SIMULATING THE IMPACT OF INCOME DISTRIBUTION ON POVERTY REDUCTION

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The paper simulates the effects of income distribution on poverty reduction in the context of Pakistan. General equilibrium framework is employed and time series macro and social data are used for the period 1979 to 2013 for prediction and simulation. The paper also attempts to explore macroeconomic and structural correlates of inequality. The empirical findings -- high poverty elasticity with respect to inequality measures -- confirm the importance of inequality in poverty reducing effort. Inflation, sectoral wage gap, and terms of trade in favor of manufacturing exacerbate inequality, while progressive taxation, investment and development expenditure on social services play a significant role in reducing inequality. The results also indicate a positive correlation between per capita GDP and income inequality. The simulation exercise establishes the insufficiency of growth alone as a vehicle for poverty reduction, and consequently highlights the importance of equity consideration in poverty alleviation efforts.

1. INTRODUCTION

The traditional notion that has held sway over 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 land- and capital-owning 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 1990's, 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 emphasized, based on empirical cross-country data, that an unequal income distribution is a serious impediment to effective poverty alleviation (Ravallion, 1997 and 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.

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 impact of public spending on poverty and inequality are discussed in Section 6. The last section gives concluding remarks.

2.   INEQUALITY, GROWTH AND POVERTY NEXUS

The conceptual validation of the inevitability of inequality as a byproduct 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, a potentially significant additional tool 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,

$$P = \mathrm{P}(Y, L(p)), \tag{1}$$

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 (or consumption) 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 postulated as follows:

$$\lambda = \frac{\partial PY}{\partial YP} \prec 0 \tag{2}$$

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 generalized 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).

$$\omega = \frac{\partial PG}{\partial GP} \succ 0 \tag{3}$$

To establish the relationship between poverty, growth and inequality, Pakistan's time series (1979-2002) data on per capita income, Headcount (poverty incidence or population below the poverty line) and Gini coefficient are used to estimate the following specification. Square of Gini coefficient is also added in equation (4) to capture the disproportional impact of inequality on poverty.[1]

$$Log(Headcount)_t = \alpha + \lambda Log(Per\ Capita\ GDP)_t + \varpi_1 Log(Gini)_t$$
$$+ \varpi_1 (Log(Gini_t))^2 + \varepsilon_t \tag{4}$$

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 statistical results of equation (4) are reproduced below:

Table 1
Determinants of Poverty
Dependent Variable: Log (Headcount)

Explanatory Variables	Coefficient	t-Statistic	Significance
GDP Per Capita	-1.79	-16.15	0.00
GINI Coefficient	8.88	1.70	0.10
Squared GINI Coefficient	4.63	1.71	0.10
Time Trend	0.05	16.43	0.00
Constant	24.97	9.43	0.00
R-squared	0.95	F-statistic	128.761
Adjusted R-squared	0.95	Probability (F-Statistics)	0.000
Durbin-Watson stat	1.35	Number of Observations	38

Notes: All variables are in logarithmic form and statistically significant.
LM and ARCH tests are applied and found no evidence of serial correlation.
The dummy variable for the correction of outlier are included.

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[1] Ideally 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.

[2] The data and methodological details for interpolation and construction of consistent poverty estimates are provided in Jamal (2004).

The results from the econometric analysis clearly indicate the importance of income distribution in determining absolute poverty level. The poverty elasticity with respect to average Gini is estimated as 2.0, while the estimated poverty elasticity with respect to income is 1.79. 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 some of the variables that influence the Gini coefficient, particularly factors that can be manipulated at the policy level to affect poverty. In the order of estimated magnitude of impact, these 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[3]. Table 2 shows the regression result of the following equation:

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

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%) hurts the poor and economic growth. Therefore, inflation (food prices) may be a good proxy for fiscal stabilization in an economy. A negative relationship is hypothesized between development expenditure, especially on social services[4] 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 hypothesized that there is a direct link between progressive tax structure[5] 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

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[3] Data 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 labor force survey. Development expenditures, direct tax and indirect taxes are collected from various issues of federal budget in brief.

