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Urbanization and the poverty level

Urbanización y nivel de pobreza

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RESUMEN:

En este trabajo se analiza el efecto del grado de urbanización sobre el nivel de pobreza. Nuestro modelo teórico sugiere una relación funcional en forma de U entre el nivel de urbanización y la pobreza. La urbanización contribuye a la reducción de la pobreza, pero a niveles mucho más altos, la urbanización conduce a aumento de la pobreza. Empíricamente, se estima el "nivel óptimo" de la urbanización mediante el uso de: (i) un enfoque de variables instrumentales utilizando el método generalizado de momentos, y (ii) un enfoque de análisis de panel dinámico. También se estudia la robustez de los efectos de la urbanización sobre el nivel de la pobreza mediante el examen de una variedad de canales de transmisión. El análisis empírico abarca diferentes regiones del mundo para estudiar si la magnitud de los efectos de la urbanización varía según la región. Los resultados apoyan la hipótesis de que existe una relación en forma de U entre los niveles de urbanización y de pobreza.

ABSTRACT:

This paper analyzes the effect of urbanization on the poverty level. Our theoretical model suggests a U-shape relationship between the level of urbanization and poverty. Urbanization contributes to poverty reduction but at much higher levels, urbanization leads to increases in poverty. Empirically, we estimate the "optimal level" of urbanization by using: (i) an instrumental variable approach in the framework of the generalized method of moments and (ii) a dynamic panel analysis approach. We also investigate the robustness of the impact of urbanization on the poverty level by examining a variety of transmission channels. The empirical analysis covers different regions of the world to study whether the magnitude of the urbanization effects varies across regions. Our results support the hypothesis that there exists a U-shape relationship between the level of urbanization and the poverty level.

1. INTRODUCTION

For many decades now, countries in all corners of the world have experienced rapid migration from rural to urban areas. A primary engine of this migration process has been people's desire to escape poverty and improve their standard of living. In parallel, the process of urbanization has been enhanced by agglomeration effects in production and consumption. These agglomeration effects have been not only fundamental forces shaping the economic structure of many countries, but they have also allowed a more efficient delivery of basic public services which, in turn, make a significant importance in the standard of living. There is little dispute in academic and policy circles that agglomeration economies and urbanization have played a significant positive role on economic development across countries. But, even though poverty reduction may be generally considered a natural by-product of the urbanization process, there is still considerable disagreement in the academic and policy literatures regarding the direction of the impact of urbanization process on the poverty level. The main goal of this paper is to contribute to this debate by taking a careful look from a theoretical and an empirical perspective at what the channels are through which the urbanization process may impact poverty levels and whether, from the perspective of poverty reduction, there is an "optimal" level of urbanization.

When studying the effects of the urbanization process, it is useful to make a distinction between urbanization itself and the associated process of urban concentration, defined as concentration of urban population in a few largest cities. Although urbanization might be associated with urban concentration and vice versa, the academic literature has been more concerned about the effect of urban concentration on poverty, as opposed to the effects of urbanization itself. In this paper we focus on clarifying the relationship between urbanization and poverty. As Ravallion et al. (World Bank 2007) have pointed out, the processes of urbanization may simply shift poverty incidence from rural to urban areas. The question we are interested in is whether the urbanization process has the net effect of reducing overall poverty incidence in both urban and rural areas and whether we can expect this relationship to be monotonic, or whether we can expect to see flattening and even reversals to that process.

In this paper we analyze, both theoretically and empirically using a variety of estimation approaches, the impact of urbanization on poverty reduction outcomes, looking at a variety of ways of defining poverty. One of our goals is to identify the different channels through which urbanization may work towards poverty reduction. Our approach allows us to derive the "optimal level" of urbanization from the perspective of poverty reduction. Unlike the urban concentration literature, in our model the non-monotonicity arises from the complementarity between the rural and urban sectors of the economy as a whole rather than the trade-off between scale economies and congestion in the largest cities. Therefore, over-urbanization might not be remedied just by spreading the urban population across a larger number of cities. Our findings have certain policy implications. To the extent that a certain degree of urbanization can be effective as a tool for poverty reduction, policymakers concerned with the effective reduction of poverty levels should pay close attention to the planning and management of urbanization processes.

The rest of the paper is organized as follows. In Section 2 we review the definitions of poverty, pro-poor growth, and urbanization processes; in this section we also briefly review the previous literature on urbanization and poverty. In Section 3 we develop a theoretical model that links urbanization processes, infrastructure provision, and income outcomes for the poor. In Section 4 we discuss our empirical estimation strategy and the data sources. In Section 5 we present our empirical results. In Section 6 we conclude.

2. WORKING DEFINITIONS AND LITERATURE REVIEW

2.1 Conceptual perspectives on the measurement of poverty

Poverty is a multi-dimensional concept and therefore it can be defined and measured in many different ways. First, poverty can be viewed from an objective and a subjective perspective. The objective approach involves some quantitative measurements, while the subjective approach places a premium on people's preferences. Second, poverty measures can capture physiological deprivation, such as those involving food and clothing, and sociological deprivations such as risk exposure and vulnerability. Poverty can also be evaluated from an absolute level or a relative level. For instance, a person may be considered absolutely poor if her income is less than a defined income poverty line; a person may be considered relatively poor if she belongs to a lowest income strata, say, the poorest 10 percent of the population. Regarding absolute poverty, for example, the World Bank has constructed poverty lines by drawing the line between poverty and non-poverty based on consumption ability. This constructed poverty line varies across different regions of the world; for example, for Africa it is usually set at 1 U.S. $ a day per person (1993 PPP$) as opposed to 2 U.S. $ (1993 PPP$) a day per person for Latin America.

In addition, the measurement of poverty can be done in monetary terms, as is the case with the World Bank poverty lines, but also in several non-monetary dimensions (based on qualitative information). The monetary approach considers circumstances in which individuals and households are impoverished; that is, when their income or consumption ability falls below a certain threshold level, which is usually defined as a minimum, socially acceptable level of well-being for a group of population (Kakwani, Khandker and Son 2004; Kraay 2006). By contrast, non-monetary indicators are used to assess poverty in terms of the level of human well-being. This approach to measuring poverty is based on the observation of human achievement outcomes in three main areas: (i) health and nutrition poverty; (ii) education poverty; and (iii) composite indices of wealth, such as civil rights or vulnerability.

In this paper, as explained below, we will approach the measurement of poverty from a variety of perspectives. Since there is no absolute best way to measure poverty, it is important that, whatever results we obtain regarding the impact of urbanization processes on poverty, these results be robust with respect to different ways of looking at poverty.

