IS THE VAT REGRESSIVE?
A CGE ANALYSIS FOR EGYPT

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Abstract

Utilizing a static Computable General Equilibrium (CGE) model for the Egyptian economy, this paper assesses the relative efficiency of VAT versus sales taxes in raising revenue and examines its equity implications. Given that the introduction of the VAT has not been uniform across sectors, it is also of interest to determine the extent to which its implementation has been distortionary. The paper further examines the interaction between fiscal and trade reform. In particular, it seeks to answer the following question: How does openness change the benefits from the VAT versus a sales tax?

ملخص

تستخدم هذه الدراسة نموذج ثابت للتوازن العام المحسوب للاقتصاد المصري لتقييم الكفاءة النسبية لضريبة القيمة المضافة في زيادة الإيرادات مقارنة بضريبة المبيعات، كما تبحث في آثارها على العدالة. وبالنظر إلى أن تطبيق ضريبة القيمة المضافة جاء متفاوتا بين القطاعات، كان من الضروري تحديد إلى أي مدى أدى تطبيقها إلى تشوهات. كما تبحث الدراسة في التفاعل بين الإصلاح المالي والتجاري، وتحديدا، تسعى للإجابة عن السؤال التالي: كيف يؤدي الانفتاح الاقتصادي إلى تغيير الفوائد التي يمكن جنيها من ضريبة القيمة المضافة مقارنة بضريبة المبيعات.

I. INTRODUCTION

As Egypt embarked on an ambitious reform program, with the goals of achieving high and sustained rates of growth as well as eradicating poverty as top priorities, the need to raise revenue had never been more critical. Replacing sales taxes with a value added tax in 2016 was conceived as a necessary step to mobilize more resources to help better target the poor and increase the chances of survival of the economic reform program. In fact, Article 3 of the value added tax law executive regulations, stipulate that one percent of the tax revenue will be allocated to social programs. If these attempts are successful, it is envisioned that the scope of the reform program can be significantly widened to include also the liberalization of trade once the government has sufficient resources to compensate the losers from trade reform.

Currently, the government raises revenue through a combination of direct taxes, VAT and tariffs. Unlike other indirect taxes, one main advantage of VAT is that it does not distort input choice in production since it eliminates the cascading effect of taxes on intermediate inputs (Go et al. 2005). Another common reason for the introduction of VAT is to facilitate trade since there is no VAT levied on exports and so that imports and domestic production are on equal footing (Bird 2005). By discouraging consumption, VAT stimulates savings and hence economic growth (Alm and El Ganiny 2013). The cost of administering the VAT is also low and it reduces rent-seeking activities, especially if uniformly applied (Bye et al. 2003). The VAT was successfully implemented in many countries around the world including the European Union member states, Canada, New Zealand (Kononova and Whalley 2009) as well as many other countries in the MENA region. For example, in Lebanon, a 10 percent VAT was implemented in 2002 and by 2004 it accounted for 23.6 percent of tax revenue and 5.1 percent of GDP in 2005 (Salti and Shaaban 2009).

However, when implemented in Russia, the VAT was found to discourage the diversification of the economy into manufacturing and away from oil, since exports of oil were exempted from VAT while manufacturing was not (Kononova and Whalley 2009). Some of disadvantages of VAT is that it can be inflationary and regressive (Ruebling 1973). Go et al. (2005) find the VAT to be mildly regressive in the case of South Africa. Nevertheless, within a partial equilibrium framework, Salti and Shaaban (2009) find the VAT to be slightly progressive for Lebanon as several items important for the poor were exempted from the tax. In the case of Nigeria, Ikpe and Nteegah (2013) find the VAT to be inflationary due to the fact that intermediate inputs were not exempt from this type of tax.

Imposing a VAT in the case Fiji was associated with an increase in prices and falling welfare (Narayan 2003). In the case of Mexico, Mariscal and Werner (2018) find the VAT to be progressive with little passthrough to inflation. The reason underlying the progressiveness of the tax is that some articles like food and beverages that the poor consume were exempt from the tax. On the other hand, the goods whose prices were most affected are those consumed by high income households. Reducing VAT on food items in Norway attenuated inequality in income distribution (Gaader 2018). In a study of the countries that adopted VAT and for which data exists, Alavuotunki et al. (2019) assert that the VAT has not necessarily led to increased inequality. Giescke and Nhi (2010) find that applying differential VAT rates of different products to be distortionary and that a move to single rate in addition to the removal of exemptions to be welfare improving. However, the removal of exemptions worsens income distribution. Similarly, a move to a uniform VAT rate in the case of Italy was found to be GDP- and welfare-improving (Gesualdo et al. 2019)