[4] This is included as percent of GDP.

[5] The ratio of Direct taxes to Indirect taxes is used as a proxy for progressivity.

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[6].

Two elements of economic structure are considered in the analysis: first, the manufacturing to agriculture wage[7] gap and secondly, the manufacturing to agriculture terms of trade[8]. 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.

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	-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	Observations	40.000

Notes: Variables (except dummy) are used after Logarithmic transformation
   LM and ARCH tests are applied and found no evidence of serial correlation
   The dummy variable included to capture the extreme point estimates

The results indicate that average growth worsens distribution and is unlikely to aid 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. Food 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 food prices lowers inequality by 0.133 percent. Raising direct tax revenues, investment, and development expenditure on social services by one

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

[7] Sectoral wage is computed as the sectoral value added divided by sectoral labor force.

[8] This is the ratio of manufacturing implicit GDP deflator to that of agriculture implicit GDP deflator.

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 TO ACHIEVE MDG TARGET

The Integrated Social Policy and Macroeconomic (ISPM) 172-equations model[9] 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 analyzing 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. Now, the Poverty and Income Distribution Block of the model consists of equation (4) and (5) with the specification and estimated magnitudes described above.

Table 3 presents the impact of various growth rates on poverty incidence. Projecting up to 2020, the model simulations 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 34 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, of 37.9 and 41.7 percent respectively. According to the Table 3, if the GDP growth rate were assumed to be 6 percent, the exogenous decline of 0.15 in the Gini reduces the poverty incidence by 0.24 percentage points. The similar decline in the Gini with the growth assumption of 5% and 4% result in a decline of poverty incidence by 0.3 and 0.4 percentage points.

Projected Poverty Incidence
[Gini Coefficient held constant at 2012 level of]

	0.400			0.385		
	GDP Growth Rate					
	6 Percent	**5 Percent**	**4 Percent**	**6 Percent**	**5 Percent**	**4 Percent**
Years	**Percentage of Population Below Poverty Line**					
2013	40.5	40.5	40.5	40.5	40.5	40.5
2015	38.3	39.3	38.8	38.0	39.0	38.6
2017	36.9	39.4	39.4	36.6	39.2	38.8
2020	34.0	37.9	41.7	33.8	37.6	41.3

Source: SPDC Macroeconomic Model Simulations

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

The analysis presented above establishes the insufficiency of growth alone as a vehicle for poverty reduction, and consequently, the inevitability of engaging with the task of reducing inequality. Of course the big question is how best to improve the distribution of income?

6. IMPACT OF PUBLIC SPENDING ON POVERTY AND INEQUALITY

This section examines the impact of public spending, especially on social expenditure on poverty and inequality. Two scenarios for notional tax and expenditure shift have been generated through the SPDC ISPM model. Besides the status quo situation, where the current structure, levels and composition of taxes and expenditures is held constant, these scenarios incorporate adjustments in the structure, levels and composition of taxes and Government expenditures, as specified below:

1. Increase in the share of direct tax in total tax revenue from 45 to 60 percent by reducing indirect tax collection by Rs. 50 billion and raising direct tax collection by a corresponding amount.

2. Decrease in current expenditure by Rs. 75 billion

3. Increase of Provincial Development Expenditure by Rs. 50 billion.

4. Increase of Provincial Non-Development Expenditures on education, health and public health by Rs. 25 billion.

The expenditure adjustments, applied on Model-generated base year estimates corresponding to the year 2012-13, are spread over a five-year period at the rate of Rs. 15 billion per year. Two approaches to finance this increase are postulated:

1. Increase in money supply through deficit financing.

2. Expenditure-switching from current to development/social sector heads.

First scenario incorporates adjustments 1, 3 and 4, implying a net increase of Rs. 75 billion in total expenditure. Scenario 2 incorporates adjustments 1, 2, 3 and 4, implying a reduction of Rs. 75 billion in current expenditure and a corresponding increase in development expenditure, leaving total expenditure constant. Scenario 1 is financed entirely through additional money supply and Scenario 2 is financed entirely through expenditure-switching. Main results of these scenarios are furnished in Table 5.