2.2 Pro-poor growth

Relevant to our perspective on urbanization and poverty is the concept of pro-poor growth, which has been brought into the discussion of economic development policies in recent times. Under pro-poor growth policies, the poor are paid special attention in the programs seeking to facilitate income and employment generation and to alleviate inequalities in the distribution of income (Kakwani and Pernia, 2000; Ravallion and Chen, 2003; and Ravallion, 2004). In this literature, essentially, economic growth is pro-poor if and only if it is associated with higher growth rates in the income of the poor vis-à-vis the income of the non-poor[1].In our analysis we are interested in identifying the link between the process of urbanization and pro-poor economic growth.

2.3 The Process of Urbanization

Rural-urban migration movements have been the main cause behind the urbanization process all over the world. Rural-urban migration brings about both costs and benefits from economic and fiscal perspectives. From an economic perspective, urbanization processes represent a general thrust towards increased productivity and greater efficiency in the allocation of national resources. However, the other side of the coin is that rural-urban migration also imposes costs arising from undesirable socioeconomic developments associated with urban growth and imposes additional

1 For example, Kakwani et al. (2004) conceptualize pro-poor growth by introducing the concept of the Poverty Equivalent Growth Rate (PEGR). The PEGR yields the same level of economic growth, without any change in inequality. Similarly Kraay (2006) discusses two sources of pro-poor growth: 1) direct economic growth that increases incomes of the poorest strata of income distribution, and 2) poverty sensitivity to growth; for example, if the income of the poorest grows faster (i.e., more sensitive) than average income, then poverty falls faster.

fiscal burdens because of the needed investment in infrastructure to meet the rapidly increasing demands for basic services (Linn 1982; Richardson 1987).

The economic benefits of urbanization arise in the form of higher productivity resulting from the “localized” and “urbanized” external economies of scale generally associated with that process. In the short run, efficiency is enhanced through the shifting of unproductive rural labor to urban areas where scale economies are realized. Location advantages generate a higher demand for consumer goods and production inputs leading to higher productivity and allowing higher wages to be paid to the new urban labor force. Thus, in the migration process there is a substitution toward more productive urban economic activities and a shrinking rural employment.

At the same time, urbanization enhances productivity of the rural sector through two kinds of complementarities. First, the rural sector benefits from a higher demand for rural goods from urban residents and from infrastructure, like farmers’ markets, that lower transaction costs in catering to that demand. Second, the productivity of the rural sector is also enhanced due to availability of new technologies. The latter effect results from the agglomeration of clusters in urbanized areas, which is likely to yield different specializations and increased productivities in each cluster as the labor pooling and availability of intermediate goods and services feed to technological progress. Due to the enhancement of rural productivity as urbanization progresses, the productivity differential between rural and urban sectors and therefore the gains from urbanization gradually diminish over time. Therefore, the relationship between urbanization and economic development appears to be a non-linear one as it is a product of the interplay of offsetting economic forces, similar to the interplay of centripetal and centrifugal forces hypothesized to shape the economic geography (Krugman 1999).

In addition, if most urban population huddles in a few metropolitan areas, at some point congestion and other costs of urban concentration outweigh its economic benefits (Henderson 2003; Bertinelli and Strobl, 2007). However, the empirical literature suggests that the relationship between urbanization, urban concentration, and industrialization is not monotonic. The early stages of industrialization are associated with both increasing urbanization and urban concentration. However, at more advanced stages of industrialization, urbanization is flattening while urban concentration starts to reverse (Kamerschen 1969).

Overall, the migration and urbanization processes have enormous potential to increase per capita income and the standard of living and on the way to reduce the poverty level in a country. However, it is far from clear that this relationship will be a monotonic one. At some higher levels, the urbanization process may not indeed contribute to further reductions in poverty but it may actually become a contributor to poverty. How that can happen is the central question examined in this paper.

2.4 The previous literature on urbanization and poverty

A voluminous literature in economic development has identified the positive "direct effect" of urbanization on poverty through rising incomes. A variety of channels have been identified, including migration processes that arbitrage wage differentials between rural and urban areas (Tadaro 1969; Harris and Tadaro 1970), and enhancements in technology and labor skills that raise productivity (Tolley and Thomas 1987; Faria and Mollick 1996; Bertinelli and Black 2004; Polèse 2005). However, some more recent studies have pointed out that while urbanization can help reduce the overall incidence of poverty, it can also possibly lead to higher poverty in urban areas (Ravallion 2001; Ravallion et al. 2007).

The empirical studies of the relationship between urbanization and economic growth have produced mixed results (Jones and Kone 1996; Easterly 1999; Fay and Opal 2000; Davis and Henderson 2003)[2]. Nevertheless, most of these papers find some positive effects of urbanization on economic growth at least up to a certain point.

Concerning some of the non-monetary dimensions of poverty, some theoretical studies have attempted to explain how differences in the availability of infrastructure for basic services between rural and urban areas relate to the urbanization process (Pham 2001; Issah et al. 2005). Some other empirical papers have found a positive and significant effect of urbanization on improved basic services (Dreze and Murthi 2001; Ramadas et al. 2002; Wodon and Ryan 2002 Liu et al. 2003; Issah et al. 2005) and increased efficiency in the provision of public infrastructure (Jayasuriya and Wodon 2002).

3. THEORETICAL FRAMEWORK

In this section we build a theoretical framework to explore more in depth the relationship between urbanization and poverty outcomes. In this framework, poverty will be examined in the context of overall social welfare measured in turn by the growth in per capita consumption.

First, we model the growth of consumption building on the Devaranjan et al. (1996) framework. In order to analyze the effect of urbanization on growth, we modify their framework in three specific ways. First, whereas Devaranjan et al. (1996) model government spending in productive and unproductive sectors, we use rural and urban

2 One possible explanation for the mixed results is the inconsistency in econometric models and data samples, for example cross-country versus time-series, used in those studies

infrastructure as the two inputs into the production function. We also assume that the government is the sole provider of rural and urban infrastructure (see in Issah, et al. 2005)[3]. Second, by using the CES production function instead of the Cobb-Douglas specification, we allow for varying degrees of complementarity between the rural and urban sectors; this allows us to accommodate completely urban economies like that of Singapore. Thus, in the generation of national income, urban infrastructure complements urban labor but to some degree those can be substituted by the combination of rural infrastructure and labor. Our third modification to Devaranjan et al.'s framework is the introduction in the production function of a composite efficiency-enhancing multiplicative term which captures long-run growth from technological innovations made possible by urban agglomeration economies in line with the previous literature on economic outcomes of urbanization (Henderson, 1988).

After we obtain the theoretical predictions for growth in per capita income and consumption, we then link those results to poverty reduction outcomes, this time building on the analytical framework of pro-poor growth developed by Kakwani and Pernia (2000); Ravallion and Chen (2003); and Kraay (2006).

