

The Income Tax Impact on Macroeconomic Indicators: A CGE Inquest for Pakistan Economy

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Abstract

This study is to analyze the impact of increase in income tax on Pakistan economy's selected indicators like GDP, national income, imports, exports, balance of trade, private and public sector investment. The assessment utilizes latest SAM 2010-11, developed by Dorosh et al. (2015), for Pakistan's economy and uses a Computable General Equilibrium Model, consistent with Lofgren et al. (2002). To investigate the effect, two experiments of a 5%, and 10% increase in income tax are performed. The results reveal that increase in direct tax results in improvement with regards to all important macroeconomic indicators. However, rural households' categories express lesser improvement in comparison to urban households' groups. Our experiment suggests that increase in income tax should steadily be implemented to overcome the deficit in public budget.

Keywords: income tax, macroeconomic indicators, computable general equilibrium model, social accounting matrix, deficit, budget.

Introduction

Economic strategies influence macro-indicators by means of various procedures. To achieve a sustainable economic development a balanced budget is essential. Budget deficit remains a serious matter in the history of Pakistan's economy, consequently, poverty and income inequality increase, welfare diminishes, and some other important macroeconomic indicators deteriorate. All this trend is a decisive obstacle to the growth of the economy.

Cut in public spending is not easy in underdeveloped economies like Pakistan, thus, the most effective instrument to decrease the budget deficit is an increase in existing rates of taxes or imposing new taxes. Fiscal policy can be deemed as a measure to balance inequality gaps and its influences on households which are extremely vital.

The main purpose of the present simulation test is to calculate the effects of increasing income tax on some particular macro indicators

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of Pakistan economy in general. This study establishes the impacts of fiscal reforms for macroeconomic stability by using the static CGE Model to focus the problem that what develops if a country steps to any other exogenous structure.

Literature Review

Fiscal policy is conducted through the public budget, which is an important plan for managing the public sector. An important feature is its treatment like a tool in the country's administration (Olawunmi and Ayinla, 2007). Fiscal deficit explains the sum of borrowed amount of funds by the government to entirely meet its expenditure. Despite the fact that public's realized incomes are frequently more than the budgeted values in some countries, extra-budgetary expenditure has been increasing swiftly and consequently fiscal deficit (Wosowei, 2013).

Ramos and Robert (2007) explored the redistribution impact of fiscal policy of UK and expressed that public spending increase the income distribution even if the country's tax system is progressive. Taxes deteriorate the income distribution and extremely indirect taxes negatively impact and consequently influence the welfare.

Devarajan et al. (1988) examined the use of CGE Models to problems of taxation and natural resources in developing economies. Application to these resource issues fall into three kinds: energy management models, Dutch disease models, and optimal depletion models. The analysis divides the application of CGE models to taxation into positive and normative investigations. The investigator realized that these are achieved to be at variance with recommendations for tax reforms based on rules-of-thumb.

For Thailand, Devarajan et al. (1991) analyzed the impact of proposed VAT reforms. The study used a multi-sector general equilibrium model and data from Social Accounting Matrix 1987. The investigators adopted four cases with various GST tax rates and excise. They selected producers exporting and agriculture sectors as winner and some non-tradable service sectors as loser. Their study conclude that GST would raise public revenue and had a marginally positive effect on distribution of income.

Go et al. (2005) assessed revenue, welfare and distributional effect of tax reforms of South Africa by CGE Model, formed by Lofgren et al. (2001) for IFPRI. The study regard 2003 as the base period and used data from the Social Accounting Matrix (SAM) developed by Claude Van Der Merwe from Quantec. The investigators solved simulations through GAMS and solver PATH. The assessors utilized CES function for production. They coped 4 simulations for the analysis like elimination of VAT, VAT increase by 50%, zero VAT

for food, and lastly replaced tariff with identical VAT. The analysis concluded that VAT positively influenced the tax structure and negatively the welfare of the low-income groups.

