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The Evolution of Urban Concentration around the World: a Panel Approach

by
Alejandro Gaviria
Ernesto Stein
inter-american development bank

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Abstract[*]

In this paper, we use a panel approach to study population growth in major cities around the world. We find that major cities grow faster in relatively backward economies and in more volatile, faster-growing economies. We also find that the effects of trade policy on the growth of major cities hinge heavily on geography. While population growth in major cities located at or near ports does not change after an upsurge of trade flows, population growth in landlocked major cities tends to slow down after the same event. On the other hand, we do not find any effect of political regime on the population growth of major cities. Finally, we find some evidence that, other things being equal, larger cities tend to grow at smaller rates.

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1. Introduction

Urbanization has been steadily increasing around the world since the dawn of the industrial revolution 200-odd years ago. The rate of urbanization has not only proceeded at different speeds from one country to another, but has also taken different forms, from a few huge central agglomerations in some countries to many scattered towns in others. The causes of these differences are many, and likely include geographical and historical factors as well as economic and political ones.

In this paper, we focus our attention on the different economic and political factors that determine the patterns of urban concentration. We focus, in particular, on the determinants of population growth in main cities. The issue is an important one. Main cities have grown so fast (and so large) in many developing countries that they have often overwhelmed the ability of local authorities to guarantee public safety and provide adequate public services--not to mention that overly dominant major cities often create resentment and exacerbate ethnic and racial conflicts.

But size is not necessarily bad when it comes to cities. Large cities often enjoy significant agglomeration economies, stemming from both knowledge spillovers among firms within the same industry and cross-fertilization among industries. Large cities also facilitate the division of labor and the provision of public services, and reduce transport costs. All these forces should make major cities more productive and, therefore, the focal points of any strategy looking to spur economic growth.[1]

Regardless, we believe that an understanding of the causes underlying the growth of major cities is paramount. This paper is not the first one to explore this line of inquiry. Wheaton and Shishido (1981) studied the connection between economic development and urban concentration (defined as the share of the total population of a country living in the country's one or two main cities). They found that urban concentration first increases and then decreases with per capita GDP and that urban concentration decreases with the size of the country. Ades and Glaeser (1995) carried out the most comprehensive study to date of the determinants of urban

1 See Glaeser (1998) for a complete analysis of the agglomeration and congestion forces that affect the productivity in cities.

concentration. They used both cross-country regressions and case studies. They found that despotic and unstable regimes tend to increase urban concentration. They also found, although the evidence is here less definitive, that trade openness tends to reduce urban concentration.

In this paper, we reexamine the evidence presented by Ades and Glaeser, using a panel of countries. Our paper differs from Ades and Glaeser's on two counts. First, we consider a larger set of explanatory factors, and, second, we focus on the population growth of major cities rather than their absolute population levels. Our methodological choices allow us not only to study the dynamics of urban concentration (e.g., do main cities grow slowly as they become larger?), but also to examine more accurately the effects of political and economic factors on the rise and fall of main cities.

We find that, other things equal, main cities grow faster in relatively underdeveloped economies and in more volatile, faster growing economies. We do not find that the type of political regime has any effect on the growth of main cities. In our sample, major cities grow at the same rate in democracies and dictatorships, which casts some doubts on Ades and Glaeser's contention to the effect that dictatorships bring about concentration in a single metropolis. However, we find, as in Ades and Glaeser, that political instability does tend to speed up the growth of main cities.

We also find that population growth in major cities slows down as they become larger, which suggests the presence of natural limits to the size of cities (i.e., a threshold above which congestion forces completely overwhelm any benefit that may stem from agglomeration). Finally, we find that the effects of trade policy on the growth of major cities hinge heavily on geography. While population growth in major cities located at or near ports does not change after an upsurge of trade flows, population growth in landlocked major cities tends to slow down after the same event.

Most of our results are robust not only to changes in specification, but also to changes in the length of the average periods used in the panels and changes in the estimation technique. The structure of this paper is as follows. Section 2 presents a conceptual discussion of the different factors that may affect urban concentration. Section 3 describes our empirical methodology. Section 4 presents the main empirical results of the paper. Section 5 presents some robustness

checks. Finally, Section 6 draws some conclusions.

2. Explaining Changes in Urban Concentration

In this section, we discuss political and economic factors that can in principle account for the observed changes in urban concentration. The discussion below emphasizes the intuitive rather than the technical aspects of the theories. Readers interested in more formal treatments are referred to original presentations (notably Ades and Glaeser, 1995 and Krugman and Livas, 1996).

Trade Policy and Urban Concentration

The connection between trade policy and urban concentration was first formalized by Krugman and Livas (1996). According to these authors, in a world of scale economies and transportation costs, a rise in trade barriers will increase urban concentration. If barriers to trade are raised, internal markets will become more important and more firms will tend to locate in the main city in order to take advantage of cheaper inputs (forward linkages) and easier access to consumers (backward linkages). Conversely, if barriers to trade are reduced, foreign markets will gain preeminence and the main city will no longer be the place to be for firms and workers looking for customers and bargains.

According to the previous argument, greater openness will reduce urban concentration by reducing the incentives faced by firms to locate in the main city. While this is certainly the case for landlocked main cities, it is not necessarily the case for main cities located near ports (or other transport nodes, for that matter). Indeed, greater openness can prompt firms to move to main cities that are located near ports. If barriers to trade are curtailed, some firms will put a greater emphasis on foreign markets and others will rely increasingly on foreign suppliers. Both will find it profitable to locate near ports in order to economize on transport costs, and, as a result, port cities could experience an outburst of growth.

To sum up, the effect of a change in openness on urban concentration is ambiguous and will depend heavily on whether the central location is an important node in the trade flows of the country in question. If so, greater openness may increase concentration. Otherwise, the

Krugman-Livas argument applies more directly, and we should expect a fall in urban concentration following a reduction in the barriers to trade.

Political Rights, Political Instability and Urban Concentration

The question here is: do authoritarian governments tend to be more biased in favor of central city dwellers than democratic ones? Ades and Glaeser (1995) argue in the affirmative. Their argument has two parts. First, they argue that political participation in democratic regimes is very different from political participation in authoritarian regimes. While in democratic regimes people participate in politics through voting and the formation of interest groups, in authoritarian regimes people participate in politics through revolts and ultimately through organized attempts to topple the extant ruler. They argue next, and this is the crux of their argument, that while central city dwellers have the edge over hinterland residents in the latter form of participation, they may not necessarily have it in the former. According to Ades and Glaeser, in authoritarian regimes, only central city dwellers have the ability to overthrow the extant government and so rulers will tend to cater mostly to them. By contrast, in democratic regimes, all citizens–no matter where they live–have the right to vote and organize into interest groups and so rulers will be more neutral when it comes to allocating resources between the central location and the hinterland.

