
	STABR			STRUCR			FREF		
	C Market	IC Market	2NU	C Market	IC Market	2NU	C Market	IC Market	2NU
Real GDP at market prices	-2.9	-3.2	-2.1	0.6	-2.9	-1.8	3.9	-2.2	-1.3
Total consumption	-15.2	-17.8	-16.6	0.4	-2.2	-0.9	-10.8	-16.0	-14.2
Inflation Rate	58	63.7	60.9	-0.20	0.9	0.4	29.0	32.2	30.7
Total Export	20.3	17.3	18.8	-0.1	-0.9	-0.4	22.3	19.0	20.6
Total Imports	-21.3	-19.5	-20.8	0.4	0.6	0.3	-20.2	-17.5	-19.8
Total investment expenditure	44.9	43.8	44.4	0.2	0.5	0.3	38.2	37.3	37.8
Wages	40.4	43.6	42.2	0.9	1.5	1.0	39.1	42.5	41.0
Capital rent	49.4	48.7	49.2	1.2	2.4	1.8	46.3	45.9	46.3
HH Income	53.5	55.9	54.9	0.23	0.34	0.3	51.0	53.6	52.5
National Welfare	-0.6	-0.4	-0.45	0.01	-0.27	-0.4	-0.2	-0.6	-0.4
Firm Income	55.7	55.7	55.8	-0.2	-2.0	-1.0	52.6	52.9	52.9
Government Income	61.9	61.6	61.8	-0.3	-3.67	-2.5	57.6	57.4	57.5

C Market: Perfect competition specifications

IC Market: Imperfect competition specifications (Cournot Oligopoly)

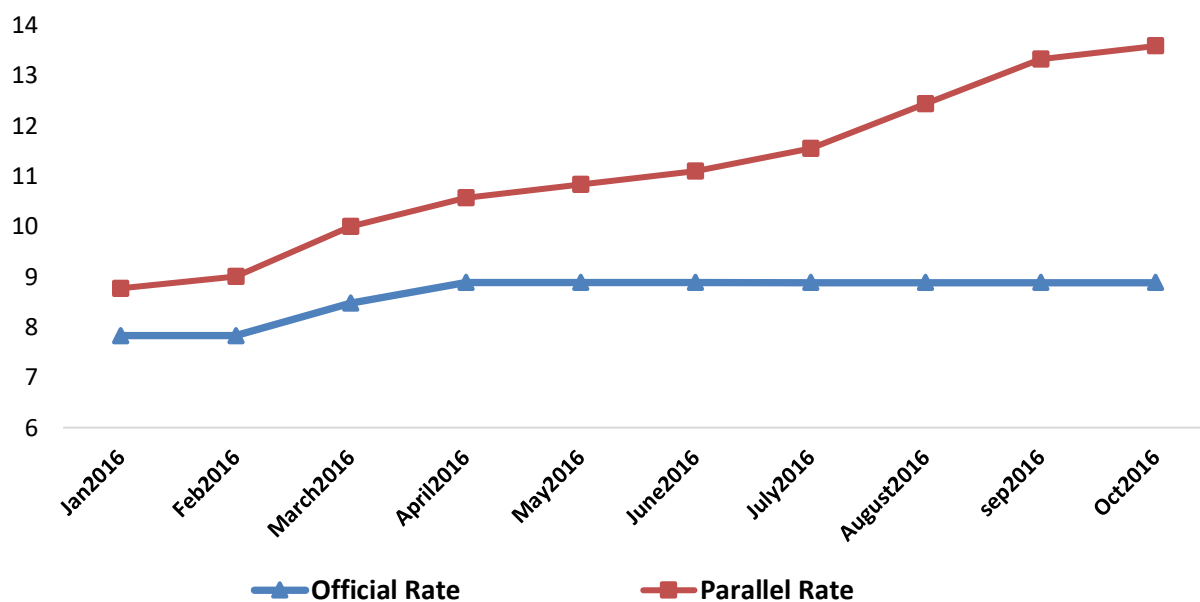
Note: The simulation results of increasing perceived price elasticity by 100% are similar to increasing number of firms by the same percentage.

Figure 1 : The Share of Government Deficit, Trade and Current Account Balances in GDP



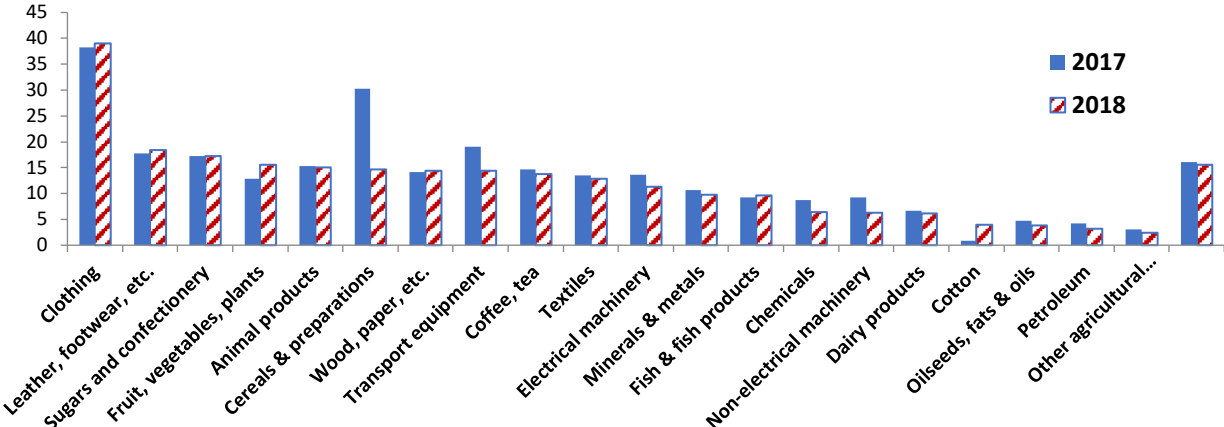
Source: Central Bank of Egypt, Monthly Bulletin

Figure 2: The Widening Gap between Parallel and Official Exchange rates (EGP/\$)



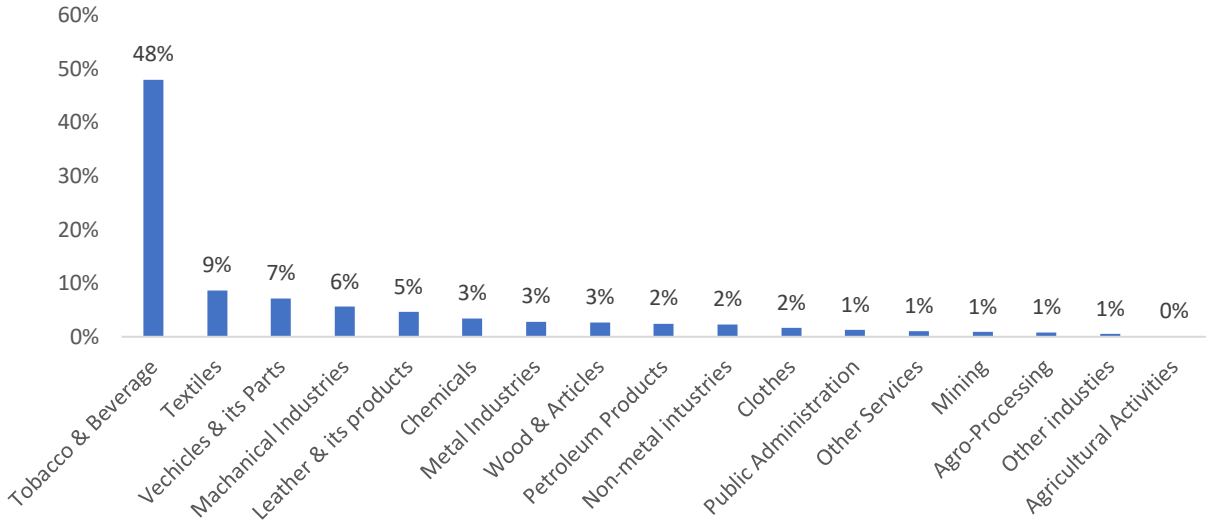
Source: IMF (2018). Review under the Extended Arrangement under the Extended Fund Facility. IMF Country Report No. 18/213, July.

Figure 3: MFN applied duties Average Tariffs by product groups on Egyptian Imports(%)



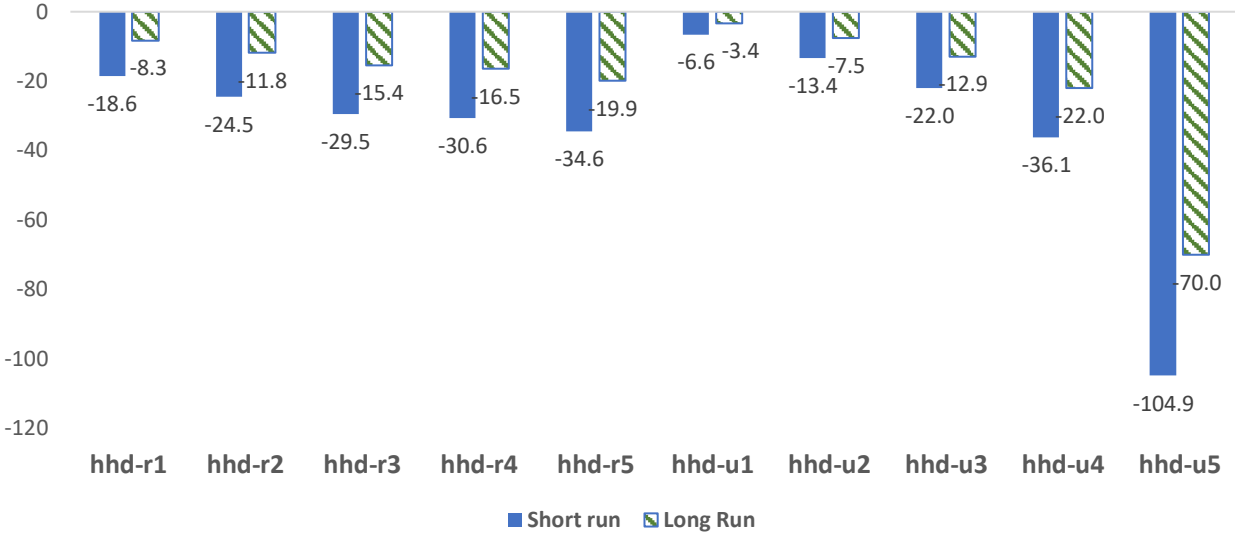
Source: World Trade Organisation.