3.1 The behavior of production units

We assume per capita production y to be a function of private capital stock k, and two types of government infrastructure: urban G_u and rural G_r, which are combined with labor measured by the urban N and rural $1\text{-}N$ shares of population respectively. We also include a multiplicative term for the technological level A and the shift factor $g(N)$. The shift factor is assumed to be a concave function of urbanization, capturing external agglomeration economies[4].[4] We assume output to be positively related to k, G_u, and G_r. Thus, the functional form for the per capita production is as follows:

$$y = A \cdot g(N) \cdot f(k, N \cdot G_u, (1 - N) \cdot G_r) \tag{3.1}$$

where A is a positive constant; $0 \leq N \leq 1$; and $f_k > 0$; $f_u > 0$; $f_r > 0$; $g_N > 0$; $g_{NN} < 0$.

3 Here government infrastructure can be interpreted as public education and health systems, roads, electricity, and other inputs to production.

4 In the addition to the share of urban population, the shift factor also depends on how this urban population is distributed among cities. Here we assume that for any given level of urbanization N, the shift factor $g(N)$ captures external agglomeration economies for the optimal level of urban concentration.

Furthermore, to facilitate the analytical derivations, we parameterize (3.1) in a form where capital is complementary with the composite public infrastructure but the latter can exhibit varying degrees of substitutability between urban and rural components:

$$y = A \cdot g(N) \cdot k^{\alpha} \cdot \left[\beta\left(NG_u\right)^{-\xi} + \theta\left(\left(1-N\right)G_r\right)^{-\xi} \right]^{-\frac{1-\alpha}{\xi}} \quad (3.1a)$$

where $0 \leq \alpha \leq 1$; $\xi \geq -1$; $\beta \geq 0$; $\theta \geq 0$.

Following Devaranjan, et al. (1996), the budget constraint for the government is assumed balanced and where infrastructure expenditures are financed through a flat rate income tax. The budget constraint thus is:

$$\tau \cdot y = G_u + G_r = G \quad (3.2)$$

where G is total government infrastructure expenditures per capita and τ is the flat tax rate.

Let us now assume the share λ of total government infrastructure expenditures accounted for by urban areas to be a function of the level of population urbanization N. Thus, the new budget constraint is given by:

$$\tau \cdot y = \lambda(N) \cdot G + (1 - \lambda(N)) \cdot G \quad (3.3)$$

where $0 \leq \lambda(N) \leq 1$; $\lambda_N > 0$.

3.2 The behavior of consumption

The life-time utility of the representative consumer is given by

$$U = \int_0^{\infty} u(c) e^{-\rho t} dt \quad , \quad \text{where } u_c > 0,\ u_c < 0 \ , \quad (3.4)$$

Following Ramsey's growth model, U is maximized subject to

$$\dot{k} = (1-\tau)y - c \quad (3.5)$$

where c is consumption and ρ is the rate of time preference, and both are strictly positive[5].

5 See Blanchard and Fischer (1989).

Substituting Equations (3.1) and (3.3) into Equation (3.5) yields the new budget constraint:

$$\dot{k} = (1-\tau)\cdot A\cdot g(N)\cdot f(k, N\cdot G_u, \left(1-N\right)\cdot G_r) - c \qquad (3.6)$$

To make derivations more tractable, we specify the utility function in the commonly used Constant Relative Risk Aversion (CRRA) form. This function, with the constant elasticity of marginal utility, is expressed as following:

$$u(c) = \frac{c^{1-\sigma}}{1-\sigma} \qquad (3.7)$$

where $0 < \sigma < 1$ is the constant elasticity of substitution between consumption in any two periods.

Solving the Hamiltonian system with the life-time utility function specified by (3.7) and (3.4) subject to the budget constraint (3.6) yields the following[6]:

$$\mu = \frac{\dot{c}}{c} = \frac{(1-\tau)\cdot A\cdot g(N)\cdot f_k(k, N\cdot G_u, \left(1-N\right)\cdot G_r) - \rho}{\sigma} \qquad (3.8)$$

where μ is the marginal value as of time zero of an additional unit of consumption.

Equation (3.8) gives the long-term steady-state growth rate for consumption, production and infrastructure expenditures (hereafter, the growth rate). For the specific functional form described in (3.1a), this growth rate can be expressed in an extensive form as a function of N[7]:

$$\mu = \frac{\dot{c}}{c} = \frac{\frac{\alpha(1-\tau)}{\tau}\left(A\tau\right)^{\frac{1}{\alpha}}\left\{g\left[\beta\left(N\lambda\right)^{-\xi} + \theta\left(\left(1-N\right)(1-\lambda)\right)^{-\xi}\right]^{\frac{(\alpha-1)}{\xi}}\right\}^{\frac{1}{\alpha}} - \rho}{\sigma} \qquad (3.9)$$

3.3 The effect of urbanization on the growth rate

Equation (3.9) suggests that the growth rate is a function of urbanization. Being a fixed fraction of the national income (by construction in our model), the total government infrastructure expenditures are also a function of urbanization. From Equation (3.9) we are able to evaluate the impact of urbanization on the growth rate:

6 The derivations are available upon request.
7 Derivations are available upon request.

$$\frac{d\mu}{dN}=\frac{\frac{\alpha(1-\tau)}{\tau}\left(A\tau\right)^{\frac{1}{\alpha}}}{\sigma}\frac{d}{dN}\left\{g\left[\beta\left(N\lambda\right)^{-\xi}+\theta\left(\left(1-N\right)(1-\lambda)\right)^{-\xi}\right]^{\frac{(\alpha-1)}{\xi}}\right\}^{\frac{1}{\alpha}} \quad (3.10)$$

What we are interested in is the sign of the RHS of Equation (3.10). The common factor term is always positive. Therefore, the sign of this derivative is determined by the sign of the expression in the brackets

$$\frac{d}{dN}\left\{g\left[\beta\left(N\lambda\right)^{-\xi}+\theta\left(\left(1-N\right)(1-\lambda)\right)^{-\xi}\right]^{\frac{(\alpha-1)}{\xi}}\right\}$$

The latter is in turn determined by the sign of the following expression

$$\frac{g^{'}(N)}{g(N)}\left[\beta\left(N\lambda\right)^{-\xi}+\theta\left(\left(1-N\right)(1-\lambda)\right)^{-\xi}\right]+\frac{(\alpha-1)}{\xi}\frac{d}{dN}\left[\beta\left(N\lambda\right)^{-\xi}+\theta\left(\left(1-N\right)(1-\lambda)\right)^{-\xi}\right]$$

