`

# IMPLICATIONS OF FISCAL REFORMS FOR MACROECONOMIC STABILITY IN PAKISTAN: A COMPUTABLE GENERAL EQUILIBRIUM ANALYSIS


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بسم الله الرحمن الرحيم

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***DEDICATED***

*to*

***my wife, daughters, and sons***

*who,*

for the last five years

have generally forgone many pleasures

*and*

have spent many lonely hours

because of my research

that took up a great deal of my time

# FINAL APPROVAL

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*Date: Oct 23, 2020*

This is to certify that we have read the thesis of ***Ghulam Moeen-ud-Din*** bearing Registration No. **139-SEP/PHD/F14**. It is our judgment that the thesis is of sufficient standard to warrant the acceptance by International Islamic University, Islamabad for the award of the degree of **Philosophy of Doctorate in Economics.**

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# DECLARATION

I, **Ghulam Moeen-ud-Din S/O Ghulam Yasin,** Registration No. 139-SE/Ph.D./F14 student of Ph.D. Economics at the School of Economics, International Institute of Islamic Economics, International Islamic University, Islamabad do hereby solemnly declare that the thesis entitled:

**“Implications of Fiscal Reforms**
**For Macroeconomic Stability in Pakistan:**
**A Computable General Equilibrium Analysis”**

submitted by me in partial fulfillment of a Ph.D. *degree in Economics,* is my original work, except where otherwise acknowledged in the text, and has not been submitted or published earlier and shall not, in future, be submitted by me for obtaining any degree from this or any other university or institution.

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# ABSTRACT

Fiscal tools perform an efficient role in stabilizing the country and attaining the macroeconomic goals. Macroeconomic effects of public spending and public revenues and effects of these on the common structure of the economy have been examined through different empirical techniques employed by different investigators in various countries as well as in Pakistan. Pakistan has been experiencing a huge budget deficit in the current years. Fiscal tools have a very important role to play in the country`s economic performance and stability. Positive fiscal reforms may convalesce the economic performance of the country and can break the budget deficit continuity. This research focus on achieving economic stability through the implication of fiscal instruments separately and/or collectively. In this study, further than erstwhile investigations, implementation of the subject is practiced by the utilization of Computable General Equilibrium (CGE) Modeling technique, an accepted instrument of empirical economic analysis, in General Algebraic Modeling System (GAMS), especially made for byzantine, modeling applications on large scale and adaptable quickly to the new situations, developed by Mujeri and Khondker (2002), Loefgren et al. (2002). In case of Pakistan, few studies examined the fiscal policy effects on macroeconomic variables by using various econometric methodologies, while Ahmed et al. (2011) examined the micro and macroeconomic effect of GST on Pakistan`s economy by applying CGE and micro-simulation structure. Up to the latest report, there is no any published research, that has empirically examined the fiscal shocks` impacts for Pakistan`s macroeconomic stability by employing this instrument. Using most recent Social Accounting Matrix (2010-11) for the economy of Pakistan, formulated by Dorosh et al., comprises 64 activities, 63 commodities, 12 factors, 16 types of the households and 17 other accounts, our study will especially analyze the potential impact of fiscal switches Like, increase in direct taxes or increase in indirect taxes as well as imposition of import duties on macroeconomic variables like, GDP, exports, imports, national income, public and private sector`s investment, balance of trade, welfare, and income inequality in Pakistan. So, we will focus on the implications of fiscal reforms on the sector-wise economic performance of Pakistan by employing a quantifiable instrument in a high-level modeling system for mathematical programming problems and utilizing an economy-wide latest data square-formed frame (that is, 172X172 SAM, summarized into 47X47), in a comprehensive poise pattern. Finally, we will suggest policy channels to reduce the fiscal deficit and to triumph macroeconomic stability.

**Keywords:** Fiscal Deficit, Computable General Equilibrium (CGE) Modeling, General Algebraic Modeling System (GAMS), Social Accounting Matrix (SAM), Macroeconomic Variables. Fiscal Reforms

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***Ghulam Moeen-ud-din***

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| ADP | Annual Development Program |
| AGEM | Applied General Equilibrium Model |
| $AP_a$ | Activity Price |
| APF | Activity Production Function |
| BOP | Balance of Payments |
| BOT | Balance of Trade |
| BVAR | Bayesian Vector Autoregression |
| CAB | Current Account Balance |
| CES | Constant Elasticity of Substitution |
| CET | Constant Elasticity of Transformation |
| CGE | Computable General Equilibrium |
| CGEM | Computable General Equilibrium Model |
| CGEM-Pk | Computable General Equilibrium Model of Pakistan |
| CM | Commodity Market |
| CSF | Composite Supply Function |
| CSF | Coalition Support Fund |
| DOV | Domestic Output Value |
| DSGE | Dynamic Stochastic General Equilibrium |
| ECM | Error Correction Mechanism |
| ENT | Enterprise |
| EXR | Exchange Rate |
| FBR | Federal Board of Revenue |
| FI | Factor Income |
| FM | Factor Market |
| FRDL | Fiscal Responsibility and Debt Limitation |

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|---|---|
| FS | Foreign Savings |
| FY | Fiscal Year / Financial Year |
| GATT | General Agreement on Trade and Tariff |
| GAMS | General Algebraic Modeling System |
| GDP | Gross Domestic Product |
| GEM | Generalized Equilibrium Modeling |
| GEP | General Equilibrium Programming |
| GST | General Sales Tax |
| HCD | Household Consumption Demand |
| HI | Household Income |
| HIES | Household Integrated Economic Survey |
| IFPRI | International Food Policy Research Institute |
| ITC | Income Tax Committee |
| LDC | Less Developed Country |
| LES | Linear Expenditure System |
| MFN | Most Favored Nations |
| NFC | National Finance Commission |
| NTRC | National Tax Reform Commission |
| OECD | Organization for Economic Co-operation and Development |
| OLG | Over-Lapping Generation |
| OLS | Ordinary Least Square |
| PD | Domestic Demand Price |
| $PE_c$ | Export Price |
| PES | Pakistan Economic Survey |
| PIHS | Pakistan Integrated Households Survey |
| $PM_c$ | Import Price |
| PPP | Purchasing Power Parity |

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| | |
|---|---|
| PQ | Price of Composite Commodities |
| PRHS | Pakistan Rural Households Survey |
| PS | Domestic Supply Price |
| PSE | Pakistan Stock Exchange |
| PX | Producer Price |
| $PVA_a$ | Price of Value Added |
| $QF_{fa}$ | Factor Demand |
| $QX_c$ | Output Function |
| R&D | Research and Development |
| ROW | Rest of the World |
| SAM | Social Accounting Matrix |
| SAP | Structural Adjustment Program |
| SAS | Self-Assessment Scheme |
| SCTS | Social Cash Transfer Scheme |
| SIB | Saving-Investment Balance |
| SROs | Statutory Regulatory Authority |
| STPF | Special Trade Promotional Funding |
| STPF | Strategic Trade Policy Framework |
| STT | Security Transaction Tax |
| SVAR | Structural Vector Autoregression |
| SVECM | Structural Vector Error Correction Model |
| TIC | Taxation Inquiry Committee |
| TVP-VAR | Time-Varying Parameter – Vector Autoregression |
| VAR | Vector Autoregression |
| VAT | Value Added Tax |
| WAEMU | West African Economic and Monetary Union |
| WTO | World Trade Organization |

# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

Governments conventionally target to promote robust and sustainable economic growth, welfare, and continuing poverty reduction. Governments implements high quality fiscal reforms to mobilize domestic savings, increase resource allocation efficiency, and direct to achieve development and growth ends. The instruments of fiscal policy are the measures through which a government acclimatizes its expenditure level to observe and influence the economy. Fiscal policy is applied along with the monetary policy, which the country`s central bank exercises to impact money supply in the country. The aims of these two major policies comprise price stability, reducing poverty levels as well as foreign debts, achieving full employment, favorable balance of payments, and high sustainable economic growth.

The developing economies with serious macroeconomic inequalities crave to stabilize their countries in order to maintain economic growth. Reducing fiscal deficit – by fiscal and/or monetary policy instruments – is an imperative element in the process of achieving economic stability. The tax systems in developing countries are not advanced, causing very small amounts of revenue with high costs of inadequacy as well as inequality.

Fiscal policy is traditionally linked with the treatment of government spending and taxation to effect economic activities and its implementation is basically channeled through public budget (Olawunmi and Ayinla, 2007). Through Fiscal policy, governments adjust their expenditure levels to affect the economic condition of the country. This strategy works as an influential instrument to control the total demand (The Strategist, 2013). Keeping in view the country`s standing state, authority implement contractionary or expansionary strategies of fiscal matters. Contractionary measures reduce the total demand while expansionary measures result into increase in aggregate demand.

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Literature shows several opinions regarding the suitable coefficient, annexed with fiscal view. Academically, there are three traditional measures of fiscal policy, like; taxation, public expenditure, and deficits. The literature reveals different measures as fiscal policy illustrative. The investigators like Rebelo (1991), Stokey and Rebelo (1995), Engen and Skinner (1996) used tax rates as a proxy, whereas Martin and Fardmanesh (1990) and Easterly and Rebelo (1993) utilized deficits as measure in their assessments. However, researcher like Barro (1990) treated public spending to estimate fiscal stance. Whilst public spending is counted as a fiscal instrument several researches respected aggregate public spending as a single variable whereas some other investigators regarded this instrument that it should be decomposed into numerous classes. Subsequently, former experimental findings vary between different analyses as highlighted the sensitivity of the results to variations in the control variables set (Levine and Renelt, 1992). Likewise, they opine that not a single of these three measures has a strong correlation with economic growth while investigated separately. Ocran (2011) indicates that a third-generation aspect and economic growth has appeared which tries to investigate the arrangement of at least two fiscal tools simultaneously.

An important snag with prior researches associated to Pakistan economy is the incapability to employ the combinations of not only the fiscal but also along with this to check the tariff abolition impact on macroeconomic stability of Pakistan economy. Previous investigations concentrated on the impact of public planned expenditure on development of the economy through selecting partly taxation tools and/or tariff impact in this regard. The present analysis includes the impacts of economic reforms on macroeconomic stability in the light of the fiscal policy`s structure by testing the various simulations regarding increasing direct taxes, decreasing indirect taxes, increasing direct and decreasing indirect taxes simultaneously, as well as reduction or abolition of tariff on macroeconomic stability in Pakistan. And above all, the implications of fiscal reforms on few major selected macroeconomic variables by the means of employing Computable General Equilibrium (CGE) Model and using most recent Social Accounting Matrix (SAM 2010-11) prepared by Dorosh et al., 2015.

The very intent of this chapter is to provide an overview of Pakistan`s economy with respect to its fiscal and trade policies over the years. Next is to discuss the budget as well as the trade deficit. Similarly, further is to form an overall strategy within which one can realize rationalization for additional experiment by demonstrating main sources of Pakistan`s taxation as well as trade pattern; that is, direct and indirect tax effect and the effect of tariff abolition not only on macroeconomic key variables but also upon welfare/ inequality of the households.

Section 1.2 (Fiscal Policy) presents its common objectives and tasks in the light of classists, Keynesians, and modern economists for attaining macroeconomic stability. Section 1.3 (Pakistan`s Fiscal Policy) highlights the fiscal policy of Pakistan with the budget deficit and trend analysis of the fiscal deficit in its subsections. Section 1.4 (Direct and Indirect Tax Effect) focuses on income and sales taxes and in its sub section, on their brief history in Pakistan. Section 1.5 (Pakistan`s Trade Policy) examines critically the country`s trade policy. Section 1.6 (Tariff Abolition Effect) is dedicated to describing a brief history of international trade agreement and tariff liberalization with reference to developing countries. Section 1.7 (Research Objectives) presents the main aims of the research. Section 1.8 (Research Question) is devoted to the problem to be investigated. Section 1.9 (Significance of the Study) is allocated to describe three things like; effect of fiscal policy on macroeconomic stability of Pakistan, sector-wise economic performance in general equilibrium framework, and computable general equilibrium approach and use of latest social accounting matrix of Pakistan economy. Section 1.10 (Study Plan) is devoted to the overall investigation design. Finally, Section 1.11 (Summary and Conclusion) concludes the chapter.

## 1.2 Fiscal Policy

Fiscal policy refers to planned changes in public spending and taxes as instruments to accelerate economic activity and it transmits through the government budget. Government spending on goods and services are one component of aggregate demand and therefore, directly influence the level of economic activity. Conversely, transfer payments and taxes, affect disposable income and consequently indirectly influences the other two foremost components of aggregate demand, that is, consumption and investment spending.

The principal target of macroeconomic policies is to attain sustainable economic growth. The components which affect economic growth include the availability of physical as well as human capital, skilled labor supply, and scientific or technological

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enhancement. The Government practices fiscal policy and other related macroeconomic strategies to affect these factors and to produce the desired change in the economy`s real sector. In this regard the government increase its expenditure on development of the infrastructure of the country to increase the opportunities of employment of all the available physical as well as human resources in optimal ways. Which ultimately results into encourage the income level and uplifting the economic condition of the economy.

Keynesians claim, fiscal policy is essential and that changes in the government spending are more effective in managing the country, and simultaneous changes in trade policy impact on the country`s macroeconomic variables, welfare/ inequality also. An inflow of the foreign financial investment files a trade deficit, whereas an outflow leads to a surplus. The link between twin deficits, that is, between budget deficits and trade deficits is that when the government forms a budget deficit through any pattern of tax cuts or increases expenditure, aggregate demand will increase, which will result into boosting the imports. Increase in imports, with fixed exports will lead to trade deficit. The function of fiscal policy, as well as trade policy as the operational economic policy instruments for attaining sustainable economic development and growth, is well documented in the literature. Free Trade may have an indirect impact on growth through fiscal policy if, as Rodrik (1998) and Cameron (1982) state, economies, open to foreign trade, have larger governments.

Classical economists had conceptualized the marginal role of the state in economic activities, leaving the market`s internal mechanisms to normalize the economy and considered nurturing long-run growth through cautiously designed tax systems and spending programs (The Effictiveness of Fiscal Policy in Stimulating Economic Activity - A Review of the Literature, 2002). Recent investigators place increasing weight to employ easy fiscal policy and its possible function in accelerating economic growth (Ciavazzi and Pagano, 1990).

Classical-Keynesian tradition expects fiscal expansion effect on economic growth to be positive, and negative when fiscal contraction policy is practiced. To achieve the economy`s desired targets and to attain its satiated capacity, the country has to pursue the economic planning approach in production, distribution and state economic sectors. By implementing national economic and fiscal outlined plans properly and adopting appropriate control techniques, numerous economies have attained significant rates of

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development and growth in both the private and public sectors. It is essential to evaluate the plans and their degree of success in developing macroeconomic variables. Plans and policies lead to be customized to allow for a change in the country.

The fiscal policy task in advanced economies is to sustain full employment and stabilize the rate of growth, while in less advanced economies this doctrine is exercised to produce the environment for swift economic development and growth. Although many developing economies have adopted economic planning, they still endure numerous recurrent problems, like colossal public debt, chronic fiscal imbalances etc., because of inappropriate fiscal policies.

The robust fiscal status is a decisive requisite for attaining economic stability at the macro level. It is progressively more realized and enduring economic growth and ultimately result in reducing the poverty and inequality. To improve the resource allocation efficiency and to achieve the goals of development and growth, domestic savings can be mobilized by the fiscal authorities carefully. Growing inflation, the increasing rate of interest, and crowding out of investment in the private sector can be the result of tax imposing fiscal policy. Thus, the significance of the strong fiscal policy cannot be overstated.

Pakistan`s fiscal policy carries deep-rooted peculiarities of a long imperial history combined with various traditions of distinctive cultures. Military intervention in 1958 played a very significant role in this context. The regime believed that economic backwardness was the result of uncoordinated decisions of previous governments. It was decided that there should be a proper controlling body for economic development. Planning Commission was sanctified for this task.

Pakistan is a federalist structure country. In addition to making its own budget, the Federal Government also allocates resources for provinces/ federating units through the National Finance Commission (NFC) Awards. Provinces also generate and utilize their own funds for their own budgets. Ministry of Finance is the core ministry which coordinates both revenue and spending sides. Figures pertaining to the recurring expenditures of the government business and debt servicing (current expenditures) are put up by the Ministry of Finance (MOF) in consultation with other departments of the government. Whereas, the development expenditures are prepared according to the

Annual Development Program (ADP), developed in consultation with the Planning Commission of Pakistan.

The fiscal policy does not work in isolation. It has strong associations with other macroeconomic strategies and shocks affecting the economy. In the framework of developing economies, like Pakistan, where active fiscal policy or non-Ricardian policy is predicted, large revenues exist and ratchet-up effects of expenditures are found Khalid et al. (2007), fiscal policy is considered as an active policy tool.

Prior literature mostly spun the debate around the comparative consequence of monetary and fiscal policy on macroeconomic activity and examines the relative importance of both the policies on the aggregate economic activity. Consequently, there is a requisite to check the effects of exogenous fiscal shocks on macro level variables of the economy.

The theoretical literature on fiscal policy effects or fiscal reforms on macroeconomic stability, development, and growth is highly developed. The empirical literature related to fiscal policy or reforms can be categorized into three sorts. The type-1 emphases on the appraisal of the macroeconomic effect of substantial diminutions in the budget deficit. The type-2 analysis evaluates the stabilizing ability of the variables of fiscal policy. The type-3 concentrates on the dynamic impact of unrestricted fiscal policy on macroeconomic variables, staged within the vector autoregression structure in the effort of Blanchard and Perotti (1999). The present study is an effort on analyzing the economy-wide implications of fiscal reforms for macroeconomic stability in Pakistan. For this purpose of analysis SAM based CGE Modeling approach is used.

### 1.2.1 Pakistan`s Budget Deficit

A budget deficit occurs when the government payments like purchases and transfer payments are more than the payments received like taxes and other fees by the government.

The economy of Pakistan is represented by huge fiscal deficits like many other countries. The economy of Pakistan realizes it arduous to satiate its inter-temporal limits of the budget with conventional income and borrowing by the government. In addition to the market borrowing, the government creates funds through financial

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repression. That is, (*a*) Public borrowing at less than the prevailing rate of interest in the market. Which is intermediated by the network of banks, which are under government control., (*b*) The setting of the loan rates of financial intermediaries on private domestic credit contrasted from the rate of exchange adjusted intermediate rate of interest.

Since 1991, a new key financing source comes from foreign currency deposits. During the phase between 1965 and 1972, due to internal and international political conflicts, the share of defense expenditure increased. In the early 1970s, the initiation of nationalization policy also contributed to the vast fiscal spending in terms of public investment. This increase in development outlay initially financed by external borrowing was not accompanied by higher revenues. The lack of a political consensus on expanding the tax base has barred any substantive increase in revenues as a percentage of GDP, the deficit remains high due to the political and administrative inability to either raise revenues or reduce (Haque and Montiel, 1991). Accordingly, during the 1980s and 1990s, the policy has been preoccupied with the requirement to contain increasing fiscal deficits and the accompanying boost in public indebtedness and attempts to curb the cost of debt servicing (Haque and Montiel, 1991).

In 1990`s credits controls and ceilings on interest rates inspired dollarization of the economy and the accumulation of large potential quasi-fiscal losses. Empirical studies which investigate the fiscal aspects in Pakistan recommend that a combination of concessionary external finance, imperfect private capital mobility, and relatively fast economic growth have permitted the government to borrow from domestic as well as from foreign sources at the rates below the marginal cost of funds in international private capital markets. Though, the increasing recourse to inland non-bank borrowing in the 1980s, to finance current deficits, rapidly boosted the stock of internal public debt and the magnitude of associated debt servicing (Haque and Montiel, 1991).

Commonly, a rule-based fiscal policy can promote fiscal discipline. It requires the government to devote to a fiscal policy strategy or to specific fiscal focuses that can be monitored. To boost fiscal sustainability and macroeconomic stability, a fiscal policy rule can be used as a tool. In Pakistan, macroeconomic disequilibrium has contributed to slowing in economic growth and investment which in turns was interpreted into a rise in poverty levels. In this framework, a rule-based fiscal policy, enshrined in the

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Fiscal Responsibility and Debt Limitation (FRDL) Act 2005, was passed by Pakistan` Parliament in June 2005. This act is planned to introduce financial discipline and also to ensure responsible and accountable fiscal management by all the governments – present and future, and to encourage the informed public debate about fiscal policy. It necessitates the government to be transparent about all the short- and long-term fiscal intentions and imposes high standards of financial disclosure.

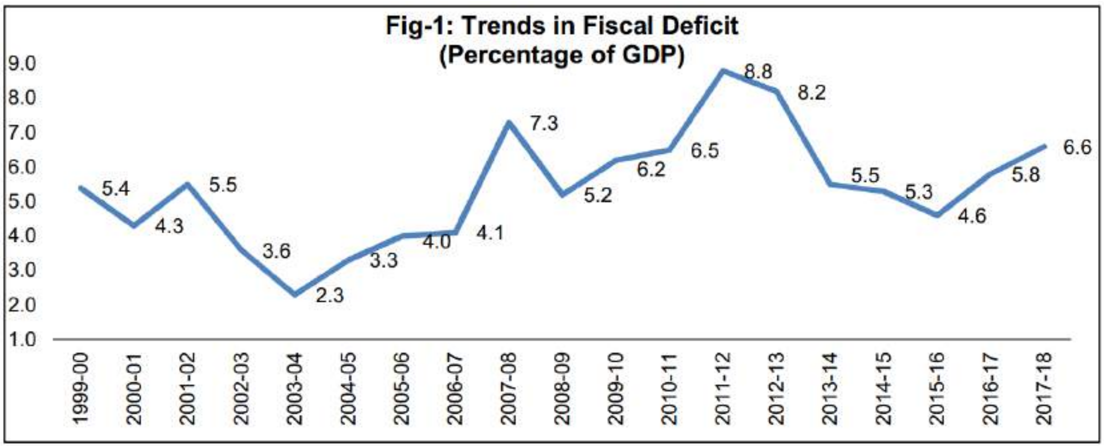


**Figure 0.1 Trend Analysis of the Fiscal Deficit (1990s-2018)**

*Source: Economic Survey of Pakistan & Debt Policy Coordination Office Staff Calculations, Ministry of Finance*

There has been a significant improvement in the fiscal deficit. The overall fiscal deficit which averaged nearly 7% of the GDP in the 1990s has gradually declined to 2.3% in 2002-03 but increased to 3.3% in 2003-04 due to high development spending. The fiscal deficit remained above 4.0% of GDP for the years 2005-06, 2006-07 and 2007-08, mainly due to the earthquake-related and other higher development expenditure, especially towards the financing of the physical and human infrastructure tasks. Government expenditure on the war against the terrorists in the northwest region also contributed to fiscal deficits level.

The decade of 1990's undergone extreme fiscal imbalances. The fiscal performance saw significant improvement during the period 2002-03 to 2006-07 primarily because of (*i*) rescheduling of foreign debt of 12 billion US$ that brought down the debt servicing from 42% in 2000-01 to 22% of the revenue in 2005-06 and (*ii*) massive flows of foreign grants and inflows from Coalition Support Fund (CSF) that raised non-tax revenue. After 2006-07, fiscal performance deteriorated considerably as the average fiscal deficit remained around 7% of the GDP during 2008-13. It was mainly because

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of challenges on internal and external fronts and policy inaction on key matters including harsh security situation, energy lacks, lower tax base, persistent losses posted by ailing Pakistan Stock Exchanges (PSEs), floods and heavy rains, increasing debt servicing obligations, greater than budgeted subsidies and gradual collapse in the socio-economic infrastructure. Trend analysis of fiscal deficit over the years 1992-2018 (Table A.1 Appendix-A) is depicted in Figure 0.1.

The budget deficit in the country was recorded 6% of GDP during the 1970s, 7.6% of GDP in 1980s, while 7% of the GDP in 1990s. After tax reforms instigated in early 2000, total revenue was recorded 13.3% of GDP (2000-01), while in 2001-02 it was increased to 14.2% of the GDP. This rise became achievable due to the rational tax policy of the government. It was also recorded that the government`s expenditures continuously decreased during the fiscal period 2000-01.

The increase in government revenues and a decrease in her expenditures resulted to reduce fiscal deficit to 3% of the GDP during 2000-05 from the 1990s 5.2% of GDP. During 2005-06, it was 3.4% (excluding expenditure on earthquake). For the fiscal period 2006-07, this deficit was leveled at 3.7% of the GDP (excluding expenditure on earthquake).

Pakistan recorded a government budget deficit equal to 5.30% of the country's GDP in 2015. Government budget in Pakistan averaged 2.16% of GDP from 1990 until 2015, reaching all times high of 8.80% of GDP in 1990 and a record low of -8.80% of GDP in 2012.

## 1.3 Direct and Indirect Tax Effect

Fiscal policy leads to changes in tax revenues of an economy, in this way having a substantial effect on public revenue growth, consequently impact the public expenditure, stabilization and consolidation procedure of the whole economic operation of economy, affect the allocation of latest public monetary assets and are also observed as a support for economic growth. Public authorities of each country require to develop for sustainable fiscal and executive measures of changing direct and indirect taxes which lead to long-term economic development and growth.

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Kneller et al. (1999), examined through a panel dataset for 22 OECD economies for 26 years, that is, 1970 to 1995, and concluded that distortionary taxes result into the decrease in growth, whereas non-distortionary taxation scarcely may have any influence. Stoilova and Patonov (2012) verify the impact of direct taxes is significant on economic growth due to their more cost-effectiveness for EU-27 economies` statistical data over 16 years, that is, 1995 to 2010. Indirect taxes show the trend to lower the revenues due to inequality in the indirect taxes structure. On the other hand, Petru-ovidiu (2015) operated an empirical model to analyze the effect of tax structure on economic growth based on panel series associated to 6 countries across Eastern Europe for 18 years, that is, 1995 to 2012. The outcome suggests that direct taxes are significantly related adversely with economic growth, whereas indirect taxes create a favorable impact on the dependent variable of economic growth.

Arnold (2008) realizes that personal income tax and corporate tax have an intensely adverse impact on economic growth, while consumption taxes and immovable property taxes have a favorable impact. Likewise, Myles (2009) affirms that "distortive taxes", that is, personal income tax and corporate income tax, weigh on growth. Acosta-Ormaechea and Yoo (2012) find that for high-income as well as medium-income economies consumption taxes and property taxes are less harmful to growth as compared to income taxes, while personal income taxes and social security contributions (SSC) are more detrimental as compared to corporate income taxes. Conversely, Xing (2012) does not realize any substantial variance between personal and corporate income taxes in terms of their growth friendliness.

Pestel and Sommer (2013) examined a favorable impact on employment in Germany, as a result of an increase in value-added tax (VAT) offset by a decrease in personal income tax. Though, this type of shift causes a regressive effect on households' budget. In another study, Arachi et al. (2015) realize a favorable and significant short-run effect from moving taxation to consumption with a panel of 15 OECD economies. In spite of mixed evidence, this empirical discussion appears to decide that corporate, capital and labor taxes are most harmful to economic growth, while consumption and recurrent property taxes are the slightest detrimental.

Conventional public finance theories state that income taxes are more distortive than consumption taxes. Accordingly, (*i*) income tax multipliers are greater than

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consumption tax multipliers and (*ii*) shifting taxation burden from income to consumption is expansionary (Altig et al., 2003).

Measuring the impact of tax change is severely exigent for (at least) two reasons. (*i*) endogeneity problem, as fiscal policy is occasionally the outcome of random testing. Tax changes are probably to contemporaneously influence different spending elements of GDP, and these changes are also contemporaneously driven by GDP and its elements at the same time. (*ii*), different tax tools are possible to impact the country via different channels, and therefore, lead to notable variations in the transmission mechanism of fiscal policy.

### 1.3.1 Direct and Indirect Tax – A Brief History of Pakistan

The Income Tax Act, (1922) was revised to regulate the taxation order in Pakistan continuously from 1947 by the government of Pakistan. Its provisions were extended to the whole territory of Pakistan except in some particular areas. According to this Act, rates of tax will be fixed every year by the Finance Acts. In 1958, a "Taxation Inquiry Committee (TIC)" was launched. This committee consists of officials as well as few representatives from trade and commerce sector of Pakistan. This committee was to investigate and submit a report after acute examination of prevailing tax Act from all possible angles and suggest some recommendations. On the basis of recommendations suggested by this committee, the authorities amended the Income Tax Act, 1922. In 1944, “PAY AS YOU EARN” scheme was introduced.

The difference in “earned” and “unearned” income was created in 1945 and a few benefits ware offered on the income “earned”. In 1959, the government imposed a super tax on incomes of the individuals of registered companies and firms. Moreover, each portion` rates were stated as income ratio respecting the "Taxation Inquiry Committee" suggestions.

The fiscal year was counted from 1st of April to 31st of March before 1960 then it was changed from 1st of July to 30th of June. After 1960, the Federal Board of Revenue (FBR) announced an "Income Tax Committee (ITC)". The core objective of introducing this committee was to make suggestions for simplifying the taxation procedure of the Income Tax Act, 1922. Before 1965, the tax liability of any person

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was assessed by an assessment officer. In 1965, the government announced a scheme, called "Self-Assessment Scheme (SAS)".

Income Tax Act, 1922 was amended much time up till 1979. Resultantly, the Act became a complex law and complexities evolved in its functioning. The "Income Tax Ordinance, 1979" was new income tax law, declared by the government of Pakistan, owing to the Finance Ordinance on $28^{th}$ of June, 1979 and comprised the hypothesis of void Act. Hence, the advantage of the all-inclusive task law established over past approximately 60 years isn`t delivered futile.

Federal Government established a National Tax Reform Commission (NTRC), consisting Senate and National Assembly members, high ranked government officials and eminent industrialists in 1985. The foremost aim of this commission was to advise technique and channels to develop the prevailing system of Pakistan`s tax acts. An income tax survey was conducted to evaluate the existing taxation system and to attain the proposals and recommendations for improvement in 1999-2000, under Income Tax Ordinance 1979. And also, under the same ordinance, many tax amnesty schemes were launched. The purpose of these schemes was to offer a chance to the people to change their black money into white. This scheme was again introduced in 2002.

To reform the taxation structure, the government of Pakistan announced "The Income Tax Ordinance, 2001" on September 13, 2001. It was published in the Extraordinary Gazette of Pakistan (pages 969-1217). The Ordinance identifies that Income Tax Ordinance, 2001 shall expand to Pakistan`s entire economic area. It also authorizes the Federal Government to notify the date that the Ordinance shall come into force on July $1^{st}$, 2002. This Ordinance overrides other laws enforceable in Pakistan. To revise income tax law in Pakistan as per time necessities, various techniques of amendments can be implemented by the income tax authorities like SROs, Circulars, etc. Finance Act (FA) 2009 is the continuance process of amendment, stated in June each fiscal year.

Income tax is the key and effective source of direct tax. There are some other sources regarded as direct tax like estate tax, wealth and welfare tax, gift tax, and fringe benefits tax, foreign travel tax, capital value tax, workers participation tax, corporate tax. etc. Indirect taxes comprise general sales tax (GST) or consumption tax, customs duty,

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federal excise tax, value-added tax (VAT), entertainment tax, security transaction tax (STT), stamp duty, services tax. Islamabad capital tax, airport value tax, etc.

An increase in value-added tax (VAT) is a very significant development in the tax system of modern times. This type of tax is deemed to have gained as compared to all other types of taxes for the reason that it removes dropping, allows zero exports rating. Moreover, it is broad-based and intricate to evade. Marginally changed the type of value-added tax is a general sales tax (GST) in Pakistan, which was introduced in 1991. It was thought that GST is of regressive type but it was soon proved as progressive (Refaqat, 2003).

Indirect taxes are mostly politically encouraging, as their burden is hidden. Indirect taxes confer a choice to the consumers. A consumer can opt to purchase the commodity or not, assuming that he is well aware of the tax burden to bear. Indirect taxes cannot be increased too high, as the elasticity of demand plays its role. Contrarily, direct taxes are painful.  So, direct tax means a consumption tax, applied directly to households and does not take the form of traditional indirect tax on consumption (Jensen, 1997).

## 1.4 Pakistan`s Trade Policy

Keeping in view modern tendencies in worldwide trading situation and trend in the exports of Pakistan economy, the government of Pakistan planned a mid-term strategic trade policy (2015-18) in 2015, structure by means of an extensive counseling procedure straddling around one year. All the government and private sector stakeholders with Ministries/ Divisions, Federation of Pakistan, Chambers of Commerce and Industry, District Chambers, Trade Missions, Trade Associations, Academia, Private Businesses, Think Tanks, and other Government Agencies were vigorously engaged. The procedure climaxed with a number of hours Advisory Council meeting, chaired by the Minister for Commerce and joined by the stakeholders, renowned exporters and decision-making authorities of the government sector.

Ascertaining from former mid-term structures of the time periods 2009-12 and 2012-15, it had been confirmed that technical and financial restrictions were eliminated in Special Trade Promotional Funding (STPF) 2015-18. Six billion rupees had been sanctioned to carry out trade policy for the year 2015-16. For achieving desired results,

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this monetary support was continued in Fiscal Year 2016-17 and 2017-18. STPF 2015-18 targets to attain annual exports boost to US$ 35 billion, improvement in export competitiveness, changing the economy from factor-driven to efficiency-driven and innovation-driven status, and increasing share in regional trade by June 30, 2018.

To attain these goals, trade policy recommends – competitiveness that is, quality infrastructure, labor efficiency, access to utilities, and technological development - compliance to standards that is, convergence of domestic and global patterns, intellectual stuff protection, and effective & efficient disputes solution system - policy milieu that is, monetary policy, tariff & tax regime, and synergic industrial & investment policies – and market access that is, regional, bilateral, and multilateral STPF 2015-18 pinpointed four supports - product sophistication and diversification that is, research and development (R&D), value addition, and branding - market access that is, enhancing share in existing markets, exploring new markets, trade diplomacy and regionalism – institutional development and strengthening that is, restructuring, capacity building, and new institutions – and trade facilitation that is, reducing the cost of doing business, standardization, and regulatory measures.

## 1.5 Tariff Abolition Effect

It is believed that tariff abolition leads to improve the households welfare, economic development, and economic growth. Michaely et al. (1991) realized free trade as:

> *"any change which leads a country's trade system toward neutrality in the sense of bringing its economy closer to the situation which would prevail if there were no governmental interference"*.

### 1.5.1 International Trade Agreement: A Brief History

Krugman (2008) say, the United States passed a tariff law (Smoot-Hawley Act) in 1930. Tariff rates increased and US trade decreased sharply. Some economists argue that this Act facilitated the Great Depression. Within a few years after the act, the US government decided that it is necessitated to decrease tariff. Reduction in a tariff required to be related to some gains to exporters. The preliminary solution was bilateral tariff negotiations. Although, this type of solution does not receive the maximum benefit of international coordination. Advantages from the bilateral negotiations may

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"spill over" to economies that have not made any discounts. For instance, if the US decreases tariffs on Brazilian coffee, Colombia will also get benefit from the higher world price of coffee. Multilateral negotiations commenced just after the end of World War-II.

After World War-II, in 1947, the General Agreement on Trade and Tariff (GATT) was created by a group of 23 countries. The main sections of this agreement were like reciprocity, tariff reduction, transparency, and Most Favored Nations (MFNs) principle. In Geneva, World Trade Organization (WTO) was instituted in the very start of 1995.

### 1.5.2 Tariff Liberalization and Developing Countries

Economists have generally debated that free trade system is important for economic development and developing countries should have confidence on the market mechanism. These countries should liberalize their economies to international trade. Major intent of trade liberalization is to stimulate economic development by annexing the benefits from trade through effective allocation of available resources, larger competition, technical know-how, larger investment opportunities, faster capital accumulation rate, and technological progress. Moreover, free trade is to accumulate economic development by appropriating the advantages from trade through advanced resource allocation in line with social marginal costs and benefits, and access to improved technologies also (Dornbusch, 1992; Santos-Paulino and Thirlwall, 2015). Similarly, Anderson and Neary (2007) say that tariff reduction serves both domestic and international goals. This policy not only raises home welfare but also expands the approach of other countries to inland markets as entailed by multilateral business agreements under the World Trade Organization (WTO).

Legrain (2006) discusses numerous investigations sustaining the credence that trade liberalization stimulates economic growth in underdeveloped economies. Researches of the nine countries like Chile, Colombia, Egypt, Ghana, India, Israel, Korea, Philippines, and Turkey revealed that trade liberalizing escorted spikier (i.e., accompanied severer) economic growth. Results were substantiated by experiments of nineteen countries like Argentina, Brazil, Chile, Colombia, Greece, Indonesia, Israel, Korea, New Zealand, Pakistan, Peru, Philippines, Portugal, Singapore, Spain, Sri Lanka, Turkey, Uruguay, and Yugoslavia (Demetris Papageorgiou; Michael Michaely

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and Armeane Choksi, 1990). Chile opened up its markets between the period of 1974 to 2000. The economy of Chile grew by nearly 7% a year between the period 1985 to 2000, and reduction in poverty was noticed by more than 50% between the period 1987 to 1998. In the case of Vietnam, reduction in poverty was registered by more than two-thirds in one decade and 50% in the year 1988, as Vietnam began to trade freely.

China started free trade in 1978 and noted growth by the average of 10% per year. China`s standard of living as measured by GDP per head at purchasing power parity (PPP) increase of over 6% per year. In the past two decades, China witnessed the fastest reduction in poverty. China strengthened richer by freeing its economy. China incorporated external trade and investment. China’s exports and imports were equal to 4% of its national income during 1970, which increased to 50% by 2000. China’s share in the world exports increased ten times, from 0.6% in 1977 to 5.8% in 2004 (Latin America and the Caribbean in the World Economy, 2004).

Nenci and Pietrobelli (2008) investigated that free trade promotes Latin American countries` trade. The empirical results impart statistical confirmation to the notion that free trade has been influential in creating a favorable environment for trade promotion. A latest empirical report by Stoilova (2017) improved an econometric model, which is formed on the basis of regressions over a pooled panel data on EU-28 for 1996-2013. This model shows that taxes on output along with tariff had a vaster favorable effect on economic growth.

## 1.6 Research Objectives

Fiscal and trade tools can go a long way for keeping full employment without inflationary and deflationary pressures in underdeveloped economies. The anti-depression tax policy raises disposable income, consumption and investment. The anti-inflationary policy measures abet to plug inflationary gap during deflation.

Major objectives of this study for Pakistan`s economy is:

1. To analyze the impact of fiscal shocks on macroeconomic variables such as GDP, exports, imports, national income, and investment in public as well as in the private sector.

2. To examine that how an increase in direct taxes, and especially decrease in indirect taxes (sales tax – excise, general sales tax on domestic products, general sales tax on imports, surcharges) or imposition of import duties results in a reduction of the budget deficit?
3. To investigate how the export-based sales tax rebates and export-based import duty rebates will reduce the budget deficit?

On the basis of this analysis, the study will suggest policy measures to reduce a budget deficit of Pakistan.

## 1.7 Research Questions

In order to achieve the objectives, the study attempted to answer the following questions:

1. How to reduce the budget deficit by increasing the direct as well as by decreasing the indirect taxes. Among tax policies that can be incorporated into CGE Models are sales taxes, value-added taxes, tariffs on imports, export taxes, personal income taxes, corporate income taxes, wealth taxes, and land taxes. At the same time, subsidies such as price and consumption support can also be analyzed in this regard.
2. How significant is the potential of tax policy as a source of government revenue in Pakistan?
3. Whether fiscal policy instruments separately and/or collectively affect the macroeconomic variables (like GDP, exports, imports, national income, public and private sector`s investment), welfare/ inequality in Pakistan.

## 1.8 The significance of the Study

The literature regarding public policies, principally concerning fiscal policy and growth, shows that the authoritative economic decisions play a very important role in economic growth and development of the economy. Pakistan is facing decreasing growth rate and increasing poverty levels due to macroeconomic imbalances. To attain the objectives, this analysis will make the following contributions, mainly on the empirical front of the literature.

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### 1.8.1 Effect of Fiscal Policy on Macroeconomic Stability of Pakistan

This research provides answers to the questions regarding the stance of fiscal policy and its function to affect macroeconomic stability in Pakistan. Although, there are few studies like, Jooste et al. (2013), Bouakez et al. (2014), Boiciuc (2015), Karagöz and Keskin (2016), Bhattarai and Trzeciakiewicz (2017), etc. on the role of fiscal policy but this investigation differs in the sense that it will employ a different methodology, consider the most recent data about macroeconomic variables. CGE Model is used in this analysis which employs real economic data comprising multi-sector economic pattern and specifies the agents` behavior clearly. It reports numerical findings, calculated from a statistical database and hence produce calculated outcomes in numerical form. Moreover, several elasticities are also included. Handling the huge data in comprehensive way, reaching on concrete results and operable policy recommendation CGE approach is selected for this study.

### 1.8.2 Sector-wise Economic Performance in General Equilibrium Framework

A large number of studies analyzed the effect of monetary and fiscal policies both collectively and/or separately on economic growth. However, there are few researchers who examined the effect of fiscal reforms or policy on economy`s growth but did not cover overall sector wise economic performance of any economy in general equilibrium framework. This study focuses on this gap, especially in Pakistan`s case. Majorly, four experiments like increase in direct tax (i.e., income tax), decrease in indirect tax (i.e., sales tax), increase in direct and decrease in indirect tax simultaneously, and reduction or abolition of tariff, applying different simulations are employed in this research to see the impacts on GDP, exports, imports, national income, public and private investment, and welfare/ inequality of Pakistan economy.

### 1.8.3 Use of Most Recent Social Accounting Matrix (SAM)

This analysis identifies the implications of fiscal reforms for macroeconomic stability in Pakistan using static Computable General Equilibrium (CGE) approach to address the problem that what ensues if a country transfers to any other exogenous position, so it provides comparative static analysis. This research is using the most recent Social Accounting Matrix (SAM) 2010-11, prepared by Dorosh et al. (2015) for the economy

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of Pakistan, especially to analyze the potential impact of fiscal reforms on discussed macroeconomic variables of the economy of Pakistan.

This research aims to suggest that how fiscal policy can be applied as an instrument to boost fiscal sustainability and macroeconomic stability in the economy of Pakistan. An appropriate fiscal policy is a crucial constituent for economic development and growth. In the economic policy debates, fiscal policy is regarded as an instrument employed to abate short-period changes in productivity, employment levels, and fetch the nation closer to its capacity. Budget deficits can be precluded if policymakers empathize the ilk of the relationship between expenditure and revenue.

On the policy side, the nature of the relationship between government expenditure and government revenue can be of three kinds. First, if government revenue causes government spending, budget deficits can be removed or reduced through the policies planned at creating more revenue. Second, if government spending causes government revenue, it indicates government actions as one where it spends first, and later to pay it imposes taxes, which produces capital outflow due to the fear of paying higher taxes in future. Third, the spending decisions are made free of revenue decisions, which can drive to severe budget deficits, since government spending increases more swiftly as compared to government revenues. Therefore, it is essential to examine government spending and government revenues (Gounder et al., 2007).

## 1.9 Data and Sources

The study will utilize Social Accounting Matrix (2010-11) of the Pakistan economy prepared by Dorosh et al. (2015), which comprises 64 activities, 63 commodities, 12 factors, 16 types of the households and 17 other accounts. Accordingly, this is 172 x 172 Matrix. The major accounts to consider in this study are activity, subsidies, sales taxes-excise, sales taxes-GST on domestic, sales taxes-GST on imports, sales taxes-surcharge, import duties, export-based sales tax rebates, export-based import duty rebates and direct taxes. To reduce budget deficit the fiscal shocks on macroeconomic variables like GDP, exports, imports, national income, public and private investment will be considered in a static CGE framework.

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## 1.10 Organization of Thesis

This thesis examines the impact of fiscal shocks on macroeconomic variables of Pakistan economy. The first chapter introduces the problem under investigation with its background and particularly discusses it with special reference to Pakistan and also highlights the objectives, questions, and contribution of the research. The second chapter attempts to discuss and present the methodology used to examine the problem, which is computable general equilibrium (CGE) Model for the economy of Pakistan. The third chapter presents the source of data, that is the most recent Social Accounting Matrix (SAM) of Pakistan 2010-11, developed by Dorosh et al. (2015). The fourth chapter attempts to review the relevant theoretical and empirical literature and also points out the methodologies employed to observe the impact of fiscal policy tools on macroeconomic variables. The fifth chapter explains the impact of direct (income) and indirect (sales) taxes on macroeconomic variables and household's welfare/ inequality, while the sixth chapter describes the impact of the abolition of import tax (tariff) on the same macroeconomic variables. Finally, the seventh chapter summarizes and proposes policy implications for the economic development and growth of Pakistan economy.

## 1.11 Summary and Conclusion

This chapter was dedicated to assessing Pakistan`s fiscal and trade policies over the years. The fiscal and trade condition of Pakistan shows that the pattern of all the selected macroeconomic variables and welfare/ inequality are more or less similar to the other developing countries. If the government of Pakistan increases direct (income) tax, or reduces indirect (sales) tax, or adopts both actions simultaneously, and/or adopts the policy of trade liberalization, that is, reducing or abolition of the tariff, it can achieve the desirable goals.

In this research, the results indicate that the action of increasing direct taxes, decreasing indirect taxes, adopting both actions and/or reducing tariff in various simulations positioned favorable effects on eminent macroeconomic variables like GDP, consumption of households and government, balance of trade position as well as households` welfare in general and reduction in inequality in the Pakistan economy. The empirical evidence supports overall the policies of tax as well as free trade.

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# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

The question of whether changes in the main tools of fiscal policy — both taxation and spending — can affect growth has been widely investigated in the literature. Endogenous growth models for example, Barro (1990) predict that fiscal policy will have temporary as well as permanent effects on growth. Empirical researches on whether taxation or government spending promotes economic growth, however, have produced mixed results.

To stimulate the economic growth, an efficient fiscal policy is needed to be implemented. For developing economies, it is needed to investigate the casual relationship between economic growth, that is, growth of real per-capita GDP, on one side and quantitative fiscal regulation, spending structure, that is, wages, salaries, social services expenditures, development expenditure and on the other side, financing budget deficits by domestic as well as foreign sources, Mahran (2005).

The organized or efficient country interference to increase growth remain core segment of the doctrine of several developing countries. However, tax base in developing countries are smaller as compared to developed countries in terms of a percentage of GNP. Wagner's law, indicates that increase in real GNP per-capita results into increase in demand for social goods relatively more while relatively less for private goods. An economy with low income spends a very high percentage of its GNP on basic requisites of life. After filling these needs, go for comforts/ luxuries like social goods.

Fiscal policy can affect the process of economic growth in an indirect manner by the mean of its key tools like government spending, government income, public debt, and fiscal equilibrium. Government spending directly affect long-run growth if materialized in commodities that are recorded in the economic agents` production function or in the households` utility function. Moreover, public spending along with common services like housing, law and order, security, defense and government services signifies "core" spending, entirely compulsory for controlling the inadequacies caused by different failures of the market and for the economy`s perfect working (Tanzi and Schuknecht, 2000).

Considering public revenues, economic growth is influenced by any tax. Tax affects the households` likings relating to their activities like consumption, savings, investment, and production. The effect of corporate tax is noticed adverse on firms` investment resources and incentives, whereas, households` consumption and savings are adversely affected by tax on wage income. Similarly, due to tax there occurs negative effect on investment in human capital also. The consumption tax also affect preferences of individuals between leisure times and work (Mendoza et al. 1997; Milesi-Ferretti and Roubini, 1998).

Authoritatively, the fiscal policy is channeled through the budget of the government. Therefore, budget is the more important strategy for managing the public sector. It indicates and forms the economy`s way of economic living. An eminent feature of the government budget is its treatment like an instrument in the country`s administration (Olawunmi and Ayinla, 2007). The aim of fiscal policy is to stabilize the economy. Public expenditure increase or government revenue decrease move the country out of a slump; whereas public expenditure decrease or government revenue increase reduces the speed of growth (Dornbusch, 1992).

Fiscal deficit is the difference of the public expenditure and public income including receipts of non-debts capital. This deficit describes the aggregate of borrowed amount of money by public authority to utterly cover its spending (Wosowei, 2013). Fiscal deficit shows public borrowing and increase to its outstanding debt. In spite of the fact that government`s realized incomes are often more than budgeted values in some economies, extra-budgetary spending has been increasing rapidly and hence fiscal deficit (Wosowei, 2013). Reducing the deficit through issuing new notes creates inflation, monetary growth, and depreciation in exchange rate (Wosowei, 2013).

Anyanwu (1997) indicates that the budget deficit in underdeveloped economies is strongly affected through instable political condition along with the government

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expenditure and income management concerns without any visible straight elections impact.

This research determines the effects of fiscal reforms for macro stability in Pakistan economy by utilizing the static CGE Model to focus the question that what results if an economy moves to any other exogenous frame. This analysis is utilizing Pakistan economy`s latest SAM 2010-11 prepared by Dorosh et al. (2015), to investigate the potential effect of fiscal reforms on some selected major macroeconomic variables.

### 2.1.1 Review of Theoretical Studies

The theoretical groundwork for this investigation is principally the endogenous growth theory. This theory advocates the stimulation of level and per-capita output growth rate through within the economic policies. The endogenous growth theory hypothesizes that the growth of any economy depends on its some internal factors only. They do not believe on the role of the external factors in this matter. They argue that long-run economic growth depends on the country`s policy measures, which have significant inferences on competition, openness and innovation (Fadare, 2010).

The endogenous growth theory further states that growth is created from inside of the structure as an explicit outcome of the system`s intramural functioning. Explicitly, the theory records that the human capital`s improvement of the economy will result into the growth through the channels of modern procedures of technological development and efficient production methods. Followers of endogenous growth theory say that the efficiency of modern industrial economies compared to the similar economies in pre-industrial times are proof that growth was generated and continued from inside the country.

The literature on theoretical growth from mid-1980s shows the evaluation to endogenize the long-run rate of growth of the output. According to the neo-classical model of economic growth, if the fiscal policy affects the incentives to save/ invest in new capital, it will change capital-output ratio, and thus, the output level path, but its rate of change will remain unchanged. The unique quality endogenous growth models of Barro (1990) and Barro et al. (1991) is that fiscal strategy can decide the output level path as well as the rate of growth of the steady-state.

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In the neoclassical growth models (Solow, 1956, and Swan, 1956), growth in per-capita income in the steady state is given exogenously. It depends on exogenous technological progress rate only that falls as 'manna from heaven'. For decades, this was used as the standard reference which molded the core for policy analyses on public expenditure and taxation. It is therefore, not shocking that utmost research on public role focused on its division and stabilization rather enlargement.

With the introduction of new endogenous growth theory introduced by the effort of Romer (1986) and Lucas (1988), the viewpoint on government role has significantly changed. In this model, not only transition growth but also steady state growth rates are also considered endogenous. The factors that have been recommended as critical for revealing long-run growth are trade-intensity, preferences, Research and Development (Grossman and Helpman, 1991), income inequality (Persson and Tabellini, 1991) and also fiscal policy (Barro, 1990 and Glomm and Ravikumar, 1994a and 1994b).

Endogenous growth theory founded by the effort of Ram (1986) and Barro (1990) amongst other researchers, indicates systems through which the output level cannot be affected by policy variables, but also the rates of growth of the steady-state. Barro (1990) establishes the foremost efforts at endogenizing the relationship between fiscal policies and growth. Barro (1990) differentiated public finance as: productive vs. non-productive expenditures and distortionary vs. non-distortionary taxation. If tax system affects investment decisions, it is distortionary. Its further influences output and growth. Similarly, tax on income and profit also impact positive on growth. Else, taxes, like consumption taxes deemed non-distortionary, apart from the consumers endogenous preference of labor or leisure.

Lane and Perotti (1998) explored the effect of changes in fiscal policy tools on trade balance for a panel of OECD economies for the years 1960–1995. They concluded that an expansion in government consumption triggers a contraction in exports and a deterioration of trade balance, mainly under flexible exchange rates.

The researchers like, Bleaney et al. (2000) observed that endogenous growth models, such as Barro (1990) foresee that public spending and taxation affect the growth not only temporarily but also permanently. The study tested the forecast utilizing panels of annual and period-averaged data for OECD economies from 1970 to 1995, separating

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fiscal effects in short-run from long-run. The outcomes extremely back the endogenous growth model and submit that long-run fiscal impacts are not totally annexed by the time averaging and static panel techniques. Bleaney et al. (2000) concluded that contrasting to earlier studies our estimations are free from inclines related with the inadequate requirement of public budget limit and do not seem to end from endogeneity of investment or fiscal variables. Likewise, Dar and Khalkhali (2002) conducted an inquiry on an endogenous growth model of fiscal policy and established that the model of public spending and taxation is very significant in forecasting the economic growth in future.

In a similar phenomenon, Kukk (2007) estimated minor impact of fiscal policy on economic growth or development in short-run. Tax change has no effect on total GDP. While in the long-run fiscal policy has a significant impact on real GDP growth. Tax revenues have positive but all expenditures categories have a negative impact on GDP. Non-tax revenues were not significant in general. The effect of interest and grant spending was not significant in various variable combinations. The research recommended the government that change in the composition and categories of revenues and taxes might have the same impact on budget balance, total government revenues, and expenditures but will have a different impact on economic growth and development.

By the same token, Forni et al. (2009) analyzed the impacts of public spending and taxation policy in the Euro region. The study reveals more substantial impact on the income side: consumption and output are affected more by taxes on consumption and cuts on income of the labor class, whereas a decline in tax on capital income improves investment as well as production in the medium-term. Lastly, the assessments recommend that variables of the fiscal policy support minorly to the cyclical variability of the leading macroeconomic indicators.

For Pakistan`s economy, Akram (2011) observed that in the 1990s, the government had to reduce its budget deficit volume to less than five percent of GDP to meet its increasing debt servicing requirements and to satisfy its commitment with IMF under Structural Adjustment Program (SAP). All successive governments being failed in revenue generation attempts continued reducing development public spending to resolve budget deficit problem. After the 9-11` incident, Pakistan received huge funds

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under debt relief and debt rescheduling facility which assisted Pakistan to raise its development expenditures and consequently experienced a reasonable improvement in GDP growth rate, poverty reduction and also in social indicators. Consequently, the hypothesis can be developed to illustrate the study about the fiscal policy effects on GDP growth or economic performance.

The researchers like Bleaney et al. (2001) exercised panel data of OECD countries since the 1970s and found that in the long-run fiscal structural changes between different types of taxes and spending affect GDP, which is realized quite rapidly, following a few years. The study concluded that if the infrastructure spending is financed through high taxes, they will have a minor effect on GDP growth in the long-run frame.

Likewise, Papageorgiou (2012) investigated the macroeconomic and welfare impacts of changes in the tax-spending mix and debt-consolidation strategies in the Greek economy. This study is on the line of the neoclassical framework of growth model augmented next to a comparatively affluent government sector. The study concludes that through tax-mix changing the growth and welfare of the economy can be achieved. The study suggests that the tax rate on labor-income should reduce while raising consumption. The study further argues that greater government expenditures on investment are suitable for the economy`s growth and lower public consumption expenditure are realized as an extension in the economy`s development. Moreover, findings of the study recommend tax-spending mix with spending-based debt merging strategies chain to poorer short-period economic activity, while deep positive impacts in the medium- as well as long-run at the end of the consolidation period.

Similarly, Iyeli and Azubuike (2013) examined the effect of fiscal policy tools on growth of Nigerian economy for the period 1970 to 2011. The outcome of this investigation exposed that there exists a long-term equilibrium correlation among fiscal policy variables and economic growth in the country. Accordingly, it is suggested that authority must frame and apply feasible fiscal policy decisions to stabilize the economy through the practice of true fiscal federalism and also through the consistency in implementation of macroeconomic policies in the economy`s non-oil sectors by offering appropriate inducements to the foreign investors wanting to invest in Nigeria`s agricultural and industrial sectors. Significantly, the study suggested that there must be suitable macroeconomic policy-mix for administering the economy of Nigeria.

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In the same way, Dinca (2013) also investigated the correlation between fiscal policy and economic growth by using multiple regression to examine the effects of fiscal pressure, gross capital formation, exchange rate, labor productivity and economic openness upon the growth rate of the Gross Domestic Product per-capita for the period 2001-2011. Their study grouped the European Union countries into two categories, that is, old and new member countries, considering the prevailing inequalities in the economic development among the member countries. Their outcomes reveal that the rate of economic growth is favorably affected by the degree of economic openness, labor efficiency, fiscal pressure, and gross capital accumulation in private sector, while public spending, public debt and exchange rate have an adverse impact on the economic growth.

Recently, Fuente (2017) assessed the redistributive effect of the fiscal policy (2015) and its different components in the economy of Zambia. The researchers found that eliminating subsidy expenses and moving to compensate low-income households would directly help fiscal policy to attain a reduction in poverty as well as income inequality. Moreover, if subsidies on agricultural inputs, electricity, and fuel were abolished totally without any considerable increase in Social Cash Transfer Scheme (SCTS) coverage, fiscal policy effect on poverty would possibly be muffled. Without reforms, low-income households will pay more in such fiscal system as compared to receiving cash amount from it. Similarly, exemptions of VAT reduce the indirect tax burden for all types of households but cannot remove the indirect tax burden on households in the target. VAT exemptions mean that government does not tax some part of value-added. VAT exempted items are comparatively essential consumption-basket items to all the households irrespective of income levels.

### 2.1.2 Review of Empirical Studies

Empirical investigations are established on monitored and computed facts. The investigations related to the area focused in this study mainly are found under various general techniques, Vector Autoregression (VAR) approaches or general equilibrium modeling, etc.

Easterly and Rebelo (1993) expressed variables of fiscal policy, development level, rate of growth; and taken past data, fresh cross-sectional data, and latest structured public

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investment series. They concluded that there is a sound association between development level and fiscal structure, less developed countries rely deeply on international trade taxes, whereas income taxes are only significant in developed countries. Fiscal policy is affected by the scale of economy, measured by population. Investment in transport and communication sector is consistently associated with growth and impacts of taxation are difficult to segregate empirically.

Alike, Fuente (1997) researched the effect of government spending and taxation on economic growth of 21 OECD economies for the period 1965 to 1995. Outcomes of the investigation could not deliver support in favor of fiscal-policy-led growth. Particularly, government spending tends to crowd-out investment in private sector preceding to a decline in disposable income and the inducement for saving. Likewise, Ghali and Al-Shamsi (1997) explored primary associations between fiscal policy (public spending) and economic growth for the period 1973 to 1995 in UAE applying a cointegration and error-correction framework. The findings delivered confirmation in favor of the existence of cointegration between public spending and Gross Domestic Product. The results of the causality tests revealed that causation runs from public spending to Gross Domestic Product.

Relatedly, for the Nigerian economy, Nurudeen and Usman (2010) explored the link between government spending and economic growth. The study realized that the government spending size is quite eminent to determine the economic performance of the country. The study recommended that the not only the private sector be encouraged but the government should also encourage the social and infrastructure as well as economic activities through budgetary provisions.

Nijkamp and Poot (2004) operated a meta-analysis of former empirical investigations of fiscal policy and growth. The study noticed that in an experiment of 41 analyses, 29% of the assessment shows an adverse while 17% positive correlation between fiscal policy and growth, and remaining 54% show an unsatisfactory correlation.

Again, Nijkamp and Poot (2004) exercised meta-analysis to answer the question that whether the government sector strengthens or weakens the economic growth in long-run. An experiment of 93 searches, having 123 meta-observations, is utilized to assess the robustness of testimony concerning the effect of fiscal policy on growth. In this

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analysis, five areas of the fiscal policy are taken into account: (*i*) common public spending, (*ii*) public infrastructure, (*iii*) education, (*iv*) defense, and (*v*) tax rates. Quite a few meta-analytical methods are operated, including rough set analysis, contingency table analysis, and descriptive statistics. On balance, the verification for a favorable effect of conventional fiscal policy on growth is rather weak, but generally recognized importance of infrastructure and education is endorsed.

Using Over-Lapping Generations (OLG) Model of saving behavior, the relationship between fiscal deficits and economic growth for a panel of 45 developing countries was explored by Adam and Bevan (2005). Based on consistent treatment of the government budget limit, it realizes evidence of a threshold effect at a level of the deficit around 1.5% of Gross Domestic Product (GDP). Whereas there occurs to be a growth payoff to diminishing deficits to this level and this effect disappears or reverses itself for further fiscal contraction. The degree of this payoff, but not its common character, inevitably depends on how changes in deficit are financed (through changes in borrowing or seigniorage) and on how the change in deficit is accommodated in another place in the budget. The investigators also attained evidence of interaction effects between deficits and debt stocks, with high debt stocks intensifying the adverse effects of high deficits.

Mansouri (2008) examined the correlation between fiscal policy and economic growth in the three countries, that is, Tunisia, Egypt, and Morocco. The selected periods of the data for these economies are 1972-2002 for Tunisia, 1975-2002 for Egypt, and 1970-2002 for Morocco. The outcomes showed that a 1% increase in government spending raised real GDP of Tunisia by 1.15%, Egypt by 0.56%, and Morocco by 1.26%. The findings revealed the long-run correlation for all these economies.

For Romania, Enache (2009) scrutinized the connection between fiscal policy and economic growth operating Predicted time series data that covered the time period between 1992 and 2013. The outcomes revealed ineffective signal for the favorable effect of fiscal policy on economic growth. The inquiry settled that government could exercise fiscal policy to influence economic growth in the indirect mode.

Examining the effect of monetary and fiscal policies on economic growth in Iran, Khosravi and Karimi (2010) applying the autoregressive distributed approach to find

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cointegration between the years 1960 to 2006. The empirical results revealed the existence of a long-run relationship between both the policies and economic growth. The outcomes further discovered an adverse effect of inflation and exchange rate, but a favorable and significant effect of public spending on growth.

On the other hand, Audu (2012) estimated the causal link between money supply, fiscal deficits, and exports as a source of exploring the effect of policy on the growth of Nigeria from 1970 to 2010. The study used Co-integration Error Correction Mechanism (ECM), a two-band recursive least square to check the economic stability and determine the impact of the fiscal deficits, broad money supply, and exports on the efficacy of fiscal policies. The analysis reveals a significant causal relation between GDP and the variables considered in this investigation. Audu (2012) deduced an important causal relationship between exports and GDP and hence fiscal policy. The analysis conclude that monetary experts should concentrate on these variables in choosing of policy tools in Nigerian economy. Likewise, fiscal deficit variable does effect GDP by – 0.2%. This shows that the fiscal deficit variable is very insignificant with -0.002 value which reveal that the economy of Nigeria does not depend upon fiscal deficit budget.

Similarly, Olasunkanmi and Babatunde (2012) observed the fiscal instruments affecting growth of Nigerian economy during 1981-2010. In this analysis secondary annual time-series data was utilized. The data on productive spending, unproductive spending, distortionary taxes, non-distortionary taxes, fiscal deficit and real growth rate of GDP was examined by using cointegration and ordinary least square (OLS) systems. Cointegration outcomes confirm a long-run correlation among the variables. Results of fiscal-growth impact model nullify the claim that only productive spending, distortionary taxes, and fiscal deficit contribute to the growth of the Nigerian economy. These outcomes draw attention towards the importance of the non-distortionary taxes as addition to other three fiscal policy variables that contribute to growth and government should reduce spending on recreational-cultural religious affairs and all other functions like political executive expenses in order to attain stabilization policies in the Nigerian economy.

Analogously, Ilegbinosa (2013) investigated the problems adjacent practices of fiscal policy and their effect on economic growth in the Nigerian economy for the period 1970-2009. The research was conducted by using statistical time series data and

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employing the Ordinary Least Squares (OLS) technique of multiple regression models. The result reveals a favorable relation between Real GDP and the fiscal variables like public Spending and Taxes. The study explains that public spending is a robust factor of economic growth, particularly, when correctly directed towards the provision of sufficient key infrastructural provisions to stabilize the investment activities. The outcome matched with the Keynes` idea, which endorses that government interest by employing fiscal policy tools could accelerate economic activities, and consequently economic growth.

Iqbal and Zahid (1998) increasing deficit of budget is ranked as a core limit to the growth rate of the Pakistan economy. Similarly, Shaheen and Turner (2009) established the positive impact of fiscal policy on macroeconomic variables by employing SVAR technique for the period 1973 to 2008 in their investigation. Their estimates from recursive approach proved the insignificant impact of public expenditure shocks on output and inflation. But their findings were different as obtained from the Blanchard and Perotti (1999) approach which gave a significant impact on public expenditure shocks and taxes on output and inflation. Public expenditures shocks had a positive impact in short-run and negative in long-run and had a drift to increase over the five-year period. The interest rate was also increased in short-run due to government shock.

Same authors also delivered a detailed assessment of the impacts of fiscal policy on economic activity for four developed economies, such as U.S., U.K., Germany, and Italy by following a BVAR technique Afonso and Sousa (2012). Findings of the investigation reveal that government expenditure shocks, usually, partially impact GDP, it creates “crowding-out” impacts, it diversely effects the prices of housing, and it create a fast drop in stock prices, which results into a depreciation in a real effective rate of exchange. In contrast, public revenue shocks have a minor and positive momentary impact on both housing as well as stock prices, and it result in an appreciation of the real effective exchange rate. The empirical results also indicate that public debt dynamics should be explicitly considered in the model.

Parkyn et al. (2013) following the system of Blanchard and Perotti (1999) researched the effect of changes in government revenue and spending on output, inflation and interest rate for New Zealand by taking into account the influence of trade cycles in an SVAR context. Empirical findings of the study show that government expenditure

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shocks have positive though small effect in short-run on output while high-interest rates and low output in medium to long-run. The sign of the impacts of tax policy changes is less obvious, while impacts on GDP seem similarly modest. The investigators explored the impacts of former fiscal policy by means of a historical decomposition of shocks and realized that discretionary fiscal policy has had a pro-cyclical effect on GDP in general and a significant effect on the real long-run interest rate. It is evinced that a fiscal development has a positive but small impact on inflation.

While Pashourtidou et al. (2014) estimated the dynamic impacts of fiscal consolidation policies on basic macroeconomic variables employing a factor-augmented VAR Model in case of a small Island economy. Results of the study point that, fiscal contraction efforts in the manner of either a reduction in public spending or an increase in public revenue lead to a fall in GDP because of the negative reactions of private consumption, investment, and employment. As a result of a reduction in economic activity, inflation decelerates. Investigators were also evinced that fiscal tightening based on spending reduction results in a larger decrease in output than consolidation through an equivalent revenue increase. In a monetary union, fiscal policy is the only tool on the demand side, which individual member countries may apply to offset the shocks.

On the other hand, Jemec et al. (2011) evaluated the dynamic effects of fiscal policy on macroeconomic growth in Slovenia, a member of EU. Following the methodology of Blanchard and Perotti (1999) where a structural VAR is utilized, the researchers found that positive public spending shocks have a positive impact on output, private consumption, and investment. While positive tax shocks have a negative immediate impact on output, private consumption, and investment. The researchers concluded that one-off changes in public spending and taxes in Slovenia are short-lived and cannot be employed for long-lasting ends. Since price and wage levels will remain sticky in the short-run, a revenues/ demand growth initiated by public spending could have a huge effect on production. Though it is also possible that the increase in the high level of openness can be absorbed by imported goods and services, and consequently, the expected big effect could not be viewed.

Ravn and Spange (2012) checked the two opposite impacts in a study carried out for Denmark where export to GDP ratio extended and fixed exchange rate regime was implemented since 1982. In this analysis performed based on SVAR Model, the

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researchers followed a determination strategy as defined by Blanchard and Perotti (1999). Results expose that, in line with economic theory, an increase in public spending has a rather large effect on output in very short-run advising that the interest rate effect under a fixed exchange rate offsets the leakage effect following from a large degree of openness. As for the impact on consumption, findings are rather inconclusive but tend to propose that private consumption reduced after an increase in public spending.

Employing Spanish data and a VAR framework, Castro and Hernández (2008) discovered that fiscal shocks have trivial but significant impacts on the variables such as GDP, private investment, private consumption, interest rates, and overall price level. Contrariwise shocks to various types of spending or taxes parade divergent profiles of responses. When the sample constrained to the 1990s a diverse sample of responses to fiscal shocks were noticed, with GDP and interest rate responses turn insignificant.

Fu et al. (2003) examined U.S. economy's growth and fiscal policy relationship. The investigation utilized a pair-wise combination of numerous fiscal indicators and developed VAR technique to estimate simultaneous shocks to more than one variable. The technique was used to check the impulse response for simultaneous, unexpected and equivalent structural shocks to pairwise mixtures of fiscal indicators. Size of the federal government and economic growth were adversely related to the sample used. The deficit came out to be the most inconsistent indicator while tax revenues were the steadiest indicators of fiscal policy.

Besides, Jooste et al. (2013) analyzed the impact of aggregate public spending and taxes on output for South Africa treating three kinds of a calibrated DSGE Model and more data-driven models such as a structural vector error correction model (SVECM) and a time-varying parameter vector autoregressive (TVP-VAR) to annex possible asymmetries and time variation of fiscal impulses.

The impulse responses show

*(i)* Increases in public expenditure have a positive effect, although less than unity, on GDP in the short-term;

*(ii)* Over the long-term, the effect of public expenditure on GDP is insignificant; and

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*(iii)* Increases in taxes reduce GDP over the short-term while having minor effects over longer horizons.

Tang et al. (2013) inspected the efficiency of fiscal policy in the Association of Five Southeast Asian Countries: Indonesia, Malaysia, Philippine, Singapore, and Thailand. Applying Structural Vector Autoregression (SVAR) Model, government expenditure is realized to have an ineffective and insignificant effect on output, while taxes are observed to have outcomes opposite to conventional theory. Extensions using a time-varying vector autoregressive model expose that the positive effect from high taxes on output reveals keen concerns over public finances during the phase of Asian financial crisis and the current universal financial crisis. Instead, for Thailand, there exists evidence that government expenditure can at times be functional as a tool for short-run countercyclical policy.

Bouakez et al. (2014) evaluated and pointed out that the studies based on Structural Vector Autoregressions (SVAR) typically realize identification by restricting the contemporaneous interaction of the fiscal and non-fiscal variables in a rather arbitrary manner. The investigators relaxed these limitations and pinpointed fiscal policy shocks by exploiting the restrictive heteroscedasticity of the structural disturbances. The study found that expansions in public spending are, generally, more effective than tax cuts in accelerating economic activity.

To Romanian economic data, Boiciuc (2015) evaluated the impacts of public expenditure as well as revenue through taxes shocks on the economy`s actions by harnessing a Vector Autoregressive (VAR) Model. For identification of these shocks the investigator first applied a recursive methodology (Cholesky decomposition) and then applied the system recommended by Lane and Perotti (1998). The findings are consistent with other searches on emergent economies. The effects of fiscal shocks on the macroeconomic variable are reduced and the fiscal multipliers are insignificant.

Recently, Karagöz and Keskin (2016) examined the impact of fiscal policy on macroeconomic variables by implementing the Bayesian Vector Autoregression (BVAR) technique in the economy of Turkey. Since BVAR considers the previous information, it is more suitable to deliver more realistic assessments compared with

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other VAR Models. Empirical findings of this study show that the government spending and revenues have limited influence on the macroeconomic variables like GDP, inflation, interest rate, stock market index and external debt.