Figure 4: The Pre-Shock Indirect Tax Rates



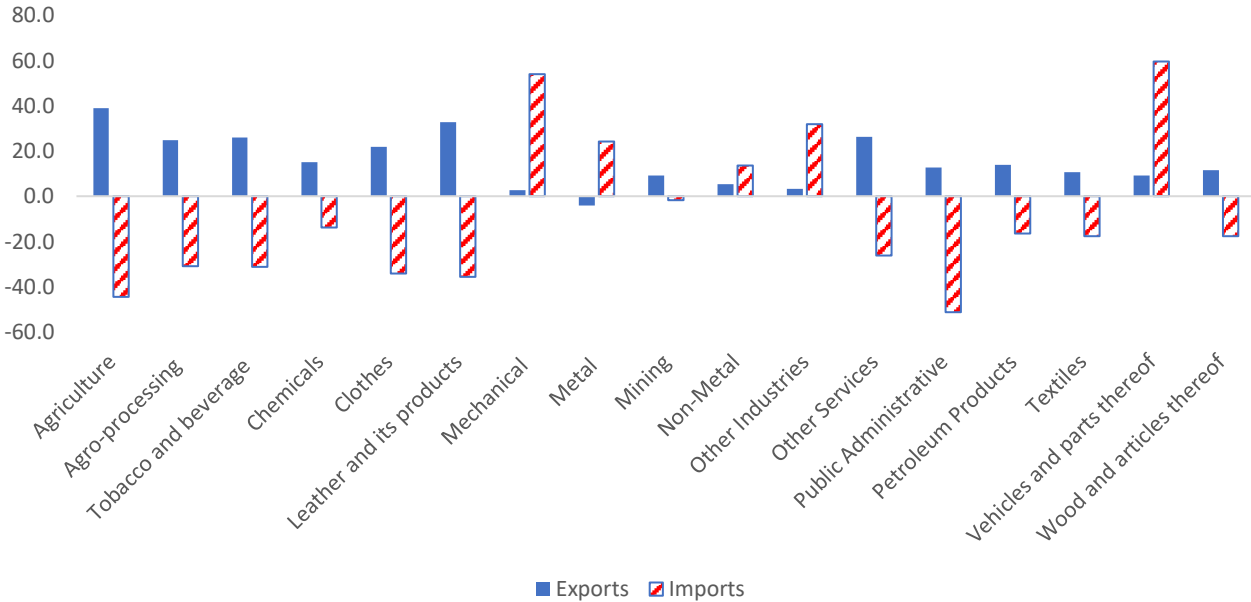
Source: Authors’ calculation based on 2014/15 SAM.

Figure 5: Welfare Impacts of Imposing 14% VAT (%)



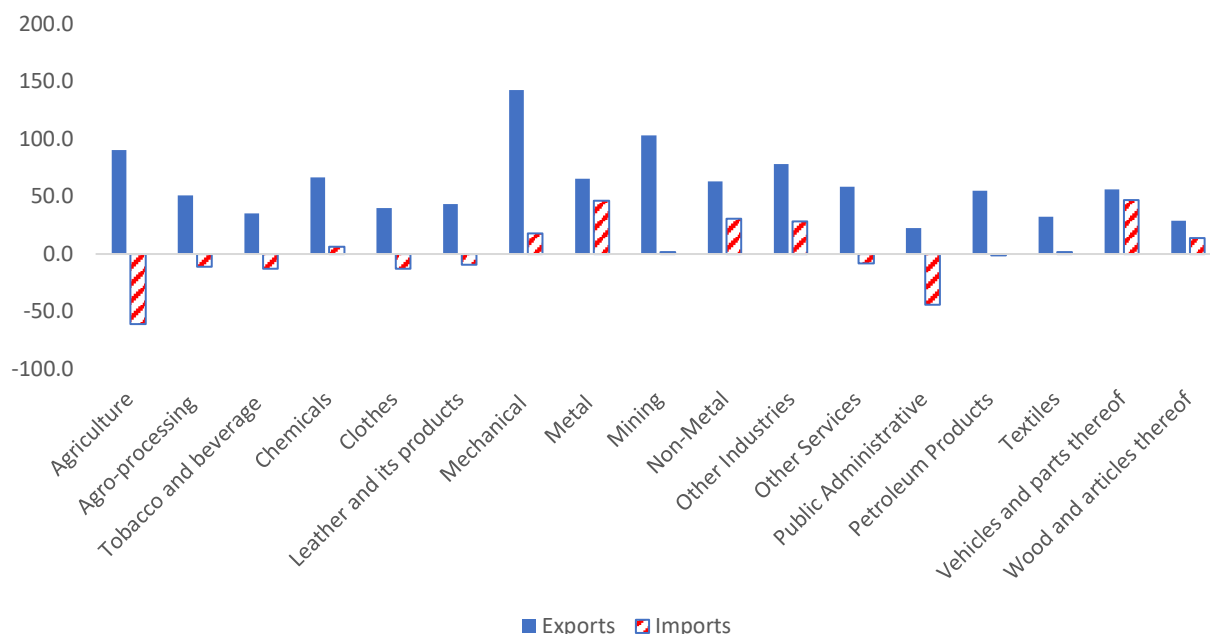
hh-r1: the poorest quantile in rural household; hh-r5 refers to the richest quantile.
 hh-u1: refers to the poorest quantile in urban household; hh-u5 refers to the richest quantile.
 Source: Authors’ calculation based on simulation results.

Figure (6a) the Short Run Foreign Trade Impacts of Stabilization Reform %



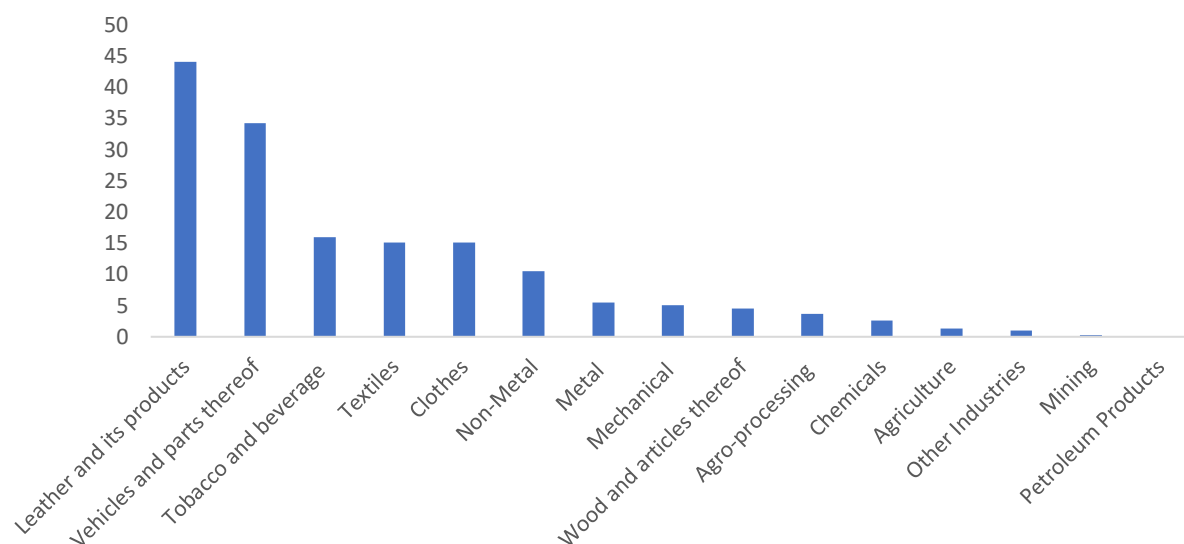
Source: Authors’ calculation based on simulations results.

Figure (6b) the Long Run Foreign Trade Impacts of Stabilization Reform %



Source: Authors' calculation based on simulations results.

Figure 7: Tariff Rate on Import based on 2014/15 SAM(%)



Source: Authors' calculation based on 2014/2015 SAM

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Appendix1: Egypt Macro-SAM (2014/2015), EGP Billion

	Act	com	lab	land	capital	ent	hh	gov	direct tax	import tariffs	sales tax	sub	S/I	change inv	ROW	Total
Activities		4354														4354
Commodities	1997						1857	286					358	16	328	4841
Labour	642															642
Land	38															38
Capital	1678															1678
Enterprises					1516			223							5	1744
Households			642	38	121	1199		119							126	2244
Government						198	11		144	22	99	-152			25	346
Direct Tax						106	38									144
Import Tariffs		22														22
Sales Tax		99														99
Subsidies		-152														-152
Saving/Investment						242	333	-286							86	374
Change In Inventory													16			16
Row		519			41	0	5	5								570
Total	4354	4841	642	38	1678	1744	2244	346	144	22	99	-152	374	16	570	

Source: The International Food Policy Research Institute (IFPRI), regionalised social accounting matrix (SAM) for Egypt2014/2015

Appendix 2: Major Characteristics of the Egyptian Economy

Table A2.1: Macro Indicators of the Egyptian Economy in 2014/2015:

	EGP, Billion	Share in GDP %
Private Consumption(C)	1857	80
Investment(I)	374	16
Government Consumption(G)	286	12
Absorption (C+I+G)	2517	108
Export(X)	328	14
Imports(M)	519	22
GDP at Market Prices= C+G+I+(X-M)	2326	100

Source: Authors' calculations from 2014/2015 SAM.

