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Working Paper

Urbanization, urban concentration and economic growth in developing countries

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Abstract
We investigate how urban concentration and urbanization affect economic growth in developing countries. Using semi-parametric estimation techniques on a cross-country panel of 39 countries for the years 1960-1990 we discover a U-shaped relationship for urban concentration. This suggests the existence of an *urban-concentration trap* where marginal increases in urban concentration would reduce growth for about a third of our sample. Furthermore, there appears to be no systematic relationship between urbanization and economic growth.

Outline

1. INTRODUCTION

It has been argued that strong urban economies are the backbone and motor of the wealth of nations (Jacobs (1984)). As countries become more reliant on manufacturing and services and less on agriculture, urban areas are more likley to become important for fostering marshallian externalities, nourishing innovation, providing a hub for trade, and encouraging human capital accumulation. Such economies should be particularly important for developing countries since trends in urbanization show that the share of the urban population has increased substantially in these since the 1950s. For example, between 1950 and 2000 urbanization, defined as the share of urban to total population, increased by 124 per cent in developing countries compared to 38 per cent in the industrialized world (United Nations (2002)), so that the gap in relative size of the urban population between developing and developed countries has narrowed substantially.[1] At the same time one has not witnessed a similar convergence in economic growth rates between these two groups. Although this discrepancy between the rates of urbanization and economic growth rates in developing countries has long been recognized, it has only recently again come strongly under the limelight; see, the 2000 World Bank Report.[2]

The traditional debate on the link between urbanization and economic development in developing nations focused on whether urbanization was 'too' high; see, for instance, Davis and Golden (1954), Sovani (1964), Kamerschen (1969) and Gugler (1982) for early discussions. Those subscribing to the *over-urbanization* hypothesis argued that developing countries' rates of urbanization are higher than that of today's developed nations compared to when these were at the same stage of development (i.e. in the 19th century) and hence are above their optimum level.[3] In contrast, opponents of this view have questioned the implicit assumption underlying this 'over-urbanization' hypothesis that the course of industrialization and urbanization in developing countries should conform to the path taken by today's industrialized countries. Instead, it has been argued that a more satisfactory approach would require analyzing whether less urbanization in

1 Urbanization was three times higher in developed countries in the 1950s, whereas now it is less than double that of developing countries.

2 See Chapter 6, "Dynamic Cities as Engines of Growth".

3 Kamerschen (1969) defines over-urbanization as follows: "Countries in the early stages of industrialization suffer an imbalance in both the size and distribution of their urban populations, implying primarily that they have a higher percentage of people living in cities and towns than is "warranted" at their stage of economic development. The term used to describe this phenomenon is 'over-urbanization' ".

developing countries would have indeed favored greater growth and development. Although important, this traditional debate has probably missed an essential point, namely to take account of the *distribution of the population across cities*, i.e., the degree of urban concentration. As a matter of fact, there is a large literature that demonstrates both theoretically and empirically that there are increasing returns at the city level, thus suggesting that urban concentration may be more important than urbanization per se; see Duranton and Puga (2004) for a theoretical survey on the micro-foundations of urban agglomeration economies and Rosenthal and Strange (2004) for a review of the empirical evidence. Examining patterns of urban concentration in developing countries, one finds that, along side increases in urbanization, developing countries have also experienced sizeable growth rates of urban concentration over the last fifty years. Specifically, whereas the growth of large cities (more than 5 million inhabitants) has been slow or even zero in the industrialized world, developing nations are experiencing ever greater population concentration in large urban agglomerations and in mega-cities (defined as cities with a population greater than 10 million). For example, between 1975 and 2000 the number of mega-cities increased from 3 to 15 in developing countries, compared to a rise from 2 to 4 in developed countries (United Nations (2002)).

In seeking econometric evidence, one discovers only a few econometric studies that have attempted to highlight the impact of urbanization or urban concentration on economic development. Moomaw and Shatter (1993) regress different measures of urbanization and urban concentration on growth and find that metropolitan concentration has a positive while urban primacy, defined as concentration of urban population in the largest city, has a negative impact. McCoskey and Kao (1998) using panel cointegration techniques find that long-run effects of urbanization on growth cannot be rejected. More recently, Henderson (2003) has identified a non-monotonous impact of urban primacy on economic development, thus suggesting a (broad) range of values of optimal primacy levels, below which urban concentration fosters rather than deters economic development.

