

Simulating the Impact of Income Distribution on Poverty Reduction

SYED KALIM HYDER, QAZI MASOOD AHMED and HAROON JAMAL

1. INTRODUCTION

The traditional notion that has influenced the development thinking for almost half a century is that economic growth is fundamental to the development process, and that the objective of poverty reduction can only be achieved by allowing the benefits of growth to ultimately trickle down to the poor. The ‘primacy of growth’ paradigm is based on the premise that high growth, through high investment, would lead to higher employment and higher wages, and thereby reducing poverty. The ‘trickle-down’ paradigm assumes that the benefits of economic growth would, in the first round, accrue to the upper income groups, and the ensuing consumption expenditures of these households would, in subsequent rounds, accrue incomes to relatively lower income households.

Importance of equity consideration in poverty alleviation efforts has been brought out of the cold and now has re-entered the mainstream development policy agenda in many developing countries. This is the consequence of a deep-rooted disillusionment with the development paradigm which placed exclusive emphasis on the pursuit of growth. During 1990s, the proliferation of quality data on income distribution from a number of countries has allowed rigorous empirical testing of standing debates on the relative importance of growth and redistribution in poverty reduction. While the debate is still inconclusive, the majority of development economists emphasised, based on empirical cross-country data, that an unequal income distribution is a serious impediment to effective poverty alleviation [Ravallion (1997, 2001)]. Many researchers suggested that growth is, in practice the main tool for fighting poverty. However, they also reiterated that the imperative of growth for combating poverty should not be misinterpreted to mean that “growth is all that matters”. Growth is a necessary condition for poverty alleviation, no doubt, but inequality also matters and should also be on the development agenda.

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Authors’ Note: First version of the paper was completed when all three authors were associated with the Social Policy and Development Centre. Authors are grateful to Dr Hafiz Pasha for his guidance and support for this paper.

The purpose of this paper is to supplement the debate by providing empirical evidence from Pakistan's poverty trends. The paper simulates the impact of inequality on poverty reduction in a macroeconomic general equilibrium framework. Time series macro and social data are used to explore the relevance of inequality for growth and poverty reduction. Section 2 presents a brief review of cross-country evidence and discusses the linkages among poverty, inequality and growth. The results of econometric specification, which treats inequality as a determinant of poverty reduction, are furnished in Section 3. The proximate macroeconomic and structural determinants of inequality are discussed in the next section. Section 5 presents the simulation results of poverty under alternative inequality scenarios. The last section gives concluding remarks.

2. INEQUALITY, GROWTH AND POVERTY NEXUS

The conceptual validation of the inevitability of inequality as a by-product of growth is drawn from the Kuznet hypothesis, propounded in 1955. Kuznets (1955) argued that the income distribution within a country was likely to vary over time with its progress from a poor agricultural society to a rich industrial society. The hypothesis predicted an increase in inequality during early periods of growth, and reduction in inequality as the economy reaches a higher stage of development. Thus, the 'primacy of growth' model assumes a trade-off between growth and equity.

Based on cross-country studies, it is maintained that distribution policies give rise to distortions in the economy, resulting in inefficiencies that may be substantial enough to adversely affect the overall well being of society. For instance, research by Kaldor (1957) and Bourguignon (1981) suggests that the marginal propensity to save of the rich is higher than that of the poor, implying that a higher degree of initial inequality will yield higher aggregate savings, capital accumulation, and growth. It is also argued that inequality within a country is stable over time and changes too slowly to make a significant difference in poverty reduction [Deininger and Squire 1998]. The conclusion drawn is that growth must precede distribution, and that the poor will pay the price of growth in terms of inequality and poverty until such time that growth builds up a 'reservoir' of wealth and its benefits trickle down in sufficient measure to reduce poverty.

The 'primacy of growth' paradigm has been challenged by empirical evidence based on rigorous testing of more recent cross-country data, and the 'trickle-down' paradigm has been effectively discredited. Further, it is reasoned that there does not exist an unavoidable trade-off between growth and equity [Naschold (2002)]. Results show that high inequality is an impediment not only to poverty reduction, but also to growth. Initial cross-country studies, including Birdsall, *et al.* (1995), found that greater initial income inequality actually reduces future growth even after controlling for initial levels of GDP and human capital. The robustness of these findings has been the subject of much debate; however recent analysis using an updated and more comparable inequality data reconfirms the negative effects of inequality on growth [Knowles (2001)]. Low inequality can therefore benefit the poor in two ways. By increasing overall growth and average incomes and by letting them share more in that growth.