Table A2.2: The Structure of Value Added and Employment by Activity(%):

	Share of VA	Share of Employment	Share of Capital
Other services	43.9	28.4	49.7
Public administration	5.2	18.2	0.3
Agriculture	11.7	14.6	10.6
Education	5.0	14.4	1.5
Other industries	6.9	6.9	6.9
Health	2.9	5.7	1.9
Agro-based processed products	2.9	2.6	3.0
Metal	1.5	1.7	1.5
Petroleum	4.3	1.1	5.5
Mining	9.1	0.9	12.1
Beverages	0.8	0.9	0.8
Chemicals	1.7	0.8	2.1
Mechanical	0.9	0.8	0.9
Non-metal	1.2	0.8	1.4
Wood	0.7	0.7	0.7
Textiles	0.4	0.6	0.3
Clothes	0.4	0.4	0.4
Vehicle and its parts	0.2	0.3	0.1
Leather	0.3	0.2	0.4
Total	100.0	100.0	100.0

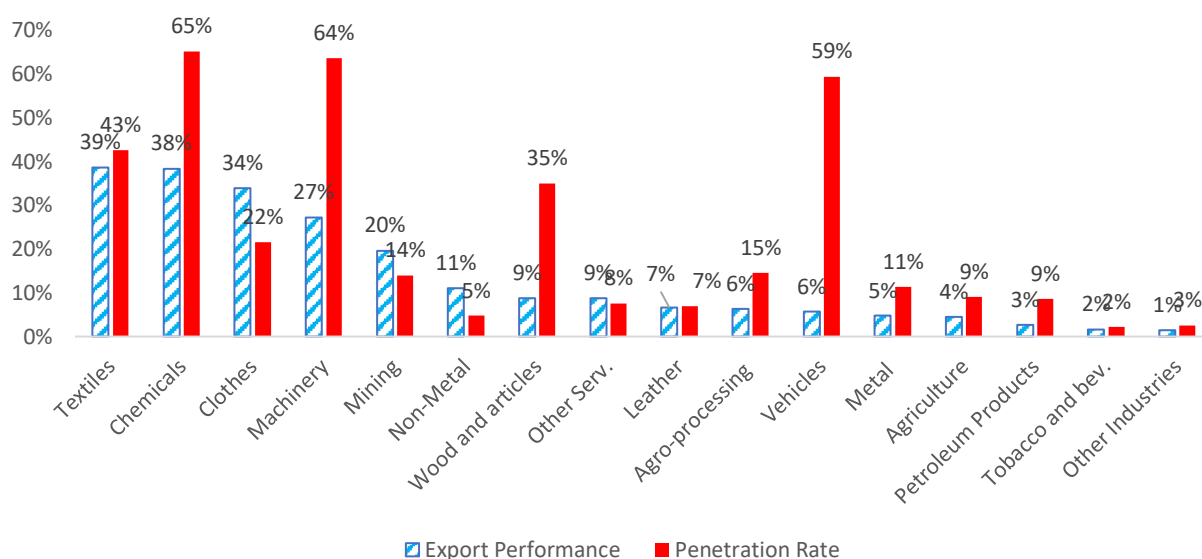
Source: Authors' calculations based on 2014/15 SAM

Table A2.3: The Pattern of Exports and Imports by Different Activity

Product	Export Share (1)	Import Share (2)	Tariff rates (3)	Export Performance (4)	Penetration Rate (5)
Agriculture	5.0%	6.7%	1.3%	4.5%	9.1%
Agro-based processed product	4.8%	7.6%	3.7%	6.4%	14.5%
Beverages	0.3%	0.2%	16.0%	1.7%	2.2%
Chemicals	8.2%	15.5%	2.6%	38.4%	65.2%
Clothes	2.0%	0.7%	15.1%	33.9%	21.6%
Leather	0.3%	0.2%	44.0%	6.6%	6.9%
Mechanical	4.4%	13.1%	5.1%	27.2%	63.6%
Metal	2.8%	4.6%	5.5%	4.8%	11.3%
Mining	14.4%	6.0%	0.2%	19.6%	13.9%
Non-metal	2.0%	0.5%	10.5%	11.1%	4.8%
Other industries	2.3%	2.7%	1.0%	1.4%	2.6%
Other services	44.7%	23.9%	-	8.7%	7.5%
Public administration	1.2%	1.2%	-	2.2%	3.6%
Petroleum	2.7%	5.8%	0.0%	2.7%	8.6%
Textiles	3.5%	2.6%	15.1%	38.7%	42.5%
Vehicles	0.3%	4.7%	34.2%	5.6%	59.4%
Wood	1.1%	3.9%	4.5%	8.7%	35.0%
Education	-	-	-	-	-
Health	-	-	-	-	-

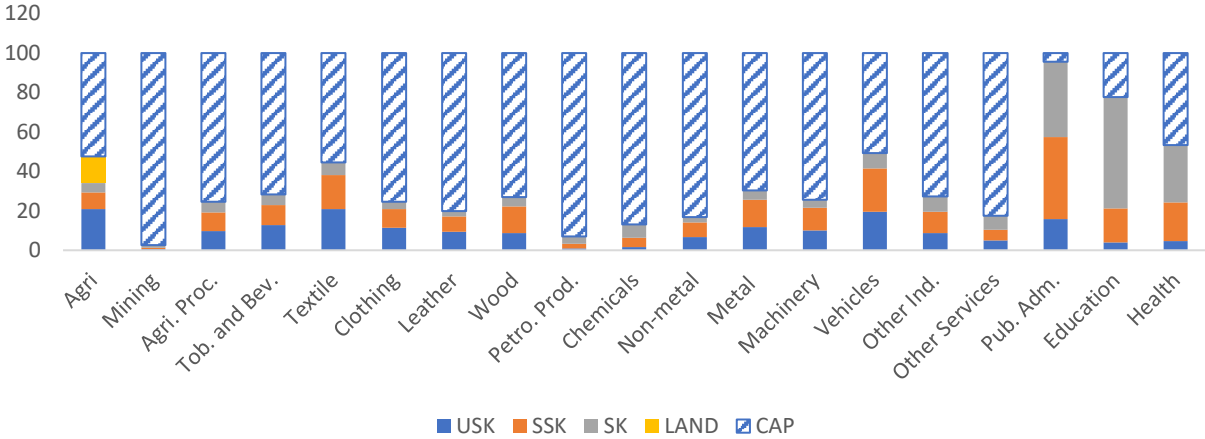
Source: Authors' calculations based on 2014/15 SAM

Figure A2.1: Foreign trade characteristics of the Egyptian economy



Source: author's calculation based on 2014/2015 SAM

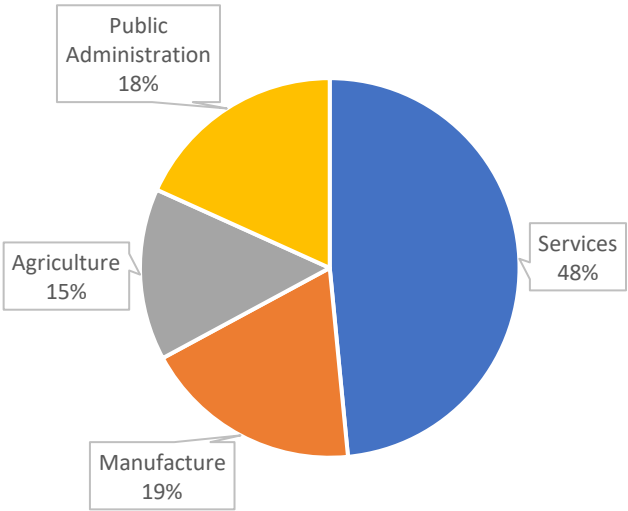
Figure A2.2: Distribution of Value-Added on Factors of Production for each Activity (%)



Source: authors’ calculation based on 2014/2015 SAM

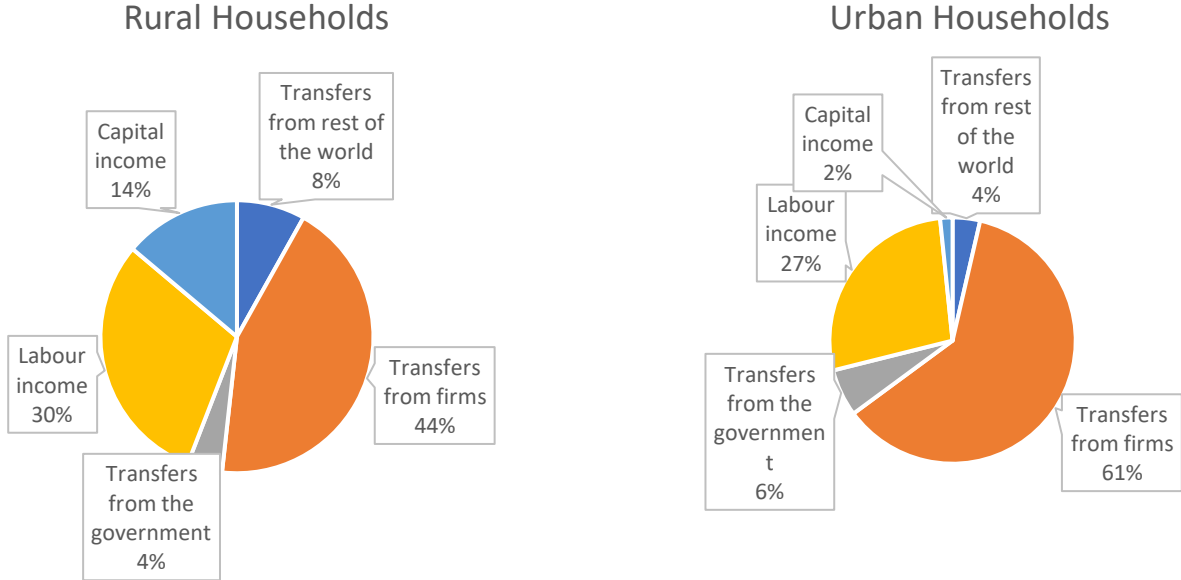
Note: USK stands for unskilled, SSK semi-skilled, SK skilled, LAND for Land, and CAP Capital.