Introducing VAT was found to increase economic efficiency measured by GDP per worker in developed countries as it leads to more capital accumulation—since investment goods are not taxed. Also, replacing distortionary taxes by a non-distortionary VAT increases efficiency and thus total factor productivity (TFP). However, these results held true in developed rather developing countries as the former had a more favorable environment (Adhikari 2019). Apart from the few studies cited above, in general there is little empirical work on the subject of VAT in developing countries (Ikpe and Nteegah2013; Adhikari 2019), especially in relation to income distribution in which research has been particularly scarce and inconclusive (Salti and Shaaban 2009). When it comes to Egypt, only one study by Helmy et al. (2019) tackled the issue of VAT reform using a CGE model, but the introduction of VAT was combined with energy subsidy removal and expansion of cash transfers to the poor. As such, the design of the policy experiment renders it difficult to disentangle the effect of the introduction of the VAT from the other two policies.

Because the introduction of a VAT can make possible the implementation of trade reform by compensating for lost revenue from the reduction in tariffs, the interaction between trade liberalization and VAT implementation warrants exploration. Hatzipanayotou, Michael and Miller (1994) and Keen and Ligthart (2002) show that in theory combining tariff cuts with consumption tax reform—often in the form of the introduction of VAT—increases welfare and public revenue. On the other hand, compared to a flat tax, Lyon and Waugh (2018) find that a progressive tax system increases the welfare gains from trade as the tax revenue is redistributed

to compensate the losers from trade reform and suggests further exploring other tax instruments and its interaction with trade reform.

Utilizing a static CGE model for the Egyptian economy, this paper assesses the relative efficiency of VAT versus sales taxes in raising revenue and examines its equity implications. Compared to a study by Elshennawy (2017)[1], where the VAT was compared to indirect production taxes and income taxes, the current paper compares sales taxes to VAT using the most recent SAM for Egypt. Given that the introduction of the VAT was not uniform across sectors, it is also of interest to determine the extent to which the implementation of the VAT has been distortionary. The paper further examines the interaction between fiscal and trade reform. In particular, and following Lyon and Waugh (2018) the paper seeks to answer the following question: How does openness change the benefits from VAT versus a sales tax.

The rest of the paper is organized as follows: Section II presents the model and data, in Section III the structure of taxes in Egypt is presented, Section IV discusses simulation results while Section V concludes.

II. THE MODEL

Among the basic features of the CGE model presented in this section is that consumers maximize a Cobb-Douglass utility function subject to budget constraint. Households are divided into rural and urban, with each further divided into five income groups from poorest to richest. Based in IFPRI standard CGE model, with Leontief function at the top of the technology nest, demands for value added and aggregate intermediate inputs are defined as Leontief functions of activity level. Value added is a CES function of disaggregated factor quantities. Following Go et al. (2005), a European-style value added tax with rebates for intermediate inputs is specified (for more details, see appendix). This way taxes on intermediate inputs do not affect prices. Factors of production include labor and capital. Labor is disaggregated into two skill categories, unskilled labor, which is immobile, and skilled labor, which is mobile across sectors. Capital is sector-specific. Factors of production are fully employed. The Armington specification for imports and domestic demand is employed. Output is a CET aggregation of exports and domestic demand. With regards to macro-closure, foreign savings are fixed and the exchange rate adjusts to equilibrate the balance of payment. Investment is savings driven. The consumer price index is the numeriare.

[1] The literature review and model description draws heavily on Elshennawy (2017).

Equilibrium is a set of prices and quantities such that 1) demand for each factor of production is equal to its supply and that 2) demand for each good is equal to its supply.

Because it captures the effect of each type of tax on prices, a CGE model is useful in analyzing issues related to the distributional impact of taxes. When the removal of the VAT tax is simulated, the model solves for market clearing prices and quantities that arise from optimizing behavior of consumers and producers given world prices and the policy environment. Because the model has data on consumption expenditure by each household, the impact of tax changes on real purchasing power of each household group can be assessed (Go et al. 2005).

The model is calibrated using the 2012/2013 Social Accounting Matrix for Egypt.[2] Following Maskus and Konan (1997), the elasticity of substitution between imports and domestically produced goods is two, while the elasticity of transformation between output sold domestically and exports is five.