#### *2.1.2.1 Studies employing General Equilibrium Technique*

Shoven and Whalley (1984) mainly focused on taxation and trade by using CGE Model. Pereira and Shoven (1988) exclusively examined the studies related to dynamic CGE Modeling of national tax issues. Melo (1988) assessed the contribution of CGE Models for quantification of trade policy scenarios in underdeveloped countries. Similarly, Decaluwe and Martens (1988) gave a comprehensive inquiry of CGE Models and discussed the economy`s specific economic structure of production, private consumption, external trade blocks, and the type of closure rules.

Devarajan et al. (1988) analyzed the application of CGE Models to issues of taxation and natural resources in underdeveloped countries. The applications to these resource issues fall into three types: (i) energy management models, i.e., natural resources as factors inputs in the production, (ii) Dutch disease models, i.e., impact of windfall gains to exporters when oil price rises; and (iii) optimal depletion models, i.e., considering the exhaustibility of natural resource and the relationship between investment decisions and optimal extraction. The study divides CGE models` application to taxation into positive and normative analyses. positive analyses, mean relationship between trade and fiscal policies and effect of change in tax on prices and incomes while normative analyses stand to calculate "optimal" taxes in revenue-constrained economies. The researcher conclude that these are obtained to be at variance with suggestions for tax reforms based on rules-of-thumb.

Hamilton and Whalley (1989) investigated the welfare effect of the Canadian economy. They utilized applied General Equilibrium Model (AGEM) with 44 industries that is, 35 are traded while 9 are non-traded, 23 consumer commodities and 42 types of households divided according to their income, assuming Canada as an open and price taking small economy. They calculated equivalent incomes by employing the Hicksian method. The model`s parameters are calibrated to an equilibrium dataset of 1980 and literature-based elasticity estimates as a benchmark. They simulated seven propositions for the analysis and found that replacing federal tax by broadly based sale tax delivered

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more gain than replacing the provincial sales taxes, although this gain is very small. The distributional effect was so minor that this can be balanced by direct taxes.

Bandara (1991) analyzed CGE experiments of policies regarding development in Less Developed Countries. The stud assessed more than sixty CGE applications associated to various policy issues in the less developed countries. This inclusive analysis presents that CGE Modeling became a quite accepted analytic instrument among policy experts in underdeveloped countries over the last few decades. Likewise, Devarajan et al. (1991) analyzed “micro-macro” CGE Models which include product, factors and assets markets. Latest CGE models are created to examine the effect on economic performance and income distribution in underdeveloped countries of structural adjustment and stabilization programs (SASPs) employed in retort to macro shocks. This study reviews the theoretical dilemmas such models face in settling micro-focused CGE models with macro models including dynamic behavior.

For the Thailand economy, Devarajan et al. (1991) examined the effect of proposed VAT reforms. In their investigation, they utilized a multi-sector general equilibrium model with some assumptions and used data from Social Accounting Matrix (SAM) 1987. The researchers assumed four cases with different rates of GST tax and excise. They took manufacturers exporting and agriculture sectors as the winner and some non-tradable service sectors as looser. They concluded that GST would increase government revenue and had a slightly favorable impact on income distribution in the country.

Similarly, Meagher and Parmenter (1993) evaluated the short-term implications of Australia’s tax reforms of 1992 by applying a General Equilibrium Model. Investigators didn’t address about changes in the composition of external trade of Australia. They concluded that GST made the minor effect on cost-sensitive industries facing Global competition in comparison to prior taxes.

In the same way, Decaluwé et al. (1999) explored the effect of reducing export crop price and the abolition of tariff on poverty and distribution of income in an African underdeveloped economy by employing Computable General Equilibrium Model. They designed the model reflecting 6 sectors, 6 types of households, and 5 types of factors. The study reveals that to mitigate the social poverty, tariffs abolition policy is useful instrument.

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Further, Lledo (2005) evaluated the Brazilian Indirect tax system with two objectives, *that is*, the reason for not approving a comprehensive reform of the tax system and the macroeconomic effect of the tax system. The researcher achieved these objectives in the light of fiscal adjustment restriction. For the goal, A-K Model is utilized giving a description of CGE Models and obtained positive long-run income growth.

Keeping in view the economic condition of South Africa, Thurlow (2002) by using recent released evidence regarding country`s annual financial reports and other facts and figures of supply side, composed a Social Accounting Matrix (SAM) for the economy of South Africa. Thurlow used the model to step up the whole economy`s effect of the recommended strategy controls, encompassing: trade barriers` elimination; public expenditure extension; and factor efficiency augmentation. Outcomes of the study reveal that the macroeconomic adjustments are eminent to finalize the expected policy effects.

Aka (2003) evaluated the impact of fiscal adjustments required to recompense the deterioration in revenue due to free trade and acceptance of tariffs in WAEMU Economies on poverty and distribution in Cote d'Ivoire by utilizing a CGE Model. Aka (2003) filled an aggregated Social Accounting Matrix (SAM), having 3 and tradable sections and non-tradable sections respectively, 1993-Cote d’Ivoire National Accounts and ENV-1998 Survey Data based 9 types of households. The researcher carried out three simulations; experiment-I entailed omission of taxes on agriproducts` exports, experiment-II comprised tariff abolition on imports of agriproducts, while experiment-III consisted of tax elimination on the export of industrial products. The results of this study show that experiments I and II leads to further poverty, whereas experiment-III demonstrate a reduction in poverty as compared to the pre-shock state.

Similarly, Obi (2003) explored the fiscal policy effectiveness as an instrument for income redistribution in the Nigerian economy by employing CGE Model. The researcher utilized and disaggregated the Social Accounting Matrix (1999) into six types of households, two categories of factors, and five kinds of other sectors. Obi examined three counterfactual situations. These situations were transmitted to the households of very low-income group, intending of the adjustment of government spending and import tariff. Obi deduced that focusing public spending appears more

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efficient instrument to redistribute the income. Likewise, adjustments of tariffs have a propensity to impair income inequality.

For the economy of Philippine, Coxhead, and Jayasuriya (2004) according to the standard of Johansen order structured a Computable General Equilibrium Model and assessed the impacts of the policy of protection on poverty as well as on deforestation. The investigation found that in short period free trade. In short-run trade liberalization tends to boost the depth of poverty and strictness among poor.

In another analysis, Go et al. (2005) measured welfare, revenue and distributional impact of the tax reforms of South Africa with the help of CGE Model, developed by Lofgren et al. for IFPRI in 2001. They considered 2003 as the base year and utilized data from the SAM developed by Claude Van Der Merwe from Quantec. The researchers solved simulations with the help of GAMS and solver PATH. CES function was utilized for production. The team of researchers included 6 sectors of the economy and 49 commodities in their model. Four production factors that is, capital, high-skilled, semi-skilled and unskilled labor were incorporated into this model. The investigators utilized various elasticities from the existing literature. They managed four simulations for the inquiry such as removal of VAT, 50% increase in VAT, zero VAT for food and replaced tariff with identical VAT. Their study concluded that VAT positively affected the overall tax structure adversely the welfare of low-income groups.

Empirically, Annabi et al. (2005) formed an assimilated dynamic microsimulation Computable General Equilibrium Model, utilizing a Social Accounting Matrix (1996), and a survey of 3278 households (1995), to investigate the inequality and poverty impact of overall and one-sided free trade in Senegal. The analysis recced that tariff abolition leads the economy to a minor rise in income inequality and poverty in a short period and reductions in the primarily sheltered sectors like agriculture and industry. In a long period, free trade boosts capital formation, specifically in the services sectors along with the industry. So, it causes considerable reduction in poverty and improvement in welfare.

Jordan and European Union are trade and political partners at regional, global, and bilateral levels due to important role in promoting moderation, inter-faith tolerance, and stability in the Middle East. An agreement of association between Jorden and European

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Union, recorded in 2002, is surveyed by Feraboli (2008). It imparts a regular attenuation of the duties over twelve years on products of the European Union. The expert explored economic implications and impacts on heterogeneous households` welfare and income distribution. The investigator presenting it in the form of a standard neo-classical dynamic CGE Model. By this means, tax and wage rate on individuals, the primary endowment of assets, government and foreign transfers, and priorities are adjusted from a household survey and noticed the favorable impact on household's general prosperity.

By using CGE Model, Matovu, Twimukye, Nabiddo and Guloba (2009) assessed the welfare effect of Indirect taxes on Uganda`s households. The investigators submitted a welfare effect on production and firm activities. Their findings revealed that reforms are progressive in nature and similar with results of existing studies. They consented to zero rates all food items. Low-income households get benefited from it. The researchers found that taxation on petrol and increasing excise duties caused this tax regressive on this part only. They discovered that removal of VAT augmented the welfare of richer households while reduced the poor`s. The analysts concluded that VAT implementation proved beneficial for a low-income group of the country.

Similarly, Naqvi et al. (2010) evaluated the policies under Structural Adjustment Programs (SAP) by employing a Computable General Equilibrium (CGE) Model for the economy of Pakistan. The main purpose of this investigation was to study the economic implications of two standard elements that is, trade liberalization and fiscal strictness, in SAP. The focus of the study was to determine the leeway to come over the deficit of trade and losses in revenue because of the abolition of the tariff. The experiment was - a sales tax increase, income tax increase, and government spending decrease, at a time. The researchers identified that the reduction in public expenditures prefers to overtake further fiscal components in terms of individual as well as the country`s overall indicators of the welfare. The researcher concludes that the imposition of tax on agricultural income is important and valuable for the households, Government and improving the economy-wide welfare indicators. The outcome recommends that imposition of tax on agricultural income tends to be a potential instrument for effective and sustainable development. Whereas, inequality alleviation and welfare increase of household indeed require other effective tools like monetary policy with fiscal policy.

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In another study, Laborde et al. (2010) applied CGE Model to study the advantages and disadvantages to the member and non-member countries of South Asian Free Trade Agreement (SAFTA). The analysis estimated both the situations, containing the important commodities seen in SAFTA and excluding from free trade procedure. The outcomes of the investigation concluded both trade creating as well as banning influences on various economies. Free trade believed to trade-avoiding impacts in term of income that was lessened because of reduction in tariff. Free Trade of sensitive commodities is noticed unfavorable for the developing economies of the region. Consequently, SAFTA`s results observed to reason low income from tariff for almost all the member countries.

Ahmad et al. (2011) examined the micro and macroeconomic effect of GST on the economy by using CGE and micro-simulation structure for Pakistan economy, which is an extension of the model by utilizing data set of the SAM prepared by Dorosh et al. (2004). This SAM also includes the data from input-output tables, national accounts, Pakistan Integrated Household Survey (2002), Pakistan Rural Household Survey (2002), and Pakistan Economic Survey (2002). The researchers used 2002 as base. LES Utility Function was employed for consumption and production structure, which has two items, intermediate inputs and value added to give the final output. The team further divided it into two parts, that is, domestic sale and export. Constant Elasticity Transformation (CET) function was used for export and Constant Elasticity of Substitution (CES) was used for import of Pakistan. They utilized CES function for the four different value addition sources called skilled labor, unskilled labor, capital, and land. Ahmad et al. (2011) modeled output price as the combination of export and local price. The researchers used 12 agricultural sectors, 16 industrial sectors and 6 service sectors for consideration. They made four simulations regarding GST. The result revealed that all simulations decreased the poverty and increased government revenue, and investment.

Nguyen (2011) examines trade liberalization effects on the Australian economy`s households' welfare and overall economic performance through overlapping generations and multi-sector CGE Model. Domestic agents` conclusions are intra-temporally as well as inter-temporally coherent under some quintessential hypotheses. Imports of Australia are under some exclusive rate of tariff whereas there is an export

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duty on commodities exiting Australian economy, all other conditions are exogenous. Reducing import duty has an encouraging whereas reducing subsidy has a discouraging effect on the Australian economy. Though, these outcomes are asymmetrical across the industries and the generations of households.

Concentrating on VAT, Sajadifar et al. (2012) computed the effect of tax reforms of Iran by using a CGE Model calibrating the data of different sources such as input-output data, national accounts, etc. Existing literature was also utilized for data. The researchers simulated results for three VAT rates that is, 3%, 4%, and 10%. They established that government revenue was boosted and household welfare was deteriorated. Implementing of VAT reduced GDP. The investigators suggested that the government should increase the VAT rate to raise its revenue.

Similarly, Mabugu et al. (2013) investigated the consequences of an expansive fiscal policy intended to accelerate economic growth in South Africa by using Inter-Temporal Computable General Equilibrium (CGE) Model. The investigation proves that an extensive fiscal policy would have a momentary effect on the gross domestic product (GDP). Exercising increased taxation to finance the extra expenditure would decrease this effect but would too negatively influence macroeconomic variables. Increased investment expenditure would increase long-run GDP under any financing scheme, and would lessen the debt-to-GDP ratio together with the deficit-to-GDP ratio. Sensitivity assessment confirms that these findings are qualitatively analogous for wide estimates of the elasticity of total factor productivity to the infrastructure. Truthfully, the findings hold even when comparing various financing schemes.

For Pakistan, Malik (2013) inspected the impacts of fiscal shocks on the functioning of alternative monetary policy regulations in a small dynamic general equilibrium framework. The researcher plainly considered the collaboration between fiscal and monetary policy canons which may be present in the real world. He used a simple pattern for the fiscal policy rule and several specifications for monetary policy rule. The study proposes that some form of flexible inflation targeting command would perform well in response to fiscal shocks compared to other sorts of policy regimes.

Efficiently, Bhatti et al. (2015) examined the relationship between fiscal policy and income distribution for the economy of Pakistan. The researchers employed simple

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Computable General Equilibrium Model for the economy of Pakistan (CGEM-Pak) developed in accordance with the Lofgren et al. (2002)'s the static model and used SAM 2002 developed by Dorosh et al. (2006). To investigate the effect of fiscal policy measures on inequality, simulation exercises are enacted, whereas budget deficit kept not allowed to be increased in the simulations` set. The researchers analyzed Inequality effects by using Theil-T, Theil-L, Theil-S as well as Hoover's Index. Outcomes reveal that a policy mix of income tax, sales tax and public spending abet to reduce inequality while at the same minimizes financial dependency of the economy.

Considering the case of UK, Bhattarai and Trzeciakiewicz (2017) developed a new-Keynesian Dynamic Stochastic General Equilibrium (DSGE) Model for testing of the policy regarding public finance. The study found that public spending on consumption as well as on investment generate the higher multipliers of GDP in short-period, while tax on capital income, as well as investment, has a leading influence on Gross Domestic Product in the long-term. Whereas the nominal interest rate is noticed on zero lower bound, investment, taxes on consumption spending, and government consumption spending are observed highly efficient tools during the analysis. Moreover, taxes on labor income and capital are realized very less useful. The study illustrates that efficacy of the policy declines in the case of a small open-economy and minor rigors increase the efficiency of government outlay and taxes on consumption spending, but reduce the taxes on income.

In the recent studies, Mengistu (2013) examined households poverty by way of the consumption expenditure changes from the CGE Model for the economy of Ethiopia. The investigator simulated domestic indirect taxes, government consumption expenditures, and government transfers to households. The results of the analysis submit that public revenue increase from indirect taxes has worsened the households` poverty. The outcomes from the CGE Model have shown a decrease in sectoral output, real GDP, employment and welfare element. In contrast, the investigation realized enhancements in households` poverty state because of the introduction of various short-term spending methods. Conversely, analysis of net impact shows in general, worsening poverty at the national level and for rural households in specific while having a declining tendency among urban households. The study concluded that tax policy has a major unfavorable impact on poverty in short-run. Therefore, policymakers are

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required to consider these adverse impacts and come up with the pro-poor expenditure policies that would shelter the households from adverse anxieties while financing policies go along.

Most recently, Jesus and Manuel (2018) analyzed the impacts of changes in the tax system on growth, welfare and income distribution of the Colombian economy by using CGE Model. They formed three scenarios: in first, they examine an increase in general VAT rate (conducted in 2017 tax reforms of Colombia) from 16% to 19%, in second, they estimated an increase of VAT to all the products (including basic products), and in third, they evaluated a decrease in Corporate Tax by 20%, reducing the nominal tax rate from 39% to 31.2%, without changing the other conditions. The study found: first, through compensated variation the welfare does not change after an increase in indirect taxes. Second, it is easy to move from taxing production process to taxing its results, reducing corporate income tax rates and making compensation, with an increase in individual income tax, even keeping no tax on lower-income part of the population. Through lessening companies` tax burden, capital accumulation can be stimulated, with eminent encouraging outcomes for the medium as well as long-run growth, without adversely affecting the system`s progressivity.

The literature reveals that there are different views about the standard fiscal policy variables; expenditure, taxation, and deficit, and did not specify any one of these as the most suggestive in terms of fiscal policy. Many investigations have made exercise of tax rates as a proxy for fiscal policy Engen and Skinner (1996); Rebelo (1991); Stokey and Rebelo (1995); Xu (1994), while the others such as Martin and Fardmanesh (1990) and Easterly and Rebelo (1993) have treated deficit to account for the fiscal policy in their investigations. Yet, some investigators have used expenditure to account for fiscal policy stance like Barro (1990), Easterly and Rebelo (1993). Levine and Renelt (2016) argue that none of the three variables has a strong association with economic growth when examined separately. Summary of the literature review using CGE Model indicates the results of the policy focus in different countries (see, *Appendix-F,* Table F.29).

In case of Pakistan, very limited number of researchers investigated the impact of fiscal policy on economy`s macroeconomic variables, such as, (Khalid et al., 2007; Ahmad and Qayyum, 2008; and Haque and Montiel, 1991), Similarly, some studies

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incorporated deficit of budget in the growth equations and noticed that budget deficit is a significant variable that affects economic growth negatively or positively, (Shabbir et al. 1992; Iqbal, 1994; Iqbal and Zahid, 1998; Zafar and Rehman, 1995; and Khilgi and Mahmood, 1997). Likewise, GDP growth rate replies adversely to the budget deficit in long-run (Iqbal and Zahid, 1998).

Considering expenditure, it is observed that some investigations have considered aggregate government expenditure as a single variable, while others have argued that this variable ought to be decomposed into several categories and then these categories should be analyzed individually. What has become increasingly acceptable is the division of government expenditure into investment and consumption. It is considered that the former accelerates growth while the later slowdowns.

Presently, however, the studies have gone a step forward to disaggregate the government expenditure into productive and unproductive (Devarajan et al., 1996). The argument regarding this is that the expenditures on health, education, and infrastructure could foster economic growth, while other types of spending can be growth distorting. However, Zagler and Dürnecker (2003) admit that certain consumption expenditures may not directly influence long-run growth. They may well have a positive impact on the welfare of the economy. When it comes to research and development (R&D) expenditures, it is expected that expenditure on R&D would stimulate output growth but in the literature, the empirical outcomes are not unanimous in that view (Grossman and Helpman, 1993).

Considering tax, it induced distortions effect on private agent's decisions unfavorably in terms of factor accumulation and supply; hence may affect growth. This is due to the assumption that all taxes are non-neutral and distortionary. Taxation is considered as a short-run fiscal policy instrument and it affects the long-term growth (Zagler and Dürnecker, 2003). Moreover, tax on saving, labor, raw capital, profit, research, and development is reckoned to have a direct influence on the growth prospects of the economy; all other tax forms are deemed as inconsequential to the growth. The net effect of taxes, however, is implicit to be the difference between the positive effects from productive government expenditure and the negative effect of taxation on growth. Indeed, there is a vital debate on how individual tax components impact economic growth (Engen and Skinner,1996; Ferretti and Roubini, 1998).

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## 2.2 Summary

Overall, the above literature suggests that the fiscal policy impacts economic development and growth. Though, signal and degree of impact of various instruments of policy are vague. Most of the researches focus on role of this strategy in reducing income inequality, poverty and improving macroeconomic performance, development, and growth by selecting few limited variables and use either some general or mostly VAR Methods of estimation, hence overlooking the importance of the policy`s sector-wise as well as overall effects on the economy and also not giving much importance to employ the CGE Modeling.

As the instrument, CGE Models are used to examine various areas of Taxation that is direct and indirect tax reforms, increase and decrease in tax rate, the tax base of income tax, corporate tax, and carbon tax, etc. Different studies focus on one or two of these as variables. Most of the work of these experiments are related to welfare impact. International competitiveness, macroeconomic effect, and distributional areas are also touched. But since there are different areas remain untouched such as the impact of GST on poverty alleviation, inflation, distribution, and international trade, where CGE Models can be employed. There is no single country and year that has more share than others in picked studies. Instead of being popular concept and technique, these outcomes leave a question unanswerable that is why few investigators involve in it? These questions, no doubt, lay a path for further research in this area.

Therefore, this study is going to fill these gaps. This study focuses on to investigate the implications of fiscal reforms for Pakistan`s macroeconomic stability by using CGE Model. That is, our research concentrates on the effect of fiscal shocks on GDP, exports, imports, national income, investment in public and private sectors, welfare and inequality. Moreover, abolition or reduction in tariff, increase in taxes, decrease in indirect taxes effect on the said variables. For this purpose, the data source used is the latest SAM (2010-11), prepared by Dorosh et al. (2015) for the economy of Pakistan.

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# CHAPTER 3

# SOCIAL ACCOUNTING MATRIX OF PAKISTAN AND OTHER VARIABLES FOR CGEM-Pk

## 3.1 Introduction

In this section, we will focus the variables for computable general equilibrium (CGE) model of the economy of Pakistan. To employ a CGE Model, reliable and updated statistical facts about different sectors of the economy are mandatory. Normally the database is shown as an input-output table. It comprises the entire economy and classifies different sectors, types of household, commodities and factors. Dorosh et al. (2015) developed 172 X 172 Social Accounting Matrix (SAM) for the economy of Pakistan, utilizing data for the fiscal year 2010-11. The pointed out available SAM is the latest and comprehensive. We adopt it as the benchmark year in our inquiry.

In addition to this SAM, we require elasticities for commodities. Export demand elasticities identify by how much of the export quantities may decrease if prices of export increase. Other elasticities may belong to constant elasticity of substitution (CES) class. Among these Armington elasticities, which present whether different countries products are close substitutes, and the elasticities measuring how simply inputs can be substituted for one another. Income elasticity of demand reveals how the household demands response to changes in income. Likewise, the structure of micro and macro SAM will be reviewed systematically.

The SAM 2010-11 was formed to investigate the link between agriculture growth and rural poverty. Given the aim of realizing rural growth and poverty, the authors stated the SAM 2010-11 in the more disaggregated structure for agriculture activities, factors of production and rural households. They divided the household groups in the SAM 2010-11 into two categories - rural and urban to examine the large difference in the production structure of agriculture and income across the country.

Our research query is different from the authors of this SAM, that is, Implications of Fiscal Reforms for Macroeconomic Stability in Pakistan, therefore, we do not require a high level of disaggregation in activities, factors, and households. Therefore, we

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aggregated the activities, factors and households account matching to our research query. We examined SAM 2010-11 to fathom the economic state of Pakistan's economy in the base year.

To achieve the objective, mentioned above, progressing segment is arranged in the the following sequence: Section 3.2 exhibits frameworks of macroeconomic accounting. The macro aggregates and structure of Macro SAM are explained in section 3.3 and 3.4, respectively. Structure of SAM 2010-11 is demonstrated in section 3.5. Trade elasticities are offered in section 3.6. Section 3.7 is devoted to wage rates of production factors. The last section will conclude this chapter.

## 3.2 The Framework of Macroeconomic Accounting

Social Accounting Matrix is a square matrix that communicates money flows to show receipts and payments of all the transactions among economy`s different sectors. Moreover, SAM pursues macroeconomic accounting structure that enables to calculate a large number of macro characters.

We can state macroeconomic accounting framework[1] in algebraic equations` system which allows the calculation of various macro identities. We can divide the institutions of an economy into households (*h*), enterprises (*e*), government (*g*), and rest of the world (*r*) to present macroeconomic structure.

We shall symbolize $Y_i$ for income, $S_i$ for saving and $E_i$ for spending in sector *i*. Likewise, entire dealings among the sectors will be indicated through $TR_{i,j}$, that identify sector *i* to sector *j* flows path for example, $TR_{h,r}$ reveals the household (*h*) transfers to rest of the world (*r*), while $TR_{r,h}$ indicates the transfers from the rest of the world to the household.

### 3.2.1 Household Sector

Household sector`s main accounts are household income ($Y_h$), household expenditures ($Y_e$), and household savings ($Y_s$).

[1] Macroeconomic Accounting Framework [Warr and Azis (1997)]

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A major source of households` income is factor income ($Y_f$). It is spawned in the production activities. In addition, the households also get income by way of transfers from the government ($TR_{g,h}$) as well as from the rest of the world ($TR_{r,h}$).

Therefore, the equation for households` income is:

$$Y_h = Y_f + TR_{g,h} + TR_{r,h} \tag{3.1}$$

*Where*

| | | |
|---|---|---|
| $Y_h$ | = | Income of Household |
| $Y_f$ | = | Factor Income |
| $TR_{g,h}$ | = | Government Transfers to Household |
| $TR_{r,h}$ | = | Rest of the world Transfers to Household |

According to the accounting principle, a household`s income must be equal to the household`s expenditure.

Household total expenditures are the sum of households' consumption, transfers to government and transfers to the rest of the world.

Mathematical expression for households` expenditure is as under:

$$E_h = C + TR_{h,g} + TR_{h,r} \tag{3.2}$$

*Where*

| | | |
|---|---|---|
| $E_h$ | = | Household Expenditure |
| $C$ | = | Household Consumption |
| $TR_{h,g}$ | = | Household Transfers to Government |
| $TR_{h,r}$ | = | Household Transfers to Rest of the World |

Savings of the households can be stated as:

$$S_h = Y_h - E_h \tag{3.3}$$

*Where*

| | | |
|---|---|---|
| $S_h$ | = | Household Savings |
| $Y_f$ | = | Household Factor Income |
| $E_h$ | = | Household Expenditures |

`

Putting eq. (3.1) and (3.2) into (3.3), we get

$$S_h = Y_f - C + NTR_h \tag{3.4}$$

*Where*

| | | |
|---|---|---|
| $S_h$ | = | Household Savings |
| $Y_f$ | = | Household Factor Income |
| $NTR_h$ | = | Net Transfers Received by Household |

Total net transfers received by the household sector are

$$NTR_h = (TR_{g,h} - TR_{h,g}) + (TR_{r,h} - TR_{h,r})$$

Accordingly, the household sector`s three key accounts can be stated through equations (3.1), (3.2) and (3.4).

### 3.2.2 Enterprise Sector

Enterprise` sector also contains three accounts, *that is*, Enterprise Income, Enterprise Expenditure and Enterprise Saving.

Enterprise income is generally produced as a result of subtracting the permanent capital consumption from overall capital revenue in manufacture performances. Government Transfers ($TR_{g,e}$), as well as Rest of the World Transfers ($TR_{r,e}$), are another supply of enterprise income. Enterprise Income equation for the enterprise is:

$$Ye = Y_{k,e} - S_d + TR_{g,e} + TR_{r,e} \tag{3.5}$$

*Where*

| | | |
|---|---|---|
| $Y_e$ | = | Enterprise Income |
| $Y_{k,e}$ | = | Enterprise Capital Income |
| $S_d$ | = | Depreciation *or* Fixed Capital Consumption |
| $TR_{g,e}$ | = | Government Transfers to Enterprise |
| $TR_{r,e}$ | = | Rest of the World Transfers to enterprise |

Similarly, expenditure of enterprises can be expressed as:

$$E_e = TR_{e,h} + TR_{e,g} + TR_{e,r} \tag{3.6}$$

*Where*

| | | |
|---|---|---|
| $E_e$ | = | Enterprise Expenditure |

`

| | | |
|---|---|---|
| $TR_{e,h}$ | = | Enterprise Transfer to Household |
| $TR_{e,g}$ | = | Enterprise Transfer to Government |
| $TR_{e,r}$ | = | Enterprise Transfer to rest of the world |

Enterprise Saving can be attained after deducting Enterprise Expenditure from Enterprise Income.

$$S_e = Y_e - E_e \tag{3.7}$$

*Where*

| | | |
|---|---|---|
| $S_e$ | = | Enterprise Saving |
| $Y_e$ | = | Enterprise Income |
| $E_e$ | = | Enterprise Expenditure |

Putting equality (3.5) and (3.6) into (3.7), we get

$$S_e = Y_{k,e} - S_d + NTR_e \tag{3.8}$$

*Where*

| | | |
|---|---|---|
| $S_e$ | = | Enterprise Saving |
| $Y_{ke}$ | = | Enterprise Capital Income |
| $S_d$ | = | Depreciation *or* Fixed Capital Consumption |
| $NTR_e$ | = | Net Transfers Received by Enterprise |

Thus, the equation for net transfer received by the enterprise can be written as:

$$NTR_e = (TR_{r,e} - TR_{e,r}) + (TR_{g,e} - TR_{e.g}) - (TR_{e,h})$$

So, Enterprise Income, Enterprise Expenditure, and Enterprise Saving can be uttered by equality (3.5), (3.6) and (3.8) respectively.

### 3.2.3 Government Sector

Government sector also comprises the same three accounts, like Revenues, Outlays, and savings.

Government revenues comprise direct and indirect taxes, income taxes and transfers from the rest of the world ($TR_{r,g}$).

`

Government Outlays ($E_g$) comprises Government Spending ($G$), Government Transfers to Households ($TR_{g,h}$), and Government Transfers to Rest of the World ($TR_{g,r}$).

Total net transfers obtained, owing to the government will be signified in this study by $NTR_g$.

Equation for government revenue ($Y_g$) can be symbolized as:

$$Y_g = I_t + TR_{h,g} + TR_{r,g} \tag{3.9}$$

*Where*

| | | |
|---|---|---|
| $Y_g$ | = | Government Revenues |
| $I_t$ | = | Indirect Taxes |
| $TR_{h,g}$ | = | Income Taxes from Households |
| $TR_{r,g}$ | = | Transfers from Rest of the World |

Likewise, equation for government expenditure ($E_g$) can be shown as:

$$E_g = G + TR_{g,h} + TR_{g,r} \tag{3.10}$$

*Where*

| | | |
|---|---|---|
| $E_g$ | = | Government Expenditure |
| $G$ | = | Government Consumption Expenditure |
| $TR_{g,h}$ | = | Government Transfer to Households |
| $TR_{g,r}$ | = | Government Transfer to Rest of the World |

Similarly, the equation for government saving ($S_g$) can be expressed as:

$$S_g = Y_g + E_g \tag{3.11}$$

*Where*

| | | |
|---|---|---|
| $S_g$ | = | Government Savings |
| $Y_g$ | = | Government Income |
| $E_g$ | = | Government Expenditure |

By substituting equations (3.9) and (3.10) into (3.11), we get

$$S_g = I_t - G + NTR_g \tag{3.12}$$

`

*Where*

| | | |
|---|---|---|
| $S_g$ | = | Government Savings |
| $G$ | = | Government Consumption Expenditures |
| $NTR_g$ | = | Net Transfers obtained by Government |

Mathematically it can be stated as:

$$NTR_g = (TR_{h,g} - TR_{g,h}) + (TR_{r,g} - TR_{g,r})$$

Thus, Govt. Income, Spending, and Savings can be stated through the equations (3.9), (3.10) and (3.12).

### 3.2.4 Rest of the World Sector

This sector indicates imports\` supply to our economy and the rest of the world\`s demand for our exports.

This sector contains three accounts, *that is*, foreigners\` total payments to local agents ($E_r$), foreigners\` all revenues from local agents ($Y_r$), and external saving ($S_r$).

Foreigners\` revenue entails imports ($M$), transfers from households ($TR_{h,r}$) coupled with transfers from govt. ($TR_{g,r}$). Whereas, foreigners\` aggregate spending ($E_r$) comprises exports ($X$) transfers to households ($TR_{r,h}$) coupled with transfers to govt. ($TR_{r,g}$).

Thus, equation for foreigners\` aggregate revenue is as under:

$$Y_r = M + TR_{g,r} + TR_{h,r} \tag{3.13}$$

*Where*

| | | |
|---|---|---|
| $Y_r$ | = | Foreigners\` Receipts from Local Agents |
| $M$ | = | Total Imports |
| $TR_{g,r}$ | = | Government Transfer to Foreigners |
| $TR_{h,r}$ | = | Households Transfer to Foreigners |

Similarly, total expenditure of the foreigners can be shown as:

$$E_r = X + TR_{r,h} + TR_{r,g} \tag{3.14}$$

`

*Where*

| | | |
|---|---|---|
| $E_r$ | = | Foreigners` Payments to Local Agents |
| $X$ | = | Total Exports |
| $TR_{r,h}$ | = | Foreigners` Transfer to Households |
| $TR_{r,g}$ | = | Foreigners` Transfer to Government |

Foreign savings identity can be stated as under:

$$S_r = Y_r + E_r \tag{3.15}$$

*Where*

| | | |
|---|---|---|
| $S_r$ | = | Foreign Savings |
| $Y_r$ | = | Total Foreigners` Receipt from Local Agents |
| $E_r$ | = | Total Foreigners` Payments to Local agents |

By substituting (3.13) and (3.14) into (3.15), we get

$$S_r = M - X + NTR_r \tag{3.16}$$

*Where*

| | | |
|---|---|---|
| $M$ | = | Total Imports |
| $X$ | = | Total Exports |
| $NTR_r$ | = | Net Transfers received by Foreigners |

Algebraically it is stated in the following form

$$NTR_r = (TR_{e,g} - TR_{r,g}) + (TR_{h,r} - TR_{r,h})$$

Rest of the World Revenue from Local Agents, Rest of the World Payments to Local Agents and rest of the World Savings are conveyed through the equalities (3.13), (3.14) and (3.16), respectively.

## 3.3 The Macro Aggregates

GDP (at market price), as well as GDP (at factor cost), can be estimated from income-expenditure aspect and also through an equilibrium between investment and saving feature.

`

The sums achievable as:

By adding the equations (3.4), (3.8), (3.12) and (3.16)

$$S_h + S_g + S_e + S_r = Y_f - C + Y_{k,e} - S_d + I_t - G + M - X \qquad (3.17)$$

*Where*

| | | |
|---|---|---|
| $S_h$ | = | Savings of Households |
| $S_g$ | = | Savings of Government |
| $S_e$ | = | Savings of Enterprises |
| $S_r$ | = | Foreign Savings |
| $S_d$ | = | Consumption of fixed Capital (*Depreciation*) |
| $Y_f$ | = | Household Factor Income |
| $Y_{k,e}$ | = | Capital Income of Enterprise |
| $C$ | = | Consumption of Households |
| $I_t$ | = | Indirect Taxes |
| $G$ | = | Government Consumption Expenditure |
| $M$ | = | Total Imports |
| $X$ | = | Total Exports |

Rearranging equation (3.17), we annex

$$S_h + S_g + S_e + S_r + S_d = Y_f - C + Y_{k,e} + I_t - G + M - X \qquad (3.18)$$

GDP (at factor cost) is demarcated like

$$YFC = Y_f + Y_{k,e} \qquad (3.19)$$

GDP (at market price) is submitted, on revenue segment, like

$$Y = YFC + I_t \qquad (3.20)$$

*Or*

$$Y = Y_f + Y_{k,e} + I_t \qquad (3.21)$$

Through replacing GDP at market price ($Y$) on right hand side of equation (3.18), we find the expression as under:

`

$$S_h + S_g + S_e + S_r + S_d = Y - C - G + M - X \qquad (3.22)$$

Inscribing GDP at the market price on the expenditure side

$$Y = C + I + G + X - M \qquad (3.23)$$

*Where* I = Gross investment`s total value at market price

Rearranging equation (3.23) for I, thus

$$I = Y - C - G + M - X \qquad (3.24)$$

Substituting for I into equation (3.22), we get

$$S_h + S_g + S_r + S_d = Y - C - G + M - X \qquad (3.25)$$

Thus, equation (3.25) presents the investment-saving equilibrium.

## 3.4 Structure of the Macro-SAM

There are two forms of the SAMs. Each form is based on the level of aggregation of different accounts within the SAM. Micro-SAM shows a more desegregated version of the accounts, normally with a detailed illustration of institutions and sectors. This desegregation is generally based on the research query of the modeler. In contrast, macro-SAM displays the high level of aggregation of all accounts where detailed institutional and sectoral accounts are nonexistent. The accounts of macro-SAM are discussed in this section while micro-SAM will be debated in the ensuing section.

The prime structure of macro-SAM is established on transfers and transactions in the economy. The structure of macro-SAM of Pakistan economy 2010-11 is presented in Table D.10 (see, Appendix-D). Which is a square matrix comprising fourteen sectors related to the economy`s various accounts. The sectors in this matrix are: Activities, Commodities, Factors of production, Households, Transaction Cost, Enterprises, Government, Activity Subsidies, Sales Tax, Import Duties, Export-based Sales Tax Rebates, Export-based Import Duty Rebates, Direct Taxes, Saving/ Investment, Rest of the World, and the Total.

`

### 3.4.1 Activities and Commodities

Row-1 (see, Appendix-D, Table D.10), activities account presents the gross output of the activities whereas the corresponding column *that is*, column-1, the cost of production is shown. Row-2, commodities account demonstrates aggregate demand for commodities whereas the correspondent column *that is*, column-2, displays the economy`s aggregate supply. Each row of the matrix imparts the division of outputs of various commodities supplied by the industry of that row, while each column of the matrix delivers the value of the output of the commodities of that column supplied by various industries (A1.2). Industry buys goods and services in the form of commodities (A2.1), employ factor services (A3.1) and also pays indirect taxes regarding the purchase of goods *and* services (A6.1).

Furthermore, commodities produced by the industries (A1.2), total imports (A8.2) are also incorporated in the aggregate supply. This supply of commodities, in addition to meeting the industries` intermediate demand, meets the needs of the components of aggregate demand. Final demand of households (A2.4), government (A2.6), investment (A2.7) and exports (A2.8) are the components of aggregate demand.

### 3.4.2 Factors

Row-3 offers Income of factors account. This account receives value added (A3.1) as an income for factor services. It is also termed Gross Domestic Product (GDP) at factor cost (that is, net of direct taxes on activities) and clarified in the algebraic form in equation (3.20). Factors` income is distributed among the institutions because they deliver factor services. It is allocated to the three accounts: household factor income (A4.3), operating surplus into enterprises (A5.3) and depreciation (A7.3) - consumption of fixed capital.

### 3.4.3 Households

Production involves intermediate goods and factors of production. Factor endowments are supplied by the households. In return, they receive factor payment as value added. They also get income from other sources, for example, transfers from the government and from the rest of the world. The household income is stated in row-4 of Table D.10

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(see, Appendix-D). In addition to the value added, households` other sources of income are distributed profit from the enterprise (A4.5), government transfers (A4.6) and Foreign transfers (A4.8).

Mathematically, households` income is elucidated in equation (3.1). On the contrary, households spend their income to purchase goods and services (consumption expenditure) and to pay taxes. The rest is saved for the future`s needs. Households` expenditure (see, Appendix-D, Table D.10, Column-4) comprises consumption expenditure (A2.4), income tax (A6.4) and transfers to rest of the world (A8.4), whereas keeping the remaining income as saving (A7.4). The mathematical expression of total household consumption expenditure is imparted in equation (3.2).

### 3.4.4 Enterprise

Row-5 and Column-5 introduce enterprise account. Enterprise income is spawned through two main sources, namely, factor income (A5.3) and transfers from the government (A5.6). However, enterprises expenditure is allocated to four accounts: transfers to households (A4.6), transfers to the government (A6.5), transfers to rest of the world (A8.5) and the residual savings of enterprise (A7.5). Algebraic expression of enterprise income, saving and expenditure are elucidated in the erstwhile section.

### 3.4.5 Government

Main sources of the government revenues are direct taxes like income tax from households, indirect taxes from production activities, and corporate profit taxes from enterprises. These receipts are then distributed among households as transfer payments, enterprises as interest payments and commodities accounts as final consumption of government.

Government's budget (see, Appendix-D, Table D.10, Column-6, and Row-6) contains government's receipts, composed of taxes on intermediate and import duties (A6.1), income taxes (A6.4), and transfers from enterprises (A6.5). Whereas, government's expenditures embrace its final consumption on goods and services (A2.6), transfer to households (A4.6) and transfer to enterprises (A5.6). The remaining receipts are savings (A7.6) which balance the budget of the government.

`

### 3.4.6 Saving/ Investment

Aggregate capital account of all the institutions in the economy is presented by the saving/ investment account. Household, enterprise and government savings altogether form total domestic savings. Economy`s total savings are aggregate of depreciation, foreign and domestic savings. These are enough to finance the investment in different production sectors. Investment demand in the economy is presented in column-7. Row-7 shows the sources of saving in the economy. These include aggregate capital depreciation in the economy (A7.3), household savings (A7.4), enterprises saving (A7.5), government savings (A7.6) and foreign savings (A7.8).

### 3.4.7 Rest of the World

The transaction between Rest of the World (ROW) and the domestic economy is expounded in row-8 and column-8. The major sources of foreign exchange inflow are exports (A2.8) and transfers to the household from the rest of the world (A4.8). While outflow of foreign exchange from the economy is imports (A8.2), a transfer from households (A8.4) and transfer from enterprises (A8.5) to rest of the world. The total difference between foreign exchange receipts (inflow) and outflow delivers net foreign exchange reserves as foreign savings (A7.8).

## 3.5 Structure of the SAM 2010-11

SAM 2010-11 submits an inclusive sketch of the whole economy of Pakistan by presenting relationships between various aspects of the economic operations in consumption, production, and investment. There are fourteen main accounts established in this SAM: Activities, Commodities, Factors, Households, Transaction Cost, Enterprises, Government, Activity Subsidies, Sales Tax, Import Duties, Export-based Sales Tax Rebates, Export-based Import Duty Rebates, Direct Taxes, Saving/ Investment, Rest of the World, and the Total.

### 3.5.1 Activities Account

Aggregation of activities is organized in Table D.11 (see, Appendix-D). Production activities have been aggregated into five sectors: agriculture (Sectors A1-A16), mining

(Sectors A17-A20), industry (Sectors A21-A47), energy (Sectors A48-A49) and services (Sectors A50–A63). Then, the industry is again disaggregated according to our requirement into five sectors (A3-A7): manufacturing of food, cotton lint, textile, leather, and manufacturing of other items. Totally, there are nine activities in SAM 2010-11. The matrix developed in SAM (see, Appendix-E, Table E.28) by the first nine rows of activities (A1-A9) intersecting nine columns of commodities (C1-C9) signifies output of every product class by every activity/ sector. Because every activity produces one corresponding product, hence it develops a diagonal form matrix.

### 3.5.2 Commodity Account

Commodity accounts reveal total supply components in value term, output domestically produced, indirect taxes, intermediate input utilize, final consumption, investment demand, total demand, govt. spending, imports, and exports. We apply a similar process to summative commodity accounts which we have employed for activities, as products charts one-to-one to activities Table D.12 (see, Appendix-D). Aggregation of other accounts is also submitted in Table D.12 (see, Appendix-D).

Matrix molded in Table E.28 (see, Appendix-E) by dint of commodities (C1-C9) all the rage rows and activities (A1-A9) all the rage columns accords each commodity`s intermediate input in each sector. Furthermore, rows indicate factors and labeled as L, N, and K offer the basic input in each activity. All these matrixes jointly comprise absorption matrix of the input-output system. Since the agriculture sector (A1) is labor intensive, it utilizes a high number of labor factor, while industries (A2-A8) as well as services (A9) utilizes a comparatively high number of intermediate factors.

Matrix designed through commodities` rows (C1-C9) interconnecting with columns headed ‘households’ (H1-H16), ‘transaction costs’ (TRC), ’enterprises’ (ENT), and ‘government’ (GOV) represent each institution`s final consumption demand of each commodity. The commodity ‘Energy’ is the only product which is neither exported nor imported by Pakistan. Indirect taxes on various commodities are given by the accounts in the row for govt. (GOV) against commodities column (C1-C9). The column headed S-I versus commodities (C1-C9) indicates each commodity`s investment expenditure. The last column headed ‘ROW’ demonstrates each commodity`s exports to the rest of

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the world. Commodities` imports (C1-C9) are flourished through records in the row headed “ROW”.

The preeminence of industry - textile, food and other manufacturing sectors in external trade is basically due to the government`s exports promotion policies (see, chapter 1) in the decade of 1990. It is observed in Table D.14 (see, Appendix-D) where the investigation of merchandise for the domestic and export market is arranged. The table reports sales tax and tariff rates. We can notice that the agriculture sector, food manufacturing sector and textile sector are extremely protected in Pakistan. Subsequently, imports share of these sectors is extremely diminutive as compared to other sectors.

Separate evaluation of commodities/ services for national as well as for international market (exports) is also presented in Table D.14 (see, Appendix-D). The major part of agricultural production 98.69%, other manufacturing 89.98% and services 97.24% is consumed within the economy. Whilst remaining 1.31% of agriculture, 10.12% of other manufacturing and 2.76% of services are freighted abroad. Similarly, 92.33% of the mining output while 93.48% of food production consumed domestically. While remaining 7.67% and 6.52% is exported. Similarly, 70.60% of the leather sector produce is consumed in the domestic market while 29.40% is exported to the international market. Likewise, 78.70% of cotton yarn/ lint and 21.30% of textile is exported while rest is consumed domestically.

The Table D.14 (see, Appendix-D) also indicates that cotton lint/ yarn contributes to the country`s total exports by 15.12%, textiles by 35.62% and other manufacturing by15.22%. Besides, services contribute by 16.27%, agriculture by 2.76 % and food manufacturing by 10.21 %. This table also confirms that the only product that is not exported is energy.

### 3.5.3 Factors Account

This segment elucidates factor income and their sources - value added in every productive activity. This account also reveals how factor payments are further distributed to different households, institutions, enterprises, and government.

The authors of SAM 2010-11 defined factors of production according to size (small/ medium/ large) of the farm, livestock, and capital (agriculture – formal/ informal) to capture the links between agriculture growth and rural poverty. Similarly, they stated households according to the land`s ownership. Since this disaggregation level is not useful for our study and as there is no direct one-to-one mapping of most factor payments to household groups, we aggregate the factors of production by ignoring the area of operation. This aggregation is enlightened in Table D.15 (see, Appendix-D).

Factors` income is flourished through matrix manner using rows and columns headed ‘F1 to F3’. Matrix designed in factors` columns (F1, F2, and F3) intersecting with the rows headed (F1, F2, and F3) indicate the factors` expenditure.

### 3.5.4 Institution Account

This head consists of four accounts, that is, Households, Enterprises, Government, and Rest of the World (ROW). In Table E.28 rows 22-37 (H1-H16), 39-40 (ENT-GOVT), and 47 (ROW) bare the income of these institutions and columns 22-37 (H1-H16), 39-40 (ENT-GOVT) and 47 (ROW) presents the expenditure of respective accounts. Aggregation of households account is shown in Table D.16 (see, Appendix-D).

#### *3.5.4.1 Households*

In SAM 2010-11, household account specifies sixteen groups. The classification of households follows the definition provided in SAM 2010-11. Here, H1-H12 groups of households are classified according to their land ownership and activities in rural areas while H13-H16 groups of households are living in urban areas. Rows and columns labeled ‘H1 to H16’ express the allocation of household`s income and consumption of each household (see, Appendix-E, Table E.28).

Households` categorization is crucial because it may depend on how the population to be sub-divided according to the question of inquiry. Rural households are classified into

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H1 (HHD-RS1: Rural Small Farmer – Quartile 1), H2 (HHD-RS234: Rural Small Farmer – Quartile 234), H3 (HHD-RM1: Rural Medium Farmer – Quartile 1), H4 (HHD-RM234; Rural Medium Farmer – Quartile 234), H5 (HHD-RL1: Rural Landless Farmer – Quartile 1), H6 (HHD-RL234: Rural Landless Farmer – Quartile 234), H7 (HHD-RW1: Rural Farm Worker – Quartile 1), and H8 (HHD-RW234: Rural Farm Worker – Quartile 234).

Similarly, rural non-farm households divided into types H9, H10, H11, and H12. These categories define H9 (HHD-RN1: Rural Non-Farm – Quartile 1), H10 (HHD-RN2: Rural Non-Farm – Quartile 2), H11 (HHD-RN3: Rural Non-Farm – Quartile 3) and H12 (HHD-RN4: Rural Non-Farm – Quartile 4). Likewise, Urban households are classified into H13 (HHD-U1: Urban – Quartile 1), H14 (HHD-U2: Urban – Quartile 2), H15 (HHD-U3: Urban – Quartile 3) and H16 (HHD-U4: Urban – Quartile 4).

To understand the characteristics of Pakistani households, the income sources and consumption pattern of various households needs to be explained. The Table D.17 (see, Appendix-D) imparts the characteristics of various households and shares of total income within an income group from different sources. It reveals that the key sources of income are labor, land, capital, and transfers form institutions. The first column shows rural and urban groups of households. Next four columns present characteristics of households.

The share of income of households of type H1-H12 from wage, land, capital, and transfer is 4.4608%, 1.6272%, 2.4483% and 3.4637% of total income (6.4337%) respectively. Likewise, the share of household income group H13-H16, from wage, it is 1.9729% which is large share from total income, a very minor share from land and capital, that is, 0.0496% and 0.0431% respectively, whereas, from transfer it is 1.9344%, which is a second large share from total income (see, Table D.17, Appendix-D).

The Table D.18 (see, Appendix-D) shows the results of households' consumption and consumption share in percentage. The highest consumption share for rural households is recorded 32.50% (C-FMAN), while for urban households it is noticed 29.31% (C-SER) sector.

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#### *3.5.4.2 Enterprises*

This account illustrates enterprise` receipts and expenditure. Enterprises receive a gross profit on their capital account. Enterprises` expenditures are stated through savings and transfers to institutions. A row of ‘CAP’ indicates savings and row of H-U1, H-U2, H-U3, and H-U4 present transfers to the household (see Appendix-E, Table E.28)

#### *3.5.4.3 Government*

This account expresses government spending and revenue. Spending incorporates government consumption, transfers from the government to the other institutions and savings while revenues comprise several forms of taxes and transfers to the government from other institutions. Row and column of the SAM headed ‘GOV’ confirm receipts and expenditure of government respectively. The Table D.19 (see, Appendix-D) states government different revenue sources. Almost half of the government receipts are created from sales tax that is 52.30%, while 37.19% is from income tax, which is paid by only H13-H16 (Urban Households). There is no income tax for H1 H12 (Rural Households). Revenue from tariff is 10.51% of the total government revenues.

### 3.5.5 Capital Account

This account explains combined equilibrium in investment and saving in Pakistan for 2010-11. This account is very important because it discovers relation with Pakistan economy`s real sectors. It confirms how the investment is financed by the savings of different institutions like Households, Enterprises, Government, and Rest of the World. All these institutions comprise the savings.

The row labeled ‘S-I’ gives the aggregate savings in the economy, comprising savings of household in intersection with the households (H1-H16), savings of the enterprise in intersection with the enterprise (ENT), savings of the government in intersection with the government (GOV), and rest of the world savings in intersection with the rest of the world (ROW). The row total shows gross savings in the economy of Pakistan. The column headed ‘S-I’ represents total investment expenditure of economy, containing investment in the intersection with commodities (C1-C9). Lastly, the column ‘TOTAL’ denotes economy`s gross fixed capital formation (see, Appendix-E, Table E.28).

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The Table D.20 (see, Appendix-D) explains the evaluation of various economic institutions` savings and financing sources Pakistan`s aggregate investment during 2010-11. This exposes aggregate investment is funded by 110.41% of household savings, 12.76% of enterprise savings while negative saving is recorded in government and foreign sectors, that is, -28.38% and -4.98% respectively. Rest of the saving is considered as other savings which are estimated at 10.19% of the total savings.

Concerning the sectoral split of aggregate investment, Table D.21 (see, Appendix-D) clarifies that less than 1% of the total investment share is in textile, leather and energy sector, in other industrial sectors 29.86%, agriculture 14.29%, food-manufacturing 1.25%, cotton lint/ yarn 3.03% and mining 1.06%, other investment 10.19% whereas the leftover 39.57% of total investment is allocated to the services.

### 3.5.6 Rest of the World Account

SAM 2010-11 of Pakistan treats all the external agents (ROW) as a single entity which must satisfy the budget constraint as far as its transactions with Pakistan economy are concerned. This account presents the demand for exports of Pakistan to and imports` supply from the rest of the world. Row marked 'ROW' beside the columns of commodities (C1-C9) demonstrates imports` demand which together constitutes rest of the world`s income. Along with the corresponding column is the rest of the world`s expenditure which incorporates net transfers to all categories of the households assumed in the model (*that is*, H1-H16). Rest of the World`s income and expenditure are equalized through totaling the foreign savings (S-I) in capital accounts column. It is a balance of payments` current account balance (see, Appendix-E, Table E.28).

## 3.6 Trade Elasticities

Ideally, the trade elasticities should be estimated by employing econometric techniques of cross-sectional and time series data. With limited resources as well as data constraints, estimating the elasticity parameters for this analysis is not possible. Consequently, it is decided to adopt acceptable assessments founded upon current literature. Elasticities` selection sets a possible question to CGE applications.

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Since econometrically estimated trade elasticities for Pakistan economy were not available, we selected our figures to keep in line with studies conducted for comparable developing economies (The impact of trade policies on Pakistan's preferential access to the European Union, 2008, Centre for the Analysis of Regional Integration at Sussex, Department of Economics. University of Sussex, United Kingdom).

In CGEM-Pk, Armington elasticity is used to capture the intensity of products substituted for one another from domestic and imported products. Imported products can be reliable substitutes for the local product if Armington elasticities` values are higher. While, if the Armington elasticities are lower, these become a feeble substitute for local goods. In case of developing countries, it is rare to see that the experimental estimations of Armington elasticities because of the absence of time series data on domestic as well as on import prices and quantities, quantifiable limitations and erstwhile variables.

The Table D.22 (see, Appendix-D) presents Armington elasticities adopted in some chosen economies, whereas for CGEM-Pk trade elasticities are given in the Table D.23 (see, Appendix-D). It should be noticed that these elasticities, that is, the value of Armington, perform a critical role in the disaggregated models.

## 3.7 Wage Rates for Factors of Production

The present study utilized the Labor Force Survey (LFS), 2001-02 to calculate numbers of various types of workers performing in each activity. This is presented in the Table D.24 (see, Appendix-D). However, the total income of factors from various activities is amassed from the SAM 2010- 11 and reported in the Table D.25 (see, Appendix-D). We computed activity specific labor wage (Pak. Rs. Billion) by using Table D.24 and Table D.25 (see, Appendix-D). The results (see, Appendix-D, Table D.26) explains that the labor engaged in A-YARN earn highest share of income that is 43.4149945 and the second highest share of income is of the labor working in the textile sector (A-TEXT), which is 12.175575, while other activities share is approximated as 4.8762828 (A-AGRI), 3.607731 (A-MINE), 5.6605078 (A-FMAN), 1.1043469 (A-LEAT), 8.4743571 (A-MANF), 9.7093433 (A-ENRG) and 0.74666324 (A-SER).

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The relative wages mentioned above can only be compared with a numerical value in our model. Therefore, statistics that we obtained is in the manner of their work where CPI is considered as "=1". These relative wage rates are presented in the Table D.26 (see, Appendix-D). Similarly, initial returns for factors of production like labor and land are presented in the Table D.27 (see, Appendix-D), which in case of labor, is approximated as 1.0635 (A-AGRI), while 1.0475 in all other sectors. Whereas, in case of capital, 1.066 for (A-AGRI and A-MANF), 1.061 for (A-MINE and A-ENRG), 1.068 for (A-SER) and 1.067 for all other sectors.

## 3.8 Summary and Conclusion

In this portion, the required variables to employ CGEM-Pk has been illuminated. A CGE Model with the fiscal and other components requires two sorts of databases, SAM containing an I-O database as well as various estimates of elasticity. Latest available SAM for Pakistan was made to address the problem and was disaggregated accordingly. Moreover, we analyzed SAM 2010-11 to realize the features of the country for the base year. In addition, the database embraces parameters of elasticity like domestic and import substitution elasticities (Armington Elasticities). These databases serve the purpose of calibration of the CGEM-Pk as described in Chapter 2, for the base year 2001-02.

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# CHAPTER 4

# COMPUTABLE GENERAL EQUILIBRIUM MODEL OF PAKISTAN (CGEM-Pk)

## 4.1 Introduction

The intent of this chapter is twofold: Firstly, to develop the knowing of Computable General Equilibrium (CGE) Modeling by analyzing various definitions, advancements and historical background of the CGE Modeling; Secondly, to develop a CGE Model of Pakistan (CGEM-Pk) and description of the relationships illuminated by equations of the model. CGE Modeling is introduced here regarding economic development evolution dilemmas of different underdeveloped countries, zealously Pakistan economy case is emphasized here. To develop this unique modeling is simple. It provides comprehensive evidence to form effective strategies consistent with the economy`s needs and requisites. Through the support of circular flow graphs, CGE Model can also be illustrated.

## 4.2 Computable General Equilibrium

Computable General Equilibrium (from now onwards CGE)[2] Models are the novel form of Walras` Competitive Economy Model. CGE Model is a multi-sector economic pattern that employs real economic data of a single or several countries to assess as to how a country could react to the amendments in policy or technology or/and other external factors. It explains the incentives and performance of all consumers and producers in the economy and the associations among all the sectors. The CGE Model clearly specifies the behavior of the economy`s different economic agents. Normally, they show households like utility-maximizers while the firms as profit-maximizers or cost minimizers. These optimizing notions climax the role of commodity prices as well as factor prices.

[2] Computable General Equilibrium (CGE) Models are also called Applied General Equilibrium (AGE) Models

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Consumption decisions by households[3] as well as production decisions by firms are affected by prices. It expresses the tendency and magnitude of policy reform change. It gives multipurpose empirical simulation testing ground for measuring the effect of economic policies and domestic economies` external shocks.

Computable implies that CGE Models report numerical findings which are calculated from a statistical database, such as the Social Accounting Matrix (SAM) of an economy. That database has a set of coefficients as well as parameters in the equations. This databank utilizes input-output financial records for a certain time period that indicates flows of products and factors between households, firms, government and the rest of the world (ROW).

Several elasticities like substitution between various inputs to processes of production, price elasticities of demand, income elasticities of demand and similarly foreign demand elasticities for exported products are included in this databank. Briefly, CGE Models produce calculated outcomes in numerical form. CGE Models show the country like a perfect structure of numerous economic factors, for example, households like utility-maximizers while the firms like profit-maximizers or cost-minimizers. Likewise, they depict the behavior of trade unions, capital creators, government, and foreign traders. In CGE Models, demand and supply of commodities and factors are assumed equal. Thus, the commodities and factors` equations are formed in that way that they produce equilibrium on the country. CGE Models deliver result in numerical using the data of actual regions or countries. They utilize real-world conditions.

Initially, CGE Model with a utility-maximizing household sector and twenty cost-minimizing industries was established by Johansen (1963) for the economy of Norway to calculate price elasticities as well as income elasticities for households but there appeared a vast gap in CGE Modeling. Treating with giant data and quantifying the shocks were two main motives that made CGE Modeling trendy in the 1970s. Since the 1970s to present, international conferences, seminars, workshops and summits of CGE modelers were normally in practice. Handling the huge data of all the sectors of the economy in a comprehensive way and reach on concrete relationships and results and above all to suggest operable policy recommendation, this investigation got the

[3] In a common CGE Model there is only a single or probably a few “households”, while the number of production sectors normally is 5–50

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motivation to use CGE Approach and to contribute something solid in the field of research.

Policymaking authorities are generally and keenly concerned in explicit coupled with implicit impacts of precise measures of the plan. Repeatedly such impacts are investigated partially. Computable General Equilibrium Models hold leverage that particular measures as advised by the policymakers can be adapted without any undue aggregation and simplification.

In Computable General Equilibrium Models, financial assets markets are not included. It focuses only on the economy`s real side. CGE technique targets toward measuring the particular policies` impact on the economy`s equilibrium, resources` allocation, and the relative values of outputs as well as inputs.

By exercising the Computable General Equilibrium Models, not merely general equilibrium impacts can be examined but also interaction of various measures can be numerically analyzed. Moreover, the intricacy of micro-macro inter-relationships can be comparatively well functioned by means of this technique of Modeling. In the economy, rich in data, micro-macro records are easily joinable to form the Computable General Equilibrium Model to produce quantifiable assessments of the effects of policies recommended.

To elucidate and deal with the research questions, this study utilizes a number of economic and planning values. These comprise the state budget, fiscal tools such as public expenditure, public revenue, and public debt, the final fiscal account, economic planning, five-year plans, planned and executed values. The study's major approach is the dilemma and solution strategy.

Shoven and Whalley (1984) coveys the main idea about CGE Model and defines it as under:

*"CGE Model is one in which all market clear simultaneously"*

There exists severe defect in this delineation because an account of unemployment can also be allowed in CGE Models. So, this definition does not ineludibly submit that "all markets clear". The similar censure employs to the Borges (1986)'s explanation, quoted in later discussion.

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Robinson (1989) quoted four features of a CGE Model.

a) Precise representatives with economic behavior needed for analysis.
b) Rules and Conditions of economic agents` behavior, under which they perform, for example, consumers` utility-maximization and producers` profit maximization.
c) Factors` Identification like prices which influence the economic agents` decision making.
d) Identification of economy`s prevailing market structure, for instance, perfect competition.

Borges (1986) defines CGE:

> *"Based on the Walrasian tradition, applied general equilibrium models describe the allocation of resources in a market economy as the result of the interaction of supply and demand, leading to equilibrium prices. The building blocks of these models are equations representing the behavior of the relevant agents --- consumers, producers, the government, etc. Each one of these agents demands or supplies goods, services, and factors of production, as a function of their prices. Assuming that market forces will lead to equilibrium between supply and demand, the general equilibrium model computes the prices that clear all markets, and determines the allocation of resources and the distribution of incomes that result from this equilibrium."*

Borges (1986) definition though comparatively perfect, but also have flaws similar to Shoven and Whalley (1984), for example, all the markets cannot be clear at any time. There can exist any sort of imperfection in any market.

Shoven and Whalley (1984), describe the following unique attributes of a CGE Model:

a) The economy consists '*n*' products and '*n*' markets.
b) The consumers are utility maximizers subject to budget constraints. This represents the economy`s demand (consumption) side.

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c) The producers are profits maximizers. This represents the economy`s supply (production) side.

d) There are constant returns to scale. Increasing Returns to Scale and Imperfect Competition can also be incorporated (Harris, 1984).

e) There is homogeneous of degree zero, non-negative, continuous demand for any product, and depends upon all the prices and satisfies Walras' Law.

On the basis of the above discussed characteristics, it is deduced that CGE Model simulates the interaction of various economic agents round the markets depending on institutional as well as behavioral limits (Dervis et al., 1982; Dixon et al. 1982; and Shoven and Whalley,1992).

CGE Models are fundamentally the latest version of Walras' Competitive Economy Model. The distinctive characteristic of General Equilibrium Modeling – originated from Walras` General Economic Equilibrium Theory – is that it reflects the country like a set of the agents. The agents interact in `n` sum of markets for a same quantity of products and services in a given group of initial talents coupled with the distribution of income. Representative describes their supply and/or demand actions through augmenting their own objectives. Agent`s decisions yield a set of excess supply functions that fulfill Walras` Law, that is income and expenditures` global identity. Arrow and Debreu (1954) proved Walras` Law that in certain general situations, there is a clique of prices which bring equilibrium in supply and demand.

It is considered as one of the main differences among CGE Models and other econometric models or the models based on microeconomics. A standard CGE Model determines factor prices, relative product, and real exchange rate, endogenously but it cannot determine nominal prices and the nominal exchange rate. In other words, CGE Models are normally aimed at illustrating the allocation of equilibrium resource and the paths of growth. Exclusively, CGE Models target to quantify the effect of particular policies on the equilibrium allocation of resources and relative prices of goods and rewards of factors.

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A few modelers developed a CGE Model beyond the prime Walras` Model to cover the market imperfections. Therefore, to emphasize the model`s pliability, a few investigators treated CGE Models as General Equilibrium Programming (GEP), Zalai (1982) or some others as Generalized Equilibrium Modeling (GEM), Nesbitt (1984).

Advanced mathematical approach and diagrammatic as well as tabular data representations are utilized to examine the problem as per need, which endeavors to locate association, correlation, and a relationship among related/ selected variables. Since this investigation aims to analyze the effectiveness of fiscal policies on the economic growth of the country, it models numerous instruments of the fiscal policy to examine the economic performance.

## 4.3 CGE Model (*Explanation through Circular Flow*)

The circular flow illustrates the base of a CGE Model. Firstly, incomes` core circular flowchart exhibits market transaction concerning two key agents[4] in an economy (see, Figure 4.1). As the owners of the factors like labor and capital, the household's supply all the type of services to firms. In return, the households receive payments as rewards of their services. Inversely, the business sector gets prices (money) from households when the buy their products. This transaction is encouraged by utility maximization from consumer side and profit maximization from producer side. As utility maximization represents the households` welfare, they try to achieve this goal by purchasing a set of goods and services within the given constraint of their budget. Oppositely, profit maximization is the behavior of producers for earning profits. They achieve this target by selling their output. Which is produced by the given technology. These sorts of behavioral functions, utility maximization as well as profit maximization, are taken strictly and completely consistent next to micro-economic literature and developed in CGE Model.

Core circular flowchart incorporates an account to show the relations amongst business organizations. It demonstrates inter-firm transaction --- firms purchase inputs for their production processes from other firms. These linkages are shown in input-output charts. Because of these linkages, an alteration in households` spending, directly influences the

[4] Households and firms

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output in one group of industries leads to an indirect change in the output in some other group of industries[5].

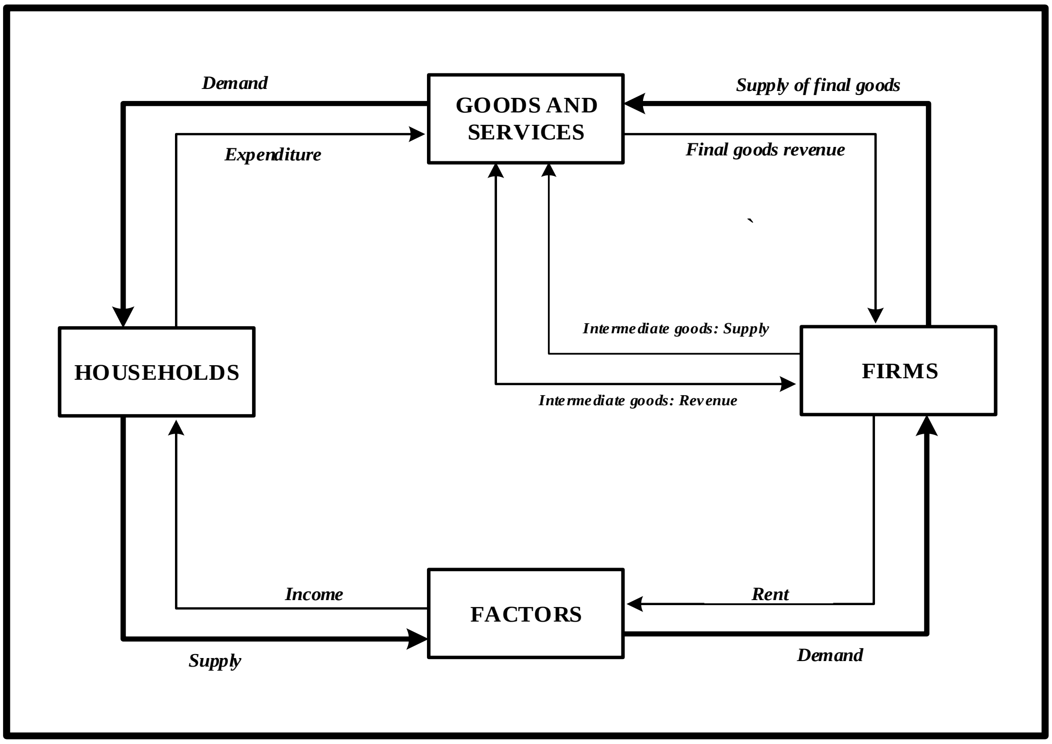


**Figure 4.1: Core Flow Chart of Income**

*Source: Ghadimi (2007)*

The flow chart of income illustrates that households and firms are the two prime agents in the market. Households are assumed as the owners of factors of production like labor and capital. Therefore, these factors supply their services to the firms through the factor market. In returns, labor and capital get rewards (income). Whereas, the firm's sale their production (final goods) to the households through the goods market, and receive prices of the products as payments from them.

Households maximize the level of satisfaction within their budget while firms maximize profit within the budget and given technology constraints. Utility and profit maximizing behaviors of the two agents' behavioral function which is included in the CGE Model. The flow graph of national income shows different firms' interaction also.

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[5] *that is*, in those industries supplying inputs to the directly affected industries

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To produce the output firms, buy and use the production of other firms as inputs, which is also described in input-output tables. All this leads to a change in one set of industries` production directly and leads to a change in the production of any other set of industry indirectly.

Adding three more agents or actors of the economy, that is, government, rest of the world (from now onwards, ROW), and a capital account in the core circular flow chart (see, Figure 4.2). Through taxation the government collects revenues from the rest of the agents. Then buying the products from business sector, the rest of the government's revenues again shifted to households and business sector. Rest of the world sales import products to and purchases export product from the economy.

Capital account develop the loanable funds market. Loanable funds` demand (investment) is savings driven. Savings encompasses individuals' savings, business' savings, public surplus or deficit, and net capital inflow of rest of the world. Preserved incomes and capital depreciation are the sources savings of the firms. Investment is riven in changes in buying new capital stocks, that is, fixed investment and inventory by the industry as well as by government. Buying of capital goods and construction services emits new capital stock.

Taxes are the major source of government revenues. The government collects taxes from the rest of the agents. Rest of the world (ROW) demands the commodities (exports) from a country and supply their commodities (imports) to that country.

The market for loanable funds is called the capital market. Demand for loanable funds is known as an investment while the supply of these funds is named as savings. Total saving of the economy is the sum of the savings by households, firms, government that is, surplus/ deficit, and net capital inflow. Higher savings results into a high level of investment and vice-versa.