Focusing on VAT, Sajadifar et al. (2012) estimated the impact of Iran's tax reforms by utilizing a CGE Model adjusting the data of numerous sources such as national accounts, input-output data etc. They simulated outcomes for three VAT rates like 3%, 4%, and 10%. They verified that public revenue was raised whereas household welfare was worsened. Employing VAT lowered GDP. They proposed that to increase public revenue, the government should increase the rate of value added tax.

Taxation induced distortions impact on private agent's decisions negatively in terms of factor accumulation and supply; therefore, may affect growth. Taxing is considered as a short-period fiscal policy tool and it impacts the long-period growth (Zagler and Dürnecker, 2003). The net impact of taxes, is implicit to be the difference between the favorable impacts from productive public spending and the unfavorable impact of taxation on growth. (Engen and Skinner, 1996; Ferretti and Roubini, 1998).

Research Methodology

This analysis focused CGE Modeling technique to estimate the effect of fiscal shocks on macro indicators of the Pakistan economy. A CGE Model is employed on reliable and updated statistical facts in the form of input-output table about different sectors of Pakistan economy. The macroeconomic challenges to the economy are identified through the support of created equations for CGE Model and then the policies are recommended to solve these problems. The mathematical equation formed for this analysis confirm that the criterion regarding outputs markets, factors markets, savings, investments, government as well as current account balances are totally satiated. A standard static model is used this assessment and hence it does not consider the changes of second period.

Dorosh et al. (2015) developed the SAM (172 X 172) 2010-11, comprises 64 activities, 63 commodities, 12 factors, 16 types of the households, and 17 other accounts. We segregated these inputs-outputs into 47 X 47 for analyzing the economy in simple, into 9 activities, 9 commodities, 3 factors, 16 households, and 10 other accounts. After condensing the SAM 2010-11, it consists the activities as well as commodities like; Agriculture (AGRI), Mining (MINE), Food Manufacturing (FMAN), Cotton Lint/Yarn (YARN), Textiles (TEXT), Leather (LEAT), Other Manufacturing (MANF), Energy (ENRG), and Services (SER), the factors like; Labor (LAB), Land (LND), and Capital (CAP), and the institutions like; households [Rural

Small Farmer – Quartile 1 (H-RS1), Rural Small Farmer – Quartile 2,3,4 (H-RS234), Rural Medium Farmer – Quartile 1 (H-RM1), Rural Medium Farmer – Quartile 2,3,4 (H-RM234), Rural Landless Farmer – Quartile 1 (H-RL1), Rural landless Farmer – Quartile 2,3,4 (H-RL234), Rural Farm Worker – Quartile 1 (H-RW1), Rural Farm Worker – Quartile – 2,3,4 (H-RW234), Rural Non-Farm – Quartile 1 (H-RN1), Rural Non-Farm – Quartile 2 (H-RN2), Rural Non-Farm – Quartile 3 (H-RN3), Rural Non-Farm – Quartile 4 (H-RN4), Urban – Quartile 1 (H-U1), Urban – Quartile 2 (H-U2), Urban – Quartile 3 (H-U3), Urban – Quartile 4 (H-U4)], transaction (TRC), enterprise (ENT), government (GOV), subsidies (SUB), sales tax (STAX), import duty (MTAX), rebate (ETAX), direct tax (DTAX), saving-investment (S-I), and rest of the world (ROW). The created equations describe the interrelationship of the whole economy.

The SAM demonstrates real amounts for the coefficients in formed equalities due to a measurement scheme. The model is firstly solved for equilibrium and then it is shocked with change in the values of chosen exogenous variables. For equilibrium values and for the changes in endogenous values, the model is solved once more. Finally, results are compared with the base year equilibrium values and in this way, the impact of exogenous shocks is measured. The model contains four blocks of the equations. (*Note: Equations can be provided by the authors on personal demand*)

Price Block

The price block includes the set of equations in which endogenous prices are associated to some other endogenous or exogenous prices as well as to some non-price variables of the model. Product's manufacturer value of the activity is shown by PX, which includes taxes on activity as well as factors in the production process. PE denotes the export price of the product including taxes whereas PM symbolizes the import price of the product after counting tariff.