If taken at face value, Ades and Glaeser's argument implies that urban concentration increases with both a reduction in political rights and an increase in political instability. But this argument (and hence its implications) can be objected to on several grounds. For one thing, hinterland residents may have the same ability to revolt against despotic governments. For example, the only three successful popular revolts against dictators in recent Latin America history (the first one in Mexico, the second in Cuba, and the third one in Nicaragua) were all waged by peasant movements with few connections with central-city interests. For another, central city dwellers can also sway political outcomes in their favor in democratic regimes, if only because the higher population densities of central locations help ameliorate the well-known

collective action problems of political participation (a point forcefully made by Bates, 1981 for the case of Africa).

On the whole, the effect of democracy on urban concentration depends on the relative political power of two different groups of citizens in two different types of political regimes and as such remains essentially an empirical question.

Volatility

Hinterland residents may migrate to the central location in the face of high volatility for at least two reasons. First, central locations have more diversified economies and hence offer some hedging opportunities not available anywhere else. And second, central locations provide more opportunities to start anew for those hinterland residents whose livelihoods are destroyed by bouts of volatility, especially so in developing countries where the presence of sophisticated informal labor markets in large cities allows new migrants to start anew almost upon arrival.[2]

According to the first argument above, moving to the central location is the best option for many hinterland residents who want to minimize risk in the absence of insurance markets. According to the second argument, moving to the central location is the only option for many hinterland residents who cannot salvage their businesses or their jobs after an economic downturn mainly because they don't have access to credit markets. So the absence of insurance and credit markets is a key condition for the postulated relationship between urban concentration and volatility.

Dynamic Considerations

The main question here is: do main cities tend to grow faster as they become larger? In theory, the answer will depend on whether the benefits of agglomeration outweigh its costs. On the one hand, dynamic externalities stemming from knowledge spillovers across different industries and across different firms of the same industry can increase economic growth (and ultimately

[2] The connection between economy-wide volatility and urban concentration was previously studied by

population growth) in large cities. On the other hand, congestion effects, in their usual manifestations of crime, pollution and traffic gridlock, can completely overwhelm the ability of large cities to continue growing. Intuitively, one would expect that cities would eventually lose some dynamism once they cross a certain threshold.

Apart from dynamic externalities, there are powerful coordination forces (of the kind emphasized by Krugman, 1991) that will prevent main cities from breaking apart even in the face of very adverse conditions. Of course, the presence of coordination effects implies that urban dynamics will exhibit a great deal of inertia, which is to say that the fate of main cities will be decided by long-run forces and not by the vagaries of this period or that.

Agriculture, Development and Urban Concentration

Ades and Glaeser (1995) argue that the potential for the centralization of economic activity (and hence the potential for urban concentration) will be lower in countries where agriculture comprises a large fraction of total output. In their view, agriculture, by tying firms to the land, reduces spatial mobility among productive units and hence the potential for the centralization of economic activity in a few locations. Although true for the *levels* of urban concentration, this argument does not make much sense if one is considering the *changes* of urban concentration. One can argue, indeed, that the potential for industrial growth and the centralization of economic activity will be much greater in agriculture-based economies where many scale and scope economies are still up for grabs.[3]

Labor Mobility and Ethnic Fragmentation

The argument here is that the potential for urban concentration will be diminished if people, for cultural or other reasons, are unwilling to move in order to take advantage of greater economic opportunities. Obviously, spatial mobility will be lower in the presence of strong ethnolinguistic

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Garcia López and Spilimbergo (1995).

[3] Wheaton and Shishido (1981) make a similar argument when studying the connection between urban concentration and the level of development.

divisions, as people are more reluctant to pursue economic opportunities if that comes at the cost of learning a new language or adapting to a new cultural environment.

Consider, for example, the case of Bolivia as described by Urquiola (2000). The pattern of urbanization in Bolivia has been very different from that of its neighboring countries. In Bolivia, urban concentration has steadily declined over the last four decades as La Paz has lost preeminence and Cochabamba and Santa Cruz have emerged as alternate population centers. Why? We must first note that Bolivia is a country with three very distinct geographical regions: the Andean (or highland region), the Sub-Andean (or Valley) region and the lowlands. These regions overlap closely with the main ethnolinguistic divisions of the country: Aymara is the most common native language in the Andean region, Quechua, the language of the Incas, is the most common language of the sub-Andean region, and Guarani is common in the lowland. According to Urquiola, the overlapping of ethnic and geographic divisions has raised the cost of between-region migration in Bolivia and has accordingly boosted within-region migration, which in turn has given rise to three main population centers, one in each region. The end result: urban concentration is very low in the country as a whole but very high within each region.[4]

In short, ethnolinguistic divisions can reduce urban concentration by limiting people's propensity to migrate in search of greater economic opportunities. Nonlinearities may be important in this context: the role of ethnic divisions will be very high if nobody dares to move but will dissipate almost completely once a critical mass of people have left the hinterlands and settled in the central location.[5]

3. Estimation Issues and Data

There are two alternative approaches to study the determinants of urban concentration. First, one could use a cross section of countries. In this case, one would first compute the average of

[4] Raphael and Riker (1998) study the connection between mobility and race in the United States. They find that the lower propensities to move among Blacks can explain a sizable fraction of the white-black wage differential.

[5] Carrington, Detragiache and Vishwanath (1996) emphasize this type on nonlinearities in their study of the so-called Great Black Migration.

both urban concentration and the different explanatory variables over some period of time, and then study the association between one and the others (as done by Ades and Glaeser, 1995). The main problem with this approach is that the level of urban concentration, which tends to be very persistent over time, can hardly be explained by the recent values of economic and political variables. Consider, for example, a case in which we are trying to measure the effects of trade liberalization on urban concentration. Ideally, we should use averages of urban concentration, trade openness and the relevant controls over a *long* period of time (at least 50 years). In practice, however, information is not always available for long periods of time, and so we may be forced to use averages over much shorter periods. The problem is then that it will be very difficult to justify any connection between the recent history of trade openness (that can differ substantially from the past history) and the current *level* of urban concentration. After all, the level of urban concentration at any point of time is the result of a long history that goes back for decades if not centuries.[6]

Alternatively, one could use a panel approach. In this case one no longer focuses on the determinants of the *levels* of urban concentration, but rather on the determinants of the *changes* in urban concentration. The main problem of this approach is that one would have to make arbitrary assumptions about the length of the time horizon needed to discern the effects of time-varying variables on urban concentration. Are ten years enough to appreciate the effects of trade liberalization on urban concentration? What about the case of a change in political regime? Can we use the same horizon in both cases? Obviously, all these questions have no easy answer as they refer to empirical matters over which is difficult to make an educated guess at the outset.

The empirical literature on economic growth and development provides a useful analogy of the choices at hand. In this literature, one could focus on either the levels of output (à la Hall and Jones, 1999) or the rates of growth (à la Barro, 1991). Likewise, one could focus here on either the levels or the changes of urban concentration. As a general rule, one should use levels if one wants to emphasize the effects of time-invariant factors (e.g., geography and culture) and one should use growth rates if one wants to emphasize the effects of policy variables that change

[6] Ades and Glaeser (1995) cope with this problem by presenting five case studies that allow a more detailed understanding of the origin and evolution of some of the most remarkable urban agglomerations in human

frequently over time (e.g., trade openness). In this paper, we want to do both but we pay especial attention to the latter, hence we opt for a panel approach.