Figure A2.3: Labour Demand by Activities



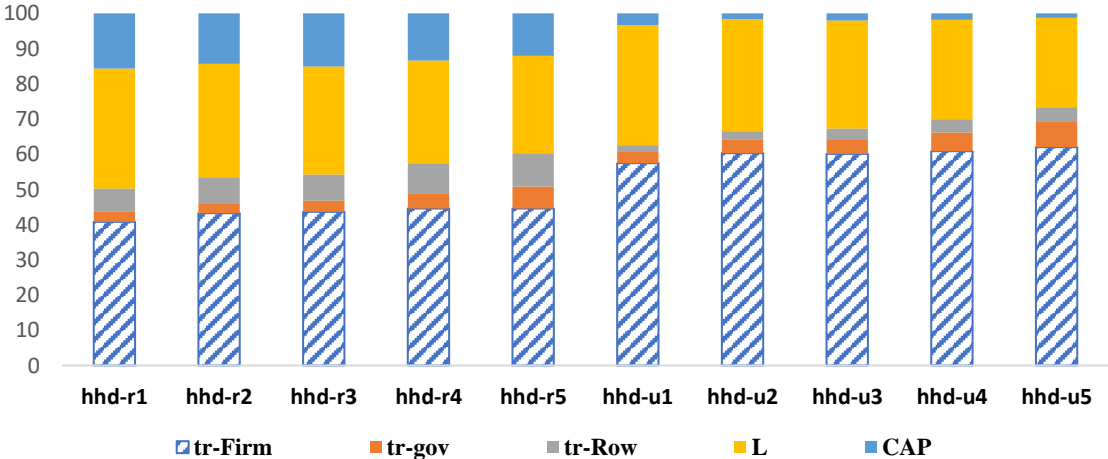
Source: authors’ calculation based on 2014/2015 SAM

Figure A2.4: Source of Household Income and Consumption



Source: authors' calculation based on 2014/2015 SAM

Figure A2.5: Sources of Household Income



Source: author's calculation based on 2014/2015 SAM

Table A2.4: Household Consumption Patterns Based on 2014/2015 SAM:

	hh-r1	hh-r2	hh-r3	hh-r4	hh-r5	hh-u1	hh-u2	hh-u3	hh-u4	hh-u5	Total hh
Food	45	43	40	37	29	43	40	38	35	26	34
Non-Food	19	20	21	21	21	19	20	21	21	19	20
Petroleum	8	7	7	7	8	6	6	5	5	9	7
Other Services	24	26	28	30	34	28	31	32	33	40	33
Education	1	1	2	2	2	1	2	2	3	3	2
Health	2	3	3	4	5	2	2	3	3	4	3
Total hh Consumption	100	100	100	100	100	100	100	100	100	100	100

Source: author's calculation based on 2014/2015 SAM

Appendix3: Recursive Dynamic EG_CGE Model Notation

Recursive Dynamic EG_CGE Model Notation:

A. List of Sets:

SET	Description
J	All industries
PUB(J)	Public industries
BUS(J)	Private industries
I	All commodities
I1(I)	All commodities except agriculture
L	Labour categories
K	Capital categories
AG	All agents
AGNG(AG)	Non-governmental agents
AGD(AG)	All domestic agents
H(AG)	Households
F(AG)	Firms
T	Time periods

B. Parameters:

aij(i,j)	Input output coefficient
A	Tobin q
A^{K_PRI}	Scale parameter (private investment function)
A^{K_PUB}	Scale parameter (public investment function)
B_j^{KD}	Scale parameter (CES - composite capital)
B_j^{LD}	Scale parameter (CES - composite labour)
B_i^M	Scale parameter (CES - composite commodity)
B_j^{VA}	Scale parameter (CES - value added)
$B_{j,i}^X$	Scale parameter (CET - exports and local sales)
B_j^{XT}	Scale parameter (CET - total output)
$\beta_{k,j}^{KD}$	Share parameter (CES - composite capital)
$\beta_{l,j}^{LD}$	Share parameter (CES - composite labour)
β_i^M	Share parameter (CES - composite commodity)
β_j^{VA}	Share parameter (CES - value added)
$\beta_{j,i}^X$	Share parameter (CET - exports and local sales)
$\beta_{j,i}^{XT}$	Share parameter (CET - total output)
$\delta_{k,pub}$ and $\delta_{k,bus}$	Depreciation rate of capital k in industry j
η	Price elasticity of indexed transfers and parameters
frisch(h)	Frisch parameter (LES function)

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γ_i^{GVT}	Share of commodity i in total current public expenditures on goods and services
γ_i^{INVPRI}	Share of commodity i in total private investment expenditures
γ_i^{INVPUB}	Share of commodity i in total public investment expenditures
$\gamma_{i,h}^{LES}$	Marginal share of commodity i in household h consumption budget
$\mathbf{io(j)}$	Coefficient (Leontief - intermediate consumption)
$\lambda_{ag,k}^{RK}$	Share of type k capital income received by agent ag
λ_{ag}^{TR}	Share parameter (transfer functions)
$\lambda_{h,l}^{WL}$	Share of type l labour income received by type h households
$\mathbf{n(t)}$	Population growth rate
$\mathbf{n1}$	Population growth rate for the first period
$\emptyset_{k,bus}$	Scale parameter (allocation of investment to industries)
$\mathbf{pop(t)}$	Population index
ρ_j^{KD}	Elasticity parameter (CES - composite capital)
ρ_j^{LD}	Elasticity parameter (CES - composite labour)
ρ_i^M	Elasticity parameter (CES - composite good)
ρ^{VA}	Elasticity parameter (CES - value added)
$\rho_{j,i}^X$	Elasticity parameter (CET - exports and local sales)
ρ_j^{XT}	Elasticity parameter (CET - total output)
$\sigma_{k,bus}^{INV}$	Elasticity (investment demand)
σ_j^{KD}	Elasticity (CES - composite capital)
σ_j^{LD}	Elasticity (CES - composite labour)
σ_i^M	Elasticity (CES - composite good)
σ_j^{VA}	Elasticity (CES - value added)
$\sigma_{j,i}^X$	Elasticity (CET - exports and local sales)
σ_j^{XT}	Elasticity (CET - total output)
σ_i^{XD}	Price elasticity of the world demand for exports of product i
$\sigma_{i,h}^Y$	Income elasticity of consumption
$\mathbf{v(j)}$	Coefficient (Leontief - value added)
$\mathbf{\Omega}$	A parameter that measures the response of the sector following the firm production change
$\mathbf{Kfr}_{k,j}$	share of fixed cost in total cost
ε_i^e	price elasticity of export demand $0 < \varepsilon_i^e < \infty$

C. Variables Definition	
Variable	Description
Volume variables	
$C_{i,h,t}$	Consumption of commodity i by type h households
$CG_{i,t}$	Public final consumption of commodity i
$CI_{j,t}$	Total intermediate consumption of industry j
$CMIN_{i,h,t}$	Minimum consumption of commodity i by type h households
$CTH_REAL_{h,t}$	Real consumption budget of type h households
$DD_{i,t}$	Domestic demand for commodity i produced locally
$DI_{i,j,t}$	Intermediate consumption of commodity i by industry j
$DIT_{i,t}$	Total intermediate demand for commodity i
$DS_{j,i,t}$	Supply of commodity i by industry j to the domestic market
$EX_{j,i,t}$	Quantity of product i exported by industry j
$EXD_{i,t}$	World demand for exports of product i
G_REAL_t	Real current government expenditures on goods and services
$GDP_BP_REAL_t$	Real GDP at basic prices
$GDP_MP_REAL_t$	Real GDP at market prices
$GFCF_PRI_REAL_t$	Real private gross fixed capital formation
$GFCF_PUB_REAL_t$	Real public gross fixed capital formation
$IM_{i,t}$	Quantity of product i imported
$IND_{k,j,t}$	Investment in capital k for industry j
$INV_{i,t}$	Total final demand of commodity i for investment purposes (GFCF)
$INV_PRI_{i,t}$	Final demand of commodity i for private investment purposes
$INV_PUB_{i,t}$	Final demand of commodity i for public investment purposes
$KD_{k,j,t}$	Demand for type k capital by industry j
$KDC_{j,t}$	Industry j demand for composite capital
$KS_{k,t}$	Supply of type k capital
$LD_{l,j,t}$	Demand for type l labour by industry j
$LDC_{j,t}$	Industry j demand for composite labour
$LS_{l,t}$	Supply of type l labour
$Q_{i,t}$	Quantity demanded of composite commodity i
$VA_{j,t}$	Value added of industry j
$VSTK_{i,t}$	Inventory change of commodity i
$XS_{j,i,t}$	Industry j production of commodity i
$XST_{j,t}$	Total aggregate output of industry j
Prices	
E_t	Exchange rate (price of foreign currency in local currency)
IR_t	Interest rate
$P_{j,i,t}$	Basic price of industry j's production of commodity i
$PC_{i,t}$	Purchaser price of composite commodity i (including all taxes and
$PCI_{j,t}$	Intermediate consumption price index of industry j
$PD_{i,t}$	Price of local product i sold on the domestic market (including all
$PE_{i,t}$	Price received for exported commodity x (excluding export taxes)
$PE_FOB_{i,t}$	FOB price of exported commodity x (in local currency)
$PIXCON_t$	Consumer price index
$PIXGDP_t$	GDP deflator