Production and Commodity Block

In the production block of a CGE Model, the factors when decided, are combined with the fixed share intermediates applying a Leontief specification. Moreover, the model also assumes that each activity produces one commodity only.

CGEM-Pk's Production and commodity blocks comprise.

- a) Domestic output and input employment.
- b) Domestic output allocation to domestic market and exports.
- c) Domestic market supply aggregation.

Cobb-Douglas production function for a Constant Elasticity of Substitution (CES) is used to attain the relationship between input utilize and the levels of activity.

Institution Block

The main institutions of this model are households, government, and enterprise. Households are the owners of all the factors. In CGEM-Pk, rewards from the factors are divided up across two groups of the households. Capital reward does not go to the households only, rather it also goes to the government and enterprises as a part of the incomes of capital as per their primary capital endowment. Taxes are the key source of government revenue. If the spending of government increases, the phenomenon is termed as budget deficit. Which is financed through borrowing from the capital market. The role of government in the CGEM-Pk is like a consumer. The expenditure of the government is fixed.

System Constraint Block

Behavioral equations require constraints for macroeconomic stability. Factors supplied should be equal to the factors employed in activities along with unemployed in factors and composite commodity markets. Likewise, foreign exchange earnings and spending equality is levied on current account balance for the rest of world. In the same way, saving-investment balance constraint is also stated. To manage this balance, an elastic scalar over every non-governmental institution is multiplied by the rates of savings.

Price Normalization

CGE is zero-degree homogeneous model. The price normalization equation is crafted to confirm single solution only, which reforms the measure of consumer price index.

Model Closure

The CGE Model includes endogenous as well as exogenous variables. The idiosyncratic equilibrium is possible only if the number of equations and the numeral of endogenous variables are exactly equal. CGE Model closure supposes fixed foreign savings and thus flexible exchange rate is used to clear the current account. To support saving-investment account, saving-driven-investment is assumed. The model believe capital as activity specific as well as totally employed. The model indicates 'Capital' as a key factor in all types of the activities.

Structure of Social Accounting Matrix 2010-11

The structure of the SAM 2010-11 offers comprehensive outline of Pakistan economy. It shows the relationship amongst the economic maneuvers in investment, production, and consumption. The SAM consists 14 major accounts of the economy. In the SAM, nine activities (A1-A9) shown row-wise intersect column-wise nine commodities imply production of every commodity by every sector/activity, as denoted diagonally. Similarly, nine commodities (C1-C9) interconnecting sixteen types of households (H1-H16), transaction cost (TRC), enterprise (ENT), and government (GOV) indicates final demand of each institution. The energy is produced and consumed within the economy, so it cannot be traded.

The accounts in column headed government (GOV) against the row of commodities (C1-C9) conveys indirect taxes on different commodities. Likewise, the column for saving-investment (S-I) against these commodities expresses investment spending on these commodities. The column titled as ROW means Pakistan exports to rest of the world. The import of commodities (C1-C9) are displayed by the row headed by ROW.

The factor income and sources are revealed in factor account. Twelve types of household i.e., H1 to H12 are categorized as per their land ownership and activities, whereas remaining four, i.e., H13 to H16 are ranked living in Pakistan urban areas. The expenditure of enterprises is listed by savings and transfers to institutions. Enterprises obtain gross profit on their capital account. The columns and rows titled GOV verify government expenditures and revenues, respectively.