One criticism that could be cast against most of the econometric findings in the studies just mentioned is their failure to distinguish between developed and developing countries. There are, however, two compelling arguments for examining developing countries separately. Firstly, developing and developed countries may be on different paths of development (see, for instance, Mankiw *et al.* (1992) and Quah (1996)). Secondly, cities are likely to be very heterogeneous across these two broad economic groups even after controlling for city size. For example, using information from the Global Urban Indicators Database for cities[4] of under one million reveals that water, telephone and electricity access are significantly higher in cities of developed than developing countries (close to 100 per cent for the former and about 50 per cent for the latter). Moreover, infant mortality rates in cities in developing countries are several multiples of the ones that can be found in similar sized cities in developed countries. A similar pattern can also be gauged from limiting the sample to cities greater than one million inhabitants. While there are a number of studies that separately discuss the role of urbanization for economic growth in developing countries (see, for instance, Fay and Opal (2000) and Henderson (2002)), to the best of our knowledge only McCoskey and Kao (1998) investigate the link econometrically.

The current paper builds on this very sparse literature on the impact of urbanization and urban concentration on the economic development of developing countries. Specifically, using panel data covering the period 1960-1990 we investigate how urban concentration and urbanization have affected economic growth in a sample of developing countries. Inspired by the finding of Henderson (2003), we explicitly focus on allowing for potential non-linearities in the relationship by utilizing semi-parametric estimation techniques. This proves to be a fruitful exercise as results support a U-shaped relationship between two different measures of urban concentration and growth. This suggests the existence of an *urban-concentration trap* where marginal increases in urban concentration would reduce growth for about a third of the countries in our sample. In contrast we find that urbanization has no straightforward link to economic development.

The paper is organized as follows. In the following section we describe our specification and our estimation method. Section III contains a description of our data and provides

4 There are two surveys available for this data, 1993 and 1998. We used data from both in order to increase the sample size. Ideally we would have liked to examined a larger number of size categories, however, the distribution of the data, in particular the smaller number of observations from industrialized nations, did not make this feasible.

some summary statistics. Our empirical results are given and discussed in Section IV. The final section contains concluding remarks.

2. MODEL SPECIFICATION AND ESTIMATION METHODOLOGY

To estimate the impact of urbanization and urban concentration on growth we follow Henderson (2003) and assume that there are only two factors of production, physical capital (K_{it}) and labor (L_{it}) so that the production function is given by:

$$Y_{it} = F[K_{it}, L_{it}, A_{it}] \tag{1}$$

where Y_{it} is the flow of output produced in country i at time t. The production function also depends on A_{it}, to reflect the effects of technological progress. Assuming a Cobb-Douglas constant returns to scale technology, first differencing and normalizing by labor, the production function in (1) becomes:

$$\Delta \log y = \Delta \log a + \alpha \Delta \log k \tag{2}$$

where lower case letters are the variables under scrutiny relative to labor, α is the distribution parameter of capital, and $\Delta \log a$ stands for productivity growth.[5] Productivity growth is modeled as a function of urban distribution as well as the level of human capital, democracy, and time and country fixed effects.[6] This leaves us with the following specification:

$$\Delta \log y = \delta Z' + g(X) + \alpha \Delta \log k \tag{3}$$

where Z' represents the vector for our control variables and X is the urbanization/urban concentration measure, our variable of interest.

One should note that in (3) we have not restricted X to have a linear impact on the dependent variable. There are at least two good reasons to account for potential non-linearities when it comes to analyzing the impact of urbanization/urban concentration on growth. First, urbanization as well as urban concentration variables are bounded from above and below, and may even just mechanically affect growth differently near their bounds compared to the mid-values. Second, using urban primacy as a measure of the X

5 Subscripts for time are not shown for simplicity of presentation.

6 To control for time specific effect and country time-invariant specific effects we included time and country dummies.

variable, Henderson (2003) has provided evidence of a parabolic relationship between X and the dependent variable in his study using a sample including both developing and developed countries. Here, rather than including squared values of X to restrict the non-linearity to be of a particular form in a similar manner to Henderson (2003), we opt for a much more flexible approach to modeling the potential non-linearity. Specifically, we use the semi-parametric Kernel regression estimator proposed by Robinson (1988), which does not restrict the non-linearity to take on any specific functional form, but still allows the use of other conditioning variables. [7]