It is also argued that a more equitable distribution of assets and income is likely to strengthen aggregate market demand, expand the economic base, and foster growth. Thus, distribution is not only a final outcome, but also a determinant of

economic growth. Given that there is no trade-off per se between growth and equality, it follows that distribution can be pursued as an additional policy objective to enhance the poverty reducing effect of growth. The removal or correction of the various anti-poor institutional constraints and policy-induced biases is likely to actually improve market efficiency, besides promoting equity. For instance, social policy ensuring adequate provision of education and health services to the poor can improve their productivity and contribution to the economy. Therefore, the conclusion drawn is that poverty reduction is not a function of high or low growth, but rather of distribution sensitive growth.

Policies and growth patterns that improve distribution are therefore potentially significant additional tools in the fight against poverty. Past changes in distribution occurred without active policy intervention, as the focus of development policy and research was on growth, rather than distribution issues. If, in future, development policy makes inequality an explicit target, it will greatly enhance the poverty reducing effect of growth.

3. INEQUALITY AS A DETERMINANT OF POVERTY

International evidence shows that the poverty elasticity of growth depends on the specific poverty measure being used [Kakwani (1993)], the degree of inequality of the income distribution [Revallion (1997)] as well as the specific characteristics of growth episodes, i.e., whether growth is inequality increasing or decreasing. As such, the degree of poverty is postulated to be a function of two factors: the average income level of the country and the extent of income inequality. Formally,

$$P = P(Y, L(p)) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

Where P is a poverty measure, Y is per capita income and $L(p)$ is the Lorenz Curve measuring the relative income distribution. The Lorenz Curve is based on ranking of population according to income and plotting the cumulative proportion of income against the cumulative proportion of population enjoying that income.

Changes in poverty can be decomposed into a growth component that relates changes in per capita income, and an inequality component that relates poverty to changes in inequality. In general, increases in average income (growth) will reduce poverty. Thus, growth elasticity of poverty (λ) may be hypothesised as follows:

$$\lambda = \left[\frac{\partial P}{\partial Y} * \frac{Y}{P} \right] > 0 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Measuring the effect of inequality on poverty is slightly more complex because inequality can change in infinite manners. It is hard to say anything general about the growth-poverty relationship when the distribution is allowed to change during growth. Although intuitively progressive distributional change is likely to reduce poverty, this result cannot be generalised without additional assumption regarding the distribution. Kakwani (1993) developed a formula for the inequality elasticity of poverty under the assumption of an equal proportionate change in the Lorenz curve. Under this assumption it is possible to express the inequality elasticity of poverty ω as the elasticity of poverty with respect to the Gini coefficient (G).

$$\omega = \left[\frac{\partial P}{\partial G} * \frac{G}{P} \right] > 0 \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

To establish the relationship between poverty, growth and inequality, Pakistan's time series (1979-2013) data on per capita income, headcount (poverty incidence or population below the poverty line) and Gini coefficient are used to estimate the following specification. In order to capture the asymmetric impact of Gini coefficient on poverty, the Gini is decomposed into two variables¹ by taking the threshold of no change; the Gini coefficient that observe the increasing (positive) trend and the Gini coefficient that observe the declining (negative) trend. These two variables are added in the Equation (4) instead of one time series of Gini coefficients to capture the disproportional impact of inequality on poverty.

$$\begin{aligned} \text{Log (Poverty)}_t = & [\alpha + \lambda \text{Log(GDP)}_t + \bar{\omega}_1(\text{Gini}^{\text{positive}})_t \\ & + \bar{\omega}_2(\text{Gini}^{\text{negative}})_t + \mu_t] \quad \dots \quad \dots \quad \dots \quad \dots \quad (4) \end{aligned}$$

As consumption and income data are collected occasionally from Household income and expenditure Surveys, poverty and inequality series are interpolated before estimation. Moreover, a consistent time series of poverty is developed to avoid the inter-temporal methodological biases.² The estimated results of Equation (4) are furnished below.