The first term represents the "channeled effect" of enhancing the level of technology through urbanization (external agglomerative economies) on the long-run growth rate. The second term represents the "channeled effect" of urbanization on the growth rate through the "economic infrastructure effect." Thus the sign of the impact of urbanization *N* on the growth rate is determined by the trade-off between the positive impact on agglomeration economies and the impact on the productivity of public infrastructure. The latter is in turn determined by a trade-off between declining rural production due to the outflow of population and public infrastructure and increasing urban production. It can be shown that the decline in rural production can outweigh gains in urban production only if the elasticity of substitution between the rural and urban sectors, which is equal to 1/ (1+ ξ), is less than two (i.e. ξ≥-0.5)[8].[8] Thus, when complementarity between rural and urban sectors is low, the impact of urbanization on growth is always positive. However, for higher levels of complementarity between the rural and urban sectors, urbanization up to a certain level has a positive impact on growth but it starts to hinder growth when urbanization increases beyond that point. This is because of the feedback from urbanization in raising rural productivity and thus narrowing the rural-urban productivity gap and thus gains from urbanization. Thus, our theoretical model identifies conditions under which the relationship between the level of urbanization and growth rate exhibits an inverse U-shape.

8 Further details on the derivations are available upon request.

3.5 The effect of urbanization on the incomes of the poor

Having established the impact of urbanization on growth, in this subsection our focus shifts to how urbanization affects the poor. We consider an aggregate measure of poverty:

$$P_t = \int_0^{H_t} f\left(y_t(p)\right)dp$$

where $y_t(p)$ is the income of the p^{th} percentile; H_t is the fraction of the national population below the poverty line z, and $f(y)$ is some measure of the severity of poverty at the income level y, such as in the Foster, Greer and Thorbecke (FGT) index:

$$f(y) = \left(1 - \frac{y}{z}\right)^{\theta}$$

Following Kraay (2006), by using Leibniz's rule we can show that the change in poverty can be expressed as follows:

$$\dot{P} = f\left(H_t\right) \cdot \dot{H}_t + \int_0^{H_t} \frac{df\left(y_t(p)\right)}{dy} \cdot \dot{y}_t(p)dp \qquad (3.11)$$

which is a sum of the change in poverty headcount and the change in severity of poverty at various percentiles of income below the poverty line.

For the same growth in the average income level, the aggregate measure of poverty, the FGT index, can change in very different ways. As Kakwani et al. (2004) put it, "the Lorenz curve can change in an infinite number of ways and thus the ex-ante analysis of change in poverty is not possible under general situations." Therefore, in this analysis, we will assume the same growth rate at each percentile of income so that the shape of the Lorenz curve does not change, i.e., the poor and the non-poor proportionally benefit from the shift in the average income. It implies that the poverty headcount H_t is a non-increasing function of urbanization N, as in Ravallion (2001).

However, even when growth preserves the shape of the Lorenz curve, different shapes of the curve can result in different rates of poverty reduction. It can be shown that, when the Lorenz curve has the a parabolic shape, that is y"(p)=0, then in the steady state, the poverty reduction rate is equal to the income growth rate[9]:

$$\frac{\dot{P}}{P} = -\mu$$

9 Further details on the derivations are available upon request.

For a different shape of the Lorenz curve whereis

$$\frac{y_t'(p)}{y}$$

the same at each percentile *p*, for example the Chotikapanich (1993) shape, poverty reduction takes place according to the following formula:

$$\dot{P} = -\mu \cdot \frac{1}{k}\left(1 - \frac{y_t(0)}{z}\right)^{\theta}$$

Thus, for the Chotikapanich shape of the Lorenz curve, the reduction of the headcount (i.e., $\theta=0$) is proportional to the average income growth. However, other FGT measures (i.e., $\theta>0$) do not have a steady state for this shape, because the rate of poverty reduction is declining as the income at the bottom of the distribution y_t (0) approaches the poverty line z. For another common shape of the Lorenz curve, the one corresponding to the Pareto distribution, it is the share of non-poor that is increasing at a rate proportional to the income growth rate μ. For other FGT indices a steady state does not exist and thus they cannot be subjected to comparative statics analysis.

In summary, for those shapes of the Lorenz curve-assuming that the shapes are preserved with economic growth-that the FGT indices have a steady state, poverty reduction is proportional to the income growth rate and therefore follows a U-shape whenever the average income growth exhibits a U-shape. The corollary of our analysis is that under sufficient complementarity between the rural and urban sectors, up to a certain point, urbanization improves poverty reduction but the effect gets reversed thereafter.

4. EMPIRICAL ESTIMATION STRATEGY

4.1 Specification of the estimation equation

Our goal in this section is to estimate the effects of urbanization on poverty reduction outcomes. The analysis makes three important contributions to the existing empirical literature. First, based on the U-shape relationship implied by our theoretical model, we include urbanization in a quadratic form as the explanatory variable of interest in the poverty regressions. Second, we allow urbanization to be endogenous with poverty when examining its effects. A number of previous studies have found a direct relationship between urbanization and the monetary dimension of well-being, especially the rate of economic growth (Jones and Kone 1996; Handerson 2003).

However, some of these studies treat urbanization as strictly exogenous. Third, we go beyond the impact of urbanization on poverty indicators and look at the specific channels for how the linkages take place including education attainment, health status, and labor productivity. Linking urbanization to poverty reduction through these channels can help policy-makers better utilize available resources through better aimed government policies.

We set out to estimate the relationship between urbanization and poverty reduction outcomes in the following general form:

$$Poverty_{it} = f(Urban_{it}, Urban_{it}^2, X_{it}) + u_{it} \tag{4.1}$$

where $Poverty_{it}$ is a poverty indicator; $Urban_{it}$ is the urbanization rate; $Urban_{it}^2$ is the urbanization rate squared; Xi_t is a set of control variables; and $u_{it}=n_i+\nu_t$ is a composite error of unobserved country-specific effects (η_t) and a vector of idiosyncratic disturbances (ν_{it}).

For our panel (GMM-IV[10]) estimation we use four alternative specifications of this general relationship:

$$Poverty_{it} = \beta_0 + \beta_1 Urban_{it} + \beta_2 Urban_{it}^2 + \beta_j X_{it} + u_{it} \tag{4.2}$$

$$Poverty_{it} = \beta_0 + \beta_1 Urban_{it} + \beta_j X_{it} + u_{it} \tag{4.3}$$

$$\begin{aligned} Poverty_{it} &= \beta_0 + \beta_1 Urban_{it} + \beta_j X_{it} + \\ &+\beta_2 UrbanEASIA + \beta_3 UrbanMENA + \beta_4 UrbanLAC + u_{it} \end{aligned} \tag{4.4}$$

The terms capturing interactions between urbanization and the regional dummy variables are introduced in Equation (4.4): East Asia (*UrbanEASIA)*, Middle East and North Africa *(UrbanMENA)*, and Latin America and the Caribbean *(UrbanLAC)*. Note that Sub-Saharan Africa is our default region as in Fay and Opal (2000). Our set of control variables includes economic and socio-demographic variables, and variables capturing government institutions relevant for the regression of a specific poverty indicator.