In addition, we firmly believe that in this case the benefits of using a panel approach outweigh the costs. A cross-sectional approach can lead to serious inference problems because in general we have information only about the recent evolution of many of the explanatory variables. Moreover, a panel approach allows us to study dynamic effects, and also allows us to address some of the most pressing endogeneity problems. We deal with the unknown lagged structure in a practical fashion: we first assume that a ten-year horizon is enough to discern the effects of political and economic variables on the changes in urban concentration and then we experiment with other values as a robustness check.

We estimate the following model

$$\ln(M_{it}) - \ln(M_{it-1}) = f\{\ln(U_{it}) - \ln(U_{it-1})\} + (g-1)\ln(M)_{it-1} + \mathbf{?}'\mathbf{z}_i + \mathbf{ß}'\mathbf{x}_{it-1} + m_i + ?_{it}, \quad (1)$$

where M_{it} is the population of the main urban agglomeration of country i at the beginning of decade t, U_{it} is the urban population of country i at the beginning of decade t, $\mathbf{z}_i$ is a vector of time-invariant attributes of country i, $\boldsymbol{x}_{it-1}$ is a vector of time-varying attributes of country i averaged over the decade t-1, μ_i is a country-specific effect and ν_{it} is the error term. Intuitively, equation (1) postulates that the difference between the population growth of main cities and the population growth of urban areas depends on the population of the main city at the beginning of the decade (in logs) and a few economic and political factors.

We can slightly rewrite equation (1) as

$$y_{it} = gy_{it-1} + \mathbf{?}'\mathbf{z}_i + \mathbf{ß}'\mathbf{x}_{it-1} + m_i + ?_{it} \quad (2)$$

where $y_{it} = \ln(M_{it})$ and the urban population growth is now part of the vector $\boldsymbol{x}_{it-1}$. Equation (2) has received a great deal of attention in the econometrics literature. Estimation of (2) must deal with the fact that, by construction, the lagged dependent variable and μ are correlated. Estimation by fixed-effects doesn't solve this problem unless the time dimension of the panel approaches infinity (which it clearly does not in this case).[7] A large menu of estimation

history.

[7] See, for example, Hsiao (1986, p.75).

techniques has been proposed in the literature to address this problem. All techniques rely on more or less restrictive assumptions about the endogeneity of the different regressors.[8] As pointed out by Kiviet (1995) and Judson and Owen (1999), none of the techniques seems to be best for all circumstances

In general, the bias and efficiency of the different estimation techniques depend on the characteristics of the data, the dimensions of the panel (T and N), and the value of γ. Judson and Owen (1999) have recently used Monte Carlo exercises to evaluate the bias and efficiency of the most popular techniques to estimate dynamic panels. Their exercise explicitly attempts to reproduce the characteristics of most macro data sets (small T, large N and relatively large explanatory power of the independent variables). These authors find first that almost all estimation techniques yield reasonable estimates of β (the biases are in most cases smaller than 3 percent). They also find that for a panel like ours ($0.8<\gamma<1$, $T<5$, $N\approx100$), OLS provides the most accurate estimators of γ. Their results to this effect are reproduced in Table 1. As shown, OLS estimators have a very small bias, the smallest standard deviations and by far the smallest mean square errors.[9]

Unlike both fixed-effects and the standard Generalized Method of Moments (GMM), OLS makes use of both the cross-sectional and temporal variation of the data. This not only increases the efficiency of the β estimators, but also permits the otherwise impossible estimation of the ρ estimators. However, OLS estimators will be biased if the explanatory variables are correlated with some omitted country-effects that go into μ. We deal with this problem in a practical fashion: we estimate equation (2) before and after controlling for several observed country effects and then we compare the estimators in the various specifications. We find that the estimators are almost identical in all the specifications, which dispel some fears regarding the importance of omitted country effects.

8 See, for example, Balestra and Nerlove (1966), Anderson and Hsiao (1982), Arellano and Bond (1991), Kiviet (1995), Arellano and Bovet (1995) and Judson and Owen (1999).

[9] Kiviet (1995, p.70) finds a very similar result using a different Monte Carlo simulation. In his words, "we find that OLS has impressingly small standard deviation, and therefore, when bias is moderate (which it is for higher γ values), it has an attractive mean squared error."

Endogeneity problems are also potentially important in this context. Dictatorships, for example, may encourage urban concentration, but urban concentration may also facilitate coups and hence the emergence of dictatorships. One the main advantage of the GMM techniques is that they allow us to minimize the endogeneity assumptions we have to make. But this advantage usually comes at the cost of diminished precision in the estimates (Kiviet, 1995 and Judson and Owen, 1999).[10] On the other hand, in light of the instrumental variable evidence reported by Ades and Glaeser (1995), endogeneity problems are likely to be small in this context.

Description of the Data

The data set we use in this paper comprises 105 countries and spans three decades: from 1960 to 1990. Data on urbanization and population come from the 1996 United Nations data set on urban agglomerations.[11] Data on GDP, trade flows and agriculture come from the Penn World Tables. Data on democracy come from the Polity III data set compiled by Jaggers and Robert (1995). Data on political instability are from Alesina, Ozler, Roubini and Swagel (1996) and the data on ethnolinguistic fragmentation from La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998). Data on land area come from the World Development Indicators, and data on ports from the Encyclopedia Britannica. Ten-year averages were used for most of the explanatory variables.

Some of our indicators require some explanation. Our indicator of democracy measures the presence of institutions that facilitate participation and inclusion. In particular, the ten-point scale measures the presence of institutions that allow citizens to express their preferences, constrain arbitrary use of power by elected leaders, and exert the right to participate in politics. This emphasis on regime structure, however, does not allow an explicit consideration of civil

[10] An alternative here would be to use the GMM technique proposed by Arellano and Bover (1995). This technique combines equations in differences and levels and makes milder exogeneity assumptions than OLS. However, little is known about the small sample properties of this technique (see Fajnzylber, Lederman and Loayza, 1998 for an application to cross-country differences in crime rates).

[11] This data set contains information for 431 urban agglomerations in 105 countries. As of 1995, the total population living in the 105 main cities of our sample was 364 million--roughly seven percent of the world's population.

liberties.[12]

We measure political instability by the average number of successful coups per year over a decade. As mentioned earlier, this variable attempts to measure the perception of the extant ruler regarding the probability of being ousted by a public-led revolt. Surprisingly, the correlation between this variable and other indicators of political instability is very low (less than 0.1 for the case of riots and political assassinations, for example). We use successful coups to ensure the comparability of our results with Ades and Glaeser's (1995).

We measure volatility by the standard deviation of GDP growth. In principle, volatility of growth can arise from many sources, including terms of trade shocks, financial shocks and changes in macroeconomic policies. Here we do not make any attempt to disentangle the effects of the different sources of GDP volatility. We measure the changes in trade policy by computing the change in total exports and imports as a percentage in GDP from one decade to the next. We use changes in openness rather than the corresponding levels because we believe that they provide a more accurate indicator of trade policy—after all, the levels of openness are the result of many geographical and historical factors that have little connection with current policy interventions.