Table 1

Determinants of Poverty
Dependent Variable – Log (Poverty Incidence – Headcount)

Explanatory Variables	Coefficient	t-Statistic	Significance
GDP Per Capita	-0.42	-2.26	0.03
GINI (High Changes)	2.30	4.13	0.00
GINI (Low Changes)	2.04	3.69	0.00
Time Trend	0.01	2.46	0.02
Constant	6.60	3.36	0.00
R-squared	0.95	F-Statistic	103
Adjusted R-squared	0.94	Probability (F-Statistics)	0.000
Durbin-Watson stat	1.60	Number of Observations	40
Q ₍₁₎	0.81	Jarque-Bera	2.01
	(0.80)		(0.36)
Q ² ₍₁₎	0.50	LM ₍₁₎	3.00
	(0.48)		(0.12)
ARCH ₍₁₎	0.44		
	(0.51)		

Notes: All variables are in logarithmic form and statistically significant.

Equation also contains a dummy variable for the year 2011 and 2012 due to large residual effect.

LM and ARCH tests are applied and found no evidence of serial correlation.

Wald test is applied to test the hypothesis that Gini has symmetric impact on poverty. The hypothesis is rejected by F-test (F-value 22.75 with probability of 0.00).

¹Ideally Atkinson class of measures or extended Gini should be used with high value of inequality aversion parameters to represent the level of society concern about inequality. Nonetheless, this was not possible due to non-availability of time-series raw data.

²The data and methodological details for interpolation and construction of consistent poverty estimates are provided in Jamal (2006).

The results from the econometric analysis clearly indicate the importance of income distribution in determining absolute poverty level. The poverty elasticity with respect to Gini observing increasing trend (positive changes) and Gini witnessing declining trend (negative changes) is estimated as 2.30 and 2.04, while the estimated poverty elasticity with respect to income is 0.42. The higher elasticity of poverty with respect to Gini implies that distribution is more important as poverty predictor than income and confirms the role of inequality in the prevalence of and/or increase in poverty.

4. EXPLAINING INEQUALITY

Given the importance of inequality as a determinant of absolute poverty, an attempt has been made to identify important variables that influence the Gini coefficient, particularly factors that can be manipulated at the policy level to affect poverty.

There is widespread consensus that macroeconomic stability is a prerequisite for pro-poor growth. In particular, it has been found repeatedly that high inflation (particularly above a level of about 10 percent) hurts the poor and economic growth. Therefore, inflation (food prices) may be a good proxy for fiscal stabilisation in an economy.

A negative relationship is hypothesised between development expenditure, especially on social services³ and income distribution. More public expenditure on health and education certainly increases the human capital endowment of the poor and hence affects on the empowerment.

A major redistribution policy is to make the tax structure pro-poor. Therefore, it is hypothesised that there is a direct link between progressive tax structure⁴ and equity. Investments, especially in infrastructure have a major impact on making economic growth pro-poor. Growth in investments is essential for reducing rate of unemployment and under-employment in the economy. Public investments by providing infrastructure play an important role in reducing poverty and increasing the share of people at the bottom of the income distribution.⁵

Two elements of economic structure are considered in the analysis: first, the manufacturing to agriculture wage⁶ gap and secondly, the manufacturing to agriculture terms of trade.⁷ Keeping the economic structure of the country, it is expected that the increase in these ratios will worsen the income distribution and will have a positive relationship with the Gini coefficient.

Equation 5 summarises these determinants⁸ of income inequality, while estimated results of the equation are furnished in Table 2.

³This is included as percent of GDP.

⁴The ratio of Direct taxes to Indirect taxes is used as a proxy for progressivity in tax structure.

⁵Some other possible candidates for explaining inequality, like economic and food subsidies, remittances, unemployment rate etc. were also tested, but not turned out statistically significant.

⁶Sectoral wage is computed as the sectoral value added divided by sectoral labour force.

⁷This is the ratio of manufacturing implicit GDP deflator to that of agriculture implicit GDP deflator.