For the dynamic panel GMM estimation[11] (the growth model) the specification is as follows:

$$Povertyg_{it} = \beta_0 + (\alpha - 1)iPoverty_{it} + \beta_2 Urban_{it} + \beta_3 Urban_{it}^2 + \beta_j X_{it} + u_{it} \tag{4.5}$$

10 See details in Baum et al. (2003)

11 See details in Bond et al. (2001) and Bond (2002).

where $Povertyg_{it} = ln\ Poverty_{it} - lnPoverty_{it-1}$ is the rate of change in the poverty indicator; $iPoverty_{it} = lnPoverty_{it-1}$ is the lagged value of the poverty indicator; and all other notation remains as explained above.

For the poverty indicators capturing improvements in human well-being (poverty reduction) such as the HDI, the testable hypothesis is that the coefficient at the linear term for urbanization is positive ($\beta_1 > 0$) while that at the quadratic term is negative ($\beta_1 < 0$). The opposite signs are hypothesized for regressions using the FGT-class indicators as the dependent variable. In Equations (4.2) and (4.5), the optimal degree of urbanization is, therefore, given by[12]

$$Urban^* = -\frac{\beta_1}{2\beta_2} \qquad (4.6)$$

4.2 Several econometric issues

Before we proceed with the estimation we need to deal with a number of econometric challenges. First, some of our regressors can be endogenous due to correlation with some unobserved factors such as economic shocks or unexpected political events. For example, random shocks such as economic crises in a country may have an impact on rural-urban migration. Higher unemployment or job-seeking uncertainty is likely to affect the patterns of migration. Urban dwellers would prefer to migrate to their native rural areas for jobs in the agricultural sectors or to move to a neighboring country if there is a free labor movement regime or lax border controls. In this situation, the standard estimation methods of panel data analysis (fixed or random effects) can produce biased estimates. We address this endogeneity problem issue by using an appropriate set of instruments in the framework of the generalized method of moments (GMM-IV)[13].

Another empirical issue is that the standard errors of the IV estimators can suffer from the presence of heteroskedasticity[14] of unknown form leading to invalid statistical inferences. We address this issue in our poverty regressions by testing for

12 For example, for Equation (4.2) this expression is derived by simply equating to zero the partial derivative with respect to urbanization (Urban):

$$\frac{\partial HDI}{\partial Urban} = \beta_1 + 2\beta_2 \overline{Urban}$$

where Urban represents the mean value of urbanization in our sample.

13 See the discussion of the appropriate set of instruments in the empirical results section.

14 Under heteroskedasticity, the variance of the error term is not constant but might vary with the values of the regressors.

heteroskedasticity and computing robust standard errors in the GMM-IV framework, as discussed in the next section.

4.3 Data

Our data are an unbalanced panel data set. The overall number of countries in the panel is 143 which are observed at 5-year intervals spanning from 1960 to 2005. The number of longitudinal observations varies between series of six to nine time periods

5. EMPIRICAL RESULTS

This section reports the results from testing the hypotheses derived in our theoretical framework. First, we present the results on the impact of urbanization on non-monetary aspects of poverty reduction. Second, we report the findings regarding the effect of urbanization on income growth of the poor. Third, we present evidence on the "channeled effects" of urbanization on poverty reduction outcomes.

5.1 Urbanization and human development

In Table 1, we report the estimation results for the regressions specified by Equations (4.2)–(4.4) respectively, with HDI as the dependent variable representing poverty reduction outcomes. Results of fixed and random effects estimations are reported in columns (1) and (2), respectively. The coefficients on urbanization and urbanization squared are both statistically significant at the 1% level and suggest a concave shape for the relationship between urbanization and poverty. In general, these results support our hypothesis that there is an optimal degree of urbanization for poverty reduction outcomes.

As discussed previously, to address the endogeneity and heteroskedasticity problems, we turn to GMM-IV estimation, using the lagged values of the independent variables as internal instruments in this estimation[15]. Column (3) of Table 1 presents

15 See Wooldridge (2002) pp 282-283 for the Wooldridge autocorrelation test. Note that Drukker (2003) provides simulation results showing that the test has good size and power properties in reasonably sized samples. He has also proposed a user-written program, *xtserial*, to perform this test in STATA. The test for autocorrelation in panel data yields the following results: F (1, 34) = 2.514, Prob > F =0.1221. This means that the hypothesis that there is no first-order autocorrelation in the data cannot be rejected at the 10% significance level.

TABLE 1
ESTIMATES OF URBANIZATION AND POVERTY REDUCTION OUTCOMES

Dependent Variable	Human Development Index (HDI)				
	Quadratic form			Linear form	
Independent Variable	(1) FE	(2) RE	(3) GMM	(4) GMM	(5) GMM
Urbanization	0.215 **	0.440 **	0.481 *	0.050 *	0.103 **
	(0.065)	(0.134)	(0.191)	(0.023)	(0.030)
Urbanization^2	-0.245 **	-0.334 **	-0.355 *		
	(0.052)	(0.092)	(0.142)		
GDP per Capita [a]	0.072 **	0.071 **	0.050 **	0.055 **	0.062 **
	(0.007)	(0.006)	(0.012)	(0.008)	(0.007)
Degree of Decentralization	0.029 #	0.032 *	0.068 #	-0.034	-0.072 *
	(0.016)	(0.015)	(0.041)	(0.034)	(0.033)
Openness	-0.003	0.002	0.047 *	-0.014	0.009
	(0.005)	(0.005)	(0.023)	(0.012)	(0.012)
ODA	0.028	-0.109	-0.209	-0.175	0.221
	(0.115)	(0.097)	(0.368)	(0.201)	(0.210)
Freedom	0.0001	0.0002	-0.004	-0.005	0.0008
	(0.001)	(0.001)	(0.006)	(0.004)	(0.004)
Population Density [a]	0.078 **	0.006	0.011	-0.014 **	-0.001
	(0.016)	(0.005)	(0.014)	(0.004)	(0.005)
Road Density [a]	0.002	0.004	-0.005	0.012 *	-0.007
	(0.002)	(0.003)	(0.012)	(0.006)	(0.007)
Urbanization x EASIA Dummy					-0.102 **
					(0.028)
Urbanization x MENA Dummy					-0.096 **
					(0.029)
Urbanization x LAC Dummy					-0.066 **
					(0.017)
Hansen Test (*p* -value)			0.5034	0.1401	0.2431
Time Dummies	Yes	Yes	Yes	No	No
No. of observations	232	232	142	116	116
R-squared	0.9464 (Within)				

** significant at 1%; * at 5%; # at 10%
[a] The variable is in the form of logarithm.
Numbers in parenthesis are robust standard errors.
Hausman Specification Test (1) vs (2) : chi(15) = 74.70 and Prob>chi2 = 0.0000
The null hypothesis of Hansen Test is that the instruments used are not correlated with the residuals.

the results of the GMM-IV estimation[16]. The coefficients on both urbanization variables are statistically significant at the 5% level. The implied optimal level of urbanization is (0.481/2x0.355) = 0.677. At the optimal level of urbanization, a one-standard deviation (0.203) increase in urbanization over five years makes the HDI drop by 0.015 (or 0.1 of the standard deviation) over the same period, ceteris paribus[17].