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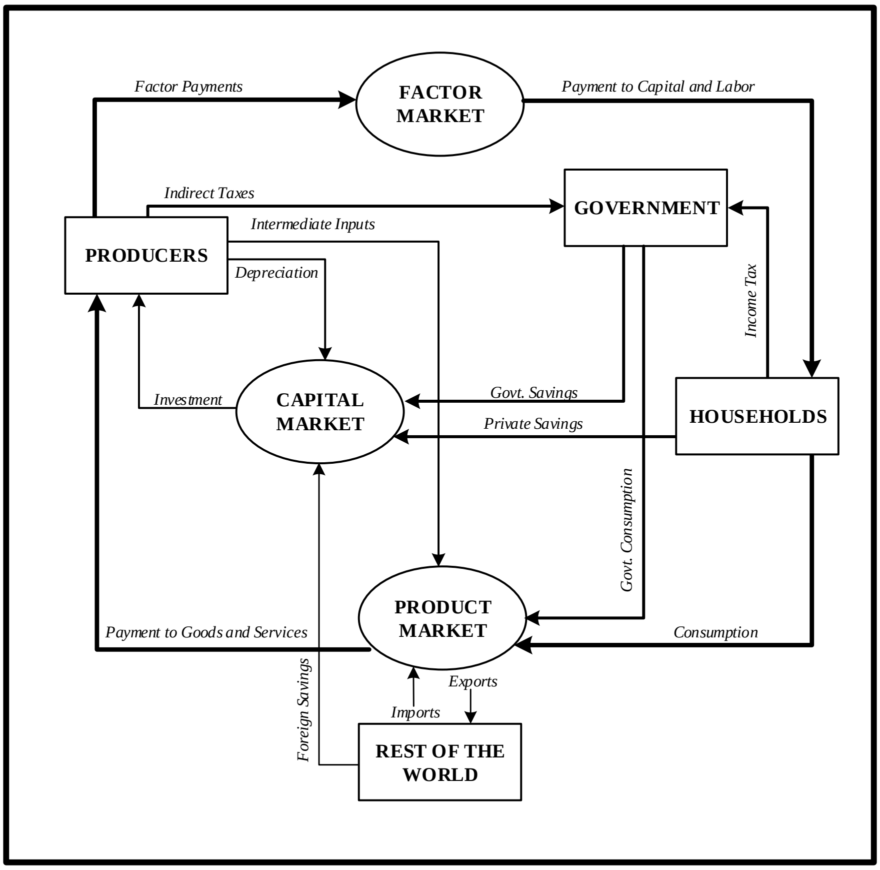


**Figure 4.2: Complete Circular Flow Chart of Income**

*Source: Ghadimi (2007)*

### 4.3.1 Closure Rules of CGE Model

Some closure rules are also an integral part of 'CGE Model'. These rules place aggregate restrictions on the economic activity simulated in a CGE Model and associate how the core macroeconomic accounts. that is, government, trade, and capital accounts adjust to regain the equilibrium in response to changes in economic activity. Their identities are as under:

i. Government Account

*Surplus/ Deficit = Public Receipts – Public Spending*

ii. Trade Account

*Capital Income`s net value from Rest of World*

*= Value of Imports – Value of Exports*

iii. Capital Account

*Total Savings = Total Investments*

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Closure rules establish the system for holding these main macroeconomic accounts in the equilibrium after a change in economic activity. Policy change works throughout all the sectors of the economy. When closing regulations rig the public deficit as well as public spending, therefore, a change in policy which boosts public receipts will actually lead to reduce taxes. With the comprehensive description of the CGE Model, it presents a procedure for quantifying the effects of shocks to a country or possible effect on the whole economy of a putative change in the fiscal policy. Applying a policy change Simulation in a CGE Model is an analogy of the economy`s two states of equilibrium (before and after policy changes and/or economic shock).

## 4.4 History of CGE Modeling

First, the CGE Model was imparted by Johansen (1960), contained one utility-maximizing household sector and twenty cost-minimizing industries. Prices played a crucial role in the determination of consumption and production decision for these optimizing actors. Johansen (1963) Model utilized market equilibrium hypotheses in price determination. He utilized Input-Output data and estimated household price and income elasticities by employing Frisch (1959) additive utility technique. This practice delivered a numerical and multi-sectoral description of growth in Norway`s economy. A number of models were encouraged or trailed by Johansen's pioneer work[6]. Johansen's Model (1960) was succeeded by the ORANI Model of Australia, which enhanced the basis of the Global Trade Analysis Project (GTAP) Model with universal linkages to the world economy.

The 1970s and 1980s witnessed a vast application of CGE Models. These models[7] mostly converged on analyzing economic development issues of the developing economies. Such models ranged the analysis of CGE Models by expanding treatment of income distribution, external trade, and different policy instruments. Various modelers[8] developed CGE Models beyond the Walrasian view by incorporating the 'structuralist' features in the CGE framework. With the latest computerized techniques, an immense deal of the CGE Models has been developed and operated for policy

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[6] *See, for example*, the ORANI model in Australia, Dixon *et al*. (1982) and Longva, Lorestsen and Olson (1985)

[7] *See, for example*, Alderman and Robinson (1978); Dervis, DeMelo, and Robinson (1982); Jeffrey D. Lewis & Jaime DeMelo & Sherman Robinson (1987); Hudson and Jorgenson (1974); Jorgenson (1984); Jorgenson and Wilcoxen (1990a and 1990b)

[8] *See, for example*, Taylor and Black (1974); Taylor and Lysy (1979).

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analysis, for example, tax reforms, trade policy, energy policy, and agricultural/ industrial policy. Many CGE Models have been prepared to explain different policy concerns in developing countries[9].

The competitive general equilibrium analysis of primal-dual solutions to Linear Programming (LP) Models of economy-wide resource allocation was an important source of motivation for CGE Modeling (Zalai, 1999). During the 1960s and 1970s, linear programming models were significantly employed for analyzing the economic policies. The activity analysis method to CGE Models was a distinct approach developed from LP tradition (Ginsburgh and Waelbroeck, 1981).

Scarf (1976) advanced and introduced an algorithm for general equilibrium problem`s solution which was an eminent breakthrough in the history of CGE Modeling. In the early 1970s, use of algorithm made the development of comprehensive, complex and complicated general equilibrium models viable, as they could be solved computationally. Innovations in the computer technology made the improvement and solution of larger and heavy models possible. Consequently, more refined versions of the algorithm were introduced. A novel research approach opened in mathematical economics to advance strong, simple and comfortable sort of general equilibrium algorithm, however, core stays as the fundamental algorithm rendered by Scarf[10].

Shoven and Whalley (1972) presented the applications of computational general equilibrium model first. The algorithm solution flexibility allowed computational models to be more practical and sophisticated. They generated a numerical answer to complex questions of vast practical interest. They addressed policy issues in the international trade and tax reforms areas. Likewise, they followed the tradition and practice of earlier analytical models. Shoven and Whalley (1972) CGE Model version was followed by many other modelers. It is important to cite three main research areas in this context. First, Hudson and Jorgenson (1974) developed a multi-sector energy model for the US economy. It was followed by numerous representative articles[11]. Although, this methodology was not close to the prime Walrasian model it made two major contributions: more sophisticated functional structures were instituted,

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[9] Robinson *et al*. (1999) wrote a handbook for building CGE models for policy analysis in developing countries
[10] It is evident in surveys such as Scarf (1984) and Todd (1984)
[11] Jorgenson and Fraumeni (1981), Jorgenson and Slesnick (1985), Jorgenson (1984).

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representing better estimate to reality, eventually leading to an organized treatment of technological progress; and it was based on a full econometric evaluation of various parameters of submodels.

Manne and Preckel (1985) commenced the second line of investigation. Its core development was a comprehensive treatment of dynamic issues by basing the solution to model on full inter-temporal optimization and by conscientiously identifying the constraints and cost related with partial adjustment on the part of economic agents. Primarily, it was operated to the area of energy policy, later broadened to the areas as development and trade policy.

Main uniqueness of these models was: simple functional forms and parameterizations; low level of desegregation; and a deep emphasis on dynamic issues. The best example of this is a three-region model of trade and economic growth presented by Manne and Preckel (1985). This three-region model is based on a simple structure, but it endows many insights into the major issues in trade among developed, less developed and oil-producing countries.

Compared to the effort of Shoven and Whalley or Jorgenson, Manne did not achieve the same degree of details. Instead, his leading idea was to simulate alternative situations in order to highlight key relationships eminent for policy.

Manne and Preckel (1985) highlighted the pedagogical function of the model. Instead of attempting to calculate precise numerical measures of the effect of a policy decision, it reveals comparatively improved forms of showing the significance of some of the interactions or feedbacks --- which are normally not taken into account in policy debates. This attribute may well be one of the most important factors of computable general equilibrium model’s success and one of the most important rationales as to why they are counted so practical. Investigation`s third line was formed from the multi-sector planning models. These models are common among the experts of development economics. Moreover, these models are backed by the World Bank, (Blitzer et al., 1975). The investigation`s this line has added notably in the promotion of CGE Models.

The desire for disaggregated models to investigate main structural issues had always been documented among policymakers and the economists dealing with the dilemmas of developing economies. Leontief Model`s extension accompanied refined consumer

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expenditures models. To attain a completely consistent framework, research developed in the direction of the concept of Social Accounting Matrices (hereinafter SAM)[12]. To arrive at this point, it was simple and easy to adopt the general equilibrium assumptions. This allowed higher consistency and in-depth treatment of key policy questions linked to economic development. An ample index of this sort of effort is submitted in Devarajan et al., (1991).

This approach is flanking to practical policy issues. Models were not simply employed to reach an academic or scientific fact about a policy decision, they impart imperative information for preparation of decisions made by the governments and on which the World Bank has to give recommendations. Such models generally focus the issues linked to international trade. In many cases, the results obtained have been valuable in policy debate. They give a better understanding of the main factors explaining certain outcomes and simulating the effects of alternative options.

Besides, the above mentioned three lines of investigation, numerous attempts have been made to employ the methodology to new problems or new economies. Likewise, a number of modelers combined some of the benefits of each of the leading lines of inquiry. Borges and Goulder (1981), made an effort to combine Shoven-Whalley tradition with more advanced flexible functional forms applied by Jorgenson in their U.S. energy policy model. Similarly, they exercised specific constraints coupled with the existence of exhaustible resources. This study led to some extra practical results regarding the effects of higher energy prices or the impacts of tax-based options of energy policy.

In Australia, a relatively different methodology was followed in the development of the ORANI Model. It was a comprehensive multi-purpose model which was capable of addressing the economy`s large and small issues. ORANI Model has confirmed to be effective for the economy`s policy analysis (Dixon et al., 1982). Mohammad and Whalley (1984) commenced a new sort of application. They endeavored to measure the inefficiency correlated with certain kinds of government intervention and distortions introduced the behavior of agents. This method has practical relevance for main policy decisions. It assimilates patently into the standard Shoven-Whalley Model framework.

[12] SAM is an inclusive procedure of representing all businesses among all type of the economic agent in an economy.

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Above explanation of some of the important contributions and applications of the general equilibrium, the methodology is not exhaustive. But what we have explained serves to highlight the objective of this study that is to demonstrate a range of applications of these models. Different emphases put by different modelers on technical sophistication or pragmatic realism elucidates the extensive variety of issues can be operated with this powerful tool, *that is* the CGE Model.

Theoretically, latest CGE Models are a part of economic theory stretching back to Walras' effort, "Elements of Pure Economics". Arrow and Debreu (1954), Arrow and Frank (2003), and Scarf (1976) had all formerly delivered the latest view of general equilibrium models in their studies. The focal focus of their studies was on existence, stability, and uniqueness of the equilibrium Bandara (1991). As an experimental complement of these theoretical advancements, CGE Models also deeply depend upon input-output model presented by Leontief (1936, 1937). To capture the interaction among various sectors of the economy, an input-output model can be applied due to its multi-sector aspects.  As a planning instrument, these models were very popular. Trends in the use of these models lasted for more than thirty years until the early 1980s.

Because of the limitations of the input-output model, extreme demand orientation and inappropriate managing of foreign trade, linear programming (LP) models were formed in the early 1960s. A great deal of flexibility was initiated in the basic input-output structure by LP. It permits inequality constraints. It also presents explicit maximization of a planner's preference function into economy-wide planning models. This flexibility makes viable for LP models to be able to permit the endogenous choice of the capacity utilization and import/ export decision (Dervis et al., 1982). Therefore, the LP Model epitomized a major advancement in the area of economy-wide modeling.

A constraint associated with both the models, that is, input-output as well as LP, is that they do not directly incorporate the sorts of price-incentive variables. Indirect taxes, subsidies, and exchange rates indicate the essential instruments of decision-makers in a mixed economy (Dervis et al.,1982). Accordingly, these models are not able to expose the functioning of a multi-market economy, where prices play a critical role in resource allocation and in which there are important substitution possibilities on both demand and production sides (Robinson, 1989). Thus, a newfangled model which combines

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prices was needed to encapsulate the interactions between demand and supply in the mixed economic system.

Johansen (1963) structured a growth model, titled "A Multi-Sectoral Study of Economic Growth" in his doctoral thesis, which is today generally regarded as first CGE model (see, Dixon and Parmenter, 1996).

Amazingly, there was no substantial improvement witnessed until the early 1970s in the effort pioneered by Johansen. Several rationales are liable for this long gap in the evolution of CGE Modeling.

They are as follows:

a. During the 1960s, the relative importance of the sectoral aspect of economic growth was not significant since most economies attained a steady growth phase.
b. Prime economists focused on refining and advancing the theoretic intentions on the continuation, optimality, exclusivity and solutions permanency to General Equilibrium Models (Scarf, 1967*a*, *b*).
c. Applied economists were hypnotized with the philosophy of econometric tactic[13] in the 1960s.

Consequently, less consideration was given to economic theory, for instance, optimizing behavior than time series data, which is the base of CGE Modeling (Bandara, 1991); Dixon and Parmenter, 1996). O'er stated, long silence was broken by Scarf (1967*b*, *c*, 1973) in the early 1970s, who instituted a direct association between theoretical general equilibrium analysis and CGE Modeling (Bandara,1991). Shoven and Whalley (1984, 1972, and 1973), who were Scarf`s pupils, further stimulated the interest in CGE Modeling. Meanwhile, development in numerical solution techniques assisted to remove the barriers in the implementation of the CGE technique. Many enriched computer programs have been advanced since the 1970s.

These programs were MPS/ GE (Rutherford, 1985a) and CASGEN (Rutherford, 1985*b*), GAMS Bisschop and Meeraus (1981), Brook et al. (1988) , Hercules et al. (2013), GEMPACK Codsi and Pearson (1988), Harrison and Pearson (2002).

[13] Let the data speak

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The packages of these software endowed suitable tools for solving general equilibrium systems. Therefore, general equilibrium economists no longer entailed expertise of programming and mathematics. Likewise, the first time (the 1970s) oil shock was accompanied by sharp changes in the international monetary system and rapid growth in real wage rates. It was not possible to explain this kind of shock by conventional macro-econometric models. This was because macro-econometric models lacked sufficient micro foundations and placed heavy dependence on historical time-series data. CGE Models with firm theoretical specifications could present insights into the possible effects of these kinds of shocks for which there was no historical familiarity (Dixon and Parmenter,1996).

## 4.5 Computable General Equilibrium (CGE) Model of Pakistan

CGE Model is based input-output table consisting reliable and updated statistical facts about different sectors of the economy, which is meant to affect the performance, allowing forecasts and counterfactuals about that economy. Using latest Social Accounting Matrix (SAM) 2010-11for the economy of Pakistan, developed by Dorosh et al. (2015), and with the help of the equations created in CGE Model, the challenges faced by the economy can be identified and effective policies to solve the problems can be suggested.

To evaluate the fiscal policy effect on country`s macroeconomic performance, Pakistan`s Computable General Equilibrium Model (hereinafter CGEM-Pk) is employed, containing the static model structure formed by Lofgren et al. (2001). CGEM-Pk is the domestic model of the economy of Pakistan. This version annexes the economy`s economic activities. CGEM-Pk is based on the latest Social Accounting Matrix (SAM) prepared by Dorosh et al. in 2010-11, segregation of activities, commodities, factors, and institutions. CGE Model`s equations are structured to satisfy micro as well as macroeconomic constraints. Since the goal of the present investigation is to evaluate the net effect of fiscal shocks on macroeconomic variables, therefore, tariff, tax (direct and indirect), and policy mix are cogitated with a few improvements in the model. Various settings are systematized to present net effect of fiscal changes on Pakistan`s economy.

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The equations formed for this investigation confirms that the requirements regarding products market and factors market, investments, savings, current account balance, and govt. the account balance is fully satisfied. The model, CGEM-Pk is not a dynamic model rather it is a standard static model. Therefore, it does not consider second-period changes.

Mathematical statement for CGE model for Pakistan (see, Appendix-C) defines sets (Table C.2), Parameters (Tables C.3), Exogenous Variables (Table C.4), Endogenous Variables (Table C.5).

The SAM 2010-11 reveal the features of the economy of Pakistan. It consists of nine activities as well as nine commodities like mining, agriculture, food manufacturing, textiles, cotton lint/ yarn, leather, other manufacturing, energy, and services, three factors like land, labor, and capital, and the institutions like households, govt., and rest of the world. The equations designed define whole economy`s interrelationship.

SAM affirms real values for the coefficients in created equalities owing to measurement maneuver. Verifying producing of base year`s data, the model was primarily solved for equilibrium, then it was shocked with an amendment in selected exogenous variables` values. For equilibrium and for alterations in endogenous variables` values, the model was solved once again. Lastly, resultant values were compared with the equilibrium values of the base year. In this manner, exogenous shock`s effect was assessed.

## 4.6 Need for CGE Modeling

Interdependence of macroeconomic variables and its mutuality is the core spirit of CGE Models (Shoven and Whalley, 1984). Since CGE Models realize about the country that it is bound by some limits, for instance, forced through foreign accounts and supplies of a factor, indirect relationships between industry`s performance ensuing as of such restrictions repeatedly in the situation. Consequently, as the main benefit, the CGE technique permits us to examine exogenous events and the effects of policy actions in the context of an interlinked, consistent, and reliable global system.

The preeminence of CGE Approach can be formed more visible if we compare it with other widely-agreed methodologies. We commence with the partial equilibrium method. Traditionally, it has been the most acknowledged technique of investigation in

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the applied economics. The main benefit of this technique is simplicity. However, it is obviously awfully inappropriate when “feedback” impacts from a specific shock or policy changes are believed to be important. For example, ultimate effects on the economy due to alterations in policy about trade will ensue from changes in consumption, production, and decisions about investment, which ultimately will be affected by the response from ensuing variations. Partial Equilibrium Analysis is also impotent to annex all the interaction of the economy as it is based on ceteris paribus. In contrast, these interactions are explicitly modeled in the CGE Model because the supply of and demand for each commodity depends upon all relative prices (Bandara, 1991).

Mathematical programming and input-output methods were common to examine the economy during the 1950s and 1960s. Both methodologies can be counted as multi-sectoral or economy-wide techniques and have the ability to obtain the effect of a change in a specific sector throughout the whole economy. The drawback of both of these methodologies is lack of the role of prices which restricts the dexterity to feign the mechanisms of price governed the mixed market economy. Conversely, prices and quantities are determined endogenously in the Computable General Equilibrium Models. This is a significant advancement of the CGE Model over mathematical programming as well as input-output methods in economy-wide testing.

Macro-econometric models are also multi-sectoral or economy-wide models. They depend greatly on historical data and pay very negligible attention to microeconomic theory. While CGE Models are established on concrete microeconomic foundations. CGE Models fully enumerate the optimizing behavior of all economic agents in the economy. Therefore, CGE Approach has a firmer analytical foundation as compared to macro-econometric models.

## 4.7 Model Blocks

Following are the main four general blocks of equations in the model;

4.7.1 Price Block

4.7.2 Production Block

4.7.3 Institution Block, *and*

4.7.4 System Constraint Block

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### 4.7.1 Price Block

PX is an activity`s Manufacture value of the product. PX comprises taxes on activity along with factors in the process of production. PE represents the product`s Export price with taxes. PM is Import price of the output, calculated after including tariff imposed. PQ is the price of composite commodities. It is settled through interaction between inland and import values of the commodities. Sales tax is included into composite commodity price to attain the final market price of the product.

Prices of traded commodities consist of the domestic sales price with taxes and/or without taxes, composite products` prices, producer prices, exports` domestic prices, imports` domestic price, exports` international price, and imports` international price. For developing economies like Pakistan, imported commodities` domestic price is determined after including the tariffs (see, Figure 4.3).

The Price Block comprises the equations in which endogenous prices are connected to other prices (endogenous or exogenous) and to non-price model variables (see, Appendix-C, Table C.6).

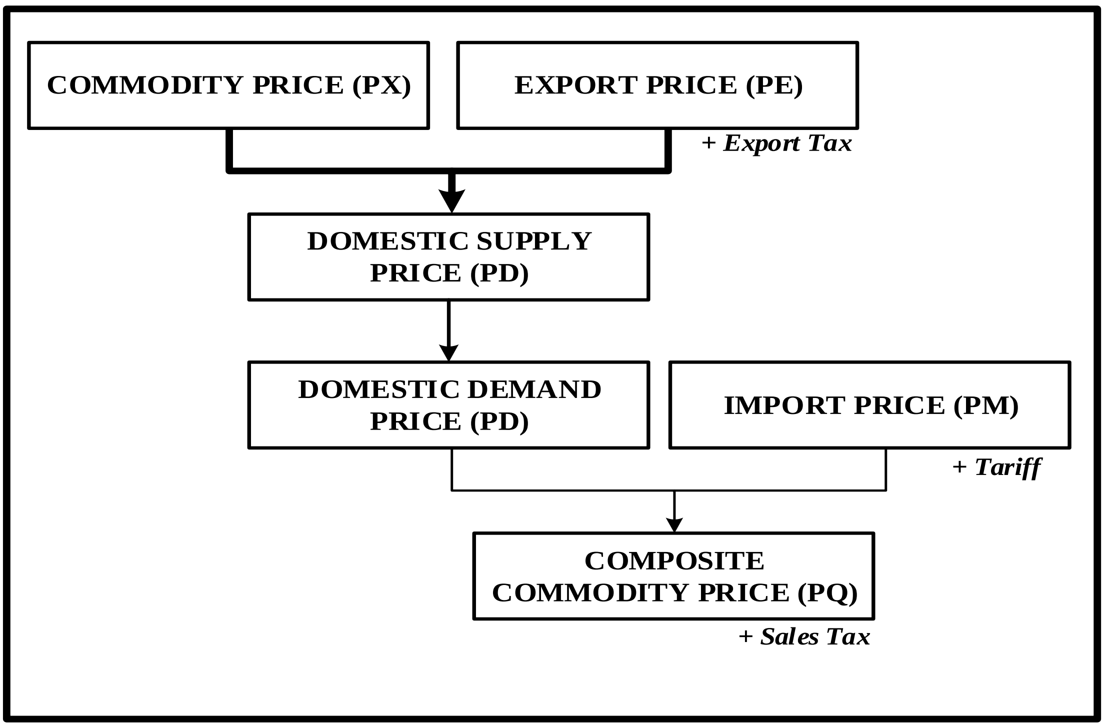


**Figure 4.3: Prices**

*Source: Lofgren et al. (2001)*

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#### 4.7.1.1 *Import Price ($PM_c$)*

Import Price Equation

$$PM_c = (1 + tm_c)\ PWM_c\ EXR \qquad c \in CM \qquad (4.1)$$

| | | | |
|---|---|---|---|
| *Where* | $PM_c$ | = | Imported Commodities\` domestic price *(Domestic Currency Unit)* |
| | $tm_c$ | = | Import\`s Tariff Rate |
| | $PWM_c$ | = | Import\`s World Price |
| | $EXR$ | = | Rate of Exchange *(Domestic Currency Unit per Foreign Currency Unit)* |
| | $c \in CM$ | = | Imported Commodities\` Set |

The exchange rate ($EXR$) and the domestic import price ($PM_c$) are flexible, whereas the tariff rate ($tm_c$) and the world import price ($PWM_c$) are fixed. Fixedness of the world import price advances from the “small country” hypothesis, viz., for all imports of the economy, the presumed share of the world trade for the modeled country is so small that it faces an infinitely elastic supply curve at the prevailing world price.

#### 4.7.1.2 *Export Price ($PX_c$)*

Export Price Equation

$$PE_c = PWE_c\ (1 + te_c)\ EXR \qquad c \in CE \qquad (4.2)$$

| | | | |
|---|---|---|---|
| *Where* | $PE_c$ | = | Export\`s Domestic Price *(Domestic Currency Unit)* |
| | $te_c$ | = | Exports\` Tariff Rate |
| | $PWE_c$ | = | Exports\` World Price *(Foreign Currency Unit)* |
| | $EXR$ | = | Rate of Exchange *(Domestic Currency Unit per Foreign Currency Unit)* |
| | $c \in CE$ | = | Exported Commodities\` Set |

Export price ($PEc$) in domestic or local currency unit (LCU) is that price which is received by local manufacturers whilst selling the production in the export market. The tax and the cost of trade inputs decrease the price received by the domestic producers of exports (instead of adding to the price paid by the inland demanders of imports). The

`

domain of this equation is the set of exported goods, all of which are produced domestically[14].

***Absorption*:** Local demand price-time quantity of local sales plus import price-times quantity of import equals net of sales tax at demand prices.

$$PQ_c\, QQ_c\, (1 + subr_{c)}) = (\, PD_c\, QD_c + PM_c\, QM_c\,)\, (1 + tq_c + icd_c\,) \qquad c \in CM \qquad (4.3)$$

| | | | |
|---|---|---|---|
| *Where* | $PQ_c$ | = | Commodity\`s Composite Price |
| | $QQ_c$ | = | Quantity Supplied to Local Market *(Composite Supply)* |
| | $Subr_c$ | = | Subsidy Rate Per-unit of Commodity *C* |
| | $PD_c$ | = | Commodity\`s Demand Price Produced and Sold in Domestic Market |
| | $QD_c$ | = | Domestic Output\`s Quantity Sold in Domestic Market |
| | $PM_c$ | = | Imported Goods\` Domestic Price *(Domestic-Currency Unit)* |
| | $QM_c$ | = | Imported Commodities\` Quantity |
| | $tq_c$ | = | Sales Tax Rate |
| | $icd_c$ | = | Trade Input of *C* Per-unit of Commodity *C* Produced and Sold Domestically |
| $c \in CM$ | | = | Commodities\` Set with Domestic and Imported Commodities\` sale in domestic market |

The equation overall applies to have the inland sale of all goods and services imported or domestically produced. So, it is not attached to the products for which total production volume is exported.

So, absorption net of non-imported products\` sales tax (at demand prices) is expressed as local demand time local sales quantity.

$$PQ_c\, QQ_c\, (1 + subr_c\,) = PD_c\, QD_c\, (1 + tq_c + icd_c\,) \qquad c \in CM \qquad (4.4)$$

[14] The commodities imported for intermediate re-export are not included in the model

`

| | | | |
|---|---|---|---|
| *Where* | $PQ_c$ | = | Composite Price of Commodity *c* |
| | $QQ_c$ | = | Quantity of Goods Supplied to Domestic Market (Composite Supply) |
| | $subr_c$ | = | Subsidy Rate Per-unit of Commodity *C* |
| | $PD_c$ | = | Domestic Price of Domestic Output |
| | $QD_c$ | = | Domestic Sales Quantity |
| | $tq_c$ | = | Rate of Sales Tax |
| | $icd_c$ | = | Trade Input of *C* Per-unit of Commodity *C* Produced and Sold Domestically |
| | $c \in CM$ | = | Non-imported Commodities` Set |

#### *4.7.1.3 Domestic Output Value (DOV)*

At producer prices, market value of output for every internally manufactured product is described as an aggregate of domestic sales value and exports value[15].

$$PX_c \, QX_c = PD_c \, QD_c + PE_c \, QE_c$$

$$c \in CX \qquad (4.5)$$

| | | | |
|---|---|---|---|
| *Where* | $PX_c$ | = | Producer Price |
| | $QX_c$ | = | Domestic Output`s Aggregate Quantity |
| | $PD_c$ | = | Domestic Commodity`s Supply Price |
| | $QD_c$ | = | Quantity of Domestic Sales |
| | $PE_c$ | = | Exported Commodities` Domestic Price |
| | $QE_c$ | = | Exports Supply |
| | $c \in CX$ | = | Commodities` Set with Domestic Production |

Domain constraint to internally produced goods and services (the components in the set CX) has to be specified explicitly given that the model embraces a category of imported goods and services without domestic production.

Likewise, the market value of output (at producer prices) for a domestically manufactured non-exported product can be stated as:

[15] This value excludes the value of the home-consumed output

`

$$PX_c\,QX_c = PD_c\,QD_c$$

$c \in CNE$ (4.6)

| | | | |
|---|---|---|---|
| *Where* | $PX_c$ | = | Commodity Price of Producer *c* for Activity *a* |
| | $QX_c$ | = | Aggregate Quantity of Domestic Output of Commodity *C* |
| | $PD_c$ | = | Domestic Price of Domestic Output |
| | $QD_c$ | = | Domestic Sales Quantity |
| | $c \in CNE$ | = | Non-imported Commodities` Set |

#### 4.7.1.4 *Activity Price ($AP_a$)*

It returns per-activity unit multiplied by prices of activity of particular product summed total products.

$$PA_a = \sum_{c \in C} \theta_{a,c}\, PX_c$$

$a \in A$ (4.7)

| | | | |
|---|---|---|---|
| *Where* | $PA_a$ | = | Activity Price *or* Gross Revenue per-activity |
| | $\theta_{a,c}$ | = | Yield of product *c* per-unit of Activity *a* |
| | $PX_c$ | = | Commodity Price of Product *c* for Activity *a* |
| | $a \in A$ | = | Activities` Set |

Gross revenue per-activity unit is the return from selling the production or production of the activity, explained as yields per-activity unit multiplied by activity-specific commodity prices, summed over all goods and services. This agrees for the fact that activities may yield multiple commodities.

#### 4.7.1.5 *Price of Value Added ($PVA_a$)*

Activity net of tax minus intermediate input cost per-activity unit results into the value-added price.

$$PVA_a = PA_a - \sum_{c \in C} ir_{c,a}\, PQ_c$$

$a \in A$ (4.8)

`

| | | | |
|---|---|---|---|
| *Where* | $PVA_a$ | = | Price of Value added<br>*(Factor Income Per-unit of Activity)* |
| | $PA_a$ | = | Activity *a* Price |
| | $ir_{c,a}$ | = | Quantity of product *c* as Intermediate Input<br>Per-unit of Activity *a* |
| | $PQ_c$ | = | Commodity`s Composite Price |
| | $a \in A$ | = | Activities` Set |

### 4.7.2 Production Block

The activities attain production in CGEM-Pk, and get income after selling their products. The activities spend their income on buying factors of production, that is buy intermediate material, make payments in the form of wages/ rent to the basic factors. The model supposes that the activities taken into account maximize their returns keeping in view the production functions as well as the neo-classical substitutability of factors of production and the fixed coefficient for inputs of intermediate form. Moreover, only one product is produced by one activity.

The CGEM-Pk classifies nine activities which mingle basic factors with the intermediate products to derive a production level. These activities are mining (A-MINE), agriculture (A-AGRI), food manufacturing (A-FMAN), textile (A-TEXT), cotton lint/ yarn (A-YARN), leather (A-LEAT), other manufacturing (A-MANF), services (A-SER), energy (A-ENRG) and Three factors of production are indicated in this model: land (N), labor (L), and capital (K).

In this model the manufacturers maximize returns subject to the constant returns to scale (CRS). They select production factors considering a constant elasticity of substitution (CES). This specification allows the manufacturers to respond to the changes in income of the factors. They can surrogate among the inputs attain a final value-added composite.

Maximization of profit implies that the production factors receive rewards where their marginal cost (MC) and marginal revenue (MR) are equal. Which is decided on the base of endogenous relative prices. Once the production factors are defined, then these are combined with the fixed-share intermediates applying a Leontief specification (see, Appendix-C, Table C.7)

`

The utilization of fixed-shares in line with the notion that the wanted blend of intermediates average production, and the ratio of intermediates to value-added, is finalized by the production technique and not by the decision-making of the producer. The technology is elucidated in Figure 4.4.

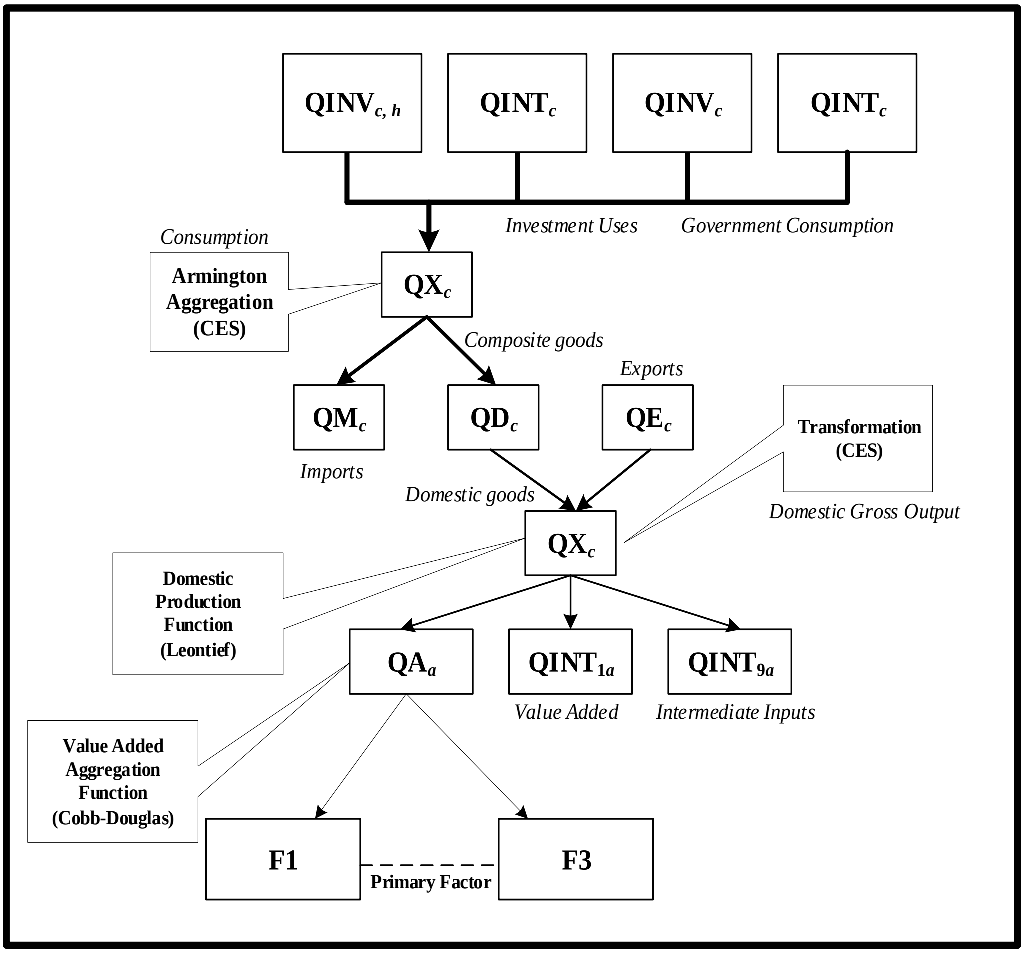


**Figure 4.4: Production Technology and Flows of Marketed Commodities**

*Source: Lofgren et al. (2001)*

*(Note: CES is Constant Elasticity of Substitution; CET is Constant Elasticity of Transformation)*

The induction of intermediate inputs into production technology (see Lofgren, 1999:12) needs that activity output be stated a function of intermediate inputs (QINT$_a$) and primary factors (QA$_{,a}$). So as to confirm that the degree of substitutability may differ among various inputs a nested production structure may be utilized. Usually in CGE modelling system a two-stage production structure is utilized. At top-level final

`

production ($QX_c$) is the function of two ‘aggregate inputs’, viz., ‘value added’, (an aggregated primary factor component), and ‘aggregate intermediate inputs’, (aggregation various inputs) that a certain activity utilizes in its production process. The aggregated inputs are themselves defined by production functions that are nested within the top-level function. Activity output level (top-level) is normally described as a Leontief function, in which case $QINT_a$ are utilized in fixed proportions, or as a Constant Elasticity of Substitution (CES) function. Accordingly, individual inputs are increased in fixed proportions as the demand for $QINT_a$ increases.

Production and commodity blocks cover the following attributes of CGEM-Pk.:

a) Inland output and factors utilization.
b) Inland output allocation to domestic and foreign markets.
c) Domestic market supply aggregation.

A Constant Elasticity of Substitution (CES) Cobb-Douglas production function is employed to obtain the association between the use of factors and level of activities. The Cobb-Douglas function is easy to use and its seemingly suitable empirical fit across various data sets. Cobb-Douglas function, Leontief function and Constant Elasticity of Substitution function, are utilized commonly in economic modelling. Usually these methods have been utilized to model the production side or consumption side of the microeconomic models.

The benchmark in CGE modelling has been to adapt the single-level value-added sort model to a multi-level output model, so with value-added as well as intermediate inputs. This is classically referred to as ‘nested’ output model, and frequently makes the use of a combinations of CES/Cobb-Douglas and Leontief functions. In open-economy Computable General Equilibrium (CGE) Models, Constant Elasticity of Substitution (CES) functions and the associated Constant Elasticity of Transformation (CET) functions have been utilized to the model producers` and consumers’ decision-making process regarding consumption of, and/or production of traded goods (imports and/or exports) and domestic goods.

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#### 4.7.2.1 Production Block [Activity Production Function (APF)]:

Finding the correlation in inputs employed and activity level, Cobb-Douglas Production Function is used.

$$QA_a = ad_a \prod_f QF_{f,a}^{\alpha_{f,a}}$$

$$a \in A \qquad (4.9)$$

| | | | |
|---|---|---|---|
| *Where* | $QA_a$ | = | Quantity of Activity *a* |
| | $ad_a$ | = | Production Function`s Activity Parameter |
| | $QF_{f,a}$ | = | Share` Value for Factor *f* in Activity *a* |
| | $\alpha_{f,a}$ | = | Value Added Share for Factor *f* in Activity *a* |
| | $a \in A$ | = | Activities` Set |

Production is carried out by the activities that are supposed to maximize profits subject to the technology, taking prices for their outputs, intermediate inputs, and factors of production as given. In simple words, it performs in a perfectly competitive environment. The CGE Model encompasses the first-order conditions for profit-maximization by producers.

##### 4.7.2.1.1 Factor Demand ($QF_{f,a}$)

For a profit-maximization subject to production function, the first-order condition can be applied to find factor demand.

$$FPD_{f,a}\, PF_f = (\alpha_{f,a}\, PVA_a\, QA_a) / QF_{f,a}$$

$$f \in F, \; a \in A \qquad (4.10)$$

| | | | |
|---|---|---|---|
| *Where* | $FPD_{f,a}$ | = | Factor Price Distortion for Factor *f* in activity *a* |
| | $PF_f$ | = | Return` Rate to Factor *f* |
| | $\alpha_{f,a}$ | = | Value Added Share for Factor *f* in Activity *a* |
| | $PVA_a$ | = | Price of Value Added |
| | $QAa$ | = | Quantity of Activity *a* |
| | $QF_{f,a}$ | = | Quantity Demanded of Factor *f* from Activity *a* |
| | $f \in F$ | = | Factors` Set |
| | $a \in A$ | = | Activities` Set |

`

According to the equation (4.10), activities demand factors at the point where marginal cost (MC) of all factors is equal to the marginal revenue product (MRP) of these factors.

#### *4.7.2.1.2 Intermediate Demand (ID)*

Intermediate inputs` demand for all the activities is settled because of Leontief expression as the level of activity times the intermediate-input coefficient. At this level aggregate intermediate demand for inputs is generally expressed as a Leontief function of the different individual intermediate inputs, i.e., it is supposed that firms utilize various intermediate inputs in fixed proportions. Thus, Individual inputs are increased in fixed proportions as the demand for $QINT_a$ increases.

$$QINT_{c,a} = ir_{c,a} \; QA_a$$

$$a \in A, \quad c \in C \qquad (4.11)$$

| | | | |
|---|---|---|---|
| *Where* | $QINT_{c,a}$ | = | Quantity of Commodity *c* as intermediate input coefficient |
| | $ir_{ca}$ | = | Quantity of Final Commodity *c* utilized as Input Per Unit of Activity *a* |
| | $QA_a$ | = | Quantity of Activity *a* |
| | $a \in A$ | = | Activities` Set |
| | $c \in C$ | = | Commodities` Set |

Likewise, factor constraint coefficient $ir_{ca}$ is in term of final product $QQ_c$ and satisfies

$$\sum_{c \in C} ir_{c,a} = 1$$

$$a \in A \qquad (4.11a)$$

#### *4.7.2.1.3 Output Function ($QX_c$)*

Mathematically, activity time yields (domestic product) vented in the following form:

$$QX_c = \sum_{a \in A} \theta_{a,c} \, QA_a$$

$$c \in C \qquad (4.12)$$

`

| | | | |
|---|---|---|---|
| *Where* | $QX_c$ | = | Domestic Production Quantity |
| | $\theta_{a\,c}$ | = | Yield of Commodity *c* Per-unit of Activity *a* |
| | $QA_a$ | = | Quantity of Activity *a* |
| | $c \in C$ | = | Commodities` Set |

Furthermore, product c`s yields share per unit of activity *a* satiate

$$\sum_{c \in C} \theta_{a,c} = 1$$

Keeping the assumption of classical theory in view, the commodity to be traded is supposed as a commodity for which the country is not price-maker rather price-taker (small economy hypothesis). Moreover, the commodity is a perfect substitute of its corresponding import. So that, world price and domestic price becomes equal to each other. Which implies that if domestically produced goods are perfect substitute of imported commodities, then trade creation impacts of trade policies tend to be stronger if the commodities are imperfect substitutes.

As a result of supposing imperfect substitutability of domestically produced commodity with foreign product imported, Armington (1969), a specific variation in the imported commodities` domestic price results into a negligible price change in domestically trafficked products. Consequently, diving substitution among domestically produced products and the products imported elucidates the problem of specialization. Assumption given Armington (1969) is followed which states, that there is imperfect substitutability between domestic and imported goods, each country produces a unique set of un-equal but substitutes to a changing intensity.

This specification has following advantages:

i. Cross-hauling (same commodity`s export and import in the same period) can be accommodated in trade data.
ii. Over specialization problem can be avoided, Mujeri and Khondker (2002).
iii. As the commodities are considered imperfect substitute, therefore, It can be attained by 'bounding the output response to changes in trade policy from the demand side, Mujeri and Khondker (2002).

`

Since domestic and imported commodities are imperfect substitutes, therefore, a specific percent change in the home price of imports leads to a negligible percent variation in the price of domestically transacted commodities. So, leaving the hypothesis of absolute substitutability between domestically produced commodities and imports solves the question of specialization. It is exclusively valuable for the under-developed countries like Pakistan.

The constant elasticity of transformation (CET) function is used to govern substitution decision among domestic and foreign output. Desire to maximize the Profit leads the firms to market their products in those areas where they can obtain maximum profits, and which are domestic and export prices based. Export prices (Domestic value) are attained by multiplying the exchange rate with world prices included any subsidies and taxes (if). Pakistan has no influence on world prices, as the economy of Pakistan is an underdeveloped small economy.

Pakistan`s domestic demand is met through the use of either domestically produced or imported commodities. The supply from these two sources is added to form a composite commodity, which is subsequently sold to domestic demanders. These demanders are assumed to minimize expenses subject to the substitutability between domestically produced and imported goods. This substitution takes place under a CES Armington specification.

In case of Pakistan, energy cannot be exported neither imported because it is the only product which is produced and consumed within the economy. Whereas, domestic demand for all other commodities is filled by domestic or imported commodities. Supply from domestic and foreign sources form a composite commodity, which is consequently sold to meet domestic demand. The demanders are supposed to minimize consumption expenditure subject to the substitutability between domestically produced and imported goods. This Substitution takes place under a CES Armington specification Armington (1969).

The finished composite commodity (domestic and imported commodities combination) is delivered to satisfy the domestic demand (intermediate and final). Final demand depends on the incomes of institutions as well as on the composition of total demand (see, Appendix-B, Figure B.1 & Figure B.2).

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#### *4.7.2.1.4 Output Transformation Function*

Through CES aggregation (transformation) total output of any product can be described as there is an exported product type.

$$QX_c = ax_c \,[\, (1 - \delta x_c)\, QD_c^{\rho x_c} + \delta x_c\, QE_c^{\rho x_c} \,]^{1/\rho x_c}$$

$c \in CE$ (4.13)

| | | | |
|---|---|---|---|
| *Where* | $QX_c$ | = | Domestic Output\`s Quantity |
| | $ax_c$ | = | Output Transformation (CET) Function\`s Shift parameter |
| | $\delta x_c$ | = | Output Transformation Share Parameter |
| | $QD_c$ | = | Domestic Output Quantity Sold Domestically |
| | $\rho x_c$ | = | Exponent utilized in CES Aggregation Function |
| | $QE_c$ | = | Export Quantity |
| | $c \in CX$ | = | Exported Commodities\` Set |

The CET function, which employs the goods that are both exported and sold domestically, is identical to a CES function except for negative substitution elasticities. The values are constrained to assure that the isoquant corresponding to output transformation function is concave to the origin.

Non-exported products are elucidated as

$$QX_c = QD_c$$

$c \in CNX$ (4.14)

| | | | |
|---|---|---|---|
| *Where* | $QX_c$ | = | Quantity of Domestic Output |
| | $QD_c$ | = | Domestic Output Quantity Sold Locally |
| | $c \in CNX$ | = | Non-exported Commodities\` Set |

The equation (4.14) represents that the product produces domestically entirely sold in the domestic market so that there is no export.

#### *4.7.2.1.5 Composite Supply Function (CSF)*

Substitution between imports and domestic production sold internally is annexed through CES aggregation function in which composite good that is supplied internally

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is “produced” by domestic and imported goods recording this function as “inputs”. As the domain of this function is restricted to goods that are both produced domestically and imported, it is often termed as an “Armington” function, called after the originator of the concept of using a CES function for this objective.

$$QQ_c = aq_c\,[\,(\,1 - \delta q_c\,)\,QD_c^{-\rho q_c} + \delta q_c\,QM_c^{-\rho q_c}\,]^{-1/\rho q_c}$$

$c \in CM$ (4.15)

| | | | |
|---|---|---|---|
| *Where* | $QQ_c$ | = | Composite Supply |
| | $aq_c$ | = | Armington Function`s Share Parameter |
| | $QD_c$ | = | Domestic Output Quantity Sold Locally |
| | $\delta q_c$ | = | Composite Commodity Share Parameter |
| | $\rho q_c$ | = | Armington Function`s Exponent |
| | $QM_c$ | = | Imports Quantity |
| | $c \in CM$ | = | Imported Commodities` Set |

#### *4.7.2.1.5.1 Composite Supply for Non-imported Commodities*

Equivalence of composite supply and not-imported internal production reinstate Armington function.

$$QQ_c = QD_c \qquad c \in CNM \qquad (4.16)$$

| | | | |
|---|---|---|---|
| *Where* | $QQ_c$ | = | Composite Supply |
| | $QD_c$ | = | Domestic Output Quantity Sold Locally |
| | $c \in CNM$ | = | Non-imported Commodities` Set |

#### *4.7.2.1.6 Import-Domestic Supply Ratio*

The problem of maximization is to minimize cost subject to the Armington function. We acquire the relative demand for imported versus domestic commodities as a function of their relative prices.

$$QM_c\,/\,QD_c = [\,(\,\delta q_c\,/\,1\text{-}\delta q_c)\,(\,PD_c\,/\,PM_c\,)]^{\sigma q_c}$$

$$\sigma q_c = 1\,/\,(1 + \rho q_c) > 0$$

$c \in CM$ (4.17)

`

| | | | |
|---|---|---|---|
| *Where* | $QM_c$ | = | Quantity of Imported Commodities |
| | $QD_c$ | = | Domestic Sales Quantity |
| | $\delta q_c$ | = | Share Parameter for the Composite Goods |
| | $PD_c$ | = | Domestic Price of Domestic Output |
| | $\sigma q_c$ | = | Transformation for Composite Commodities Elasticity |
| | $c \in CM$ | = | Imported Commodities` Set |

The eq. (4.17) enlightens domestic demand ratio and import which states optimal combination of domestic production and imports. While domestic and export supply ratio describes the optimum mix of domestic and supply of exports.

#### *4.7.2.1.7 Export-Domestic Supply Ratio*

Export supply arising from the profit maximization to the producers is as under:

$$QD_c / QE_c = [ ( \delta x_c / 1 - \delta x_c ) ( PD_c / PE_c ]^{\sigma x_c}$$
$$\sigma x_c = 1 / \rho x_c - 1 > 0$$
$$c \in CE \qquad (4.18)$$

| | | | |
|---|---|---|---|
| *Where* | $QD_c$ | = | Domestic Sales Quantity |
| | $QE_c$ | = | Supply of Exports |
| | $\delta x_c$ | = | Share Parameter for Output Transformation |
| | $PD_c$ | = | Domestic Price of Domestic Output |
| | $PE_c$ | = | Domestic Price of Exported Goods |
| | $\sigma x_c$ | = | Elasticity of Transformation for Output Transformation |
| | $\rho x_c$ | = | Exponent used in the CES Aggregation Function |
| | $c \in CE$ | = | Exported Commodities` Set |

`

### 4.7.3 Institution Block

This model considers households, government, and enterprise as main institutions in the economy (see, Appendix-B, Figure B.3). These institutions can be analyzed as:

#### *4.7.3.1 Factor Income (FI)*

In this model, there are numerous income sources of the institutions. The households' main source of income is income from factors services. These factors (labor, land, and capital) take rewards from their contribution to value-added. The factors` reward is, in turn, to be paid to the institutions, supplying these factors.

In CGEM-Pk, returns from the factors like, land and labor are spread out through two types of household. Contrariwise, income of capital does not go to individuals only, rather also as a share of the capital income to the enterprises and government as per initial capital endowment of both the sectors. Thus, the capital income is allocated to the two categories of the household, that is, government, and enterprises (see, Appendix-C, Table C.8).

The share of institutions categorizes in factor income is stated as:

$$YF_{i,f} = shry_{i,f} \sum_{a \in A} FPD_{f,a} PF_f QF_{f,a};$$

$$i \in I \ , \ f \in F \qquad (4.19)$$

| | | | |
|---|---|---|---|
| *Where* | $YF_{i,f}$ | = | Factor $f$ Income Transfers to Institutions $i$ |
| | $shry_{i,f}$ | = | Institutions $i$ share in Income of Factor $f$ |
| | $FPD_{f,a}$ | = | Factor Price Distortion for Factor $f$ in Activity $a$ |
| | $PF_f$ | = | Rate of Return to Factor $f$ |
| | $QF_{f,a}$ | = | Factor $f$ Quantity Demanded from Activity $a$ |
| | $i \in I$ | = | Institutions` Set |
| | $f \in F$ | = | Factors` Set |

For confirming the distribution of factors` income, essentially the share must satiate:

$$shry_{s,f} + \sum_{h \in H} shry_{h,f} = 1$$

`

#### 4.7.3.2 Households (HH)

The main source of households` income is factor return caused in the process of production. Supply of capital is assumed as static during the given period of time and immobile from sector to sector, accordingly, indicating that the capital receives sector precise incomes.

The secondary source of households` income is transfers from other institutions like; government, enterprise, and rest of the world (ROW). Disposable income of the households is net of the personal direct tax, like income tax and savings established on the stable rates and static marginal propensities respectively.

Demand functions explain real consumption of each commodity given prices and income of the household; however, households spend their income to consume commodities, save, pay taxes, and make transfers to other institutions. Households` consumption is dispersed across the market and home commodities.

##### 4.7.3.2.1 Household Income (HI)

Income of the household is the aggregate of factor incomes and transfers (domestic and foreign). Household`s income is stated as under:

$$YH_h = \sum_{f \in F} YF_{h,f} + TR_{h,g}\ CPI + EXR \cdot TR_{h,r} + TR_{h,s}$$

$$h \in H \quad (4.20)$$

| | | | |
|---|---|---|---|
| *Where* | $YH_h$ | = | Household *h* Income |
| | $YF_{hf}$ | = | Factor *f* Income Transfer to Household *h* |
| | $TR_{gh}$ | = | Government Transfers to Household *h* |
| | $TR_{hs}$ | = | Enterprise Transfers to Household *h* |
| | $CPI$ | = | Consumer Price Index |
| | $EXR$ | = | Rate of Exchange |
| | $\boldsymbol{TR}_{hr}$ | = | Rest of the World *r* Transfers to Household *h* |
| | $h \in H$ | = | Households` Set |

`

#### 4.7.3.2.2 Households` Savings

Household`s saving in this model is stated as under:

$$HTS = \sum_h MPS_h \left(1 - ty_h\right) YH_h \tag{4.21}$$

| | | | |
|---|---|---|---|
| *Where* | $HTS$ | = | Households` Savings |
| | $MPS_h$ | = | Households` Marginal Propensity to Save |
| | $ty_h$ | = | Household Income Tax Rate |
| | $YH_h$ | = | Households` Income |

##### 4.7.3.2.2.1 Domestic Households` Savings (HDS)

Domestic household saving (HDS) is as:

$$HDS = HTS - \sum_h TR_{h,r} \cdot EXR \tag{4.22}$$

| | | | |
|---|---|---|---|
| *Where* | $HDS$ | = | Domestic Household Saving |
| | $HTS$ | = | Households` Savings |
| | $EXR$ | = | Rate of Exchange |
| | $TR_{h,r}$ | = | Transfer from the Rest of the World |

##### 4.7.3.2.2.2 Households` Marginal Propensity to Save ($MPS_h$)

Marginal propensity to save of the household is described as:

$$MPS_h = MPSIN_h \left(1 + MPSADJ \,.\, MPSDUM_h\right) \tag{4.23}$$

| | | | |
|---|---|---|---|
| *Where* | $MPS_h$ | = | Households` Marginal Propensity to Save |
| | $MPSIN_h$ | = | Households` Initial Marginal Propensity to Save |
| | $MPSDUM_h$ | = | 0 - 1 Dummy:<br>1 = For those *h* that saving changes<br>0 = Otherwise |
| | $MPSADJ$ | = | Average Marginal Propensity to Save |

`

#### 4.7.3.2.3 Household Consumption Demand (HCD)

Maximizing Cobb-Douglas Utility Function subject to Budget Constraint is the consumption behavior of all the households. It can be written as:

$$UH_h = \prod_c \left( \frac{QH_{c,h}}{\beta_{c,h}} \right)^{\beta_{c,h}}$$

$$h \in H \quad (4.24)$$

| | | | |
|---|---|---|---|
| *Where* | $UH_h$ | = | Utility of Household *h* |
| | $QH_{c,h}$ | = | Quantity Consumed of Commodity *c* by Household *h* |
| | $\beta_{c,h}$ | = | Consumption Spending Share of Household *h* on Commodity *c* |
| $h \in H$ | | = | Households` Set |

$$QH_{c,h} = [\beta_{c,h} EH] / PQ_c$$

$$h \in H, \ c \in C \quad (4.25)$$

| | | | |
|---|---|---|---|
| *Where* | $QH_{c,h}$ | = | Quantity Consumed of Commodity *c* by Household *h* |
| | $\beta_{c,h}$ | = | Consumption Spending Share of Household *h* on Commodity *c* |
| | $PQ_c$ | = | Commodity`s Composite Price |
| $h \in H$ | | = | Households` Set |
| $c \in C$ | | = | Commodity`s Set |

##### 4.7.3.2.3.1 Households Expenditure

Expenditure of household can be explained as under:

$$EH_h = (1 - MPS_h)(1 - ty_h) YH_h$$

$$h \in H \quad (4.26)$$

| | | | |
|---|---|---|---|
| *Where* | $EH_h$ | = | Households Expenditure |
| | $YH_h$ | = | Households Income |
| | $ty_h$ | = | Household Income Tax Rate |
| | $MPS_h$ | = | Household Marginal Propensity to Save |
| $h \in H$ | | = | Households` Set |

`

#### 4.7.3.3 Consumer Price Index (CPI)

The consumer price index for each household type $h$ can be described as:

$$CPIH_h = \prod_c PQ_c^{\beta_{c,h}}$$

$h \in H$ (4.27)

| | | | |
|---|---|---|---|
| *Where* | $CPIH_h$ | = | Consumer Price Index of Household *h* |
| | $PQ_c$ | = | Composite Price of Commodity *c* |
| | $\beta_{c\,h}$ | = | Consumption Spending share of Household *h* on Commodity *c* |
| $h \in H$ | | = | Households` Set |

A consumer price index can be defined as:

$$CPI = \sum_h \mu_h \cdot CPIH_h$$

(4.28)

| | | | |
|---|---|---|---|
| *Where* | $CPI$ | = | Consumer Price Index |
| | $\mu_h$ | = | Weight of utility of household *h* |
| | $CPIH_h$ | = | Consumer Price Index of Household *h* |

The weight of utility of household *h* in the CPI can be stated as:

$$\mu_h = \frac{UH_h}{\sum_h UH_h}$$

$h \in H$ (4.29)

| | | | |
|---|---|---|---|
| *Where* | $\mu_h$ | = | Weight of utility of household *h* |
| | $UH_h$ | = | Utility of Household *h* |
| $h \in H$ | | = | Households` Set |

`

Investment demand is formed by multiplying base year quantity with the adjustment factor.

$$QINV_c = INV_c \, IADJ$$

$$c \in C \qquad (4.30)$$

| | | | |
|---|---|---|---|
| *Where* | $QINV_c$ | = | Investment Demand Quantity for Commodity *c* |
| | $INV_c$ | = | Investment Demand in Base Year |
| | $IADJ$ | = | Investment Adjustment Factor |
| | $c \in C$ | = | Commodities` Set |

#### *4.7.3.4 Government Budget (GB)*

Public revenue is the total of the revenues from taxes on factors and transfers from rest of the world whereas public spending is the sum of government spending on consumption and transfers.

$$GBS = \sum_{h \in H} ty_h YH_h + EXR \cdot TR_{g,r} + \sum_{c \in C} tq_c PD_c QD_c +$$

$$\sum_{c \in CM} tq_c PM_c QM_c + YF_{g,f}$$

$$+ \sum_{c \in CM} tm_c EXR \cdot PWM_c QM_c + \sum_{c \in CM} te_c EXR \cdot PWE_c QE_c$$

$$- \left[ subr_c PQ_c QQ_c + \left( TR_{s,g} + \sum_{h \in H} TR_{h,g} \right) CPI + \sum_{c \in C} PQ_c QG_c \right]$$

(4.31)

| | | | |
|---|---|---|---|
| *Where* | $GBS$ | = | Government Budget Surplus |
| | $ty_h$ | = | Household Income Tax Rate |
| | $YH_h$ | = | Household *h* Income |
| | $EXR$ | = | Foreign Exchange Rate by means of Domestic Currency Per-unit of Foreign Currency |

`

| | | |
|---|---|---|
| $TR_{g,r}$ | = | Rest of the World`s Transfers to Government |
| $tq_c$ | = | Sales Tax Rate on Commodity |
| $PD_c$ | = | Domestic Price of Domestic Output |
| $QD_c$ | = | Domestic Sale Quantity |
| $PM_c$ | = | Domestic Price of Imported Goods (*Local-Currency Unit*) |
| $QM_c$ | = | Quantity of Imported Commodities |
| $YF_{g,f}$ | = | Transfer of Factor Income to Government |
| $tm_c$ | = | Imports` Tariff Rate |
| $PWM_c$ | = | Import Price in Foreign Currency |
| $QM_c$ | = | Quantity of Imported Commodities |
| $te_c$ | = | Exports Tax Rate on Commodity *c* |
| $PWE_c$ | = | Commodity *c*`s Export Price in Foreign Currency |
| $QEc$ | = | Supply of Exports |
| $subr_c$ | = | Subsidy Rate Per-unit of Commodity *C* |
| $TR_{s,g}$ | = | Government *g* Transfer to Enterprise *s* |
| $TR_{h,g}$ | = | Government *g* Transfers to Household *h* |
| $CPI$ | = | Consumer Price Index |
| $PQc$ | = | Composite Price of Commodity *c* |
| $QG_c$ | = | Government *g* Consumption Quantity of Commodity *c* |

The government collects its revenue from taxes (direct and indirect), and afterwards spends this collected amount on her day to day spending and transfers to the households. Furthermore, the government obtains capital income. In real terms these payments are fixed. If public revenues are less than her spending, it is termed as the budget deficit, which is mainly covered by borrowing (or dis-saving) from the capital market of the country. In the CGEM-Pk, government play like a consumer. Spending of the government is fixed exogenously. The Keynesian hypothesis, recommends that any types of government spending, even of a recurrent quality, can provide positively to economic growth. The efficacy of fiscal policy in steadying aggregate demand also depends on whether or not public expenditure crowds-out private expenditure. An increase in public expenditure that is not matched by a rise in public revenues leads to

`

a budget deficit and that have to be financed. If the deficit is financed by the issuing domestic debt, it may have negative impacts on domestic interest rates, which may crowds-out private expenditure (Kandil, 2006). Government`s transfers can be fixed in nominal terms, *that is*, transfers are CPI-Indexed.

#### *4.7.3.5 Enterprises (ENT)*

Return on capital is the only mean of enterprises` revenue. Afterwards the enterprises make payments in order to cover savings and transfers to households. It is supposed that the enterprises do not consume the goods.

$$YFRM = YF_{s,k} \tag{4.32}$$

| | | | |
|---|---|---|---|
| *Where* | $YFRM$ | = | Income of Enterprise |
| | $YF_{s,k}$ | = | Transfer of Capital Income to Enterprises |

Enterprises` savings are define as the difference between revenue and cost of the enterprises.

$$FRMS = YF_{s,k} - TR_{h,s} \tag{4.33}$$

| | | | |
|---|---|---|---|
| *Where* | $FRMS$ | = | Savings of Enterprises |
| | $YF_{s,k}$ | = | Transfer of Capital Income to Enterprise |
| | $TR_{h,s}$ | = | Transfer from Households to Enterprise |

***Equation for Total Transaction Cost***

$$QT_c = icd_c \; QD_c \tag{4.34}$$

| | | | |
|---|---|---|---|
| *Where* | $QT_c$ | = | Transaction Cost (*Total*) |
| | $icd_c$ | = | Trade Input of *C* Per-unit of Commodity *C* Produced and Sold Domestically |
| | $QD_c$ | = | Domestic Sale Quantity |

`

***Equation for Subsidy***

$$SUB_c = subr_c \, PQ_c \, QQ_c \tag{4.35}$$

| | | | |
|---|---|---|---|
| *Where* | $SUB_c$ | = | Subsidy on Commodity *C* |
| | $subr_c$ | = | Subsidy Rate Per-unit of Commodity *C* |
| | $PQ_c$ | = | Composite Price of Commodity *C* |
| | $QQ_c$ | = | Quantity of Goods Supplied to Domestic Market |

### 4.7.4 System Constraint Block

To attain macroeconomic stability, behavioral equations need constraints. Constraints` options decide the structure where macroeconomic variables adapt in the modeled economy. A specific country contains only a single option of these limits (see, Appendix-C,
Table C.9).

#### *4.7.4.1 Factor Market (FM)*

For equilibrium in factor market, there exist three different options.

***i. Full Employment.***

It is assumed full employment in the factor market. As the sum of demand for factors from all activities equals the factors supplied because prices of the factor change freely whereas the total supply of factors is supposedly fixed.

***ii. The existence of Unemployment.***

Allowing unemployment is realized by permitting the supply of each factor to adjust. It keeps nominal wage unchanged. Supply of factors indicates demand for factors.

***iii. Segmented Factor Market.***

Activities are focused to exercise the observed base year quantities; therefore, factor market is segmented. As supposed substantial worth distinctions amongst inputs within various activities, it becomes more effective.

`

The equality between aggregate supply and aggregate supply for every factor can be shown by the following equation:

$$\sum_{a \in A} QF_{f,a} + QFU_f = QFS_f \qquad f \in F \qquad (4.36)$$

| | | | |
|---|---|---|---|
| *Where* | $QF_{fa}$ | = | Factor *f* Quantity Demanded by Activity *a* |
| | $QFU_f$ | = | Factors *f* unused Supply |
| | $QFS_f$ | = | Factor *f* Supply |
| | $f \in F$ | = | Factors\` Set |

#### *4.7.4.2 Commodity Market (CM)*

Composite commodities equilibrium between quantity demanded (equations 4.10, 4.21, 4.25, and 4.30) and quantity supplied (equations 4.14 and 4.15) can be presented in the following form.

$$QQ_c = \sum_{a \in A} QINT_{c,a} + \sum_{h \in H} QH_{c,h} + QG_c + QINV_c + QDST_c + QT_c \qquad c \in C \qquad (4.37)$$

| | | | |
|---|---|---|---|
| *Where* | $QQ_c$ | = | Composite Commodity Supply |
| | $QINT_{c,a}$ | = | Commodity *c* Quantity utilized as Intermediate Input |
| | $QH_{c,h}$ | = | Commodity *c* Quantity Consumed by Households *h* |
| | $QG_c$ | = | Commodity *c* Quantity Consumed by Government *g* |
| | $QINV_c$ | = | Quantity of Investment Demand for Commodity *c* |
| | $QDST_c$ | = | Quantity of Change in Stock of Commodity *c* |
| | $QT_c$ | = | Transaction Cost (Total) |
| | $c \in C$ | = | Commodities\` Set |

`

#### *4.7.4.3 Current Account Balance (CAB) for Rest of the World:*

Two choices are available to treat external balance.

***i.*** Foreign savings or borrowings are fixed while the real rate of exchange is flexible [Devarajan et al. (1995)].

The balance of Trade (BOT) is kept unchanging, for the reason that external balance components (that is, transfers among domestic and foreign institutions) are supposed as unchanged.

***ii.*** Fixed real exchange rate while foreign savings level (trade balance) flexible.

Rest of the world`s receipts comprise exports of products whereas, spending comprises imports and transfers to households. All foreign transfers are fixed in foreign currency. Difference between foreign payments and receipts is foreign savings.

Country`s foreign exchange equilibrium in expenditure and revenue can be presented with the help of the following equation:

$$FS + \sum_{c \in CE} PWE_c QE_c + \sum_{i \in I} TR_{i,r} = \sum_{c \in CM} PWM_c QM + \sum_{i \in I} TR_{r,i} \tag{4.38}$$

*Where*

| | | | |
|---|---|---|---|
| *Where* | $FS$ | = | Balance of Payment (*Foreign Currency Unit*) |
| | $PWE_c$ | = | Export Price of Commodity *c* in term of Foreign Currency |
| | $PWM_c$ | = | Import Price in term of Foreign Currency |
| | $QM_c$ | = | Imports Quantity |
| | $QE_c$ | = | Exports Quantity |
| | $TR_{i,r}$ | = | Rest of the World Transfers to Domestic Institutions |
| | $TR_{r,i}$ | = | Domestic Institutions Transfers to Rest of the World |

`

#### 4.7.4.4 *Saving-Investment Balance (SIB)*

Savings-Investment balance constraints lie in two questions:

i. Investment is believed to be saving-driven? *or*
ii. Saving is inferred to be investment-driven?

***a.*** In the case of the saving-driven economy, the rate of saving is held fixed for all institutions.

***b.*** In the case of the investment-driven economy, the rate of saving regulates to retain that particular rate of investment.

By using a dummy endogenous variable (*WALR*), the above-cited equilibrium is attainable through *Walrs' law.*

$$WALR = \begin{bmatrix} \sum_{h \in H} MPS_h (1 - ty_h) YH_h + FRMS + GBS \\ + EXR \cdot BOP \end{bmatrix} - \sum_{c \in C} PQ_c \, QINV_c - \sum_{c \in C} PQ_c QT_c \tag{4.39}$$

| | | | |
|---|---|---|---|
| *Where* | $WALR$ | = | Dummy Variable |
| | $MPS_h$ | = | Marginal Propensity to Save for Household *h* |
| | $ty_h$ | = | Household Income Tax Rate |
| | $YH_h$ | = | Income of the Household *h* |
| | $FRMS$ | = | Total Savings of Enterprise |
| | $GBS$ | = | Government Budget Surplus |
| | $EXR$ | = | Foreign Exchange Rate as Domestic Currency Per-unit of Foreign Currency |
| | $BOP$ | = | Balance of Payment |
| | $PQ_c$ | = | Composite Price of Commodity *c* |
| | $QINV_c$ | = | Quantity of Investment Demand for Commodity *c* |
| | $QT_c$ | = | Transaction Cost (*Total*) |

`

## 4.8 Model Closure

The model contains endogenous and exogenous variables. Distinctive equilibrium explanation is attainable only if there is exact equality in the number of equations and the number of endogenous variables in the model. Closure expresses macroeconomic assumptions to perform simulations, which are normally performed through altering the exogenous value of policy variables. After this, the effect of these enacted simulations on the endogenous variable`s equilibrium values is quantified.

Closure in CGE Model supposes foreign savings are fixed and hence the current account is cleared by a flexible rate of exchange. In favor of savings-investment account, savings-driven investment is supposed, thus, saving is inflexible while investment adjustment factor is elastic, enabling investment to adapt. In support of the capital market, the model assumes that capital is activity-specific. Moreover, capital is fully employed. This implies that to clear the market factor price distortion and fixed capital price adjusts. The important input, utilized in all the sorts of activities is 'Capital'.

## 4.9 Summary

Nature, structure, composition, and formation of the CGE Model are discussed in this segment. Following the precedent of Lofgren et al. (2002) and Naqvi et al. (2010), CGE Model for the country is composed. CGE Model for Pakistan`s economy is discussed in historical assessments. Performance of consumers, factors, producers, govt. and the rest of the world is stated in mathematical functional systems. Commodity and factor markets indicate general equilibrium in mathematical standings. Likewise, foreign current account along with balances of savings and investment are presented in equations` system. Finally, Equation of price normalization is instituted to assure the standard of Consumer Price Index.

Due to the equalities developed in this model, challenges to the country can be highlighted and way out through effective policies can be recommended on solid justifications, consequently, desired results can be attained in mathematical and logical modes after applying the policies recommended at the end of this research. In this way the country`s economic status can be advanced to the desired level.

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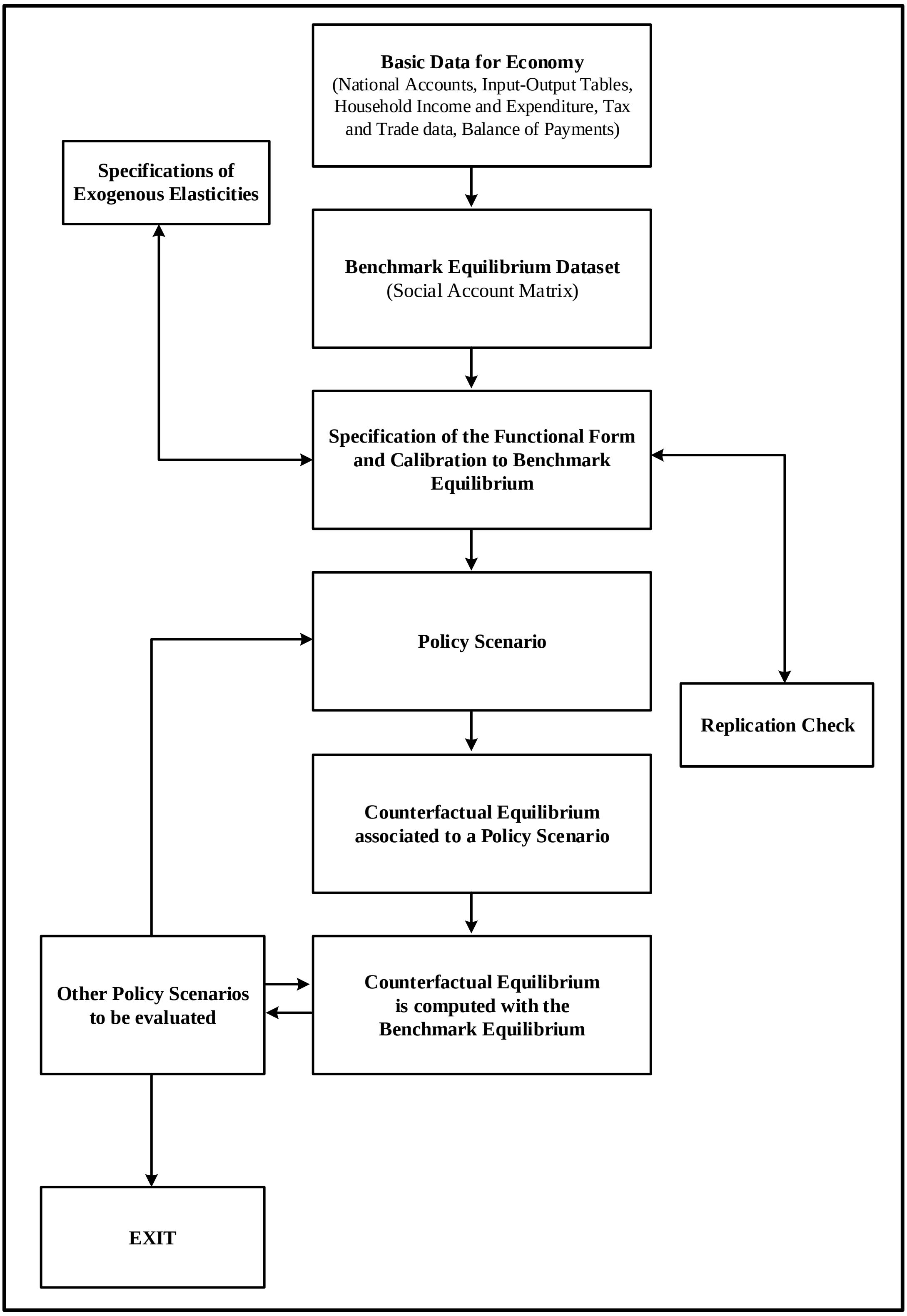


**Figure 4.5: Commodity flowchart outlining Calibration Procedures for Pakistan's SAM**

*Source: Shoven and Walley, 1992*

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# CHAPTER 5

# IMPACT OF DIRECT AND INDIRECT TAXES ON MACROECONOMIC VARIABLES AND HOUSEHOLDS` WELFARE/ INEQUALITY

## 5.1 Introduction

Economic policies affect macro indicators and household's welfare/ inequality through different mechanisms. These policies openly influence household's income by changing the returns to key factors or affect household's disposable income through changing direct taxes like income tax or similarly, impact the same through subsidies or affect the price level which ultimately brings changes in the households` real income. To attain a sustainable economic growth balanced budget is very eminent. Budget deficit remains a very critical concern in the history of the economy of Pakistan, as a result, income inequality and poverty increases, welfare decreases, and some other key macroeconomic variables of the economy deteriorate. All this phenomenon is a critical barrier to the growth and development of the country.