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PIXGVT _t	Public expenditures' price index
PIXINV_PRI _t	Private investment price index
PIXINV_PUB _t	Public investment price index
PK_PRI _t	Price of new private capital
PK_PUB _t	Price of new public capital
PL _{i,t}	Price of local product i (excluding all taxes on products)
PM _{i,t}	Price of imported product i (including all taxes and tariffs)
PP _{j,t}	Industry j unit cost including taxes directly related to the use of capital and labour but excluding other taxes on production
PT _{j,t}	Basic price of industry j's output
PVA _{j,t}	Price of industry j value added (including taxes on production directly related to the use of capital and labor)
PWM _{i,t}	World price of imported product i (expressed in foreign currency)
PWX _{i,t}	World price of exported product i (expressed in foreign currency)
R _{k,j,t}	Rental rate of type k capital in industry j
RC _{j,t}	Rental rate of industry j composite capital
RTI _{k,j,t}	Rental rate paid by industry j for type k capital including capital taxes
U _{k,j,t}	User cost of type k capital in industry j
W _{l,t}	Wage rate of type l labour
WC _{j,t}	Wage rate of industry j composite labour
WTI _{l,j,t}	Wage rate paid by industry j for type l labour including payroll taxes
Nominal (value) variables	
CAB _t	Current account balance
CTH _{h,t}	Consumption budget of type h households
G _t	Current government expenditures on goods and services
GDP_BP _t	GDP at basic prices
GDP_FD _t	GDP at purchasers' prices from the perspective of final demand
GDP_IB _t	GDP at market prices (income-based)
GDP_MP _t	GDP at market prices
GFCF _t	Gross fixed capital formation
IT _t	Total investment expenditures
IT_PRI _t	Total private investment expenditures
IT_PUB _t	Total public investment expenditures
SF _{f,t}	Savings of type f businesses
SG _t	Government savings
SH _{h,t}	Savings of type h households
SROW _t	Rest-of-the-world savings
TDF _{f,t}	Income taxes of type f businesses
TDFT _t	Total government revenue from business income taxes
TDH _{h,t}	Income taxes of type h households
TDHT _t	Total government revenue from household income taxes
TIC _{i,t}	Government revenue from indirect taxes on product i
TICT _t	Total government receipts of indirect taxes on commodities
TIS _{i,t}	Government sub exp on product i
TIST _t	Total government sub exp on commodities
TIK _{k,j,t}	Government revenue from taxes on type k capital used by industry j

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TIKT _t	Total government revenue from taxes on capital
TIM _{i,t}	Government revenue from import duties on product i
TIMT _t	Total government revenue from import duties
TIP _{j,t}	Government revenue from taxes on industry j production (excluding taxes directly related to the use of capital and labor)
TIPT _t	Total government revenue from production taxes (excluding taxes directly related to the use of capital and labor)
TIW _{l,j,t}	Government revenue from payroll taxes on type l labour in industry j
TIWT _t	Total government revenue from payroll taxes
TIX _{i,t}	Government revenue from export taxes on product i
TIXT _t	Total government revenue from export taxes
TPRCTS _t	Total government revenue from taxes on products and imports
TPRODN _t	Total government revenue from other taxes on production
TR _{ag,agj,t}	Transfers from agent agj to agent ag
YDF _{f,t}	Disposable income of type f businesses
YDH _{h,t}	Disposable income of type h households
YF _{f,t}	Total income of type f businesses
YFK _{f,t}	Capital income of type f businesses
YFTR _{f,t}	Transfer income of type f businesses
YG _t	Total government income
YGK _t	Government capital income
YGTR _t	Government transfer income
YH _{h,t}	Total income of type h households
YHK _{h,t}	Capital income of type h households
YHL _{h,t}	Labour income of type h households
YHTR _{h,t}	Transfer income of type h households
YROW _t	Rest-of-the-world income
Rates and intercepts	
sho _{h,t}	Intercept (type h household savings)
sh1 _{h,t}	Slope (type h household savings)
tro _{h,t}	Intercept (transfers by type h households to government)
tr1 _{h,t}	Marginal rate of transfers by type h households to government
ttdfo _{f,t}	Intercept (income taxes of type f businesses)
ttdf1 _{f,t}	Marginal income tax rate of type f businesses
ttdho _{h,t}	Intercept (income taxes of type h households)
ttdh1 _{h,t}	Marginal income tax rate of type h households
ttic _{i,t}	Tax rate on commodity i
ttis _{i,t}	Subsidy rate on commodity i
ttik _{k,j,t}	Tax rate on type k capital used in industry j
ttim _{i,t}	Rate of taxes and duties on imports of commodity m
ttip _{j,t}	Tax rate on the production of industry j
ttiwl _{l,j,t}	Tax rate on type l worker compensation in industry j
ttix _{i,t}	Export tax rate on exported commodity x
Oligopoly Model in Static EG_CGE	
nu _i	No. Of firms
ε^d_i	Price elasticity of domestic demand $0 < \epsilon^d_i < \infty$

mc_i^d	Marginal cost of product sold in domestic market
mc_i^e	Marginal cost of product exported
KV_j	Variable capital cost
$FK_{k,j}$	Fixed capital cost
PR_j	Profit of oligopoly branch
TC_j	Total cost
AC_j	Total profit
XF_i	Firm output level
Other Variables	
$EV_{h,t}$	Equivalent variation for households
EVT_t	National welfare
$LEON_t$	Excess supply on the last market

D. Equations of EG_CGE model:

Production :

$$VA_{j,t} = v_j XST_{j,t} \quad (1)$$

$$CI_{j,t} = io_j XST_{j,t} \quad (2)$$

$$VA_{j,t} = B_j^{VA} \left(\beta_j^{VA} LDC_{j,t}^{-\rho^{VA}} + (1 - \beta_j^{VA}) KDC_{j,t}^{-\rho^{VA}} \right)^{-\frac{1}{\rho_j^{VA}}} \quad (3)$$

$$LDC_{j,t} = \left[\frac{\beta_j^{VA}}{1 - \beta_j^{VA}} \frac{RC_{j,t}}{WC_{j,t}} \right]^{\sigma_j^{VA}} KDC_{j,t} \quad (4)$$

$$LDC_{j,t} = B_j^{LD} \left[\sum_l \beta_{l,j}^{LD} LD_{l,j,t}^{-\rho_j^{LD}} \right]^{-\frac{1}{\rho_j^{LD}}} \quad (5)$$

$$LD_{l,j,t} = \left[\frac{\beta_{l,j}^{LD} WC_{j,t}}{WTI_{l,j,t}} \right]^{\sigma_j^{LD}} (B_j^{LD})^{\sigma_j^{LD} - 1} LDC_{j,t} \quad (6)$$

$$KDC_{j,t} = B_j^{KD} \left[\sum_k \beta_{k,j}^{KD} KD_{k,j,t}^{-\rho_j^{KD}} \right]^{-\frac{1}{\rho_j^{KD}}} \quad (7)$$

$$KD_{k,j,t} = \left[\frac{\beta_{k,j}^{KD} RC_{j,t}}{RTI_{k,j,t}} \right]^{\sigma_j^{KD}} (B_j^{KD})^{\sigma_j^{KD} - 1} KDC_{j,t} \quad (8)$$

$$DI_{i,j,t} = a_{ij} CI_{j,t} \quad (9)$$

Incomes and Savings

$$YH_{h,t} = YHL_{h,t} + YHK_{h,t} + YHTR_{h,t} \quad (10)$$

$$YHL_{h,t} = \sum_l \lambda_{h,l}^{WL} [W_{l,t} \sum_j LD_{l,j,t}] \quad (11)$$

$$YHK_{h,t} = \sum_k \lambda_{h,k}^{RK} [\sum_j R_{k,j,t} KD_{k,j,t}] \quad (12)$$

$$YHTR_{h,t} = \sum_{ag} TR_{h,ag,t} \quad (13)$$

$$YDH_{h,t} = YH_{h,t} - TDH_{h,t} - TR_{gvt,h,t} \quad (14)$$

$$CTH_{h,t} = YDH_{h,t} - SH_{h,t} - \sum_{agn} TR_{agn,h,t} \quad (15)$$

$$SH_{h,t} = PIXCON_t^\eta sh0_{h,t} + sh1_{h,t} YDH_{h,t} \quad (16)$$

$$TR_{agn,h,t} = \lambda_{agn,h}^{TR} YDH_{h,t} \quad (17)$$

$$TR_{gvt,h,t} = PIXCON_t^\eta tr0_{h,t} + tr1_{h,t} YH_{h,t} \quad (18)$$

$$YF_{f,t} = YFK_{f,t} + YFTR_{f,t} \quad (19)$$

$$YFK_{f,t} = \sum_k \lambda_{f,k}^{RK} \left[\sum_j R_{k,j,t} KD_{k,j,t} \right] \quad (20)$$