Table 2 presents descriptive statistics for the key variables of our study. The average ten-year population growth of the main cities in our sample is 35.9%, a rate slightly higher than that of the total urban population. Interestingly, most variables in our sample vary much more across countries than across decades. Thus, almost all the variation in political regimes and the levels of trade, most of the variation in political instability and most of the variation in GDP volatility comes from differences between countries. These results highlight the importance of taking into account the cross-country variation when estimating the effects of these variables.

4. Results

[12] For the mid-nineties, the correlation coefficient between our index of democracy and the civil liberties index of Freedom House is 0.83.

Table 3 presents the OLS estimates of Equation (1). The dependent variable is the population growth in the main city from on decade to the next. The independent variables include averages of the political and economic indicators mentioned above, the population in the main city at the beginning of the period (in logs), and the growth of the urban population in the decade under scrutiny. The correlations between the dependent and the explanatory variables are presented in Appendix 1.

The estimates of (γ-1) are negative, significant and very similar across all specifications. This result provides compelling evidence that the rate of population growth of main cities tend to slow down as they become larger, perhaps because of their inability to cope with congestion problems. On the other hand, the various estimates of ($1-\gamma$) also imply that the population of main cities moves very sluggishly over time: seldom do large changes occur from one decade to the next, indicating that population levels tend to be very persistent over time.

Regression (1) of Table 3 shows that on average trade policy appears to have little effect on the population growth of main cities: the coefficient on the change in openness is negative but not significant. Regressions (2)-(4) show that if we allow the effects of trade policy to differ according to whether or not the main city is a port, a somewhat different conclusion emerges. In the new specifications, the results show that an increase in openness will affect the rate of population growth only in major cities that are landlocked. All else being equal, an increase in trade flows over GDP of ten percentage points will reduce population growth by 1.5 percentage points per decade in landlocked main cities, and will have no effect in port cities. In sum, the Krugman and Livas hypothesis appears to apply only to central locations (in the literal sense of the word), but even there the effects are likely to be small.

We also find that main cities tend to grow faster in those countries where agriculture comprises a higher fraction of total output. All else being equal, a difference of ten percentage points in the relative importance of agriculture will be associated with 1.8 percentage points per decade of faster growth in main cities. This result suggests that main cities grow very fast in the earlier stages of development, and then slow down (but continue growing) as development advances. Figure 1 is consistent with this view. As shown, the fraction of the total population

living in main cities has grown steadily since 1950 in both developed and developing countries, but has done it much faster in the latter group.

GDP volatility also appears to speed up the rate of population growth in main cities. The effects are noticeable and significant in all cases. A difference of four percentage points in volatility (roughly equivalent to the difference in mean volatilities of OECD and Sub-Saharan countries) will be associated with at least three percentage points per decade of faster population growth in main cities. Average economic growth also appears to speed up the rate of population growth of main cities, implying that temporary bursts of growth could trigger massive migration toward central locations where presumably the bulk of the growth-generating activity is taking place.[13]

We don't find any effect of the type of political regime on the rate of population growth of main cities. In our sample, main cities grow at similar rates in democracies and dictatorships. This result stands in sharp contrast with the contention of Ades and Glaeser to the effect that dictatorships cause concentration in a single metropolis. Ades and Glaeser base their contention on the positive correlation between average urban concentration from 1970 to 1985 and "average" political regime in the same period. The problem with Ades and Glaeser's argument is that the *levels* of urban concentration (which surely embodied a history of many years) are not likely to be greatly affected by recent political developments. To put it bluntly, the high levels of urban concentration of Argentina and Chile in the 1970s and 1980s were not caused by the military regimes that ruled these countries during these decades. After all, Buenos Aires and Santiago already comprised over 30 percent of their countries' population in 1970, not to mention that Chile was ruled by democratic regimes for most of the 20th century.[14]

As in Ades and Glaeser, we find that political instability is associated with higher population growth in major cities. Because political instability is usually highly correlated with civil strife, this result may not reflect so much the urban biases of unstable regimes suggested by

[13] We include GDP growth mainly as a control. Because we use the standard deviation of growth rates of GDP to measure volatility, controlling for average growth is necessary to make sure that our indicator of volatility is not just capturing growth effects.

[14] Moreover, the share of the Argentina's population living in Buenos Aires fell from 35.13 in 1970 to 34. 72 in 1985.

Ades and Glaeser as the migration toward main cities of hinterland residents who have been threatened or dispossessed by the parties in conflict.[15] On the other hand, we don't find compelling evidence of any relationship between ethnolinguistic fragmentation and main city growth. As predicted above, the coefficient in question is negative in all specifications, but is also very small and non-significant throughout.

As mentioned above, OLS estimates will be biased if some of the covariates are correlated with omitted country-specific variables. In a panel approach, we can obviate this problem by either estimating the equation in first differences or in differences from the country means. These options, however, ignore the cross-country variation altogether, greatly limiting the information available to estimate the various effects under analysis. Here we try to assess the importance of this problem by first estimating our basic specification with and without some observed country specific factors and then comparing the estimates of the different time-varying factors across the different specifications.

Thus, regression (3) includes three additional country-specific variables, the log of the area and one dummy variable for capitals and another for ports. And regression (4) includes three regional dummies (one for Latin America, one for OECD countries and the last one for Sub-Saharan countries). As shown, the estimates are very similar across the different specifications, which offers partial support to our contention that biases stemming from omitted country factors are likely to be small. [16]

5. Robustness Checks

In this section, we carry out two robustness checks. First, we change the lengths of the panel periods and then we use two alternative estimation techniques.

Table 4 shows the main results of the first exercise. Two remarks are in order before

[15] The United Nations estimates that around the world at least four million people are "internally displaced" every year as a result of civil strife. In Colombia alone, clashes between leftist and right-wing paramilitary groups have driven as many as a million from their homes in the last thirty years. See Parfit (1998).

[16] We obtain almost identical results when we try other country-specific variables, including average fertility rates, latitude, and dummies for communist regimes and for islands.

looking at the results. First, the number of observations changes not only because more or fewer periods are added to the panels but also because more or fewer countries become available as we shorten or lengthen the size of the periods. And second, because the dependent variable refers to the change in population in the period under question (it is not the annualized rate), the units of some of the implied slopes change from one case to another and so the coefficients are not immediately comparable.

Several of the main results discussed above hold up regardless of the length of the period considered. The dampening effect of population size in the subsequent changes in population is evident in all cases considered. Similarly, the effects of agriculture are positive, significant and--once the units are transformed--of similar magnitude in all cases. The effects of volatility are also of similar size in all cases, but non-significant when five-year periods are used. Finally, the type of political regime appears to have little effect on the growth of major cities irrespective of the time period used in the estimation.

