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The Poverty-Growth-Inequality Triangle Hypothesis: An Empirical Examination

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Abstract: This paper is motivated by empirical observations on the interaction between distribution and growth in reducing absolute poverty. Using data on sixty-six developing countries over the periods 1970-1979, 1980-1989 and 1990-1998, we find that improvement in income distribution is the key channel for poverty reduction. In addition, growth accompanied by improved distribution works better than growth and distribution alone, and that provision of civil liberties and political rights enable people to more actively participate in reducing poverty.

Key Words: economic growth, inequality, poverty, improvement in distribution, social capability

JEL classification: O4, I3

1. Introduction

There is profound disagreement about the relationship between growth and distribution in the academic circles and among development agencies. A large body of the development literature examines the inverted-U hypothesis by Kuznets (1955) in that the distribution of income tends to worsen in early stages of growth, but improves in later stages. As a result, structural transformation experienced by low-income countries would ignite a sequence of increasing and then decreasing inequality. A number of cross-sectional studies verify the inverted-U hypothesis and illustrate that in low-income countries inequality is negatively and robustly correlated with growth (e.g., Paukert 1973; Adelman and Morris 1973; Ahluwalia 1976; Clarke 1992; Higgins and Williamson 2002). In contrast, several studies utilizing data on individual countries across time cast doubt about the validity of the inverted-U hypothesis and conclude that public policy measures could help improve equality as growth proceeds (e.g., Jain 1975; Ranis 1977a and 1977b; Papanek and Kyn 1986; Fields 2001). Citing historical experiences and case studies, Loehr and Powelson (1981) conclude that public policy could help inequality get progressively less as growth proceeds and that sustained growth and improved equality are compatible vehicles for poverty reduction.

Still, the relationship between growth, distribution, and poverty remains at the heart of development economics. Recently, the focus of the field has evolved to how the combination of growth and distribution help reduce absolute poverty. There is plenty of evidence suggesting that the combination of growth and distribution are essential for poverty reduction (e.g., Deininger-Squire 1996; Foster and Szekely 2001; Dollar and Kraay 2002; Ravallion 2002; Krayy 2004). In particular, Bourguignon (2004) has redirected our attention from the growth-distribution debate to the interaction between growth and distribution in reducing absolute poverty. He suggests a poverty-growth-inequality triangle (PGIT) hypothesis that is based on the idea that development strategy should be guided by the goal of reducing absolute poverty, which can be achieved by implementing country-specific combination of growth and distribution policies. The PGIT hypothesis identifies two channels as to how redistribution affects growth: a

permanent redistribution of income reduces poverty instantaneously through the distribution effect, and redistribution contributes to a permanent increase in the growth elasticity of poverty reduction, therefore accelerating the rate of poverty reduction for a given rate of growth. If empirically verified, the PGIT hypothesis would point to an important policy-making direction in that a strategy of sustained growth and improved distribution raise the standard of living for the poorest segment of the population.

Our contribution to the literature is to offer an empirical examination of the PGIT hypothesis using panel data from a sample of developing countries. In doing so, we will examine relationships among growth, distribution, and poverty. In addition to these relationships, we will investigate the interaction between growth and distribution in reducing poverty. We will also augment our empirical PGIT model by adding indicators of social development to help formulate policies of poverty reduction.

Our key findings are that a development strategy based on improvement in income distribution and reinforced by economic growth and socio-political freedom would help reduce absolute poverty. In section 2, we formulate an empirical poverty-reduction model based on the PGIT hypothesis. Section 3 describes the data and econometric methodology. Section 4 presents estimation results of the model and section 5 includes some concluding remarks.

2. The PGIT Hypothesis

The extent and magnitude of absolute poverty depends on two factors: the growth of the mean level of real per capita income and the degree of inequality in the distribution of income. In the PGIT hypothesis, the strategy of poverty reduction requires both growth and improved distribution. Growth is a process of sustained long-term increase in the mean level of per capita income, and improved distribution refers to greater equality in the distribution of income. At any given level of per capita income, the more unequal the distribution of income, the greater is the incidence of poverty. Likewise, for any given pattern of income distribution, the lower the level of per capita income, the greater is the incidence of poverty.

The PGIT hypothesis illustrates the decomposition of poverty reduction into growth effect and distribution effect. In Figure 1, the headcount ratio is the area under the density function at the left of the poverty line. This function illustrates the distribution of income at each level of income in logarithmic scale on the horizontal axis. The move from the initial density function to a target density function (T) requires an intermediate step. This step is shown by the horizontal translation of the initial density function to the intermediate density function (I). The growth effect is shown by this shift of the density function corresponding to a proportional increase in per capita income for a given pattern of income distribution. The distribution effect corresponding to a change in income distribution of relative income at constant mean income entails the shift of the density function I to T.[1]

[Figure 1 here]

Applying this decomposition for small changes in mean income and distribution, the PGIT hypothesis formulates poverty reduction as a function of the growth of mean income, existing pattern of income distribution, and improvement in the distribution of income:

$$\boldsymbol{P = F(G, D, ID)}$$

Here, ***P*** stands for poverty reduction, ***G*** is growth, ***D*** represents the existing pattern of distribution, and ***ID*** indicates improvement in income distribution over the previous period. Under the standard assumption that the density function approximates log-normal, both the growth and distribution elasticities of poverty are increasing functions of the level of development and decreasing functions of the degree of relative income inequality.