One can consider the following equation to be estimated:

$$\tilde{y} = \alpha + g(X) + \delta Z + u \tag{4}$$

where $Z=(Z'|\Delta \log k)$ are a set of explanatory variables that are assumed to have a linear effect on $\tilde{y}$ (which stands for $\Delta \log y$), $g()$ is a smooth and continuous, possibly non-linear, unknown function of X, and u is a random error term. A common used non-parametric estimator of an unknown function like $g(X)$ without allowing for the effect of other conditioning variables is the well-known Nadaraya-Watson estimator:[8]

$$\hat{m}_h(X) = \frac{n^{-1} \sum_{i=1}^{n} K_h(X - X_i)\tilde{y}_i}{n^{-1} \sum_{i=1}^{n} K_h(X - X_i)} \tag{5}$$

such that $i=1 \ldots n$ are the n number of observations, $K_h()$ is the shape function, commonly referred to as the Kernel, that is a continuous, bounded and real function that integrates to one and acts as a weighting function of observations around X and depends on the choice of bandwith h. The appeal of this estimator lies in its very flexible approach to non-linearity by allowing the relationship of $\tilde{y}$ with respect to X to vary over all values of X. Specifically, this technique corresponds to estimating the regression function at a particular point by locally fitting constants to the data via weighted least squares, where those observations closer to the chosen point have more influence on the regression estimate than those further away, as determined by the choice of h and K. An additional

7 See Blundell and Duncan (1998) for details and a helpful discussion of the implementation of this method.
8 See Nadaraya (1964) and Watson (1964).

appeal of this sort of technique is that it avoids any parametric assumptions regarding the conditional mean function *m(X)*, and thus about its functional form or error structure.

Allowing for the linear effect of other explanatory variables only slightly complicates the estimation of *g(X)*. Specifically, Robinson (1988) showed that in controlling for other conditioning variables the (semi-parametric) Kernel regression estimator for *g(X)* simply becomes:[9]

$$\hat{g}(X) = \hat{m}_{\tilde{y}}(X) - \hat{\delta}\,\hat{m}_X(X) \tag{6}$$

where $\hat{m}_{\tilde{y}}(X)$ and $\hat{m}_X(X)$ are the (non-parametric) Kernel regression estimates of $E(\tilde{y}\,/X)$ and $E(Z\,/X)$, and $\hat{\delta}$ is the OLS estimator of:

$$\tilde{y} - \hat{m}_{\tilde{y}}(X) = \delta\left(Z - \hat{m}_X(X)\right) + \varepsilon \tag{7}$$

where ε is a random error term. Intuitively, $\hat{g}(X)$ is the estimate of *g(X)* after the independent effect(s) of *Z* on *Y* has been removed.

Given that the estimate of $\hat{g}(X)$ is at least in part based on non-parametric estimation techniques, one cannot subject it to the standard statistical type tests (e.g. *t*-test) that economists have grown so accustomed to using in parametric regressions. One can, however, relatively easily calculate upper and lower pointwise confidence bands as:[10]

CI = g^(X) +/- $(c_\alpha c_K)^{1/2}$ η^(x) / [h $CI = \hat{g}(X) \pm (c_\alpha c_K)^{\frac{1}{2}}\,\hat{\eta}(X) \Big/ \left[\sum_{i=1}^{n} K_h(X - X_i)\right]^{\frac{1}{2}}$ (8)

where $c_\alpha c_K$ is a kernel specific constant corresponding to the α quantile of the distribution and $\hat{\eta}^2(X)$ is defined as:

$$\hat{\eta}^2(X) = n^{-1}\frac{\sum_{i=1}^{n} K_h(X - X_i)\tilde{y}_i}{n^{-1}\sum_{i=1}^{n} K_h(X - X_i)} \tag{9}$$

9 The fact that δ is in part estimated using OLS makes this a semi- rather than non-parametric estimator.
10 See Haerdle (1990) for details.

One should note that (6) ignores the possible approximation error bias of $\hat{g}(X)$. Including this in (6) would complicate the expression considerably since the bias is a complicated function of the first and second derivatives of *g(X)*. This bias tends to be highest at sudden peaks of $\hat{g}(X)$ and at the necessarily truncated left and right boundaries of the data. However, if *h* is chosen proportional to $1/n^{(1/5)}$ times a sequence that tends slowly to zero then the bias vanishes asymptotically for the interior points.[11] For all our estimations we use a Gaussian kernel for K_h and an optimal bandwidth *h* such that:

$$h = \frac{0.9m}{n^{1/5}} \tag{10}$$

where $m = (\hat{\sigma}^2(X) \times (\text{interquantile range})_X / 1.349)$

One should also note that the size of $\hat{\sigma}^2(X)$ at any point of *X* will depend proportionally on the marginal distribution of *X*. In other words the accuracy of the estimate of *g(X)* at *X* is positively related to the density of other observations around that point. In order to visualize this effect we, as suggested by Haerdle (1990), calculate the pointwise confidence bands at points chosen according to the distribution of *X*. Specifically, we chose points so that five per cent of the observations lie between them.[12]