The status quo scenario shows that to sustain an economic growth rate of 6 percent, the required total investment/GDP ratio rises from 16.2 percent in the base year to 18.6 percent and the public investment/GDP ratio is required to be over 5 percent in Year 5 - the terminal year of the analysis. Inflation rises from 4.2 percent in the base year to 5.7 percent in Year 5. In this scenario, the budget deficit/GDP ratio declines from 5.1 to 4.8 percent, and the current account balance/GDP ratio deteriorates from a marginal surplus of 0.8 percent to a deficit of 4.3 percent. Increasing trends in both poverty and inequality are also evident from the table.

Table 5
Impact of Public Spending on Poverty and Inequality

	Base Year	Year 1	Year 2	Year 3	Year 4	Year 5
Status Quo						
GDP Growth (%)	6.0	6.0	6.0	6.0	6.0	6.0
Inflation	4.2	4.7	5.2	5.3	5.5	5.7
Gini Coefficient (%)	41.7	41.9	42.2	42.5	42.7	42.9
Poverty (Headcount %)	40.0	40.1	40.5	41.2	41.2	41.7
Scenario - 1:						
Increase in Development/Social Expenditure Through Deficit Financing						
GDP Growth (%)	6.3	6.7	7.0	7.5	7.5	7.6
Inflation	4.2	4.8	5.0	4.9	5.0	5.0
Gini Coefficient (%)	41.7	41.4	41.6	41.8	42.1	42.4
Poverty (Headcount %)	40.0	37.1	36.7	36.6	36.2	36.2
Scenario – 2:						
Increase in Development /Social Expenditure Through Expenditure Switching						
GDP Growth (%)	6.3	6.7	7	7.5	7.5	7.7
Inflation	4.2	4.7	4.6	4.4	4.2	4.1
Gini Coefficient (%)	41.7	41.4	41.5	41.8	42.0	42.2
Poverty (Headcount %)	40.0	37.1	36.6	36.3	35.8	35.6

Source: SPDC Macroeconomic Model Simulations

The first simulation shows that the increase in development expenditure and provincial social sector expenditure to the tune of Rs. 75 billion over the stipulated period, financed through growth in money supply, i.e., through deficit financing, is likely to enhance the GDP growth rate from 6.3 percent in the base year to 7.6 percent in Year 5, as against 6 percent in the status quo scenario. This would require total investment/GDP ratio to rise from 16.2 percent in the base year to 19.8 percent and the public investment/GDP ratio to be nearly 6 percent in Year 5. This scenario shows inflation rising from 4.2 percent in the base year to 4.8 percent in Year 1, and then remaining constant at around 5 percent, slightly lower than 5.2 percent in the status quo scenario. Inflation does not rise relative to the base despite the increase in money supply because higher GDP growth occurs largely due to the expansion of output supply and, by itself, puts downward pressure on prices. The Gini coefficient continues to rise, although at a lower rate,

and stands at 0.424 in Year 5 as against 0.429 in the status quo scenario. The poverty incidence declines from 30 percent in the base year to 26.2 percent in Year 5

Scenario 2 involves the same increase in development and social sector expenditure as simulated in the first Scenario, but it is financed through switching of current expenditure. The increase in the GDP growth rate is the same as in Scenario 1 and would require the same growth in total investment/GDP and public investment/GDP ratios. However in this Scenario, inflation rises from 4.2 percent in the base year to 4.7 percent in Year 1 and then declines to 4.1 percent in Year 5. Poverty declines from 30 to 25.6 percent. The Gini coefficient continues to rise; although, at a lower rate than in the status quo scenario or in Scenario 1, and stands at 0.422 in Year 5. The budget deficit/GDP ratio first rises to 5.5 percent in Year 1 and then declines to 4.9 percent by Year 5.