[1] Here, Bourguignon acknowledges path dependence in this decomposition (i.e., moving first up and down, and then moving left to right). He asserts that although not necessarily equivalent except for infinitesimal changes, changes associated with the order of movements are assumed to be sufficiently small to permit discarding path dependence.

3. Data and Results

We collected data on observed growth periods for which distribution data were available at the beginning and end of the period. The sample consisted of sixty-six countries and three time periods of 1970-79, 1980-89, and 1990-98. Data on poverty showed the percentage of population living below the international poverty line (i.e., less than $1 a day); growth was measured in per capita GDP in purchasing power parity; and distribution was expressed as the Gini Index. The main source of data was annual issues of *World Development Report*.

To test the PGIT hypothesis, we present two sets of results in Table 1 based on the Ordinary Least Squares (OLS) and Generalized Least Squares heteroscedastic errors method (GLS). In the initial PGIT model, *Poverty Reduction* is a function of *Growth*, *Distribution*, and *Improvement in Distribution*. In these sets of results, only *Improvement in Distribution* exhibits positive and significant effects on *Poverty Reduction*.

[Table 1 here]

In the second group of results, we augment the PGIT model to illustrate that reduction in absolute poverty can be accelerated with human capital investment and socio-political freedom. Two additional explanatory variables, *Educational Attainment* and *Social Capability*, account for these effects, respectively. *Educational Attainment* is measured by primary school enrollments as percentage of the age group. *Social Capability* is quantified by the arithmetic mean of political rights and civil liberties indicators complied annually by the Freedom House (see also Grammy and Assane 1996). Results of this augmented model further emphasize the positive and significant effect of *Improvement in Distribution* on *Poverty Reduction*. Among control variables, coefficients of *Educational Attainment* exhibit the expected positive signs and are statistically significant. *Social Capability* exerts positive and highly significant effects on *Poverty Reduction*.

Unexpectedly though, our estimation results fail to verify fully the PGIT hypothesis as coefficients of *Growth* and *Distribution* are statistically insignificant. In subsequent estimation of the augmented model, we deleted these insignificant variables.

Now, we find *Educational Attainment* not to be significant. One possible explanation for this effect is collinearity between *Improvement in Distribution* and *Educational Attainment*. By and large, policies of improving income distribution require investment in human capital, especially at the primary levels of formal education. Statistically, we find the partial correlation coefficient between *Improvement in Distribution* and *Educational Attainment* to be significant at the five percent level. To continue our empirical examination of the PGIT hypothesis, we dropped this variable. Once again, *Improvement in Distribution* and *Social Capability* have the expected positive signs and highly significant coefficients.

Next, we introduced an interaction variable of *Growth-Improvement in Distribution*. The rationale for introducing this variable is the basis for the PGIT hypothesis in that reduction in absolute poverty requires simultaneous improvements in the mean level of per capita income and in the pattern of income distribution. In this modification of the PGIT model, *Improvement in Distribution* and *Growth-Improvement in Distribution* show positive and significant effects on *Poverty Reduction.* Likewise, coefficients of *Social Capability* remain positive and highly significant.

5. Conclusion

Our examination of the initial PGIT hypothesis indicates that reduction in absolute poverty is made possible by improvement in income distribution. All being equal, the elasticity coefficient of improvement in distribution asserts that for a one-percent reduction in the headcount ratio, income inequality must fall by four percent. When we augmented the model by a set of control variables, improvement in distribution and socio-political development remained the key factors for poverty reduction. However, growth and distribution show insignificant effects on poverty reduction. In the modified PGIT model, we replaced growth and distribution by a new variable capturing the interaction between growth and improved distribution. This interaction variable exhibited positive and significant effects on poverty reduction. In summary, we have identified three major factors contributing to poverty reduction:

- Improvement in income distribution is fundamental for poverty reduction
- Growth accompanied by improvement in income distribution works better than growth and distribution alone
- Provision of civil liberties and political rights enable people to more actively participate in reducing poverty

A poverty reduction strategy would require a wide-range of public policy measures that help accelerate growth and improve distribution. These actions include removal of market imperfections in credit, marketing, and pricing; labor- and skill-intensive industrialization; technological diffusion; rural development and job creation; and fiscal and monetary responsibility and accountability. In addition, enhancements in political rights and civil liberties would be needed to enable agents to actively and effectively participate in economic progress. Hence, policies of poverty reduction need to offer a comprehensive approach of sustained growth, improved distribution, and greater participation in social advancement.