3. DATA DESCRIPTION AND SUMMARY STATISTICS

Estimation of (3) requires time varying cross-country data for developing countries. In terms of classifying countries as 'developing' we use those that under the World Banks 2001 classification are determined to be either low ($745 or less), lower-middle ($746 - $2,975) or upper-middle ($2,976 - $9,205) income nations, where the first and second group each comprise about 40 per cent and the remaining category accounts for about 20 per cent of the total observations used in our empirical analysis. [13] Information to construct our dependent and independent variables are gathered from a number of sources. Specifically, we use information from the data set compiled by James Davis and Vernon Henderson, covering the period 1960-1990 over five year intervals, to generate

11See Haerdle (1990) and Wand and Jones (1995) for a discussion of these aspects.
12 From the endpoints we chose the 1 and 99 percentiles of the distribution.
13 Further details as well as sources on other variables that were used are provided in the appendix.

the vector Z' of control variables. Data on GDP and physical capital, on the other hand, stem from the Dhareshwar and Nehru (1993) database.

Our source for constructing our various measures of *X* is the 2001 Revision of the UN World Urbanization Prospects data. As mentioned earlier, for externalities to arise it may not be urbanization per se, but rather the variation in the population distribution across urban areas that is important. Hence our main focus will be on measures of urban concentration rather than urbanization, although we do, for completeness sake, also report results for this latter measure. Specifically, we use two measures of urban concentration in our estimations. First, we utilize a measure of primacy, defined as the share of urban population living in the largest city. This has been used by Henderson (2003), for instance. Primacy may, however, not be a satisfactory measure when there are huge differences between country sizes. In small countries or areas it is common for the quasi-totality of the urban population to be concentrated in a single city. Extreme cases, where primate cities account for or close to 100 per cent of the urban population include Hong Kong, Kuwait City, Singapore, Gaza City. These cases, clearly being outliers, were not considered in our final data set.

However, there are often cities other than the largest city that account for large proportions of the urban population. Thus using primacy as a measure of urban concentration results in attributing low values to countries like India which has many large cities, but tends to be very large for small countries. Furthermore, changes in primacy do not always reflect overall changes in the total population. In particular, whereas the share of the largest city's population often decreased as a consequence of increasing urbanization, urban concentration increased due to a more than proportional increase in medium and large agglomerations. We thus propose also using an alternative measures, which we term urban density, rather than primacy as a measure of the urban concentration. This measure of urban density is defined as the share of the urban population living in cities larger than 750,000 inhabitants.[14]

14 Our choice of this rather than a lower threshold is due to data restrictions in the UN data set.

All in all our data sources provide us with the necessary information for continuous observations for 6 five-year periods over the years 1960-1990 on 39 countries. Summary statistics for our measures of *X* are given in Table 1. First of all it is apparent that there is a reasonable amount of variation in our data for our three measures. Eyeballing the raw data would reveal that this variation is both due to cross-country and within country changes.[15] More importantly, the low correlation coefficients across all three measures suggest that they capture different aspects of the urban phenomenon.

Table 1: Summary Statistics

	Mean	Std.	Max.	Min.	Corr. with: Urbaniz.	Corr. with: Primacy	Corr. with: Urban Conc.
Urbaniz.	0.391	0.191	0.872	0.051	1	---	---
Primacy	0.329	0.139	0.656	0.050	0.081	1	---
Urban Conc.	0.432	0.124	0.836	0.124	0.146	0.438	1