A comparative analysis of these scenarios clearly demonstrates that a high GDP growth rate, without accompanying equity-promoting policy shifts, is by itself unlikely to reduce the incidence of poverty. As shown in status quo situation, where the tax and expenditure levels and composition are held constant, a 6 percent annual growth rate over a five-year period does not reduce poverty because inequality continues to rise and high growth serves to redistribute a greater proportion of incremental income in favor of upper income groups.

The partial shift of the tax burden from indirect to direct sources and the allocation of additional resources to developmental and social heads of expenditure accelerates the rate of economic growth. Clearly, the adjustment offers positive efficiency gains. There are equity gains as well, since it also reduces the rate of growth of the Gini coefficient and reduces poverty. Most significantly, the rising curve of poverty incidence is reversed.

The rate of increase of the Gini coefficient is lower; consequently, the decline of poverty is somewhat greater under the expenditure-switching scenario than under the increased money supply scenario. Accordingly, the budget deficit/GDP ratio and inflation are also higher under Scenario 1 than under Scenario 2.

The results provide meaningful conclusions and highlight the possibilities that exist for economic growth and for reduction of inequality and poverty. The two scenarios - one where financing is through increase in money supply and the other where financing is through expenditure-switching - represent two ends of the spectrum and possibilities exist for various combinations of the two. The analysis presented above establishes the insufficiency of growth alone as a vehicle for poverty reduction, and consequently, the inevitability of engaging with the task of

reducing inequality. The analysis also establishes the fact that progressive measures on the fiscal and monetary policy fronts, while inclined to reduce to some extent, do not have a perceptible effect on inequality. This may be because of the ingrained inequality in the distribution of assets, particularly land in rural areas.

7. 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 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. Summing up, the conclusions of this research are the following: 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 mattes, 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.

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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 analyzing 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 endogenizing 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 analyzing 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.

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.

CHART A.1
BASIC STRUCTURE OF THE ISPM MODEL
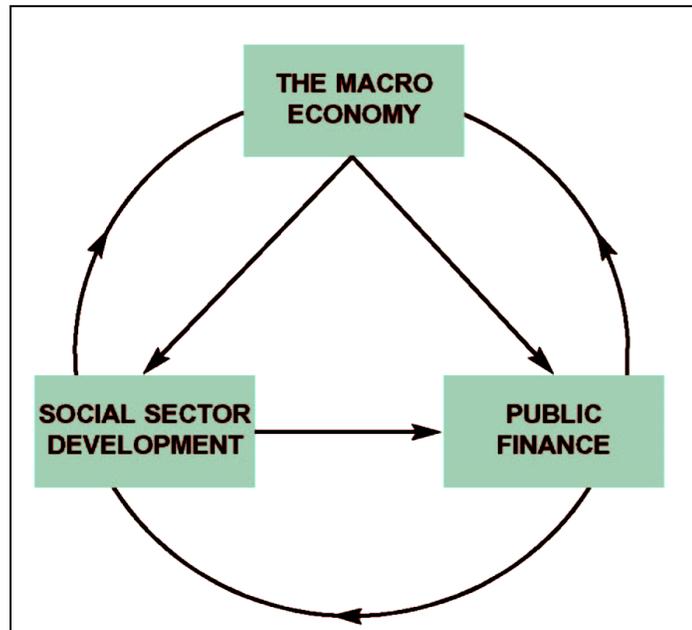
Macro ➔ *Public Finance*
The key link here traces the impact of developments in the macroeconomy on the growth of the tax bases (including divisible pool taxes) and thus affects the fiscal status of different governments.