$$YFTR_{f,t} = \sum_{ag} TR_{f,ag,t} \quad (21)$$

$$YDF_{f,t} = YF_{f,t} - TDF_{f,t} \quad (22)$$

$$SF_{f,t} = YDF_{f,t} - \sum_{ag} TR_{ag,f,t} \quad (23)$$

$$TR_{agn,f,t} = \lambda_{ag,f}^{TR} YDF_{f,t} \quad (24)$$

$$YG_t = YGK_t + TDHT_t + TDFT_t + TPROD_t + TPRCTS_t + YGTR_t \quad (25)$$

$$TPROD_t = TIWT_t + TIKT_t + TIPT_t \quad (26)$$

$$TPRCTS_t = TICT_t + TIST_t + TIMT_t + TIXT_t \quad (27)$$

$$YGK_{f,t} = \sum_k \lambda_{gvt,k}^{RK} \left[\sum_j R_{k,j,t} KD_{k,j,t} \right] \quad (28)$$

$$YGTR_t = \sum_{agn} TR_{gvt,agn,t} \quad (29)$$

$$TDHT_t = \sum_h TDH_{h,t} \quad (30)$$

$$TDH_{h,t} = PIXCON_t^\eta ttdh0_{h,t} + ttdh1_{h,t} YH_{h,t} \quad (31)$$

$$TDFT_t = \sum_f TDF_{f,t} \quad (32)$$

$$TDF_{f,t} = PIXCON_t^\eta ttdf0_{f,t} + ttdf1_{f,t} YFK_{f,t} \quad (33)$$

$$TIW_{l,j,t} = ttiw_{l,j,t} W_{l,t} LD_{l,j,t} \quad (34)$$

$$TIWT_t = \sum_{l,j} TIW_{l,j,t} \quad (35)$$

$$TIK_{k,j,t} = ttik_{k,j,t} R_{k,j,t} KD_{k,j,t} \quad (36)$$

$$TIKT_t = \sum_{k,j} TIK_{k,j,t} \quad (37)$$

$$TIP_{j,t} = ttip_{j,t} PP_{j,t} XST_{j,t} \quad (38)$$

$$TIPT_t = \sum_j TIP_{j,t} \quad (39)$$

$$TIC_{i,t} = ttic_{i,t} \{ PL_{i,t} DD_{i,t} + (1 + ttim_{i,t}) PWM_{i,t} e_t IM_{i,t} \} \quad (40)$$

$$TICT_t = \sum_i TIC_{i,t} \quad (41)$$

$$TIS_{i,t} = tti_{i,t} \{ PL_{i,t} DD_{i,t} + (1 + ttim_{i,t}) PWM_{i,t} e_t IM_{i,t} \} \quad (42)$$

$$TIST_t = \sum_i TIS_{i,t} \quad (43)$$

$$TIMT_t = \sum_i TIM_{i,t} \quad (44)$$

$$TIM_{i,t} = ttim_{i,t} PWM_{i,t} e_t IM_{i,t} \quad (45)$$

$$TIXT_t = \sum_i TIX_{i,t} \quad (46)$$

$$TIX_{i,t} = ttix_{i,t} PE_{i,t} EXD_{i,t} \quad (47)$$

$$TR_{agng,gvt,t} = PIXCON_t^\eta TR_{agng,gvt}^o POP_t \quad (48)$$

$$SG_t = YG_t - \sum_{agng} TR_{agng,gvt,t} - G_t \quad (49)$$

$$YROW_t = e_t \sum_i PWM_{i,t} IM_{i,t} + \sum_k \lambda_{row,k}^{RK} (\sum_j R_{k,j,t} KD_{k,j,t}) + \sum_{agd} TR_{row,agd,t} \quad (50)$$

$$TR_{agd,row,t} = PIXCON_t^\eta TR_{agd,row}^o POP_t \quad (51)$$

$$SROW_t = YROW_t - \sum_i PE_{i,t}^{FOB} EXD_{i,t} - \sum_{agd} TR_{agd,row,t} \quad (52)$$

$$SROW_t = -CAB_t \quad (53)$$

Demand:

$$PC_{i,t} C_{i,t} = PC_{i,t} C_{i,h,t}^{MIN} + \gamma_{i,h}^{LES} \{CTH_{h,t} - \sum_{ij} PC_{ij,t} C_{ij,h,t}^{MIN}\} \quad (54)$$

$$PC_{i,t} CG_{i,t} = \gamma_i^{GVT} G_t \quad (55)$$

$$GFCF_t = IT_t - \sum_i PC_{i,t} VSTK_{i,t} \quad (56)$$

$$PC_{i,t} INV_{i,t}^{PRI} = \gamma_i^{INVPRI} IT_t^{PRI} \quad (57)$$

$$PC_{i,t} INV_{i,t}^{PUB} = \gamma_i^{INVPUB} IT_t^{PUB} \quad (57)$$

$$INV_{i,t} = INV_{i,t}^{PRI} + INV_{i,t}^{PUB} \quad (58)$$

$$DIT_{i,t} = \sum_j DI_{i,j,t} \quad (59)$$

Supply and International Trade:

$$XST_{j,t} = B_j^{XT} \left[\sum_k \beta_{j,i}^{XT} XS_{j,i,t}^{\rho_j^{XT}} \right]^{\frac{1}{\rho_j^{XT}}} \quad (60)$$

$$XS_{j,i,t} = \frac{XST_{j,t}}{(B_j^{XT})^{1+\sigma_j^{XT}}} \left[\frac{P_{j,i,t}}{\beta_{j,i}^{XT} PT_{j,t}} \right] \quad (61)$$

$$XS_{j,i,t} = B_{j,i}^X \left[\beta_{j,i}^X EX_{j,i,t}^{\rho_{j,i}^X} + (1 - \beta_{j,i}^X) DS_{j,i,t}^{\rho_{j,i}^X} \right]^{\frac{1}{\rho_{j,i}^X}} \quad (62)$$

$$EX_{j,i,t} = \left[\frac{(1 - \beta_{j,i}^X) PE_{i,t}}{\beta_{j,i}^X PL_{i,t}} \right]^{\sigma_{j,i}^X} DS_{j,i,t} \quad (63)$$

$$EXD_{i,t} = EXD_{i,t}^0 POP_t \left(\frac{e_t PWX_{i,t}}{PE_{i,t}^{FOB}} \right)^{\sigma_i^{XD}} \quad (64)$$

$$Q_{i,t} = B_i^M \left[\beta_i^M IM_{i,t}^{-\rho_i^M} + (1 - \beta_i^M) DD_{i,t}^{-\rho_i^M} \right]^{\frac{-1}{\rho_i^M}} \quad (65)$$

$$IM_{i,t} = \left[\frac{(1-\beta_i^M)}{\beta_i^M} \frac{PD_{i,t}}{PM_{i,t}} \right]^{\sigma_i^M} DD_{i,t} \quad (66)$$

Prices:

$$PP_{j,t} = \frac{PV_{j,t} VA_{j,t} + PCI_{j,t} CI_{j,t}}{XST_{j,t}} \quad (67)$$

$$PT_{j,t} = (1 + ttip_{j,t}) PP_{j,t} \quad (68)$$

$$PCI_{j,t} = \frac{\sum_i PC_{i,t} DI_{i,j,t}}{CI_{j,t}} \quad (69)$$

$$PVA_{j,t} = \frac{WC_{j,t} LDC_{j,t} + RC_{j,t} KDC_{j,t}}{VA_{j,t}} \quad (70)$$

$$WC_{j,t} = \frac{\sum_l WTI_{l,j,t} LD_{l,j,t}}{LDC_{j,t}} \quad (71)$$

$$WTI_{l,j,t} = (1 + ttiw_{l,j,t}) W_{l,j,t} \quad (72)$$

$$RC_{j,t} = \frac{\sum_k RTI_{k,j,t} KD_{k,j,t}}{KDC_{j,t}} \quad (73)$$

$$RTI_{k,j,t} = (1 + ttik_{k,j,t}) R_{k,j,t} \quad (74)$$

$$PT_{j,t} = \frac{\sum_i P_{j,i,t} XS_{j,i,t}}{XST_{j,t}} \quad (75)$$

$$P_{j,i,t} = \frac{PE_{i,t} EX_{j,i,t} + PL_{i,t} DS_{j,i,t}}{XS_{j,i,t}} \quad (76)$$

$$PE_{i,t}^{FOB} = PE_{i,t} (1 + ttix_{i,t}) \quad (77)$$

$$PD_{i,t} = (1 + ttic_{i,t} + ttis_{i,t}) PL_{i,t} \quad (78)$$

$$PM_{i,t} = (1 + ttic_{i,t} + ttis_{i,t}) (1 + ttim_{i,t}) e_t PWM_{i,t} \quad (79)$$

$$PC_{i,t} = \frac{PM_{i,t} IM_{i,t} + PD_{i,t} DD_{i,t}}{Q_{i,t}} \quad (80)$$

GDP Deflator:

$$PIXGDP_t = \sqrt{\frac{\sum_j PVA_{j,t} VA_{j,t}^0 \sum_j PVA_{j,t} VA_{j,t}}{\sum_j PVA_{j,t}^0 VA_{j,t}^0 \sum_j PVA_{j,t}^0 VA_{j,t}}} \quad (81)$$

Consumer Price Index

$$PIXCON_t = \frac{\sum_i PC_{i,t} \sum_h C^0_{i,h}}{\sum_{ij} PC^0_{ij,t} \sum_h C^0_{ij,h}} \quad (82)$$

Investment Price Index

$$PIXINV_t^{PRI} = \prod_i \left(\frac{PC_{i,t}}{PC_i^0} \right)^{\gamma_i^{INVPRI}} \quad (83)$$

$$PIXINV_t^{PUB} = \prod_i \left(\frac{PC_{i,t}}{PC_i^0} \right)^{\gamma_i^{INVPUB}} \quad (84)$$

Public Expenditure Price Index

$$PIXGVT_t = \prod_i \left(\frac{PC_{i,t}}{PC_i^0} \right)^{\gamma_i^{GVT}} \quad (85)$$