⁸Data on the per capita income, investment, term of trade between agriculture and manufacturing and food prices are taken from various issues of Pakistan Economic Survey. Relative wages are taken from various issues of Labour Force Survey. Development expenditures, direct tax and indirect taxes are collected from various issues of Federal Budget in Brief.

$$\begin{aligned}
\text{Log}(\text{Gini})_t = & \alpha + \beta_1 \text{Log}(\text{Per Capita GDP})_t + \beta_2 \text{Log}(\text{Food Prices})_t \\
& + \beta_3 \text{Log}(\text{Taxation})_t + \beta_4 \text{Log}(\text{Public Investment})_t \\
& + \beta_5 \text{Log}(\text{Government Spending})_t + \beta_6 \text{Log}(\text{Wage Differential})_t \\
& + \beta_7 \text{Log}(\text{Terms Of Trade})_t + \varepsilon_t \quad \dots \quad \dots \quad \dots \quad (5)
\end{aligned}$$

Table 2

Determinants of Inequality
Dependent Variable: Log (Gini Coefficient)

Explanatory Variables	Coefficient	t-Statistic	Significance
Per Capita GDP	0.172	3.81	0.00
Real Price of Wheat	0.133	4.82	0.00
Wage Gap	0.076	2.72	0.01
Direct to Indirect Tax Ratio	-0.037	-1.87	0.07
Development Expenditure on Social Services	-0.139	-8.07	0.00
Investment	-0.167	-4.59	0.00
Constant (Intercept)	-1.805	-3.50	0.00
R-squared	0.922	F-statistic	39.321
Adjusted R-squared	0.898	Probability (F-St.)	0.00
Durbin-Watson stat	1.409	Number of Observations	40
Q ₍₁₎	0.227	Jarque-Bera	1.299
	(0.14)		(0.52)
Q ² ₍₁₎	0.104	LM ₍₁₎	2.127
	(0.49)		(0.16)
ARCH ₍₁₎	0.452		
	(0.51)		

Notes: Variables (except dummy) are used after Logarithmic transformation.

LM and ARCH tests are applied and found no evidence of serial correlation.

Three dummy variables are also used in the equation to capture the extreme point estimates.

The determinants of income inequality in the order of estimated magnitude of impact (elasticities) are: food prices; per capita income; manufacturing-to-agriculture terms of trade; investment/GDP ratio; direct/indirect tax ratio; ratio of development expenditure on social services to GDP; and ratio of manufacturing and agricultural wages.

The results indicate that average growth worsens distribution and is unlikely to help in reducing poverty, without explicit distribution policies. This is evident from the fact that an increase in per capita income also raises inequality, with a one percent increase in per capita income raising inequality by 0.172 percent. Real wheat prices emerge as the most important determinant of inequality as measured by magnitude of the estimated elasticity. The analysis shows that a one percent decline in real wheat prices lowers inequality by 0.133 percent. Raising direct tax revenues, investment, and development expenditure on social services by one percent each is likely to reduce inequality by 0.037, 0.167 and 0.139 percent, respectively. Further, improving agricultural wages are also likely to reduce inequality by 0.076 percent.

5. POVERTY SIMULATIONS

The Integrated Social Policy and Macroeconomic (ISPM) model⁹ of the SPDC is employed to simulate poverty and inequality under various assumptions and scenarios. The ISPM model incorporates the social, fiscal and macroeconomic dimensions of the economy under one interrelated system. It provides the basic framework for analysing the implications of numerous economic measures on the long-term development of Pakistan's social sectors. The Poverty Module has recently modified and Income distribution is introduced in the block after having powerful evidence of the fact that the nature of growth in Pakistan is 'inequality-increasing' and the income distribution is an important determinant of absolute poverty. The Poverty and Income Distribution Block of the model consists of Equations (4) and (5) with the specification and estimated magnitudes described above.

Table 3 presents the simulation results of various combinations of growth and inequality to achieve the desired level of poverty. The simulations results show that if the GDP growth rate continued to be maintained at 6 percent per annum and measures were adopted to hold the Gini coefficient constant at the 2012 level of 0.400, poverty incidence would probably decline to 38.3 percent by 2020. However, with the Gini coefficient held constant at 0.400, lower GDP growth rates of 5 and 4 percent are likely to result in a higher incidence of poverty in 2020; 39.3 and 40.2 percent respectively. Similarly, if the GDP growth rate were assumed to be 6 percent, reducing poverty incidence to 35 percent in 2020 would require that the Gini coefficient to be lowered to 0.35 from 0.4.