The budget deficit can be financed by releasing government bonds (that is, by borrowing money), which mostly leads to an increase in interest rate and hence crowed-out some private investment expenditure. As a result, the expansionary impact of deficit expenditure reduces. Similarly, the government can finance the budget deficit by printing new currency notes. It shows no crowding-out in private expenditure. It is expansionary, however more inflationary. Cut in government expenditure is not easy, particularly in developing countries like Pakistan, therefore, the most effective tool to reduce the budget deficit is an increase in taxes or levying new taxes, both direct or indirect. Appropriate changes in tax structure can bring the required effect on reducing the gap between rich and poor households.

Fiscality can be regarded as a criterion to compensate inequality gaps and its effects on households which are awfully important. Fiscal structures epitomize a strategic factor in the impact over an economy. The fiscal experts determine the increase of savings,

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investments, with effect on production efficiency, a labor force that symbolizes important components in economic strategy that formulate fiscal reform as a very significant part of the economic reforms.

The core objective of the present simulation experiment is to point out and compute the impacts of firstly; increasing income tax, secondly; decreasing sales tax, and then thirdly; mix of the both these actions on some particular macro indicators (as stated above) of the economy of Pakistan in general and in specific, welfare of the households and inequality. Consequently, a simulation is completed to evaluate the influences of increase in income tax, decrease in sales tax and in both at a time, on few selected macro indicators of Pakistan economy, household's welfare, and inequality.

This chapter is planned in the standard that section 5.2 expounds policy experiment, section 5.3 presents income inequality/ welfare in Pakistan, section 5.4 present results of the two simulations in three experiments [that is, (*i*) impact of Increase in income (direct) tax, (*ii*) Decrease in sales (indirect) tax, and (*iii*) Increase in income and decrease in sales (mix of direct and indirect) taxes] on macroeconomic variables, households welfare, and inequality, and section 5.5 elucidates conclusion and policy implication.

## 5.2 Policy Experiments

Neoclassicals believe that fiscal policy has momentary impacts on economic growth. Therefore, it becomes arduous to some extent to determine the fiscal policy impacts on income inequality/ welfare. While evaluating in the endogenous growth model's framework, the role of fiscal policy in income inequality/ welfare is easy to see. And in this way, momentary impact changes into permanent impact.

Fiscal policy can be utilized as a key instrument for redistribution. Government spending as a fiscal policy component in the forms of expenditure on social welfare, subsidies, infrastructure, poverty reduction programs, food and health, initiate the inequality to reduce (Ramos and Robert, 2007). Governments need finance to meet these expenditures. Commonly progressive tax revenue becomes a key source to fill these expenditures. It is evinced that reduction in income inequality is the result of developmental expenditures and not the current (Ali and Ahmad, 2010). On the other

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hand, Gallo and Sagalés (2014) demonstrated that current expenditures like pensions and other fringe benefits boost inequality, while all these are cogitated as reducing the inequality/ enhancing the welfare.

An empirical study proved that fiscal policy instruments are very effective, efficient, and successful in developed countries. Public expenditure on food, health, housing, and education diminish inequality (Decoster et al., 2011). The OECD countries evidence revealed that the Gini coefficient was decreased by 15% through efficient functioning of fiscal instruments (Brandolini and Smeeding,2009); Gallo and Sagalés, 2014,*b*). Governments in these countries mostly believe in spending and transfer payments as effective tools for reducing inequality/ increasing welfare. However, the role of direct and indirect taxes becomes crucial in the efficiency evaluation. The indirect taxes produce to increase the inequality because they are sufficiently regressive[16].

Conversely, Gallo and Sagalés (2014,*a*) stated that in spite of being one of the economies with low inequality level in Latin America, Uruguay is considered by continuous high inequality levels in relation to that high income or upper-middle economies with similar relative public sector. This study investigates to what level these two aspects are consistent and whether economic growth influences and is influenced by this correlation. Empirical outcomes from VAR models expose the presence of significant long-run Keynesian impacts related to government spending, and that the economy's spending structure is, in part, liable for growing household's disposable income inequality[17], being the government investment the only fiscal policy that stops this propensity.

Ramos and Robert (2007) investigated the redistribution effect of UK`s fiscal policy and described that government expenditures improve the income distribution even if the country`s tax system is progressive. Taxes worsen the distribution of income and intensely indirect taxes adversely influence the income distribution and hence affect welfare.

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[16] However, Samanta and Cerf (2009) have revealed that higher income inequality has positive effect on GDP growth rate. *European Journal of Economic Studies*, 2015, Vol. (13), Is. 3 163

[17] However, Galo and Sagales (2013) found that direct taxes increase income inequality. In some economies, the income inequality negatively impacts the fiscal multiplier and its effectiveness (*see* Samanta and Cerf, 2009) *European Journal of Economic Studies*, 2015, Vol. (13), Is. 3 164

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## 5.3 Income Inequality/ Welfare in Pakistan

The inequality trend from both sources, the income ratio share of the top and bottom quintiles are shown in Figure below. The path income inequality path is varying in nature. According to the World Bank report, the ratio of inequality was relatively high in during late 1980s. Later, this ratio fell during the decade of 1990s, reaching at lowest level in 1995. During the coming thirteen it rose swiftly to a highest in 2008. Afterwards, it has decreased till 2013. The Household Integrated Economic Survey (HIES) 2015-16, outcomes are same in character, though for a short-run. Evidently, the income inequality level increased from 2001 to 2008, touching maximum ratio in the last year. There seems to be some decrease in income inequality up to the final observed year, 2015-16. Thus, both sources are indicating same trends.

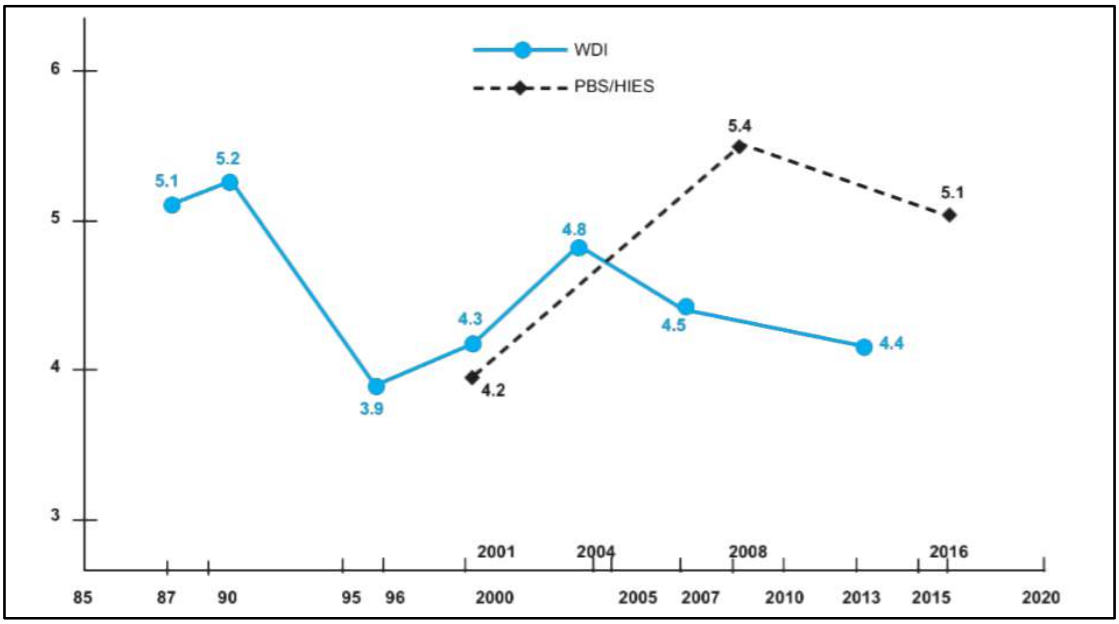


**Figure 5.1 Income Share Ratio between Top and Bottom Quintiles in Pakistan, 1987 to 2016**

*(Source; World Bank Report, 2015-16, Household Integrated Economic Survey 2015-16)*

Income distribution trend in the history of Pakistan confirms a tenacious existence of inequality. In the 1980s it increases but comparatively at a lower rate. In 1990s inequality increases more tartly probably because of Structural Adjustment Programs (SAP). This program leads to a decrease in public sector plan, subsidies withdrawal and tax increasing which augmented the burden on common households.

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Literature acknowledged various factors influencing inequality/ welfare in Pakistan. The investigators admitted the factors like, movement of the households from rural to urban areas, tax structure, government spending, political inefficiency in allocation of spending, financial development, adaptation of SAP, loan from IMF [Shirazi et al. (2001);Shahbaz and Islam (2008); Ali and Ahmad (2010); Shahbaz and Islam (2008)]. In Pakistan, the main emphasis is on indirect taxes. This structure is regressive by nature. The high-income group is escaping while middle or low-income groups are paying the tax. Moreover, government spending is not only politically induced but unproductively allocated [Shirazi et al. (2001); Ali and Ahmad (2010); Shahbaz and Islam (2008)].

Fiscal policy may be one of the aspects of inequality in Pakistan but theoretically one of the aims of fiscal policy is to abate the inequality and raise the level of welfare. For Pakistan, this policy is effective for attaining this objective and requires keen concentration of the investigators.

The present analyses attempt to realize the function of fiscal policy tools like direct and indirect taxes in reducing income inequality and increasing the welfare of common households in Pakistan.

## 5.4 Results of the Simulations Experiments

To estimate the effect on different macroeconomic indicators like GDP, Exports, Imports, National Income, Public and Private Investment, Inequality/ Welfare, etc., of the economy of Pakistan, following three different experiments each with two simulations (*that is*, 5% and 10%) are conducted:

i. Increase in income (*direct*) tax
ii. Decrease in sales (*indirect*) tax, and
iii. Increase in income and a decrease in sales (*mix of direct and indirect*) taxes

### 5.4.1 Increase in Income (*Direct*) Tax

The sectoral and macro results of increasing income tax in simulation-I by 5% and simulation-II by 10% are presented here.

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#### 5.4.1.1 *Effects on Macro Level (National Income Accounts)*

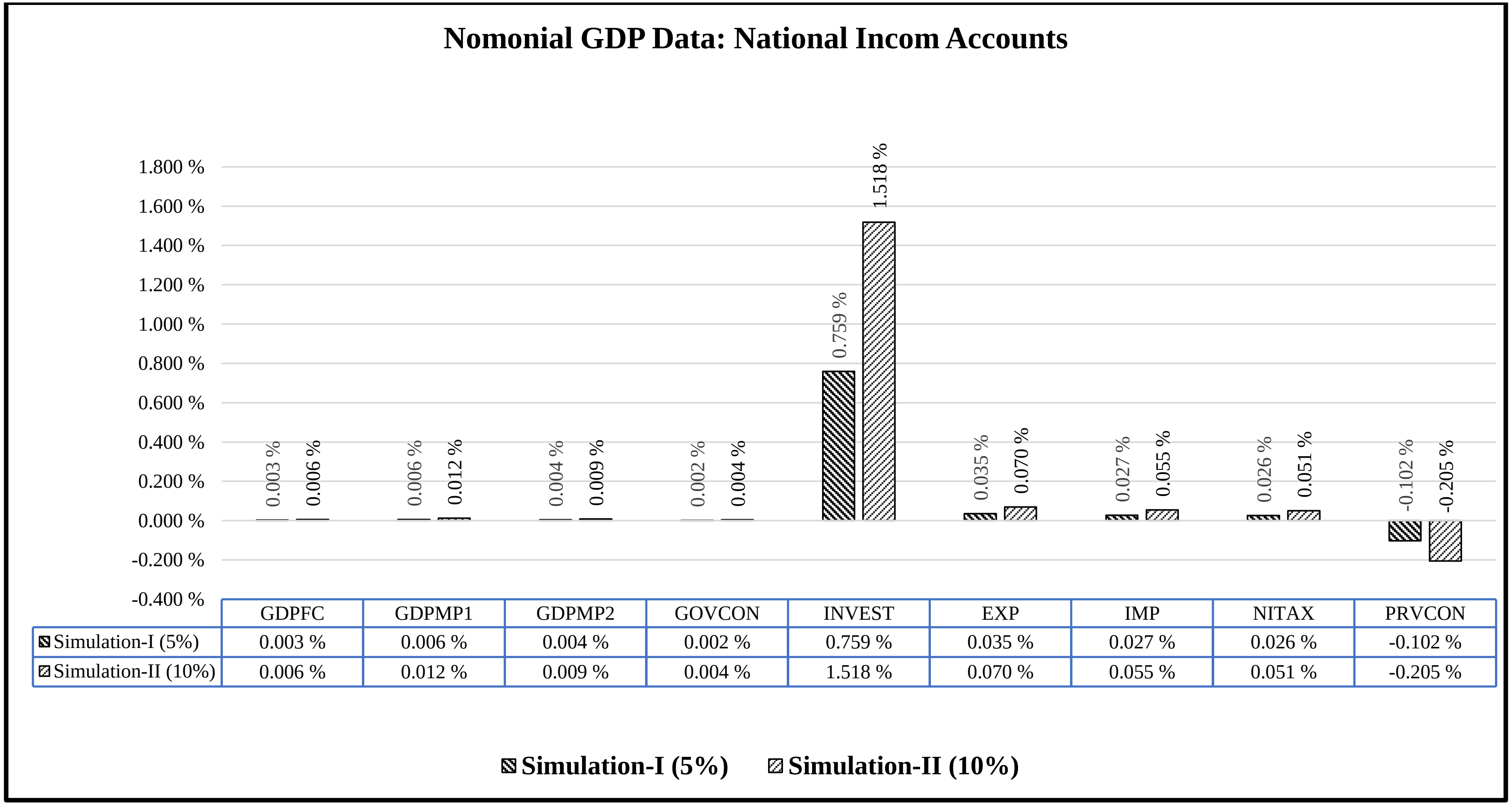
Considering the Table it-5.1, the increase in income tax by 5% and 10% results into increase in Gross Domestic Product in Pakistan by 0.003% in simulation-I and 0.006% in simulation-II respectively. Similarly, GDP at market price from expenditure side (GDPMP1), as well as GDP at market price from income side (GDPMP2), also increases in both the experiments of increasing income tax, *that is*, 0.006% and 0.12%, and 0.004% and 0.009% respectively.

This increase in government income can be attributed to an increase in government revenue directly. Investment is appreciated by 0.759% and 1.518% in experiment I and II. This increase in investment is the result of an increase in government income and then spending on different developmental and non-developmental projects, as reflected by positive figures in the Table it-5.1, that is, 0.002% and 0.004%. Whereas, in simulation-I private consumption falls by 0.102% and in simulation-II by 0.205%, which indicates the negative effect of the direct tax (see, Figure it-5.1).

**Table *it*-5.1: 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*




| | GDPFC | GDPMP1 | GDPMP2 | GOVCON | INVEST | EXP | IMP | NITAX | PRVCON |
|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | 0.003 % | 0.006 % | 0.004 % | 0.002 % | 0.759 % | 0.035 % | 0.027 % | 0.026 % | -0.102 % |
| Simulation-II (10%) | 0.006 % | 0.012 % | 0.009 % | 0.004 % | 1.518 % | 0.070 % | 0.055 % | 0.051 % | -0.205 % |

**Figure *it-5.1*: Nominal GDP Data (National Income Accounts)**

*Source: Simulation Results*

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The impact of both simulations on foreign trade also appear positive. The exports growth rate in simulation-I is recorded at 0.035% and in simulation-II it is 0.070%, while the rise in imports growth rate in simulation-I is estimated at 0.027% and in simulation-II it is 0.055%. All these results into correct the adversity of the balance of payments.

#### *5.4.1.2 The quantity of Domestic Output of Commodities*

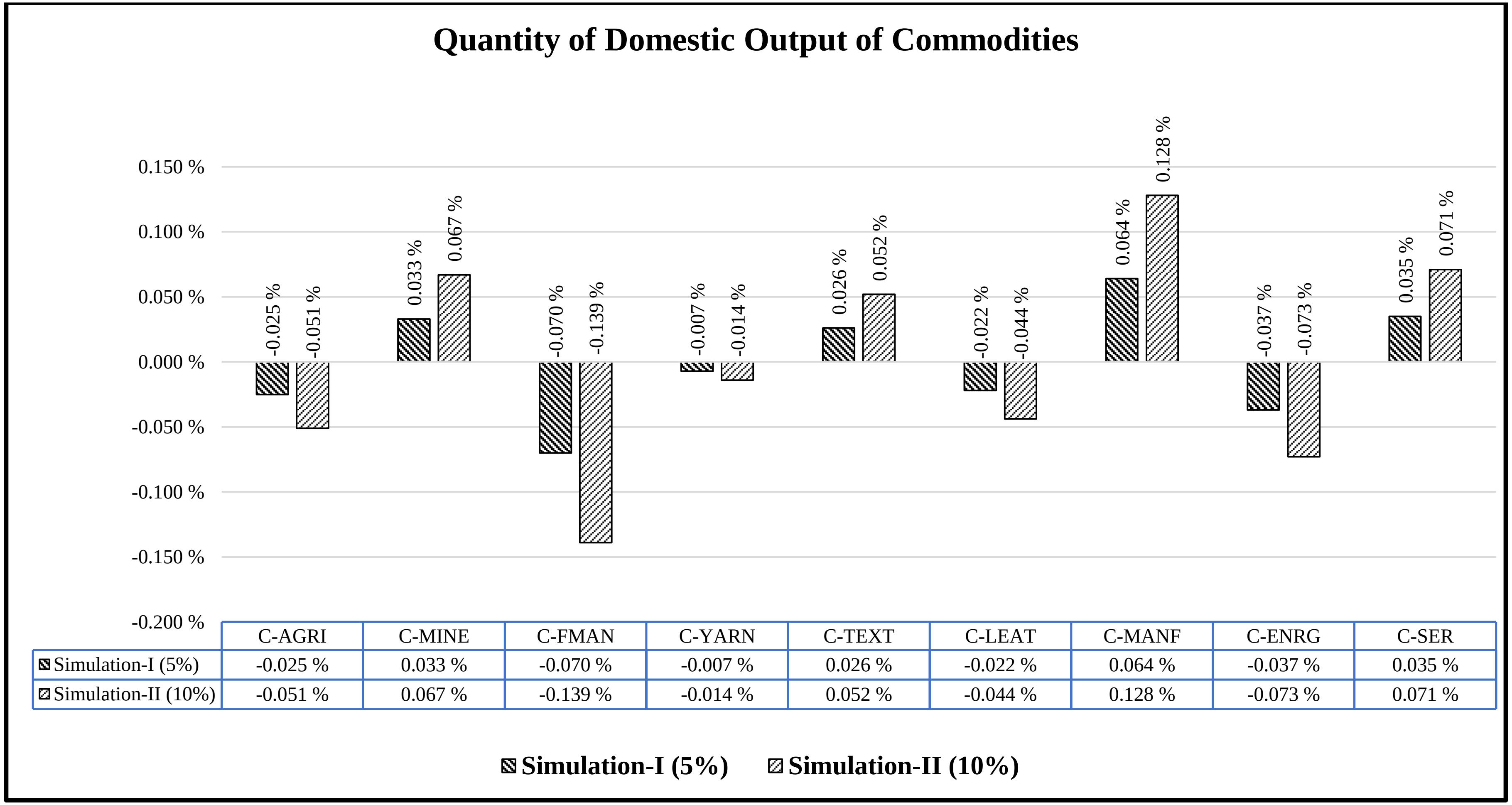
Quantity of domestic output of the commodities like mine (C-MINE), textile (C-TEXT), other manufacturing (C-MANF), and services (C-SER) has increasing trend, while rest of all the commodities *that is*, agricultural products (C-AGRI), food manufacturing (C-FMAN), yarn (C-YARN), leather (C-LEAT), and energy (C-ENRG) has negative impact in both the experiments.

In this test, it is observed that the production of other manufacturing (C-MANF) sector increased at a high rate as compared to all other sector`s output. It is 0.064% in simulation-I and 0.128% in simulation-II. Whereas, in services this performance is 0.035% *and* 0.071%, in mine 0.033% *and* 0.067%, and in textile 0.026% *and* 0.052% in both sims respectively. The highest negative impact appeared in the food manufacturing sector, which is in simulation-I 0.070% and in simulation-II 0.139%. It is due to the direct effect of income tax on households purchasing power. Increase in income tax diminished demand and hence output to supply (see, Figure it-5.2).

**Table *it*-5.2: Quantity of Domestic Output of Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| C-AGRI | 7047.148 | 7045.365 | -0.025 | 7043.582 | -0.051 |
| C-MINE | 730.595 | 730.838 | 0.033 | 731.082 | 0.067 |
| C-FMAN | 5073.711 | 5070.180 | -0.070 | 5066.649 | -0.139 |
| C-YARN | 2480.102 | 2479.927 | -0.007 | 2479.753 | -0.014 |
| C-TEXT | 1757.475 | 1757.934 | 0.026 | 1758.393 | 0.052 |
| C-LEAT | 362.897 | 362.816 | -0.022 | 362.735 | -0.044 |
| C-MANF | 4439.234 | 4442.070 | 0.064 | 4444.908 | 0.128 |
| C-ENRG | 1956.650 | 1955.936 | -0.037 | 1955.221 | -0.073 |
| C-SER | 9337.056 | 9340.356 | 0.035 | 9343.656 | 0.071 |

*Source: Simulation Results*




| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-ENRG | C-SER |
|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | -0.025 % | 0.033 % | -0.070 % | -0.007 % | 0.026 % | -0.022 % | 0.064 % | -0.037 % | 0.035 % |
| Simulation-II (10%) | -0.051 % | 0.067 % | -0.139 % | -0.014 % | 0.052 % | -0.044 % | 0.128 % | -0.073 % | 0.071 % |

**Figure *it-5.2*: Quantity of Domestic Output of Commodities**

*Source: Simulation Results*

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#### *5.4.1.3 Incomes of Households*

Results of increasing tax on household's income reveal that in both the experiments the households belong to the categories of the rural small, medium, and large farmers suffered while all other ten categories benefitted, although it seems very minor. The highest negative impact of income tax is faced by the rural medium households of category-1 and also of category-234 as per this study, which is in test-I 0.011 and 0.010 and in test-II 0.022 and 0.019. The growth rate of increase in income of the farm workers H-RW1 and H-RW234 is positive. It is 0.007% in sim-I and 0.014% in sim-II for H-RW1, while 0.006% in sim-I and 0.012% in sim-II for RW234. Income of all the rural non-farm categories of households (that is, H-RN1, H-RN2, H-RN3, and H-RN4) also increases. The higher rate of increase in income is recorded for H-RN1, that is, 0.008% in simulation-I and 0.016% in simulation-II. Similarly, all the urban categories of households like H-U1, H-U2, H-U3, and H-U4, also seem to come with positive growth rates after these experiments (see Appendix-G, Table G.44).

#### *5.4.1.4 Average Price of Factors*

Employing the two simulations, the outcome reveals negative result in case of land (N), while positive in case of capital (K). The rate of decrease in the price of land in simulation-I is noticed 0.031% while in simulation-II it is 0.062%. On the other hand, the rate of increase in the price of capital in the first experiment is observed at 0.003% while in the second it appeared 0.007% (see, Appendix-G, Table G.35).

#### *5.4.1.5 The welfare of the Households*

Due to an increase in income tax on households in Pakistan, the results of all the two simulations show that the overall welfare of the eleven categories out of sixteen has decreased. Imposition of income tax shrink the constraints to consume. Nine types of rural and two types of urban households face a reduction in their consumption expenditures. Households categories of small, medium and large farmers like H-RS1 & H-RS234, H-RM1 & H-RM234, and H-RL1 & H-RL234 suffer reduction in their consumption in simulations I & II by [0.005%, 0.010%] & [0.032%, 0.065%], [0.001%, 0.022%] & [0.033%, 0.066%], and [0.009%, 0.019%] & [0.132%, 0.263%]

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respectively (see, Appendix-G, Table G.31). As a result, correspondingly the utility of all these households seems to fall in both experiments by [0.009%, 0.017%] & [0.569%, 1.138%], [0.001%, 0.003%] & [0.212%, 0.423%], and [0.015%, 0.029%] & [1.086%, 2.172%] (see, Table it-5.3).

Further, consumption of the rural farm workers of the category H-RW234, non-farm households of the type H-RN3 and H-RN4, and urban households of the class H-U3 and H-U4 also declined in test I and II both. Which is recorded [0.042%, 0.083%] for H-RW234, [0.071%, 0.143%] for H-RN3, [0.129%, 0.258%] for H-RN4, [0.121%, 0.241%] for H-U3 and [0.188%, 0.376%] for H-U4. (see, Appendix-G, Table G.31). Resultantly, the level of welfare of these categories of the households in both the experiments also tends to diminish, as shown in Table it-5.3. It is recorded [0.237%, 0.473%] for H-RW234, [0.461%, 0.923%] for H-RN3, [1.217%, 2.434%] for H-RN4, [1.246%, 2.493%] for H-U3, and [8.849%, 17.699%] for H-U4 type of the households of the model (see, Table it-5.3).

**Table *it*-5.3: Compensating Variation of Households**

| Households | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|
| **H-RS1** | -0.009 | -0.017 |
| **H-RS234** | -0.569 | -1.138 |
| **H-RM1** | -0.001 | -0.003 |
| **H-RM234** | -0.212 | -0.423 |
| **H-RL1** | -0.015 | -0.029 |
| **H-RL234** | -1.086 | -2.172 |
| **H-RW1** | 0.017 | 0.035 |
| **H-RW234** | -0.237 | -0.473 |
| **H-RN1** | 0.037 | 0.074 |
| **H-RN2** | 0.041 | 0.083 |
| **H-RN3** | -0.461 | -0.923 |
| **H-RN4** | -1.217 | -2.434 |
| **H-U1** | 0.015 | 0.030 |
| **H-U2** | 0.036 | 0.071 |
| **H-U3** | -1.246 | -2.493 |
| **H-U4** | -8.849 | -17.699 |

*Source: Simulation Results*

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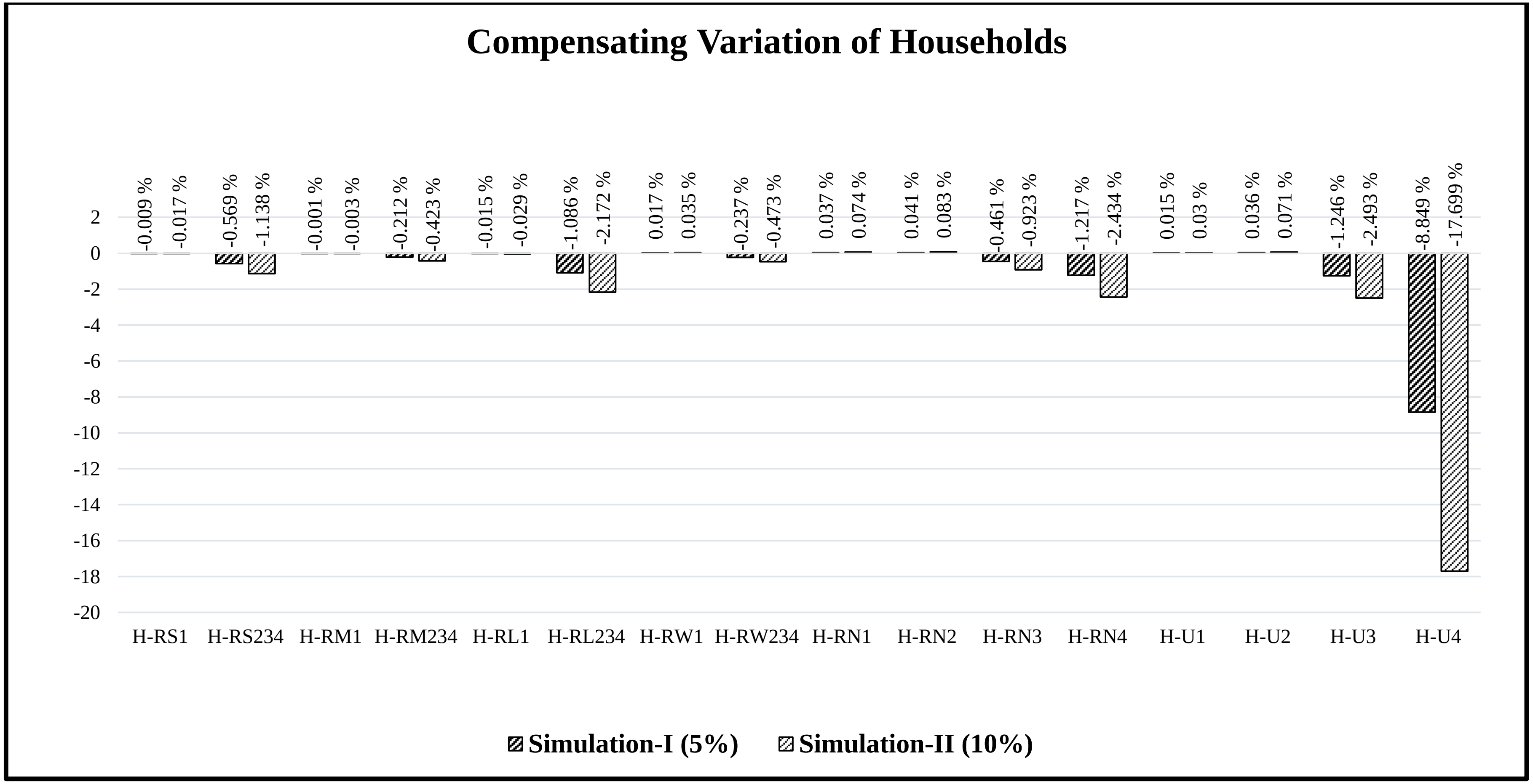


**Figure *it-5.3*: Compensating Variation of Households**

*Source: Simulation Results*

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The above statistical results indicate that welfare of all these eleven types of the households declined due to increase in income tax, which can also be assessed by comparing the prices of land as a factor owned by a large number of the households (see, Appendix-G, Table G.35) and consumer price of commodities (see, Appendix-G, Table G.30). The results show that factor`s average prices decreased at the higher rate as compared to consumer price of commodities. Subsequently, the households` real income decreased and therefore, the welfare too.

Contrary to all above, positive growth effect of imposing direct (income) tax in simulation-I as well as in simulation-II is noted almost same on the consumption expenditures of remaining five households like H-RW1, H-RN1, H-RN2, H-U1, and H-U2 (see, Appendix-G, Table G.31). It is increased by [0.007%, 0.014%] for rural farm workers, [0.008%, 0.016%] for rural non-farm quartile-1 households, [0.007%, 0.013%] for rural non-form quartile-2 households, [0.006%, 0.011%] for urban quartile-1 households, and [0.006%, 0.012%] for urban quartile-2 households.

The results of compensating variation (CV) of households reveal that these five types of households have positive compensating variation. However, the highest compensating variation is recorded by the sequence H-RN2, H-RN1, H-U2, H-RW1, and H-U1. In both the experiments, growth rates are recorded for the household's non-farm quartile-2 [0.041%, 0.083%], for non-farm quartile-1 [0.037%, 0.074%], for urban quartile-2 [0.036%, 0.071%], for rural farm workers quartile-1 [0.017%, 0.035%], and lastly for urban quartile-1[0.015%, 0.030%] (see, Table it-5.3).

The economy-wide compensating variation shows that the experiments regarding increasing direct tax by 5% and then by 10% results into negative impact. All the households have adverse compensating variation. In simulation-I, it is estimated at 0.102% while in simulation-II it becomes 0.203% (see, Table it-5.4, & Figure it-5.4).

**Table *it*-5.4: Economy-Wide Compensating Variation**

| **Compensating Variation** | **Simulation-I [5%]** | **Simulation-II [10%]** |
|---|---|---|
| **TCV** | -0.102 | -0.203 |

*Source: Simulation Results*

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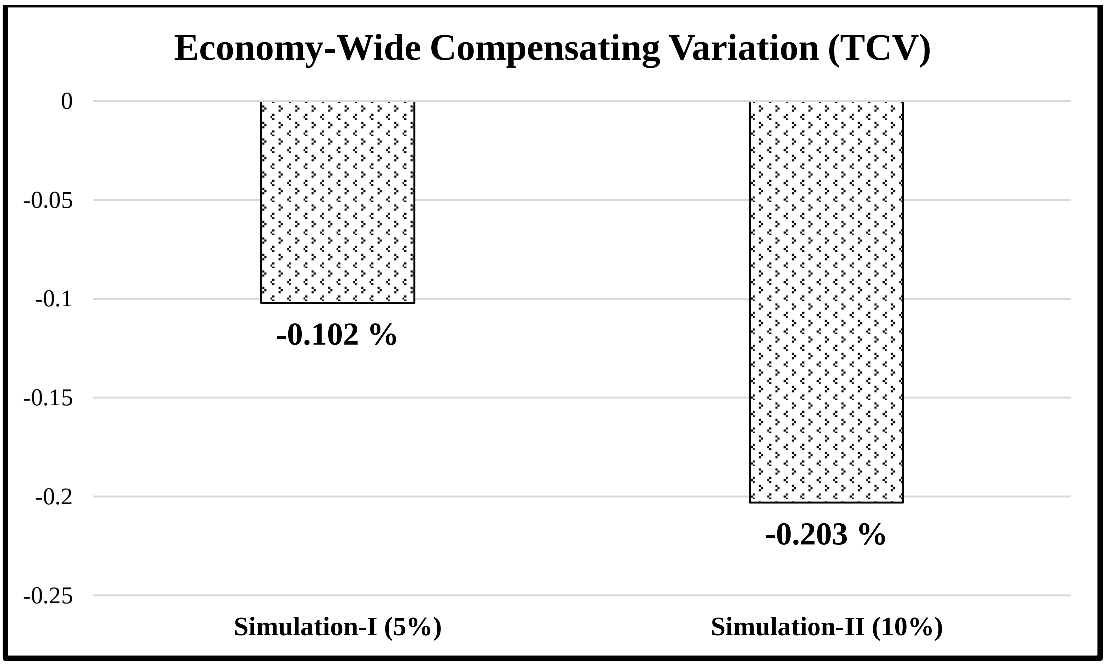


**Figure it-5.4: Economy-wide Compensating Variation**

*Source: Simulation Results*

#### *5.4.1.6 Balance of Trade*

Increasing income tax impacts are positive on trade balance, as exports of all the commodities except food manufacturing (C-FMAN) and leather (C-LEAT) in both the experiments increase (see, Table it-5.5, & Figure it-5.5), while imports of all the products except mines (C-MINE), manufacturing (C-MANF), and services (C-SER) indicates a negative trend (see, Table it-5.6, & Figure it-5.6). The result shows a remarkable increase in the consumption of exportable commodities at home while the reduction in importable commodities. This indicates that an increase in direct (income) tax improves the balance of trade.

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**Table *it*-5.5: Quantity of Exports for Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shocked | %∆ | Shocked | %∆ |
| 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 *it*-5.6: Quantity of Imports for Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shocked | %∆ | Shocked | %∆ |
| 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*

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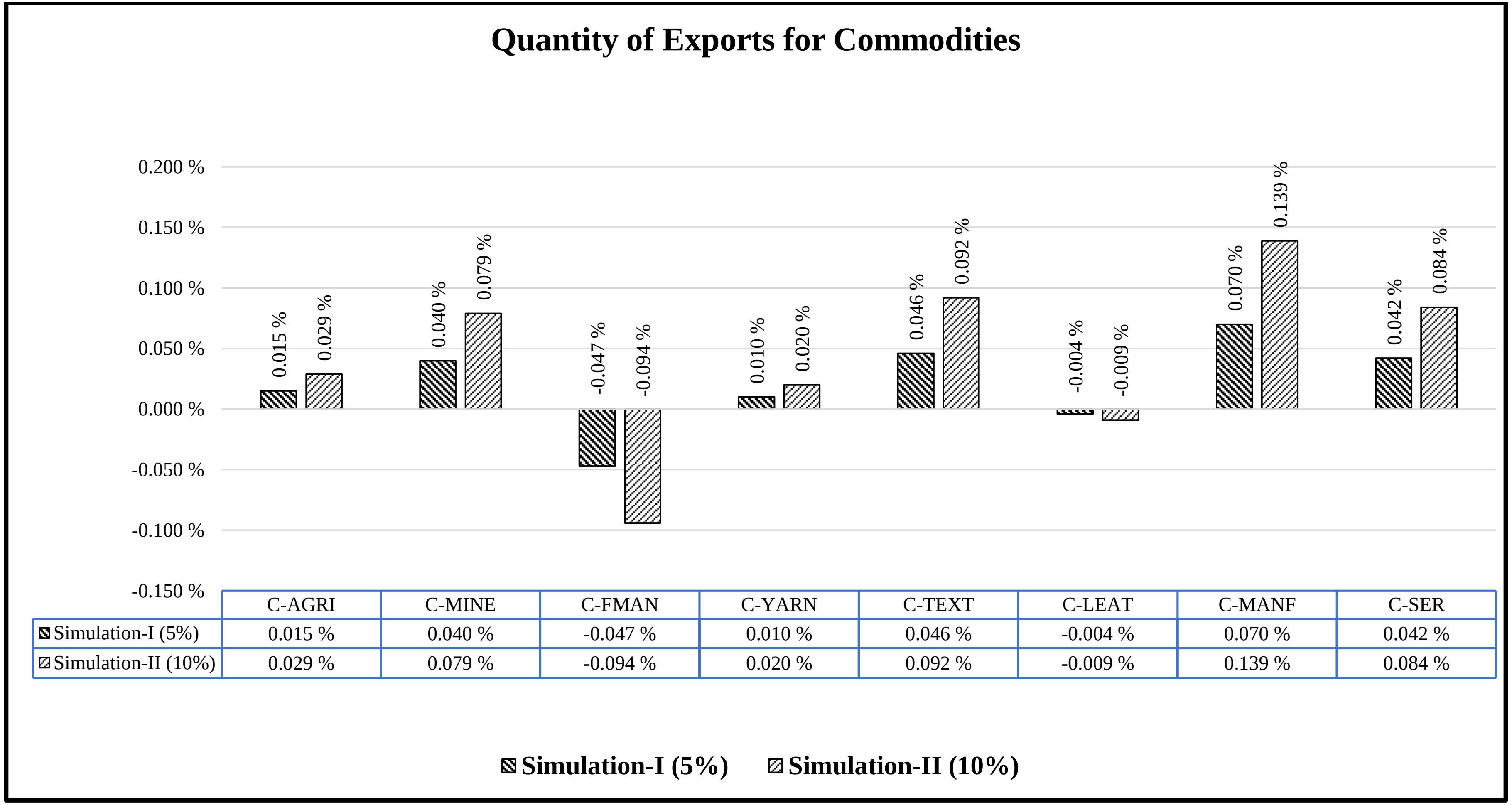
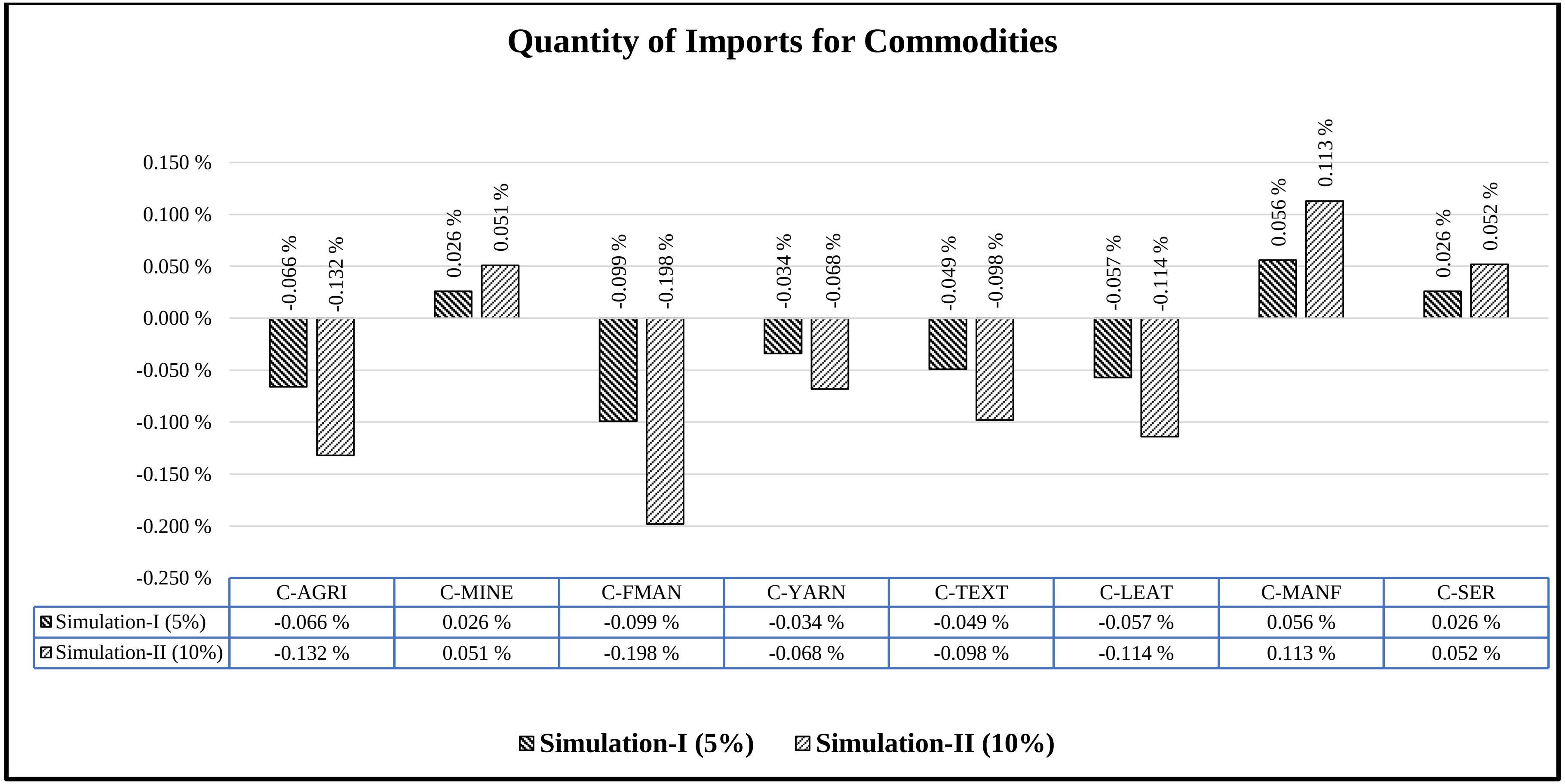



| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | 0.015 % | 0.040 % | -0.047 % | 0.010 % | 0.046 % | -0.004 % | 0.070 % | 0.042 % |
| Simulation-II (10%) | 0.029 % | 0.079 % | -0.094 % | 0.020 % | 0.092 % | -0.009 % | 0.139 % | 0.084 % |

**Figure *it-5.5*: Quantity of Exports for Commodities**

*Source: Simulation Results*




| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | -0.066 % | 0.026 % | -0.099 % | -0.034 % | -0.049 % | -0.057 % | 0.056 % | 0.026 % |
| Simulation-II (10%) | -0.132 % | 0.051 % | -0.198 % | -0.068 % | -0.098 % | -0.114 % | 0.113 % | 0.052 % |

**Figure *it-5.6*: Quantity of Imports for Commodities**

*Source: Simulation Results*

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After increasing the direct taxes, comparing the above outcomes, it is clear to describe in simulation-I and simulation-II, the growth in exports of agricultural commodities (C-AGRI), yarn (C-YARN), and textile (C-TEXT) are positive that is, [0.015%, 0.029%], [0.010%, 0.020%], and [0.046%, 0.092%] respectively, while their imports are recorded negative *that is*, [0.066%, 0.132%], [0.034%, 0.068%], and [0.049%, 0.098%].

The exports of mine products (C-MINE), manufacturing (C-MANF), and services (C-SER) are noticed as positive in both the cases of export as well as import, that is, export of mine is documented as [0.040%, 0.079%] and the import as [0.026%, 0.051%] but the growth in export is 65% more than import, which affects BOT positively. Similarly, export of manufacturing is grown by [0.070%, 0.139%], while its import`s growth is verified by [0.056%, 0.113%], which reflects that growth in export of these products is 80% more as compared to the imports.

The services sector also indicates a favorable position. After the imposition of the direct tax, growth in export of services sector is reported by [0.042%, 0.084%] while in the import sector its growth remains positive but less, that is, [0.026%, 0.052%], so growth in export of services shows 62% more than growth in its import. Hence balance of payments (BOP) improves.

The effect of the direct tax on export and import of food manufacturing (C-FMAN) and leather commodities (C-LEAT) is negative. On export side, food manufacturing is noticed decreased by [0.047%, 0.094%], whereas import is noted as a decrease by [0.099%, 0.198%]. Similarly, leather products are noticed to decrease in exports by [0.004%, 0.009%] and in imports by [0.057%, 0.114%]. All the above discussion reflect that increase in income tax has a positive impact on the balance of trade.

#### *5.4.1.7 Indices of Inequality*

To measure inequality, Theil Indices and Hoover Index are used. The Theil index is a measurement utilized to assess economic inequality. The Theil index evaluates an entropic "distance" where the people are leaving away from an "ideal" free state having equal income. The result in numerical form is in negative terms entropy. A higher number signals more order, i.e., further away from "ideal" of maximum disorder.

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Expressing the index to denote negative entropy in place of entropy permits it to be an inequality measure rather than equality. While the Hoover Index is the simple inequality metrics. It is utilized to evaluate the deviation from the selected equal distribution. The index is equal to the community`s income portion. This portion would be taken from higher income half of the total population and given to the lower income half of the remaining population for a society to achieve perfect equality. Where there will be no further need to redistribute the income to achieve an equal distribution of wealth state. The Hoover Index is also known as the Schutz Index or the Robin Hood Index.

In the simulations considered here, inequalities between group are measured, which are the result of data limitations. By implementing 5%- and 10%-income tax on households in simulation-I and simulation-II, Theil Indices --- Theil-T, Theil-L, Theil-S, and Hoover indices, the results register no change in income inequality (see, Table it-5.7, & Figure it-5.7).

**Table *it*-5.7: Indices of Inequality**

| Indices | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **Theil-T** | 0.313 | 0.313 | 0.313 |
| **Theil-L** | 0.316 | 0.316 | 0.316 |
| **Theil-S** | 0.315 | 0.315 | 0.314 |
| **Hoover** | 0.324 | 0.324 | 0.324 |

*Source: Simulation Results*

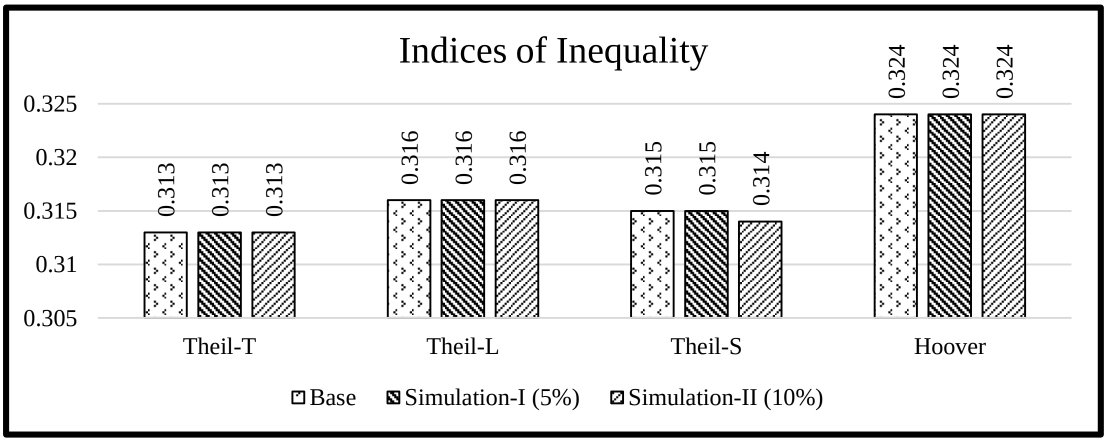


**Figure *it-5.7*: Indices of Inequality**

*Source: Simulation Results*

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The Appendix-G reveal the effect of increase in income tax on output of all other accounts of the model in the ways like, Exchange Rate (Value of one unit of foreign currency in terms of domestic currency) consists positive effect in both the simulations that is, 0.005% and 0.010% (see, Table G.32), Price of Activities (see, Table G.33) and Domestic Price of Domestic Output (see, Table G.34) show minor negative effect on activities and commodities like A-AGRI & C-AGRI, A-FMAN & C-FMAN, A-YARN & C-YARN, A-TEXT & C-TEXT, and A-LEAT & C-LEAT, whereas minor positive effect on A-MINE & C-MINE, A-MANF & C-MANF, A-ENGR & C-ENGR, and A-SER & C-SER. The Table G.36 & Table G.37 presents Import Price of Commodities (Domestic Currency) and Export Price of Commodities (Domestic Currency), which is quite the same. Composite Commodity Price (see, Table G.38) and Producer Price for Commodities (see, Table G.39) show an adverse impact on the commodities like C-AGRI, C-FMAN, C-YARN, C-TEXT, and C-LEAT while the favorable impact on remaining selected products that is, C-MINE, C-MANF, C-ENRG, and C-SER.

The Level of Activities (see, Table G.40) and Quantity of Domestic Output Sold Domestically (see, Source: Simulation *Results*

Table G.41) depict negative effect on the commodities like C-AGRI, C-FMAN, C-YARN, C-LEAT, and C-ENRG, whereas the positive effect on C-MINE, C-TEXT, C-MANF, and C-SER. Income of the Enterprises registered positive in both the experiments that is, 0.003% and 0.006% (see, Table G.43). Finally, the Utility of Households (see, Table G.45) confirm positive impact of a tax increase on only five types of the households like H-RW1, H-RN1, H-RN2, H-U1, and H-U2, while all the remaining eleven households seem to face adverse effect.

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### 5.4.2 Decrease in Sales (*Indirect*) Tax

The sectoral and macro level outcomes of reduction in sales tax in simulation-I by 5% and simulation-II by 10% are submitted as under.

#### *5.4.2.1 Effects on Macro Level (National Income Accounts)*

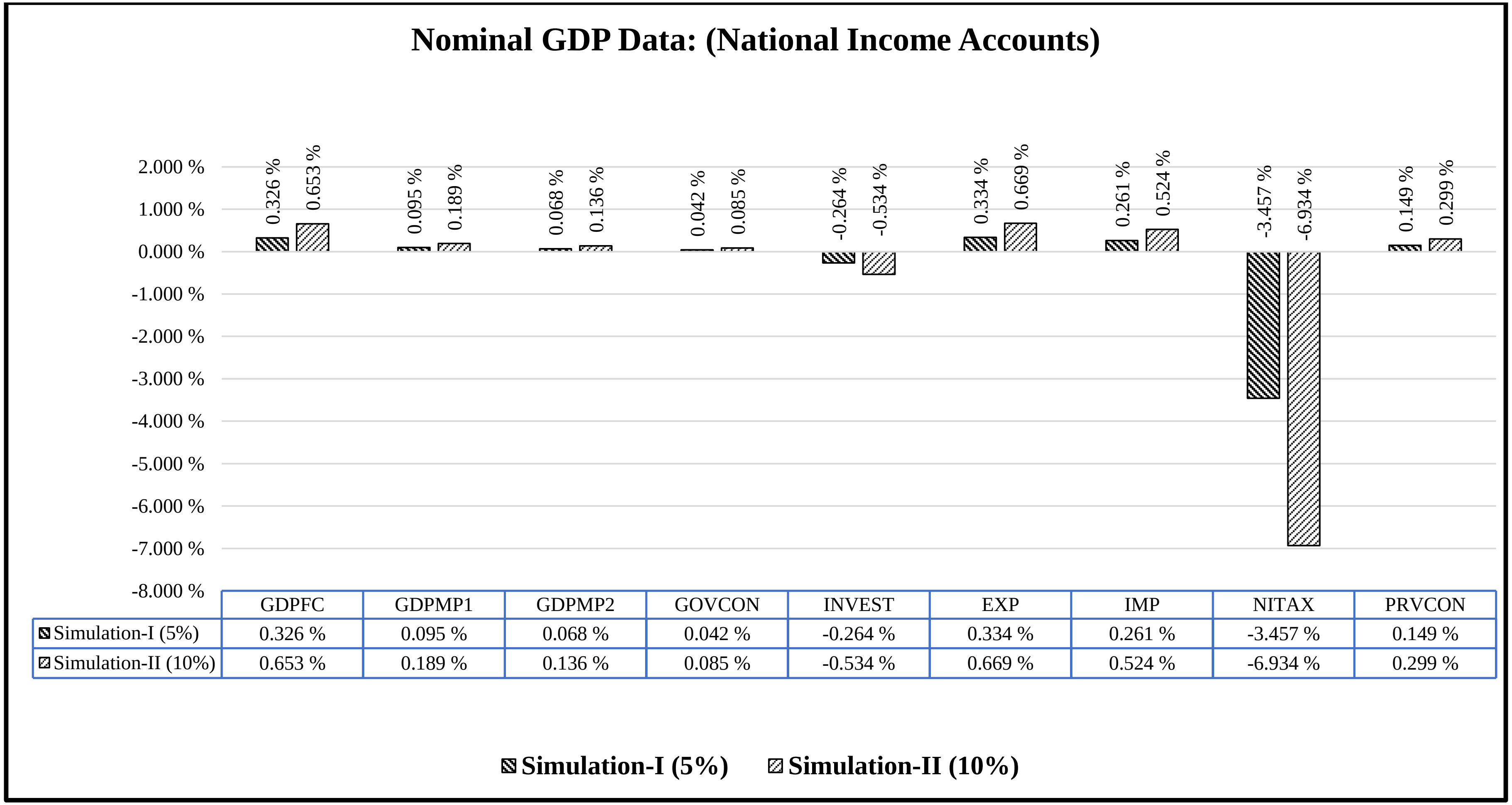
Reducing sales tax impacts positive almost on all the macroeconomic variables except investment, imports, and net indirect taxes. The Table st-5.8 & Figure st-5.8 given below indicates that in simulation-I as well as in simulation-II GDP at factor cost, GDP at market prices from spending side, and GDP at market price from income side increases by [0.326%, 0.653%], [0.095%, 0.189%], and [0.068%, 0.136%] respectively. Government consumption expands by 0.042% in Experiment-I while in Experiment-II it increases by 0.085%.

Similarly, exports increased by 0.334% and 0.669%. Private consumption level is also appreciated by 0.149% and 0.299%. The rise in imports by 0.261% and 0.524% in sim-I & II also indicates a favorable sign to correct the balance of payments. So, the impact on foreign trade is positive. Decrease in sales tax affected investment and net indirect taxes by [0.264%, 0.534%] and [3.457%, 6.934%] respectively.

**Table *st*-5.8: Nominal GDP Data: (National Income Accounts)**

| Variable | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **GDPFC** | 15255.095 | 15304.839 | 0.326 | 15354.725 | 0.653 |
| **GDPMP1** | 16320.344 | 16335.824 | 0.095 | 16351.257 | 0.189 |
| **GDPMP2** | 16370.419 | 16381.611 | 0.068 | 16392.717 | 0.136 |
| **GOVCON** | 1711.912 | 1712.636 | 0.042 | 1713.364 | 0.085 |
| **INVEST** | 1954.580 | 1949.413 | -0.264 | 1944.152 | -0.534 |
| **EXP** | 2778.963 | 2788.240 | 0.334 | 2797.568 | 0.669 |
| **IMP** | 3667.333 | 3676.923 | 0.261 | 3686.566 | 0.524 |
| **NITAX** | 1115.324 | 1076.772 | -3.457 | 1037.992 | -6.934 |
| **PRVCON** | 13542.222 | 13562.458 | 0.149 | 13582.738 | 0.299 |

*Source: Simulation Results*




| | GDPFC | GDPMP1 | GDPMP2 | GOVCON | INVEST | EXP | IMP | NITAX | PRVCON |
|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | 0.326 % | 0.095 % | 0.068 % | 0.042 % | -0.264 % | 0.334 % | 0.261 % | -3.457 % | 0.149 % |
| Simulation-II (10%) | 0.653 % | 0.189 % | 0.136 % | 0.085 % | -0.534 % | 0.669 % | 0.524 % | -6.934 % | 0.299 % |

**Figure *st-5.8*: Nominal GDP Data (National Income Accounts)**

*Source: Simulation Results*

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#### 5.4.2.2 *The quantity of Domestic Output of Commodities*

In our model the experiments of reducing sales tax shows its positive impact on domestic output of the commodities except agricultural products (C-AGRI) and yarn (C-YARN). Which is in simulation-I $8.22296e^{-4}$% and 0.015%, while in simulation-II 0.002% and 0.031%. The quantity of the domestic production of all other selected products for this study like mine (C-MINE), food manufacturing (C-FMAN), textile (C-TEXT), leather (C-LEAT), other manufacturing (C-MANF), energy (C-ENRG), and services (C-SER). C-MINE grows in simulation-I by 0.081% while in simulation-II by 0.163%, C-FMAN by 0.069% and 138%, C-TEXT by 0.544% and 1.087%, C-LEAT by 0.345% and 0.690%, C-MANF by 0.574% and 1.151%, C-ENRG by 0.300% and 0.602%, and C-SER by 0.069% and 0.138% (see, Table st-5.9, & Figure st-5.9). The above empirical analyses depict that if the government decreases indirect tax, production of domestically produced goods increases, which leads the consumption of households to increase and hence the utility.

**Table *st*-5.9: Quantity of Domestic Output of Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| C-AGRI | 7047.148 | 7047.090 | $-8.22296e^{-4}$ | 7047.012 | -0.002 |
| C-MINE | 730.595 | 731.190 | 0.081 | 731.786 | 0.163 |
| C-FMAN | 5073.711 | 5077.214 | 0.069 | 5080.723 | 0.138 |
| C-YARN | 2480.102 | 2479.728 | -0.015 | 2479.342 | -0.031 |
| C-TEXT | 1757.475 | 1767.032 | 0.544 | 1776.581 | 1.087 |
| C-LEAT | 362.897 | 364.148 | 0.345 | 365.399 | 0.690 |
| C-MANF | 4439.234 | 4464.712 | 0.574 | 4490.337 | 1.151 |
| C-ENRG | 1956.650 | 1962.528 | 0.300 | 1968.423 | 0.602 |
| C-SER | 9337.056 | 9343.528 | 0.069 | 9349.850 | 0.138 |

*Source: Simulation Results*

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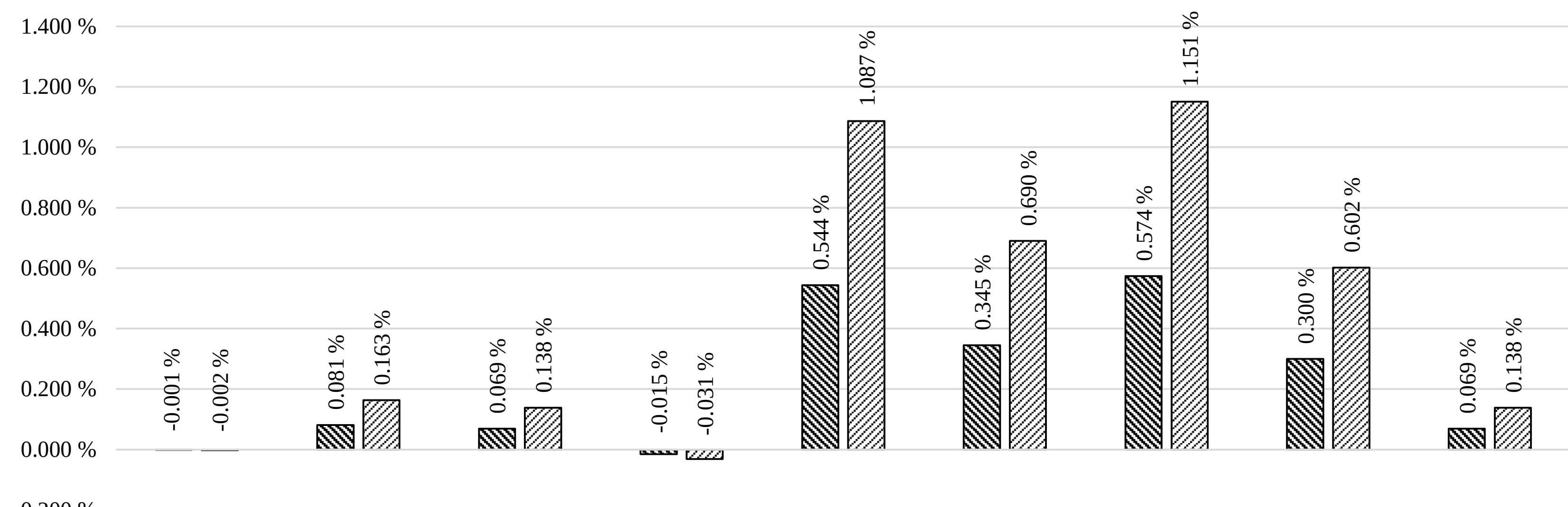
**Quantity of Domestic Output of Commodities**




| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-ENRG | C-SER |
|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | -0.001 % | 0.081 % | 0.069 % | -0.015 % | 0.544 % | 0.345 % | 0.574 % | 0.300 % | 0.069 % |
| Simulation-II (10%) | -0.002 % | 0.163 % | 0.138 % | -0.031 % | 1.087 % | 0.690 % | 1.151 % | 0.602 % | 0.138 % |

**Simulation-I (5%)** **Simulation-II (10%)**

**Figure *st-5.9*: Quantity of Domestic Output of Commodities**

*Source: Simulation Results*

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#### 5.4.2.3 *Income of Households*

Simulation-I and II, regarding reduction in sales tax by 5% and 10% respectively illustrate the positive effect on the model`s all the sixteen categories (rural as well as urban) of the households. Obviously, their real income increases which in turn raises the consumption level and hence the welfare standard. Income growth of rural households small, medium, and large farm categories increases in both the tests in the sequence of H-RS1 and H-RS234 by [0.248%, 0.496%] & [0.246%, 0.493%], H-RH1 and H-RM234 by [0.233%, 0.467%] & [0.241%, 0.483%], and H-RL1 and H-RL234 by [0.227%, 0.455%] & [0.219%, 0.438%] respectively.

The households of the category like rural farm workers such as H-RW1 and H-RW234 income grows by [0.285%, 0.571%] *&* [0.282%, 0.0.564%]. Four categories of the rural non-farm households` income increases in experiment-I and II by [0.189%, 0.378%], [0.151%, 0.302%], [0.120%, 0.240%], and [0.068%, 0.137%]. These households are symbolized by H-RN1, H-RN2, H-RN3, and H-RN4. Remaining four categories of the households are urban, epitomized by H-U1, H-U2, H-U3, and H-U4. Their income grows after decrease in sales tax in the two simulations by [0.180%, 0.360%], [0.164%, 0.329%], [0.134%. 0.267%], and [0.074%, 0.148%] correspondingly (see, Appendix-H, Table H.60).

#### 5.4.2.4 *Average Price of Factors*

The average price of the factors like land (N) and capital (K) shows growth in simulation-I as well as simulation-II. It is recorded in case of land 0.252% while in case of capital 0.351% in the first experiment. In the second experiment, it is noted by the increase in the case of land by 0.504% whereas in the case of capital 0.704%. Thus, reducing sales tax impacts positively on factors` average prices (see, Appendix-H, Table H.51).

#### 5.4.2.5 *The welfare of the Households*

The results of the two simulations with 5% and 10% decrease in sales tax reveal an increasing trend in the utility and compensating the variation of households as well as compensating the variation of the economy as a whole. The decrease in indirect tax

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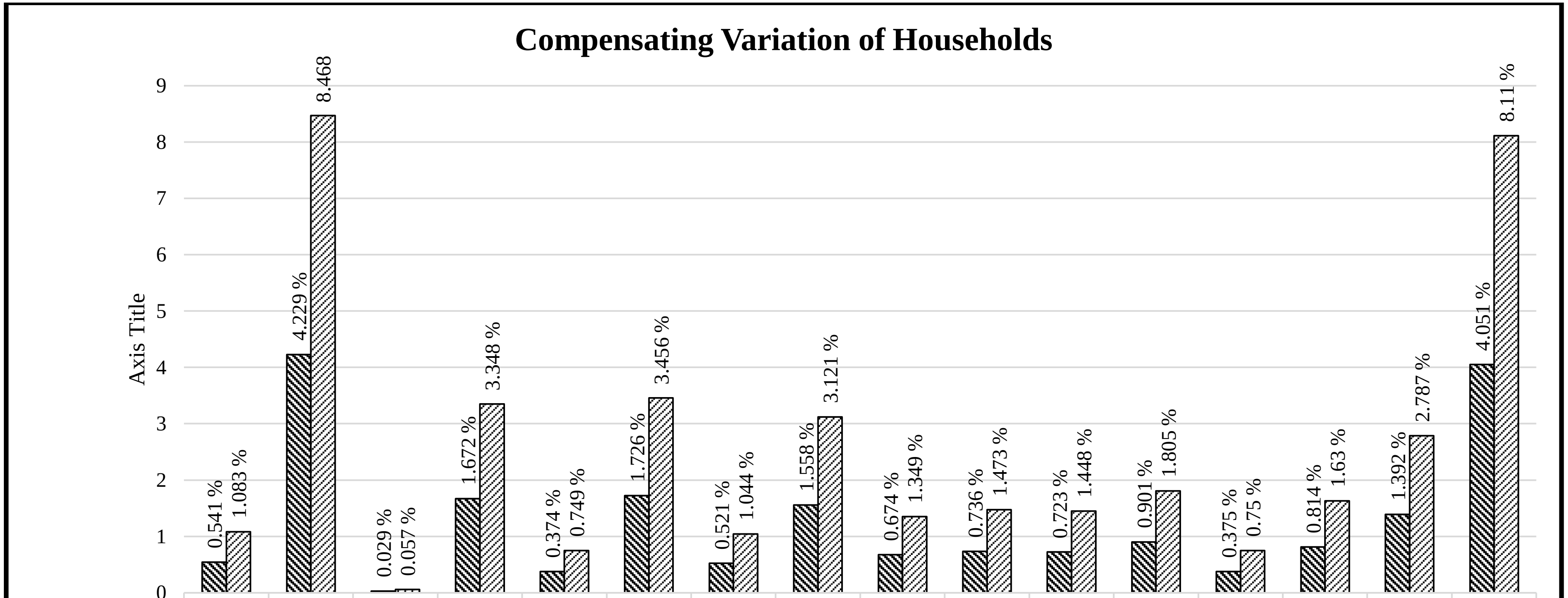
resulted into increase in the real income of the households, which ultimately improved the consumers to consume more (see, Appendix-H, Table H.47). Resultantly utility of all the sixteen types of the households in model augmented (see, Appendix-H, Table H.61).

Households` welfare lifted upward, that can be assessed by comparing with factors` prices and commodities` prices (see, Appendix-H, Table H.51 & Table H.46). The outcomes indicate that factors` average prices increased at a higher rate compared to commodities` consumer prices. Sequels of the model confirm that diminution of sales tax in simulation-I and simulation-II impacts positively on all the types of households in Pakistan. Compensation variation (CV) specifies improvement. The highest CV is recorded by H-RS234 and H-U4. For the households of the type rural small farmer quartile-234 (H-RS234) in simulation-I CV is verified by 4.229% while in simulation-II it is grown by 8.468%, similarly, for the households of the type urban quartile 4, it is grown by 4.051% in simulation-I, whereas 8.110% in simulation-II.

**Table *st*-5.10: Compensating Variation of Households**

| Households | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|
| **H-RS1** | 0.541 | 1.083 |
| **H-RS234** | 4.229 | 8.468 |
| **H-RM1** | 0.029 | 0.057 |
| **H-RM234** | 1.672 | 3.348 |
| **H-RL1** | 0.374 | 0.749 |
| **H-RL234** | 1.726 | 3.456 |
| **H-RW1** | 0.521 | 1.044 |
| **H-RW234** | 1.558 | 3.121 |
| **H-RN1** | 0.674 | 1.349 |
| **H-RN2** | 0.736 | 1.473 |
| **H-RN3** | 0.723 | 1.448 |
| **H-RN4** | 0.901 | 1.805 |
| **H-U1** | 0.375 | 0.750 |
| **H-U2** | 0.814 | 1.630 |
| **H-U3** | 1.392 | 2.787 |
| **H-U4** | 4.051 | 8.110 |

*Source: Simulation Results*




| | H-RS1 | H-RS234 | H-RM1 | H-RM234 | H-RL1 | H-RL234 | H-RW1 | H-RW234 | H-RN1 | H-RN2 | H-RN3 | H-RN4 | H-U1 | H-U2 | H-U3 | H-U4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Simulation-I | 0.541 | 4.229 | 0.029 | 1.672 | 0.374 | 1.726 | 0.521 | 1.558 | 0.674 | 0.736 | 0.723 | 0.901 | 0.375 | 0.814 | 1.392 | 4.051 |
| Simulation-II | 1.083 | 8.468 | 0.057 | 3.348 | 0.749 | 3.456 | 1.044 | 3.121 | 1.349 | 1.473 | 1.448 | 1.805 | 0.75 | 1.63 | 2.787 | 8.11 |

**Figure *st-5.10*: Compensating Variation of Households**

*Source: Simulation Results*

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On the other hand, the lowest compensating variation is documented for the households of the type rural medium quartile-1, which is grown by 0.029% in simulation-I and 0.057% in simulation-II (see, Table st-5.10, & Figure st-5.10).