The capital account verifies, how savings of the institutions finance investment. The account of the rest of world reports Pakistan exports to and imports from the international markets. In SAM, demand for imports is shown by the row denoted by ROW beside commodities (C1-C9) column at the same time represents the income of the world also. The column S-I shows the equality in income and expenditures of the rows of world through sum of foreign savings in the capital account. It is the current account balance of BOP. (*Note: SAM can be provided by the authors on personal demand*)

Trade Elasticities

The Armington elasticity is used to describe the domestic product's intensity substituted with imported one in CGEM-Pk. If this elasticity is higher, it reflects that imported product ensue reliable alternates for the domestic product and vice-versa.

Results

The increase in income tax by 5% and 10% results into increase in Pakistan's GDP by 0.003% and 0.006% in simulation-I and -II, respectively. Likewise, GDP at market price from expenditure as well as from income sides, also increases by 0.006%, 0.012% and 0.004%, 0.009%. Government consumption also indicates positive response by 0.002% and 0.004%. Increase in investment, exports, imports, and tax seems by 0.759% & 1.518%, 0.035% & 0.070%, 0.027% & 0.055%, and 0.026% & 0.051% in simulation I and II, respectively. While there appears negative impact on private consumption by 0.102% and 0.205%. The effect of increase in income tax on foreign trade appears positive and shows that this action helps into correcting the adversity of the balance of payments. Investment is encouraged high as compared to all other variables. (See Table # 1)

Table No. 1: Nominal GDP Data: (National Income Accounts)

Variable	Base	Simulation-I [5%]		Simulation-II [10%]	
		Shock	%Δ	Shock	%Δ
GDPFC	15255.095	15255.532	0.003	15255.969	0.006
GDPMP1	16320.344	16321.308	0.006	16322.272	0.012
GDPMP2	16370.419	16371.140	0.004	16371.863	0.009
GOVCON	1711.912	1711.945	0.002	1711.977	0.004
INVEST	1954.580	1969.413	0.759	1984.247	1.518
EXP	2778.963	2779.929	0.035	2780.895	0.070
IMP	3667.333	3668.344	0.027	3669.355	0.055
NITAX	1115.324	1115.609	0.026	1115.894	0.051
PRVCON	13542.222	13528.365	-0.102	13514.508	-0.205

Source: Simulation Results

Note: GDPFC is GDP at factor cost, GDPGAP is GDP at market price, GDPMP1 is market price from expenditure side, GDPMP2 is market price from income side, GOVCON is government consumption, INVEST is investment in public and private sectors, EXP is export, IMP is import, NITAX is national income tax, and PRVCON is private consumption

Income of Households

The outcomes of the experiments show slight negative impact on six categories of small, medium, and large rural farmers, whereas, other all ten groups are benefitted, though minor. Comparing the negative impact, the highly suffered are all the rural medium households, i.e., H-RM1 and H-RM234. The percentage change of both the shocks they face are -0.011%, -0.022% and -0.010%, -0.019% respectively. The impact on farm workers H-RW1 is 0.007%, 0.014% and on H-RW234

it is registered as 0.006%, 0.012% in both tests. Similarly, the impact on all non-farm groups like H-RN1 to H-RN4 is positive. The highest recorded impact is on H-RN1, which is noted as 0.008%, and 0.016%. All the categories of urban households represent positive growth rate in both simulations, that is, H-U1 (0.006%, 0.011%), H-U2 (0.006%, 0.012%), H-U3 (0.005%, 0.010%), and H-U4 (0.003%, 0.006%). (see, Table No. 3)

Table No. 3: Income of Households

Households	Base	Simulation-I [5%]		Simulation-II [10%]	
		Shock	%Δ	Shock	%Δ
H-RS1	266.794	266.781	-0.005	266.767	-0.010
H-RS234	2162.746	2162.651	-0.004	2162.557	-0.009
H-RM1	14.465	14.463	-0.011	14.462	-0.022
H-RM234	863.868	863.785	-0.010	863.703	-0.019
H-RL1	196.529	196.511	-0.009	196.492	-0.019
H-RL234	932.712	932.653	-0.006	932.593	-0.013
H-RW1	200.420	200.434	0.007	200.448	0.014
H-RW234	620.021	620.059	0.006	620.097	0.012
H-RN1	400.802	400.834	0.008	400.866	0.016
H-RN2	556.320	556.356	0.007	556.393	0.013
H-RN3	754.234	754.274	0.005	754.315	0.011
H-RN4	1297.821	1297.864	0.003	1297.908	0.007
H-U1	232.361	232.375	0.006	232.388	0.011
H-U2	565.192	565.226	0.006	565.259	0.012
H-U3	1207.981	1208.041	0.005	1208.101	0.010
H-U4	6499.509	6499.702	0.003	6499.895	0.006