Equilibrium:

$$Q_{i,t} = \sum_h C_{i,h,t} + CG_{i,t} + INV_{i,t} + VSTK_{i,t} + DIT_{i,t} \quad (86)$$

$$\sum_j LD_{l,j,t} = LS_{l,t} \quad (87)$$

$$\sum_j KD_{k,j,t} = KS_{k,t} \quad (87)$$

$$IT_t = \sum_h SH_{h,t} + \sum_f SF_{f,t} + SG_t + SROW_t \quad (88)$$

$$\sum_j DS_{j,i,t} = DD_{i,t} \quad (89)$$

$$\sum_j EX_{j,i,t} = EXD_{i,t} \quad (90)$$

Gross Domestic Product

$$GDP_t^{BP} = \sum_j PVA_{j,t} VA_{j,t} + TIPT_t \quad (91)$$

$$GDP_t^{MP} = GDP_t^{BP} + TPRCTS_t \quad (92)$$

$$GDP_t^{IB} = \sum_{l,j} W_{l,t} LD_{l,j,t} + \sum_{k,j} R_{k,t} KD_{k,j,t} + TPROD_t + TPRCTS_t \quad (93)$$

$$GDP_t^{FD} = \sum_i PC_{i,t} [\sum_h C_{i,h,t} + CG_{i,t} + INV_{i,t} + VSTK_{i,t}] + \sum_i PE_{i,t}^{FOB} EXD_{i,t} - \sum_i e_t PWM_{i,t} IM_{i,t} \quad (94)$$

Dynamic Equations:

$$IT_t^{PUB} = PK_t^{PUB} \sum_{k,pub} IND_{k,pub,t} \quad (95)$$

$$PK_t^{PUB} = \frac{1}{A_{K,PUB}} \prod_i \left(\frac{PC_{i,t}}{\gamma_i^{INVPUB}} \right)^{\gamma_i^{INVPUB}} \quad (96)$$

$$KD_{k,pub,t+1} = KD_{k,pub,t} (1 - \delta_{k,pub}) + IND_{k,pub,t} \quad (97)$$

$$IT_t^{PRI} = IT_t - IT_t^{PUB} - \sum_i PC_{i,t} VSTK_{i,t} \quad (98)$$

$$IT_t^{PRI} = PK_t^{PRI} \sum_{k,bus} IND_{k,bus,t} \quad (99)$$

$$PK_t^{PRI} = \frac{1}{A_{K,PRI}} \prod_i \left(\frac{PC_{i,t}}{\gamma_i^{INVPRI}} \right)^{\gamma_i^{INVPRI}} \quad (100)$$

$$IND_{k,bus,t} = \phi_{k,bus} \left[\frac{R_{k,bus,t}}{U_{k,bus,t}} \right]^{\sigma_{k,bus}^{INV}} KD_{k,bus,t} \quad (101)$$

$$KD_{k,bus,t+1} = KD_{k,bus,t} (1 - \delta_{k,bus}) + IND_{k,bus,t} \quad (102)$$

$$U_{k,bus,t} = PK_t^{PRI} (\delta_{k,bus} + IR_t) \quad (103)$$

$$EV_{h,t} = \left\{ (CTH_{h,t} - \sum_{ij} PC_i CMIN_{ij,t}) \prod_i \left[\frac{PC_i^0}{PC_{i,t}} \right]^{\gamma_i^{LES}} - (CTH_{h,t}^0 - \sum_{ij} PC_i^0 CMIN_{ij,t}^0) \right\} \quad (104)$$

$$EVT_t = \frac{\sum_h CTH_{h,t} PIXCON^0 - \sum_h CTH_h^0 PIXCON^0}{\sum_h YH_{h,t}} \quad (105)$$

Oligopoly Modul in Static EG_CGE:

$$\frac{PD_i - MCD_i}{PD_i} = \frac{\Omega}{NU_i \varepsilon_i^d} \quad (106)$$

$$\frac{PE_{FOB_i} - MCE_i}{PE_{FOB_i}} = \frac{\Omega}{NU_i \varepsilon_i^e} \quad (107)$$

$$KV_j = KDC_j - \sum_k FK_{kj} \quad (108)$$

$$TC_j = \sum_i PC_i DI_{ij} + WC_j LDC_j + RC_j KDC_j + \sum_k RC_j FK_{kj} \quad (109)$$

$$PR_j = \sum_j P_{ji} XS_{ji} - TC_j \quad (110)$$

$$AC_j = \frac{TC_j}{\sum_i XS_{ji}} \quad (111)$$

$$FX_i = \frac{\sum_i XS_{ji}}{NU_i} \quad (112)$$

Appendix 4: Simulation Results

Table A4.1: Simulation Summary

Time horizon	Market Structure	The simulation		How to implement this simulation
Long run (recursive dynamic CGE)	Competition in all product markets	Internal stabilisation reform	<ul style="list-style-type: none"> - Imposing 14% VAT on all products except agricultural ones - Petroleum subsidies' elimination 	<ul style="list-style-type: none"> - Simulate $\tau_{ic}(i,t)=0.14$, where $t=10$ years. - Simulate completely removing petroleum subsidies by 10% over ten years.
		External stabilisation	<ul style="list-style-type: none"> - 100% depreciation in exchange rate 	<ul style="list-style-type: none"> - Depreciating exchange rate by 100% compared with the benchmark level in the next ten years. -
		Structural reform	<ul style="list-style-type: none"> - 100% increase in public expenditure on education and health - Full tariff removal 	<ul style="list-style-type: none"> - Simulate doubling public spending in education and health by 10% over ten years. - Simulate completely removing import tariffs by 10% over ten years.
		Combined stabilisation & structural reforms	<ul style="list-style-type: none"> - Imposing 14% VAT - Petroleum subsidies' elimination - 100% depreciation in exchange rate - Full tariff removal - 100% increase in public expenditure on education and health 	Running all the above experiments simultaneously

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Table A4.1: Simulation Summary (continued)

Time horizon	Market Structure	The simulation		How to implement this simulation
Static CGE	Competition in all product markets	Internal stabilisation reform	<ul style="list-style-type: none"> - Imposing 14% VAT on all products except agricultural ones - Petroleum subsidies' elimination 	<ul style="list-style-type: none"> - We simulate $ttic(i)=0.14$. - We simulate 10% removal of petroleum subsidies.
		External stabilisation	<ul style="list-style-type: none"> - 100% depreciation in exchange rate 	<ul style="list-style-type: none"> - Depreciating exchange rate by 100% compared with the benchmark level.
		Structural reform	<ul style="list-style-type: none"> - Increase in public current spending on education and health - Tariff removal 	<ul style="list-style-type: none"> - 10% increase in public current expenditure on education and health. - Simulate 10% removal of import.
		Combined stabilisation & structural reforms	<ul style="list-style-type: none"> - Imposing 14% VAT - Petroleum subsidies' elimination - 100% depreciation in exchange rate - Tariff removal - Increase in public investment on education and health 	All the above mentioned static simulation
Static CGE	Oligopolistic product markets except in agriculture, agro-based, mining and beverages and tobacco activities	Internal stabilisation reform	<ul style="list-style-type: none"> - Imposing 14% VAT on all products except agricultural ones - Petroleum subsidies' elimination 	<ul style="list-style-type: none"> - We simulate $ttic(i)=0.14$. Simulate 10% removal of petroleum subsidies.
		External stabilisation	<ul style="list-style-type: none"> - 100% depreciation in exchange rate 	<ul style="list-style-type: none"> - Depreciating exchange rate by 100% compared with the benchmark level.
		Structural reform	<ul style="list-style-type: none"> - Increase in public current spending on education and health - Tariff removal 	<ul style="list-style-type: none"> - 100% increase in public current expenditure on education and health. - Simulate 10% removal of import.
		Reducing entry barriers	<ul style="list-style-type: none"> - Compare all structure reform effects with reducing entry barriers 	We simulate 100% increase in number of firms compared with benchmark number (we assume number of firms =30 in benchmark year)

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Table A4.2: Sectoral Foreign Trade Impacts of Stabilisation Policies

	GDEV				SDEV				VAT			
	Imports		Exports		Imports		Exports		Imports		Exports	
	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run
Agricultural activities	-15.5	-67.6	7.6	49.5	-72.8	-64.8	67.2	38.8	-24.9	-55.0	15.1	67.3
Agro-processing	-3.9	-24.7	4.7	34.3	-22.7	-24.5	37.6	30.8	-21.2	-19.9	9.7	38.5
Tobacco and beverage	-4.1	-24.8	4.2	28.1	-22.6	-24.5	31.2	25.9	-17.9	-15.9	10.5	32.1
Chemicals	-1.3	-8.4	2.1	16.1	-7.0	-9.2	13.2	16.6	-10.1	-0.5	5.6	43.0
Clothes	-3.7	-21.5	3.2	19.5	-19.7	-21.1	21.3	17.5	-23.5	-22.8	8.9	28.6
Leather and its products	-3.7	-21.8	3.7	23.0	-19.7	-21.7	25.0	20.5	-25.3	-21.6	16.4	38.9
Mechanical industries	-5.1	-29.4	4.1	33.1	-26.8	-28.8	28.1	33.2	60.6	69.3	-10.1	53.8
Metal industries	-2.6	-14.1	3.1	18.9	-13.7	-13.6	20.4	16.9	25.2	53.0	-12.7	19.1
Mining	-2.5	-17.7	2.5	17.8	-13.8	-18.4	16.0	17.0	0.9	4.4	2.5	64.0
Non-Metal	-3.5	-20.0	3.4	18.4	-18.7	-19.5	22.5	15.3	16.8	33.1	-3.6	37.8
Other Industries	-4.2	-23.5	3.5	17.7	-22.6	-22.7	23.2	14.1	36.5	52.4	-7.6	36.7
Other Services	-3.2	-19.0	3.6	21.1	-17.7	-18.6	24.0	17.8	-15.5	-11.6	10.2	43.0
Public Administrative	-3.8	-21.0	4.1	27.7	-20.9	-19.9	28.2	25.4	-11.9	-10.1	7.4	23.1
Petroleum products	-3.1	-18.3	3.1	17.7	-16.3	-18.6	19.4	15.8	-10.8	-3.0	5.1	35.2
Textiles	-1.6	-8.9	3.3	23.1	-7.9	-9.3	23.6	21.7	-13.2	-6.3	-0.1	15.2
Vehicles and parts thereof	-4.1	-22.9	2.3	10.7	-22.0	-22.2	14.7	8.6	61.0	87.8	-1.2	28.2
Wood and articles thereof	-2.4	-14.5	2.8	15.0	-13.0	-14.9	17.9	12.8	-11.4	5.7	1.6	15.1

Table A4.2: Sectoral Foreign Trade Impacts of Stabilisation Policies (cont.)