The outcomes of compensating variation indicate that welfare of all the categories of rural as well as urban households has increased due to reducing indirect taxes by the government because the reduction in sales tax, in fact, results into increase in real income which ultimately increases the purchasing power of the households. Hence, this results into boost the welfare of the households.

The experiments regarding the decrease in indirect (sales) tax by 5% and 10% also document the increase in economy-wide compensating variation in simulation-I and simulation-II by 0.150% and 0.300% respectively (see, Table st-5.11, & Figure st-5.11). The utility of all the sixteen categories of households reflects positive growth after employing both the simulations of reducing sales tax (see, Appendix-H, Table H.61).

**Table *st*-5.11: Economy-Wide Compensating Variation**

| Compensating Variation | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|
| **TCV** | 0.150 | 0.300 |

*Source: Simulation Results*

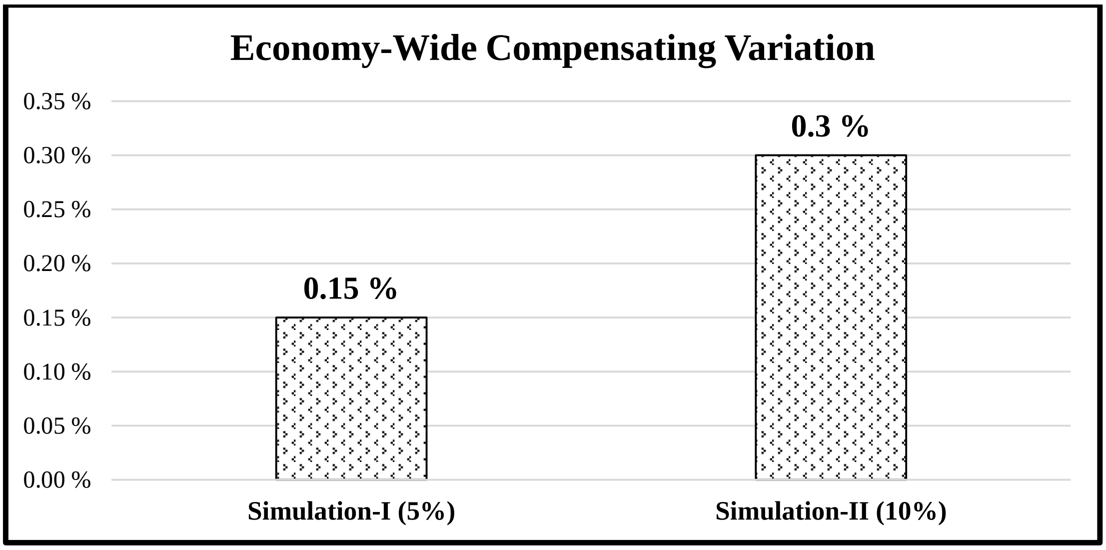


**Figure *st-5.11*: Economy-wide Compensating Variation**

*Source: Simulation Results*

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#### *5.4.2.6 Balance of Trade*

Lessening sales tax explains adverse impact on quantity of exports for commodities like agricultural products (C-AGRI), mine (C-MINE), food manufacturing (C-FMAN), yarn (C-YARN), and services (C-SER), while favorable effect on textile (C-TEXT), leather (C-LEAT), and other manufacturing (C-MANF) in both the simulations, that is, 5% and 10% decrease in sales tax experiments in this model.

The negative growth is noticed by [0.654%, 1.304%] in C-AGRI, [0.545%, 1.088%] in C-MINE, [0.258%, 0.515%] in C-FMAN, [0.284%, 0.569%] in C-YARN, and [0.003%, 0.006%] in C-SER. Decrease in export of these commodities reflects that households consume more of these at home, which indicates increase in their welfare. While, positive growth is recorded by [0.642%, 1.283%] in C-TEXT, [0.512%, 1.024%] in C-LEAT, and [0.990%, 1.989%] in C-MANF (see, Table st-5.12, & Figure st-5.12).

In this model, the influence of a decrease in sales tax on the number of imports for all selected commodities displays positive outcomes in both the simulations. It confirms an increase in real income of the households and hence more consumption of imports which leads to raising welfare level. Growth in import of the commodities in simulation-I (5%) and simulation-II (10%) is charted by [0.672%, 1.348%] in C-AGRI, [0.832%, 1.671%] in C-MINE, [0.499%, 1.001%] in C-FMAN, [0.412%, 0.825%] in C-YARN, [0.172%, 0.345%] in C-TEXT, [0.021%, 0.042%] in C-LEAT, [0.038%, 0.076%] in C-MANF, and [0.172%, 0.344%] in C-SER respectively (see, Table st-5.13, & Figure st- 5.13).

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**Table *st*-5.12: Quantity of Exports for Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| C-AGRI | 82.769 | 82.228 | -0.654 | 81.690 | -1.304 |
| C-MINE | 59.731 | 59.406 | -0.545 | 59.082 | -1.088 |
| C-FMAN | 318.911 | 318.088 | -0.258 | 317.267 | -0.515 |
| C-YARN | 499.595 | 498.175 | -0.284 | 496.753 | -0.569 |
| C-TEXT | 999.712 | 1006.129 | 0.642 | 1012.542 | 1.283 |
| C-LEAT | 97.557 | 98.056 | 0.512 | 98.556 | 1.024 |
| C-MANF | 435.110 | 439.416 | 0.990 | 443.763 | 1.989 |
| C-SER | 272.101 | 272.094 | -0.003 | 272.084 | -0.006 |

*Source: Simulation Results*

**Table *st*-5.13: Quantity of Imports for Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| C-AGRI | 160.616 | 161.696 | 0.672 | 162.781 | 1.348 |
| C-MINE | 406.733 | 410.119 | 0.832 | 413.530 | 1.671 |
| C-FMAN | 421.239 | 423.343 | 0.499 | 425.457 | 1.001 |
| C-YARN | 108.664 | 109.111 | 0.412 | 109.560 | 0.825 |
| C-TEXT | 160.194 | 160.469 | 0.172 | 160.746 | 0.345 |
| C-LEAT | 11.901 | 11.904 | 0.021 | 11.906 | 0.042 |
| C-MANF | 2340.378 | 2341.263 | 0.038 | 2342.146 | 0.076 |
| C-SER | 335.117 | 335.693 | 0.172 | 336.270 | 0.344 |

*Source: Simulation Results*

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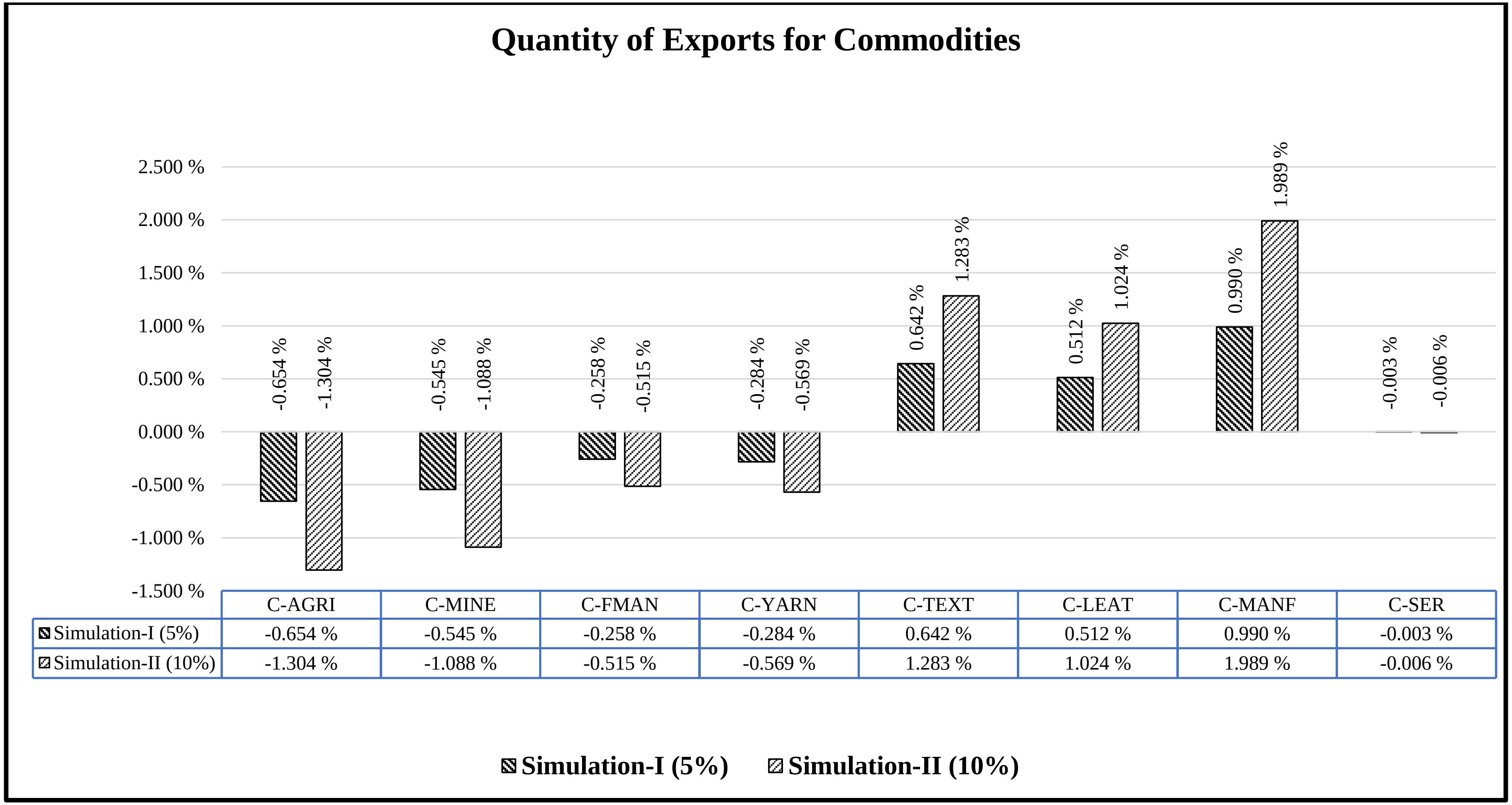


| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | -0.654 % | -0.545 % | -0.258 % | -0.284 % | 0.642 % | 0.512 % | 0.990 % | -0.003 % |
| Simulation-II (10%) | -1.304 % | -1.088 % | -0.515 % | -0.569 % | 1.283 % | 1.024 % | 1.989 % | -0.006 % |

**Figure *st-5.12*: Quantity of Exports for Commodities**

*Source: Simulation Results*

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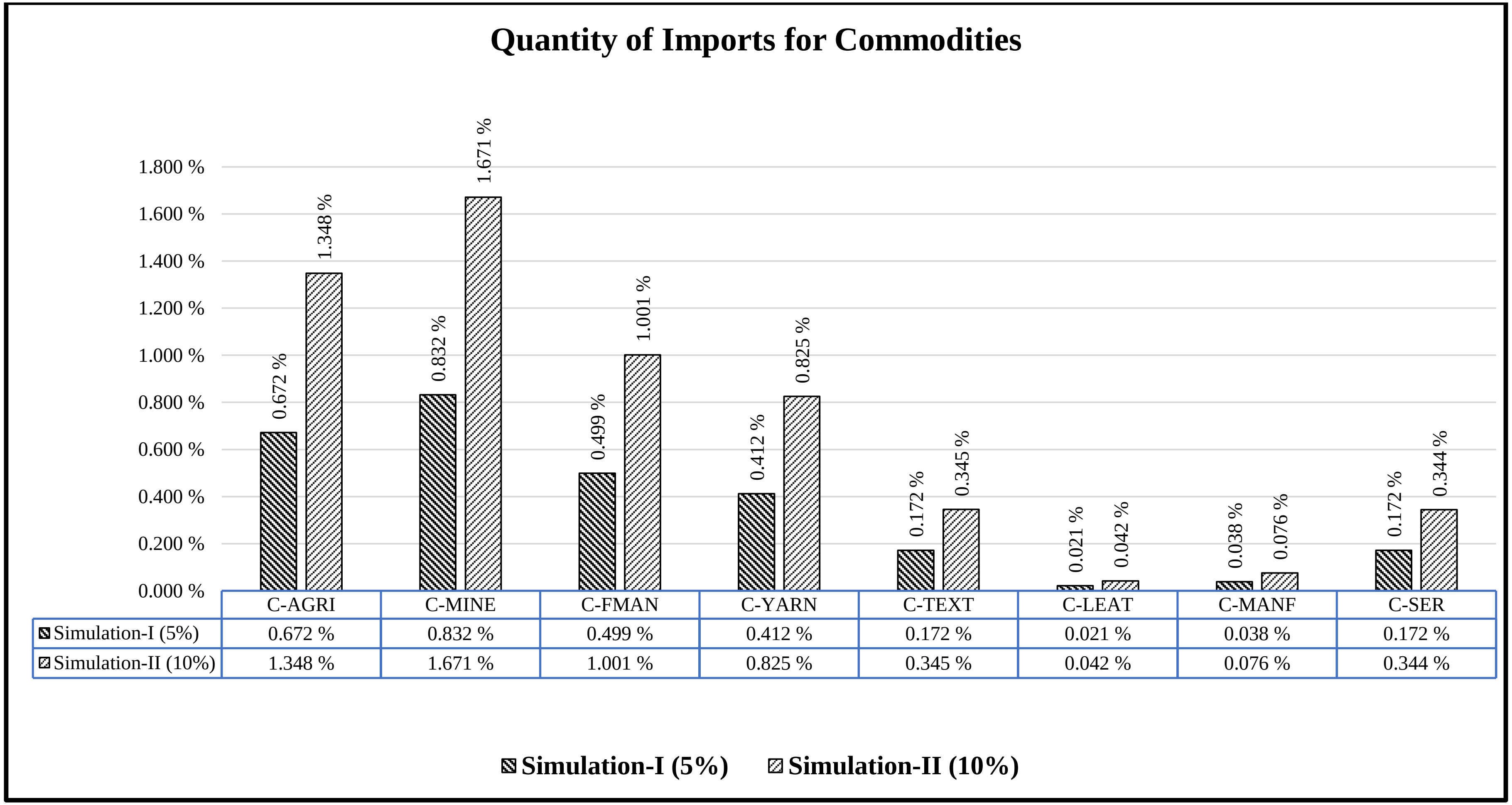


| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | 0.672 % | 0.832 % | 0.499 % | 0.412 % | 0.172 % | 0.021 % | 0.038 % | 0.172 % |
| Simulation-II (10%) | 1.348 % | 1.671 % | 1.001 % | 0.825 % | 0.345 % | 0.042 % | 0.076 % | 0.344 % |

**Figure *st-* 5.13: Quantity of Imports for Commodities**

*Source: Simulation Results*

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### *5.4.2.7 Indices of Inequality*

Theil indices and Hoover index are utilized to measure the inequality between groups which are the result of data limitations. In simulation-I, when sales tax is reduced by 5%, Theil-T and Theil-L show no change in income inequality, while in case of reducing 10% reduction in sales tax both the indices indicates the decrease in inequality, that is, 0.312% and 0.315% respectively. Theil-S register the same fall in income inequality in both the experiments, that is, 0.314% and 0.314%. However, Hoover Index depicts zero change in income inequality in simulation-I as well as in simulation-II (see, Table st-5.14, & Figure st- 5.14).

**Table *st*-5.14: Indices of Inequality**

| Indices | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **Theil-T** | 0.313 | 0.313 | 0.312 |
| **Theil-L** | 0.316 | 0.316 | 0.315 |
| **Theil-S** | 0.315 | 0.314 | 0.314 |
| **Hoover** | 0.324 | 0.324 | 0.324 |

*Source: Simulation Results*

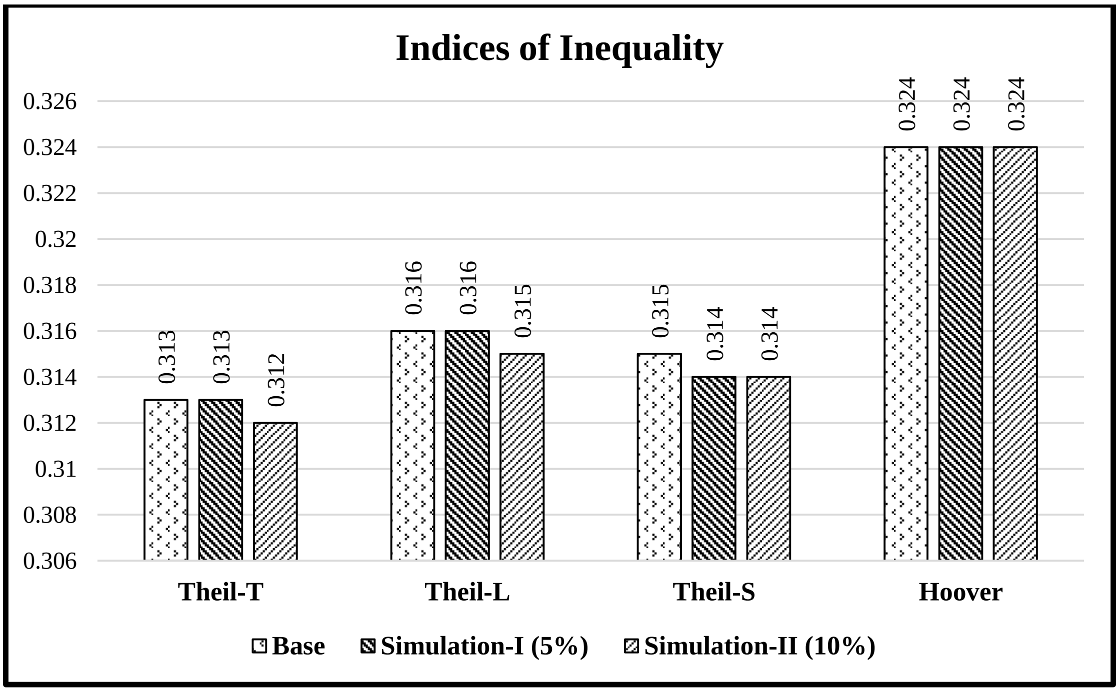


**Figure *st*- 5.14: Indices of Inequality**

*Source: Simulation Results*

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The Appendix-H vindicates the impact of 5% and then 10% decrease in sales tax experiments on other accounts of the Pakistan economy. A positive effect on Exchange Rate (see, Table H.48) is noticed, that is, 0.035% and 0.071%. Price of Activities (see, Table H.49) indicates a positive effect on all the selected goods except only three activities, that is, A-LEAT, A-MANF, and A-ENRG. Similarly, this policy shows the impact of reducing sales tax on producer price for the same commodities (see, Table H.55) as same. The highest positive impact is on A-MINE/ C-MINE, which is noted as 0.245% and 0.491%. In the same way, the positive impact is registered for Domestic Price of Domestic Output (Table H.55) of five commodities out of nine.

Import and Export Price for Commodities (Domestic Currency) totally show encouraging impact (see, Table H.52 & Table H.53). In case of Composite Commodity Price (see, Table H.54), the effect of decreasing sales tax is noticed adverse on C-MINE, C-TEXT, C-LEAT, C-MANF, and C-ENRG, while it is favorable on all other model products. In C-AGRI, it is high as 0.185% and 0.370%, after agricultural commodities, the yarn is at second, that is, 0.130% and 0.261%. The level of only two activities, that is, A-AGRI and A-YARN are suffered under this action, while all other activities are benefitted (see, Table H.56).

The most benefitted activities noticed are A-LEAT and A-ENRG, that is, 0.345% & 0.690% and 0.300% & 0.602% respectively. After these two tests, the impact of reducing sales tax on Quantity of Domestic Output Sold Domestically as well as Quantity of Composite Goods Supplied Domestically is found positive (see, Table H.57 & Table H.58).

Under the Quantity of Domestic Output Sold Domestically, C-TEXT appears at the top, that is, 0.425% & 0.849%, whereas, C-MINE seem at peak with 0.414% & 0.829% in case of Quantity of Composite Goods Supplied Domestically. The Table H.59 show favorable impact of this experiment when the study focuses the Income of Enterprise, that is, 0.308% & 0.617%.

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### 5.4.3 Increase in Income and Decrease in Sales (*Mix of Direct and Indirect*) Taxes

The sectoral and macro results of 5% increase in income tax and 5% decrease in sales tax mix in simulation-I while in simulation-II 10% increase in income tax and 10% decrease in sales tax mix are recorded as under.

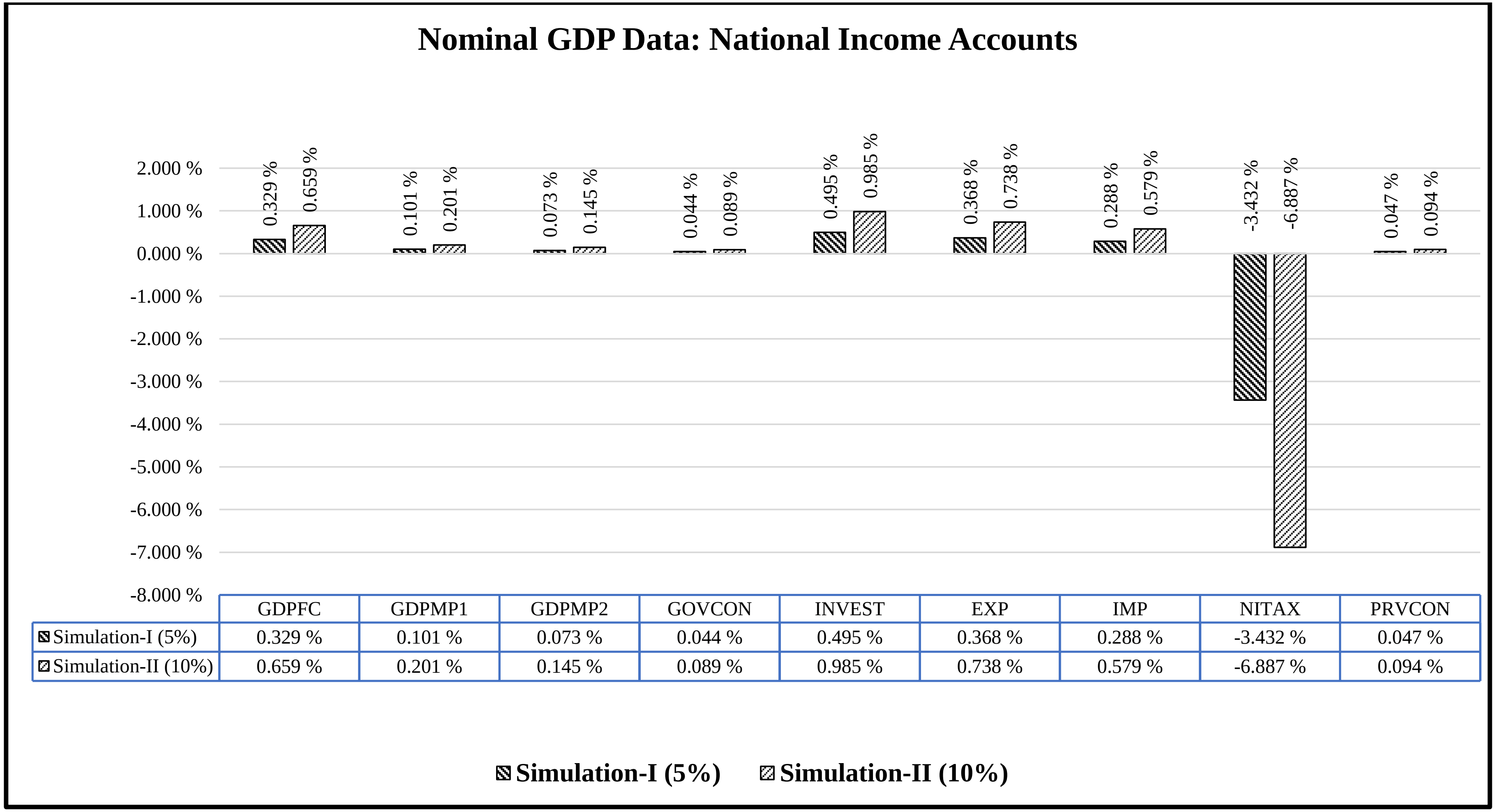
#### *5.4.3.1 Effect on Macro Level (National Income Account)*

Nominal GDP data of the results of both the taxes mix experiments show the favorable impact on different macroeconomic indicators except net indirect taxes (see, Table itst-5.15, & Figure itst-5.15). Due to this policy mix growth in macroeconomic variables is recorded in the descending sequence like, investment at [0.495%, 0.985%], exports (EXP) at [0.368%, 0.738%], Gross Domestic Product at fixed cost (GDPFC) at [0.329%, 0.659%], imports (IMP) at [0.288%, 0.579%], gross domestic product at market price (GDPMP1) from expenditure side it is at [0.101%, 0.201%], gross domestic product at market price (GDPMP2) from income side is at [0.073%, 0.145%], and government consumption (GOVCON) at [0.044%, 0.089%], while private consumption (PRVCON) at [0.047%, 0.094%]. On the other hand, the negative impact of this policy on net indirect tax is noted at [3.432%, 6.887%] (see, Table itst-5.15, & Figure itst-5.15).

**Table *itst*-5.15: Nominal GDP Data: (National Income Accounts)**

| Variable | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **GDPFC** | 15255.095 | 15305.278 | 0.329 | 15355.605 | 0.659 |
| **GDPMP1** | 16320.344 | 16336.777 | 0.101 | 16353.144 | 0.201 |
| **GDPMP2** | 16370.419 | 16382.322 | 0.073 | 16394.119 | 0.145 |
| **GOVCON** | 1711.912 | 1712.668 | 0.044 | 1713.429 | 0.089 |
| **INVEST** | 1954.580 | 1964.249 | 0.495 | 1973.833 | 0.985 |
| **EXP** | 2778.963 | 2789.201 | 0.368 | 2799.483 | 0.738 |
| **IMP** | 3667.333 | 3677.929 | 0.288 | 3688.569 | 0.579 |
| **NITAX** | 1115.324 | 1077.045 | -3.432 | 1038.515 | -6.887 |
| **PRVCON** | 13542.222 | 13548.587 | 0.047 | 13554.969 | 0.094 |

*Source: Simulation Results*




| | GDPFC | GDPMP1 | GDPMP2 | GOVCON | INVEST | EXP | IMP | NITAX | PRVCON |
|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | 0.329 % | 0.101 % | 0.073 % | 0.044 % | 0.495 % | 0.368 % | 0.288 % | -3.432 % | 0.047 % |
| Simulation-II (10%) | 0.659 % | 0.201 % | 0.145 % | 0.089 % | 0.985 % | 0.738 % | 0.579 % | -6.887 % | 0.094 % |

**Figure *itst-5.15*: Nominal GDP Data (National Income Accounts)**

*Source: Simulation Results*

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#### *5.4.3.2 The quantity of Domestic Output of Commodities*

The trials` fallouts of increase in income tax and a decrease in sales tax mix illustrate a positive impact on the growth of the selected commodities in the model except for agricultural output, food manufacturing, and yarn. It is noted that in simulation-I, the growth of agricultural output (C-AGRI) falls by 0.026 %, while in simulation-II it decreased by 0.052%.

Food manufacturing growth (C-FMAN) declined to -5.75960e$^{-4}$ in simulation-I, whereas by 0.001% in simulation-II. Similarly, the growth of yarn (C-YARN) in test-I declined by 0.022% and in test-II by 0.045% (see, Table itst-5.16, & Figure itst-5.16). These experiments indicate the growing impact on all other domestic outputs. That is, in simulation-I when income tax was increased by 5% and sales tax was decreased by the same proportion, that is, 5%, and in simulation-II when it was tested at 10% in the same way in mix action, the effects on growth recorded as, (explaining in descending order), in the domestic output of products like, other manufacturing (C-MANF) by [0.638%, 1.279%], textile (C-TEXT) by [0.570%, 1.139%], leather (C-LEAT) by [0.322%, 0.644%], energy (C-ENRG) by [0.264%, 0.528%], mine (C-MINE) by -[0.114%, 0.229%], and s$^{e}$rvices (C-SER) by [0.105%, 0.209%] (see, Table itst-5.16, & Figure itst-5.16).

**Table *itst*-5.16: Quantity of Domestic Output of Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 7047.148 | 7045.309 | -0.026 | 7043.454 | -0.052 |
| **C-MINE** | 730.595 | 731.432 | 0.114 | 732.267 | 0.229 |
| **C-FMAN** | 5073.711 | 5073.681 | -5.75960e$^{-4}$ | 5073.652 | -0.001 |
| **C-YARN** | 2480.102 | 2479.551 | -0.022 | 2478.983 | -0.045 |
| **C-TEXT** | 1757.475 | 1767.487 | 0.570 | 1777.485 | 1.139 |
| **C-LEAT** | 362.897 | 364.067 | 0.322 | 365.235 | 0.644 |
| **C-MANF** | 4439.234 | 4467.552 | 0.638 | 4496.022 | 1.279 |
| **C-ENRG** | 1956.650 | 1961.810 | 0.264 | 1966.982 | 0.528 |
| **C-SER** | 9337.056 | 9346.832 | 0.105 | 9356.565 | 0.209 |

*Source: Simulation Results*

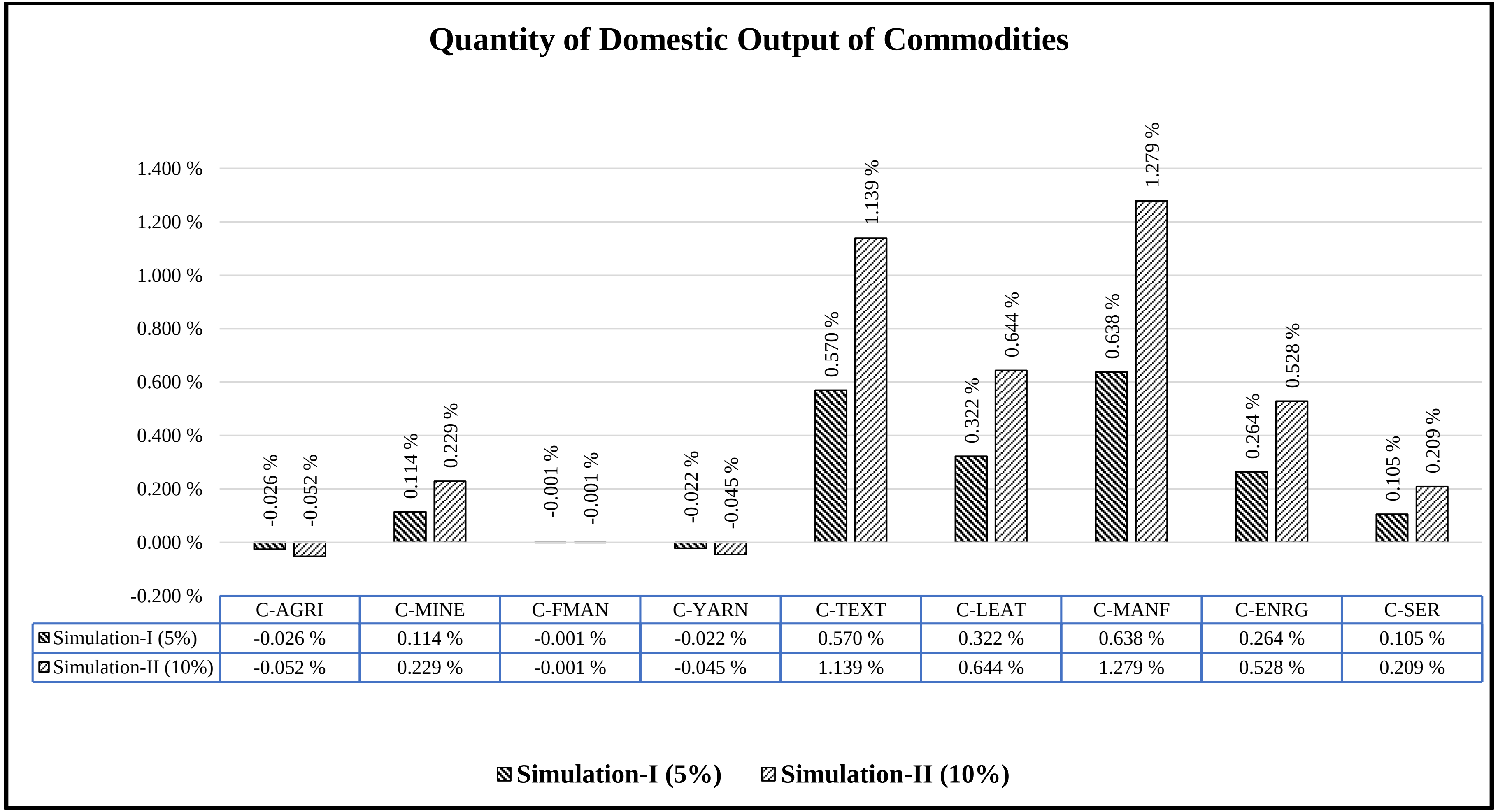


**Figure *itst-5.16*: Quantity of Domestic Output of Commodities**

*Source: Simulation Results*

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Experiments of this policy mix reveal the negative effect on the sectors under nature like agriculture and yarn, while the positive effect on all other sectors` products which are directly or indirectly related to the manufacturing process.

#### *5.4.3.3 Income of Households*

All the categories of households assumed in the model are benefitted in both the simulations. Increase in direct tax results into a decrease in real income of the households but a decrease in sale tax on domestic commodities boost the real income. It shows that if the government increases income tax and at the same time decreases sales tax at the same rate, the real income of the households improves. Which results into increase in consumption power and hence welfare of the households.

In simulation-I and simulation-II, at a time 5% increase in income tax and 5% decrease in sales tax, and then 10% increase in income tax and 10% decrease in sales tax results into growth in income of all the categories of rural as well as urban households.

Increase in income of the households category wise recorded is as, for rural small farm quartile-1 (H-RS1) by [0.243%, 0.486%], rural small farm quartile-234 (H-RS234) by [0.242%, 0.484%], rural medium farm quartile-1 (H-RM1) by [0.223%, 0.445%], rural medium farm quartile-234 (H-RM234) by [0.232%, 0.464%], rural large farm quartile-1 (H-RL1) by [0.218%, 0.436%], rural large farm quartile-234 (H-RL234) by [0.212%, 0.425%], rural farm workers quartile-1 (H-RW1) by [0.292%, 0.585%], rural farm workers quartile-234 (H-RW234) by [0.288%, 0.577%].

Similarly, rural non-farm quartile-1 (H-RN1) by [0.197%, 0.394%], rural non-farm quartile-2 (H-RN2) by [0.157%, 0.315%], rural non-farm quartile-3 (H-RN3) by [0.125%, 0.251%], rural non-farm quartile-4 (H-RN4) by [0.072%, 0.143%], urban quartile-1 (H-U1) by [0.185%, 0.371%], urban quartile-2 (H-U2) by [0.170%, 0.341%], urban quartile-3 (H-U3) by [0.138%, 0.277%], and urban quartile-4 (H-U4) by [0.077%, 0.154%] (see, Appendix-I, Table I.76).

#### *5.4.3.4 Average Price of Factors*

This policy mix experiment recorded a positive impact on the average price of the factors. In both the simulations increase in the average price of capital (K) is registered

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higher than that of the land (N). In simulation-I, this growth is noticed 0.221% for land while 0.355% for capital. In simulation-II, the rise is noted by 0.442% and 0.711% for land and capital respectively (see, Appendix-I, Table I.67).

#### *5.4.3.5 The welfare of the Households*

Experiments of mix policy presented appreciation in both the tests except two quartiles of the households, that is, rural non-farm quartile-4 (H-RN4) and urban quartile-4 (H-U4). The outcomes express the increase in utility level of all other households after increasing income tax along with decreasing sales tax at the same rate in both the simulations. Most of the rural households like H-RS1, H-RS234, H-RM1, H-M234, H-RL1, H-RL234, H-RW1, and RW234 are highly benefitted, while rural non-farm and urban households, as compared to them, enjoyed less utility (see, Appendix-I, Table I.77). Similarly, their consumption expenditure also reflects the same trend (see, Appendix-I, Table I.63). The positive tendency of increase in consumption means improvement in the level of welfare.

Compensating variation (CV) of the households recorded improving impact on fourteen categories of the model`s households. Only two are worsened. The highest value of compensating variation is noted by rural small farm quartile-234 (H-RS234), which is in simulation-I 3.659%, while in simulation-II 7.326%. This is due to the increase in the average price of the factor land (N). Whereas, a very high negative impact is noticed for urban households' quartile-4 (H-U4), which is in simulation-I 4.804% and in simulation-II 9.613%. Rest of the households are noted with a boost in welfare, except rural non-farm quartile-4 (H-RN4), whose welfare is declined by 0.316% in simulation-I and 0.632% in simulation-II. The CV of all others increased in the two simulations.

Welfare increases for the households belong to the categories like rural small farms quartile-1(H-RS1) by [0.532%, 1.066%], rural medium farms quartile-1(H-RM1) by [0.027%, 0.055%], rural medium farms quartile-234 (H-RM234) by [1.460%, 2.924%], rural large farms quartile-1 (H-RL1) by [0.360%, 0.720%], rural large farms quartile-234 (H-RL234) by [0.638%, 1.275%], rural farm workers quartile-1(H-RW1) by [0.538%, 1.079%], rural farm workers quartile-234 (H-RW234) by [1.321%, 2.645%], non-farm quartile-1 (H-RN1) by [0.711%, 1.423%], non-farm quartile-2 (H-RN2) by [0.777%, 1.557%], non-farm quartile-3 (H-RN3) by [0.262%, 0.524%], urban quartile-

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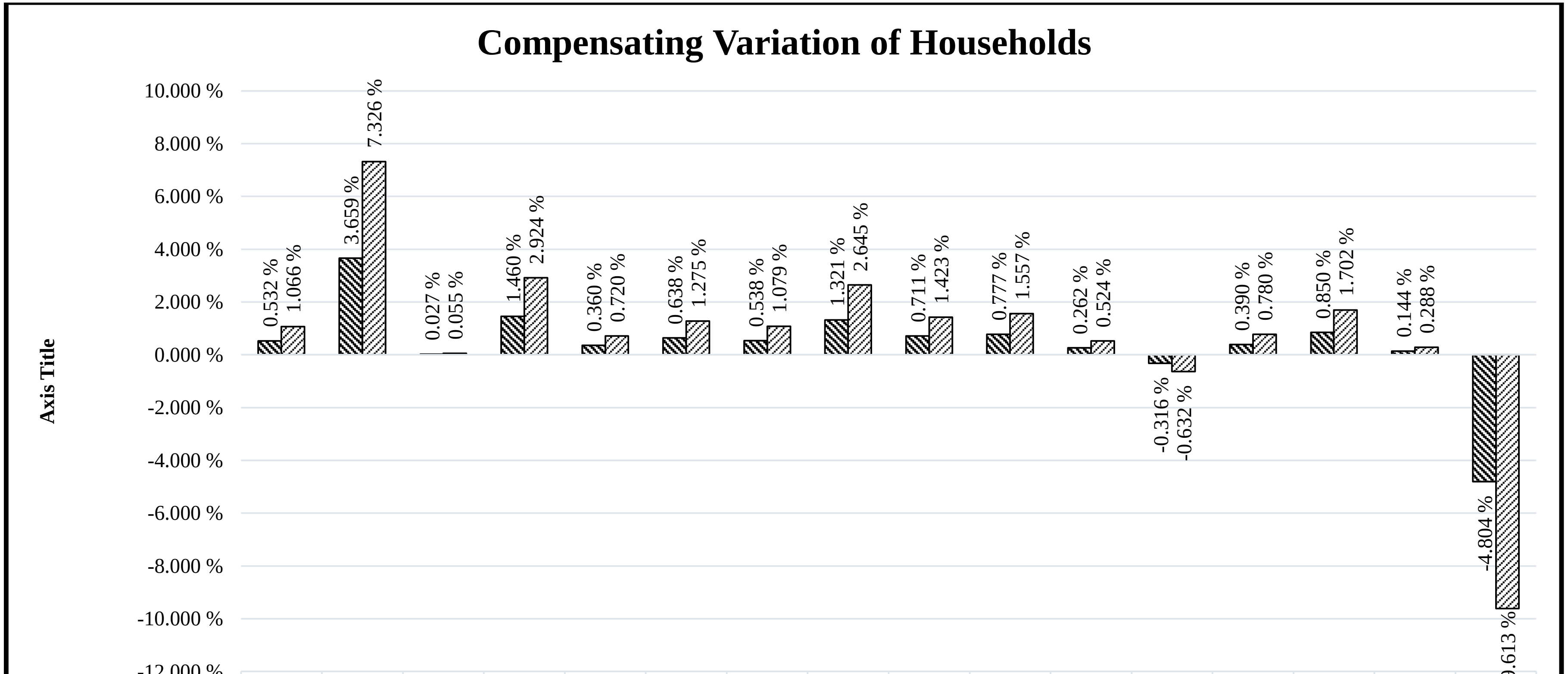
1 (H-U1) by [0.390%, 0.780%], urban quartile-2 (H-U2) by [0.850%, 1.702%], and urban quartle-3 (H-U3) by [0.144%, 0.288%] (see, Table itst-5.17, & Figure itst-5.17).

**Table *itst*-5.17: Compensating Variation of Households**

| Households | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|
| **H-RS1** | 0.532 | 1.066 |
| **H-RS234** | 3.659 | 7.326 |
| **H-RM1** | 0.027 | 0.055 |
| **H-RM234** | 1.460 | 2.924 |
| **H-RL1** | 0.360 | 0.720 |
| **H-RL234** | 0.638 | 1.275 |
| **H-RW1** | 0.538 | 1.079 |
| **H-RW234** | 1.321 | 2.645 |
| **H-RN1** | 0.711 | 1.423 |
| **H-RN2** | 0.777 | 1.557 |
| **H-RN3** | 0.262 | 0.524 |
| **H-RN4** | -0.316 | -0.632 |
| **H-U1** | 0.390 | 0.780 |
| **H-U2** | 0.850 | 1.702 |
| **H-U3** | 0.144 | 0.288 |
| **H-U4** | -4.804 | -9.613 |

*Source: Simulation Results*




| | H-RS1 | H-RS234 | H-RM1 | H-RM234 | H-RL1 | H-RL234 | H-RW1 | H-RW234 | H-RN1 | H-RN2 | H-RN3 | H-RN4 | H-U1 | H-U2 | H-U3 | H-U4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | 0.532 % | 3.659 % | 0.027 % | 1.460 % | 0.360 % | 0.638 % | 0.538 % | 1.321 % | 0.711 % | 0.777 % | 0.262 % | -0.316 % | 0.390 % | 0.850 % | 0.144 % | -4.804 % |
| Simulation-II (10%) | 1.066 % | 7.326 % | 0.055 % | 2.924 % | 0.720 % | 1.275 % | 1.079 % | 2.645 % | 1.423 % | 1.557 % | 0.524 % | -0.632 % | 0.780 % | 1.702 % | 0.288 % | -9.613 % |

**Figure *itst*-5.17: Compensating Variation of Households**

*Source: Simulation Results*

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Similarly, the compensating variation related to the whole economy also verifies favorable outcomes. In Experiment-I, the growth in CV is logged by 0.048% and in Experiment-II it is charted by 0.097% (see, Table itst-5.18, & Figure itst-5.18).

**Table *itst*-5.18: Economy-Wide Compensating Variation**

| Compensating Variation | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|
| TCV | 0.048 | 0.097 |

*Source: Simulation Results*

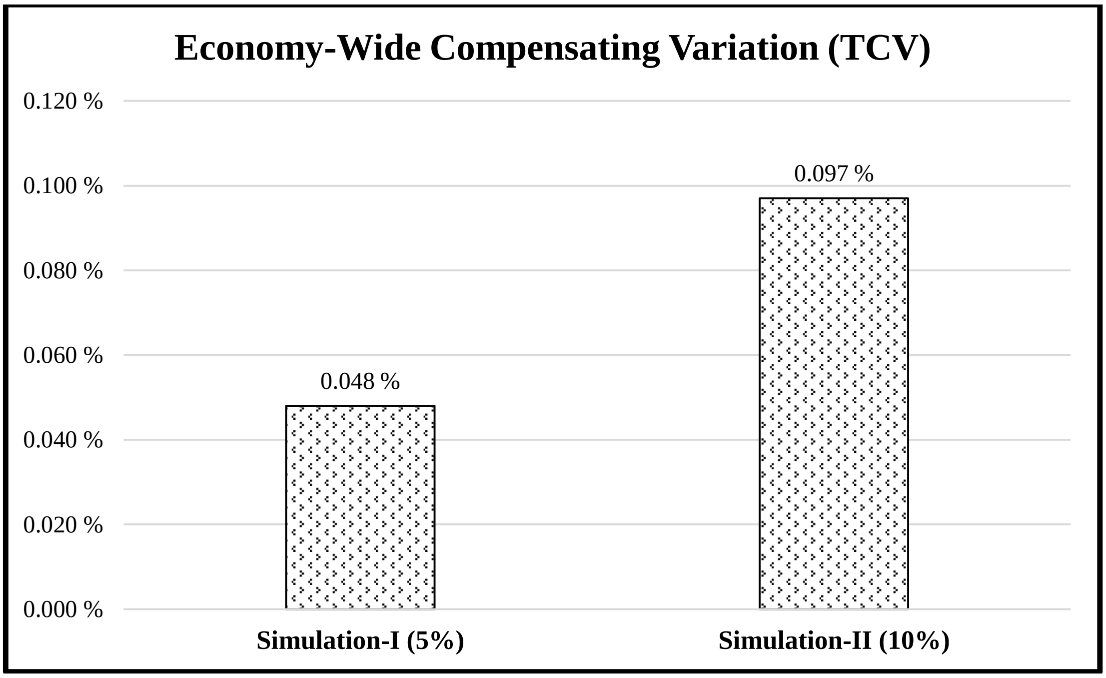


**Figure *itst*-5.18: Economy-wide Compensating Variation**

*Source: Simulation Results*

Increase in the welfare of all the households described above coincides with the increase in their average prices which in fact is due to the increase in the real income of the households. As the sim-I verified 0.221% growth and sim-II documented 0.442% for the factor land (N), while for capital it is chronicled by 0.355% and 0.711% in sim-I and sim-II respectively (see, Appendix-I, Table I.67)

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#### *5.4.3.6 Balance of Trade*

Testing policy mix of increasing income tax and decreasing sales tax at a time resulted into a decrease in export of four commodities like C-AGRI, C-MINE, C-FAN, and C-YARN in both the simulations while the increase in export of other four goods of the model, that is, C-TEXT, C-LEAT, C-MANF, and C-SER is recorded. On the other hand, the same policy express increases in all the commodities except C-LEAT. Firmly, all this confirms a negative impact on the balance of payments of the country (see, Table itst-5.19, & Table itst-5.20 and Figure itst-5.19, & Figure itst-5.20).

In both the simulations, fall in export of commodities is recorded in agricultural produce (C-AGRI) by [0.640%, 1.276%], mine (C-MINE) by [0.506%, 1.011%], food manufacturing (F-MAN) by [0.305%, 0.610%], and yarn (C-YARN) by [0.274%, 0.550%]. While, on the other hand increase in import of the same commodities are noticed in agricultural produce (C-AGRI) by [0.606%, 1.215%], mine (C-MINE) by [0.858%, 1.723%], food manufacturing (C-FMAN) by [0.400%, 0.802%], and yarn (C-YARN) by [0.377%, 0.757%]. This ultimately results into fall in receipts and increase in payments of the country (see, Table itst-5.19, & Table itst-5.20, and Figure itst-5.19, & Figure itst-5.20).

Opposite to above-noted trade export of leather (C-LEAT) is increased in both the experiments by [0.507%, 1.014%], while its import is decreased by [0.036%, 0.071%]. Export as well as import of textile (C-TEXT) and other manufacturing (C-MANF) both are increased in sim-I and sim-II, but it is observed that growth in exports is higher as compared to imports` growth, that is, export of textile by [0.688%, 1.374%], whereas its import by [0.123%, 0.248%], and export of other manufacturing by [1.060%, 2.129%], whereas its import by [0.094%, 0.188%] . All this may positively impact the balance of trade.

Contrary to this, increase in export of services (C-SER) in both the simulations is seen [0.039%, 0.077%], which is less than its import, as it is stated by [0.198%, 0.397%] in the results (see, Table itst-5.19, & Table itst-5.20, and Figure itst-5.19, & Figure itst-5.20). The overall results depict that the consumption level of the households appreciated due to the policy mix step which may indicate an increase in the welfare of the people. But the balance of trade may become adverse.

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**Table *itst*-5.19: Quantity of Exports for Commodities**

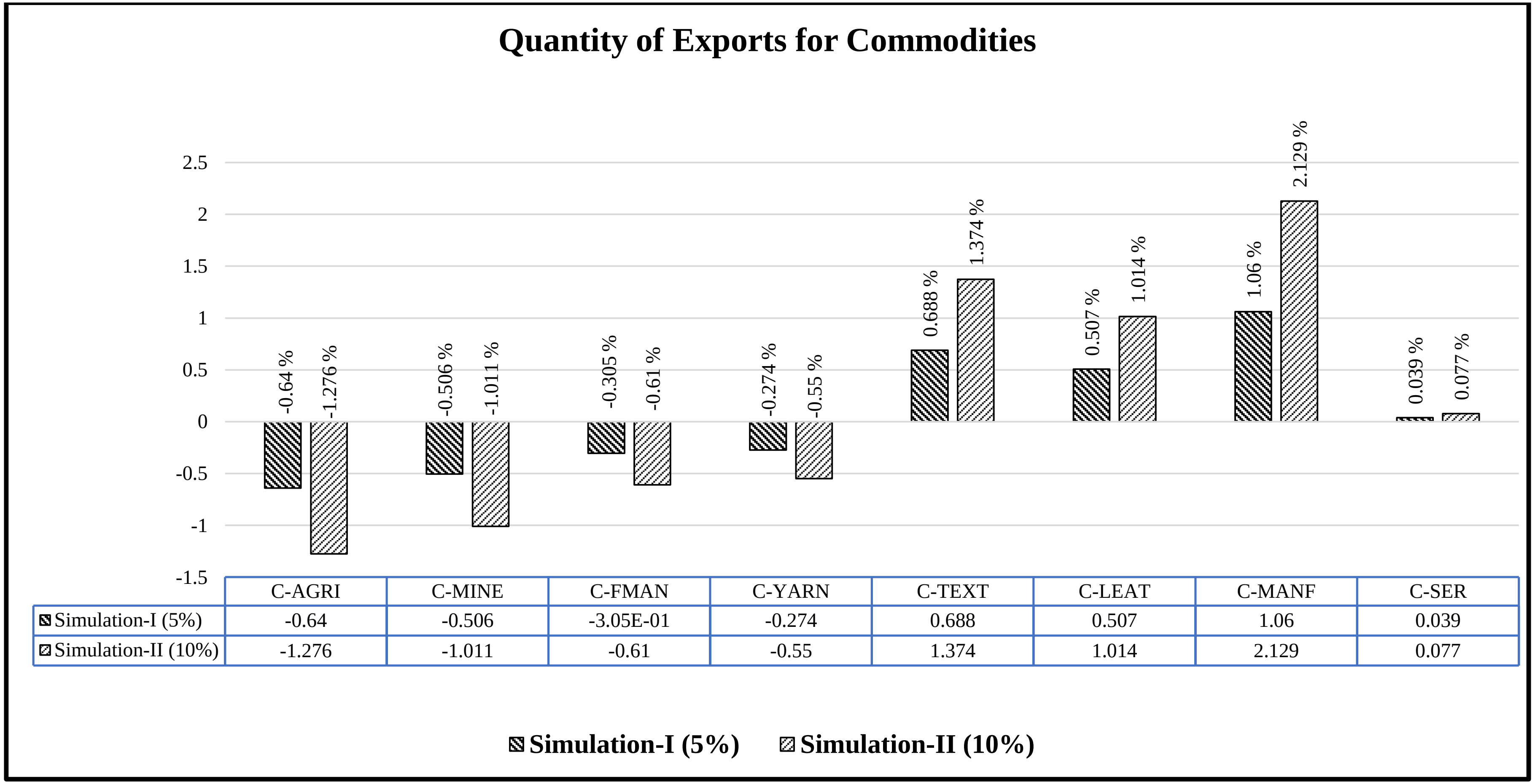
| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| C-AGRI | 82.769 | 82.240 | -0.640 | 81.713 | -1.276 |
| C-MINE | 59.731 | 59.429 | -0.506 | 59.128 | -1.011 |
| C-FMAN | 318.911 | 317.938 | -0.305 | 316.966 | -0.610 |
| C-YARN | 499.595 | 498.224 | -0.274 | 496.848 | -0.550 |
| C-TEXT | 999.712 | 1006.586 | 0.688 | 1013.451 | 1.374 |
| C-LEAT | 97.557 | 98.051 | 0.507 | 98.546 | 1.014 |
| C-MANF | 435.110 | 439.721 | 1.060 | 444.374 | 2.129 |
| C-SER | 272.101 | 272.207 | 0.039 | 272.310 | 0.077 |

*Source: Simulation Results*

**Table *itst*-5.20: Quantity of Imports for Commodities**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| C-AGRI | 160.616 | 161.589 | 0.606 | 162.567 | 1.215 |
| C-MINE | 406.733 | 410.224 | 0.858 | 413.742 | 1.723 |
| C-FMAN | 421.239 | 422.924 | 0.400 | 424.618 | 0.802 |
| C-YARN | 108.664 | 109.074 | 0.377 | 109.486 | 0.757 |
| C-TEXT | 160.194 | 160.391 | 0.123 | 160.590 | 0.248 |
| C-LEAT | 11.901 | 11.897 | -0.036 | 11.893 | -0.071 |
| C-MANF | 2340.378 | 2342.579 | 0.094 | 2344.770 | 0.188 |
| C-SER | 335.117 | 335.781 | 0.198 | 336.448 | 0.397 |

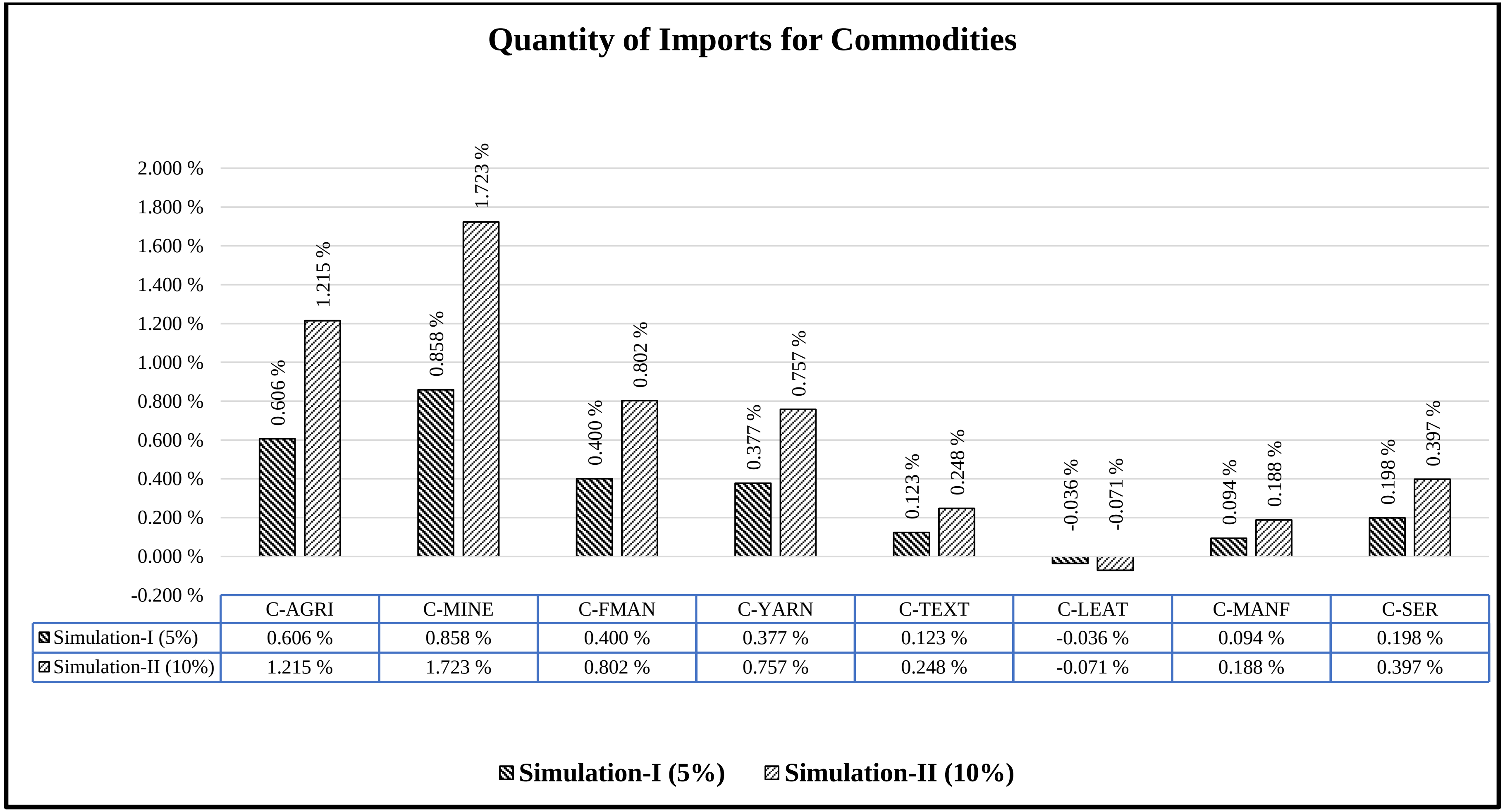
*Source: Simulation Results*




| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | -0.64 | -0.506 | -3.05E-01 | -0.274 | 0.688 | 0.507 | 1.06 | 0.039 |
| Simulation-II (10%) | -1.276 | -1.011 | -0.61 | -0.55 | 1.374 | 1.014 | 2.129 | 0.077 |

**Figure *itst-5.19*: Quantity of Exports for Commodities**

*Source: Simulation Results*




| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (5%) | 0.606 % | 0.858 % | 0.400 % | 0.377 % | 0.123 % | -0.036 % | 0.094 % | 0.198 % |
| Simulation-II (10%) | 1.215 % | 1.723 % | 0.802 % | 0.757 % | 0.248 % | -0.071 % | 0.188 % | 0.397 % |

**Figure *itst-5.20*: Quantity of Imports for Commodities**

*Source: Simulation Results*

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#### 5.4.3.7 *Indices of Inequality*

Theil indices and Hoover index are utilized to measure the inequality between the group which is the outcome of data limitation. Increasing income tax and decreasing sales tax by 5% in simulation-I Theil-T, Theil-L, and Hoover indices results register no change in income inequality that is, remained 0.313%, 0.316%, and 0.324% respectively, while Theil-S shows minor reduction that is, it reduced from 0.315% to 0.314 %. In simulation-II, Theil-T fall to 0.312%, Theil-L fall to 0.315% and Theil-S fall to 0.314%, while Hoover Index remains unchanged that is, 0.324% (see, Table itst-5.21, & Figure itst-5.21).

**Table *itst*-5.21: Indices of Inequality**

| Indices | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **Theil-T** | 0.313 | 0.313 | 0.312 |
| **Theil-L** | 0.316 | 0.316 | 0.315 |
| **Theil-S** | 0.315 | 0.314 | 0.314 |
| **Hoover** | 0.324 | 0.324 | 0.324 |

*Source: Simulation Results*

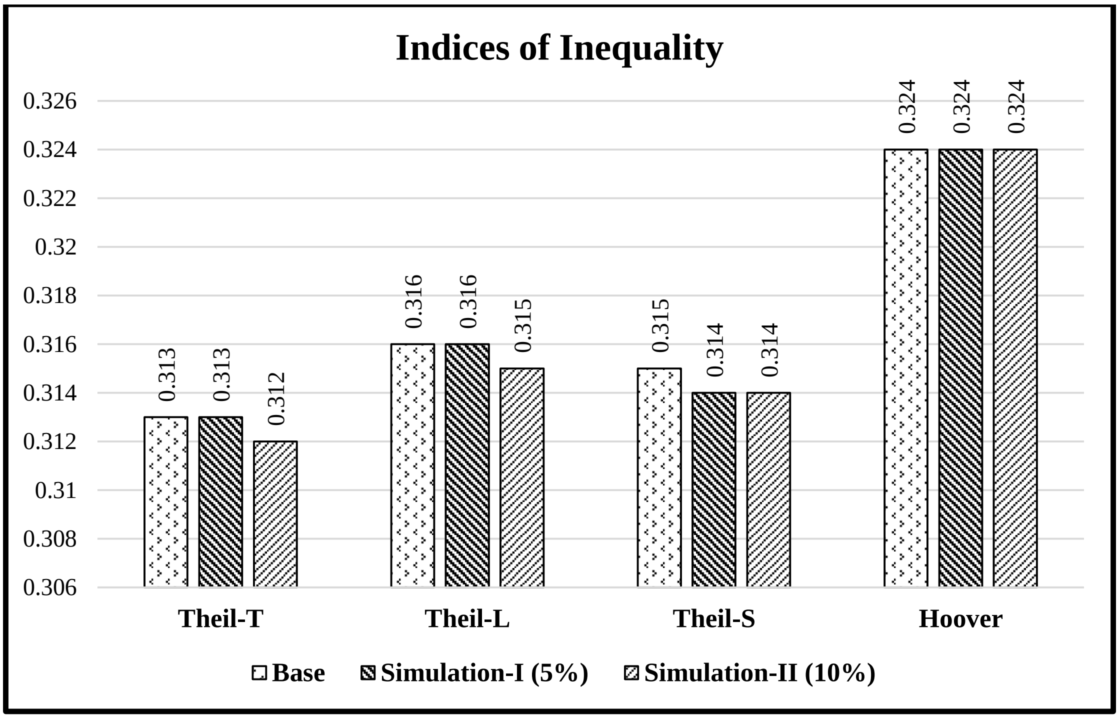


**Figure *itst*-5.21: Indices of Inequality**

*Source: Simulation Results*

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The Appendix-I demonstrates the output of the other accounts when sales tax plus income tax mix policy experiments of 5% and then 10% each are examined. The Household Consumer Price Index (see, Appendix-I, Table I.62) show a positive increase in both the simulations on various categories of the households except H-RM234, H-RN4, H-U3, and H-U4. Exchange Rate (see, Table I.64) also indicate positive result, that is, 0.040% and 0.081%.

Price of Activities (see, Table I.65) register favorable outcome in both the experiments except A-LEAT, A-MANF, and A-ENRG. The same effect is noticed on Producer Price for Commodities (see, Table I.71). It is highest on activity as well as commodity, that is, 0.248% in Simulation-I and 0.497% in Simulation-II.

In case of Domestic Price of Domestic Output, mix policy impact negatively on C-TEXT, C-LEAT, C-MANF, and C-ENRG, while it is positive on all other commodities. Import and Export Price for Commodities (Domestic Currency) also indicate positive result in the experiments made (see, Table I.68 & Table I.69). Imposition of this policy mix indicates the adverse impact on Composite Commodity Price of five types like C-AGRI, C-MINE, C-TEXT, C-MANF, and C-ENRG (see, Appendix-I, Table I.70).

Level of Activities (see, Appendix-I, Table I.72) show a positive impact on six activities except three like A-AGRI, A-FMAN, and A-YARN. The most favorable impact is recorded on A-LEAT, which is 0.322% and 0.644% in Simulation-I and Simulation-II respectively. The Table I.73 & Table I.74 express that Quantity of Domestic Output Sold Domestically as well as Quantity of Composite Goods Supplied Domestically are influenced favorably by the experiments of policy mix except for only one commodity, that is, A-AGRI. Impact on Income of Enterprise (see, Appendix-I, Table I.75) is also increasing by 0.311% and 0.623% in these experiments.

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## 5.5 Conclusion and Policy Implication

To analyze the impact of direct as well as the indirect tax on macroeconomic variables, welfare, and inequality in the economy of Pakistan, this study employed Computable General Equilibrium (CGE) Model and utilized Social Accounting Matrix (SAM) 2010-11 to examine the impact of increase in income tax and decrease in sales tax on macroeconomic indicators like GDP, Exports, Imports, Balance of Trade, National Income, Investment, Households Welfare, and Income Inequality. For this purpose, two simulations are tested for three times, that is, increasing income tax (by 5%, and by 10%), sales tax (by 5%, and by 10%) separately and then increasing both income tax and sales tax at the same time by the same rate.

The investigation shows that in general, this action positioned favorable effect on all the above-stated indicators as well as households' welfare and income inequality. Though there are few indicators which show that increasing income tax or/and decreasing sales tax effect unfavorable as well, but the favorable effect is viewed on eminent variables like GDP, consumption of households and government, BOT, welfare, reduction in inequality. So, there is a boost in different economic activities.

Keeping in view the above findings, the study recommends that an increase in direct and decrease in indirect tax process can be instigated gradually. Increase in income tax and decrease in sales tax, have a favorable impact on inequality and welfare of the household types. In spite of this, rural household groups represent a comparatively less increase over the urban. Hence, the empirical evidence supports overall this type of tax policy.

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# CHAPTER 6

# ABOLITION OF IMPORT TAX AND ITS IMPLICATIONS ON MACROECONOMIC VARIABLES AND HOUSEHOLDS` WELFARE/ INEQUALITY

## 6.1 Introduction

Import tax (tariff) influences the trade, production, consumption, income, and welfare of the trading countries. Tariffs generate a wedge among domestic and international prices, impelling demand towards the substitutes produced domestically. Empirical evidence from the latest literature reveals that potential benefits from dismantling the tariff blocks are significant (Dessus et. al.,1999; Cernat et. al.,2002; Francois et. al., 2003; Laird et. al.,2003). OCED (2003) presents welfare gains overview of existing estimates associated with tariff reduction.

Tariff abolition or reduction depends upon the economy`s structure and reform`s extent. Thus, it is exceptionally crucial to consider the structure of the economy while investigating the impacts of import tax abolition or reduction. In recent eon, abolition or reduction in import tax impacts on major macroeconomic variables like GDP, Exports, Imports, National Income, Investment (in public as well as in the private sector). Moreover, Households welfare and Inequality have become the issue of deep debate in the present era. The effects of tariff abolition or reduction are not easy to find. It generates a web of direct and indirect changes that makes it awfully arduous to track down the impact on various groups of the households.

It is necessary for underdeveloped countries like Pakistan to ardently involve in multilateral tariff liberalization. It is because they would attain substantial advantages from their particular tariff policy. Moreover, by adopting these measures, they are more likely to achieve appropriate entry in the markets of industrial countries.

It is mandatory to owe the tedious errand of making a social accounting matrix (SAM), which is based on real and authentic data. It is to specify a CGE Model that is based on this constructed SAM. Therefore, the purpose of this chapter is to execute an experiment of a simulation operating the Computable General Equilibrium Model of Pakistan (CGEM-Pk) designed in the Chapter # 2 and the database sketched in the Chapter # 3 to annex the effect of tax reforms (tariff abolition or reduction).

The main aim of this simulation experiment is to pinpoint and enumerate the influences of tariff abolition on few selected macroeconomic variables (as mentioned above) of Pakistan`s economy in general and in particular, the household's welfare and inequality. Accordingly, a simulation is accomplished to measure the effects of abolition or reduction of import tax on some selected Pakistan`s macroeconomic variables, households' welfare, and income inequality.

This chapter is designed in the manner that section 6.2 expounds policy experiment, section 6.3 presents the model calibration of parameters and trade elasticities values, section 6.4 describes model closure, section 6.5 offers policy experiments` results (that is, the impact of tariff abolition or reduction on macroeconomic variables, households' welfare, and inequality).

## 6.2 Policy Experiments

Pakistan`s policymakers are intensely concerned with the abolition or reduction process in tariffs on imports and its impact on country`s GDP, exports, imports, national income, public and private sectors` investment, households` welfare and inequality (explained in the chapter # 1). Pakistan experienced fanatic move towards a regime in which trade policy was more liberalized and export-oriented (mentioned in section 1.5, chapter # 1). In this policy, the main emphasis was given to reduce tariff rates and elimination of export duty on commodities and tariffication of quantitative import restrictions.

In Pakistan, the general trend of poverty among households waned towards the end of 2nd last decade of the last century that is, the 1980s. In rural regions, it has been growing since the mid of the mentioned decade while in urban zones it seems on increasing in the mid of very next decade that is, 1995. Pakistan`s rural population comprises 63.62% in 2017, according to the Pakistan Bureau of Statistics. The present poverty incidence induces intense concern. Therefore, the successive governments incessantly maneuver the plans to reduce poverty and inequality. Moreover, it is also observed that gulf

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between the haves and have-nots is widened in the same decades, that ultimately resulted in an increase in relative poverty, inequality and exacerbating macroeconomic variables.

The observation above recommend that tariff abolition or reduction could be regarded as one of the core components not only to make more severe the incidence of poverty, households' welfare as well as inequality in the economy of Pakistan but also to deteriorate GDP, National Income, Investment and other macro-level variables that elicit economic growth and development. Conversely, the experts at international organizations like International Monetary Fund and World Bank support more to the trade liberalization policy and market-oriented trade reforms to alleviate poverty, inequality and to ameliorate household's welfare and all macroeconomic variables of the country. As, any experimental inquiry on nexus concerning trade reforms and income inequality, particularly in Pakistan, is not found in literature, therefore, it is arduous to compose any assessment on above-discussed hypotheses. The empirical inquiry will cast further light on this concern.

To examine the relationship between fiscal tools and macro-level variables as well as the household's welfare and inequality, the CGE framework is an ideal apparatus (discussed in Chapter # 4). This current chapter emphasis on said demeanor by means of operating a counterfactual simulation experiment. Considering that tariff reforms are deemed as one of the incredibly adopted policy tools in many countries, we focused on this instrument and made few simulation experiments to see their implications on macro-level variables, household welfare, and inequality as well. In the experiment of complete abolition of the tariff, we allowed the government budget to change in response to a decrease in revenue compensating through borrowing to cover revenue/ expenditure implicitly.

## 6.3 Calibration of Parameters and Trade Elasticities Values

A benchmark calibration technique (Mansur and Whalley, 1984) is esteemed in this analysis, which is based on the base year data set (SAM 2010-11) for the economy of Pakistan, developed by Dorosh et al., (2015). This data set is micro-consistent and complies with all the conditions of equilibrium and attributes of CGEM-Pk. Calibration of parameters in this model like shares in returns to factors by the households, input-

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output coefficients, and Cobb-Douglas functions are principally exactly from benchmark data. The functions CES, as well as CET, are seized from prevailing literature (Section 3.6, Chapter # 3). Given the functional forms, other coefficients are implicit. Consequently, the model imitates preliminary time in the lack of any shock. For reckonings of the entire model, the software acknowledged as Generalized Algebraic Modelling System (GAMS), is operated.

## 6.4 Model Closures

In an economic model, the researcher has to make a choice between the endogenous variables, that is, what is to be established within the model and the exogenous variables, that is, what is to be counted outside the model. An economic model, in numerical form or otherwise, is merely a technique of interpreting endogenous variables in terms of exogenous variables. Where the investigator selects to draw the line between these variables and precisely the variables, he opts to be exogenous depends on the model observance and the objective for which the simulations are to be utilized. The choice that the analyst constitute is termed as the model closure. At this point, we will discuss some of the problems enveloping closure for CGE Models.