We observe the largest discrepancies for political instability and GDP growth. The former variable becomes almost irrelevant when 15-year periods are used and loses significance, although it is still quantitatively important, when 5-year periods are used. The latter variable has a more erratic behavior: it is positive and significant in the 5-year case and negative and marginal significant in the 15-year one. Interestingly, the latter result suggests that whereas short bursts of economic growth have a positive effect on main city growth, longer and (perhaps more permanent) accelerations of growth rates have the opposite effect.

The effects of trade policy, measured here by changes in trade flows over GDP, also seem sensitive to the length of the period used in the analysis, especially if we focus on the significance of the coefficients. This result notwithstanding, the signs of the coefficients tell a familiar story: trade liberalizations dampen growth in landlocked major cities and have little effect on major cities located at or near ports.

In section 4, we use OLS to estimate the effects of various economic and political variables on the population growth of major cities. We justify the use of OLS on two grounds. First, OLS appears to yield, at least for the type of problem at hand, the most precise estimates

of the coefficient on the lagged dependent variable. And second, OLS yields much more efficient small-sample estimators than those techniques that disregard the cross-country variation of the data. Now, these two properties (and especially the second one) are not unique to OLS. Indeed, the use of any estimation technique based on the assumption of random country effects could be justified on similar grounds.

As a robustness check, here we reestimate our basic specification under the assumption of random country effects. We use two different techniques: the standard random-effect regression estimator and a maximum likelihood estimator. The results are shown in Table 5. The coefficients on the lagged dependent variable are almost identical as before. The effects of political regime are, as before, irrelevant and non-significant. The effects of GDP growth, agriculture and political instability are again noticeable and significant. On the other hand, the effects of volatility and trade policy are smaller and non-significant under the new estimations.

6. Concluding Remarks

Democracy and free trade have often been prescribed as the best antidotes against excessive urban concentration in a single metropolitan area--a malady that afflicts many developing countries.[17] These prescriptions, based mainly on the works of Krugman and Livas and Ades and Glaeser, are partially challenged in this paper. For one thing, we find that, at least for the post-war period, there is hardly any systematic relationship between political regime and the rate of population growth of major cities. For another, we find that trade liberalization will not necessarily curb population growth in main cities that are located at or near ports.

We find, on the other hand, that reducing political and economic instability may reduce population growth in main cities. Our evidence suggests thus that main cities should be understood not only as agglomerations of rent and bargain seekers (as suggested repeatedly in the literature), but also as risk shelters. We also find that main cities tend to grow faster in agricultural-based economies and in economies experiencing temporary bursts of economic

[17] Krugman (1994) has argued, for example, that the models of the so-called new economic geography suggest "that Washington consensus policies of reduced government intervention and trade opening tend

growth. All in all, we find that main cities grow faster in times of political and economic turmoil than in times of stability.

Furthermore, we find that the rate of growth of main cities slows down as they become larger. We interpret this result as evidence that congestion effects will eventually overwhelm any dynamic externality stemming from either urban diversity or greater population density. Finally, we find that, as predicted by most models of urban dynamics, main cities are glued together by powerful forces that prevent them from breaking apart even in the presence of the most adverse circumstances. That is to say that inertia provides a very powerful backdrop against which we must be able to distinguish the workings of lesser forces. Therein lies one of the main difficulties of this type of empirical analysis.

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to reduce the size of major cities or at least slow their relative growth."

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Table 1. Bias Estimates for γ Using Various Estimators

Taken from Judson and Owen (1999)

Method	BIAS	S.E.	RMSE
OLS	0.049	0.026	0.055
Fixed Effects	-0.504	0.058	0.508
Fixed Effects (Corrected)*	-0.131	0.08	0.154
Anderson-Hsiao	0.007	0.202	0.202
GMM	-0.116	0.15	0.19

Parameters: γ=0.8, T=5 and N=100

* See Kiviet (1995)

Table 2. Summary Statistics

		Standard Deviation			
	Mean	Within	Between	Minimum	Maximum
Population Growth Main City	35.9%	10.8%	20.8%	-14.7%	115.0%
Population Growth All Urban Aereas	34.5%	6.2%	18.7%	-0.3%	107.6%
Annual Growth of GDP per Capita	2.0%	2.1%	1.9%	-10.4%	9.5%
Standard Deviation of Growth	4.6%	1.8%	2.8%	1.1%	18.6%
Trade as a Percentage of GDP	49.9%	8.6%	22.4%	9.3%	143.0%
Change in Trade as Percentage of GDP	4.3%	8.3%	7.2%	-35.8%	34.3%
Agriculture as Percentage of GDP	44.1%	51.5%	25.8%	2.4%	93.0%
Democracy (Polity III)	0.042	0.897	3.990	0.000	10.000
Successful Coups	0.049	0.055	0.080	0.000	0.667
Ethnolinguistic Fragmentation	0.334	0.000	0.293	0.000	0.890

Sources are discussed in the text.

Table 3. OLS Estimates of Urban Concentration

Dependent Variable: Percent Change of Population in Main City				
	(1)	(2)	(3)	(4)
Intercept	0.563	0.556	0.603	0.499
	(0.139)	(0.139)	(0.150)	(0.152)
%Δ(Urban Population)	0.625	0.630	0.595	0.632
	(0.078)	(0.078)	(0.081)	(0.081)
Ln(Population Main City) at beginning of the decade	-0.039	-0.038	-0.047	-0.036
	(0.009)	(0.009)	(0.010)	(0.009)
(Trade/GDP) - (Trade/GDP)$_{-1}$	-0.114	-0.165	-0.137	-0.169
	(0.090)	(0.103)	(0.106)	(0.105)
{(Trade/GDP) - (Trade/GDP)$_{-1}$}*Port		0.176	0.167	0.194
		(0.172)	(0.192)	(0.176)
Agriculture/GDP	0.184	0.178	0.184	0.176
	(0.0609)	(0.061)	(0.062)	(0.067)
Standard Deviation of GDP	0.779	0.753	0.703	0.801
	(0.319)	(0.320)	(0.321)	(0.337)
Growth of GDP	0.851	0.900	0.860	1.009
	(0.359)	(0.361)	(0.366)	(0.391)
Democracy	-0.093	-0.112	-0.202	-0.123
	(0.305)	(0.306)	(0.320)	(0.328)
Coups	0.134	0.132	0.132	0.119
	(0.080)	(0.080)	(0.080)	(0.083)
Ethnolinguistic Fragmentation	-0.012	-0.010	-0.033	-0.003
	(0.038)	(0.039)	(0.041)	(0.047)
Capital			-0.025	
			(0.026)	
Ln(Area)			0.010	
			(0.008)	
Ports			-0.005	
			(0.021)	
R2	0.73	0.73	0.73	0.73
N	206	206	206	206

Most variables refer to ten-year averages. Standard errors are in parenthesis.
Democracy and riots variables were divided by 100 to facilitate the presentation of the results
Regression (4) includes dummies for Latin Amerira, Sub-Sahara Africa and OECD.