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	SSUB				GSUB				STABR			
	Imports		Exports		Imports		Exports		Imports		Exports	
	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run
Agricultural activities	-1.5	-12.3	0.6	8.6	-0.3	-8.5	0.1	5.3	-44.6	-60.9	39.0	90.3
Agro-processing	-1.5	-2.9	0.3	5.4	-0.3	-3.1	0.1	3.2	-31.0	-11.0	24.8	50.7
Tobacco and beverage	-1.8	-4.0	0.5	4.9	-0.4	-4.1	0.1	3.2	-31.3	-12.6	25.8	35.1
Chemicals	-0.8	0.3	0.3	5.7	-0.2	-0.6	0.1	3.2	-13.9	6.5	15.0	66.8
Clothes	-1.7	-3.9	0.5	5.4	-0.4	-4.0	0.1	3.4	-34.1	-12.6	21.8	39.8
Leather and its products	-1.9	-3.7	1.0	6.3	-0.4	-4.1	0.2	4.4	-35.6	-9.2	32.8	43.4
Mechanical industries	5.4	11.8	-1.1	8.4	1.1	11.5	-0.2	3.4	53.9	17.9	2.8	142.2
Metal industries	2.5	8.7	-0.9	3.7	0.5	7.0	-0.2	1.0	24.1	46.1	-4.1	65.4
Mining	-0.3	0.8	0.3	8.0	-0.1	0.4	0.1	4.3	-1.8	1.9	9.2	102.8
Non-Metal	3.0	8.6	-1.7	3.0	0.6	7.5	-0.4	0.0	13.5	30.7	5.4	62.8
Other Industries	4.0	9.6	-1.1	5.9	0.8	8.9	-0.2	2.3	31.8	28.6	3.2	78.0
Other Services	-1.0	-1.6	0.5	6.8	-0.2	-1.9	0.1	4.1	-26.3	-8.1	26.1	58.6
Public Administrative	-0.2	0.0	0.6	4.2	0.0	-0.1	0.1	2.9	-51.3	-43.8	12.6	22.5
Petroleum products	-4.1	-2.5	2.5	5.6	-0.9	-3.0	0.5	3.3	-16.4	-1.3	13.7	55.1
Textiles	-1.1	-0.8	-0.1	3.4	-0.2	-1.5	0.0	1.8	-17.8	1.9	10.5	32.6
Vehicles and parts thereof	5.3	13.9	-0.2	4.2	1.1	12.5	0.0	1.9	59.6	46.9	9.2	56.3
Wood and articles thereof	-0.8	1.2	0.2	4.4	-0.2	-0.1	0.0	2.5	-17.7	13.7	11.6	28.9

Table A4.3: Sectoral Foreign Trade Impacts of Structural Policies

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	EDU				HLT				EDU+GSUB			
	Imports		Exports		Imports		Exports		Imports		Exports	
	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run
Agricultural activities	-7.2	-24.1	1.7	2.8	-1.8	-5.9	0.4	0.6	-7.3	-27.4	1.8	7.7
Agro-processing	0.1	-0.7	0.7	4.5	0.0	-0.3	0.2	1.0	-0.3	-3.6	0.8	7.0
Tobacco and beverage	0.6	1.9	0.2	4.2	0.1	0.2	0.1	0.9	0.2	-2.3	0.3	6.9
Chemicals	0.3	1.7	-0.5	-1.7	0.2	1.4	-0.1	-0.4	0.1	1.0	-0.4	1.6
Clothes	0.7	3.7	-0.3	-0.3	0.1	0.5	-0.1	0.0	0.3	-0.7	-0.2	3.1
Leather and its products	0.7	2.8	-0.4	-0.1	0.1	0.3	-0.1	0.1	0.3	-1.6	-0.2	4.2
Mechanical industries	0.9	5.2	-0.5	-1.1	0.2	1.1	-0.1	-0.2	2.0	17.0	-0.7	2.2
Metal industries	0.5	3.1	-0.4	-0.7	0.1	0.6	-0.1	-0.1	1.0	10.1	-0.5	0.2
Mining	0.3	2.4	-0.3	-0.6	0.1	0.4	-0.1	-0.1	0.2	2.7	-0.3	3.6
Non-Metal	0.5	3.1	-0.4	-0.2	0.2	1.0	-0.1	0.0	1.1	10.6	-0.8	-0.2
Other Industries	0.8	4.1	-0.6	-0.9	0.2	0.7	-0.1	-0.1	1.6	13.3	-0.8	1.4
Other Services	0.4	2.4	-0.4	-1.9	0.1	0.3	-0.1	-0.2	0.2	0.1	-0.3	2.3
Public Administrative	1.0	6.2	-1.1	-5.9	0.2	0.9	-0.2	-0.9	0.9	3.4	-1.0	-3.4
Petroleum products	0.6	1.8	-0.7	-0.8	0.1	0.3	-0.1	-0.1	-0.3	-1.3	-0.1	2.4
Textiles	0.4	2.4	0.1	1.4	0.1	0.4	0.0	0.3	0.2	0.7	0.1	3.0
Vehicles and parts thereof	0.8	4.8	-0.2	0.3	0.2	0.8	0.0	0.1	1.9	17.6	-0.2	2.2
Wood and articles thereof	0.6	3.7	-0.4	-0.3	0.2	1.1	-0.1	0.0	0.5	3.3	-0.3	2.2

Table A4.3: Sectoral Foreign Trade Impacts of Structural Policies (cont.)

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	HLT+GSUB				TL				STRUCR			
	Imports		Exports		Imports		Exports		Imports		Exports	
	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run	short run	long run
Agricultural activities	-1.9	-10.9	0.5	5.8	0.3	2.1	-0.1	0.6	-8.9	-29.0	2.4	5.1
Agro-processing	-0.3	-3.0	0.2	3.6	0.4	4.0	0.0	0.8	0.2	0.6	1.1	6.7
Tobacco and beverage	-0.3	-4.0	0.2	3.5	1.4	15.5	-0.1	1.1	1.7	14.8	0.5	6.4
Chemicals	0.0	0.8	0.0	2.8	0.2	1.9	0.0	0.9	0.5	3.1	-0.4	-1.2
Clothes	-0.2	-3.7	0.1	3.3	1.3	13.4	0.0	2.3	1.8	15.1	-0.1	2.2
Leather and its products	-0.3	-3.9	0.1	4.3	2.7	35.6	0.0	1.6	3.2	35.6	-0.1	2.2
Mechanical industries	1.3	13.1	-0.3	3.0	0.9	8.9	0.0	1.5	0.9	3.1	-0.2	1.1
Metal industries	0.6	7.7	-0.2	0.7	0.5	5.7	0.0	1.0	0.5	2.3	-0.2	0.9
Mining	0.0	1.1	0.0	4.0	0.2	2.1	-0.1	0.5	0.1	-0.5	-0.2	0.4
Non-Metal	0.8	8.6	-0.5	-0.1	1.0	10.6	-0.1	1.3	1.0	7.6	-0.2	1.0
Other Industries	1.0	10.1	-0.3	2.0	0.4	3.3	-0.1	1.1	0.4	-1.3	-0.4	0.0
Other Services	-0.2	-1.8	0.1	3.9	0.1	1.2	-0.1	0.6	0.3	1.3	-0.3	-1.4
Public Administrative	0.0	-1.6	-0.1	1.6	0.1	0.5	-0.1	-0.3	1.0	5.6	-1.1	-5.4
Petroleum products	-0.8	-2.4	0.4	3.0	0.2	1.5	-0.2	0.5	0.5	-0.2	-0.6	0.1
Textiles	-0.1	-1.2	0.0	1.9	0.7	8.0	0.2	3.4	1.1	8.9	0.6	5.9
Vehicles and parts thereof	1.3	13.9	-0.1	1.8	2.5	30.6	0.4	6.8	2.4	22.4	0.3	5.4
Wood and articles thereof	0.0	0.9	0.0	2.3	0.4	4.0	0.0	1.5	0.9	5.4	-0.2	1.3



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- Private sector, micro, small and medium –sized enterprises development, entrepreneurship and social business;
- Digital economy;
- Healthcare policy;
- Human capital development, education, innovation, skill mismatch and migration;
- Labor markets, employment and employability;
- Finance, financial inclusion and the real economy;
- Sustainable development;
- Regional integration;
- Euro-Mediterranean economic partnership;
- Scenarios analysis and foresight.

EMNES performs **research activities**, disseminated through series of internal and external publications (studies, working papers, policy papers, policy-graphics and books) and the organization of **annual conferences**, and **policy workshop meetings and online webinars** to bring together leading researchers, policy makers and representatives of the civil society to discuss and debate optimal policies for the future of the region.

EMNES research and outputs are underpinned on the **four fundamental principles: Independence, Scientific Excellence, Policy Relevance and Deep Knowledge of Euro-Mediterranean Affairs.**

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