4. EMPIRICAL RESULTS

Urban Concentration

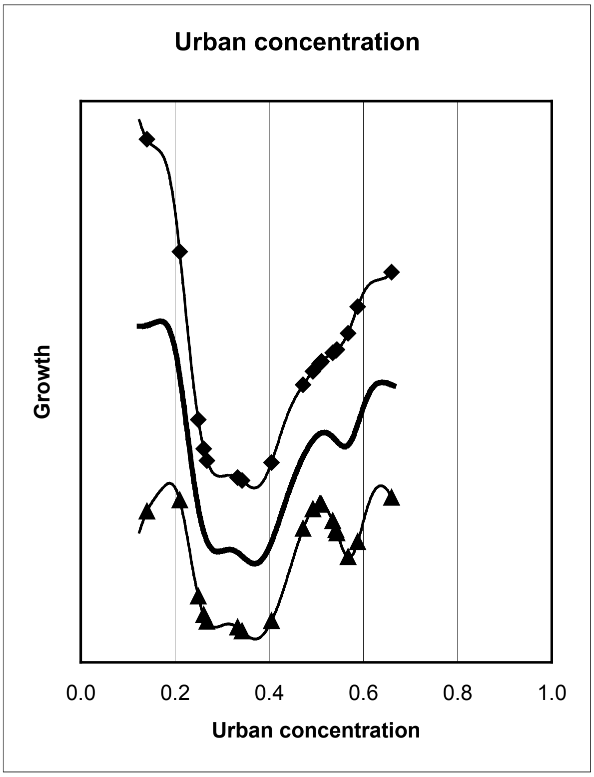
Since our semi-parametric methodology allows the link between economic growth and our urban variable to vary over the entire observed range of urban concentration/urbanization, results are, as is standard when using this estimator, depicted graphically. As stated earlier, this also allows one to link the statistical accuracy of the results with confidence bands and the distribution of observations. More precisely, single depicted points below and above the continuous line constitute lower and upper confidence bands. The horizontal distance between each set of confidence points on the confidence bands indicates the distribution of the observations across the indicated range of *X*, where five per cent of the sample lie between each set of points. One should also note that we do not report the actual estimates of *g(X)* on the vertical axes, just graph the relationship between *X* and the dependent variable. Our primary reason for not reporting these is that our estimates of *g(X)* are predicted values from which the influence of the other control variables have been purged, and hence, cannot be directly linked to the actual range of observed $\tilde{y}$. Moreover, the predicted absolute levels of *g(X)* cannot be

15 The mean standard deviation within countries across time is equal to 0.05, 0.03, and 0.03 for urbanization, primacy, and urban concentration, respectively.

strictly compared across graphs. Instead one should use the figures to gauge the estimated slope of the relationship in question.

In Figure 1 we first graph our estimates of *g(X)* using urban density. As can be seen, while the general shape suggests a U-shaped relationship between urban concentration and growth, this link is not very smooth near either end of the curve. However, as can be gauged from the horizontal distance between the confidence band points at the ends, our estimate of *g(X)* in these areas is based on relatively few observations. For example, only one per cent of the observations lie between the last set of confidence band points and the end of the curve.[16] Both of these factors would tend to make our estimates around this area relatively inaccurate.

Figure 1: GDP growth and primacy



NB: time and country dummies, growth of physical capital, human capital and democracy as control variables

16 One has to, however, keep in mind that, in contrast to the endpoints, the horizontal distance between all other confidence band points indicates that five per cent of the sample lie within the observed range.

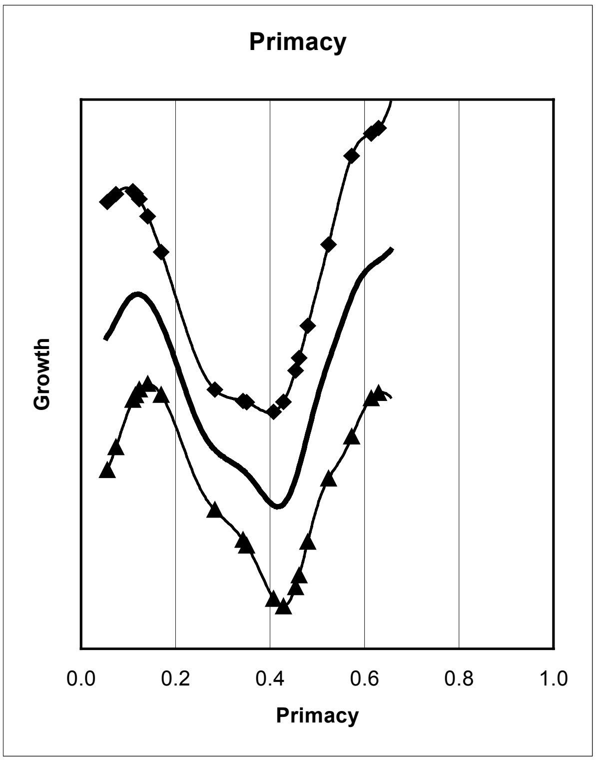
We can use these results to separate our sample into countries that are on the left or right side of the turning point value of urban density, which is estimated to be 0.36, according to their actual observed level of urban density at the beginning and end of the sample period, 1960 and 1990. This is shown in the first two columns of Table 2. Accordingly, in 1960 12 of our 39 countries had urban density levels below the threshold value and thus were in an *urban-concentration trap*. This figure was only reduced by 1 by 1990, although comparison across time for individual countries reveals that there was more movement across categories than the aggregate numbers suggest. In particular, while the urban density in Indonesia and Tunisia fell to such an extent that these two countries fell into the *urban-concentration trap*, growth in urban density pushed El Salvador, Myanmar, and Nicaragua into the upward sloping part of the estimated curve.