III. THE STRUCTURE OF TAXES

The Egyptian government generates revenue through a combination of income taxes, tariffs, other taxes like petroleum and tobacco tax, sales taxes on both domestic and imported goods (before 2016) and VAT tax as of 2016. According to the SAM, Egypt had a regressive income tax system as evident from Table 1 below. However, the tax rates are quite low. More recently, the income tax rate has become slightly progressive (Ibarra et al. 2019). The sales tax rate calibrated from the SAM ranged from a maximum of 9 percent on machinery to a minimum of 0.2 percent on dairy products. In general, tariff rates—also calibrated from the SAM—are quite low ranging from a maximum of 5 percent on fish to a minimum of 0.2 percent on mining. These ranges, however, mask important differences given the aggregation of the sectors underlying the model.

Income taxes constitute about 55 percent of government revenue from different taxes, while tariffs constitute about 7 percent of government revenue. Sales taxes and other taxes account for 20 percent and 16 percent, respectively, of government revenue. It is important to note that the low tariff rates as well as the low share of tariffs do not imply that the economy

[2] While a new regional SAM for 2015 has been released, it was not publically available at the time of calibration of the model. Given the very short period between SAM 2012/13 and SAM (2015), the economy is not expected to have undergone major structural changes, and hence the results using SAM 2015 will not be different from those of SAM 2013/2013.

has become more open to trade as the government has in many instances replaced tariffs with sales taxes on imported goods. Thus, trade liberalization in this paper will take place not only via removal of tariffs, but also any other taxes on imports.

According to the VAT law issued in 2016, a flat uniform VAT rate of 14 percent is imposed on all goods and services. Nonetheless, to reduce the burden of the tax on the poor, some food items as well as drugs are exempt from the tax. Also, some services including utilities, transportation, banking and insurance, health and education—to mention but a few—are exempt. The VAT Law also imposes a scheduled tax on a number of luxury products such as soft drinks, perfumes and cosmetics, air conditions, some passenger cars, etc. but these were not modelled.

Table 1. Direct Tax Rates

U-1	1.77
U-2	1.45
U-3	1.37
U-4	1.18
U-5	0.56
R-1	2.24
R-2	1.91
R-3	1.80
R-4	1.75
R-5	1.06

U=Urban, R= Rural

Source: Egypt SAM 2012/2013.

Table 2. Tax Revenue as Percent of Government Revenue

Tariffs	6.96
Sales Tax	20.45
O-taxes	16.87
Direct Taxes	55.72

Source: Egypt SAM 2012/2013.

IV. SIMULATIONS RESULTS

Assessing the merits of the decision made by the government to replace sales taxes with value added taxes begins by examining how the economy is affected by the removal of sales taxes. In Simulation one (SIMU1) sales taxes on both domestically produced and imported goods are

removed. In table three, percent change in welfare of households—from poorest to richest—measured by equivalent variation is presented. It is clear from the table that the richest quintiles are the most hurt by the removal of sales taxes in the urban sector while the poorest quintile in the rural sector are the ones who benefit the most. This indicates that implementation of sales taxes in the case of Egypt was regressive. In other words, hurting the poor more than rich.

Table 3. Simulation Results

	SIMU1	SIMU2	SIMU3	SIMU4
Welfare.HU1	-0.10	0.00	0.05	-0.03
Welfare.HU2	0.09	-0.06	0.12	0.00
Welfare.HU3	-0.33	-0.11	-0.04	-0.23
Welfare.HU4	-0.66	0.03	-0.16	-0.22
Welfare.HU5	-1.31	0.23	-0.43	-0.29
Welfare.HR1	2.05	-0.15	0.86	0.71
Welfare.HR2	2.03	-0.37	0.83	0.45
Welfare.HR3	1.94	-0.36	0.80	0.43
Welfare.HR4	1.72	-0.27	0.71	0.42
Welfare.HR5	0.28	0.27	0.16	0.38