Table 4. Changes in the Length of the Periods in the Panel

	15-year period	5-year period
Intercept	0.603	0.208
	(0.237)	(0.056)
%Δ(Urban Population)	0.652	0.683
	(0.105)	(0.056)
Ln(Population Main City) at beginning of the decade	-0.035	-0.015
	(0.015)	(0.004)
(Trade/GDP) - $(Trade/GDP)_{-1}$	-0.103	-0.010
	(0.137)	(0.053)
{(Trade/GDP) - $(Trade/GDP)_{-1}$}*Port	0.387	0.100
	(0.265)	(0.085)
Agriculture/GDP	0.323	0.100
	(0.099)	(0.024)
Standard Deviation of GDP	1.201	0.156
	(0.592)	(0.109)
Growth of GDP	-1.277	0.357
	(0.702)	(0.119)
Democracy	-0.674	-0.037
	(0.538)	(0.116)
Coups	-0.003	0.036
	(0.001)	(0.028)
Ethnolinguistic Fragmentation	-0.027	-0.009
	(0.064)	(0.015)
R2	0.76	0.70
N	127	348

Standard errors are in parenthesis.

Table 5. Random Effects Estimates

	Random Effects	MLE
Intercept	0.715	0.692
	(0.172)	(0.170)
%Δ(Urban Population)	0.600	0.603
	(0.086)	(0.083)
Ln(Population Main City) at beginning of the decade	-0.048	-0.047
	(0.011)	(0.011)
(Trade/GDP) - (Trade/GDP)$_{-1}$	-0.164	-0.165
	(0.102)	(0.0992)
{(Trade/GDP) - (Trade/GDP)$_{-1}$}*Port	0.084	0.096
	(0.170)	(0.168)
Agriculture/GDP	0.180	0.180
	(0.074)	(0.070)
Standard Deviation of GDP	0.436	0.477
	(0.320)	(0.324)
Growth of GDP	0.886	0.892
	(0.341)	(0.334)
Democracy	-0.145	-0.001
	(0.341)	(0.327)
Coups	0.183	0.177
	(0.079)	(0.078)
Ethnolinguistic Fragmentation	-0.009	-0.009
	(0.049)	(0.046)
R2	0.72	--
N	206	206

Standard errors are in parenthesis.