Table 2: Distribution of countries above and below the estimated threshold levels

Country	Urban Density 1960	Urban Density 1990	Primacy 1960	Primacy 1990
Algeria	**0.25**	**0.15**	**0.23**	**0.12**
Argentina	0.57	0.53	0.45	**0.40**
Bolivia	0.40	0.46	**0.28**	**0.29**
Brazil	0.53	0.46	**0.15**	**0.14**
Cameroon	0.37	0.39	**0.23**	**0.22**
Chile	0.39	0.42	**0.39**	0.42
Colombia	0.42	0.48	**0.16**	**0.20**
Costa Rica	0.63	0.55	0.63	0.56
Dominican Republic	0.59	0.63	0.46	0.59
Ecuador	0.51	0.46	**0.29**	**0.26**
El Salvador	**0.31**	0.43	**0.25**	0.46
Ghana	**0.25**	**0.27**	**0.25**	**0.27**
Guatemala	0.41	0.50	0.41	0.50
Haiti	0.43	0.56	0.43	0.56
Honduras	**0.30**	**0.35**	**0.30**	**0.35**
India	0.39	0.41	**0.07**	**0.06**
Indonesia	0.48	**0.32**	**0.19**	**0.14**
Iran	0.45	0.41	**0.25**	**0.20**
Jordan	**0.30**	**0.30**	**0.30**	**0.30**
Malaysia	**0.16**	**0.13**	**0.16**	**0.13**
Mali	**0.26**	**0.35**	**0.26**	**0.35**
Mexico	0.47	0.50	**0.29**	**0.25**
Myanmar	**0.29**	0.39	**0.23**	**0.33**
Nicaragua	**0.33**	0.36	**0.33**	**0.35**
Pakistan	0.45	0.46	**0.17**	**0.21**
Panama	0.61	0.66	0.61	0.66
Paraguay	0.47	0.45	0.47	0.45
Peru	0.37	0.39	**0.37**	**0.39**
Philippines	**0.30**	**0.30**	**0.27**	**0.27**
Senegal	0.36	0.48	**0.36**	0.48
South Africa	0.49	0.56	**0.14**	**0.14**
Sudan	**0.30**	**0.29**	**0.30**	**0.29**
Thailand	0.65	0.57	0.65	0.57
Tunisia	0.38	**0.33**	**0.38**	**0.33**
Turkey	0.48	0.38	**0.21**	**0.19**
Uganda	0.41	0.41	0.41	0.41
Uruguay	0.57	0.46	0.57	0.45
Venezuela	0.51	0.45	**0.28**	**0.18**
Zambia	**0.16**	**0.34**	**0.16**	**0.34**

In Figure 2, the relationship between *urban primacy* and growth is depicted. Again, a U-shaped curve, but much smoother than for the case of urban density, is apparent. Specifically using this semi-parametric estimate suggests that there is a negative relationship between primacy and growth, up until primal cities have less than 41 per cent of the urban population (compared to 36 per cent for the urban concentration case), thus leaving nearly three quarters of the countries considered in an *urban-concentration trap* – as shown in the last two columns of Table 2. Moreover, by 1990, only Chile and El Salvador managed to escape levels of urban primacy that are associated with negative economic growth.

Figure 2: GDP growth and urban concentration



NB: (i) time and country dummies, growth of physical capital, human capital and democracy as control variables; (ii) without China

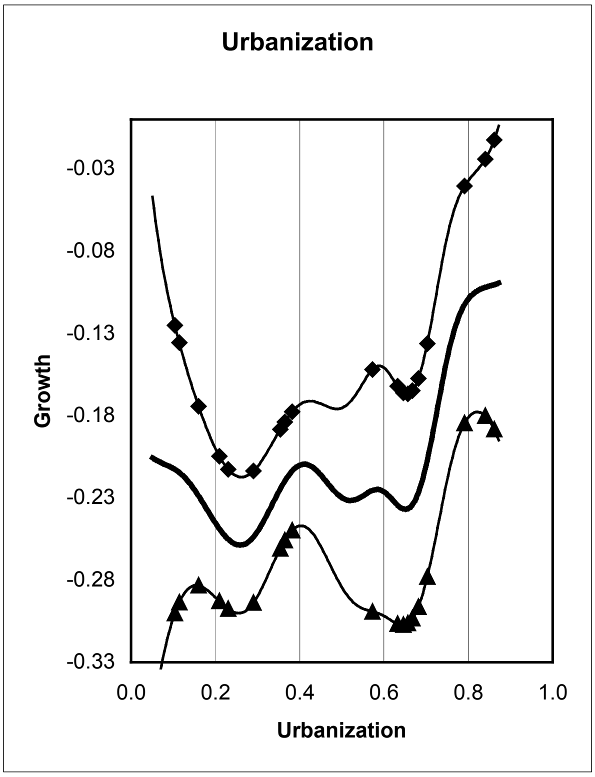
In comparing the results for our two different measures of urban concentration one should note that countries that are on the right segment of the urban density curve, but on the left part of its primacy counterpart, are mainly large countries, such as Brazil, India, and South Africa. This is consistent with our discussion earlier about how the two measures can potentially present different pictures concerning a country's level of urban concentration, in that large countries tend to have much smaller levels of urban primacy than small countries. For instance, in 1990, Brazil had an urban primacy level of 13.6 per cent, whereas its urban concentration was 46.3 per cent. On the contrary, Uruguay, which is almost fifty times smaller than Brazil, had a primacy level of 45.2 per cent, and an urban concentration level of 46.3 per cent.