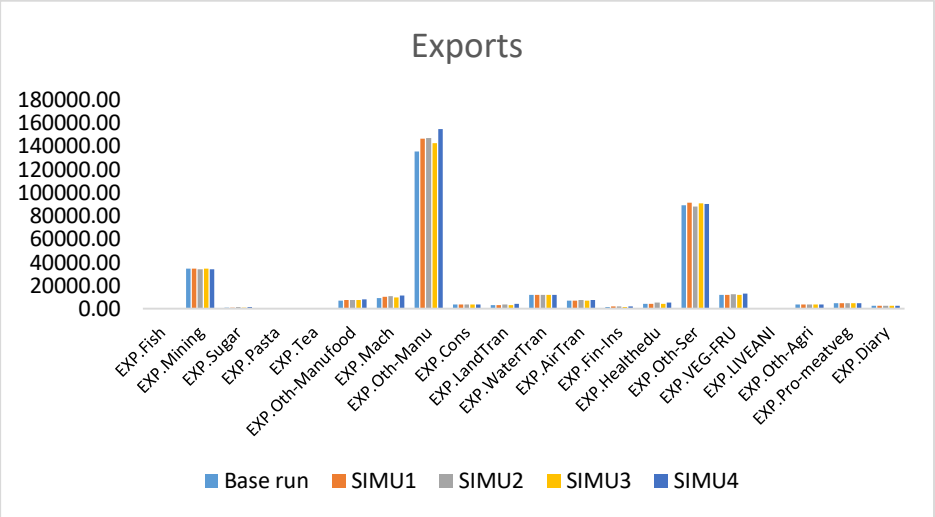
Source: Author calculations from CGE model.

HU= urban household

HR= rural household

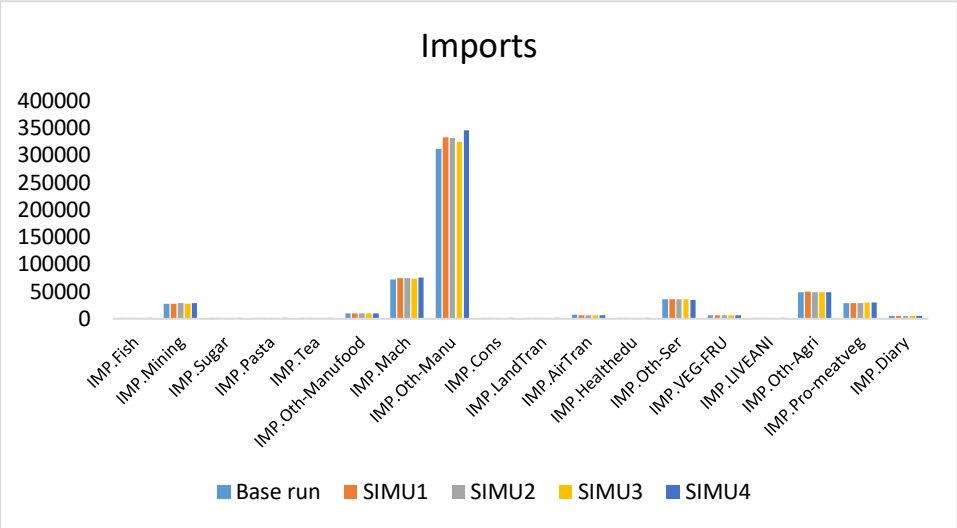
As the sales tax on both domestically produced and imported goods is removed, imports of several goods including sugar, pasta, tea and manufactured goods and all exports of goods and services increased above the base run. Strikingly, the exchange rate depreciates by over 100 percent. The removal of sales taxes results in a weaker currency, which implies that the sales tax artificially strengthens the currency. By diverting production from the domestic market to exports, producers that were previously protected from imports via sales taxes were able to avoid a reduction in output as this protection was removed and imports expanded. Almost all sectors experienced an increase in output as the sales tax was removed. Thus, the sales tax is contractionary.

Figure 1. Exports



Source: CGE model.

Figure 2. Imports



Source: CGE model.

Contrary to expectations, government revenue increases by 79.5 percent above the base run as sales taxes fall to zero. This result is, however, mainly driven by the depreciation of the currency, which increases the value of transfers from the rest of the world to the government along with tariff revenue added the expansion in the volume of imports. Revenue from other types of taxes increases as composite goods increase, making up for fall in revenue due the removal of the sales tax. Income tax revenue also increases as all institutions enjoy significantly higher income. Fueled by the depreciation of the currency, the consumer price index increases by 179 percent above the base run, which indicates that the sales tax was deflationary.

Under SIMU2, the sales tax is replaced by a 14 percent value added tax with rebates to intermediate goods. Several goods like food and agricultural goods etc., which affect the poor, are exempt from the tax while the rate on machinery is 5 percent as stipulated by the law. The welfare results show that the value added tax is regressive, especially in the case of rural households. Compared to sales tax, however, the value added tax seems to be less regressive, particularly for the rural household. Given that the poor mainly reside in the rural sector, one can deduce that the value added tax is relatively better for the poor compared to the sales tax.