Columns (4) and (5) of Table 1 demonstrate how the estimates of the urbanization impact on poverty weaken when we fail to control for the distance from the optimum. The economic interpretation of Column (4) results imply that one-standard deviation (0.203) increase in urbanization over five years makes HDI increase by 0.01 (or 0.07 standard deviation)[18]. This misspecification is somewhat mitigated in the regression reported in Column (5), by including an interaction term for each of four regional dummies to control for the distance from the optimal level of urbanization for the region as a whole. Holding other things constant, the magnitude of the effect of urbanization on the HDI varies across regions and can be characterized as follows. In East Asia, one-standard deviation (0.203) increase in urbanization is associated with an increase in the HDI of (0.103–0.102) x0.203 = 0.0002 (or 0.001 standard deviation). In the Middle East and North Africa, a one-standard deviation (0.203) increase in urbanization is associated with an increase in the HDI of (0.103–0.096) x0.203 = 0.0014 percentage points (or 0.009 standard deviation). In Latin America and the Caribbean a one-standard deviation (0.203) increase in urbanization is associated with an increase in the HDI of (0.103–0.066) x0.203 = 0.00751 (or 0.049 of the standard deviation). Note that in the default region of Sub-Saharan Africa, a one-standard deviation (0.203) increase in urbanization is associated with an increase in the HDI of 0.103x0.203 = 0.021 (or 0.136 of the standard deviation)[19]. The evidence supports our hypothesis that the impact of further urbanization on poverty reduction outcomes depends on the position of the status quo vis-à-vis the optimum.

16 We test the presence of heteroskedasticity for the IV approach to see whether we will look for GMM or IV by using *ivhettest* in STATA. The results are Pagan-Hall general test statistic = 7.491, *p*-value = 0.0062. This means that the hypothesis that the disturbance is homoskedastic can be rejected at the 1% significance level.

17 The figure 0.015 is the difference of the amount derived by substituting the different levels of urbanization in the quadratic form of urbanization. That is $0.015 = \{(0.481x0.677)-(0.355x0.677^2)\}-\{(0.481x0.880)-(0.355x0.880^2)\}$, where one standard deviation (0.203) is obtained from the descriptive statistics based on the sample in this estimation.

18 For this model specification, we also test for autocorrelation in panel data yielding the following results: $F(1, 34) = 2.978$, Prob > F = 0.0935. This means that the hypothesis that there is no first-order autocorrelation in the data cannot be rejected at the 5% significance level.

19 The impact of urbanization in South Asia and Eurasia is not statistically significantly different from that in the default region.

5.2 Urbanization and monetary poverty

In Table 2 we report the results of the dynamic panel analysis of reduction in monetary poverty (Equation 4.5) using the two-step approach to the system GMM estimation[20]. The system GMM estimator addresses with a set of "internal instruments" the endogeneity problems concerning both the lagged dependent variable and potentially endogenous explanatory variables including urbanization. More specifically, we use the second and further lags of the dependent variable and potential endogenous regressors as a set of instrumental variables.

Columns (1)—(3) of Table 2, present the results of the dynamic panel estimation using as a dependent variable three alternative poverty indicators from the FGT class: the headcount index (HI), the poverty gap (PG), and the squared poverty gap (SPG), respectively. Unlike the estimations presented earlier, here the data sample does not include developed countries. Similar to the static panel analysis, we can use the estimated coefficients to infer the optimal level of urbanization.

For the HI regression, reported in Column (1) of Table 2, the coefficients for the urbanization terms, which are statistically significant at the 5% level, imply the optimal degree of urbanization of (15.354/2x15.650) = 0.491. At the optimal level of urbanization, a one-standard deviation (0.19) increase in urbanization over five years makes the rate of HI reduction drop by 53.8 percent over the same period, ceteris paribus. Thus under a suboptimal level of urbanization we have a significantly smaller rate of reduction in the number of people living below U.S. 1$ income/consumption per day

In Column (2) of Table 2 we employ the rate of PG change as the dependent variable. The table reports estimated coefficients for both urbanization terms that are statistically significant at the 10% level. The implied optimal level of urbanization is (12.990/ (2x13.739)) = 0.473. A one-standard deviation (0.190) change from the optimal level of urbanization leads the PG reduction rate to drop by 49.7 percent over five years, all else constant. Recall that the PG index measures how far the mean aggregate income or consumption of the poor falls below the established poverty line, i.e., the depth of poverty.

In Column (3) of Table 2**,** we utilize the SPG change as the dependent variable. Recall that the SPG index is a distributional measure that captures differences in

20 According to Arellano and Bond (1991) and Blundell and Bond (1998), although the two-step approach is asymptotically more efficient, the two-step standard errors tend to be severely downward biased. Roodman (2006) proposed a user-written program on STATA, *xtabond2,* to compensate this disadvantage and to make available a finite-sample correction to the two-step covariance matrix derived by Windmeijer (2005). This can make the two-step robust approach more efficient than the one-step robust estimator leading to more accurate inference.

TABLE 2
ESTIMATES OF URBANIZATION AND PRO-POOR GROWTH

Dependent Variable (Growth Rate)	Headcount Index (HI)	Poverty Gap (PG)	Square Poverty Gap (SPG)
Independent Variable	**(1)**	**(2)**	**(3)**
Urbanization	-15.354 *	-12.990 #	-29.685 #
	(6.619)	(7.676)	(18.064)
Urbanization^2	15.650 *	13.739 #	29.684 #
	(6.994)	(7.425)	(15.981)
Initial Level of Dependent Variable	-0.543 **	-0.426 #	-1.122 **
	(0.113)	(0.244)	(0.259)
Inflation [b]	-0.077	0.176	0.259
	(0.290)	(0.450)	(0.395)
Openness [a]	-0.066	-0.529	-0.272
	(0.485)	(0.374)	(1.121)
Agricultural Share [a]	0.994 *	1.223 #	1.980 #
	(0.491)	(0.729)	(1.042)
Schooling	0.035	0.142	0.058
	(0.113)	(0.108)	(0.253)
Government Consumption Share [a]	0.177		1.041
	(0.390)		(0.748)
Hansen Test (*p* -value)	0.990	0.989	0.994
Serial Correlation Test (*p* -value)	0.748	0.301	0.643
Time Dummies	Yes	Yes	Yes
No. of observations	117	117	117

** significant at 1%; * at 5%; # at 10%

[a] The variable is in the form of logarithm.