Source: Simulation Results

Balance of Trade

Except food manufacturing and leather, the impact is positive on trade balance in both the simulations, whereas, the effect on all the selected commodities except mines, manufacturing, and services reveals negative trend. The outcomes also indicate remarkable increase in exportable and reduction in importable goods at home. Thus, this action improves trade balance position of Pakistan. An increase in income tax results into growth in export of agricultural products by 0.015% and 0.029%, mines by 0.040% and 0.079%, yarn by 0.010% and 0.020%, textile by 0.046% and 0.092%, manufacturing by 0.070% and 0.139%, and services by 0.042% and 0.084%, respectively (see table # 5). Table no. 5 and 6 indicates positive impact of income tax on export and import of three items like: mine,

manufacturing, and services. Growth of exports is more than the imports. In mine export is 0.040% and 0.079% while import is 0.026% and 0.051%, in manufacturing exports is verified by 0.070% and 0.139%, whereas import by 0.056% and 113%, and in services export is noted by 0.042% and 0.084%, while import by 0.026% and 0.052%. Thus, the net result is favorable impact on balance of trade. Increase in income tax reveals adverse impact on import of products like agricultural commodities, food manufacturing, yarn, textile, and leather. Which is recorded as -0.066% and -0.132%, -0.099% and -0.198%, -0.034% and -0.068%, -0.49% and -0.98%, and -0.057% and -0.114% respectively. All this indicates favorable impact on trade balance.

Table No. 5: Quantity of Exports for Commodities

Commodities	Base	Simulation-I [5%]		Simulation-II [10%]	
		Shocked	%Δ	Shocked	%Δ
C-AGRI	82.769	82.781	0.015	82.794	0.029
C-MINE	59.731	59.755	0.040	59.779	0.079
C-FMAN	318.911	318.761	-0.047	318.611	-0.094
C-YARN	499.595	499.645	0.010	499.696	0.020
C-TEXT	999.712	1000.171	0.046	1000.630	0.092
C-LEAT	97.557	97.552	-0.004	97.548	-0.009
C-MANF	435.110	435.414	0.070	435.717	0.139
C-SER	272.101	272.215	0.042	272.329	0.084

Source: Simulation Results

Table No 6: Quantity of Imports for Commodities

Commodities	Base	Simulation-I [5%]		Simulation-II [10%]	
		Shocked	%Δ	Shocked	%Δ
C-AGRI	160.616	160.510	-0.066	160.403	-0.132
C-MINE	406.733	406.838	0.026	406.942	0.051
C-FMAN	421.239	420.822	-0.099	420.405	-0.198
C-YARN	108.664	108.627	-0.034	108.590	-0.068
C-TEXT	160.194	160.115	-0.049	160.037	-0.098
C-LEAT	11.901	11.894	-0.057	11.887	-0.114
C-MANF	2340.378	2341.697	0.056	2343.017	0.113
C-SER	335.117	335.204	0.026	335.292	0.052

Source: Simulation Results

Conclusion

The outcomes reveal that the tests present positive impacts on all the eminent selected macroeconomic indicators. Although few variables show adverse effect as well. Hence, the economic activities boosted up. Considering all the above discussed results, the study

suggests that an increase in income tax can be instigated gradually. Rural household categories show a comparatively small rise over than urbans. Thus, the empirical evidence supports to increase in direct tax.

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