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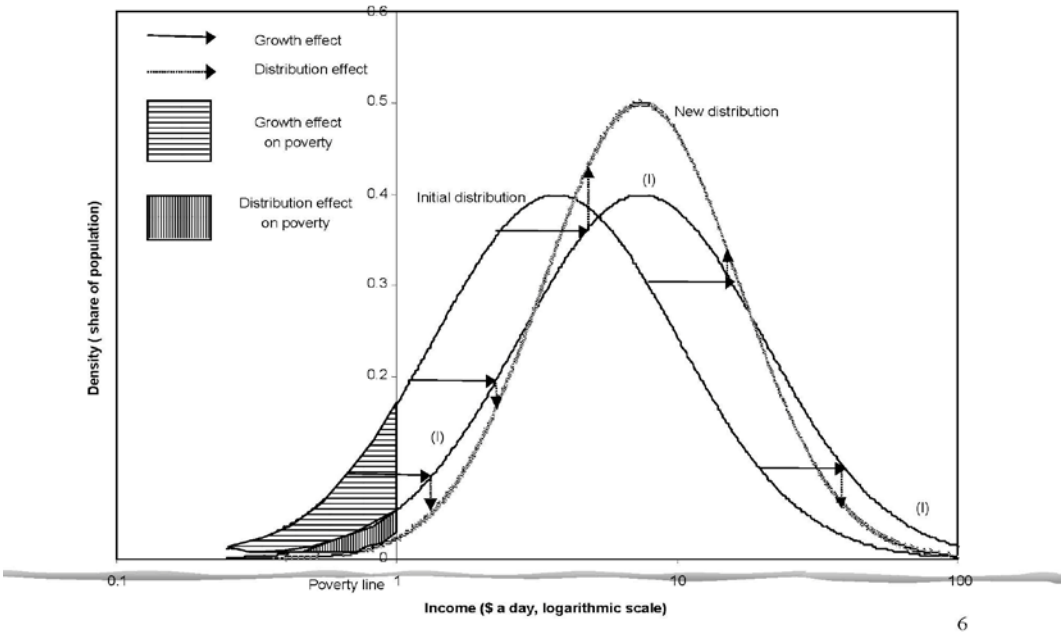
Figure 1

Decomposition of Change in Distribution and Poverty into Growth and Distributional Effects



6

Table 1 : Results of the PGIT Models

	Initial		Augmented				Modified Augmented					
	PGIT		PGIT 1		PGIT 2		PGIT 1		PGIT 2		PGIT 3	
Variables/Methods	**OLS**	**GLS**	**OLS**	**GLS**	**OLS**	**GLS**	**OLS**	**GLS**	**OLS**	**GLS**	**OLS**	**GLS**
Growth	-0.14	-0.14	-0.49	-0.49								
	(0.40)	(0.41)	(0.41)	(0.42)								
Initial Distribution	-0.11	-0.11	-0.45	-0.4								
	(0.15)	(0.15)	(0.14)	(0.14)								
Improvement in Distribution	0.28*	0.28*	0.26*	0.27*	0.25*	0.25*	0.26*	0.26*			0.16***	0.16***
	(0.09)	(0.09)	(0.09)	(0.08)	(0.09)	(0.09)	(0.08)	(0.09)			(0.10)	(0.10)
Growth-Improvement in Distribution									0.06*	0.06*	0.04**	0.04**
									(0.02)	(0.02)	(0.02)	(0.02)
Educational Attainment			0.08**	0.08**	0.06	0.06						
			(0.04)	(0.04)	(0.05)	(0.05)						
Social Capability			2.86*	2.87*	2.61*	2.61*	2.39*	2.39*	2.08*	2.08*	2.18*	2.18*
			(0.90)	(0.92)	(0.82)	(0.87)	(0.83)	(0.85)	(0.84)	(0.86)	(0.84)	(0.85)
Constant	3.57	3.65	-13.97	-13.97	-15.41	-15.4	-10.61	-10.61	-9.42	-9.41	-9.93	-9.93
	(6.57)	(6.71)	(9.07)	(9.07)	(5.67)	(5.76)	(3.42)	(3.46)	(3.42)	(3.47)	(3.43)	(3.48)
R^2	0.1		0.14		0.12		0.12		0.12		0.14	
Wald Chi-square		10.16*		20.21*		18.93*		17.82*		17.95*		19.73*
Observations	132	132	132	132	132	132	132	132	132	132	132	132

Note: Numbers in parentheses are standard errors of the estimate. Levels of significance are denoted by * for 1%, ** for 5%, and *** for 10%.