Table 3

<i>Simulation of Poverty Incidence with Alternative Growth and Inequality Scenario</i>									
	Gini Coefficient Scenario								
	0.400			0.385			0.350		
	GDP Growth Rate Scenario								
	6%	5%	4%	6%	5%	4%	6%	5%	4%
Year									
2013 = Base	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
2015	39.3	39.5	39.6	38.1	38.3	38.4	35.6	35.7	35.8
2017	39.0	39.5	39.8	37.8	38.3	38.6	35.3	35.6	35.9
2020	38.3	39.3	40.2	37.2	38.1	39.0	34.7	35.4	36.3

Source: SPDC Macroeconomic Model Simulations.

The simulation results presented in the table clearly establish the insufficiency of growth alone as a vehicle for poverty reduction, and consequently, the inevitability of engaging with the task of reducing inequality.

6. CONCLUDING REMARKS

Poverty reduction has always been a priority of development policy, albeit sometime only at the rhetorical level. The end of the 2000s brought increased emphasis on bringing the benefits of growth to the poor. However, growth alone is a rather blunt instrument for poverty reduction, since the consensus of empirical work

⁹The detail description of the model with various linkages is provided in the Appendix A.

suggests that it is distribution neutral. Along with emphasis on poverty reduction, a shift occurred in the policy literature towards a *moiré* favorable view of policies to redistribute income and assets. An integration of distributional concerns and a priority on poverty reduction could be the basis for a new policy agenda to foster growth with equity.

This paper highlights the importance of distribution policies in poverty reduction using Pakistan time series macroeconomic and social data during the period 1979 to 2013. Simulation exercise is carried out by employing SPDC integrated macroeconomic model.

Following are the main findings of this research. First, the poverty elasticity with respect to Gini coefficient is statistically significant and also the magnitude is relatively high as compared with poverty elasticity of growth. Second, the study found inflation, sectoral wage gap, and terms of trade in favor of manufacturing as the significant positive correlates of inequality, while progressive taxation, investment and development expenditure on social services are negatively impacting on inequality. Third, the simulation exercise in a general equilibrium framework clearly demonstrates that a high GDP growth rate, without accompanying equity-promoting policy shifts, is by itself unlikely to reduce the incidence of poverty.

Finally, it is true that redistribution often has limited potential and that growth is a necessary condition for poverty reduction. Yet the level of inequality and change therein, still matters. This is because the level of inequality affects the degree of poverty as well as growth elasticity of poverty. Further, low level of inequality contributes for an acceleration of poverty reduction for a given level of growth. For these reasons, inequality still matters, and the search for effective policies for reducing inequality, or at least prevent them from rising, should be an integral part of the development agenda.

APPENDIX – A

INTEGRATED SOCIAL POLICY AND MACROECONOMIC MODEL

Social Policy and Development Centre (SPDC) has developed one of the pioneer models which can be used as an effective planning tool for social sector development. The Integrated Social Policy and Macroeconomic (ISPM) model integrates the social, fiscal and macroeconomic dimensions of the economy under one interrelated system. It provides the basic framework for analysing the implications of numerous economic measures on the long-term development of Pakistan's social sectors. Recently the ISPM model incorporated the changes in Pakistan's economy by endogenising both interest rate and exchange rate variables.

The model is highly disaggregated and covers all three levels of government. It is capable of predicting outcomes in considerable detail, even at the level of individual social service provision. The ability to disaggregate the model at the provincial level in terms of revenues and expenditures on social services (e.g., schools, hospitals, doctors, teachers, enrolments, etc.) is helpful in analysing the impact of related initiatives on the macro economy and social development.

The ISPM model is based on consistent national level data from 1973 onwards and is estimated by single equation regression techniques. It consists of 409 equations, of

which 172 are behavioral and the rest are identities. These equations are subsumed into 18 interrelated blocks. The blocks, along with their size in terms of equations and identities, are listed in Table A.1.