In the static CGE Models, we are mostly concerned with the components of factor market closure, as well as with macroeconomic variables concerning to the investment (Public and Private) and government expenditure (Gilbert and Tower, 2012). Variations in capital market closure are generally used to signify various adjustment time frames.

### 6.4.1 Factor Market

Factor market equilibrium is possible under three options:

Under the first option, it is assumed that factors are fully employed, that is, the supply of each factor is fixed. Factor rewards spontaneously adjust because the aggregate of the quantity demanded factors from all the activities equals quantity supplied. Activity-specific reward to the factors paid by each activity is equal to the economy-wide reward multiplied by an activity specific reward distortion. Moreover, this distortion is fixed.

Under the second option, it is assumed that factors are not fully employed, that is, unemployment is allowed. This ensures that the supply of each factor can be adjusted

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according to the quantity demanded. In this option, the nominal reward is kept as fixed. At this given reward each activity is free to employ the factor as much as its demand. Whereas, quantity supplied of each factor reflects its quantity demanded.

Under the third option, it is assumed that the factor market is segmented. Additionally, each activity is compelled to employ the observed quantities of the base year. All this indicates that factors are activity specific. Hence, not mobile amongst the activities. In this state, the activity specific demand for factors as well as economy-wide rewards terms is inelastic. Whereas, activity specific reward distortion and factor supply terms are elastic. This option is valuable if quality differences among factors in various activities are significant.

In the CGE Models labor is regarded as the mobile factor (Dixon et al., 1982), whereas ORANI Model of Australia considers it as sector specific. Furthermore, all the model suppose that supply of labor is given and there is full employment in the labor market, whereas this phenomenon is possible only through equality between the demand for and supply of the labor at equilibrium wage rate. To investigate the issues related to labor market like rural-urban migration, some models assume unemployment (Clarete and Whalley, 1988) and similarly the problems like the elimination of minimum wage rate (Devarajan et al., 1995-b).

### 6.4.2 Current Account Balance for Rest of the World

External balance management is feasible under two options:

- Under the first option, we assume that foreign savings/ borrowings are constant and allowing the real rate of exchange to regulate.
- Under the second option, we assume that the real exchange rate is fixed and allowing foreign savings to regulate.

Keeping in view the present real time policy of Pakistan economy, we choose the first option for CGEM-Pk. To keep other elements of external balance fixed in the model, the balance of trade (BOT) is taken constantly. These elements of external balance embrace transfers among domestic institutions and the rest of the world. For example, the real exchange rate will depreciate due to falling in external savings, as result exports will increase while imports will decrease till restoring the prime level of balance of

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trade. Exports result in receipts from the rest of the world while imports form expenditure. Note that all transfers from/ to rest of the world are fixed in term of foreign currency. Foreign savings equals foreign receipt minus foreign payments.

### 6.4.3 Savings and Investment Balance

Savings and investment balance are possible under the following options:

- Under the first option, we assume that the economy is an investment driven. In this sort, a fixed investment level is given and the saving rate is to regulate. That is, the very objective is to generate adequate savings equivalent to investment cost, the saving rates of some selected non-government institutions are attuned till attaining of equilibrium.

- Under the second option, we assume that the economy is again investment driven. In this sort, to achieve saving-investment balance savings rates are multiplied by a flexible scaler across all non-government institutions.

- Under the third option, we assume that the economy is saving the drive. In this sort, saving rates are fixed for all non-government institutions. To achieve saving-investment balance, a flexible scaler is multiplied by the quantity of product produced. Finally, investment becomes equal to the novel savings level.

In CGEM-Pk, we selected the third option of saving-investment closure, because it is in line with the current real time policy of Pakistan economy.

## 6.5 Results of the Simulations` Experiments

Three tests are conducted to estimate the effect of reducing or even abolition of tariff on different macroeconomic indicators like GDP, exports, imports, national income, public and private investment, inequality/ welfare, etc., of the economy of Pakistan. The sectoral and macro results of reduction in tariff in simulation-I by 50%, in simulation-II by 75%, and then the abolition of all tariff, that is, by 100% in simulation-III, experiments are presented here (see, Appendix-D, Table D.14). These tables

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indicate that C-MANF and C-TEXT hold the largest share in imports and exports of Pakistan respectively.

Fall in imports` prices influences all other prices in the economy due to interlinkages. Thus, domestic prices fall leads not only to a switch to production of exports rather at the same time to imported goods also. It causes a change in production structure and hence a change in the income of the institutions. Export-oriented sectors are gaining sectors. They absorb more of the factors, used intensively in their output. On the other hand, the sectors whose production is being substituted by imports are expected to decrease their output, and thereby affect negatively the factors they use intensively. Not only the factors, rather the owners of such productions too, face the same effect. So, poverty ultimately results in, because of the combination of this income and induced price effects. It is very crucial to realize the effect on prices of food especially because the low-income group of the households generally allocate a very huge share of their income to food only.

### 6.5.1 Effects on Macro Level (*National Income Accounts*)

This section presents the estimated macro level inferences of the reduction or total elimination of import tax (tariff) on the economy`s macro indicators. The possible implications on nominal GDP data (national income accounts) are presented in Table tf-6.1, & Figure tf-6.1. GDP of Pakistan at fixed cost has revealed growth of 1.259% in sim-I, 0.610% in sim-II and 2.696% in sim-III. This GDP growth assisted investment expansion, advanced activities level, augment incomes of the households, and hence boost the savings. Investment is grown by 2.350%, 1.171%, and 4.683% in all the 3-experiments of reducing tariffs by 50%, 75%, and 100% respectively. This intensification in investment is due to acceleration in institutional earnings and the resulting improvement in savings.

Public expenditure on a day to day requirements are lifted by 0.282% in experiment-I, 0.136% in -II, and 0.607% in -III, while private consumption induces to increase by 0.686%, 0.333%, and 1.458% correspondingly. This boost in consumers spending is because of the rise in institutional incomes attached with a decrease in consumers goods prices as well as imports prices in term of domestic currency as its value is appreciated (see, Table tf-6.1, & Figure tf-6.1).

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Import and export both grow but the growth rate of export appears faster than imports rate. The exports growth rate in the experiment is 8.809%, 4.198%, and 19.516% respectively in all the three tests of reduction in tariffs by 50%, 75%, and 100%. This growth is because of advancement in the level of economic activity, increase in production and rise in GDP. Import is increased in three experiments by 6.850%, 3.271%, and 15.111% respectively. This tendency in imports is because the import`s price is correlated with the appreciation of domestic currency as well as a rise in the reserves of foreign currency because of increase in exports (see, Table tf-6.1, & Figure tf-6.1).

### 6.5.2 The Quantity of Domestic Output of Commodities

The experiment reflects that domestic production of numerous commodities has increasing propensity excluding mine (C-MINE), food manufacturing (C-FMINE), and other manufacturing (C-MANF). Textile products (C-TEXT) output rises at a higher rate as compared to the increase in rest of the outputs. It is 13.322% in sim-I, 6.207% in sim-II, and 30.803% in sim-III.

The output of those commodities is grown whose producer price is increased and vice-versa (see, Table tf-6.2, & Figure tf-6.2). Fall in the output of other manufacturing (C-MANF) is noticed at the faster rate, that is, 2.318%, 1.130%, and 4.891% in I, II, and III simulations respectively.

**Table *tf*-6.1: Nominal GDP Data: (National Income Accounts)**

| Variable | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **GDPFC** | 15255.095 | 15447.182 | 1.259 | 15348.075 | 0.610 | 15666.338 | 2.696 |
| **GDPMP1** | 16320.344 | 16457.609 | 0.841 | 16387.394 | 0.411 | 16607.844 | 1.762 |
| **GDPMP2** | 16370.419 | 16458.970 | 0.541 | 16413.965 | 0.266 | 16552.792 | 1.114 |
| **GOVCON** | 1711.912 | 1716.733 | 0.282 | 1714.239 | 0.136 | 1722.302 | 0.607 |
| **INVEST** | 1954.580 | 2000.510 | 2.350 | 1977.468 | 1.171 | 2046.103 | 4.683 |
| **EXP** | 2778.963 | 3023.765 | 8.809 | 2895.613 | 4.198 | 3321.297 | 19.516 |
| **IMP** | 3667.333 | 3918.542 | 6.850 | 3787.295 | 3.271 | 4221.505 | 15.111 |
| **NITAX** | 1115.324 | 1011.789 | -9.283 | 1065.889 | -4.432 | 886.454 | -20.520 |
| **PRVCON** | 13542.222 | 13635.143 | 0.686 | 13587.369 | 0.333 | 13739.647 | 1.458 |

*Source: Simulations Results*

**Table *tf*-6.2: Quantity of Domestic Output of Commodities**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 7047.148 | 7048.996 | 0.026 | 7048.407 | 0.018 | 7047.736 | 0.008 |
| **C-MINE** | 730.595 | 721.454 | -1.251 | 726.389 | -0.576 | 709.166 | -2.933 |
| **C-FMAN** | 5073.711 | 5009.376 | -1.268 | 5043.422 | -0.597 | 4928.209 | -2.868 |
| **C-YARN** | 2480.102 | 2561.381 | 3.277 | 2519.350 | 1.583 | 2654.823 | 7.045 |
| **C-TEXT** | 1757.475 | 1991.603 | 13.322 | 1866.570 | 6.207 | 2298.837 | 30.803 |
| **C-LEAT** | 362.897 | 380.879 | 4.955 | 371.654 | 2.413 | 400.356 | 10.322 |
| **C-MANF** | 4439.234 | 4336.311 | -2.318 | 4389.054 | -1.130 | 4222.089 | -4.891 |
| **C-ENRG** | 1956.650 | 1985.588 | 1.479 | 1970.274 | 0.696 | 2022.179 | 3.349 |
| **C-SER** | 9337.056 | 9427.198 | 0.965 | 9380.853 | 0.469 | 9528.273 | 2.048 |

*Source: Simulations Results*

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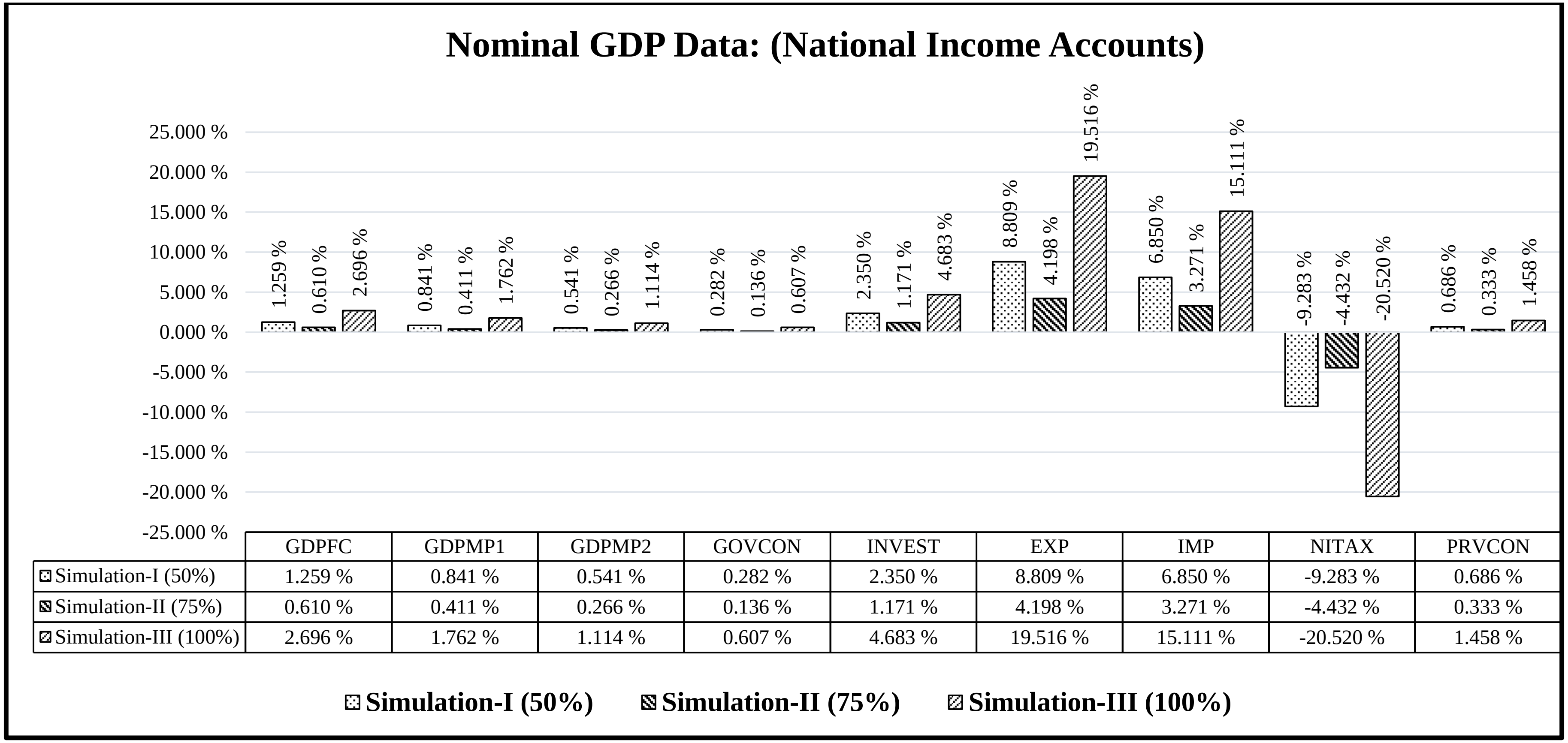
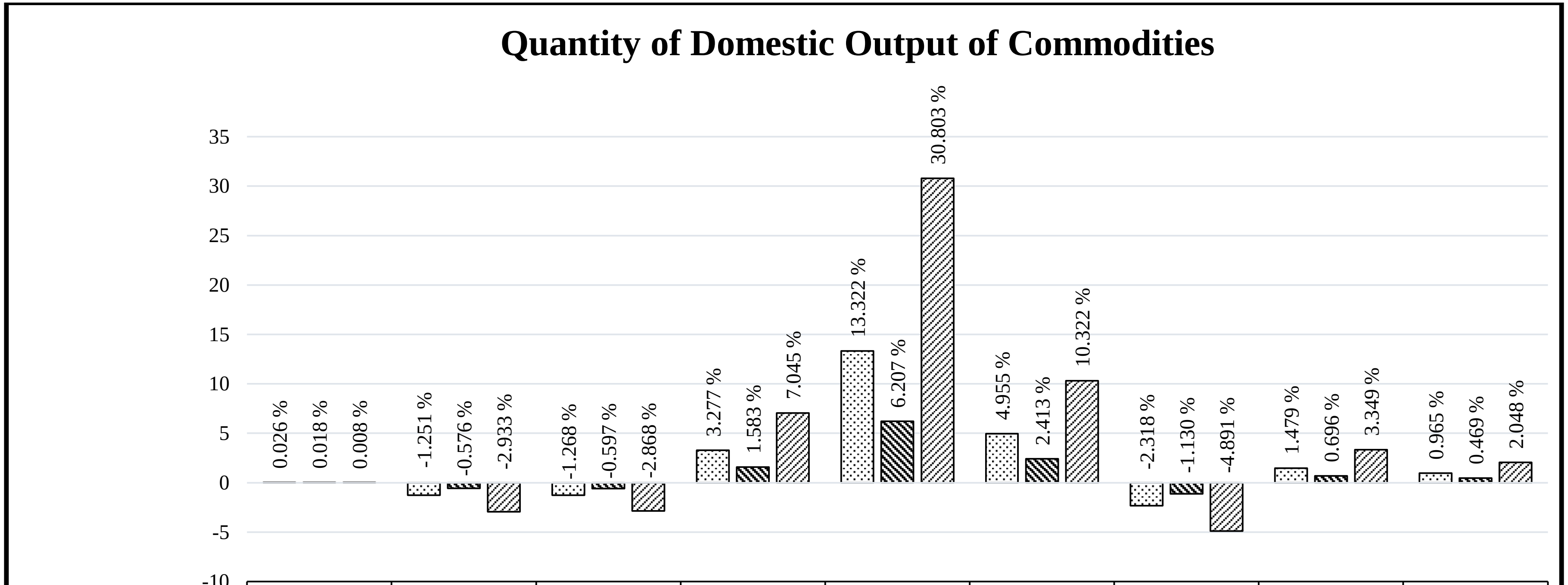



| | GDPFC | GDPMP1 | GDPMP2 | GOVCON | INVEST | EXP | IMP | NITAX | PRVCON |
|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (50%) | 1.259 % | 0.841 % | 0.541 % | 0.282 % | 2.350 % | 8.809 % | 6.850 % | -9.283 % | 0.686 % |
| Simulation-II (75%) | 0.610 % | 0.411 % | 0.266 % | 0.136 % | 1.171 % | 4.198 % | 3.271 % | -4.432 % | 0.333 % |
| Simulation-III (100%) | 2.696 % | 1.762 % | 1.114 % | 0.607 % | 4.683 % | 19.516 % | 15.111 % | -20.520 % | 1.458 % |

**Figure *tf-6.1*: Nominal GDP Data (National Income Accounts)**

*Source: Simulation Result*




| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-ENRG | C-SER |
|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (50%) | 0.026 | -1.251 | -1.268 | 3.277 | 13.322 | 4.955 | -2.318 | 1.479 | 0.965 |
| Simulation-II (75%) | 0.018 | -0.576 | -0.597 | 1.583 | 6.207 | 2.413 | -1.13 | 0.696 | 0.469 |
| Simulation-III (100%) | 0.008 | -2.933 | -2.868 | 7.045 | 30.803 | 10.322 | -4.891 | 3.349 | 2.048 |

**Simulation-I (50%) Simulation-II (75%) Simulation-III (100%)**

**Figure *tf-6.2*: Quantity of Domestic Output of Commodities**

*Source: Simulation Results*

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### 6.5.3 Income of Households

Incomes of all the sixteen types of households as categorized in this model are revealing positive trend as a result of all the three simulations that is, reduction in tariff rate by 50%, 75%, and 100%, but resultantly the rate of increase in income is not same, rather it varies from household to household. The rate of increase in income of the rural farm workers (H-RW1 & H-RW234) sectors is rapid as compared to the rate of increase in income of all other categories of the households of the model. It is recorded as 1.202% in simulation-1 (50%), 0.581% in simulation-II (75%), and 2.582% in simulation-III (100%) for H-RW1 type of households while for H-RW234 type of households in simulations-I, II, and III, results are recorded as 1.142%, 0.553%, and 2.448% respectively. The second highest growth rate of increase in income is enjoyed by the rural small farmers (H-RS1 & H-RS234). Contrarily, the lowest but positive benefit of reduction in import tax seems to be taken by urban category-4 (H-U4), that is, 0.402%, 0.195%, and 0.853% respectively from I, II, and III sims (see, Appendix-J, Table J.92).

### 6.5.4 Average Price of Factors

Labor, land, and capital are key factors used in the production process. Employing the three simulations, the results show increasing trends. The rate of increase in the price of capital is higher in all the tests as compared to land. As in simulation-I, it is 1.183%, in simulation-II, it is 0.573%, and in simulation-III, it is 2.532%. while, in case of land, the results are low in are the three experiments, that is, 0.886%, 0.436%, and 1.829% in I, II, and III simulations respectively (see, Appendix-J, Table J.83).

### 6.5.5 The welfare of the Households

Due to a reduction in tariff rate, the output indicates an increase in the welfare of almost all the types of households in all the three experiments. The households with high incomes (see, Appendix-J, Table J.92) have raised their restrictions to spend more on consumer goods (see, Appendix-J, Table J.79). Resultantly, there occurs a prominent increase in the utility of the households in all the tests (see, Appendix-J, Table J.93). Households` welfare is increased, that can be judged by competing factors prices with the commodities` consumer prices (see, Appendix-J, Table J.78).

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The outcomes demonstrate that factors` average prices rose at a high rate as compared to the commodities` consumer prices. Accordingly, the households` real income is augmented, therefore the welfare of the households boosted upward.

Households` Compensating variation (see, Table tf-6.3, and Figure tf-6.3) indicates that all the sixteen types of households are enjoying more utility as and when the tariff rate is reduced. Especially, H-U4 type of households is relatively deriving high welfare level worth 20.144% in simulation-I, 9.800% in simulation-II, and 42.675% in simulation-III. Similarly, following H-U4, H-RS234 type is with next high welfare level after tariff abolition. Considering, households consumer price index (see, Appendix-J, Table J.78) households like H-U4, H-RM234, and H-RN4 are deriving more utility due to the reason that CPI is not positive.

**Table *tf*-6.3: Compensating Variation of Households**

| Households | Simulation-I [50%] | Simulation-II [75%] | Simulation-III [100%] |
|---|---|---|---|
| **H-RS1** | 2.187 | 1.063 | 4.645 |
| **H-RS234** | 16.898 | 8.228 | 35.740 |
| **H-RM1** | 0.117 | 0.057 | 0.246 |
| **H-RM234** | 6.520 | 3.177 | 13.762 |
| **H-RL1** | 1.522 | 0.741 | 3.222 |
| **H-RL234** | 7.108 | 3.461 | 15.030 |
| **H-RW1** | 2.273 | 1.097 | 4.891 |
| **H-RW234** | 6.460 | 3.124 | 13.858 |
| **H-RN1** | 3.711 | 1.793 | 7.981 |
| **H-RN2** | 4.199 | 2.033 | 8.986 |
| **H-RN3** | 4.277 | 2.078 | 9.086 |
| **H-RN4** | 4.810 | 2.358 | 10.029 |
| **H-U1** | 1.895 | 0.915 | 4.079 |
| **H-U2** | 4.170 | 2.014 | 8.975 |
| **H-U3** | 6.954 | 3.362 | 14.920 |
| **H-U4** | 20.144 | 9.800 | 42.675 |

*Source: Simulations Results*

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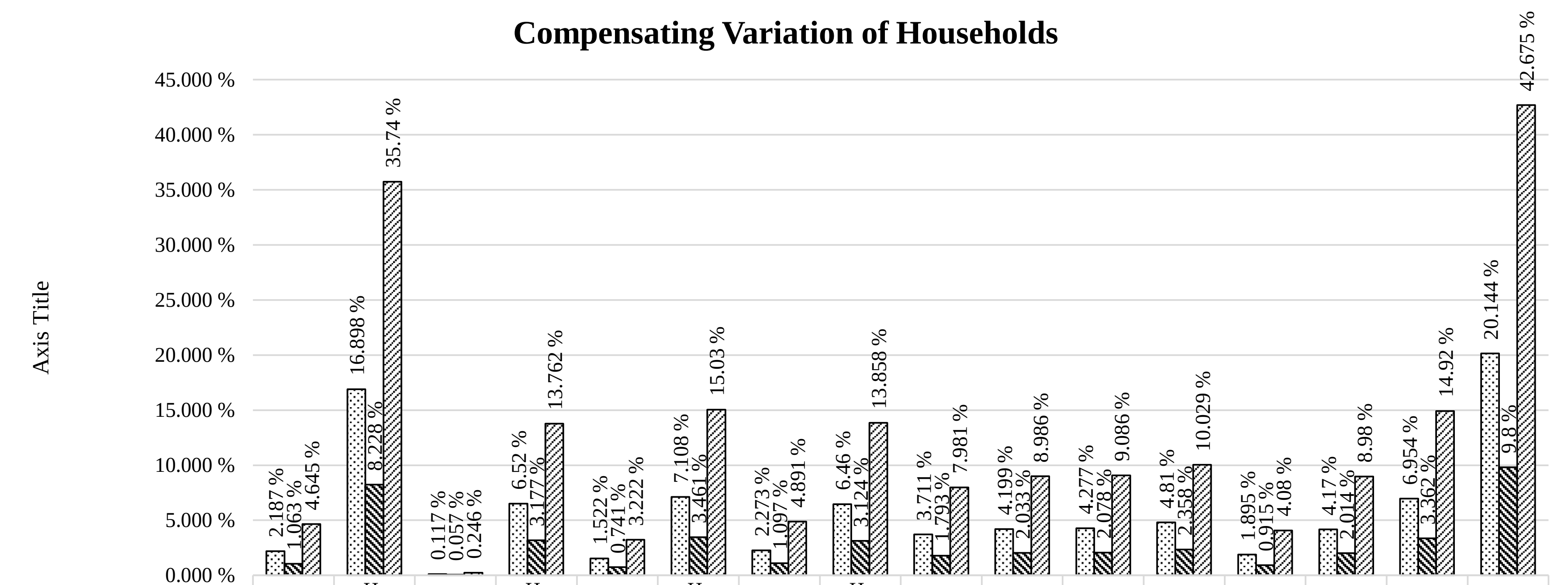


| | H-RS1 | H-RS234 | H-RM1 | H-RM234 | H-RL1 | H-RL234 | H-RW1 | H-RW234 | H-RN1 | H-RN2 | H-RN3 | H-RN4 | H-U1 | H-U2 | H-U3 | H-U4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Simulation-I (50%) | 2.187 % | 16.898 % | 0.117 % | 6.52 % | 1.522 % | 7.108 % | 2.273 % | 6.46 % | 3.711 % | 4.199 % | 4.277 % | 4.81 % | 1.895 % | 4.17 % | 6.954 % | 20.144 % |
| Simulation-II (75%) | 1.063 % | 8.228 % | 0.057 % | 3.177 % | 0.741 % | 3.461 % | 1.097 % | 3.124 % | 1.793 % | 2.033 % | 2.078 % | 2.358 % | 0.915 % | 2.014 % | 3.362 % | 9.8 % |
| Simulation-III (100%) | 4.645 % | 35.74 % | 0.246 % | 13.762 % | 3.222 % | 15.03 % | 4.891 % | 13.858 % | 7.981 % | 8.986 % | 9.086 % | 10.029 % | 4.08 % | 8.98 % | 14.92 % | 42.675 % |

**Figure *tf-6.3*: Compensating Variation of Households**

*Source: Simulation Result*

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Economy-wide compensating variation is also confirming that in overall the whole economy`s welfare has increased due to tariff abolition. As in the first simulation, when tariff reduction was tested by 50%, welfare increased by 0.689%. In the second experiment, when it was exercised by 75%, resultant rise in welfare appeared by 0.335%. Lastly, at 100% abolition of the tariff, welfare increases to 1.463% (see, **Error! Not a valid bookmark self-reference.**, & Figure tf-6.4). All this shows that in free trade regime, households are better off.

**Table *tf*-6.4: Economy-Wide Compensating Variation**

| Compensating Variation | Simulation-I [50%] | Simulation-II [75%] | Simulation-III [100%] |
|---|---|---|---|
| **TCV** | 0.689 | 0.335 | 1.463 |

*Source: Simulations Results*

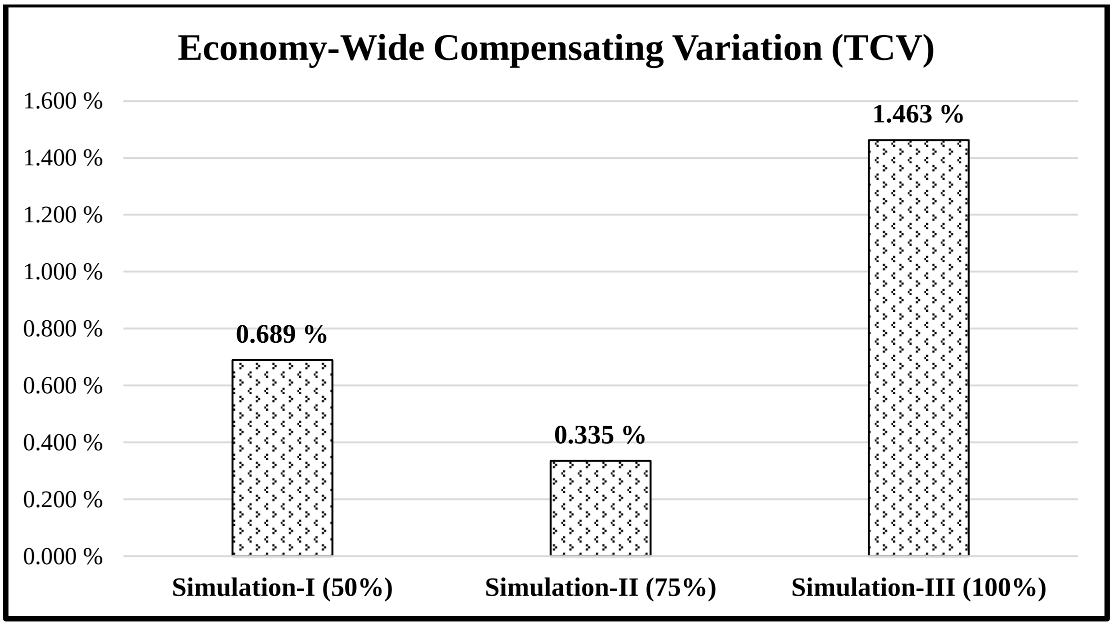


**Figure *tf-6.4*: Economy-wide Compensating Variations**

*Source: Simulation Results*

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### 6.5.6 The Balance of Trade (BOT)

Abolition in tariff also brings improvement in the position of trade balance, as exports of all commodities except C-MINE and C-FMAN (in all the three experiments) and minorly C-AGRI and C-MANF when the tariff is reduced only by 100%, are indicating an obvious increase (see, Table tf-6.5, & Figure tf-6.5). Similarly, there seems a positive trend in imports of all commodities except C-MINE and C-SER in all the three tests (see, Table tf-6.6, & Figure tf-6.6).

The result indicates a remarkable increase in the consumption of exports as well as imports. Export prices of all commodities have a trend of increase at a constant rate while import prices do not have the same rate. Rather it varies. Prices of all the commodities have declined except C-MINE and C-SER, but this decline is varying. The decline in prices in simulation-I is more than in simulation-II but less than simulation-III (see, Appendix-J, Table J.84). Obviously, this indicates that the abolition of tariff improves the balance of trade.

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**Table *tf*-6.5: Quantity of Exports for Commodities**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 82.769 | 82.881 | 0.135 | 82.901 | 0.159 | 82.327 | -0.535 |
| **C-MINE** | 59.731 | 58.765 | -1.617 | 59.323 | -0.684 | 57.162 | -4.301 |
| **C-FMAN** | 318.911 | 316.848 | -0.647 | 318.191 | -0.226 | 312.053 | -2.150 |
| **C-YARN** | 499.595 | 521.520 | 4.389 | 510.555 | 2.194 | 543.240 | 8.736 |
| **C-TEXT** | 999.712 | 1189.531 | 18.987 | 1088.189 | 8.850 | 1438.827 | 43.924 |
| **C-LEAT** | 97.557 | 108.192 | 10.901 | 102.703 | 5.275 | 120.134 | 23.143 |
| **C-MANF** | 435.110 | 435.661 | 0.127 | 435.708 | 0.137 | 433.330 | -0.409 |
| **C-SER** | 272.101 | 277.158 | 1.858 | 274.682 | 0.948 | 281.720 | 3.535 |

*Source: Simulations Results*

**Table *tf*-6.6: Quantity of Imports for Commodities**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 160.616 | 171.726 | 6.917 | 165.915 | 3.299 | 185.177 | 15.291 |
| **C-MINE** | 406.733 | 403.424 | -0.814 | 404.916 | -0.447 | 401.524 | -1.281 |
| **C-FMAN** | 421.239 | 488.912 | 16.065 | 453.176 | 7.582 | 574.252 | 36.324 |
| **C-YARN** | 108.664 | 121.144 | 11.485 | 114.530 | 5.399 | 137.159 | 26.223 |
| **C-TEXT** | 160.194 | 187.533 | 17.066 | 172.925 | 7.948 | 224.005 | 39.834 |
| **C-LEAT** | 11.901 | 16.153 | 35.725 | 13.802 | 15.969 | 22.821 | 91.753 |
| **C-MANF** | 2340.378 | 2468.153 | 5.460 | 2402.055 | 2.635 | 2615.499 | 11.755 |
| **C-SER** | 335.117 | 334.139 | -0.292 | 334.417 | -0.209 | 335.011 | -0.032 |

*Source: Simulations Results*

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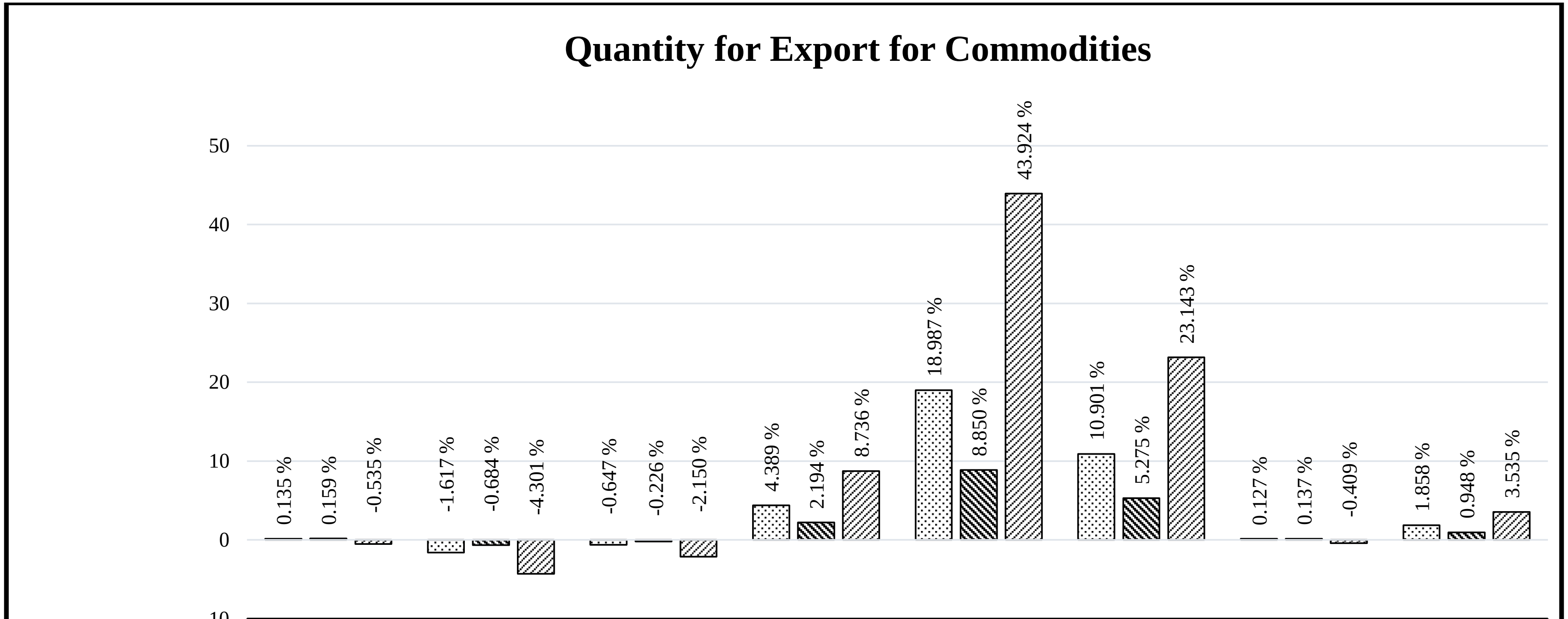


| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (50%) | 0.135 | -1.617 | -0.647 | 4.389 | 18.987 | 10.901 | 0.127 | 1.858 |
| Simulation-II (75%) | 0.159 | -0.684 | -0.226 | 2.194 | 8.85 | 5.275 | 0.137 | 0.948 |
| Simulation-III (100%) | -0.535 | -4.301 | -2.15 | 8.736 | 43.924 | 23.143 | -0.409 | 3.535 |

**Figure *tf-6.5*: Quantity of Exports for Commodities**

*Source: Simulation Results*

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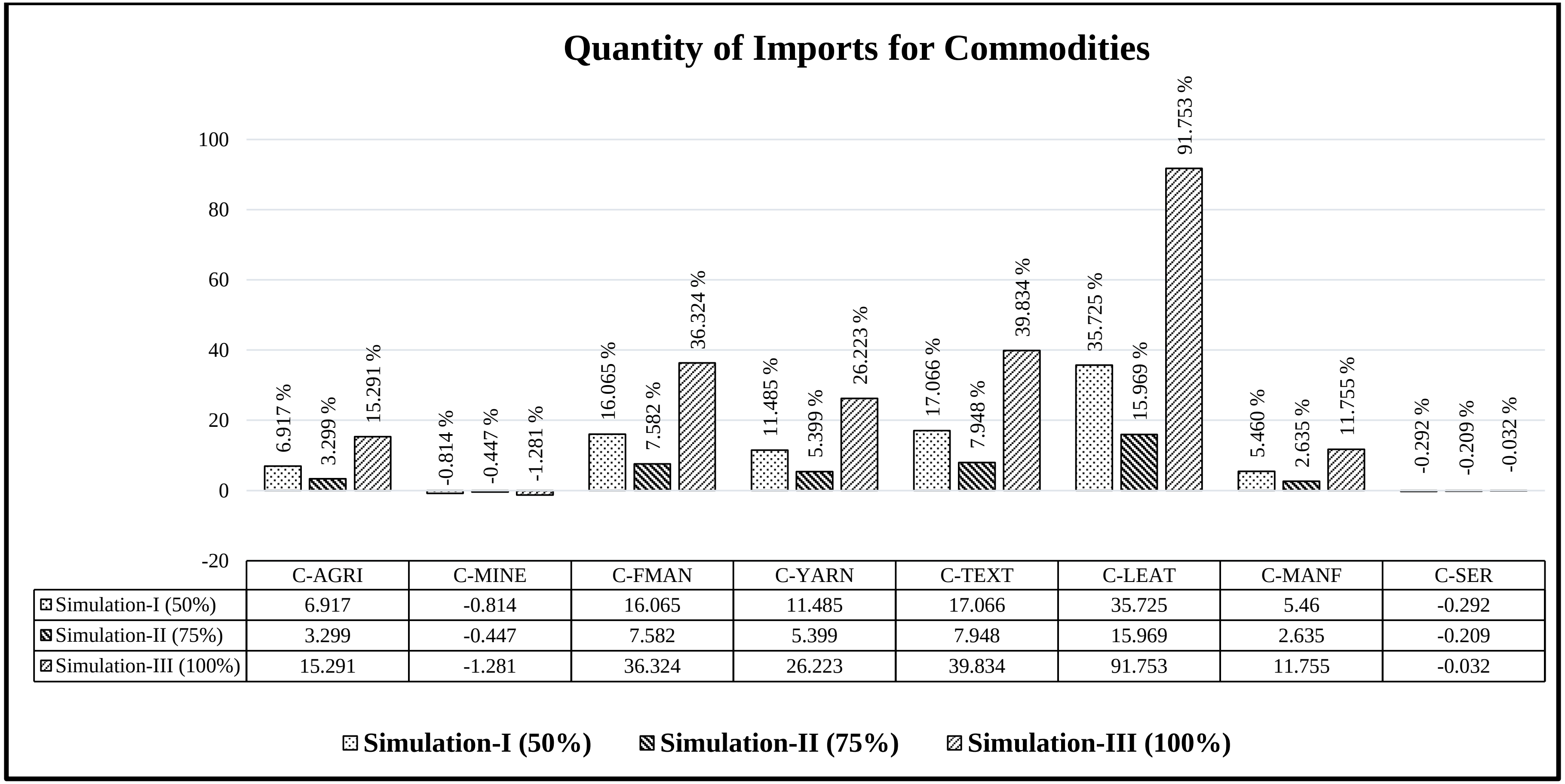


| | C-AGRI | C-MINE | C-FMAN | C-YARN | C-TEXT | C-LEAT | C-MANF | C-SER |
|---|---|---|---|---|---|---|---|---|
| Simulation-I (50%) | 6.917 | -0.814 | 16.065 | 11.485 | 17.066 | 35.725 | 5.46 | -0.292 |
| Simulation-II (75%) | 3.299 | -0.447 | 7.582 | 5.399 | 7.948 | 15.969 | 2.635 | -0.209 |
| Simulation-III (100%) | 15.291 | -1.281 | 36.324 | 26.223 | 39.834 | 91.753 | 11.755 | -0.032 |

**Figure *tf-6.6*: Quantity of Imports for Commodities**

*Source: Simulation Results*

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### 6.5.7 Indices of Inequality

Economic literature focused on the question that weather income inequality slows the growth process of the economy or not? To arrive at the concrete answer, the economists used various methods and/or techniques.

In this regard, very acceptable and commonly practiced approaches in the literature found are the Theil Indices, that is, Theil-T, Theil-L, and Theil-S and Hoover Index.

These indicators compute, measure and consider inter-group as well as intra-group inequality. In spite of this, the research focuses to gauge the inequality amongst groups.

**Table *tf*-6.7: Indices of Inequality**

| Indices | Base | Simulation-I [50%] | Simulation-II [75%] | Simulation-III [100%] |
|---|---|---|---|---|
| **Theil-T** | 0.313 | 0.312 | 0.312 | 0.310 |
| **Theil-L** | 0.316 | 0.314 | 0.315 | 0.313 |
| **Theil-S** | 0.315 | 0.313 | 0.314 | 0.311 |
| **Hoover** | 0.324 | 0.324 | 0.324 | 0.323 |

*Sources: Simulations Results*

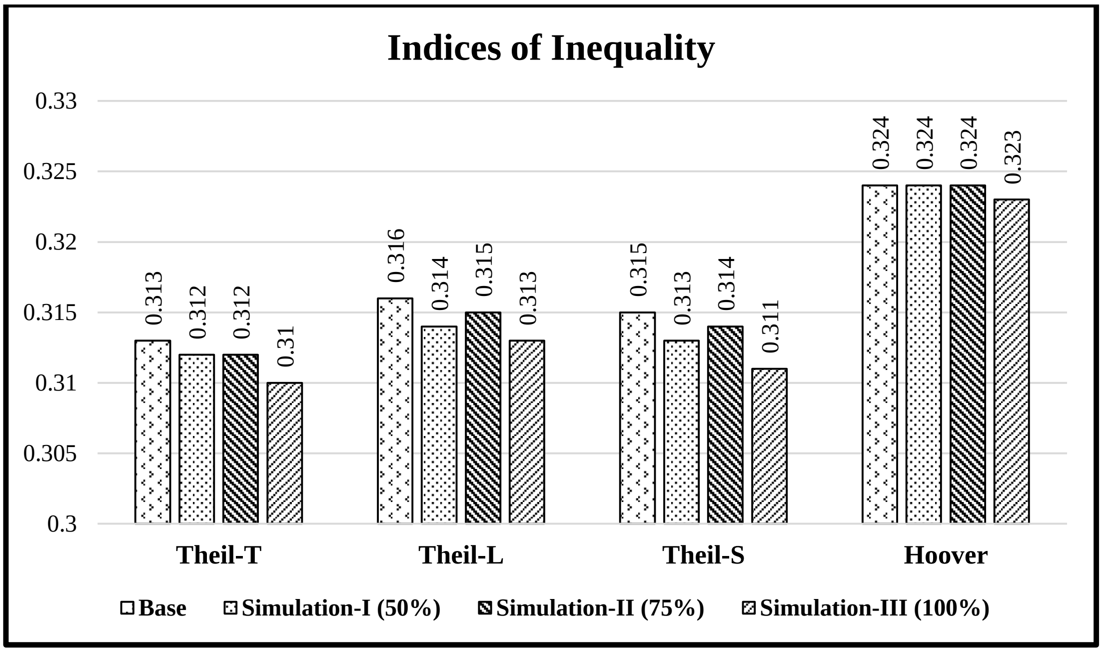


**Figure *tf-6.7*: Indices of Inequality**

*Source: Simulation Results*

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The outcomes (see, Table tf-6.7, & Figure tf-6.7) shows that by implementing the reduction in tariff by 50%, little bit reduction in income inequality of the households is indicated by Theil-T, -L, and -S, while by Hoover Index no change is found. Same results with very minor changes are indicated in simulation-II (that is, reduction in tariff by 75%). In the third experiment, when 100% tariff is reduced, like Theil-T, -L and -S, Hoover also very slightly decreased. So, in this case, too, income inequality decreased.

The Appendix-J illustrates the output of the model when the experiments of reducing tariff by 50%, 75%, and 100% are tested on different accounts of the Pakistan economy. The Exchange Rate (value of one unit of foreign currency in terms of domestic currency) in all the three simulations presents positive result, that is, 0.721%, 0.373%, and 1.333% (see, Table J.80).

Price of Activities (see, Table J.81) shows the favorable impact of reducing or abolition of tariff on the activities like A-AGRI, A-MINE, A-FMAN, A-YARN, and A-SER, while adverse on remaining activities as A-TEXT, A-LEAT, A-MANF, and A-ENRG. Same impacts are noticed on Domestic Price of Domestic Output (see, Appendix-J, Table J.82), Composite Commodity Price (see, Table J.86) and Producer Price for Commodities (see, Table J.87) in case of commodities.

Reduction in tariff shows a positive effect on Exports Price for Commodities (Domestic Currency) in all the three simulations (see, Table J.85). In the case of Level of Activities (see, Table J.88) and Quantity of Domestic Output Sold Domestically (see, Table J.89) indicate the similar impact on activities and commodities. It is positive on A-AGRI & C-AGRI, A-YARN & C-YARN, A-TEXT & C-TEXT, A-LEAT & C-LEAT, A-ENRG & C-ENRG, and A-SER & C-SER, whereas negative on activities and commodities, that is, A-MINE & C-MINE, A-FMAN & C-FMAN, and A-MANF & C-MANF.

The output depicts that there is a positive effect on eight commodities of the account of Quantity of Composite Goods Supplied Domestically (see, Table J.90), while on only one commodity, that is, reduction in tariff impacts negative, and that is C-MINE. As for as Income of Enterprise is concerned, tariff reduction or abolition policy benefits it, that is, in experiments, it is noted 1.064%, 0.516%, and 2.268% respectively. Hence, the overall impact of the reduction or abolition of the tariff is registered positive on the economy of Pakistan.

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## 6.6 Conclusion and Policy Implication

Computable General Equilibrium (CGE) Model has been employed in this research. Social Accounting Matrix (SAM) 2010-11 has been utilized to investigate the impact of free trade on macroeconomic variables like GDP, Exports, Imports, Balance of Trade, National Income, Investment, Households Welfare, and Income Inequality. To check the impact of the reduction in as well as the abolition of tariff three simulations have been experimented, that is, reduction of tariff by 50%, by 75%, and by 100%.

The research indicates that in overall this act placed a positive impact on all the above-mentioned variables as well as welfare and inequality. Although there are few variables which indicate that free trade impact negative impact as well, but positive impact is observed on important variables like GDP, consumption of households and government, BOT, welfare, reduction in inequality. So, there is a boost in different economic activities.

In light of these findings, the study suggests that trade liberalization process can be implemented gradually. To overcome the deficit of the balance of trade, the tools to cut the imports can be employed. Tariff abolition policy has a favorable impact on inequality and the welfare of the household types. However, rural household groups represent a comparatively less increase over the urban. Hence, the empirical evidence supports overall free trade policy.

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# CHAPTER 7

# SUMMARY AND CONCLUSION

## 7.1 Introduction

This research has attempted to contribute the implication of fiscal reforms for macroeconomic stability in Pakistan as a case study within a general equilibrium framework. To examine the impact of reduction in tariff or its complete abolition, increase in income tax, a decrease in sales tax on GDP, exports, imports, national income, public and private sector`s investment, balance of trade, household's welfare, and income inequality, a multi-household CGE Model (CGEM-Pk) was developed for the economy of Pakistan.

The model used in this study is a static multi-sector CGE Model, proceeded for the time period (2010-11), strictly follows the Lofgren et al. (2002) methodology with certain modifications to improve fit the economy of Pakistan. CGE Model vindicates all payments based on Pakistan`s SAM (2010-11). The justification for adopting the Lofgren et al. (2002) CGE Model is debated in Chapter 2.

According to this model, producers are aiming at maximizing the level of their profits, whereas consumers` objective is to maximize the level of utility or satisfaction. Equilibrium is embodied by a set of prices and the levels of factors are fully utilized. Prices are fixed; therefore, profits are zero at equilibrium. Factor incomes divvied amongst households. Total household income is used to consume and save, that is Y=C+S. Whereas, sources of government revenue are mainly direct taxes, indirect taxes, tariffs, etc. In this study, household incomes equal household outlays, that is, equilibrium condition. Household consumption is settled by hypotheses concerning consumer behavior. The Armington (1969) approach permits to regard domestically manufactured as well as imported varieties of commodities as imperfect substitutes.

A computable general equilibrium modeling technique in general algebraic modeling system (GAMS) tailored for complex data by Lofgren et al. (2002) is employed on above-mentioned variables. To explore the impact of the reduction in tariff, three experiments that is, 50%. 75%, and 100%, whereas for an increase in income tax and then a decrease in sales tax each, two experiments that is, 5% and 10% are performed

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in order to identify the implications on macroeconomic indicators, welfare, and inequality.

The research is arranged in seven chapters.

Chapter # 1 presents an introduction and highlights the research problem, specify the study`s objectives, reviews the overview of Pakistan economy.

Chapter # 2 offers a literature review on the impact of fiscal policy on macroeconomic variables. In this chapter, the studies reviewed are theoretical as well as empirical that is, the studies using general methodologies, different econometrical techniques, and specifically computable general equilibrium modeling are reviewed.

In chapter # 3, the database for the model that is, the Social Accounting Matrix (SAM) of Pakistan for the year 2010-11 and other data for CGEM-Pk is analyzed. Which explains the framework of macroeconomic accounting, macroaggregates, SAM`s structure, trade elasticities, and factor`s rewards.

Chapter # 4 submits Computable General Equilibrium Model of Pakistan (CGEM-Pk) with its history, need, evolution, and blocks that is, price, production, and commodity, institutions, and system constraints. In this chapter, price normalization is also discussed.

Following the CGEM-Pk, in chapter # 5 and # 6, the results and discussion on the impact of direct and indirect taxes on macroeconomic variables and household's welfare/ inequality, and then the abolition of import tax and its implications on the same is presented respectively. Simulation experiments are carried out through utilizing CGEM-Pk. The aim of these experiments is to fathom the relationship between these fiscal instruments and above-mentioned macro variables along with welfare and inequality among the households within the Pakistan context. Lastly, the nub aim of this closing chapter is to synopsize the core findings, accentuate the study`s limitations, and to suggest the future research directions.

Chapter # 7 is designed as follows: Section 7.2 states a summary of research findings. Which is followed by the study`s limitations in section 7.3. Section 7.4 focuses insinuations for further research. Finally, section 7.5 describes closing remarks.

## 7.2 Summary of Research Findings

In this segment, we summarize the key verdicts of the research. To see the impact on macroeconomic variables, welfare, and inequality, two experiments are made, that is, (a). increase in income tax, decrease in sales tax, and finally mix of increase in income tax and decrease in sales tax, that is, in a simulation-I increase in income tax or/and decrease in sales tax by 5% and in simulation-II, it is by 10% in all the three experiments, (b). reduction or abolition of import tax --- in simulation-I, the tariff is reduced by 50%, in simulation-II by 75% and finally in simulation-III by 100%.

### 7.2.1 Impact of Direct and Indirect Taxes on Macroeconomic Variables and Welfare/ Inequality

In this section, three experiments are made each with two simulations to observe the impact of direct and indirect taxes separately and then simultaneously on macro variables like GDP, exports, imports, national income, public and private sectors` investment, the balance of trade, welfare, and income inequality etc.

#### *7.2.1.1 Impact of Increase in Income (direct) Tax*

The experiment shows that increase in income tax results into increase in Gross Domestic Product (GDP) at a fixed cost, increase in GDP at market price from expenditure side (GDPMP1), increase in GDP at market price from income side (GDPMP2), which attribute to increase government revenue directly. Investment is appreciated and hence again the government income and spending on developmental and non-developmental projects encouraged. Increase in income tax discourages private sector`s consumption. Increase in direct tax also shows a positive impact on foreign trade. Exports are encouraged at a higher rate compared to imports (see, Chapter # 5, Table it-5.1, & Figure it-5.1).

The quantity of domestic output of few commodities like mine, textile, other manufacturing, and services indicate a rising tendency, while other output like agricultural products, food manufacturing, yarn, leather, and energy present falling trend. It is due to the direct effect of income tax on households` purchasing power, which diminishes demand and hence output to supply (see, Chapter # 5, Table it-5.2, & Figure it-5.2).

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Similarly, the results of increasing tax on household's income confirm that households belong to the categories of the rural small, medium, and large farmers suffered while all other ten groups benefitted, although it seems very minor. In this study, the highest adverse effect of this direct tax is faced by the rural medium households of quartile-1 and quartile-234. All urban groups seem to come with positive growth rates in these experiments (see, Appendix-G Table G.44). Considering the average price of factors, the outcome reveals a negative impact in the case of land, whereas the positive effect in the case of the factor capital (see, Appendix-G, Table G.35).

The investigations reveal that due to an increase in income tax on households in Pakistan, overall welfare of the eleven out of sixteen categories declined. This policy shrinks the constraint to consume. Nine types of rural and two types of urban households face a reduction in their consumption expenditures. Resultantly, the level of welfare of these groups tends to diminish. It can be assessed by comparing with the prices of land owned by a large number of the households (see, Appendix-G, Table G.31) and consumer price of commodities (see, Appendix-G, Table G.30).

The results reveal that the factor`s average prices decrease at a faster rate as compared to commodities` consumer. Therefore, the households` real income decreases and thus their prosperity too. Contrary to this, positive compensating variation is noticed on five types of households (see, Chapter # 5, Table it-5.3, & Figure it-5.3). Likewise, economywide compensating variation produces that the experiment regarding increasing income tax affects adversely on all the types of households (see, Chapter # 5, Table it-5.4, & Figure it-5.4).

Further, there appears a positive influence of increasing income tax on the balance of trade. Export of all the selected products increases except food manufacturing and leather (see, Chapter # 5, Table it-5.5, & Figure it-5.5), while imports of all the products except mines, manufacturing, and services show a negative trend (see, Chapter # 5, Table it-5.6, & Figure it-5.6). The outcomes display a significant increase in the consumption of exportable commodities at home while the reduction in importable commodities. Hence, the balance of trade improves. After increasing the direct tax, export of service sector reports higher increase as compared to its imports, therefore the balance of payments also tends to improve. Measuring rods like Theils and Hoover to estimate inequality reveals no change (see, Chapter # 5, Table it-5.7, & Figure it-5.7).

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#### 7.2.1.2 *Impact of a Decrease in Sales (indirect) Tax*

The study resulted in that decreasing sales tax impacts positively almost on all the macroeconomic variables except investment, imports, and net indirect taxes. GDP at factor cost, GDP at market prices from spending side, GDP at market prices from income side, public spending, exports, private consumption all indicate increasing trend after the policy of reducing sales tax (see, Chapter # 5, Table st-5.8, & Figure st-5.8).

The experiment of reducing sales tax reveals its impact on domestic output of the commodities positive except two products, that is, agriculture and yarn. The analysis depicts that reduction in indirect tax like sales tax results into a rise in the domestic product of almost all the goods, which leads to increase the consumption level of the households and hence the utility (see, Chapter # 5, Table st-5.9, & Figure st-5.9). All the sixteen categories of rural and urban households in model submit positive effect of reducing sales tax on their income, purchasing power, consumption, utility, and welfare (see, Appendix-H, Table H.47). Similarly, average prices of the factors land (N) and capital (K) are also registered as positive because of reducing the sales tax (see Appendix-H, Table H.51).

Moreover, the test regarding reduction in sales tax also presents an increasing trend in utility and compensating the variation of not only the households but also of the economy as a whole. The decrease in sales tax had lifted the real income of the households upward, which ultimately improve the constraint to raise the consumption pattern (see, Appendix-H, Table H.47). As a result of the level of utility of all the households ultimately augmented (see, Appendix-H, Table H.61).

Households` welfare lifted upward, that can be judged by comparing the factors` prices and the goods` prices (see, Appendix-H, Table H.51, Table H.47). The output of compensating variation indicates that the welfare of all the types of households increased due to a reduction in sales tax by the government. As this policy results into increase in real income of the households, therefore their welfare boosted up. Likewise, the analysis document that economy-wide compensating variation also rises (see, Chapter # 5, Table st-5.11, & Figure st-5.11).

Lessening sales tax demonstrates an adverse impact on exports for few outputs like agricultural products, mine, food manufacturing, yarn, and services, while the favorable

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effect on textile, leather, and other manufacturing. The decrease in exports shows that households consume more of these products now at home, which indicates an increase in welfare (see, Chapter # 5, Table st-5.12, & Figure st-5.12). on the other side, the influence of reducing sales tax shows a positive impact on imports of all selected commodities. Increase in consumption of the imports along with domestic products indicates an increase in the welfare of the households (see, Chapter # 5, Table st-5.13, & Figure st- 5.13). Finally, Theil indices and Hoover index pinpoints infinitesimally small change, which describes no change in income inequality (see, Chapter # 5, Table st-5.14, & Figure st- 5.14).

#### *7.2.1.3 Impact of Increase in Income (direct) Tax and a Decrease in Sales (indirect) Tax Simultaneously*

A mix of increase in income tax and a decrease in sales tax simultaneously results into the positive impact on all the selected macroeconomic variables like GDP, government spending, investment, exports, imports, private consumption in both the simulations of this study (see, Chapter # 5, Table itst-5.15, & Figure itst-5.15). It shows that the reduction in sales tax impact more than the increase in income tax on all the accounts of nominal GDP data, that is national income account. The experiment of increase in income tax and a decrease in sales tax at a time illustrates positive impact on the growth of selected products domestically produced except the sectors works under nature, directly or indirectly, like, agricultural output, food manufacturing, and yarn (see, Chapter # 5, Table itst-5.16, & Figure itst-5.16).

Increase in income tax results into a decrease in real income of the households but a decrease in sales tax on domestic products boosts the purchasing power. It reveals that if the government increases direct tax like income tax and at the same time reduces indirect tax like a sales tax at the same rate, the real income of the households improves. Which ultimately results into increase in consumption power and hence welfare of the households will increase (see, Appendix-I, Table I.76).

Average prices of the factors record the favorable effect of this policy mix. In both the simulations increase in average price of capital is registered higher than the increase in average price of land. So, both the factors are benefitted (see, Appendix-I, Table I.67).

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The outcomes express the increase in utility level of fourteen households except for rural non-farm Q-4 and urban Q-4, after the experiment of this policy mix in both the simulations. Most of the rural households are highly benefitted as compared to rural non-farms and urban (see, Appendix-I, Table I.77). Likewise, their consumption expenditure also reveals the same trend (see, Appendix-I, Table J.81). Compensating variation (CV) of the households recorded improving impact on fourteen categories of the model`s households. Only two are worsened as mentioned above (see, Chapter # 5, Table itst-5.17, & Figure itst-5.17). Compensating variation related to the whole economy also verified the positive result of experimenting mix of increase and the decrease of income and sales tax respectively (see, Chapter 5, Table itst-5.18, & Figure itst-5.18).

The experiment of policy mixes recorded decrease in export and increase in import of four commodities like agricultural output, mine, food manufacturing, and yarn while the test noticed an increase in export of other four product like textile, leather, other manufacturing, and services as considered in the model. This ultimately results in fall in receipts and increase in payments of the country. Export of leather is increased while its import is decreased. Textile`s and other manufacturing`s export and import both are increased in both the experiments, but it is observed that growth in export is higher than import (see, Chapter # 5, Table itst-5.19, & Figure itst-5.19, and Table itst-5.20, & Figure itst-5.20). Theil indices indicate a minor reduction in the income inequality while Hoover index shows no change due to implementing this policy mix (see, Chapter # 5, Table itst-5.21, & Figure itst-5.21).

### 7.2.2 Abolition of Import Tax (*tariff)* and its Implications on Macroeconomic Variables, Welfare/ Inequality

A descriptive examination of the tariff abolition within Pakistan context presents several conclusions. On the government`s trade deficit, dealing with trade deficit through reducing or abolishing import tax has a significant contractionary effect. This measure betters BOT and all major macro variables as well as causes to improve the welfare of the households and reduces the income inequality.

Three tests are conducted to estimate the effect of reducing or even abolition of tariff on different macroeconomic indicators like GDP, exports, imports, national income,

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public and private investment, inequality and welfare, etc., of the economy of Pakistan. The sectoral and macro results of reduction in tariff in simulation-I by 50%, in simulation-II by 75%, and then abolition of all the tariff, that is, by 100% in simulation-III, experiments are presented here. For instance, six sectors (C-AGRI, C-MINE, C-FMAN, C-TEXT, C-LEAT, and C-MANF) out of nine were subjected to import tax (tariff). These sectors were expected under direct effect of the fall in imports` prices due to a reduction in tariff rate or its entire removal.

Fall in imports` prices influences all other prices in the economy due to interlinkages. Thus, domestic prices fall leads not only to a switch to production of exports rather at the same time to imported goods also. It causes a change in production structure and hence a change in the income of the institutions. Export-oriented sectors are gaining sectors. They absorb more of the factors, used intensively in their output. On the other hand, the sectors whose production is being substituted by imports are expected to decrease their output, and thereby affect negatively the factors they use intensively. Not only have the factors, rather the owners of such productions too, faced the same effect. So, poverty ultimately results in, because of the combination of this income and induced price effects. It is very crucial to realize the effect on prices of food especially because the low-income group of the households generally allocate a very huge share of their income to food only.

The possible implications on nominal GDP data (national income accounts) reveal growth in all the three simulations. This growth in GDP endorses to expand investment, advance activities level, augment household income, accelerate institutional income, boost up savings, increase government as well as private consumption. Consumption increase is because of institutional incomes increase couple with a decrease in prices of consumers goods and imports in term of domestic currency as its value is appreciated (see, Chapter # 6, Table tf-6.1, & Figure tf-6.1). Import and export both grown but export growth rate appears faster as compare to that of imports rate. It is because of advancement in the level of economic activity, production, and GDP. The tendency of increase in imports is due to import`s price link with domestic currency appreciation as well as the increase in foreign currency reserves due to an increase in exports (see, Chapter # 6, Table tf-6.5, & Figure tf-6.5, and Table tf-6.5, & Figure tf-6.6).

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The tests reveal that the quantity of most of the commodities produced domestically has an increasing trend except three types of commodities like mine (C-MINE), food manufacturing (C-FMAN), and other manufacturing (C-MANF). Leather products` output (C-LEAT) rises at a higher rate as compared to an increase in the rest of the products. Moreover, the results show that the output of those commodities is raised whose price rise.

Income of all the sixteen types of households as categorized in this model are exposing positive tendency as a result of experiments, although the increasing rate varies from household to household. It is noticed that the growth rate of increase in income of rural farm workers is higher than that of all the other categories of model`s households (see, Appendix-J, Table J.92). Similarly, labor, land, and capital are key factors used in the production process. Employing the three simulations, the outcomes reveals an increasing trend, though the rate of increase in capital price is higher in all the experiments relative to land (see, Appendix-J, Table J.83).

Due to reducing the rate of tariff, the sequels present that households welfare augmented. Higher income groups (see, Appendix-J, Table J.92) raised constrained to make more consumption (see, Appendix-J, Table J.79). Resultantly, the utility level of the households improved in all the experiments (see, Appendix-J, Table J.93). Households` welfare increased. It can be judged by the comparison of prices of factors owned by them and commodities` consumer prices (see, Appendix-J, Table J.78). Factor average prices rate of increase in registered higher as compared to commodities` consumer prices. Resultantly, an increase in the households` real income is noticed which causes welfare and prosperity.

Households` compensating variation (see, Chapter # 6, Table tf-6.3, & Figure tf-6.3) reveals that all the types of households are having more utility as and when the abolition of tariff policy experiment is adopted. Considering, household consumer price index (see, Appendix-J, Table J.78), a number of the households are deriving more utility due to reason that CPI is not positive. Likewise, economy-wide compensating variation is also confirming that in overall the whole economy`s welfare is increased due to the abolition of import tax (see, Chapter # 6, Economy-wide compensating variation is also confirming that in overall the whole economy`s welfare has increased due to tariff abolition. As in the first simulation, when tariff reduction was tested by 50%, welfare

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increased by 0.689%. In the second experiment, when it was exercised by 75%, resultant rise in welfare appeared by 0.335%. Lastly, at 100% abolition of the tariff, welfare increases to 1.463% (see, **Error! Not a valid bookmark self-reference.**, & Figure tf-6.4). All this shows that in free trade regime, households are better off.

Table *tf*-6.4, & Figure tf-6.4).

The experiment also presents that abolition of tariff brings improvement in the position of trade balance, as exports of most of the products increase (see, Chapter 6, Table tf-6.5, & Figure tf-6.5, and Table tf-6.6, & Figure tf-6.6). In the same line, the positive tendency in the use of imports is also noticed. The results indicate a remarkable increase in the consumption of exports and imports except for energy. Export prices of all the goods have an increasing tendency at a constant rate, whereas the import prices do not have a fixed rate, rather the rate varies. Hence, the balance of trade improved in these tests.

Results of Theil indices and Hoover index (see, Chapter # 6, Table tf-6.7, & Figure tf-6.7) indicates that by implementing the policy of tariff reduction in experiment-I, little bit reduction and zero change in inequality respectively is realized. Same results with very minor changes appear in experiment-II. In experiment-III, all the indices are slightly decreased. All this registers a positive impact on income distribution.

To conclude it can be said that the government should reduce import tax (tariff) to get improvement in all the macroeconomic variables of the Pakistan economy as well as to develop welfare and to reduce inequality, which will result into sustainable economic development and growth in the long run.

## 7.3 Limitations of the Study

Empirical studies are usually constrained with a number of limitations. In the same way, this study has also some limits. These are as under:

7.3.1 Like other studies based on CGE Models, the parameters related to elasticity used in this model are not econometrically estimated using Pakistan data, rather borrowed from another study. Although a reasonable confidence level can be enclosed to the model simulations` inferences (outcomes were robust with various Armington parameter values checked under sensitivity analysis),

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Results of the welfare of households were observed sensitive to the supposed parameter values. Similarly, a better sensitivity could be attained at household level if there exists capability in the investigation to utilize more disaggregated data at this level.

7.3.2 Model is simulated for comparative static outcomes rather than dynamic. Which is possible to realize the track that changes households over time income and expenditure. Whereas, employing dynamic model is appropriate for policy implication. The composition of Pakistan`s dynamic CGE Model is sternly confined by apropos data like time series forecasts, capital stock, etc.

7.3.3 Lack of regional level data in Pakistan is a serious restriction in composing CGE Model for the economy. Whereas, regional disparity is considered an important issue in determining poverty standard and income inequality. For this purpose, econometrically estimated microsimulation CGE Model of Pakistan at the household level is required to attain welfare and inequality effect of the policies related to trade and fiscal matters.

In spite of the above stated constraints, the computable general equilibrium model of Pakistan (CGEM-Pk) along with extremely up-to-date composed social accounting matrix (SAM) for Pakistan economy and other database, created possible empirical outcomes in examining the implication of fiscal reforms for macroeconomic stability in Pakistan, especially the impact of abolition of tariff, increase in income tax, decrease in sales tax, and mix of increase in income (direct) tax and decrease in sales (indirect) tax on GDP, national income, exports, imports, balance of trade (BOT), investment in public and private sectors, welfare/ inequality.

## 7.4 Suggestions for further research

Areas of further research are associated with some of the above-stated constraints of this analysis. Some suggestions for further research are as under:

7.4.1 Some key feature should also be included in the database, for example, estimating elasticity parameters econometrically in the current data, for various exogenous variables - time series forecasts, regional input-output tables to study and to suggest policy for welfare and inequality at the regional level.

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7.4.2 In order to secure the ground realities of Pakistan market in efficient way, it is advised to expand the Pakistan CGE Model by including imperfect competition features, relating to dynamics in formulating conditional forecasts and tracing regional disparities. A dynamic model can capture households saving behavior since their utility depends upon their present as well as future consumption, and also investment at each time period. Ballard (1987) mentions that:

> *"a tax analysis using a static general equilibrium model could give some misleading results if used for long-term analysis. Using a static CGE Model, a policy that looks harmful in the short term can provide substantial welfare gains in the long term. Therefore, in order to capture the long-term effect of tax policy, it is important to adopt a dynamic CGE Model."*

7.4.3 To procure detailed multidimensional features of welfare/ inequality, an empirical econometrically estimated microsimulation model is required. This model can be associated with CGE Model if permitting feedback impact.

The above-mentioned recommendations are considered if, the further research on the implication of fiscal reforms on macroeconomic stability of Pakistan will improve the outcomes in more realistic form and the suggestion regarding trade and fiscal policies will be more effective and contributive.

## 7.5 Concluding observations

In this research, despite some constraints, the model developed for Pakistan economy creates credible outcomes of the simulations which would help to recommend the government to achieve household's welfare and reduce inequality through the implication of fiscal reforms as experimented in this study like abolition of tariff, increase in direct tax, decrease in indirect tax, and/or at a time increase indirect as well as decrease in indirect tax.

Although free trade, that is, the abolition of tariff results into losses in public revenue, but the results of simulations regarding the abolition of tariff show a better balance of payment and all the selected macroeconomic variables in this study also cause to

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improve household’s welfare as well as to reduce inequality. Tariff abolition step leads to falling in import`s prices that affect the prices of economy`s other products due to interlinkages. As a result, demand switches to the home-produced output along with imports. Production structure and institutions income changes. Households income positively changes, although it varies type to type. Factor prices increase. Households welfare augmented. Compensating variation indicates more utility at household as well as at economy level. Ends of Theils and Hoover indices register a favorable impact on inequality. Hence, this empirical evidence confirms that government should adopt tariff abolition policy to achieve long-run sustainable economic development and economic growth.

Simulations regarding direct and indirect taxes present that increase in income tax encouraged most of the macroeconomic variables except the private sector`s consumption, fall in production of some sectors, suffering of few types of households. Moreover, welfare declined, consumption diminished, and compensation variation impacted adversely on households. On the other hand, reducing sales tax impacts positive on almost all the selected macroeconomic variables except investment and imports.

The result submits increase in consumption, utility, welfare, compensating variation, factor prices, *etc.* But the mix of the direct and indirect taxes results into a positive impact on all the macroeconomic variables in this study. Increase in income tax and at the same time, a decrease in sales tax indicates improvement in household’s real income, which causes an increase in consumption, utility, and welfare. Factors` average prices recorded a favorable impact. CV registered an improving impact on households and the economy as a whole. The favorable effect is noticed on the balance of trade. Theils and Hoover indices show infinitesimally small impact.

Increasing direct and decreasing indirect tax simultaneously compensate the revenue loss due to reduction or abolition of import tax. This recommends that this policy mix of all the three fiscal measures are in accordance with the economic development and growth theories, especially for the developing countries like Pakistan.