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
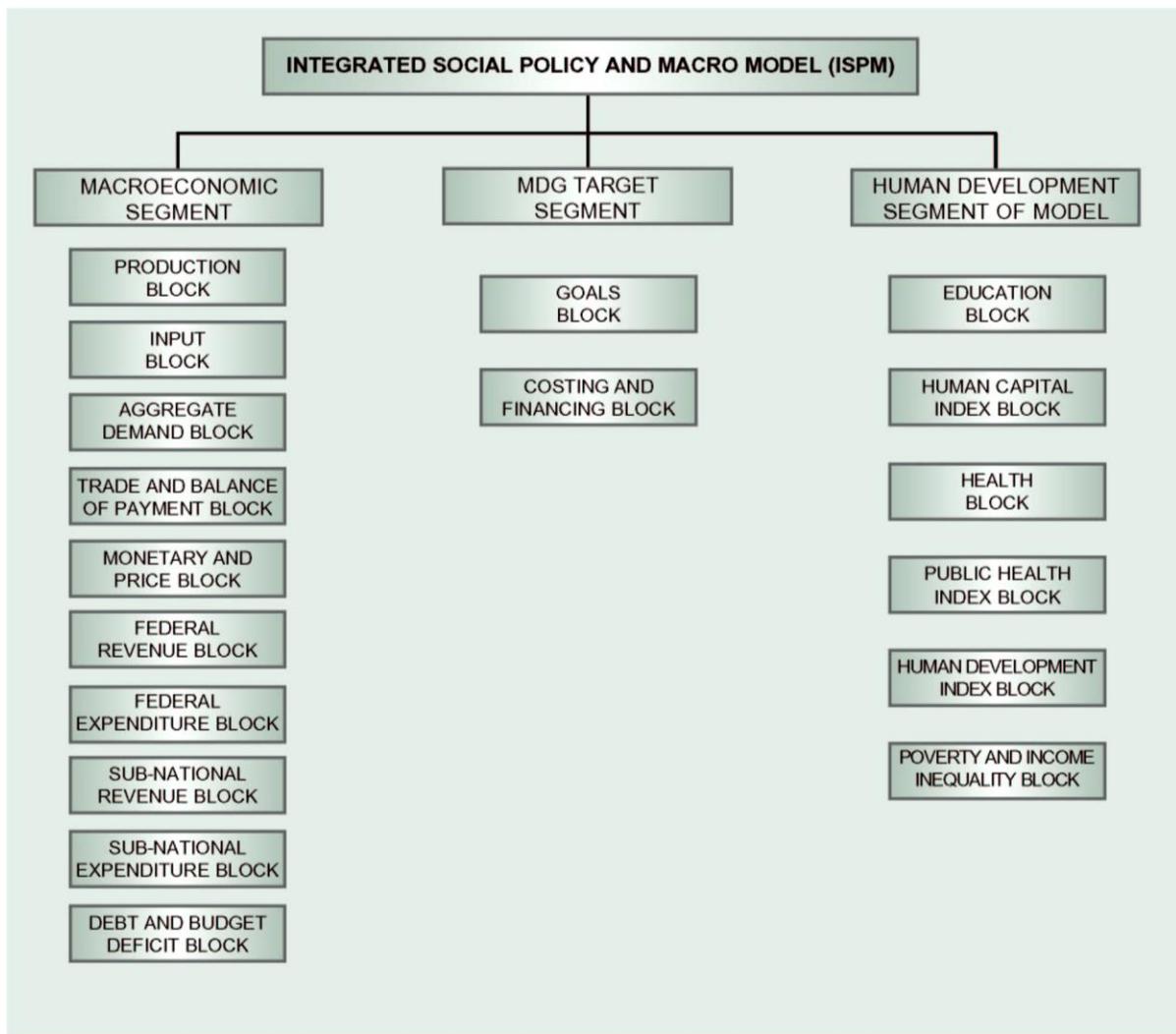
Macro Economy ➔ *Social Sector Development*

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 decentralization) 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 analyze the consequences of particular policy actions by the government.

For example, if the federal government decides to pursue a policy of higher tax mobilization 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 pubic 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 mobilization 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 A3.3.

CHART A3.3
LINKS OF ISPM MODEL WITH SPECIAL REFERENCE TO POVERTY AND INEQUALITY