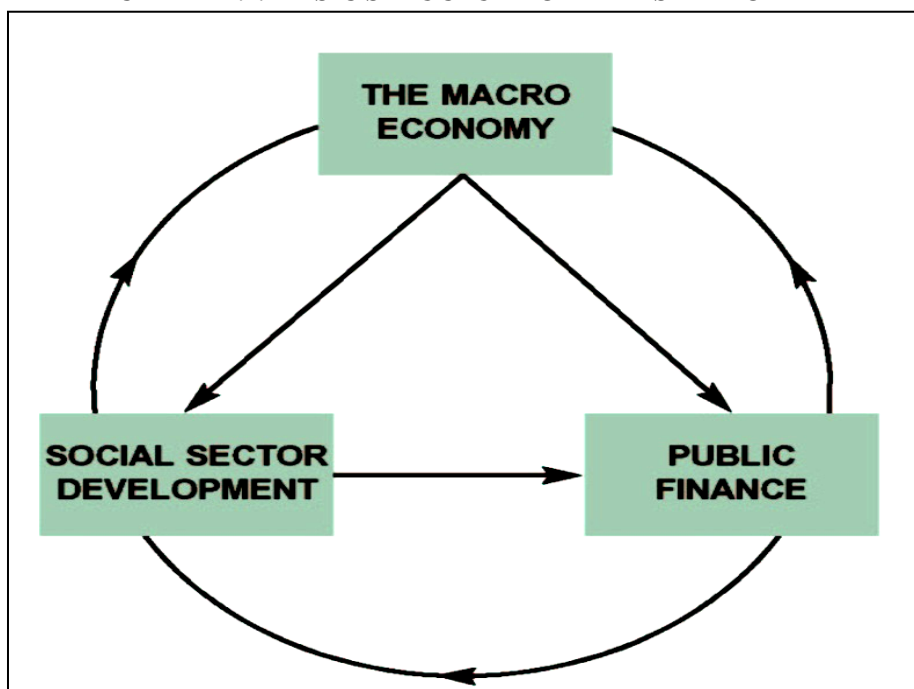
Table A.1

Integrated Social Policy and Macro Model (ISPM)

	Total	Equations	Identities
Block A Production Block	27	11	16
Block B Input Block	37	16	21
Block C Aggregate Demand Block	34	20	14
Block D Trade and Balance of Payments Block	19	11	8
Block E Monetary and Prices Block	10	7	3
Block F Federal Revenue Block	12	4	8
Block G Federal Expenditure Block	16	9	7
Block H Sub-National Revenue Block	26	11	15
Block I Sub-National Expenditure Block	32	22	10
Block J Debt and Budget Deficit Block	12	2	10
Block K Education Block	47	24	23
Block L Human Capital Index Block	16	5	11
Block M Health Block	27	18	9
Block N Public Health Index Block	4	3	1
Block O Human Development Index Block	7	0	7
Block P Poverty and Income Inequality Block	12	3	9
Block Q Goals Block	63	6	57
Block R Costing and Financing Block	8	0	8
Total	409	172	237

Although the model is broadly Keynesian in spirit, the specification of individual blocks and equations is based on a pragmatic approach and also captures the non-market clearing aspects of Pakistan's economy. Thus, the macroeconomic block is essentially supply driven. In addition, the social sector indicators are also resource determined.

CHART A.1. BASIC STRUCTURE OF THE ISPM MODEL



The model has dynamic specifications which vary across the blocks. In some cases, the linkage is simultaneous and in some cases it is recursive. Examples include the linkages between the macro-production and input blocks; the production and expenditure blocks; the fiscal revenues and expenditure blocks; and the macro production, poverty and inequality blocks. The broad links (see Chart A.1) of the model can be traced as follows.

Macro → Public Finance

The key link here traces the impact of developments in the macroeconomy on the growth of the tax bases (including divisible pool taxes) and thus affects the fiscal status of different governments.

Public Finance → Social Sector Development

The availability of resources, both external and internal, determines the level of development and recurring outlays to social sectors by different levels of government, particularly provincial and local.