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# APPENDIX-A

**Table A.1: Year wise Real GDP Fiscal Growth, Deficit, Exp. & Rev. of Pakistan`s Govt.**

| Year | Real GDP Fiscal Growth | Year Deficit | Expenditure | | | Revenue | | |
|---|---|---|---|---|---|---|---|---|
| | | | Total | Current | Dev | Total | Tax | Non-Tax |
| 1992 | 7.6 | 7.5 | 26.7 | 19.1 | 7.6 | 19.2 | 13.7 | 5.5 |
| 1993 | 2.1 | 8.1 | 26.2 | 20.5 | 5.7 | 18.1 | 13.4 | 4.7 |
| 1994 | 4.4 | 5.9 | 23.4 | 18.8 | 4.6 | 17.5 | 13.4 | 4.1 |
| 1995 | 5.1 | 5.6 | 22.9 | 18.5 | 4.4 | 17.3 | 13.8 | 3.5 |
| 1996 | 6.6 | 6.5 | 24.4 | 20.0 | 4.4 | 17.9 | 14.4 | 3.5 |
| 1997 | 1.7 | 6.4 | 22.3 | 18.8 | 3.5 | 15.8 | 13.4 | 2.4 |
| 1998 | 3.5 | 7.7 | 23.7 | 19.8 | 3.9 | 16.0 | 13.2 | 2.8 |
| 1999 | 4.2 | 6.1 | 21.9 | 18.6 | 3.3 | 16.0 | 13.3 | 2.7 |
| 2000 | 3.9 | 5.4 | 18.9 | 16.4 | 2.5 | 13.4 | 10.6 | 2.8 |
| 2001 | 2.0 | 4.3 | 17.4 | 15.3 | 2.1 | 13.1 | 10.5 | 2.6 |
| 2002 | 3.1 | 5.5 | 19.6 | 16.2 | 3.4 | 14.2 | 10.7 | 3.5 |
| 2003 | 4.7 | 3.6 | 18.4 | 16.0 | 2.4 | 14.8 | 11.4 | 3.4 |
| 2004 | 7.5 | 2.3 | 16.4 | 13.8 | 2.6 | 14.1 | 10.8 | 3.3 |
| 2005 | 9.0 | 3.3 | 17.2 | 14.5 | 2.7 | 13.8 | 10.1 | 3.7 |
| 2006 | 5.5 | 4.0 | 17.1 | 13.6 | 3.4 | 13.1 | 9.2 | 3.9 |
| 2007 | 6.8 | 4.1 | 18.1 | 14.9 | 3.2 | 14.0 | 9.6 | 4.4 |
| 2008 | 5.0 | 7.3 | 21.4 | 17.5 | 3.9 | 14.1 | 9.9 | 4.2 |
| 2009 | 0.4 | 5.2 | 19.2 | 15.5 | 3.7 | 14.0 | 9.1 | 4.9 |
| 2010 | 2.6 | 6.2 | 20.2 | 16.0 | 4.2 | 14.0 | 9.9 | 4.1 |
| 2011 | 3.7 | 6.5 | 18.9 | 15.9 | 3.0 | 12.3 | 9.3 | 3.0 |
| 2012 | 3.8 | 8.8 | 19.6 | 15.6 | 4.1 | 12.8 | 10.2 | 2.6 |
| 2013 | 3.7 | 8.2 | 21.4 | 16.3 | 5.1 | 13.3 | 9.8 | 3.5 |
| 2014 | 4.0 | 5.5 | 19.8 | 15.8 | 4.0 | 14.3 | 10.1 | 4.2 |
| 2015 | 4.2 | 5.3 | 20.3 | 16.2 | 4.1 | 14.4 | 11.0 | 3.3 |
| 2016 | 4.5 | 4.6 | 19.9 | 16.1 | 4.5 | 15.3 | 12.6 | 2.7 |
| 2017 | 5.3 | 5.8 | 21.3 | 16.3 | 5.3 | 15.5 | 12.5 | 3.0 |

*Source: Economic Survey of Pakistan & Debt Policy Coordination Office Staff Calculations, Ministry of Finance*

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# APPENDIX-B

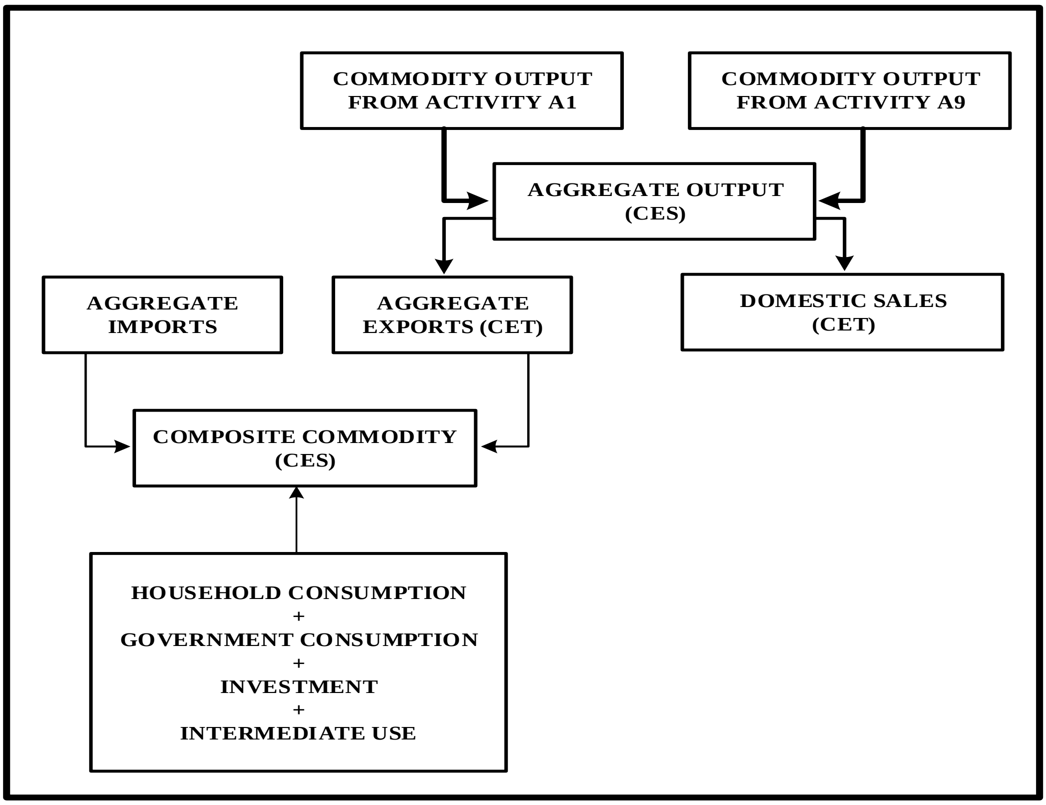


**Figure B.1: Production**

*Source: Lofgren et al. (2001)*

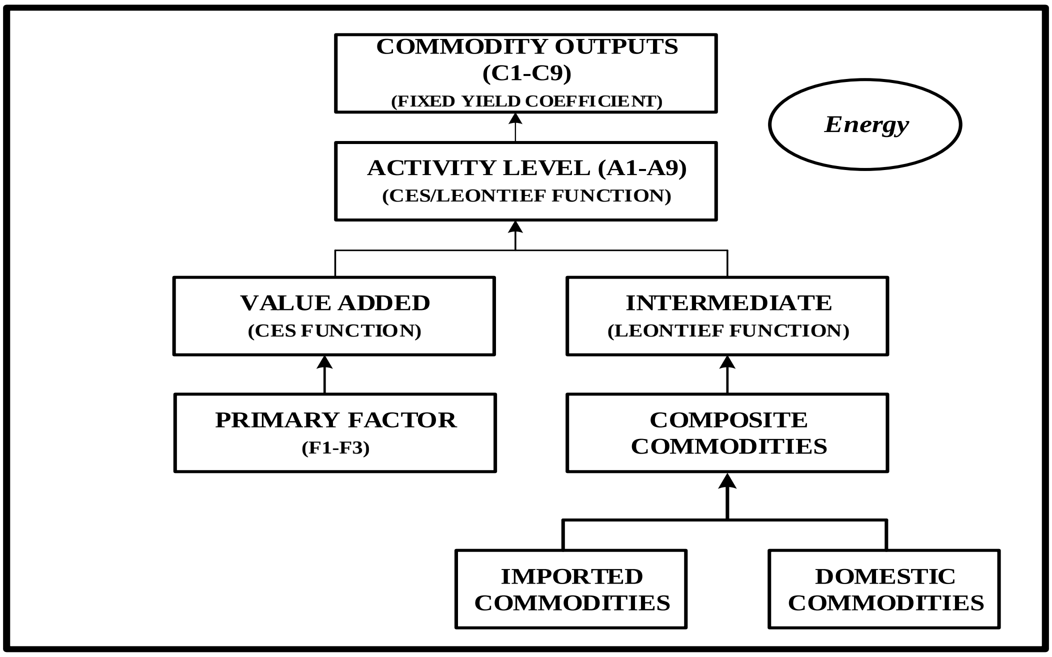


**Figure B.2: Consumption**

*Source: Lofgren et al (2001)*

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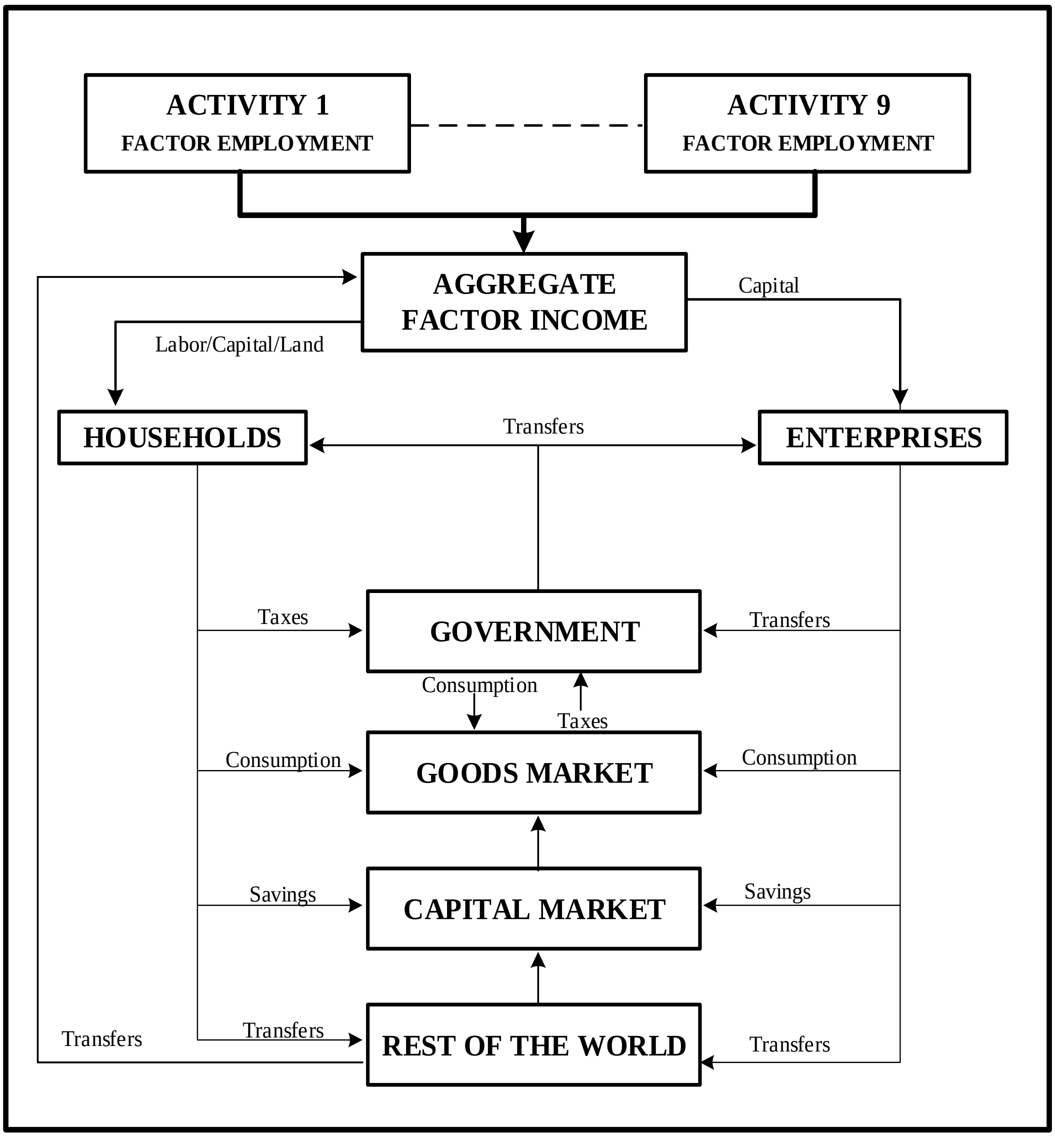


**Figure B.3: Institutional Income and Domestic Demand**

*Source: Lofgren et al (2001)*

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# APPENDIX-C

## Mathematical Statements of CGE Model for Pakistan

**Table C.2: Sets**

| *Sets* | *Definition* |
|---|---|
| $a \in A$ | ***Activities*:** Agriculture, Mining, Food manufacturing, Yarn, Textiles, Leather, Manufacturing, Energy, Services |
| $a \in AA \subset A$ | ***Agriculture Activities*:** Agriculture |
| $a \in ANA \subset A$ | ***Non-Agriculture Activities*:** Mining, Food manufacturing, Yarn, Textiles, Leather, Manufacturing, Energy, Services |
| $c \in C$ | ***Commodities*:** Agriculture, Mining, Food manufacturing, Yarn, Textiles, Leather, Manufacturing, Energy, Services |
| $c \in CA \subset C$ | ***Agriculture Commodities*:** Agriculture |
| $c \in CNA \subset C$ | ***Non-Agriculture Commodities*:** Mining, Food manufacturing, Yarn, Textiles, Leather, Manufacturing, Energy, Services |
| $c \in CM \subset C$ | ***Imported Commodities*:** Agriculture, Mining, Food manufacturing, Yarn, Textiles, Leather, Manufacturing, Services |
| $c \in CNM \subset C$ | ***Non-imported Commodities*:** Energy |
| $c \in CE \subset C$ | ***Exported Commodities*:** Agriculture, Mining, Food manufacturing, Yarn, Textiles, Leather, Manufacturing, Services |
| $c \in CNE \subset C$ | ***Non-exported Commodities*:** Energy |
| $f \in F$ | ***Factors*:** Labor, Land, Capital |
| $i \in I$ | ***Institutions*:** ***Households that is,*** Rural Small Farmer (Quartile 1), Rural Small Farmer (Quartile 234), Rural Medium Farmer (Quartile 1), Rural Medium Farmer (Quartile 234), Rural Landless Farmer (Quartile 1), Rural Landless Farmer (Quartile 234), Rural Farm Worker (Quartile 1), Rural Farm Worker (Quartile 234), Rural Non-Farm (Quartile 1), Rural Non-Farm (Quartile 2), Rural Non-Farm (Quartile 3), Rural Non-Farm (Quartile 4), (Quartile 1), (Quartile 2), (Quartile 3), (Quartile 4). **Enterprise, Government, Rest of the world.** |

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| | |
|---|---|
| $\square \in H \subset I$ | Rural Small Farmer (Quartile 1), Rural Small Farmer (Quartile 234), Rural Medium Farmer (Quartile 1), Rural Medium Farmer (Quartile 234), Rural Landless Farmer (Quartile 1), Rural Landless Farmer (Quartile 234), Rural Farm Worker (Quartile 1), Rural Farm Worker (Quartile 234), Rural Non-Farm (Quartile 1), Rural Non-Farm (Quartile 2), Rural Non-Farm (Quartile 3), Rural Non-Farm (Quartile 4), (Quartile 1), (Quartile 2), (Quartile 3), (Quartile 4) |
| $s \in S \subset I$ | **Government** |
| $r \in R \subset I$ | **Rest of the World** |

**Table C.3: Parameters**

| ***Parameter*** | ***Definition*** |
|---|---|
| $ad_a$ | Activity parameter of the production function |
| $aq_c$ | Shift parameter of Armington function |
| $ax_c$ | Shift parameter for output transformation (CET) function |
| $cwts_c$ | Weight of commodity *c* in the *CPI* |
| $ir_{c,a}$ | Quantity of *c* as intermediate input per unit of activity *a* |
| $icd_c$ | Trade input of *C* per unit of commodity C produced *and* sold domestically |
| $shry_{i,f}$ | Share for institutions *i* in income of factor *f* |
| $\alpha_{f,a}$ | Value-added share for factor *f* in activity *a* |
| $\beta_{c,h}$ | The share of consumption spending of household *h* on commodity *c* |
| $\delta q_c$ | Share parameter for the composite good |
| $\delta x_c$ | Share parameter for output transformation |
| $\theta_{a,c}$ | The yield of output *c* per unit of activity *a* |
| $\rho q_c$ | Exponent of Armington function |
| $\rho x_c$ | Exponent used in the CES aggregation function |
| $\sigma q_c$ | The elasticity of transformation for composite goods |
| $\sigma x_c$ | The elasticity of transformation for output transformation. |

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**Table C.4: Exogenous variables**

| *Variable* | *Definition* |
|---|---|
| $CPI$ | Consumer price index |
| $INV_c$ | Base year investment demand |
| $MPSIN_h$ | Initial marginal propensity to consume |
| $MPSDUM_h$ | 0-1 dummy: (1= for those H that saving changes, 0 otherwise) |
| $MPS_h$ | Marginal propensity to save for household *h* |
| $PWE_c$ | The world price of exports (*Foreign currency units*) |
| $PWM_c$ | The world price of imports (*Foreign currency units*) |
| $QFS_f$ | Supply of factor *f* |
| $QG_c$ | The quantity of consumption of commodity *c* by govt. *g*. |
| $QT_c$ | Transaction cost (total) |
| $te_c$ | Sales tax on imports |
| $tm_c$ | Import tariff rate |
| $tq_c$ | Rate of sales tax |
| $TR_{i,j}$ | Transfers from institution *j* to institution *i* |
| $TSTAX_c$ | Total sales tax on commodity *c* |
| $TTAR_c$ | Total tariff on commodity *c* |
| $ty_h$ | Household income tax rate |

**Table C.5: Endogenous variables**

| *Variable* | *Definition* | **No.** |
|---|---|---|
| $CPIH_h$ | The consumer price index of household *h* | 16 |
| $EH_h$ | Consumption expenditure of household *h* | 16 |
| $EXR$ | Foreign exchange rate as domestic currency per unit of foreign currency | 1 |
| $FRMS$ | Total saving of enterprise | 1 |
| $FPD_{f,a}$ | Factor price distortion for factor *f* in activity *a* | 144 |
| $FS$ | The balance of payment (*foreign currency units*) | 1 |

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| | | |
|---|---|---|
| $GBS$ | Government budget surplus | 1 |
| $IADJ$ | Investment adjustment factor | 1 |
| $PA_a$ | Gross revenue per activity (*activity price*) | 9 |
| $PD_c$ | Domestic price of domestic output | 9 |
| $PE_c$ | Domestic price of exported good | 9 |
| $PF_f$ | Rate of return to factor *f* | 16 |
| $PM_c$ | Domestic price of imported goods (*local-currency unit*) | 9 |
| $PQ_c$ | Composite price of commodity *c* | 9 |
| $PVA_a$ | Price of value added (*factor income per unit of activity*) | 9 |
| $PX_c$ | The commodity price of producer *c* for activity *a* | 9 |
| $QA_a$ | Quantity (*level*) of activity *a* | 9 |
| $QD_c$ | Domestic sales quantity | 9 |
| $QE_c$ | Supply of exports | 8 |
| $QF_{f,a}$ | Quantity demanded of factor *f* from activity *a* | 144 |
| $QFU_f$ | Unused supply of factors *f* | 16 |
| $QH_{c,h}$ | Quantity consumed of commodity *c* by household *h* | 144 |
| $QINT_{c,a}$ | Quantity of commodity *c* as intermediate input coefficient | 9 |
| $QINV_c$ | Quantity of investment demand for commodity *c* | 9 |
| $QM_c$ | Quantity of imported commodities | 9 |
| $QQ_c$ | The quantity of goods supplied to the domestic market (*composite supply*) | 9 |
| $QX_c$ | The aggregate quantity of domestic output | 9 |
| $UH_h$ | Utility of household *h* | 16 |
| $WALR$ | Dummy variable | 1 |
| $YFRM$ | Income of enterprise | 3 |
| $YF_{h,f}$ | Transfers of factor income to the household | 48 |
| $YF_{s,f}$ | Transfer of factor income to firms | 3 |
| $YH_h$ | Income of household *h* | 16 |
| $\mu_h$ | Weight of utility of household *h* | 16 |

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**Table C.6: Equations (Price Block)**

| | *Equations* | *Domain* | |
|---|---|---|---|
| 1 | $PM_c = (1+tm_c)\,PWM_c\,EXR$ | $c \in CM$ | 8 |
| 2 | $PE_c = PWE_c(1-te_c)\,EXR$ | $c \in CE$ | 8 |
| 3 | $PQ_c\,QQ_c(1+subr_c) = (PD_c\,QD_c + PM_c\,QM_c)(1+tq_c+icd_c)$ | $c \in CM$ | 9 |
| 4 | $PQ_c\,QQ_c(1+subr_c) = PD_c\,QD_c(1+tq_c+icd_c)$ | $c \in CNM$ | 9 |
| 5 | $PX_c\,QX_c = PD_c\,QD_c + PE_c\,QE_c$ | $c \in CE$ | 9 |
| 6 | $PX_c\,QX_c = PD_c\,QD_c$ | $c \in CNE$ | 1 |
| 7 | $PA_a = \sum_{c\in C}\theta_{a,c}\,PX_c$ | $a \in A$ | 9 |
| 8 | $PVA_a = PA_a - \sum_{c\in C} ir_{c,a}\,PQ_c$ | $a \in A$ | 9 |

**Table C.7: Equations (Production Block)**

| | | | |
|---|---|---|---|
| 9 | $QA_a = ad_a \prod_f QF_{f,a}^{\alpha_{f,a}}$ | $a \in A$ | 9 |
| 10 | $FPD_{f,a}\,PF_f = (\alpha_{f,a}\,PVA_a\,QA_a)/QF_{f,a}$ | $f \in F$,<br>$a \in A$ | 144 |
| 11 | $QINT_{c,a} = ir_{c,a}\,QA_a$ | $a \in A$,<br>$c \in C$ | 81 |
| 12 | $QX_c = \sum_{a\in A}\theta_{a,c}\,QA_a$ | $c \in C$ | 9 |
| 13 | $QX_c = ax_c[(1-\delta x_c)QD_c^{\rho x_c} + \delta x_c\,QE_c^{\rho x_c}]^{1/\rho x_c}$ | $c \in CE$ | 8 |
| 14 | $QX_c = QD_c$ | $c \in CNE$ | 9 |
| 15 | $QQ_c = aq_c[(1-\delta q_c)QD_c^{-\rho q_c} + \delta q_c\,QM_c^{-\rho q_c}]^{-1/\rho q_c}$ | $c \in CM$ | 8 |
| 16 | $QQ_c = QD_c$ | $c \in CNM$ | 1 |
| 17 | $QM_c/QD_c = [(\delta q_c/1-\delta q_c)(PD_c/PM_c)]^{\sigma q_c}$,<br>$\sigma q_c = 1/(1+\rho q_c) > 0$ | $c \in CM$ | 8 |
| 18 | $QD_c/QE_c = [(\delta x_c/1-\delta x_c)(PD_c/PE_c)]^{\sigma x_c}$,<br>$\sigma x_c = 1/(\rho x_c - 1) > 0$ | $c \in CE$ | 8 |

**Table C.8: Equations (Institution Block)**

| | | | |
|---|---|---|---|
| 19 | $YF_{i,f} = shry_{i,f} \sum_{a \in A} FPD_{f,a} PF_f QF_{f,a};$ | $i \in I,$ $f \in F$ | 57 |
| 20 | $YH_h = \sum_{f \in F} YF_{h,f} + TR_{h,g}\, CPI + EXR \cdot TR_{h,r} + TR_{h,s}$ | $h \in H$ | 16 |
| 21 | $HTS = \sum_h MPS_h \left(1 - ty_h\right) YH_h$ | | 1 |
| 22 | $HDS = HTS - \sum_h TR_{h,r} \cdot EXR$ | | 1 |
| 23 | $MPS_h = MPSIN_h \left(1 + MPSADJ \cdot MPSDUM_h\right)$ | | 19 |
| 24 | $UH_h = \prod_c \left( \frac{QH_{c,h}}{\beta_{c,h}} \right)^{\beta_{c,h}}$ | $h \in H$ | 16 |
| 25 | $QH_{c,h} = \frac{\beta_{c,h} EH_h}{PQ_c}$ | $h \in H,$ $c \in C$ | 144 |
| 26 | $EH_h = \left(1 - MPS_h\right)\left(1 - ty_h\right) YH_h$ | $h \in H$ | 16 |
| 27 | $CPIH_h = \prod_c PQ_c^{\beta_{c,h}}$ | $h \in H$ | 16 |
| 28 | $CPI = \sum_h \mu_h \cdot CPIH_h$ | | 1 |
| 29 | $\mu_h = \frac{UH_h}{\sum_h UH_h}$ | $h \in H$ | 16 |

| | | | |
|---|---|---|---|
| 30 | $QINV_c = INV_c \, IADJ$ | $c \in C$ | 9 |
| 31 | $GBS = \sum_{h\in H} ty_h YH_h + EXR \cdot TR_{g,r} + \sum_{c\in C} tq_c PD_c QD_c + \sum_{c\in CM} tq_c PM_c QM_c + YF_{g,f} + \sum_{c\in CM} tm_c EXR \cdot PWM_c QM_c + \sum_{c\in CM} te_c EXR \cdot PWE_c QE_c - \left[ subr_c PQ_c QQ_c + \left( TR_{s,g} + \sum_{h\in H} TR_{h,g} \right) CPI + \sum_{c\in C} PQ_c QG_c \right]$ | | 1 |
| 32 | $YFRM = YF_{s,k}$ | | 1 |
| 33 | $FRMS = YF_{s,k} - TR_{h,s}$ | | 1 |
| 34 | $QT_c = icd_c \, QD_c$ | | 9 |
| 35 | $SUB_c = subr_c PQ_c QQ_c$ | | 9 |

**Table C.9: Equations (System Constraint Block)**

| | | | |
|---|---|---|---|
| 36 | $\sum_{a\in A} QF_{f,a} + QFU_f = QFS_f$ | $f \in F$ | 16 |
| 37 | $QQ_c = \sum_{a\in A} QINT_{c,a} + \sum_{h\in H} QH_{c,h} + QG_c + QINV_c + QDST_c + QT_c$ | $c \in C$ | 9 |
| 38 | $FS + \sum_{c\in CE} PWE_c QE_c + \sum_{i\in I} TR_{i,r} = \sum_{c\in CM} PWM_c QM + \sum_{i\in I} TR_{r,i}$ | | 1 |
| 39 | $\text{WALR} = \left[ \sum_{h \in H} MPS_h \, (1\text{-}ty_h) YH_h + FRMS + GBS + EXR \,.\, BOP \right] - \sum_{c \in C} PQ_c \, QINV_c - \sum_{c = C} PQ_c QT_c$ | | 1 |

# APPENDIX-D

## Table D.10: Basic Structure of Macro SAM

| | (1)<br>**Activities** | (2)<br>**Commodities** | (3)<br>**Factors** | (4)<br>**Households** | (5)<br>**Enterprises** | (6)<br>**Government** | (7)<br>**Investment** | (8)<br>**Rest of the World** | (9)<br>**Total** |
|---|---|---|---|---|---|---|---|---|---|
| (1)<br>**Activities** | | A 1.2<br>Gross Output | | | | | | | **Gross Output** |
| (2)<br>**Commodities** | A 2.1<br>Intermediate Input | | | A 2.4<br>Households Consumption (C) | | A 2.6<br>Government Consumption (G) | A 2.7<br>Investment Expenditure (I) | A 2.8<br>Exports<br>(E) | **Aggregate Demand** |
| (3)<br>**Factors** | A 3.1<br>Value Added<br>(*YFC*) | | | | | | | | **Factor Income** |
| (4)<br>**Households** | | | A 4.3<br>Factor Income<br>($Y_f$) | | A 4.5<br>Distributed Profit<br>($TR_{eh}$) | A 4.6<br>Transfers<br>($TR_{gh}$) | | A 4.8<br>Foreign Transfer<br>($TR_{re}$) | **Household Income** |
| (5)<br>**Enterprises** | | | A 5.3<br>Factor Income<br>($Y_{ke}$) | | | A 5.6<br>Interest Payments<br>($TR_{ge}$) | | | **Enterprise Income** |
| (6)<br>**Government** | A 6.1<br>Taxes on Intermediate, Imports Duties ($I_t$) | | | A 6.4<br>Income Tax<br>($TR_{hg}$) | A 6.5<br>Profit Taxes<br>($TR_{eg}$) | | | | **Government Income** |
| (7)<br>**Savings** | | | A 7.3<br>Depreciation<br>($S_d$) | A 7.4<br>Households Saving<br>($S_h$) | A 7.5<br>Enterprises Saving<br>($S_e$) | A 7.6<br>Government Saving<br>($S_g$) | | A 7.8<br>Foreign Saving<br>($S_r$) | **Savings** |
| (8)<br>**Rest of the World** | | A 8.2<br>Imports<br>(*M*) | | A 8.4<br>Transfer to Rest of the World ($TR_{hr}$) | A 8.5<br>Transfer to Rest of the World<br>($TR_{er}$) | | | | **Foreign Exchange Outflow** |
| (9)<br>**Total** | **Cost of production** | **Aggregate Supply** | **Factor Expenditure** | **Household Expenditure** | **Enterprise Expenditure** | **Government Expenditure** | **Investment** | **Foreign Exchange Inflow** | |

[This macro SAM structure is extensively used structure and derived from transforming the macro SAM structure developed by Nielsen (2001) for Vietnam]

**Table D.11: Aggregation of Activities**

| Types of Activities in SAM 2010-11 | | | | | Author's Aggregation | | |
|---|---|---|---|---|---|---|---|
| Activities | Agriculture | A1a | A-WHTI | Wheat Irrigated | A1 | Agriculture | A-AGRI |
| | | A1b | A-WHTN | Wheat Non-Irrigated | | | |
| | | A2 | A-PADI | Paddy-IRRI | | | |
| | | A3 | A-PADB | Paddy-Basmati | | | |
| | | A4 | A-COTT | Raw Cotton | | | |
| | | A5 | A-SUGR | Sugarcane | | | |
| | | A6 | A-MAIZE | Maize | | | |
| | | A7 | A-OILS | Oilseeds (*sunflower, soyabean, mustard and rapeseed, linseed etc*.) | | | |
| | | A8 | A-OCRP | All other crops (*bajra, jowar, pulses, fodders, tobacco, flowers etc*.) | | | |
| | | A9 | A-POTA | Potato | | | |
| | | A10 | A-VEGE | Other Vegetables | | | |
| | | A11 | A-FRUI | Fruits *and* edible nuts (*almond, pistachio etc.; groundnuts also included here*). | | | |
| | | A12 | A-CATT | Cattle, sheep, goats *etc*. --- including wool *and* hair, raw fur skin *and* hides, and animal husbandry services; but not raw milk - *see* MILK | | | |
| | | A13 | A-MILK | Raw Milk | | | |
| | | A14 | A-POUL | Poultry *(and other domestic. birds*) - including eggs | | | |
| | | A15 | A-FORE | Forestry (*timber, logging and wild forest materials*) and Hunting | | | |
| | | A16 | A-FISH | Fishing | | | |
| | Mining | A17 | A-COIL | Mining of crude oil | A2 | Mining | A-MINE |
| | | A18 | A-NGAS | Mining of natural gas | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | A19 | A-COAL | Mining of coal, lignite, peat. Coke oven products also included here (*coke of coal, tar, other coke*) | | | |
| | | A20 | A-OMIN | Other Mining | | | |
| | Industry | A21 | A-MEAT | Other mining | A3 | Food Manufacturing | A-FMAN |
| | | A22 | A-DAIR | Meat *and* Meat Products: slaughtering, prep. of meat products, processing of raw hides *and* skins, offal *etc*. (*Rendering of edible fats excluded - see* EDOIL). | | | |
| | | A23 | A-VOIL | Milk, cream, ghee, butter, curd, cheese, ice-cream | | | |
| | | A24 | A-GMWH | Vegetable *and* animal oils *and* fats - may include non-edible products as well (waxes). Also, includes rendering *and* refining of edible fats (*in meat processing*). | | | |
| | | A25 | A-GMRI | Rice-Husking, Milling IRRI | | | |
| | | A26 | A-GMRB | Rice-Husking *and* Milling – Basmati | | | |
| | | A27 | A-SREF | Sugar | | | |
| | | A28 | A-FOOD | Other Food/ Beverage *and* Tobacco Products | | | |
| | | A29 | A-LINT | Cotton Ginning (*Lint*) | A4 | Cotton Lint/ Yarn | A-YARN |
| | | A30 | A-YARN | Cotton Spinning *and* Preparation of fibers (*yarn*) but may include other yarns of natural fibers (*wool, silk*) | | | |
| | | A31 | A-CLTH | Cotton Weaving | | | |
| | | A32 | A-KNIT | Knitted, Crotchet, Textile | A5 | Textile | A-TEXT |
| | | A33 | A-GARM | Wearing Apparel | | | |
| | | A34 | A-OTXT | Other Textiles | | | |

| | | | | | |
|---|---|---|---|---|---|
| A35 | A-LEAT | Leather | **A6** | **Leather** | **A-LEAT** |
| A36 | A-WOOD | Cotton Weaving (*cloth incl. cotton fabrics, terry toweling, weaving on khadi/ handloom*) | **A7** | **Other Manufacturing** | **A-MANF** |
| A37 | A-PETR | Wearing apparel (*excluding articles of leather and fur; see* LEAT) | | | |
| A38 | A-FERT | Manufacture of all other textiles (*synthetic fibers, yarns and fabrics; carpets, rugs, ropes and cordage, embroidery etc*.) … | | | |
| A39 | A-CHEM | Tanning of leather, manufacture of leather garments, fur garments, all footwear, luggage *and* saddlery | | | |
| A40 | A-CEME | Sawmilling, chipping, shaping, treating of wood; and manufacture of wood products (*panels, boards, plywood, veneer sheets, containers etc*.) … | | | |
| A41 | A-NMET | Baked construction products: ceramic tiles *and* flags, construction products of baked clay. Glass and glass products | | | |
| A42 | A-METL | Iron, Steel *and* Non-Ferrous Metals | | | |
| A43 | A-METP | Metal products (*cutlery, buckets, etc*.) | | | |
| A44 | A-APPL | Domestic Appliances *and* office Machinery | | | |
| A45 | A-MACH | General and specialized machinery (*for example, for use in production processes*) | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | A46 | A-VEHI | Vehicles *and* Transport Equipment | | | |
| | | A47 | A-OMAN | Paper, Publishing, Furniture | | | |
| | **Energy** | A48 | A-ELEC | Electricity Generation | **A8** | **Energy** | **A-ENER** |
| | | A49 | A-DIST | Electricity Distribution | | | |
| | **Services** | A50 | A-CONS | Construction | **A9** | **Services** | **A-SER** |
| | | A51 | A-TRAD | Wholesale *and* Retail Trade | | | |
| | | A52 | A-REST | Hotels *and* Restaurants | | | |
| | | A53 | A-TRAN | Transport, Cargo-Handling *and* Storage | | | |
| | | A54 | A-COMM | General and specialized machinery (*for example, for use in production processes*) | | | |
| | | A55 | A-FSRV | Finance (*public and private financial sector inst*.) | | | |
| | | A56 | A-BSRV | Business services | | | |
| | | A57 | A-REAL | Services of real estate agents and housing cooperative societies | | | |
| | | A58 | A-DWEL | Ownership of Dwellings | | | |
| | | A59 | A-PADM | Public services other than health *and* education (*public admin and defence, other*) | | | |
| | | A60 | A-EDUC | Public *and* Private Education | | | |
| | | A61 | A-HEAL | Public *and* Private Health, Social Work | | | |
| | | A62 | A-DSRV | Services of domestic staff | | | |
| | | A63 | A-OSRV | All other services (*renting of machinery, sports recreation culture, membership org, other*) as well as repair of M. Vehicles, personal services. | | | |

**Table D.12: Aggregation of Commodities**

| Types of Commodities in SAM 2010-11 | | | | | Author's Aggregation | | |
|---|---|---|---|---|---|---|---|
| Commodities | Agriculture | C1 | C-WHEA | Wheat | C1 | Agriculture | C-AGRI |
| | | C2 | C-PADI | Paddy-IRRI | | | |
| | | C3 | C-PADB | Paddy-Basmati | | | |
| | | C4 | C-COTT | Raw Cotton | | | |
| | | C5 | C-SUGR | Sugarcane | | | |
| | | C6 | C-MAIZE | Maize | | | |
| | | C7 | C-OILS | Oilseeds (*sunflower, soya bean, mustard and rapeseed, linseed etc*.) | | | |
| | | C8 | C-OCRP | All other crops (*bajra, jowar, pulses, fodders, tobacco, flowers etc*.) | | | |
| | | C9 | C-POTA | Potato | | | |
| | | C10 | C-VEGE | Other Vegetables | | | |
| | | C11 | C-FRUI | Fruits *and* edible nuts (*almond, pistachio etc.; groundnuts also included here*). | | | |
| | | C12 | C-CATT | Cattle, sheep, goats *etc*. - including wool *and* hair, raw fur skin *and* hides, and animal husbandry services; but not raw milk - *see* MILK | | | |
| | | C13 | C-MILK | Raw Milk | | | |
| | | C14 | C-POUL | Poultry *(and other domestic birds*) - including eggs | | | |
| | | C15 | C-FORE | Forestry (*timber, logging and wild forest materials*) and Hunting | | | |
| | | C16 | C-FISH | Fishing | | | |
| | Mining | C17 | C-COIL | Mining of crude oil | C2 | Mining | C-MINE |
| | | C18 | C-NGAS | Mining of natural gas | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | C19 | C-COAL | Mining of coal, lignite, peat. Coke oven products also included here (*coke of coal, tar, other coke*) | | | |
| | | C20 | C-OMIN | Other Mining | | | |
| | **Industry** | C21 | C-MEAT | Meat *and* Meat Products: slaughtering, prep. of meat products, processing of raw hides *and* skins, offal *etc*. (*Rendering of edible fats excluded - see* EDOIL). | **C3** | **Food Manufacturing** | **C-FMAN** |
| | | C22 | C-DAIR | Milk, cream, ghee, butter, curd, cheese, ice-cream | | | |
| | | C23 | C-VOIL | Vegetable *and* animal oils *and* fats - may include non-edible products as well (waxes). Also, includes rendering *and* refining of edible fats (*in meat processing*). | | | |
| | | C24 | C-GMWH | Wheat Milling (*Wheat Flour*) | | | |
| | | C25 | C-GMRI | Rice-Husking, Milling IRRI | | | |
| | | C26 | C-GMRB | Rice-Husking *and* Milling – Basmati | | | |
| | | C27 | C-SREF | Sugar | | | |
| | | C28 | C-FOOD | Other Food/ Beverage *and* Tobacco Products | | | |
| | | C29 | C-LINT | Cotton Ginning (*Lint*) | **C4** | **Cotton Lint/ Yarn** | **C-YARN** |
| | | C30 | C-YARN | Cotton Spinning and Preparation of fibers (*yarn*) but may include other yarns of natural fibers (*wool, silk*) | | | |
| | | C31 | C-CLTH | Cotton Weaving (*cloth incl. cotton fabrics, terry toweling, weaving on khadi/handloom*) | | | |
| | | C32 | C-KNIT | Knitted, Crotchet, Textile | **C5** | **Textile** | **C-TEXT** |
| | | C33 | C-GARM | Wearing apparel (*excluding articles of leather and fur; see* LEAT) | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | C34 | C-OTXT | Manufacture of all other textiles (*synthetic fibers, yarns and fabrics; carpets, rugs, ropes and cordage, embroidery etc*.) … | | | |
| | | C35 | C-LEAT | Tanning of leather, manufacture of leather garments, fur garments, all footwear, luggage *and* saddlery | **C6** | **Leather** | **C-LEAT** |
| | | C36 | C-WOOD | Sawmilling, chipping, shaping, treating of wood; and manufacture of wood products (*panels, boards, plywood, veneer sheets, containers etc*.) | **C7** | **Other Manufacturing** | **C-MANF** |
| | | C37 | C-PETR | Petroleum products incl. petroleum gases | | | |
| | | C38 | C-FERT | Fertilizers *and* Pesticides - Fertilizers *and* nitrogen compounds; and pesticides and agrochemical products | | | |
| | | C39 | C-CHEM | Chemicals (*not including fertilizers, pesticides - see* FNP). Radioactive elements included here… | | | |
| | | C40 | C-CEME | Cement, and all quarry-related products: lime, plaster, mixed concrete. Also included here: articles of fibre cement, concrete, plaster, mortars *etc*. for construction | | | |
| | | C41 | C-NMET | Baked construction products: ceramic tiles *and* flags, construction products of baked clay. Glass and glass products | | | |
| | | C42 | C-METL | Iron, Steel *and* Non-Ferrous Metals | | | |
| | | C43 | C-METP | Metal products (*cutlery, buckets, etc*.) | | | |
| | | C44 | C-APPL | Domestic Appliances *and* office Machinery | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | C45 | C-MACH | General and specialized machinery (*for example, for use in production processes*) | | | |
| | | C46 | C-VEHI | Vehicles *and* Transport Equipment | | | |
| | | C47 | C-OMAN | Paper, Publishing, Furniture | | | |
| | **Energy** | C48 | C-ELEC | Electricity Generation | **C8** | **Energy** | **C-ENER** |
| | | C49 | C-DIST | Electricity Distribution | | | |
| | **Services** | C50 | C-CONS | Construction | **C9** | **Services** | **C-SER** |
| | | C51 | C-TRAD | Wholesale *and* Retail Trade | | | |
| | | C52 | C-REST | Hotels and Restaurants | | | |
| | | C53 | C-TRAN | Transport, Cargo-Handling *and* Storage | | | |
| | | C54 | C-COMM | Telecomm, courier, post, cable TV providers, *and* internet service providers | | | |
| | | C55 | C-FSRV | Finance (*public and private financial sector inst.*) | | | |
| | | C56 | C-BSRV | Business services | | | |
| | | C57 | C-REAL | Services of real estate agents and housing cooperative societies | | | |
| | | C58 | C-DWEL | Public services other than health and education (*public admin and defense, other*) | | | |
| | | C59 | C-PADM | Public and private education services | | | |
| | | C60 | C-EDUC | Public and private health and social work services | | | |
| | | C61 | C-HEAL | Services of domestic staff | | | |
| | | C62 | C-DSRV | All other services (*renting of machinery, sports recreation culture, membership org, other*) as well as repair of M. Vehicles, personal services | | | |
| | | C63 | C-OSRV | Services of real estate agents and housing cooperative societies | | | |

**Table D.13: Aggregation of Other Accounts**

| Types of Other Accounts in SAM 2010-11 | | | | | Author's Aggregation | | |
|---|---|---|---|---|---|---|---|
| Other Accounts | Trans-action | J1 | TRC | Transaction Cost | **J1** | **Transaction** | **TRC** |
| | Enterprises | J2 | ENT-A | Enterprises – Agricultural | **J2** | **Enterprise** | **ENT** |
| | | J3 | ENT-F | Enterprises - Formal | | | |
| | | J4 | ENT-I | Enterprises - Informal | | | |
| | Govt. | J5 | GOV | Government | **J3** | **Govt.** | **GOV** |
| | Subsidies | J6 | ASUB | Activity Subsidies | **J4** | **Subsidies** | **SUB** |
| | Sales Taxes | J7 | STAX-EXC | Sales Taxes - Excise | **J5** | **Sales Tax** | **STAX** |
| | | J8 | STAX-GSTD | Sales Taxes - GST on Domestic | | | |
| | | J9 | STAX-GSTM | Sales Taxes - GST on Imports | | | |
| | | J10 | STAX-SUR | Sales-Taxes - Surcharge | | | |
| | Import Duty | J11 | MTAX | Import Duties | **J6** | **Import Duty** | **MTAX** |
| | Rebates | J12 | ETAX-GST | Export-Based Sales Tax Rebate | **J7** | **Rebate** | **ETAX** |
| | | J13 | ETAX-DUT | Export-Based Import Duty Rebate | | | |
| | Tax | J14 | DTAX | Direct Taxes | **J8** | **Direct Tax** | **DTAX** |
| | Stocks | J15 | DSTK | Change in Stocks | **J9** | **S-I** | **S-I** |
| | | J16 | S-I | Savings - Investment | | | |
| | World | J17 | ROW | Rest of World | **J10** | **Rest of World** | **ROW** |
| | Total | | **TOTL** | **Total** | | **Total** | **TOTL** |

**Table D.14: Goods for Domestic Market and Export Market for the year 2010-11**

| | Total Production (Pak Rs. Million) | Domestic Demand for Total Production (Pak Rs. Million) | Domestic Demand as % of Total Production | Exports of Goods (Pak Rs. Million) | Export as % of Total Production | Sectoral Share in Total Exports (%) |
|---|---|---|---|---|---|---|
| **A-AGRI** | 5435.949 | 5364.716 | 98.68959 | 71.23308 | 1.3104 | 2.76 |
| **A-MINE** | 581.0389 | 536.43459 | 92.32335 | 44.60431 | 7.67664 | 1.73 |
| **A-FMAN** | 4035.255 | 3772.2482 | 93.48227 | 263.0068 | 6.51772 | 10.21 |
| **A-YARN** | 1829.58 | 1439.8104 | 78.69622 | 389.7696 | 21.30377 | 15.12 |
| **A-TEXT** | 1428.062 | 510.0688 | 35.71755 | 917.9932 | 64.28244 | 35.62 |
| **A-LEAT** | 269.4879 | 190.26014 | 70.60062 | 79.22776 | 29.39937 | 3.07 |
| **A-MANF** | 3811.188 | 3418.9295 | 89.970771 | 392.2585 | 10.1029228 | 15.22 |
| **A-ENRG** | 2197.714 | 2197.714 | 100 | 0 | 0 | 0 |
| **A-SER** | 15160.06 | 14740.705 | 97.23381 | 419.3551 | 2.76618 | 16.27 |
| **Totals** | **34748.333** | **32170.884** | **-** | **2577.4482** | **-** | **100** |

*Source: SAM 2010-11*

**Table D.15: Aggregation of Factors**

| Types of Factors in SAM 2010-11 | | | | | Author's Aggregation | | |
|---|---|---|---|---|---|---|---|
| Factors | Labor | F1 | FLAB-S | Labor - Small Farmer | F1 | Labor | LAB |
| | | F2 | FLAB-M | Labor -Medium Farmer | | | |
| | | F3 | FLAB-W | Labor - Farm Worker | | | |
| | | F4 | FLAB-L | Labor - Non-Farm Low Skilled | | | |
| | | F5 | FLAB-H | Labor - Non-Farm High Skilled | | | |
| | Land | F6 | FLND-S | Land - Small | F2 | Land | LND |
| | | F7 | FLND-M | Land - Medium | | | |
| | | F8 | FLND-L | Land - Large | | | |
| | Capital | F9 | FLIV | Livestock | F3 | Capital | CAP |
| | | F10 | FCAP-A | Capital - Agriculture | | | |
| | | F11 | FCAP-F | Capital - Formal | | | |
| | | F12 | FCAP-I | Capital - Informal | | | |

**Table D.16: Aggregation of Households**

| Types of Households in SAM 2010-11 | | | | | Author`s Aggregation |
|---|---|---|---|---|---|
| Institutions | Rural Households | H1 | HHD-RS1 | Rural Small Farmer (Quartile 1) | **H-RS1** |
| | | H2 | HHD-RS234 | Rural Small Farmer (Quartile 234) | **H-RS234** |
| | | H3 | HHD-RM1 | Rural Medium Farmer (Quartile 1) | **H-RM1** |
| | | H4 | HHD-RM234 | Rural Medium Farmer (Quartile 234) | **H-RM234** |
| | | H5 | HHD-RL1 | Rural Landless Farmer (Quartile 1) | **H-RL1** |
| | | H6 | HHD-RL234 | Rural Landless Farmer (Quartile 234) | **H-RL234** |
| | | H7 | HHD-RW1 | Rural Farm Worker (Quartile 1) | **H-RW1** |
| | | H8 | HHD-RW234 | Rural Farm Worker (Quartile 234) | **H-RW234** |
| | | H9 | HHD-RN1 | Rural Non-Farm (Quartile 1) | **H-RN1** |
| | | H10 | HHD-RN2 | Rural Non-Farm (Quartile 2) | **H-RN2** |
| | | H11 | HHD-RN3 | Rural Non-Farm (Quartile 3) | **H-RN3** |
| | | H12 | HHD-RN4 | Rural Non-Farm (Quartile 4) | **H-RN4** |
| | Urban Households | H13 | HHD-U1 | Urban (Quartile 1) | **H-U1** |
| | | H14 | HHD-U2 | Urban (Quartile 2) | **H-U2** |
| | | H15 | HHD-U3 | Urban (Quartile 3) | **H-U3** |
| | | H16 | HHD-U4 | Urban (Quartile 4) | **H-U4** |

**Table D.17: Characteristics of Household Groups**

*[Rural Population: 104251, Urban Population: 41709]*

| Household Groups | Population (Thousands) | Income (Pak Rs.) | % Population (Share) | Per-Capita Income | Wage Income (% Share) | Income From Land (% Share) | Capital Income (% Share) | Transfer (% Share) |
|---|---|---|---|---|---|---|---|---|
| **H-RS1** | 7993 | 275.6327 | 5.4762 | 34.4843 | 0.2639 | 0.2098 | 0.3451 | 0.1812 |
| **H-RS234** | 23978 | 2232.853 | 16.4278 | 93.1209 | 0.2150 | 0.1899 | 0.3934 | 0.2017 |
| **H-RM1** | 608 | 14.13264 | 0.4165 | 23.2444 | 0.2874 | 0.3542 | 0.1767 | 0.1817 |
| **H-RM234** | 5520 | 853.3687 | 3.7818 | 154.5957 | 0.2549 | 0.3172 | 0.2551 | 0.1728 |
| **H-RL1** | 2952 | 194.3888 | 2.0225 | 65.8498 | 0.2818 | 0.3147 | 0.1934 | 0.2101 |
| **H-RL234** | 8855 | 947.8456 | 6.0667 | 107.0407 | 0.2880 | 0.2414 | 0.2172 | 0.2534 |
| **H-RW1** | 2397 | 238.9349 | 1.6423 | 99.6808 | 0.5093 | 0 | 0.3881 | 0.1026 |
| **H-RW234** | 7190 | 722.2187 | 4.9260 | 100.4476 | 0.3917 | 0 | 0.4793 | 0.1290 |
| **H-RN1** | 9589 | 481.5706 | 6.5696 | 50.2212 | 0.6874 | 0 | 0 | 0.3126 |
| **H-RN2** | 13125 | 645.3767 | 8.9922 | 49.1715 | 0.5638 | 0 | 0 | 0.4362 |
| **H-RN3** | 11832 | 849.5021 | 8.1063 | 71.7970 | 0.4562 | 0 | 0 | 0.5438 |
| **H-RN4** | 10212 | 1388.453 | 6.9964 | 135.9629 | 0.2614 | 0 | 0 | 0.7386 |
| **H-U1** | 16573 | 271.7564 | 11.3545 | 16.3975 | 0.6250 | 0.0260 | 0.0086 | 0.3404 |
| **H-U2** | 13256 | 657.4251 | 9.0820 | 49.5945 | 0.5862 | 0.0118 | 0.0120 | 0.3900 |
| **H-U3** | 6716 | 1366.653 | 4.6013 | 203.4921 | 0.4770 | 0.0072 | 0.0203 | 0.4955 |
| **H-U4** | 5164 | 6979.068 | 3.5379 | 1351.4849 | 0.2847 | 0.0046 | 0.0022 | 0.7085 |
| **ALL PAKISTAN** | **145960** | **18119.1799** | **100** | **124.1379** | **6.4337** | **1.6768** | **2.4914** | **5.3981** |

*Source: SAM 2010-11*

**Table D.18: Household Consumption and Consumption Share (%)**

| | RHH | | UHH | |
|---|---|---|---|---|
| | **Consumption** | **Consumption Share (%)** | **Consumption** | **Consumption Share (%)** |
| **C-AGRI** | 1628.339 | 21.53 | 1135.112 | 16.18 |
| **C-MINE** | 46.52531 | 0.62 | 113.543 | 1.62 |
| **C-FMAN** | 2456.68 | 32.50 | 1876.862 | 26.76 |
| **C-YARN** | 476.8822 | 6.31 | 403.9388 | 5.76 |
| **C-TEXT** | 153.4767 | 2.03 | 152.844 | 2.18 |
| **C-LEAT** | 78.27357 | 1.03 | 65.54227 | 0.94 |
| **C-MANF** | 906.9343 | 12.00 | 882.0735 | 12.57 |
| **C-ENRG** | 225.5481 | 2.98 | 328.1742 | 4.68 |
| **C-SER** | 1587.676 | 21.00 | 2055.741 | 29.31 |
| **Total** | **7560.33518** | **100** | **7013.8307** | **100** |

*Source: SAM 2010-11*

**Table D.19: Sources of Government Revenues**

| **Sources** | **Government Revenue Pak Rs. (Million)** | **% Share in Total Revenues** |
|---|---|---|
| **Direct Tax** (Income Tax) | 669.0353 | 37.19 |
| **Indirect Tax** (Sales Tax) | 940.8886 | 52.30 |
| **Tariff** | 189.0833 | 10.51 |
| **Total** | **1799.0072** | **100** |

*Source: SAM 2010-11*

## *Savings and Investment balance in 2010-11*

**Table D.20: Savings**

| Savings | Rs. (*Million*) | % of Total Savings |
|---|---|---|
| **Households Savings** | 3159.34429 | 110.41 |
| **Enterprises Savings** | 365.0933 | 12.76 |
| **Government Savings** | -812.25881 | -28.38 |
| **Foreign Savings** | -142.4977 | -4.98 |
| **Other Savings** | 291.7022 | 10.19 |
| **Total** | **2861.384** | **100** |

*Source: SAM 2010-11*

**Table D.21: Investment**

| Investment Sector | Rs. (*Million*) | % of Investment |
|---|---|---|
| **Agriculture** | 408.8557 | 14.29 |
| **Mining** | 30.2435 | 1.06 |
| **Food Manufacturing** | 35.81618 | 1.25 |
| **Cotton Lint/ Yarn** | 86.8019 | 3.03 |
| **Textile** | 13.58047 | 0.47 |
| **Leather** | 7.586272 | 0.27 |
| **Other Manufacturing** | 854.4276 | 29.86 |
| **Energy** | 0.256011 | 0.01 |
| **Services** | 1132.114 | 39.57 |
| **Other Investments** | 291.7022 | 10.19 |
| **Total** | **2861.384** | **100** |

*Source: SAM 2010-11*

**Table D.22: Armington Elasticities in Selected Countries**

| Source | Armington Elasticity | Country |
|---|---|---|
| **Alaouze et al. (1977)** | 2 | Australia |
| **Vincent (1986)** | 2 | Chile |
| **Vincent (1986)** | 0.5 to 5.0 | Colombia |
| **Vincent (1986)** | 2 | Ivory Coast |
| **Vincent (1986)** | 0.5 to 5.0 | Kenya |
| **Vincent (1986)** | 0.5 to 5.0 | India |
| **Vincent (1986)** | 0.2 to 2.0 | Turkey |
| **Vincent (1986)** | Less than 2 | South Korea |
| **Kapuscinski and Warr (1992)** | 2 | Philippines |
| **Comber (1995)** | 1.64 to 3.5 | New Zealand |
| **Kapuscinski and Warr (1996)** | 0.04 to 3.8 | Philippines |

*Source: Samaratne, W. G. (1998)*

**Table D.23: Trade Elasticities**

| Commodities | Armington Elasticities | CET Elasticity |
|---|---|---|
| **C-AGRI** | 4.0 | 4.0 |
| **C-MINE** | 3.0 | 3.0 |
| **C-FMAN** | 3.5 | 3.0 |
| **C-YARN** | 3.2 | 3.0 |
| **C-TEXT** | 3.5 | 3.0 |
| **C-LEAT** | 3.5 | 3.0 |
| **C-MANF** | 3.2 | 3.0 |
| **C-ENRG** | 3.0 | 3.0 |
| **C-SER** | 2.7 | 2.0 |

*Source: Ahmad et al (2008)*

**Table D.24: Total Number of Labor in Employment (Thousands)**

| | A-AGRI | A-MINE | A-FMAN | A-YARN | A-TEXT | A-LEAT | A-MANF | A-ENRG | A-SER |
|---|---|---|---|---|---|---|---|---|---|
| **LAB** | 4636418 | 201794 | 1112073 | 355907 | 1050308 | 24651 | 1448249 | 730120 | 33650474 |

*Source: LFS 2001-02*

**Table D.25: Total Income from Work (Million Pak Rs.)**

| | A-AGRI | A-MINE | A-FMAN | A-YARN | A-TEXT | A-LEAT | A-MANF | A-ENRG | A-SER |
|---|---|---|---|---|---|---|---|---|---|
| **LAB** | 950.8099 | 55.93377 | 196.4617 | 81.97799 | 86.26352 | 22.32179 | 170.8978 | 75.19767 | 4506.78 |
| **LND** | 1105.086 | - | - | - | - | - | - | - | - |
| **CAP** | 2450.377 | 449.1861 | 611.3547 | 351.0882 | 139.8931 | 36.65484 | 871.3269 | 346.8706 | 4866.62 |

*Source: SAM 2010-11*

**Table D.26: Activity Specific Labor Wage (Pk Rs. Billions)**

| | A-AGRI | A-MINE | A-FMAN | A-YARN | A-TEXT | A-LEAT | A-MANF | A-ENRG | A-SER |
|---|---|---|---|---|---|---|---|---|---|
| **LAB** | 4.8762828 | 3.607731 | 5.6605078 | 43.4149945 | 12.175575 | 1.1043469 | 8.4743571 | 9.7093433 | 0.74666324 |

*Source: Calculated by using Table 3.15 and Table 3.1*

**Table D.27: Initial Reward Rates for Factors of Production**

| | A-AGRI | A-MINE | A-FMAN | A-YARN | A-TEXT | A-LEAT | A-MANF | A-ENRG | A-SER |
|---|---|---|---|---|---|---|---|---|---|
| **LAB** | 1.0635 | 1.0475 | 1.0475 | 1.0475 | 1.0475 | 1.0475 | 1.0475 | 1.0475 | 1.0475 |
| **LND** | 1.03875 | - | - | - | - | - | - | - | - |
| **CAP** | 1.066 | 1.061 | 1.067 | 1.067 | 1.067 | 1.067 | 1.066 | 1.061 | 1.068 |

*Source: Ahmad et al. (2008)*

# APPENDIX-E

## Social Accounting Matrix (SAM)

### Table E.28: PAKISTAN SAM 2010-11 (in Million PKR)

| ACCOUNTS | | A1 | A2 | A3 | A4 | A5 | A6 |
|---|---|---|---|---|---|---|---|
| | | A-AGRI | A-MINE | A-FMAN | A-YARN | A-TEXT | A-LEAT |
| A1 | A-AGRI | | | | | | |
| A2 | A-MINE | | | | | | |
| A3 | A-FMAN | | | | | | |
| A4 | A-YARN | | | | | | |
| A5 | A-TEXT | | | | | | |
| A6 | A-LEAT | | | | | | |
| A7 | A-MANF | | | | | | |
| A8 | A-ENRG | | | | | | |
| A9 | A-SER | | | | | | |
| C1 | C-AGRI | 325.3186611 | 0.00173254 | 2288.12883 | 426.690565 | 125.826888 | 4.7599851 |
| C2 | C-MINE | 0 | 1.77468807 | 1.64146098 | 0.65209532 | 0 | 0 |
| C3 | C-FMAN | 185.4099847 | 0.01699397 | 543.664024 | 1.70754562 | 6.77390913 | 5.08365647 |
| C4 | C-YARN | 0.494778341 | 0.00173254 | 10.5244675 | 636.737068 | 225.913956 | 9.80984275 |
| C5 | C-TEXT | 1.5937625 | 0.37639543 | 28.7086409 | 5.71701033 | 378.374051 | 47.7941837 |
| C6 | C-LEAT | 0 | 0 | 0 | 0.78513379 | 22.5974734 | 62.6139781 |
| C7 | C-MANF | 308.4835739 | 35.3911087 | 102.745464 | 83.8656658 | 168.178625 | 36.8444586 |
| C8 | C-ENRG | 37.18953094 | 4.04501533 | 72.86589 | 81.0644268 | 72.8300787 | 8.5029173 |
| C9 | C-SER | 71.18508227 | 34.3113484 | 179.159357 | 167.552721 | 209.659188 | 35.1022568 |
| F1 | LAB | 950.8099379 | 55.9337742 | 196.461693 | 81.9779935 | 86.2635195 | 22.3217889 |
| F2 | LND | 1105.086498 | 0 | 0 | 0 | 0 | 0 |
| F3 | CAP | 2450.376936 | 449.186069 | 611.354711 | 351.088234 | 139.893106 | 36.6548383 |
| H1 | H-RS1 | | | | | | |
| H2 | H-RS234 | | | | | | |
| H3 | H-RM1 | | | | | | |
| H4 | H-RM234 | | | | | | |
| H5 | H-RL1 | | | | | | |
| H6 | H-RL234 | | | | | | |
| H7 | H-RW1 | | | | | | |
| H8 | H-RW234 | | | | | | |
| H9 | H-RN1 | | | | | | |
| H10 | H-RN2 | | | | | | |
| H11 | H-RN3 | | | | | | |
| H12 | H-RN4 | | | | | | |
| H13 | H-U1 | | | | | | |
| H14 | H-U2 | | | | | | |
| H15 | H-U3 | | | | | | |
| H16 | H-U4 | | | | | | |
| J1 | TRC | | | | | | |
| J2 | ENT | | | | | | |
| J3 | GOV | | | | | | |
| J4 | SUB | 0 | 0 | 0 | -8.258307 | -8.248573 | 0 |
| J5 | STAX | | | | | | |
| J6 | MTAX | | | | | | |
| J7 | ETAX | | | | | | |
| J8 | DTAX | | | | | | |
| J9 | S-I | | | | | | |
| J10 | ROW | | | | | | |
| Total | | **5435.948746** | **581.038858** | **4035.25454** | **1829.58015** | **1428.06222** | **269.487906** |

| A7 | A8 | A9 | C1 | C2 | C3 | C4 |
|---|---|---|---|---|---|---|
| **A-MANF** | **A-ENRG** | **A-SER** | **C-AGRI** | **C-MINE** | **C-FMAN** | **C-YARN** |
| | | | 5435.948746 | 0 | 0 | 0 |
| | | | 0 | 581.0388582 | 0 | 0 |
| | | | 0 | 0 | 4035.254542 | 0 |
| | | | 0 | 0 | 0 | 1829.580152 |
| | | | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | 0 | 0 |
| 6.081314231 | 0 | 157.2058756 | | | | |
| 607.5963692 | 271.4243041 | 63.42081444 | | | | |
| 25.90725358 | 0 | 277.8992369 | | | | |
| 1.574325832 | 0 | 10.69134488 | | | | |
| 24.47544513 | 0.20078998 | 59.85710919 | | | | |
| 4.906157458 | 0 | 20.84587925 | | | | |
| 1584.233597 | 826.9731234 | 1889.182018 | | | | |
| 150.8485559 | 1059.22033 | 169.0752119 | | | | |
| 363.3402752 | 21.71655706 | 3138.484975 | | | | |
| 170.8977846 | 75.1976662 | 4506.779662 | | | | |
| 0 | 0 | 0 | | | | |
| 871.3268909 | 346.8706487 | 4866.620315 | | | | |
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| | | | 1011.432575 | 139.7921324 | 1149.72906 | 348.5447645 |
| | | | | | | |
| | | | | | | |
| 0 | -403.8889726 | 0 | | | | |
| | | | 18.82846663 | 69.08845399 | 172.5453552 | 4.911625791 |
| | | | 3.771877386 | 0 | 30.74649788 | 4.299165336 |
| | | | -0.971604129 | -4.662605059 | -3.018302078 | -4.597844391 |
| | | | | | | |
| | | | | | | |
| | | | 108.5434248 | 396.1689694 | 293.5702483 | 70.40215643 |
| **3811.18797** | **2197.71445** | **15160.0624** | **6577.55349** | **1181.42581** | **5678.8274** | **2253.14002** |

*Continued…(2/7)*

| C5 | C6 | C7 | C8 | C9 | F1 | F2 |
|---|---|---|---|---|---|---|
| **C-TEXT** | **C-LEAT** | **C-MANF** | **C-ENRG** | **C-SER** | **LAB** | **LND** |
| 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | | |
| 0 | 0 | 0 | 0 | 0 | | |
| 1428.062221 | 0 | 0 | 0 | 0 | | |
| 0 | 269.4879061 | 0 | 0 | 0 | | |
| 0 | 0 | 3811.187969 | 0 | 0 | | |
| 0 | 0 | 0 | 2197.714447 | 0 | | |
| 0 | 0 | 0 | 0 | 15160.06244 | | |
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| | | | | | | |
| | | | | | 72.74486146 | 57.84055032 |
| | | | | | 480.073538 | 424.1775149 |
| | | | | | 4.061641017 | 5.005443843 |
| | | | | | 217.5259019 | 270.717445 |
| | | | | | 54.79218567 | 61.18668927 |
| | | | | | 272.9759821 | 228.8789081 |
| | | | | | 121.7017238 | 0 |
| | | | | | 282.924717 | 0 |
| | | | | | 331.027955 | 0 |
| | | | | | 363.9188964 | 0 |
| | | | | | 387.5536553 | 0 |
| | | | | | 363.0719481 | 0 |
| | | | | | 169.8424995 | 7.069660619 |
| | | | | | 385.3749489 | 7.777345263 |
| | | | | | 651.9015068 | 9.904901697 |
| | | | | | 1,987.15 | 32.52803926 |
| 277.2143937 | 66.12963416 | 1647.24546 | 0 | 0 | | |
| | | | | | 0 | 0 |
| | | | | | | |
| | | | | | | |
| 5.119184348 | 0.433464333 | 561.6367436 | 19.57363181 | 88.75163648 | | |
| 9.744629116 | 1.51919096 | 139.001942 | 0 | 0 | | |
| -2.85332755 | -1.3154582 | -28.6005655 | -7.66785722 | 0 | | |
| | | | | | | |
| | | | | | | |
| 67.70463308 | 6.123754283 | 1941.120009 | 0 | 585.9047313 | | |
| **1784.99173** | **342.378492** | **8071.59156** | **2209.62022** | **15834.7188** | **6146.64382** | **1105.0865** |

*Continued…(3/7)*

| F3 | H1 | H2 | H3 | H4 | H5 | H6 |
|---|---|---|---|---|---|---|
| **CAP** | **H-RS1** | **H-RS234** | **H-RM1** | **H-RM234** | **H-RL1** | **H-RL234** |
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| | 62.70 | 447.42 | 2.95 | 135.16 | 40.25 | 193.44 |
| | 0.41 | 8.26 | 0.00 | 3.19 | 0.12 | 2.98 |
| | 94.44 | 594.01 | 5.02 | 188.22 | 74.29 | 280.68 |
| | 16.99 | 115.56 | 1.11 | 38.45 | 12.29 | 53.88 |
| | 4.45 | 38.12 | 0.17 | 13.48 | 2.79 | 14.85 |
| | 2.66 | 18.41 | 0.17 | 5.44 | 2.04 | 8.16 |
| | 21.89 | 210.97 | 1.27 | 110.27 | 14.86 | 97.20 |
| | 6.35 | 52.47 | 0.29 | 19.81 | 4.35 | 24.25 |
| | 42.03 | 392.03 | 2.19 | 130.33 | 30.73 | 167.40 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 95.13231376 | | | | | | |
| 878.5513591 | | | | | | |
| 2.49810616 | | | | | | |
| 217.6595821 | | | | | | |
| 37.61142102 | | | | | | |
| 205.9359733 | | | | | | |
| 92.72169798 | | | | | | |
| 346.2098588 | | | | | | |
| 0 | | | | | | |
| 0 | | | | | | |
| 0 | | | | | | |
| 0 | | | | | | |
| 2.356368078 | | | | | | |
| 7.901666526 | | | | | | |
| 27.81978746 | | | | | | |
| 15.08076634 | | | | | | |
| | | | | | | |
| 8193.892848 | | | | | | |
| | 0.03 | 1.56 | 0.00 | 0.85 | 0.02 | 0.58 |
| | | | | | | |
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| | | | | | | |
| | | | | | | |
| | | 12.46 | | 4.01 | | 23.18 |
| | 23.68192145 | 341.5843221 | 0.960086488 | 204.1536758 | 12.65057368 | 81.24281595 |
| | | | | | | |
| **10123.3717** | **275.6326556** | **2232.853377** | **14.13264176** | **853.3686793** | **194.388825** | **947.8455674** |

*Continued…(4/7)*

| **H7** | **H8** | **H9** | **H10** | **H11** | **H12** | **H13** |
|---|---|---|---|---|---|---|
| **H-RW1** | **H-RW234** | **H-RN1** | **H-RN2** | **H-RN3** | **H-RN4** | **H-U1** |
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| | | | | | | |
| 53.69 | 159.32 | 96.00 | 126.02 | 149.24 | 162.16 | 45.26 |
| 0.17 | 2.23 | 1.57 | 3.53 | 8.40 | 15.66 | 3.95 |
| 92.64 | 232.91 | 186.61 | 226.34 | 241.03 | 240.48 | 93.71 |
| 16.35 | 41.94 | 33.94 | 41.12 | 49.32 | 55.92 | 18.43 |
| 4.02 | 13.17 | 8.81 | 13.82 | 17.32 | 22.48 | 4.67 |
| 2.71 | 6.46 | 5.83 | 7.64 | 8.99 | 9.74 | 3.02 |
| 19.78 | 71.53 | 40.87 | 58.55 | 75.82 | 183.92 | 22.92 |
| 6.11 | 18.77 | 14.68 | 20.68 | 25.34 | 32.46 | 11.58 |
| 42.36 | 136.22 | 83.26 | 121.99 | 160.84 | 278.30 | 50.96 |
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| 0.00 | 0.14 | 0.01 | 0.09 | 0.30 | 0.73 | 0.01 |
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| | | | | | | |
| | | | | | | |
| | 6.83 | | | 12.85 | 35.81 | |
| 1.105093274 | 32.68525154 | 9.986476824 | 25.59122695 | 100.0661518 | 350.7887897 | 17.23853077 |
| | | | | | | |
| **238.9348635** | **722.2187421** | **481.5706166** | **645.3766653** | **849.5020593** | **1388.452779** | **271.7564102** |

*Continued…(5/7)*

| H14 | H15 | H16 | J1 | J2 | J3 | J4 |
|---|---|---|---|---|---|---|
| **H-U2** | **H-U3** | **H-U4** | **TRC** | **ENT** | **GOV** | **SUB** |
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| 110.23 | 211.63 | 767.98 | 0 | | 0 | |
| 10.81 | 22.50 | 76.29 | 0 | | 0 | |
| 201.44 | 356.85 | 1,224.86 | 0 | | 0 | |
| 39.40 | 71.54 | 274.57 | 0 | | 0 | |
| 13.19 | 24.99 | 109.99 | 0 | | 0 | |
| 6.68 | 11.94 | 43.90 | 0 | | 0 | |
| 56.41 | 128.24 | 674.50 | 0 | | 0 | |
| 27.08 | 56.44 | 233.08 | 0 | | 0 | |
| 135.75 | 288.17 | 1,580.87 | 4640.08802 | | 1779.232166 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | 39.35070486 | 3.98 | |
| | | | | 313.2369007 | 12.24 | |
| | | | | 2.24122009 | 0.12 | |
| | | | | 125.474997 | 3.66 | |
| | | | | 36.41266977 | 2.47 | |
| | | | | 198.8549411 | 6.94 | |
| | | | | 18.5675713 | 4.14 | |
| | | | | 68.16698555 | 8.81 | |
| | | | | 121.0743659 | 12.42 | |
| | | | | 231.6308662 | 10.35 | |
| | | | | 375.1632134 | 10.94 | |
| | | | | 835.086594 | 10.07 | |
| | | | | 85.24761622 | 3.59 | |
| | | | | 239.4273533 | 6.95 | |
| | | | | 630.6238056 | 9.68 | |
| | | | | 4,537.97 | 34.15 | |
| | | | | | | |
| | | | | | 707.2889351 | |
| 0.04 | 0.42 | 5.94 | | 511.9690637 | | -420.3958533 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | 33.47 | 257.06 | | 283.3666219 | 0 | |
| 56.40894758 | 160.4616707 | 1730.039198 | | 365.093257 | -801.5586376 | |
| | | | | 267.492581 | 68.09015988 | |
| **657.4250863** | **1366.652822** | **6979.068164** | **4640.08802** | **9286.45231** | **1893.55025** | **-420.395853** |