All exports are higher under SIMU2 compared to the base run, that is when sales taxes were in place while import of most goods like manufactured and agricultural goods are higher. Value added tax is associated with an appreciation of the exchange rate. Output of all goods increase when a sales tax is replaced by a value added tax. Output is stimulated due to rebates to intermediate goods that is possible under a value added tax. The value added tax is thus expansionary.

Under a value added tax, government revenue is lower by 4.8 percent compared to its level when a sales tax was effective. This can be partially explained by effect of the appreciation of the exchange rate that took place under a value added tax. These results point to the importance of the need to take account of all the general equilibrium effects of the imposition of a value added tax. When the interaction between the exchange rate and the value added tax is taken into consideration, the value added tax does not seem to raise more revenue compared to a sales tax. The consumer price index is lower by 15 percent under a value added tax compared to a sales tax, which provides evidence that the former is deflationary. These results stand in contrast to the results reported in the literature, which point to the inflationary effect of the value added tax.

Turning to the interaction of trade reform with sales versus value added tax, welfare of household under SIMU3 where tariffs are set to zero in the presence of a sales tax shows that the richest urban households lose the most while the richest rural household gains the least. These results also hold true under SIMU4 when a sales tax is replaced by a value added tax and tariffs fall to zero. The poorest households in both urban and rural sector gain from trade reform when a sales tax is in place (SIMU3), while the poorest urban household lose and the poorest rural household gain less from trade reform when a value added tax is in place (SIMU4). Considering its effect on poverty, these results show that trade reform is harder to implement when a value added tax is in place compared to a sales tax.

The exchange rate depreciates more under SIMU3 compared to SIMU4. The consumer price index is, therefore, higher under the former scenario compared to the latter. Government revenue is lower under SIMU4 compared to SIMU3. This result provides further evidence that value added tax increases the difficulty of implementing trade reform.

Exports of almost all goods increase and apart from services, imports increase more under SIMU4 compared to SIMU3. With the exception of "Other Services" sector, output of all sectors is higher under SIMU4 compared to SIMU3.

V. Sensitivity Analysis

Following Breisinger et al. (2018), the above four simulations were rerun under elasticity of substitution between imports and domestic goods and elasticity of substitution between exports and domestic goods of 5.05. The major results related to the impact of sales and value added taxes—as well as their interaction with trade reform—on household welfare remains unchanged. The same results pertaining to the exchange rate and government revenue continue to hold.

VI. Conclusion and Policy Implications

This paper investigated the merits of replacing a sales tax with a value added tax in the case of Egypt. Simulation results using a static CGE model show that this was a step in the right direction. Although both types of taxes proved to be regressive in the case of both urban and rural households, the value added tax was found to be less regressive than sales tax particularly for the rural household. Given that most of the poor reside in rural areas, the value added tax can be considered pro-poor relative to sales tax.

The value added tax was also found to be deflationary, a result that again stands in contrast to what was reported in previous studies. Analyzing the impact of value added tax versus sales tax on government revenue is complicated due to the fact that the exchange rate is flexible. Model results show that government revenue would not necessarily fall as sales taxes are removed due to the depreciation of the exchange rate. On the other hand, government revenue falls as the sales tax is replaced by a value added tax given the appreciation of the currency. That is under a flexible exchange rate regime, a value added tax need not necessarily increase government revenue compared to a sales tax. Regarding the interaction of trade reform with sales versus value added tax, simulation results show that the value added tax renders trade reform harder to implement. This is true when the effect on both welfare of the poor or on government revenue are considered.

One caveat with the analysis conducted in this paper lies in the static nature of the model used. The value added tax is likely to affect investment and hence growth, which would in turn affect simulation results. The task of future research is thus to examine the economywide implications of implementing a value added tax using a dynamic general equilibrium model.

Appendix. How VAT was implemented in the model

$$\mathrm{QVA} = \alpha\left(\sum_{f \varepsilon F}^{n} \delta_f \ QF_f^{-\rho}\right)^{-1/\rho}$$

$$\mathrm{WF}_f = \mathrm{PVA}\ (1\text{-tva})\ \mathrm{QVA}\left(\sum_{f \varepsilon F}^{n} \delta_f \ QF_f^{-\rho}\right)^{-1} \delta_f \ QF_f^{-\rho-1}$$

QVA= Value added

QF_f =quantity demanded of factor of production f

PVA=value added price

δ_f =CES share parameter

ρ =CES exponent

tva=value added tax

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