Social Sector Development → Macroeconomy

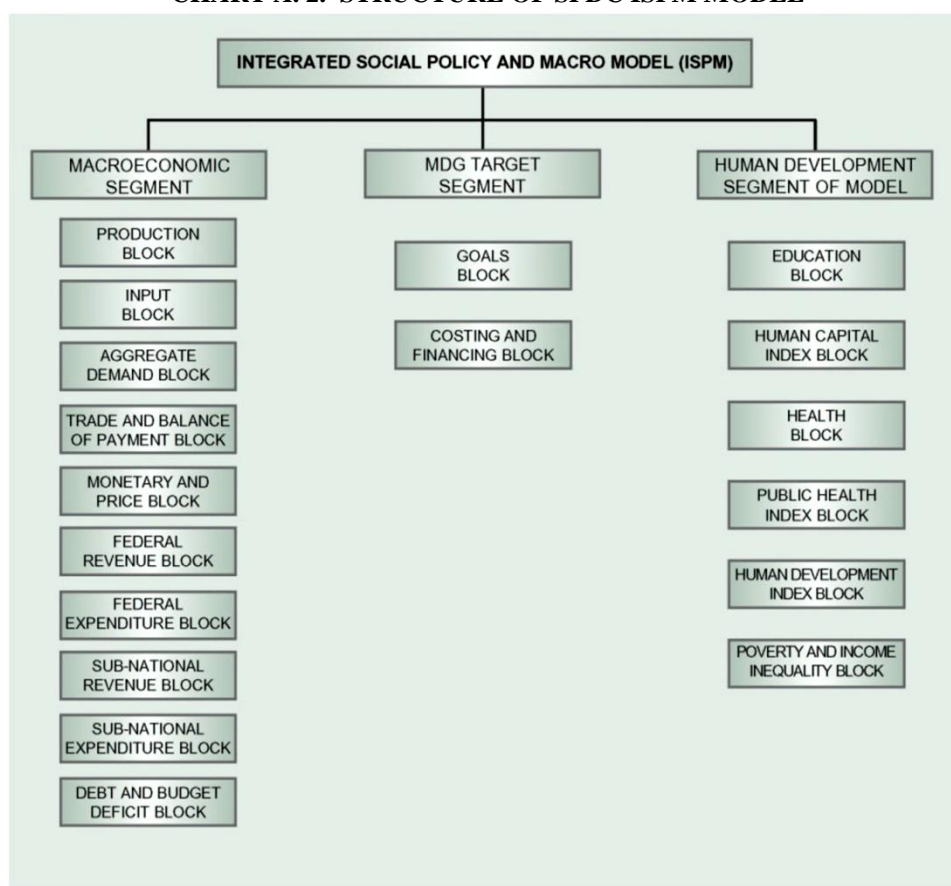
Higher output of educated workers and their entry into the labour force raises the human capital stock and could contribute to improvements in productivity and a higher growth rate of output in the economy. Similarly, an improvement in public health standards may also have a favorable impact on production.

Public Finance → Macroeconomy

The level of government expenditure could exert a demand side effect on national income, while the size of the overall budget deficit of the federal and provincial governments influences the rate of monetary expansion and consequently the rate of inflation in the economy.

Social Sector Development → Public Finance

A vital link in the model is between the rate of social sector development and the state of public finances. Higher social sector development implies higher recurring expenditures of provincial governments, which are consequently reflected in the budget deficit, level of debt stock and debt servicing of provincial governments.

CHART A. 2. STRUCTURE OF SPDC ISPM MODEL***Macro Economy → Social Sector Development***

Macro and other socio-economic changes affect the demand for social sector facilities such as schools and hospitals, and thus influence the level of social sector outputs.

Apart from these broad linkages among different modules, there are also links between different blocks within each module (see Chart A.2).

An example of a major linkage within the macro module is the two-way linkage to and from the macro-production block and macro-input blocks. This link is due to the dependence of sectoral value added to the factors of production and input demand functions on the value of production. Macro production determines macro expenditure, just as private consumption is influenced by income.

The two-way link between the macro-production block and the trade block is due to the fact that the value of imports and exports determines and is determined by economic production activity. The trade gap affects the level of money supply.

Important linkages in the fiscal module consist of the simultaneous dependence of revenues and expenditures of various levels of government. Non-tax receipts of governments have been made a function of the recurring expenditure on particular services via cost recovery ratios. Similarly, the level of government expenditure is affected by the government's level of resource generation.

Important vertical links between levels of government include fiscal transfers in the form of divisible pool transfers and non-development grants (in line with the feasible level of decentralisation) from provincial to local governments. The link between the budget deficits of the federal and provincial governments and their revenues and expenditures is obvious.