*Continued…(6/7)*

| J5<br>STAX | J6<br>MTAX | J7<br>ETAX | J8<br>DTAX | J9<br>S-I | J10<br>ROW | Total |
|---|---|---|---|---|---|---|
| | | | | | | 5435.94875 |
| | | | | | | 581.038858 |
| | | | | | | 4035.25454 |
| | | | | | | 1829.58015 |
| | | | | | | 1428.06222 |
| | | | | | | 269.487906 |
| | | | | | | 3811.18797 |
| | | | | | | 2197.71445 |
| | | | | | | 15160.0624 |
| | | | | 408.8557329 | 71.2330823 | 6577.55349 |
| | | | | 30.24349716 | 44.60431044 | 1181.42581 |
| | | | | 35.81617896 | 263.006809 | 5678.8274 |
| | | | | 86.80190296 | 389.7696309 | 2253.14002 |
| | | | | 13.58046519 | 917.9931511 | 1784.99173 |
| | | | | 7.586271689 | 79.22776406 | 342.378492 |
| | | | | 854.4275925 | 392.2584895 | 8071.59156 |
| | | | | 0.256011111 | 0 | 2209.62022 |
| | | | | 1132.114005 | 419.3550924 | 15834.7188 |
| | | | | | | 6146.64382 |
| | | | | | | 1105.0865 |
| | | | | | | 10123.3717 |
| | | | | | 6.579715513 | 275.632656 |
| | | | | | 124.5764337 | 2232.85338 |
| | | | | | 0.210497446 | 14.1326418 |
| | | | | | 18.32957404 | 853.368679 |
| | | | | | 1.919343268 | 194.388825 |
| | | | | | 34.26214424 | 947.845567 |
| | | | | | 1.808746627 | 238.934864 |
| | | | | | 16.10944245 | 722.218742 |
| | | | | | 17.0488408 | 481.570617 |
| | | | | | 39.47889338 | 645.376665 |
| | | | | | 75.84596682 | 849.502059 |
| | | | | | 180.2201873 | 1388.45278 |
| | | | | | 3.652448694 | 271.75641 |
| | | | | | 9.991359528 | 657.425086 |
| | | | | | 36.7258768 | 1366.65282 |
| | | | | | 372.1828567 | 6979.06816 |
| | | | | | | 4640.08802 |
| | | | | | 385.270524 | 9286.45231 |
| 940.8885622 | 189.0833026 | -53.6875642 | 669.0353466 | | 45.95718091 | 1893.55025 |
| | | | | | | -420.395853 |
| | | | | | | 940.888562 |
| | | | | | | 189.083303 |
| | | | | | | -53.6875642 |
| | | | | | | 669.035347 |
| | | | | 291.7021614 | -142.4976948 | 2861.38382 |
| | | | | | | 3805.12067 |
| **940.888562** | **189.083303** | **-53.6875642** | **669.035347** | **2861.38382** | **3805.12067** | **137988.386** |

*Source: International Food Policy Research Institute (IFPRI), Pakistan Strategy Support Program (PSSP), (Dorosh, Niazi and Nazli 2015)* *(7/7)*

# APPENDIX-F

**Table F.29: Summary of the Review of Literature Using CGE Model**

| Author | Methodology | Policy Focus | Results |
|---|---|---|---|
| **Jesus B. G.<br>and<br>Manuel C. G.<br>(2018)**<br>Colombia | CGE<br>Model | Fiscal Policy<br>and<br>Inequality<br>in CGE Model<br>For Colombia | 1. Through compensated variation, the welfare does not change after an increase in indirect taxes.<br>2. It is easy to move from taxing production process to taxing its results, reducing corporate income tax rates and making compensation, with the increase in individual income tax, even keeping no tax on lower-income part of the population.<br>3. Through lessening companies` tax burden, capital accumulation can be stimulated, with eminent encouraging outcomes for the medium as well as long-run growth, without adversely affecting the system`s progressivity |
| **Bhattarai and<br>Trzeciakiewicz<br>(2016)**<br>UK | DSGE<br>Model | Macroeconomic<br>Impacts of Fiscal<br>Policy Shocks in the<br>UK: A DSGE Analysis | 1. Public consumption and investment generate the highest GDP multiplier in short-run, while capital income tax, as well as public investment, has a leading influence on GDP in the long-run.<br>2. Capital and labor income tax are founded to be the slightest effective. |

| | | | |
|---|---|---|---|
| **Daniel A. M. (2016)**<br>Ethiopia | CGE Model | The Impact of Fiscal Policy on Poverty: A Computable General Equilibrium Microsimulation Analysis | 1. Tax policy has a major unfavorable impact on poverty in short-run.<br>2. Policy makers are required to consider these adverse impacts and come up with the pro-poor expenditure policies that would shelter the households from adverse anxieties while financing policies go along |
| **A. A. Bhatti, Z. Batool and H. A. Naqvi (2015)**<br>Pakistan | CGE Model | Fiscal Policy and its Role in Reducing Income Inequality: A CGE Analysis for Pakistan | 1. a policy mix of income tax, sales tax and public spending abet to reduce inequality while at the same minimizes financial dependency of the economy. |
| **Malik (2013)**<br>Pakistan | CGE Model | The Effects of Fiscal Spending Shocks on the Performance of Simple Monetary Policy Rules | 1. The study proposes that some form of flexible inflation targeting command would perform well in response to fiscal shocks compared to other sorts of policy regimes. |
| **Mabugu et al. (2013)**<br>South Africa | CGE Model | Impact of Fiscal Policy in an intertemporal CGE Model for South Africa | 1. An extensive fiscal policy would have the momentary effect on GDP.<br>2. Increased taxation would negatively influence macroeconomic variables.<br>3. Increased investment expenditure would increase long-run GDP under any financing scheme and would lessen the debt-to-GDP ratio together with the deficit-to-GDP ratio. |

| | | | |
|---|---|---|---|
| **Sajadifar et al. (2012)** Iran | CGE Model | A Computable General Equilibrium Model for Evaluating the Effects of Value-Added Tax Reform in Iran | 1. The research established that government revenue was boosted and the household’s welfare was deteriorated.<br>2. Implementing of VAT reduced GDP. |
| **Naqvi et al. (2011)** Pakistan | CGE Model | Impact of Implementation of Agricultural Tax | 1. Agricultural Income Tax is Favorable in Terms of Household and Economy-Wide Welfare Indicator |
| **Ahmad et al. (2011)** Pakistan | CGE Model | Reforming Indirect taxation in Pakistan: A Macro-Micro Analysis | 1. The result revealed that all simulations increased the poverty, government revenue, and investment. |
| **Ha Viet Nguyen (2011)** Australia | CGE Model | Impact of Trade Liberalization on Welfare and Economic Performance | 1. Positive Effect of Fall in Import Duty<br>2. Negative Effect of Reduction in Subsidy |
| **Bouet et al. (2010)** SAFTA | CGE Model | Impact of SAFTA On Member Countries | 1. Positive effect on incomes of unskilled laborers<br>2. Negative Effect on Tariff Income |

| | | | |
|---|---|---|---|
| **Matovu et al. (2009)** Uganda | CGE Model | Impact of Tax Reforms of Households Welfare | 1. Removal of VAT augmented the welfare of richer households while reduced the poor`s. |
| **Naqvi et al. (2009)** Pakistan | CGE Model | Impact of Increase in Sales Tax, Increase in Income Tax and the decrease in Government Spending on Budget Deficit | 1. Positive Effect on Government Budget Deficit<br>2. Positive Effect on Covering the Losses arising out of the import tariff elimination |
| **Feraboli (2008)** Jordan | CGE Model | Impact of Gradual Diminution of Import Duties on Welfare and Income Distribution of Heterogeneous Households | 1. Positive Effect on Tax Rate, Wage Rate, Assets, Transfers, and Preferences |
| **Annabi et al. (2005)** Senegal | CGE Model | Impact of Total and Unilateral Trade Liberalization On Poverty and Inequality | 1. Full Tariff Removal leads to Small Increase in Poverty and Inequality in SR<br>2. Trade Liberalization increase capital Accumulation in LR |
| **Go et al. (2004)** South Africa | CGE Model | An Analysis of South Africa`s Value Added Tax | 1. VAT positively affected the overall tax structure and adversely the welfare of the low-income group. |

| | | | |
|---|---|---|---|
| **Coxhead and Jayasuriya (2004)** Philippine | CGE Model | Effect of Protection Policy on Poverty and Deforestation | 1. Trade Liberalization Tends to Increase the Depth and Severity of Poverty among Lower Income Groups<br>2. Environmental Consequences of Poverty Changes are Ambiguous |
| **Obi (2007)** Nigeria | CGE Model | Effect of Fiscal Policy on Redistribution of Income | 1. Public Spending is More Effective Instrument for Redistribution of Income<br>2. Tariff Adjustments Worsen Income Inequality |
| **Aka (2003)** Korea | CGE Model | Fiscal Adjustment, Poverty, Inequality, and Welfare in Cote d'Ivoire: A CGE Model Analysis | 1. The exclusion of agricultural export and import taxes leads to more poor households than in the pre-shock situation.<br>2. The removal of taxes on industrial exports lessens the number of households that are poor in comparison to the pre-shock situation. |
| **James Thurlow et al. (2002)** South Africa | CGE Model | Effects of Increase in Government Spending, Removal of Trade Barriers and Enhancement in Total Factor Productivity | 1. Hypothesis Made Regarding Systems of Macroeconomic Adjustment are Important in Determining the Anticipated Impacts of These Policies |

| | | | |
|---|---|---|---|
| **Lledo (2001)**<br>Brazil | CGE Model | On the Implementation of the Brazilian Indirect Tax Reforms | 1. Utilizing A-K model and giving the description of CGE models, obtained positive long-run income growth. |
| **Decaluwe et al. (1999)**<br>Africa | CGE Model | CGE Modeling and Developing Economies: A Concise Empirical Survey of 73 Application to 26 Countries | 1. Reduction in import tariffs is beneficial to the alleviation of social poverty. |
| **Meagher and Parmenter (1993)**<br>Australia | CGE Model | Some Short Run Implications of Fightback: A General Equilibrium Analysis | 1. GST made a minor effect on cost-sensitive industries facing global competition in comparison to prior taxes. |
| **Devarajan et al. (1991)**<br>Thailand | CGE Model | A Value-Added Tax (VAT) in Thailand: Who Wins and Who Loses? | 1. Manufacturers exporting and agriculture sectors as winners while some non-tradable service sectors as looser.<br>2. GST would increase government revenue and had a slightly favorable impact on income distribution. |
| **Hamilton and Whalley (1989)**<br>Canada | CGE Model | Reforming Indirect Taxes in Canada: Some general Equilibrium Estimates | 1. Replacing federal tax by broadly based sales tax delivered more gain than replacing the provincial sales taxes, although this gain is very small.<br>2. The distributional effect was minor which can be balanced by direct taxes. |

# APPENDIX-G

## Output of the Model (Results): {Income Tax ↑ }

**Table G.30: Household Consumer Price Index (% Variation)**

| Households | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| H-RS1 | 1.167 | -0.002 | -0.003 |
| H-RS234 | 1.157 | -0.001 | -0.002 |
| H-RM1 | 1.167 | -0.001 | -0.003 |
| H-RM234 | 1.162 | $-7.86753e^{-4}$ | -0.002 |
| H-RL1 | 1.167 | -0.002 | -0.003 |
| H-RL234 | 1.160 | -0.001 | -0.002 |
| H-RW1 | 1.165 | -0.001 | -0.003 |
| H-RW234 | 1.159 | -0.001 | -0.003 |
| H-RN1 | 1.167 | -0.001 | -0.003 |
| H-RN2 | 1.162 | -0.001 | -0.002 |
| H-RN3 | 1.155 | -0.001 | -0.002 |
| H-RN4 | 1.144 | $-2.12256e^{-4}$ | $-4.25320e^{-4}$ |
| H-U1 | 1.161 | -0.001 | -0.002 |
| H-U2 | 1.154 | $-9.29015e^{-4}$ | -0.002 |
| H-U3 | 1.150 | $-7.20069e^{-4}$ | -0.001 |
| H-U4 | 1.133 | $-2.39189e^{-4}$ | $-4.79132e^{-4}$ |

*Source: Simulation Results*

**Table G.31: Consumption Expenditures of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| H-RS1 | 243.869 | 243.857 | -0.005 | 243.844 | -0.010 |
| H-RS234 | 1821.438 | 1820.847 | -0.032 | 1820.256 | -0.065 |
| H-RM1 | 13.482 | 13.481 | -0.001 | 13.479 | -0.022 |
| H-RM234 | 653.910 | 653.694 | -0.033 | 653.477 | -0.066 |
| H-RL1 | 183.739 | 183.721 | -0.009 | 183.704 | -0.019 |
| H-RL234 | 831.864 | 830.768 | -0.132 | 829.672 | -0.263 |
| H-RW1 | 199.493 | 199.507 | 0.007 | 199.521 | 0.014 |
| H-RW234 | 586.354 | 586.110 | -0.042 | 585.866 | -0.083 |
| H-RN1 | 392.490 | 392.521 | 0.008 | 392.553 | 0.016 |
| H-RN2 | 534.257 | 534.292 | 0.007 | 534.327 | 0.013 |
| H-RN3 | 655.291 | 654.823 | -0.071 | 654.355 | -0.143 |
| H-RN4 | 944.746 | 943.527 | -0.129 | 942.308 | -0.258 |
| H-U1 | 217.622 | 217.634 | 0.006 | 217.647 | 0.011 |
| H-U2 | 516.694 | 516.725 | 0.006 | 516.756 | 0.012 |
| H-U3 | 1039.996 | 1038.742 | -0.121 | 1037.488 | -0.241 |
| H-U4 | 4706.977 | 4698.116 | -0.188 | 4689.255 | -0.376 |

*Source: Simulation Results*

**Table G.32: Exchange Rate**

| Exchange Rate | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **ER** | 0.987 | 0.005 | 0.010 |

*Source: Simulation Result*

**Table G.33: Price of Activities**

| Activities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **A-AGRI** | 1.011 | -0.005 | -0.010 |
| **A-MINE** | 0.924 | 0.003 | 0.006 |
| **A-FMAN** | 0.995 | -0.002 | -0.005 |
| **A-YARN** | 0.999 | $-6.11388e^{-4}$ | -0.001 |
| **A-TEXT** | 1.025 | -0.001 | -0.003 |
| **A-LEAT** | 1.007 | $-8.48084e^{-4}$ | -0.002 |
| **A-MANF** | 0.971 | 0.003 | 0.006 |
| **A-ENRG** | 1.300 | 0.003 | 0.007 |
| **A-SER** | 0.962 | 0.002 | 0.004 |

*Source: Simulation Results*

**Table G.34: Domestic Price of Domestic Output**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.012 | -0.005 | -0.010 |
| **C-MINE** | 0.927 | 0.003 | 0.006 |
| **C-FMAN** | 0.996 | -0.003 | -0.006 |
| **C-YARN** | 1.006 | -0.002 | -0.004 |
| **C-TEXT** | 1.089 | -0.009 | -0.019 |
| **C-LEAT** | 1.021 | -0.003 | -0.006 |
| **C-MANF** | 0.978 | 0.003 | 0.006 |
| **C-ENRG** | 1.300 | 0.003 | 0.007 |
| **C-SER** | 0.961 | 0.002 | 0.004 |

*Source: Simulation Results*

**Table G.35: Average Price of Factors**

| Factors | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **L** | 1.059 | 1.059 | | 1.059 | |
| **N** | 1.388 | 1.388 | -0.031 | 1.387 | -0.062 |
| **K** | 0.965 | 0.965 | 0.003 | 0.965 | 0.007 |

*Source: Simulation Results*

**Table G.36: Import Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 0.987 | 0.005 | 0.010 |
| **C-MINE** | 0.987 | 0.005 | 0.010 |
| **C-FMAN** | 0.987 | 0.005 | 0.010 |
| **C-YARN** | 0.987 | 0.005 | 0.010 |
| **C-TEXT** | 0.987 | 0.005 | 0.010 |
| **C-LEAT** | 0.987 | 0.005 | 0.010 |
| **C-MANF** | 0.987 | 0.005 | 0.010 |
| **C-ENRG** | 1.000 | | |
| **C-SER** | 0.987 | 0.005 | 0.010 |

*Source: Simulation Results*

**Table G.37: Export Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 0.987 | 0.005 | 0.010 |
| **C-MINE** | 0.987 | 0.005 | 0.010 |
| **C-FMAN** | 0.987 | 0.005 | 0.010 |
| **C-YARN** | 0.987 | 0.005 | 0.010 |
| **C-TEXT** | 0.987 | 0.005 | 0.010 |
| **C-LEAT** | 0.987 | 0.005 | 0.010 |
| **C-MANF** | 0.987 | 0.005 | 0.010 |
| **C-ENRG** | 1.000 | | |
| **C-SER** | 0.987 | 0.005 | 0.010 |

*Source: Simulation Results*

**Table G.38: Composite Commodity Price**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.169 | -0.005 | -0.010 |
| **C-MINE** | 1.126 | 0.004 | 0.007 |
| **C-FMAN** | 1.230 | -0.002 | -0.005 |
| **C-YARN** | 1.163 | -0.002 | -0.003 |
| **C-TEXT** | 1.247 | -0.007 | -0.014 |
| **C-LEAT** | 1.218 | -0.003 | -0.005 |
| **C-MANF** | 1.259 | 0.004 | 0.008 |
| **C-ENRG** | 1.311 | 0.003 | 0.007 |
| **C-SER** | 0.968 | 0.002 | 0.004 |

*Source: Simulation Results*

**Table G.39: Producer price for Commodities**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.011 | -0.005 | -0.010 |
| **C-MINE** | 0.924 | 0.003 | 0.006 |
| **C-FMAN** | 0.995 | -0.002 | -0.005 |
| **C-YARN** | 0.999 | $-6.11388e^{-4}$ | -0.001 |
| **C-TEXT** | 1.025 | -0.001 | -0.003 |
| **C-LEAT** | 1.007 | $-8.48084e^{-4}$ | -0.002 |
| **C-MANF** | 0.971 | 0.003 | 0.006 |
| **C-ENRG** | 1.300 | 0.003 | 0.007 |
| **C-SER** | 0.962 | 0.002 | 0.004 |

*Source: Simulation Results*

**Table G.40: Level of Activities**

| Activities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **A-AGRI** | 7047.148 | 7045.365 | -0.025 | 7043.582 | -0.051 |
| **A-MINE** | 730.595 | 730.838 | 0.033 | 731.082 | 0.067 |
| **A-FMAN** | 5073.711 | 5070.180 | -0.070 | 5066.649 | -0.139 |
| **A-YARN** | 2480.102 | 2479.927 | -0.007 | 2479.753 | -0.014 |
| **A-TEXT** | 1757.475 | 1757.934 | 0.026 | 1758.393 | 0.052 |
| **A-LEAT** | 362.897 | 362.816 | -0.022 | 362.735 | -0.044 |
| **A-MANF** | 4439.234 | 4442.070 | 0.064 | 4444.908 | 0.128 |
| **A-ENRG** | 1956.650 | 1955.936 | -0.037 | 1955.221 | -0.073 |
| **A-SER** | 9337.056 | 9340.356 | 0.035 | 9343.656 | 0.071 |

*Source: Simulation Results*

**Table G.41: Quantity of Domestic Output Sold Domestically**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 6963.021 | 6961.227 | -0.026 | 6959.433 | -0.052 |
| **C-MINE** | 664.689 | 664.906 | 0.033 | 665.123 | 0.065 |
| **C-FMAN** | 4750.970 | 4747.953 | -0.071 | 4744.215 | -0.142 |
| **C-YARN** | 1974.068 | 1973.845 | -0.011 | 1973.622 | -0.023 |
| **C-TEXT** | 748.124 | 748.140 | 0.002 | 748.156 | 0.004 |
| **C-LEAT** | 263.447 | 263.372 | -0.029 | 263.297 | -0.057 |
| **C-MANF** | 3970.752 | 3973.264 | 0.063 | 3975.776 | 0.127 |
| **C-ENRG** | 1956.650 | 1955.936 | -0.037 | 1955.221 | -0.073 |
| **C-SER** | 9064.766 | 9067.951 | 0.035 | 9071.137 | 0.070 |

*Source: Simulation Results*

**Table G.42: Quantity of Composite Goods Supplied Domestically**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 7123.460 | 7121.561 | -0.027 | 7119.662 | -0.053 |
| **C-MINE** | 1069.909 | 1070.229 | 0.030 | 1070.549 | 0.060 |
| **C-FMAN** | 5172.157 | 5168.364 | -0.073 | 5164.570 | -0.147 |
| **C-YARN** | 2082.677 | 2082.417 | -0.012 | 2082.158 | -0.025 |
| **C-TEXT** | 906.300 | 906.245 | -0.006 | 906.189 | -0.012 |
| **C-LEAT** | 275.327 | 275.245 | -0.030 | 275.163 | -0.060 |
| **C-MANF** | 6310.897 | 6314.727 | 0.061 | 6318.558 | 0.121 |
| **C-ENRG** | 1956.650 | 1955.936 | -0.037 | 1955.221 | -0.073 |
| **C-SER** | 9399.559 | 9402.831 | 0.035 | 9406.103 | 0.070 |

*Source: Simulation Results*

**Table G.43: Income of Enterprise**

| Enterprise | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **ENT** | 8497.089 | 8497.359 | 0.003 | 8497.629 | 0.006 |

*Source: Simulation Results*

**Table G.44: 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*

**Table G.45: Utility of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 209.026 | 209.019 | -0.003 | 209.011 | -0.007 |
| **H-RS234** | 1574.720 | 1574.229 | -0.031 | 1573.737 | -0.062 |
| **H-RM1** | 11.550 | 11.549 | -0.009 | 11.548 | -0.019 |
| **H-RM234** | 562.715 | 562.533 | -0.032 | 562.351 | -0.065 |
| **H-RL1** | 157.381 | 157.369 | -0.008 | 157.356 | -0.016 |
| **H-RL234** | 717.089 | 716.153 | -0.131 | 715.217 | -0.261 |
| **H-RW1** | 171.265 | 171.280 | 0.009 | 171.294 | 0.017 |
| **H-RW234** | 505.740 | 505.536 | -0.040 | 505.332 | -0.081 |
| **H-RN1** | 336.441 | 336.472 | 0.009 | 336.504 | 0.019 |
| **H-RN2** | 459.968 | 460.003 | 0.008 | 460.039 | 0.016 |
| **H-RN3** | 567.222 | 566.823 | -0.070 | 566.424 | -0.141 |
| **H-RN4** | 826.154 | 825.089 | -0.129 | 824.025 | -0.258 |
| **H-U1** | 187.381 | 187.394 | 0.007 | 187.407 | 0.014 |
| **H-U2** | 447.636 | 447.667 | 0.007 | 447.698 | 0.014 |
| **H-U3** | 904.536 | 903.452 | -0.120 | 902.368 | -0.240 |
| **H-U4** | 4153.751 | 4145.941 | -0.188 | 4138.132 | -0.376 |

*Source: Simulation Results*

# APPENDIX-H

## Output of the Model (Results): {Sales Tax ↓ }

**Table H.46: Household Consumer Price Index (% Variation)**

| Households | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| H-RS1 | 1.167 | 0.026 | 0.052 |
| H-RS234 | 1.157 | 0.014 | 0.028 |
| H-RM1 | 1.167 | 0.021 | 0.042 |
| H-RM234 | 1.162 | -0.014 | -0.029 |
| H-RL1 | 1.167 | 0.024 | 0.047 |
| H-RL234 | 1.160 | 0.011 | 0.023 |
| H-RW1 | 1.165 | 0.024 | 0.047 |
| H-RW234 | 1.159 | 0.016 | 0.032 |
| H-RN1 | 1.167 | 0.017 | 0.034 |
| H-RN2 | 1.162 | 0.013 | 0.026 |
| H-RN3 | 1.155 | 0.010 | 0.019 |
| H-RN4 | 1.144 | -0.027 | -0.054 |
| H-U1 | 1.161 | 0.007 | 0.015 |
| H-U2 | 1.154 | 0.007 | 0.013 |
| H-U3 | 1.150 | $-3.26059e^{-4}$ | $-6.61694e^{-4}$ |
| H-U4 | 1.133 | -0.012 | -0.025 |

*Source: Simulation Results*

**Table H.47: Consumption Expenditures of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| H-RS1 | 243.869 | 244.473 | 0.248 | 245.078 | 0.496 |
| H-RS234 | 1821.438 | 1825.922 | 0.246 | 1830.417 | 0.493 |
| H-RM1 | 13.482 | 13.514 | 0.233 | 13.545 | 0.467 |
| H-RM234 | 653.910 | 655.489 | 0.241 | 657.071 | 0.483 |
| H-RL1 | 183.739 | 184.156 | 0.227 | 184.574 | 0.455 |
| H-RL234 | 831.864 | 833.685 | 0.219 | 835.509 | 0.438 |
| H-RW1 | 199.493 | 200.061 | 0.285 | 200.631 | 0.571 |
| H-RW234 | 586.354 | 588.006 | 0.282 | 589.663 | 0.564 |
| H-RN1 | 392.490 | 393.231 | 0.189 | 393.974 | 0.378 |
| H-RN2 | 534.257 | 535.063 | 0.151 | 535.871 | 0.302 |
| H-RN3 | 655.291 | 656.078 | 0.120 | 656.867 | 0.240 |
| H-RN4 | 944.746 | 945.392 | 0.068 | 946.038 | 0.137 |
| H-U1 | 217.622 | 218.013 | 0.180 | 218.404 | 0.360 |
| H-U2 | 516.694 | 517.543 | 0.164 | 518.393 | 0.329 |
| H-U3 | 1039.996 | 1041.384 | 0.134 | 1042.776 | 0.267 |
| H-U4 | 4706.977 | 4710.448 | 0.074 | 4713.926 | 0.148 |

*Source: Simulation Results*

**Table H.48: Exchange Rate**

***(Value of one unit of foreign currency in terms of domestic currency)***

| Exchange Rate | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **ER** | 0.987 | 0.035 | 0.071 |

*Source: Simulation Results*

**Table H.49: Price of Activities**

| Activities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **A-AGRI** | 1.011 | 0.199 | 0.399 |
| **A-MINE** | 0.924 | 0.245 | 0.491 |
| **A-FMAN** | 0.995 | 0.144 | 0.289 |
| **A-YARN** | 0.999 | 0.125 | 0.251 |
| **A-TEXT** | 1.025 | 0.003 | 0.006 |
| **A-LEAT** | 1.007 | -0.020 | -0.040 |
| **A-MANF** | 0.971 | -0.102 | -0.204 |
| **A-ENRG** | 1.300 | -0.184 | -0.367 |
| **A-SER** | 0.962 | 0.071 | 0.143 |

*Source: Simulation Results*

**Table H.50: Domestic Price of Domestic Output**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.012 | 0.201 | 0.403 |
| **C-MINE** | 0.927 | 0.265 | 0.531 |
| **C-FMAN** | 0.996 | 0.152 | 0.304 |
| **C-YARN** | 1.006 | 0.148 | 0.296 |
| **C-TEXT** | 1.089 | -0.037 | -0.073 |
| **C-LEAT** | 1.021 | -0.040 | -0.080 |
| **C-MANF** | 0.978 | -0.117 | -0.234 |
| **C-ENRG** | 1.300 | -0.184 | -0.367 |
| **C-SER** | 0.961 | 0.072 | 0.145 |

*Source: Simulation Results*

**Table H.51: Average Price of Factors**

| Factors | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **L** | 1.059 | 1.059 | | 1.059 | |
| **N** | 1.388 | 1.392 | 0.252 | 1.395 | 0.504 |
| **K** | 0.965 | 0.968 | 0.351 | 0.972 | 0.704 |

*Source: Simulation Results*

**Table H.52: Import Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 0.987 | 0.035 | 0.071 |
| **C-MINE** | 0.987 | 0.035 | 0.071 |
| **C-FMAN** | 0.987 | 0.035 | 0.071 |
| **C-YARN** | 0.987 | 0.035 | 0.071 |
| **C-TEXT** | 0.987 | 0.035 | 0.071 |
| **C-LEAT** | 0.987 | 0.035 | 0.071 |
| **C-MANF** | 0.987 | 0.035 | 0.071 |
| **C-ENRG** | 1.000 | | |
| **C-SER** | 0.987 | 0.035 | 0.071 |

*Source: Simulation Results*

**Table H.53: Export Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 0.987 | 0.035 | 0.071 |
| **C-MINE** | 0.987 | 0.035 | 0.071 |
| **C-FMAN** | 0.987 | 0.035 | 0.071 |
| **C-YARN** | 0.987 | 0.035 | 0.071 |
| **C-TEXT** | 0.987 | 0.035 | 0.071 |
| **C-LEAT** | 0.987 | 0.035 | 0.071 |
| **C-MANF** | 0.987 | 0.035 | 0.071 |
| **C-ENRG** | 1.000 | | |
| **C-SER** | 0.987 | 0.035 | 0.071 |

*Source: Simulation Results*

**Table H.54: Composite Commodity Price**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.169 | 0.185 | 0.370 |
| **C-MINE** | 1.126 | -0.100 | -0.200 |
| **C-FMAN** | 1.230 | 0.009 | 0.018 |
| **C-YARN** | 1.163 | 0.130 | 0.261 |
| **C-TEXT** | 1.247 | -0.051 | -0.100 |
| **C-LEAT** | 1.218 | -0.044 | -0.087 |
| **C-MANF** | 1.259 | -0.368 | -0.735 |
| **C-ENRG** | 1.311 | -0.228 | -0.456 |
| **C-SER** | 0.968 | 0.042 | 0.085 |

*Source: Simulation Results*

**Table H.55: Producer price for Commodities**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.011 | 0.199 | 0.399 |
| **C-MINE** | 0.924 | 0.245 | 0.491 |
| **C-FMAN** | 0.995 | 0.144 | 0.289 |
| **C-YARN** | 0.999 | 0.125 | 0.251 |
| **C-TEXT** | 1.025 | 0.003 | 0.006 |
| **C-LEAT** | 1.007 | -0.020 | -0.040 |
| **C-MANF** | 0.971 | -0.102 | -0.204 |
| **C-ENRG** | 1.300 | -0.184 | -0.367 |
| **C-SER** | 0.962 | 0.071 | 0.143 |

*Source: Simulation Results*

**Table H.56: Level of Activities**

| Activities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %$\Delta$ | Shock | %$\Delta$ |
| **A-AGRI** | 7047.148 | 7047.090 | $-8.22296e^{-4}$ | 7047.012 | -0.002 |
| **A-MINE** | 730.595 | 731.190 | 0.081 | 731.786 | 0.163 |
| **A-FMAN** | 5073.711 | 5077.214 | 0.069 | 5080.723 | 0.138 |
| **A-YARN** | 2480.102 | 2479.728 | -0.015 | 2479.342 | -0.031 |
| **A-TEXT** | 1757.475 | 1767.032 | 0.544 | 1776.581 | 1.087 |
| **A-LEAT** | 362.897 | 364.148 | 0.345 | 365.399 | 0.690 |
| **A-MANF** | 4439.234 | 4464.712 | 0.574 | 4490.337 | 1.151 |
| **A-ENRG** | 1956.650 | 1962.528 | 0.300 | 1968.423 | 0.602 |
| **A-SER** | 9337.056 | 9343.528 | 0.069 | 9349.950 | 0.138 |

*Source: Simulation Results*

**Table H.57: Quantity of Domestic Output Sold Domestically**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| C-AGRI | 6963.021 | 6963.491 | 0.007 | 6963.937 | 0.013 |
| C-MINE | 664.689 | 665.628 | 0.141 | 666.566 | 0.282 |
| C-FMAN | 4750.970 | 4755.283 | 0.091 | 4759.600 | 0.182 |
| C-YARN | 1974.068 | 1975.091 | 0.052 | 1976.101 | 0.103 |
| C-TEXT | 748.124 | 751.302 | 0.425 | 754.477 | 0.849 |
| C-LEAT | 263.447 | 264.198 | 0.285 | 264.948 | 0.570 |
| C-MANF | 3970.752 | 3991.714 | 0.528 | 4012.777 | 1.058 |
| C-ENRG | 1956.650 | 1962.528 | 0.300 | 1968.423 | 0.602 |
| C-SER | 9064.766 | 9071.251 | 0.072 | 9077.687 | 0.143 |

*Source: Simulation Results*

**Table H.58: Quantity of Composite Goods Supplied Domestically**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| C-AGRI | 7123.460 | 7124.984 | 0.021 | 7126.487 | 0.042 |
| C-MINE | 1069.909 | 1074.335 | 0.414 | 1078.783 | 0.829 |
| C-FMAN | 5172.157 | 5178.559 | 0.124 | 5184.973 | 0.248 |
| C-YARN | 2082.677 | 2084.139 | 0.070 | 2085.591 | 0.140 |
| C-TEXT | 906.300 | 909.778 | 0.384 | 913.253 | 0.767 |
| C-LEAT | 275.327 | 276.081 | 0.274 | 276.835 | 0.548 |
| C-MANF | 6310.897 | 6332.666 | 0.345 | 6354.523 | 0.691 |
| C-ENRG | 1956.650 | 1962.528 | 0.300 | 1968.423 | 0.602 |
| C-SER | 9399.559 | 9406.629 | 0.075 | 9413.650 | 0.150 |

*Source: Simulation Results*

**Table H.59: Income of Enterprise**

| Enterprise | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| ENT | 8497.089 | 8523.244 | 0.308 | 8549.490 | 0.617 |

*Source: Simulation Results*

**Table H.60: Income of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 266.794 | 267.455 | 0.248 | 268.117 | 0.496 |
| **H-RS234** | 2162.746 | 2168.071 | 0.246 | 2173.408 | 0.493 |
| **H-RM1** | 14.465 | 14.499 | 0.233 | 14.532 | 0.467 |
| **H-RM234** | 863.868 | 865.953 | 0.241 | 868.043 | 0.483 |
| **H-RL1** | 196.529 | 196.976 | 0.227 | 197.424 | 0.455 |
| **H-RL234** | 932.712 | 934.754 | 0.219 | 936.800 | 0.438 |
| **H-RW1** | 200.420 | 200.991 | 0.285 | 201.563 | 0.571 |
| **H-RW234** | 620.021 | 621.768 | 0.282 | 623.520 | 0.564 |
| **H-RN1** | 400.802 | 401.559 | 0.189 | 402.317 | 0.378 |
| **H-RN2** | 556.320 | 557.160 | 0.151 | 558.000 | 0.302 |
| **H-RN3** | 754.234 | 755.140 | 0.120 | 756.047 | 0.240 |
| **H-RN4** | 1297.821 | 1298.707 | 0.068 | 1299.596 | 0.137 |
| **H-U1** | 232.361 | 232.779 | 0.180 | 233.197 | 0.360 |
| **H-U2** | 565.192 | 566.120 | 0.164 | 567.051 | 0.329 |
| **H-U3** | 1207.981 | 1209.594 | 0.134 | 1211.210 | 0.267 |
| **H-U4** | 6499.509 | 6504.302 | 0.074 | 6509.105 | 0.148 |

*Source: Simulation Results*

**Table H.61: Utility of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 209.026 | 209.489 | 0.222 | 209.954 | 0.444 |
| **H-RS234** | 1574.720 | 1578.376 | 0.232 | 1582.040 | 0.465 |
| **H-RM1** | 11.550 | 11.575 | 0.212 | 11.599 | 0.425 |
| **H-RM234** | 562.715 | 564.155 | 0.256 | 565.597 | 0.512 |
| **H-RL1** | 157.381 | 157.702 | 0.204 | 158.023 | 0.407 |
| **H-RL234** | 717.089 | 718.577 | 0.207 | 720.068 | 0.415 |
| **H-RW1** | 171.265 | 171.712 | 0.261 | 172.160 | 0.523 |
| **H-RW234** | 505.740 | 507.084 | 0.266 | 508.431 | 0.532 |
| **H-RN1** | 336.441 | 337.018 | 0.172 | 337.597 | 0.344 |
| **H-RN2** | 459.968 | 460.601 | 0.138 | 461.236 | 0.276 |
| **H-RN3** | 567.222 | 567.849 | 0.110 | 568.476 | 0.221 |
| **H-RN4** | 826.154 | 826.942 | 0.095 | 827.733 | 0.191 |
| **H-U1** | 187.381 | 187.704 | 0.172 | 188.027 | 0.345 |
| **H-U2** | 447.636 | 448.341 | 0.158 | 449.048 | 0.315 |
| **H-U3** | 904.536 | 905.747 | 0.134 | 906.960 | 0.268 |
| **H-U4** | 4153.751 | 4157.326 | 0.086 | 4160.909 | 0.172 |

*Source: Simulation Results*

# APPENDIX-I

## Output of the Model (Results): {Income Tax ↑ + Sales Tax ↓}

**Table I.62: Household Consumer Price Index (% Variation)**

| Households | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **H-RS1** | 1.167 | 0.024 | 0.049 |
| **H-RS234** | 1.157 | 0.013 | 0.026 |
| **H-RM1** | 1.167 | 0.020 | 0.039 |
| **H-RM234** | 1.162 | -0.015 | -0.030 |
| **H-RL1** | 1.167 | 0.022 | 0.044 |
| **H-RL234** | 1.160 | 0.010 | 0.020 |
| **H-RW1** | 1.165 | 0.022 | 0.045 |
| **H-RW234** | 1.159 | 0.015 | 0.029 |
| **H-RN1** | 1.167 | 0.016 | 0.031 |
| **H-RN2** | 1.162 | 0.012 | 0.024 |
| **H-RN3** | 1.155 | 0.009 | 0.017 |
| **H-RN4** | 1.144 | -0.027 | -0.055 |
| **H-U1** | 1.161 | 0.006 | 0.013 |
| **H-U2** | 1.154 | 0.006 | 0.012 |
| **H-U3** | 1.150 | -0.001 | -0.002 |
| **H-U4** | 1.133 | -0.013 | -0.025 |

*Source: Simulation Results*

**Table I.63: Consumption Expenditures of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 243.869 | 244.461 | 0.243 | 245.053 | 0.486 |
| **H-RS234** | 1821.438 | 1825.330 | 0.214 | 1829.230 | 0.428 |
| **H-RM1** | 13.482 | 13.512 | 0.223 | 13.542 | 0.445 |
| **H-RM234** | 653.910 | 655.272 | 0.208 | 656.636 | 0.417 |
| **H-RL1** | 183.739 | 184.139 | 0.218 | 184.540 | 0.436 |
| **H-RL234** | 831.864 | 832.587 | 0.087 | 833.308 | 0.174 |
| **H-RW1** | 199.493 | 200.076 | 0.292 | 200.660 | 0.585 |
| **H-RW234** | 586.354 | 587.761 | 0.240 | 589.172 | 0.481 |
| **H-RN1** | 392.490 | 393.263 | 0.197 | 394.037 | 0.394 |
| **H-RN2** | 534.257 | 535.098 | 0.157 | 535.941 | 0.315 |
| **H-RN3** | 655.291 | 655.609 | 0.049 | 655.928 | 0.097 |
| **H-RN4** | 944.746 | 944.172 | -0.061 | 943.597 | -0.122 |
| **H-U1** | 217.622 | 218.025 | 0.185 | 218.429 | 0.371 |
| **H-U2** | 516.694 | 517.574 | 0.170 | 518.456 | 0.341 |
| **H-U3** | 1039.996 | 1040.129 | 0.013 | 1040.261 | 0.026 |
| **H-U4** | 4706.977 | 4701.581 | -0.115 | 4696.179 | -0.229 |

*Source: Simulation Results*

**Table I.64: Exchange Rate**

***(Value of one unit of foreign currency in terms of domestic currency)***

| Exchange Rate | Base | Simulation-I (5%) | Simulation-II (10%) |
|---|---|---|---|
| **ER** | 0.987 | 0.040 | 0.081 |

*Source: Simulation Results*

**Table I.65: Price of Activities**

| Activities | Base | Simulation-I (5%) | Simulation-II (10%) |
|---|---|---|---|
| **A-AGRI** | 1.011 | 0.194 | 0.389 |
| **A-MINE** | 0.924 | 0.248 | 0.497 |
| **A-FMAN** | 0.995 | 0.142 | 0.285 |
| **A-YARN** | 0.999 | 0.125 | 0.250 |
| **A-TEXT** | 1.025 | 0.001 | 0.003 |
| **A-LEAT** | 1.007 | -0.021 | -0.042 |
| **A-MANF** | 0.971 | -0.099 | -0.198 |
| **A-ENRG** | 1.300 | -0.180 | -0.361 |
| **A-SER** | 0.962 | 0.073 | 0.147 |

*Source: Simulation Results*

**Table I.66: Domestic Price of Domestic Output**

| Commodities | Base | Simulation-I (5%) | Simulation-II (10%) |
|---|---|---|---|
| **C-AGRI** | 1.012 | 0.196 | 0.393 |
| **C-MINE** | 0.927 | 0.268 | 0.536 |
| **C-FMAN** | 0.996 | 0.149 | 0.298 |
| **C-YARN** | 1.006 | 0.146 | 0.292 |
| **C-TEXT** | 1.089 | -0.046 | -0.091 |
| **C-LEAT** | 1.021 | -0.043 | -0.085 |
| **C-MANF** | 0.978 | -0.114 | -0.229 |
| **C-ENRG** | 1.300 | -0.180 | -0.361 |
| **C-SER** | 0.961 | 0.074 | 0.149 |

*Source: Simulation Results*

**Table I.67: Average Price of Factors**

| Factors | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ |
| **L** | 1.059 | 1.059 | | 1.059 | |
| **N** | 1.388 | 1.391 | 0.221 | 1.394 | 0.221 |
| **K** | 0.965 | 0.968 | 0.355 | 0.972 | 0.355 |

*Source: Simulation Results*

**Table I.68: Import Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I (5%) | Simulation-II (10%) |
|---|---|---|---|
| **C-AGRI** | 0.987 | 0.040 | 0.081 |
| **C-MINE** | 0.987 | 0.040 | 0.081 |
| **C-FMAN** | 0.987 | 0.040 | 0.081 |
| **C-YARN** | 0.987 | 0.040 | 0.081 |
| **C-TEXT** | 0.987 | 0.040 | 0.081 |
| **C-LEAT** | 0.987 | 0.040 | 0.081 |
| **C-MANF** | 0.987 | 0.040 | 0.081 |
| **C-ENRG** | 1.000 | | |
| **C-SER** | 0.987 | 0.040 | 0.081 |

*Source: Simulation Results*

**Table I.69: Export Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I (5%) | Simulation-II (10%) |
|---|---|---|---|
| **C-AGRI** | 0.987 | 0.040 | 0.081 |
| **C-MINE** | 0.987 | 0.040 | 0.081 |
| **C-FMAN** | 0.987 | 0.040 | 0.081 |
| **C-YARN** | 0.987 | 0.040 | 0.081 |
| **C-TEXT** | 0.987 | 0.040 | 0.081 |
| **C-LEAT** | 0.987 | 0.040 | 0.081 |
| **C-MANF** | 0.987 | 0.040 | 0.081 |
| **C-ENRG** | 1.000 | | |
| **C-SER** | 0.987 | 0.040 | 0.081 |

*Source: Simulation Results*

**Table I.70: Composite Commodity Price**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.169 | 0.180 | 0.361 |
| **C-MINE** | 1.126 | -0.096 | -0.193 |
| **C-FMAN** | 1.230 | 0.007 | 0.013 |
| **C-YARN** | 1.163 | 0.129 | 0.258 |
| **C-TEXT** | 1.247 | -0.058 | -0.115 |
| **C-LEAT** | 1.218 | -0.046 | -0.092 |
| **C-MANF** | 1.259 | -0.364 | -0.728 |
| **C-ENRG** | 1.311 | -0.225 | -0.449 |
| **C-SER** | 0.968 | 0.044 | 0.089 |

*Source: Simulation Results*

**Table I.71: Producer price for Commodities**

| Commodities | Base | Simulation-I [5%] | Simulation-II [10%] |
|---|---|---|---|
| **C-AGRI** | 1.011 | 0.194 | 0.398 |
| **C-MINE** | 0.924 | 0.248 | 0.497 |
| **C-FMAN** | 0.995 | 0.142 | 0.285 |
| **C-YARN** | 0.999 | 0.125 | 0.250 |
| **C-TEXT** | 1.025 | 0.001 | 0.003 |
| **C-LEAT** | 1.007 | -0.021 | -0.042 |
| **C-MANF** | 0.971 | -0.009 | -0.198 |
| **C-ENRG** | 1.300 | -0.180 | -0.361 |
| **C-SER** | 0.962 | 0.073 | 0.147 |

*Source: Simulation Results*

**Table I.72: Level of Activities**

| Activities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **A-AGRI** | 7047.148 | 7045.309 | -0.026 | 7043.454 | -0.052 |
| **A-MINE** | 730.595 | 731.432 | 0.114 | 732.267 | 0.229 |
| **A-FMAN** | 5073.711 | 5073.681 | $-5.75960e^{-4}$ | 5073.652 | -0.001 |
| **A-YARN** | 2480.102 | 2479.551 | -0.022 | 2478.983 | -0.045 |
| **A-TEXT** | 1757.475 | 1767.487 | 0.570 | 1777.485 | 1.139 |
| **A-LEAT** | 362.897 | 364.067 | 0.322 | 365.235 | 0.644 |
| **A-MANF** | 4439.234 | 4467.552 | 0.638 | 4496.022 | 1.279 |
| **A-ENRG** | 1956.650 | 1961.810 | 0.264 | 1966.982 | 0.528 |
| **A-SER** | 9337.056 | 9346.832 | 0.105 | 9356.565 | 0.209 |

*Source: Simulation Results*

**Table I.73: Quantity of Domestic Output Sold Domestically**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| C-AGRI | 6963.021 | 6961.700 | -0.019 | 6960.258 | -0.038 |
| C-MINE | 664.689 | 665.844 | 0.147 | 666.996 | 0.347 |
| C-FMAN | 4750.970 | 4751.904 | 0.020 | 4752.837 | 0.039 |
| C-YARN | 1974.068 | 1974.867 | 0.040 | 1975.651 | 0.080 |
| C-TEXT | 748.124 | 751.317 | 0.427 | 754.503 | 0.853 |
| C-LEAT | 263.447 | 264.122 | 0.256 | 264.796 | 0.512 |
| C-MANF | 3970.752 | 3994.227 | 0.591 | 4017.807 | 1.185 |
| C-ENRG | 1956.650 | 1961.810 | 0.264 | 1966.982 | 0.528 |
| C-SER | 9064.766 | 9074.441 | 0.107 | 9084.075 | 0.213 |

*Source: Simulation Results*

**Table I.74: Quantity of Composite Goods Supplied Domestically**

| Commodities | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| C-AGRI | 7123.460 | 7123.087 | -0.005 | 7122.697 | -0.011 |
| C-MINE | 1069.909 | 1074.655 | 0.444 | 1079.423 | 0.889 |
| C-FMAN | 5172.157 | 5174.763 | 0.050 | 5177.373 | 0.101 |
| C-YARN | 2082.677 | 2083.879 | 0.058 | 2085.068 | 0.115 |
| C-TEXT | 906.300 | 909.721 | 0.377 | 913.137 | 0.754 |
| C-LEAT | 275.327 | 275.999 | 0.244 | 276.669 | 0.488 |
| C-MANF | 6310.897 | 6336.494 | 0.406 | 6362.173 | 0.813 |
| C-ENRG | 1956.650 | 1961.810 | 0.264 | 1966.982 | 0.528 |
| C-SER | 9399.559 | 9409.906 | 0.110 | 9420.214 | 0.220 |

*Source: Simulation Results*

**Table I.75: Income of Enterprise**

| Enterprise | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| ENT | 8497.089 | 8523.514 | 0.311 | 8550.030 | 0.623 |

*Source: Simulation Results*

**Table I.76: Income of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 266.794 | 267.441 | 0.243 | 268.090 | 0.486 |
| **H-RS234** | 2162.746 | 2167.976 | 0.242 | 2173.218 | 0.484 |
| **H-RM1** | 14.465 | 14.497 | 0.223 | 14.529 | 0.445 |
| **H-RM234** | 863.868 | 865.871 | 0.232 | 867.878 | 0.464 |
| **H-RL1** | 196.529 | 196.957 | 0.218 | 197.386 | 0.436 |
| **H-RL234** | 932.712 | 934.694 | 0.212 | 936.680 | 0.425 |
| **H-RW1** | 200.420 | 201.005 | 0.292 | 201.592 | 0.585 |
| **H-RW234** | 620.021 | 621.806 | 0.288 | 623.596 | 0.577 |
| **H-RN1** | 400.802 | 401.591 | 0.197 | 402.381 | 0.394 |
| **H-RN2** | 556.320 | 557.196 | 0.157 | 558.073 | 0.315 |
| **H-RN3** | 754.234 | 755.180 | 0.125 | 756.128 | 0.251 |
| **H-RN4** | 1297.821 | 1298.751 | 0.072 | 1299.682 | 0.143 |
| **H-U1** | 232.361 | 232.792 | 0.185 | 233.224 | 0.371 |
| **H-U2** | 565.192 | 566.154 | 0.170 | 567.119 | 0.341 |
| **H-U3** | 1207.981 | 1209.654 | 0.138 | 1211.331 | 0.277 |
| **H-U4** | 6499.509 | 6504.496 | 0.077 | 6509.492 | 0.154 |

*Source: Simulation Results*

**Table I.77: Utility of Households**

| Households | Base | Simulation-I [5%] | | Simulation-II [10%] | |
|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 209.026 | 209.482 | 0.218 | 209.939 | 0.437 |
| **H-RS234** | 1574.720 | 1577.883 | 0.201 | 1581.052 | 0.402 |
| **H-RM1** | 11.550 | 11.573 | 0.203 | 11.597 | 0.406 |
| **H-RM234** | 562.715 | 563.972 | 0.223 | 565.232 | 0.447 |
| **H-RL1** | 157.381 | 157.689 | 0.196 | 157.998 | 0.392 |
| **H-RL234** | 717.089 | 717.639 | 0.077 | 718.188 | 0.153 |
| **H-RW1** | 171.265 | 171.727 | 0.270 | 172.190 | 0.540 |
| **H-RW234** | 505.740 | 506.879 | 0.225 | 508.021 | 0.451 |
| **H-RN1** | 336.441 | 337.050 | 0.181 | 337.660 | 0.363 |
| **H-RN2** | 459.968 | 460.637 | 0.145 | 461.308 | 0.291 |
| **H-RN3** | 567.222 | 567.449 | 0.040 | 567.676 | 0.080 |
| **H-RN4** | 826.154 | 825.877 | -0.033 | 825.600 | -0.067 |
| **H-U1** | 187.381 | 187.717 | 0.179 | 188.053 | 0.358 |
| **H-U2** | 447.636 | 448.372 | 0.165 | 449.110 | 0.329 |
| **H-U3** | 904.536 | 904.662 | 0.014 | 904.786 | 0.028 |
| **H-U4** | 4153.751 | 4149.511 | -0.102 | 4145.265 | -0.204 |

*Source: Simulation Results*

# APPENDIX-J

## Output of the Model (Results): {Abolition of Tariff}

**Table J.78: Household Consumer Price Index (% Variation)**

| Households | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 1.167 | 1.167 | 0.069 | 1.167 | 0.034 | 1.168 | 0.143 |
| **H-RS234** | 1.157 | 1.157 | 0.032 | 1.157 | 0.016 | 1.157 | 0.067 |
| **H-RM1** | 1.167 | 1.168 | 0.056 | 1.168 | 0.027 | 1.169 | 0.117 |
| **H-RM234** | 1.162 | 1.161 | -0.058 | 1.162 | -0.028 | 1.161 | -0.121 |
| **H-RL1** | 1.167 | 1.168 | 0.067 | 1.168 | 0.033 | 1.169 | 0.138 |
| **H-RL234** | 1.160 | 1.160 | 0.031 | 1.160 | 0.015 | 1.161 | 0.064 |
| **H-RW1** | 1.165 | 1.166 | 0.063 | 1.165 | 0.031 | 1.166 | 0.130 |
| **H-RW234** | 1.159 | 1.160 | 0.041 | 1.160 | 0.020 | 1.160 | 0.084 |
| **H-RN1** | 1.167 | 1.167 | 0.038 | 1.167 | 0.019 | 1.167 | 0.076 |
| **H-RN2** | 1.162 | 1.162 | 0.019 | 1.162 | 0.010 | 1.162 | 0.038 |
| **H-RN3** | 1.155 | 1.155 | 0.012 | 1.155 | 0.006 | 1.156 | 0.024 |
| **H-RN4** | 1.144 | 1.143 | -0.088 | 1.143 | -0.043 | 1.141 | -0.183 |
| **H-U1** | 1.161 | 1.162 | 0.030 | 1.162 | 0.015 | 1.162 | 0.060 |
| **H-U2** | 1.154 | 1.155 | 0.023 | 1.154 | 0.011 | 1.155 | 0.047 |
| **H-U3** | 1.150 | 1.150 | 0.010 | 1.150 | 0.005 | 1.150 | 0.020 |
| **H-U4** | 1.133 | 1.133 | -0.026 | 1.133 | -0.013 | 1.133 | -0.054 |

*Source: Simulation Results*

**Table J.79: Consumption Expenditures of Households**

| Households | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 243.869 | 246.224 | 0.966 | 245.014 | 0.470 | 248.862 | 2.047 |
| **H-RS234** | 1821.438 | 1838.919 | 0.960 | 1829.951 | 0.467 | 1858.392 | 2.029 |
| **H-RM1** | 13.482 | 13.606 | 0.921 | 13.543 | 0.449 | 13.744 | 1.943 |
| **H-RM234** | 653.910 | 660.053 | 0.939 | 656.904 | 0.458 | 666.878 | 1.983 |
| **H-RL1** | 183.739 | 185.383 | 0.895 | 184.840 | 0.436 | 187.214 | 1.892 |
| **H-RL234** | 831.864 | 839.228 | 0.885 | 835.451 | 0.431 | 847.425 | 1.871 |
| **H-RW1** | 199.493 | 201.891 | 1.202 | 200.652 | 0.581 | 204.643 | 2.582 |
| **H-RW234** | 586.354 | 593.053 | 1.142 | 589.596 | 0.553 | 600.707 | 2.448 |
| **H-RN1** | 392.490 | 396.348 | 0.983 | 394.356 | 0.475 | 400.771 | 2.110 |
| **H-RN2** | 534.257 | 538.559 | 0.805 | 536.342 | 0.390 | 543.447 | 1.720 |
| **H-RN3** | 655.291 | 659.645 | 0.664 | 657.408 | 0.323 | 664.531 | 1.410 |
| **H-RN4** | 944.746 | 948.729 | 0.422 | 946.700 | 0.207 | 953.045 | 0.878 |
| **H-U1** | 217.622 | 219.582 | 0.901 | 218.569 | 0.435 | 221.832 | 1.935 |
| **H-U2** | 516.694 | 520.983 | 0.830 | 518.766 | 0.401 | 525.911 | 1.784 |
| **H-U3** | 1039.996 | 1047.051 | 0.678 | 1043.409 | 0.328 | 1055.121 | 1.454 |
| **H-U4** | 4706.977 | 4725.888 | 0.402 | 4716.169 | 0.195 | 4747.124 | 0.853 |

*Source: Simulation Results*

**Table J.80: Exchange Rate**

***(Value of one unit of foreign currency in terms of domestic currency)***

| Exchange Rate | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **ER** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |

*Source: Simulation Results*

**Table J.81: Price of Activities**

| Activities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **A-AGRI** | 1.011 | 1.018 | 0.694 | 1.014 | 0.337 | 1.026 | 1.471 |
| **A-MINE** | 0.924 | 0.932 | 0.846 | 0.928 | 0.409 | 0.941 | 1.813 |
| **A-FMAN** | 0.995 | 1.000 | 0.511 | 0.997 | 0.248 | 1.006 | 1.084 |
| **A-YARN** | 0.999 | 1.003 | 0.362 | 1.001 | 0.172 | 1.007 | 0.804 |
| **A-TEXT** | 1.025 | 1.016 | -0.903 | 1.021 | -0.446 | 1.006 | -1.845 |
| **A-LEAT** | 1.007 | 0.995 | -1.112 | 1.001 | -0.545 | 0.983 | -2.314 |
| **A-MANF** | 0.971 | 0.970 | -0.105 | 0.971 | -0.052 | 0.969 | -0.211 |
| **A-ENRG** | 1.300 | 1.297 | -0.223 | 1.298 | -0.110 | 1.294 | -0.460 |
| **A-SER** | 0.962 | 0.965 | 0.279 | 0.963 | 1.134 | 0.968 | 0.602 |

*Source: Simulation Results*

**Table J.82: Domestic Price of Domestic Output**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 1.012 | 1.019 | 0.693 | 1.015 | 0.337 | 1.026 | 1.472 |
| **C-MINE** | 0.927 | 0.935 | 0.858 | 0.931 | 0.413 | 0.945 | 1.859 |
| **C-FMAN** | 0.996 | 1.001 | 0.497 | 0.998 | 0.240 | 1.007 | 1.068 |
| **C-YARN** | 1.006 | 1.009 | 0.273 | 1.007 | 0.122 | 1.013 | 0.672 |
| **C-TEXT** | 1.089 | 1.057 | -2.985 | 1.073 | -1.466 | 1.022 | -6.162 |
| **C-LEAT** | 1.021 | 1.003 | -1.794 | 1.012 | -0.880 | 0.983 | -3.725 |
| **C-MANF** | 0.978 | 0.976 | -0.198 | 0.977 | -0.100 | 0.974 | -0.386 |
| **C-ENRG** | 1.300 | 1.097 | -0.223 | 1.298 | -0.110 | 1.294 | -0.460 |
| **C-SER** | 0.961 | 0.964 | 0.265 | 0.962 | 0.127 | 0.967 | 0.580 |

*Source: Simulation Results*

**Table J.83: Average Price of Factors**

| Factors | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **L** | 1.059 | 1.059 | | 1.059 | | 1.059 | |
| **N** | 1.388 | 1.401 | 0.886 | 1.394 | 0.436 | 1.414 | 1.829 |
| **K** | 0.965 | 0.976 | 1.183 | 0.970 | 0.573 | 0.989 | 2.532 |

*Source: Simulation Results*

**Table J.84: Import Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 0.987 | 0.978 | -0.970 | 0.983 | -0.470 | 0.967 | -2.071 |
| **C-MINE** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-FMAN** | 0.987 | 0.947 | -4.053 | 0.968 | -2.006 | 0.906 | -8.274 |
| **C-YARN** | 0.987 | 0.966 | -2.177 | 0.977 | -1.071 | 0.943 | -4.499 |
| **C-TEXT** | 0.987 | 0.932 | -5.615 | 0.960 | -2.784 | 0.875 | -11.417 |
| **C-LEAT** | 0.987 | 0.896 | -9.289 | 0.942 | -4.615 | 0.802 | -18.809 |
| **C-MANF** | 0.987 | 0.961 | -2.644 | 0.974 | -1.304 | 0.934 | -5.439 |
| **C-SER** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |

*Source: Simulation Results*

**Table J.85: Export Price for Commodities (Domestic Currency)**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-MINE** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-FMAN** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-YARN** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-TEXT** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-LEAT** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-MANF** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |
| **C-SER** | 0.987 | 0.994 | 0.721 | 0.991 | 0.373 | 1.001 | 1.333 |

*Source: Simulation Results*

**Table J.86: Composite Commodity Price**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ | Shock | %∆ |
| **C-AGRI** | 1.169 | 1.177 | 0.656 | 1.173 | 0.319 | 1.186 | 1.389 |
| **C-MINE** | 1.126 | 1.135 | 0.804 | 1.130 | 0.397 | 1.144 | 1.650 |
| **C-FMAN** | 1.230 | 1.231 | 0.101 | 1.230 | 0.052 | 1.232 | 0.185 |
| **C-YARN** | 1.163 | 1.165 | 0.142 | 1.164 | 0.060 | 1.167 | 0.385 |
| **C-TEXT** | 1.247 | 1.204 | -3.430 | 1.226 | -1.685 | 1.158 | -7.091 |
| **C-LEAT** | 1.218 | 1.192 | -2.153 | 1.206 | -1.047 | 1.163 | -4.568 |
| **C-MANF** | 1.259 | 1.245 | -1.134 | 1.252 | -0.555 | 1.229 | -2.371 |
| **C-ENRG** | 1.311 | 1.308 | -0.223 | 1.310 | -0.110 | 1.305 | -0.460 |
| **C-SER** | 0.968 | 0.970 | 0.282 | 0.969 | 0.136 | 0.974 | 0.607 |

*Source: Simulation Results*

**Table J.87: Producer price for Commodities**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ | Shock | %∆ |
| **C-AGRI** | 1.011 | 1.018 | 0.694 | 1.014 | 0.337 | 1.026 | 1.471 |
| **C-MINE** | 0.924 | 0.932 | 0.846 | 0.928 | 0.409 | 0.941 | 1.813 |
| **C-FMAN** | 0.995 | 1.000 | 0.511 | 0.997 | 0.248 | 1.006 | 1.084 |
| **C-YARN** | 0.999 | 1.003 | 0.362 | 1.001 | 0.172 | 1.007 | 0.804 |
| **C-TEXT** | 1.025 | 1.016 | -0.903 | 1.021 | -0.446 | 1.006 | -1.845 |
| **C-LEAT** | 1.007 | 0.995 | -1.112 | 1.001 | -0.545 | 0.983 | -2.314 |
| **C-MANF** | 0.971 | 0.970 | -0.105 | 0.971 | -0.052 | 0.969 | -0.211 |
| **C-ENRG** | 1.300 | 1.297 | -0.223 | 1.298 | -0.110 | 1.294 | -0.460 |
| **C-SER** | 0.962 | 0.965 | 0.279 | 0.963 | 0.134 | 0.968 | 0.602 |

*Source: Simulation Results*

**Table J.88: Level of Activities**

| Activities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ | Shock | %∆ |
| **A-AGRI** | 7047.148 | 7048.996 | 0.026 | 7048.407 | 0.018 | 7047.736 | 0.008 |
| **A-MINE** | 730.595 | 721.454 | -1.251 | 726.389 | -0.576 | 709.166 | -2.933 |
| **A-FMAN** | 5073.711 | 5009.376 | -1.268 | 5043.422 | -0.597 | 4928.209 | -2.868 |
| **A-YARN** | 2480.102 | 2561.381 | 3.277 | 2519.350 | 1.583 | 2654.823 | 7.045 |
| **A-TEXT** | 1757.475 | 1991.603 | 13.322 | 1866.570 | 6.207 | 2298.837 | 30.803 |
| **A-LEAT** | 362.897 | 380.879 | 4.955 | 371.654 | 2.413 | 400.356 | 10.322 |
| **A-MANF** | 4439.234 | 4336.311 | -2.318 | 4389.054 | -1.130 | 4222.089 | -4.891 |
| **A-ENRG** | 1956.650 | 1985.588 | 1.479 | 1970.274 | 0.696 | 2022.179 | 3.349 |
| **A-SER** | 9337.056 | 9427.198 | 0.965 | 9380.853 | 0.469 | 9528.273 | 2.048 |

*Source: Simulation Results*

**Table J.89: Quantity of Domestic Output Sold Domestically**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ | Shock | %∆ |
| **C-AGRI** | 6963.021 | 6964.759 | 0.025 | 6964.150 | 0.016 | 6964.040 | 0.015 |
| **C-MINE** | 664.689 | 656.605 | -1.216 | 660.931 | -0.565 | 646.060 | -2.803 |
| **C-FMAN** | 4750.970 | 4688.762 | -1.309 | 4721.434 | -0.622 | 4612.453 | -2.916 |
| **C-YARN** | 1974.068 | 2033.301 | 3.001 | 2002.306 | 1.430 | 2104.818 | 6.623 |
| **C-TEXT** | 748.124 | 795.478 | 6.330 | 770.393 | 2.977 | 855.051 | 14.293 |
| **C-LEAT** | 263.447 | 270.821 | 2.799 | 267.088 | 1.382 | 278.229 | 5.611 |
| **C-MANF** | 3970.752 | 3867.897 | -2.590 | 3920.284 | -1.271 | 3756.655 | -5.392 |
| **C-ENRG** | 1956.650 | 1985.588 | 1.479 | 1970.274 | 0.696 | 2022.179 | 3.349 |
| **C-SER** | 9064.766 | 9149.778 | 0.938 | 9105.945 | 0.454 | 9246.236 | 2.002 |

*Source: Simulation Results*

**Table J.90: Quantity of Composite Goods Supplied Domestically**

| Commodities | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **C-AGRI** | 7123.460 | 7135.960 | 0.175 | 7129.744 | 0.088 | 7148.043 | 0.345 |
| **C-MINE** | 1069.909 | 1058.595 | -1.057 | 1064.361 | -0.519 | 1046.336 | -2.203 |
| **C-FMAN** | 5172.157 | 5175.473 | 0.064 | 5173.921 | 0.034 | 5177.881 | 0.111 |
| **C-YARN** | 2082.677 | 2154.121 | 3.430 | 2116.681 | 1.633 | 2241.019 | 7.603 |
| **C-TEXT** | 906.300 | 979.300 | 8.055 | 940.559 | 3.780 | 1072.545 | 18.343 |
| **C-LEAT** | 275.327 | 286.680 | 4.124 | 280.781 | 1.981 | 299.866 | 8.913 |
| **C-MANF** | 6310.897 | 6335.517 | 0.390 | 6322.328 | 0.181 | 6367.826 | 0.902 |
| **C-ENRG** | 1956.650 | 1985.588 | 1.479 | 1970.274 | 0.696 | 2022.179 | 3.349 |
| **C-SER** | 9399.559 | 9483.473 | 0.893 | 9439.975 | 0.430 | 9580.713 | 1.927 |

*Source: Simulation Results*

**Table J.91: Income of Enterprise**

| Enterprise | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **ENT** | 8497.089 | 8587.521 | 1.064 | 8540.962 | 0.516 | 8689.843 | 2.268 |

*Source: Simulation Results*

**Table J.92: Income of Households**

| Households | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %Δ | Shock | %Δ | Shock | %Δ |
| **H-RS1** | 266.794 | 269.370 | 0.966 | 268.047 | 0.470 | 272.257 | 2.047 |
| **H-RS234** | 2162.746 | 2183.503 | 0.960 | 2172.855 | 0.467 | 2206.625 | 2.029 |
| **H-RM1** | 14.465 | 14.598 | 0.921 | 14.530 | 0.449 | 14.746 | 1.943 |
| **H-RM234** | 863.868 | 871.983 | 0.939 | 867.822 | 0.458 | 880.999 | 1.983 |
| **H-RL1** | 196.529 | 198.289 | 0.895 | 197.386 | 0.436 | 200.247 | 1.892 |
| **H-RL234** | 932.712 | 940.969 | 0.885 | 936.734 | 0.431 | 950.160 | 1.871 |
| **H-RW1** | 200.420 | 202.829 | 1.202 | 201.584 | 0.581 | 205.594 | 2.582 |
| **H-RW234** | 620.021 | 627.105 | 1.142 | 623.449 | 0.553 | 635.198 | 2.448 |
| **H-RN1** | 400.802 | 404.742 | 0.983 | 402.707 | 0.475 | 409.258 | 2.110 |
| **H-RN2** | 556.320 | 560.799 | 0.805 | 558.491 | 0.390 | 565.889 | 1.720 |
| **H-RN3** | 754.234 | 759.245 | 0.664 | 756.670 | 0.323 | 764.869 | 1.410 |
| **H-RN4** | 1297.821 | 1303.293 | 0.422 | 1300.505 | 0.207 | 1309.221 | 0.878 |
| **H-U1** | 232.361 | 234.454 | 0.901 | 233.373 | 0.435 | 236.857 | 1.935 |
| **H-U2** | 565.192 | 569.883 | 0.830 | 567.459 | 0.401 | 575.274 | 1.784 |
| **H-U3** | 1207.981 | 1216.176 | 0.678 | 1211.945 | 0.328 | 1225.550 | 1.454 |
| **H-U4** | 6499.509 | 6525.622 | 0.402 | 6512.203 | 0.195 | 6554.946 | 0.853 |

*Source: Simulation Results*

**Table J.93: Utility of Households**

| Households | Base | Simulation-I [50%] | | Simulation-II [75%] | | Simulation-III [100%] | |
|---|---|---|---|---|---|---|---|
| | | Shock | %∆ | Shock | %∆ | Shock | %∆ |
| **H-RS1** | 209.026 | 210.899 | 0.896 | 209.937 | 0.436 | 213.002 | 1.902 |
| **H-RS234** | 1574.720 | 1589.325 | 0.927 | 1581.833 | 0.452 | 1605.599 | 1.961 |
| **H-RM1** | 11.550 | 11.650 | 0.865 | 11.599 | 0.422 | 11.761 | 1.824 |
| **H-RM234** | 562.715 | 568.329 | 0.998 | 565.450 | 0.486 | 574.573 | 2.107 |
| **H-RL1** | 157.381 | 158.684 | 0.828 | 158.015 | 0.403 | 160.138 | 1.751 |
| **H-RL234** | 717.089 | 723.214 | 0.854 | 720.072 | 0.416 | 730.037 | 1.806 |
| **H-RW1** | 171.265 | 173.214 | 1.138 | 172.207 | 0.550 | 175.458 | 2.449 |
| **H-RW234** | 505.740 | 511.309 | 1.101 | 508.434 | 0.533 | 517.683 | 2.361 |
| **H-RN1** | 336.441 | 339.621 | 0.945 | 337.977 | 0.457 | 343.277 | 2.032 |
| **H-RN2** | 459.968 | 463.582 | 0.786 | 461.718 | 0.381 | 467.701 | 1.681 |
| **H-RN3** | 567.222 | 570.924 | 0.653 | 569.021 | 0.317 | 575.085 | 1.386 |
| **H-RN4** | 826.154 | 830.364 | 0.510 | 828.217 | 0.250 | 834.940 | 1.064 |
| **H-U1** | 187.381 | 189.013 | 0.871 | 188.169 | 0.421 | 190.891 | 1.873 |
| **H-U2** | 447.636 | 451.248 | 0.807 | 449.380 | 0.390 | 455.408 | 1.736 |
| **H-U3** | 904.536 | 910.584 | 0.669 | 907.461 | 0.323 | 917.511 | 1.434 |
| **H-U4** | 4153.751 | 4171.532 | 0.428 | 4162.400 | 0.208 | 4191.430 | 0.907 |

*Source: Simulation Results*

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