Overall, our results on urban concentration are consistent with the existence of a non-linear relationship between urban concentration and growth. The lack of a linear relationship between urban primacy and growth had already been highlighted by Henderson (2003), although, he, in contrast, finds a bell-shaped relationship, thus suggesting the presence of an *optimal urban concentration level* above which primacy deters growth. However, our results do not necessarily refute those of Henderson. Specifically, it must be pointed out that Henderson's result is based on a sample of about 70 countries, of which approximately a third are high-income nations. As already mentioned above, we only consider the case of developing countries. Thus any optimal urban concentration levels will not be driven by already developed nations. For example, in the bell-shaped curve found by Henderson (2003) using parametric estimators of the effect of first and second order terms of primacy on growth, mostly high income countries are driving the left hand side of the curve.

Urbanization

So far, we have focused our attention on urban concentration measures rather than urbanization. There are, however, some studies that have attempted to link urbanization and output, as, for instance, McCoskey and Kao (1998). Starting from a Cobb-Douglas production function framework using non-stationary panel data techniques, these authors try to highlight the link between urbanization and output at the country level, accounting explicitly for developed and developing countries. Although novel, their approach leads to mixed results, in particular when estimating average effects. One should also note that they do not consider non-linear effects in their framework. Moreover, we, in contrast, concentrate specifically on urban concentration measures as urbanization may be correlated with the general level of development. However, when it comes to capturing externalities related to the size of cities, the distribution rather than the share of urban population is arguably the relevant variable. Indeed, in our sample of LDCs, rural population is strongly negatively correlated with urban population (-0.93), hinting at the fact that urbanization may actually convey information on the industrial structure of a country, i.e., the distribution of agricultural vs. non-agricultural activities. Nevertheless we estimated (3) using urbanization, the results of which are shown in Figure 3. As can be seen, there is no clear relationship between urbanization and growth, a result consistent with the finding of McCoskey and Kao (1998).

Figure 3: GDP growth and urbanization



NB: time and country dummies, growth of physical capital, human capital and democracy as control variables

4. CONCLUDING REMARKS

The central feature that can be deduced from our analysis is the existence in developing countries of a threshold value below which marginal increases in urban concentration would deter and above which would foster growth. In contrast, we find no systematic relationship between economic growth and urbanization. Thus our result suggests that the traditional question of whether developing countries are over-urbanized or not is probably ill-posed. What matters is not urbanization per se, but urban hierarchies, i.e., how the urban population is distributed among cities. Urbanization may instead simply reflect the passage of a nation from an agricultural to an industrial based economy, rather than capture the benefits for development associated with the growth of cities.

Finally, we are careful to point out that one must be cautious in terms of the policy implications of our result. In particular, our analysis only measures the net macro-economic impact across an observed range of levels of urban concentration, but does not address the costs individual city dwellers typically incur living in large metropolitan areas in developing countries, such as over-crowding, poor sanitary conditions, and deficient infrastructure. Clearly further research is required in order to derive any conclusion regarding an optimal policy package.

REFERENCES

Barro, R. and J. Lee (1993), International Comparisons of Educational Attainment, *Journal of Monetary Economics*, 32(3), pp.363-394.

Blundell, R. and A. Duncan (1998), Kernel Regression in Empirical Microeconomics, *Journal of Human Resources*, 33(1), pp.62-87

Davis, J. and V. Henderson (2003), Evidence on the political economy of the urbanization process, *Journal of Urban Economics*, 53(1) pp.98-125.