Forecasting and Policy Analysis Tool

Given the richness of its structure and the complex web of interrelationships and interactions it embodies, the ISPM model can be used both as a forecasting tool for the medium and long term, and for undertaking policy simulations to analyse the consequences of particular policy actions by the government.

For example, if the federal government decides to pursue a policy of higher tax mobilisation and opts for a rigorous fiscal effort, the model can forecast the impact, not only on federal finances, but also on the fiscal status of the provincial governments. In this scenario, it could also forecast key macroeconomic magnitudes such as growth in the gross domestic product, social development, budget deficit, changes in income inequality and the inflation rate.

The model can also perform simulations to find the relative strength of different policy options for a specific objective. In the case of the macro economy, it can provide the impact of different policy options on:

- short and medium-term projections of the growth of important sectors (agriculture, manufacturing, construction, electricity and gas distribution);
- short and medium-term projections of the growth of GDP, GNP, per capita income;
- factor input (e.g., capital and labor) demand; and
- short and medium-term projections of the public and private investment in various sectors of the economy.

In the case of public finance, it can:

- provide short and medium-term projections of the quantum of revenue transfers to the provincial governments by the federal government under different scenarios;

- determine the impact of different rates and patterns of economic growth on provincial tax bases and revenues; and
- determine the impact of changes in provincial expenditure priorities on fiscal status, levels of service provision and the overall macro economy.

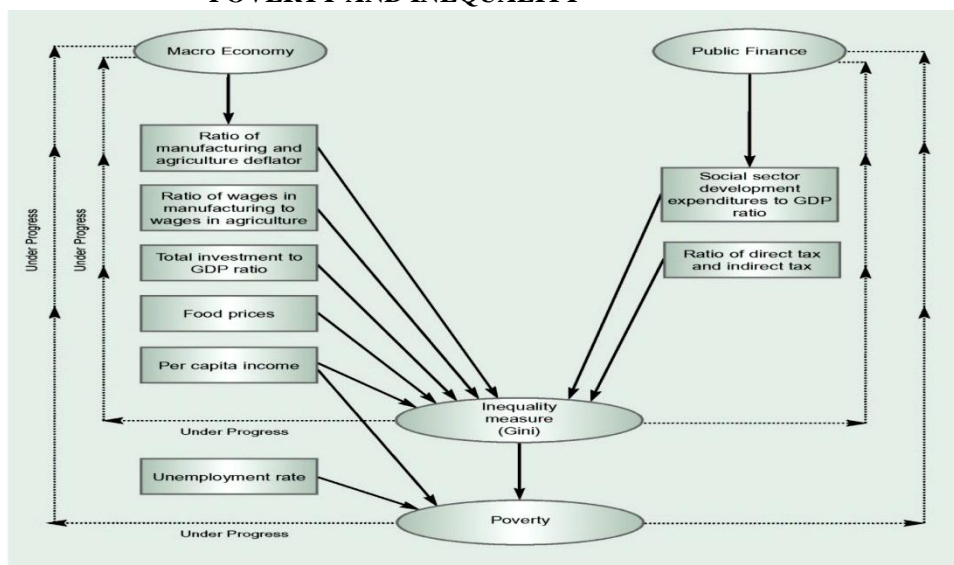
In the case of social development, it can determine the impact on:

- poverty reduction strategy related expenditures;
- social sector expenditures by provincial governments on income inequality that further changes the poverty rate;
- education expenditures by provincial governments on sectoral inputs (schools, teachers), enrolments, outputs, entry into the labour force and literacy rates;
- health expenditures by provincial governments on sectoral inputs (beds, rural health centres, doctors, nurses, paramedics) and on the health status of the population; and
- higher levels of resource mobilisation by provincial governments on federal transfers, sectoral levels of expenditure and fiscal status.

Income Inequality and Poverty Block

An important aspect of the SPDC's macro model is the incorporation of the poverty and inequality block. In this block, the linkage of macro, public finance and human development variables with the measure of income inequality (Gini Coefficient) is developed, which also helps in determining poverty. This is one of the pioneer works in the economic literature of developing countries that explores the impact of economic growth and government expenditures on income inequality and poverty. The complete linkages between growth, income distribution and poverty are shown in Chart A3.

CHART A3. LINKS OF ISPM MODEL WITH SPECIAL REFERENCE TO POVERTY AND INEQUALITY



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