[b] The variable is in the form of logarithm (1+variable).

Numbers in parenthesis are robust standard errors.

The null hypothesis of Hansen Test is that the instruments used are not correlated with the residuals.

The null hypothesis of Serial Correlation Test is that the errors difference regression shows no second-order serial correlation.

income levels among the poor, i.e., the severity of poverty in terms of inequality among the poor. The coefficients for both urbanization terms are statistically significant at the 10% level. They imply an optimal level of urbanization of (29.685/ (2x29.684)) = 0.500. A one-standard deviation (0.190) increase in urbanization over five years leads the SPG reduction rate to drop by 107.2 percent over the same time period, all other things constant. This means that inequality among the poor will be improving much slower when the country is away from the optimal level of urbanization.

5.3 Urbanization and the channels for poverty reduction outcomes

In this subsection, we present and discuss the results of our estimation of the "channeled effects" of urbanization for three potential channels for poverty reduction: education, health, and productivity.

Basic Education Outcomes

We estimate the effect of urbanization on basic education using the specification described by Equation (4.2). We use primary school net enrollment and the youth literacy rate as the dependent variables while including the quadratic form of urbanization and a set of controls as the explanatory variables in the regressions.

The potential endogeneity of some of our regressors such as GDP per capita, public expenditure on education and urbanization are treated by a set of appropriate instruments used in the literature (Pritchett and Summer 1996; Filmer and Pritchett 1997)[21]: income is instrumented by whether or not the country's primary export is oil; public expenditure on education is instrumented by the education share in total expenditures of the country's geographic neighbors. Selecting instruments for urbanization is based on the idea that rural-urban migration in one country would correlate with the level of urbanization in neighborhood countries. For example, external economic shocks affecting urban employment in one country are likely to affect the neighboring countries and their urbanization patterns in a similar fashion. Therefore, to instrument urbanization in a country, we use the urbanization level of its geographic neighbors.

Columns (1) and (2) of Table 3 report the estimates of the effect of urbanization on basic education. Column (1) presents the results from GMM-IV estimation using the primary school net enrollment as the dependent variable. The implied optimal

21 The test for autocorrelation in panel data yields the following results: $F(1, 30) = 621.914$, $Prob > F = 0.0000$. This means that the hypothesis that there is no first-order autocorrelation in the data can be rejected at the 1% significance level. Their internal lagged values are not an appropriate set of instruments for the GMM-IV estimation.

level of urbanization is (3.379/ (2x2.730)) = 0.619. At the optimal level of urbanization, a one-standard deviation (0.225) increase in urbanization over five years makes the primary school net enrollment drop 13.8 percentage points (or 1.15 standard deviations) over the same time period, ceteris paribus. Column (2) reports the results of the GMM-IV estimation using the youth literacy rate as the dependent variable. The implied optimal level of urbanization is (2.813/ (2x1.788)) = 0.787. A one standard deviation (0.205) increase in urbanization over five years is associated with a drop in the youth literacy rate of 7.5 percentage points (or 0.413 standard deviation) over the same time period, all else constant.

TABLE 3

ESTIMATES FOR URBANIZATION AND EDUCATIN OUTCOMES

Dependent Variable	Education Outcomes: Primary School Net Enrollment (% aged >15	Education Outcomes: Youth Literacy Rate (% aged 15-24
Independent Variable	**(1) IV [b]**	**(2) IV [c]**
Urbanization	3.379 *	2.813 #
	(1.596	(1.519
Urbanization^2	-2.730 *	-1.788 #
	(1.261	(1.086
GDP per Capita [a]	-0.01[illegible]	-0.06[illegible]
	(0.043	(0.113
Population Density [a]	-0.023 #	0.02[illegible]
	(0.012	(0.037
Education Expenditure Share	0.208 #	-0.380
	(0.123)	(0.348)
Hansen Test (p-value	0.6021	0.6256
Time Dummies	Yes	Yes
No. of	116	81

** significant at 1%; * at 5%; # at 10%.

[a] The variable is in the form of logarithm.

Numbers in parenthesis are robust standard errors.

The null hypothesis of Hansen Test is that the instruments used are not correlated with the residuals.

[b] The IV heteroskedasticity test yield p-value = 0.916. The hypothesis that the disturbance is homoskedastic can not be rejected.

[c] The IV heteroskedasticity test yield p-value = 0.374. The hypothesis that the disturbance is homoskedastic can not be rejected.

Basic health outcomes

To examine the impact on poverty through health outcomes, we regress the infant mortality rate and life expectancy at birth on a quadratic form of urbanization and a set of control variables as described by Equation (4.2).

We address potential endogeneity problems with a strategy similar to the one we used for the estimation of the basic education channel. For the urbanization variable we use exactly the same instruments as in the education regression while for health spending we use the neighbors' health spending as a share of their total expenditure, instead of the share of education spending[22].

Columns (1) and (2) of Table 4 present the estimates of the effect of urbanization on the two basic health outcomes. Tests for the IV heteroskedasticity do not reject homoskedasticity for either dependent variable. Column (1) presents the results for the infant mortality rate as the dependent variable[23]. The estimates imply an optimal level of urbanization of (455.392/ (2x366.150)) = 0.622. At the optimal level of urbanization, a one standard deviation (0.212) increase in urbanization over five years is associated with a rise in infant mortality of 16.456 infants per 1,000 live births (or 0.46 standard deviations) over the same time period, holding other things constant. Column (2) reports the results from using life expectancy at birth as the dependent variable. The implied optimal level of urbanization is (66.275/ (2x48.945)) = 0.677. A one standard deviation (0.206) increase in urbanization above the optimal level over five years is associated with a drop in life expectancy at birth of 2.077 years (or 0.23 standard deviations) over the same time period, all else constant.

Potential productivity outcomes

In this subsection, we examine the "channeled effect" of urbanization on the productivity growth rate by means of the dynamic panel system GMM estimation based on Equation (4.5). The potential productivity channel is measured with value added per worker in agriculture and non-agricultural output as a share of GDP. It is important to note that in this estimation we treat all time-varying RHS variables as potentially endogenous. We use the second and further lags of the respective potential endogenous variables and the dependent variable as instruments.