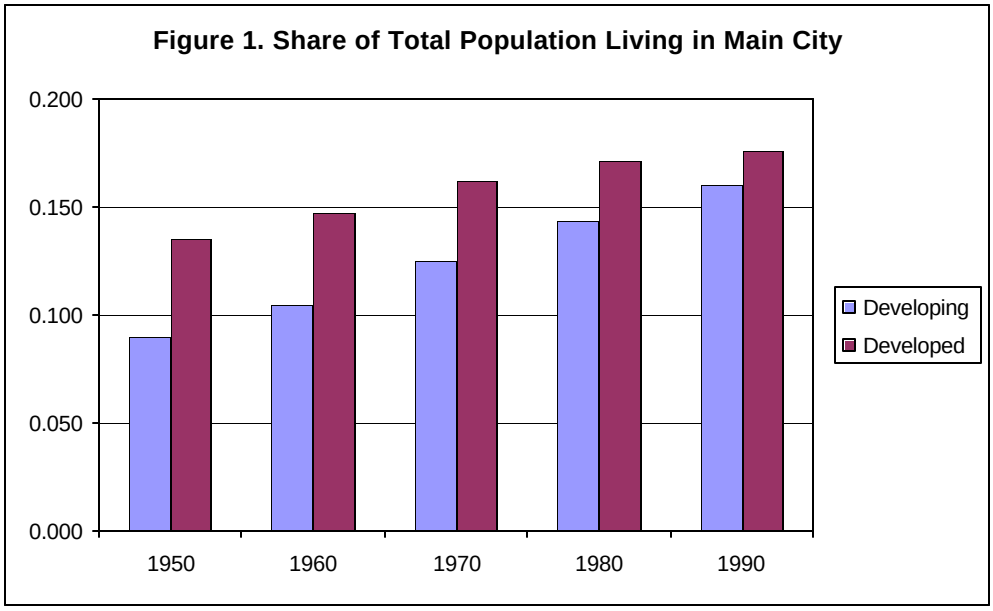
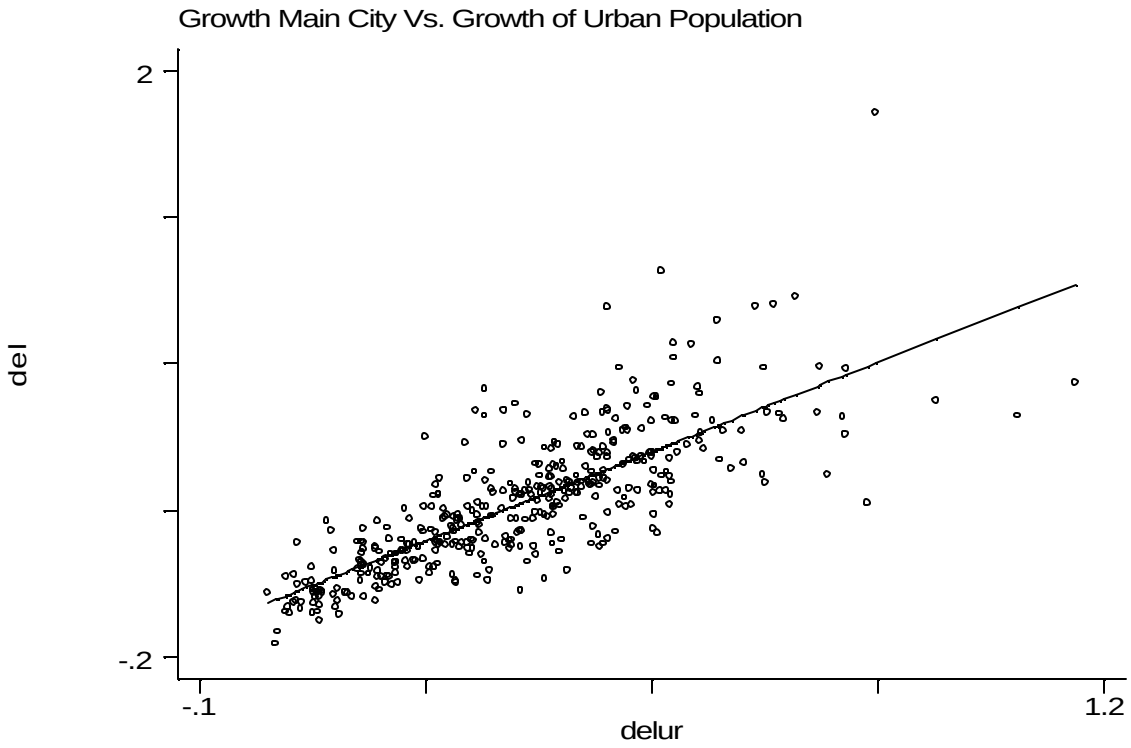
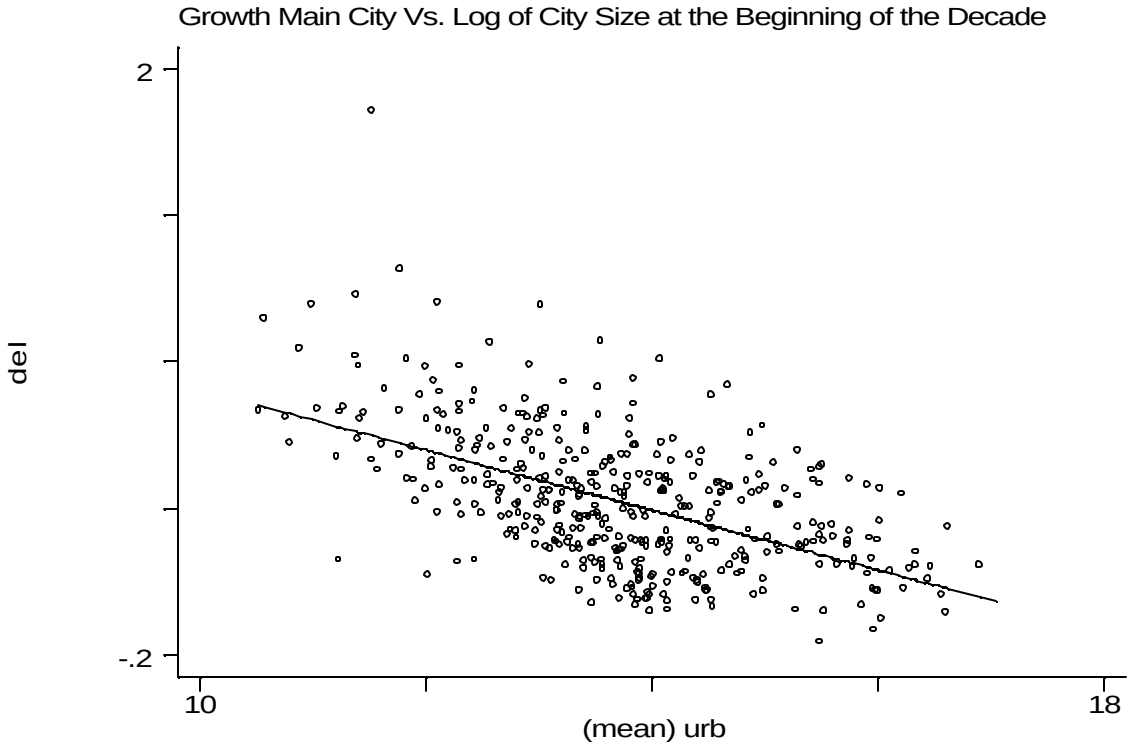
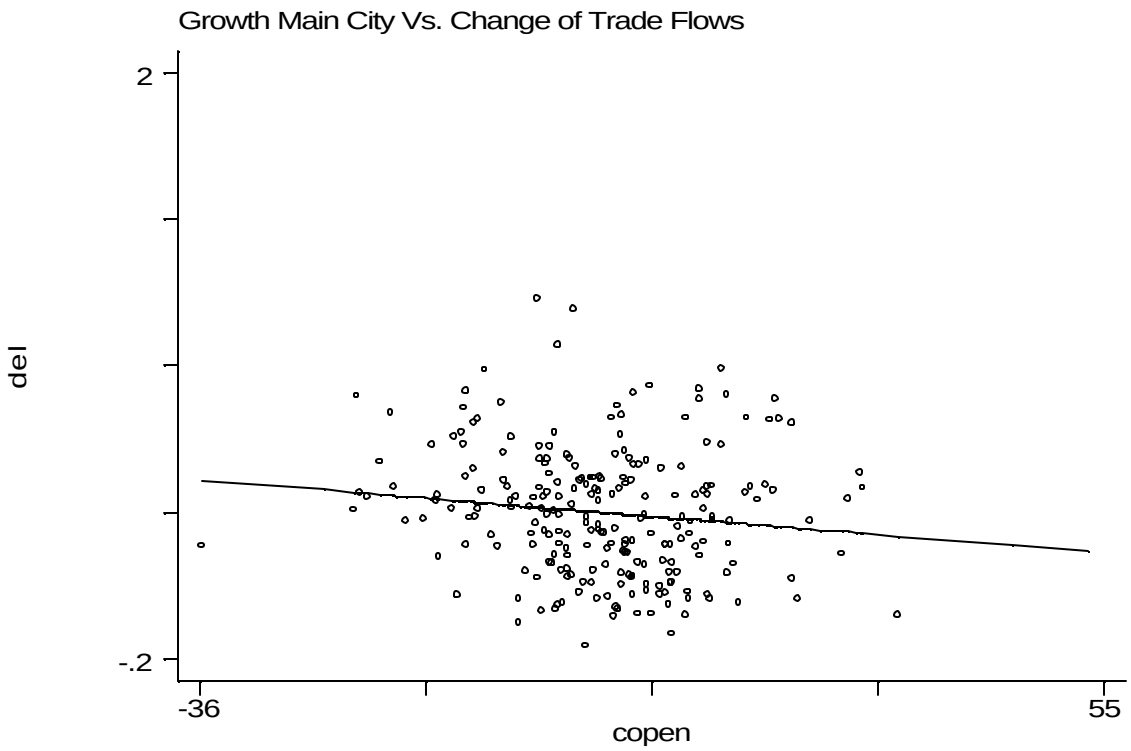


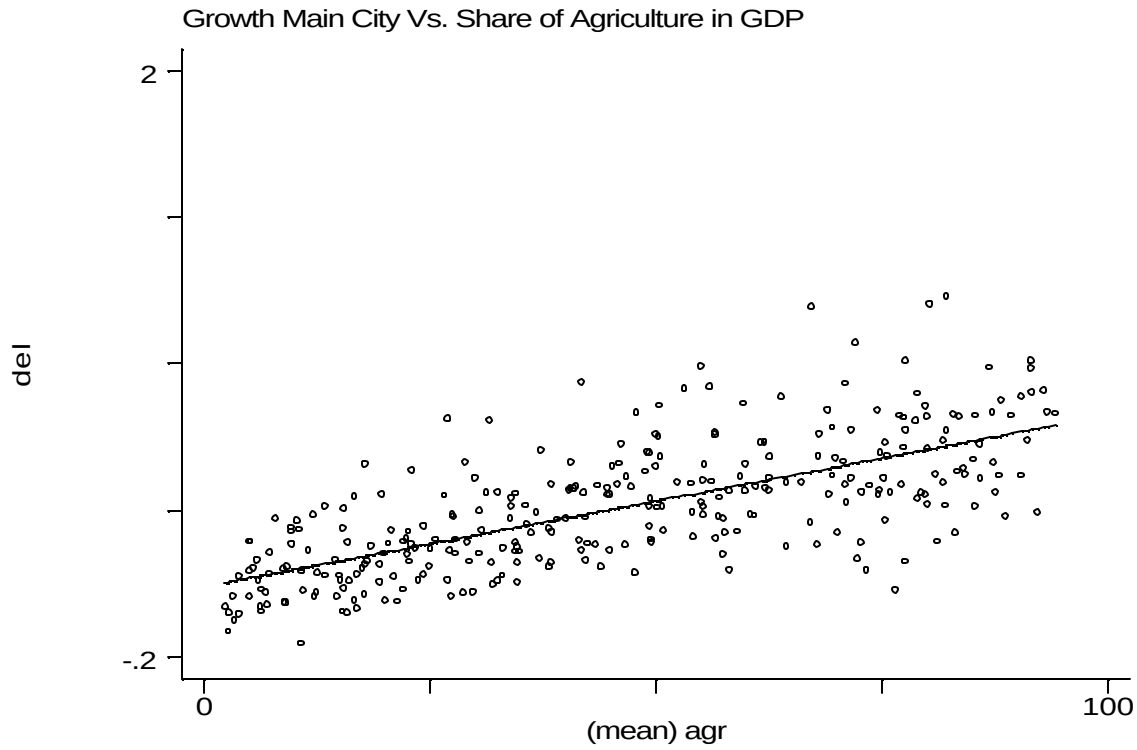
Figure 1. Share of Total Population Living in Main City
0.200
0.150
0.100
0.050
0.000
1950
1960
1970
1980
1990
Developing
Developed