Davis, K. and HH. Golden (1954), Urbanization and the Development of Pre-Industrial Areas, *Economic Development and Cultural Change*, 3(1)

Dhareshwar, A. and V. Nehru (1993), A New Database on Physical Capital Stock: Sources, Methodology and Results, *Revista de Analisis Economico*, 8, pp.37-59

Duranton, G. and D. Puga (2004), Micro-foundations of urban agglomeration economies, in JF. Thisse and JV. Henderson, *Handbook of Urban and Regional Economic*, Volume 4.

Fay, M. and Ch. Opal (2000), Urbanization without Growth: A not so uncommon Phenomenon, World Bank Working Paper 2412

Gugler, J. (1982), Overurbanization Reconsidered, *Economic Development and Cultural Change*, 31, pp.173-189

Haerdle, W. (1990), *Applied Nonparametric Regression*, Cambridge University Press.

Henderson, JV. (2002), Urbanization in Developing Countries, *World Bank Research Observer*, 17(1), pp.89-112

Henderson, JV. (2003), The Urbanization Process and Economic Growth: The So-What Question, *Journal of Economic Growth*, 8(1), pp.47-71

Jacobs, J. (1984), *Cities and the Wealth of Nations,* Random House, New York

Kamerschen, DR. (1969), Further Analysis of Overurbanization*, Economic Development and Cultural Change*, 12 (2), pp.235-53

Mankiw, G., D. Romer and D. Weil (1992), A contribution to the empirics of economic growth, *Quarterly Journal of Economics*, 107(2), pp.407-437

McCoskey, S. and Ch. Kao (1998), A Panel Data Investigation of the Relationship between Urbanization and Growth, mimeo Syracuse University

Moomaw, RL. And AM. Shatter (1993), Urbanization as a Factor of Economic Growth, *Journal of Economics*, 19(2), pp.1-6

Mutlu, S. (1989), Urban Concentration and Primacy Revisited: An Analysis and Some Policy Conclusions, *Economic Development and Cultural Change*, 37, pp.611-39

Nadarya, E. (1964), On estimating regression, *Theory of Probability and its Applications*, 9, 141-142.

Quah, D. (1996), Empirics for economic growth and convergence*, European Economic Review* 40, 1353-1375.

Robinson, P. (1988), Root-N-Consistent Semiparametric Regression, *Econometrica* 56, 931-54.

Rosenthal, S. and W. Strange (2004), Evidence on the nature and sources of agglomeration economies, in JF. Thisse and JV. Henderson*, Handbook of Urban And Regional Economic*, Volume 4.

Sovani, NV. (1964), The Analysis of Over-Urbanization, *Economic Development and Cultural Change*, 7(2), pp.113-122

United Nations (2002), *World Urbanization Prospects: The 2001 Revision, Population Division*

Wand, M.P. and M.C. Jones (1995), *Kernel Smoothing*, Chapman & Hall.

Watson, G.S. (1964), Smooth regression analysis, *Sankhya*, Series A, 26, 359-372.

World Bank (2000), *World Development Report 1999/2000: Entering the 21st Century*, Washington

Appendix A: List of Countries Used in the Analysis

Algeria, Argentina, Bolivia, Brazil, Cameroon, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Ghana, Guatemala, Haiti, Honduras, India, Indonesia, Iran, Jordan, Malaysia, Mali, Mexico, Myanmar, Nicaragua, Pakistan, Panama, Paraguay, Peru, Philippines, Senegal, South Africa, Sudan, Thailand, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zambia

Appendix B: Data Sources

Data	**Source**
Urban population	National urban population. UN World Urbanization Prospects, Table A.3 Urban population
Population of Urban Agglomerations with 750,000 Inhabitants or More in 2000	National urban population. UN World Urbanization Prospects CD-rom, File 10 POP/DB/WUP/Rev.2001/2/F10
GDP/capita Capital/capita	Dhareshwar, A. and V. Nehru (1993), A New Database on Physical Capital Stock: Sources, Methodology and Results, Revista de Analisis Economico, 8, pp.37-59 http://www.worldbank.org/research/growth/ddnehdha.htm
democracy	Our democracy index stems from Davis and Henderson (2003) and was constructed by combining annual PolityIII indicators into five year averages, and then subtracting the autocracy value from the democracy value. The index ranges from a dictatorship at -10 to a pure democracy at 10, and takes non-integer values due to the averaging (though it is not in a strict sense continuous).
Human capital	Average years of secondary and higher education stems from stem from Henderson (2003) and represents the average years of schooling in the total population aged 25 and over. These figures were retrieved from Barro and Lee (1993) and from census and survey figures primarily obtained from UNESCO Statistical Yearbooks and UN Demographic Yearbooks. The remaining values are estimated using UNESCO school enrollment data and a perpetual inventory method. The data are not adjusted for quality of education or length of school day or year.

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