22 The test for autocorrelation in panel data yields the following results: F (1, 40) = 48.290, Prob > F = 0.0000. This means that their internal lagged values are not an appropriate set of instruments for the GMM-IV estimation.

23 The infant mortality rate is measured as the number of infant deaths between birth and the age of one per 1,000 live births.

TABLE 4
ESTIMATES OF URBANIZATION AND HEALTH OUTCOMES

Dependent Variable	Health Outcomes	
	Infant Mortality Rate	Life Expectancy at Birth
Independent Variable	**(1) IV [b]**	**(2) IV [c]**
Urbanization	-455.392 *	66.275 *
	(204.355)	(39.140)
Urbanization^2	336.150 #	-48.945 #
	(187.948)	(29.263)
GDP per Capita [a]	-7.647	1.788
	(6.004)	(1.387)
Schooling	-0.608	0.226
	(2.959)	(0.438)
Health Expenditure Share	-26.733	-19.080
	(109.713)	(14.952)
Freedom	0.238	-1.019 **
	(1.620)	(0.333)
Hansen Test (*p* -value)	0.1172	0.1006
Time Dummies	Yes	Yes
No. of observations	115	112

** significant at 1%; * at 5%; # at 10%

[a] The variable is in the form of logarithm.

Numbers in parenthesis are robust standard errors.

The null hypothesis of Hansen Test is that the instruments used are not correlated with the residuals.

[b] The IV heteroskedasticity test yields *p* -value = 0.124. The hypothesis that the disturbance is homoskedastic can not be rejected.

[c] The IV heteroskedasticity test yields *p* -value = 0.494. The hypothesis that the disturbance is homoskedastic can not be rejected.

Column (1) of Table 5 reports the results of the estimation using value added per worker in agriculture as the dependent variable The coefficients on the urbanization variables, which are significant at the 1% level, imply the optimal degree of urbanization of (2.345/(2x2.214)) = 0.530. At the optimal level of urbanization, a one-standard deviation (0.235) increase in urbanization is associated with a drop in the growth rate of value added per agricultural worker of 12.2 percent over the same time period, ceteris paribus.

Column (2) of Table 5 reports the impact of urbanization on the growth rate of the share of non-agricultural output in GDP. The coefficients on the urbanization terms are both statistically significant at the 1% level and imply an optimal degree of urbanization of (0.889/ (2x0.681)) = 0.653. At the optimal level of urbanization, a one-standard deviation (0.240) increase over five years in urbanization is associated with a drop in the growth rate of the share of non-agriculture output in GDP of 3.9 percent over the same period, ceteris paribus.

TABLE 5
ESTIMATES OF URBANIZATION AND PRODUCTIVITY OUTCOMES

Dependent Variable (Growth rate)	**Productivity Outcomes**	
	Agriculture Value Added Per Worker	**Non-Agricultural Outputs per GDP**
Independent Variable	**(1)**	**(2)**
Urbanization	2.345 **	0.889 **
	(0.768)	(0.212)
Urbanization^2	-2.214 **	-0.681 **
	(0.842)	(0.214)
Initial Level of Dependent Variable	-0.401 **	-0.560 **
	(0.113)	(0.500)
Agricultural Labor Force [a]	-0.606 **	-0.035
	(0.145)	(0.021)
Openness [a]	0.041	0.078 **
	(0.077)	(0.019)
Schooling	0.038	0.005
	(0.029)	(0.534)
Precipitation [b]	0.043	
	(0.030)	
Hansen Test (*p* -value)	1.000	1.000
Serial Correlation Test (*p* -value)	0.309	0.977
Time Dummies	Yes	Yes
No. of observations	515	532

** significant at 1%; * at 5%; # at 10%
[a] The variable is in the form of logarithm.
[b] The values of this variable are normalized by calculting into the unit of metre.
Numbers in parenthesis are robust standard errors.
The null hypothesis of Hansen Test is that the instruments used are not correlated with the residuals.
The null hypothesis of Serial Correlation Test is that the errors difference regression shows no second-order serial correlation.

6. CONCLUSION

In this paper, we analyze theoretically and empirically the effect of the urbanization level on poverty reduction outcomes by considering a variety of dimensions in the concept of poverty. Our theoretical model suggests a U-shape relationship between the level of urbanization and poverty. We explore empirically the effects of urbanization on poverty reduction outcomes using a panel data set for a sample of 143 countries over the period of 1965-2005. Due to multi-dimensionality of poverty, we employ several estimation approaches to regress various poverty measures. First, to analyze the non-monetary aspects of poverty reduction, we use instrumental variables (IV) in the framework of the generalized method of moments (GMM) to examine the impact of urbanization on the Human Development Index, which takes into account basic human well-being achievements. We also attempt to examine relative differences among different regions of the world in terms of the impact of urbanization on poverty. Second, using the system GMM estimation, we investigate the effect of urbanization on the rate of reduction in the three monetary measures of poverty: the Headcount Index, the Poverty Gap, and the Square Poverty Gap. Finally we examine several potential transmission channels for the impact of urbanization through improvements in basic education, health (both using the IV estimation), and productivity enhancement (using the system GMM estimation).

In accordance with our theoretical predictions we find evidence of a U-shaped relationship between urbanization and poverty. According to our estimates, the optimal level of urbanization in terms of poverty reduction ranges from 47.3% to 78.7% of national population, depending on the poverty aspect. This can be compared to the existing studies of the optimal level of urban concentration with respect to economic growth. When Henderson (2003) estimates the impact of urbanization without controlling for urban concentration on a sample of countries with the urban share below 0.7, the estimates imply the optimal level of urbanization to be about 0.35. However, when he controls for urban primacy (the share of the largest city in total urban population), the estimate of the optimal urbanization level rises above 0.7; that is for the entire sample range of urbanization levels the impact on growth is positive. In this latter regression, the optimal urban primacy estimated for the sample mean values of country characteristics appears to be around 0.12[24]. For comparison, when Henderson (2003) does not control for the share of urban population, he

24 The optimal levels of urbanization and primacy are our own calculations based on Henderson's (2003) estimates. In his paper, he does not report the implied optimal level of urbanization as he questions plausibility of his estimates of the optimal degree of urbanization declining as the output per worker rises. On our request, he was not able to supply us with sample mean values or confirm our calculations.

finds the best urban primacy rate for medium size countries to range from 0.19 for high-income countries to 0.41 for low income countries.

Our related finding is that the impact of urbanization on poverty varies among regions of the world because of their different position relative to the optimal level. Furthermore, our empirical analysis also confirms a significant non-linear relationship between urbanization and poverty reduction through the channels of basic services provision (education and health) and productivity growth. Reallocation of labor and public resources from rural to urban areas appears to bring about economic gains or losses depending on whether the country is under- or over- urbanized.

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