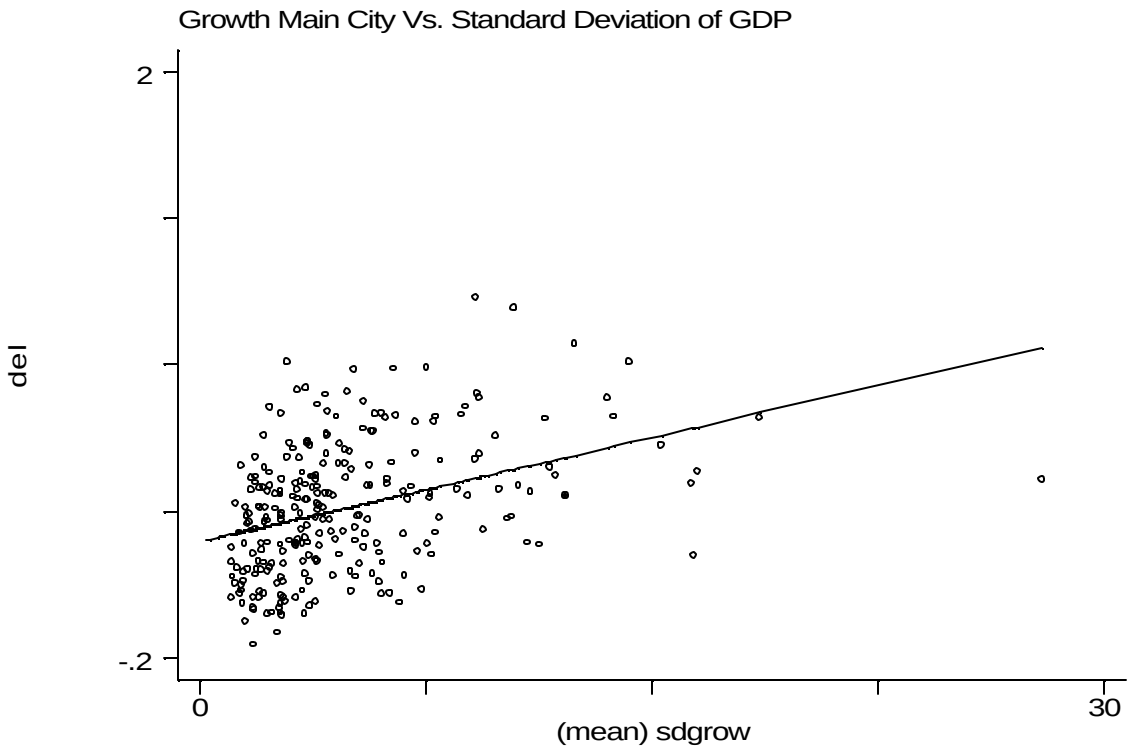
Appendix 1. Scatter Plots

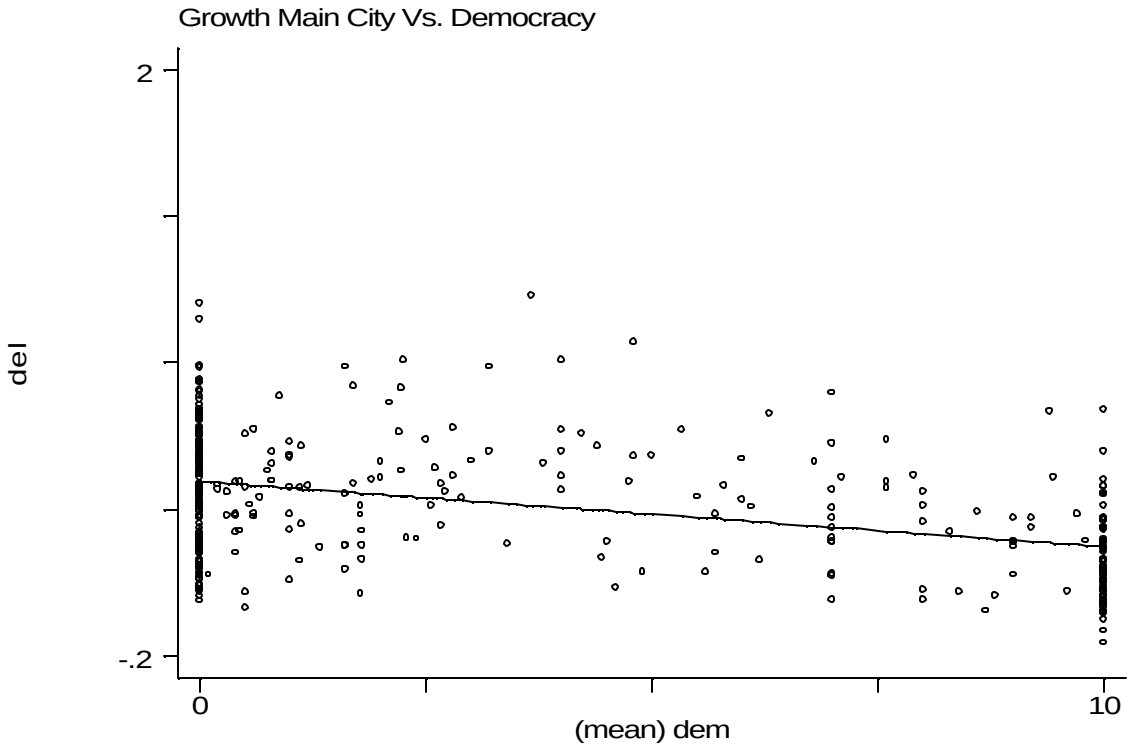





Growth Main City Vs. Change of Trade Flows
2
-.2
del
-36
55
copen


Growth Main City Vs. Share of Agriculture in GDP
2
-.2
del
0
100
(mean) agr


Growth Main City Vs. Standard Deviation of GDP
2
-.2
del
0
30
(mean) sdgrow


Growth Main City Vs. Democracy
2
-.2
del
0
10
(mean) dem