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CONCENTRATION OF POPULATION IN CAPITAL CITIES: DETERMINANTS AND ECONOMIC EFFECTS

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Resumen

Este trabajo estudia el impacto y los determinantes de la concentración de población en las capitales para una muestra amplia de países. La aglomeración excesiva de población en las ciudades capitales es un fenómeno observado en muchos países, muchos de ellos de características muy distintas. Mas aún, este hecho constituye una de las pocas violaciones de la ley de Zipf, una fuerte regularidad empírica en la distribución de tamaños de ciudades al interior de los países. Este trabajo estudia primero el impacto de este fenómeno sobre el crecimiento económico. Se presenta un modelo para estudiar las consecuencias de distorsiones en la distribución espacial de recursos en la producción. Los resultados empíricos muestran una correlación negativa entre esta distorsión y el crecimiento económico. La segunda parte estudia los determinantes del exceso de concentración. Se testean tres hipótesis de la literatura. Los resultados muestran que la concentración no puede ser explicada por barreras comerciales ni por inestabilidad política. Estos resultados son robustos y contradicen resultados anteriores de la literatura. Los resultados indican, por otra parte, que la concentración puede ser explicada por un bajo nivel de derechos políticos en la población.

Abstract

This paper studies the impact and determinants of the concentration of population in capital cities across countries. Fast population growth in capital cities is a widespread phenomenon that does not seems to be explained by economic factors. In addition, this fact violates Zipf's law, a strong empirical regularity in the distribution of city sizes. The paper addresses first the impact of this fact on economic growth. A model is built to study the consequences of distortions in the spatial allocation of resources in production. The empirical results show a negative correlation between this distortion and economic growth. The second part of the paper studies the determinants of this phenomenon. Three hypotheses advanced in the literature are tested. The results show that trade barriers do not explain concentration in capitals, nor does political instability. Both results are robust and oppose previous findings in the literature. This paper finds support to the hypothesis that concentration in capitals can be explained by weak political rights in the population.

This paper is based on Chapter 2 of the author's Ph.D. Dissertation in Economics at Harvard University. The author is grateful to Robert Barro and David Cutler for their helpful comments. All errors remain my own.
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1. Introduction

Urban giants have intrigued economists and urbanists for long time. In Argentina, the seventh largest country in the world in area, a third of the population lives within the urban area of Buenos Aires, while the country's second largest urban agglomeration accounts for a mere 3.6% of the population[1]. Italy, in comparison, with a total population almost double that of Argentina and an area about a tenth the size, had 8.1% of its population living in Milan, its largest urban agglomeration. The population of Milan in 1990 was less than half of the population of Buenos Aires in the same year. This paper examines the determinants of oversized capital cities and their consequences on growth.

Theories of the spatial allocation of resources (Krugman (1993), Henderson (1988)) do not predict abnormal concentrations of populations within a single location. On the empirical side, evidence about the spatial distribution of populations within countries has documented some persistent regularities. Among these, the most remarkable is Zipf's law, which says--in the most simple terms--that if we order the cities of a country by population, and we plot the log of the rank of different cities against the log of their population, the result will be a straight line with a slope close to –1. This regularity has been shown to exist in countries as diverse as India and the U.S. over different time periods (Krugman 1996). Several authors have tried to explain this regularity as emerging from characteristics in the stochastic process of population growth and city formation. Recently, Gabaix (1999) showed that Zipf's law appears as a property of the limiting distribution of city sizes if cities (or at least a fraction of them) share a similar growth process, i.e. the same mean and variance.

Capital cities, however, are a salient exception to Zipf's law. When capital cities are the largest city in the country (as in most countries), Zipf's law does not hold true and they are usually larger than what this law would predict. In terms of Gabaix's theory, growth of capital cities follows a process that is different than that of other cities in the country.

At least two theories have been put forward to explain the apparent tendency by capital cities to have a higher rate of growth than other cities. Krugman and Livas (1996) explain the growth in the third world metropolis as the consequence of restrictions to trade. Policies that favored import-substitution caused production to be oriented towards the local market. Production from manufacture tended to concentrate around big population agglomerations because of the proximity to consumers and input providers. This argument explains the explosion of the largest city in the country when protectionist policies are adopted. That large city, however, may not be the capital. These authors do not present an empirical test of their theory.

Certainly, what distinguishes the capital city from others is that it is the location of political power. Ades and Glaeser (1995) present evidence in favor of the idea that the concentration of population in the capital city is due to political factors. In particular, their model is based on the idea that physical proximity increases influence, i.e. the government will respond more to the demands of those close to it. For this reason, it would be convenient to be close to the government. Given this, they predict that the more easily a government can be influenced, the more the population will concentrate around the capital city. They approximate the easiness of being influenced by an index of

[1] Figures for 1990. In 1950, the population living in the Buenos Aires urban area was 30% of the total population, and the second largest urban area accounted for 3.1% of the population.

political instability. The idea is that a more unstable government would respond more easily to demands. A second prediction is that dictatorships also produce larger capital cities. This is because they have more ability to spend taxes unequally between the capital and the rest of the country. Given this power, the dictators would favor themselves; expenditures will be concentrated in the capital (and possibly, the rest of the country will be more heavily taxed). The evidence they find is based on the determinants of the absolute size of cities, measured in terms of population.

This paper studies two dimensions of the problem of excessive growth of capital cities. First, it studies its consequences on growth. A model is presented that explains why these distortions can have an impact in the level of output in the long run, followed by an empirical estimation of the importance of this effect. Second, this paper estimates the determinants of concentration of population in the capital cities. The estimation performed herein tests the hypotheses put forward in the literature that argue that urban giants are explained by: 1) Barriers to trade (Krugman and Livas, *op. cit.*); 2) Political Instability (Ades and Glaeser, *op. cit.*); and 3) Low degree of Political Rights (Ades and Glaeser, *op. cit.*).

The empirical strategy adopted in this paper differs substantially from Ades and Glaeser and so do the results obtained. These authors estimate the determinants of city sizes (absolute population) in a cross section of countries. This approach has two problems. One is that certain variables correlate naturally with size. For example, small countries have a larger share of trade to GDP than large countries simply because there are economies of scale and specialization. Therefore a negative correlation between trade and city size, measured in terms of the absolute level of population, can not be interpreted as trade causing less concentration in capitals.

The second problem is that location decisions face important adjustment costs (costs to migrate). Therefore the concentration of population that we observe in a capital at a certain point in time may not necessarily be responding to incentives currently present but rather may be the consequence of forces acting in the past. To continue using the same example, the causes of the *size* of Buenos Aires in the seventies may be found in forces acting early in the century, when the city boomed, rather than current forces. Even if the force causing the growth of the city disappears, the location decision may not be reversed because it is costly to do it. Then *sizes* may reflect the structure of incentives, but only after a long lag.

To get around both problems, I estimate the determinants of the *rate of growth* of capital cities. This allows for a comparison across countries independent of the absolute size. Also, the response to contemporaneous forces is more immediately reflected by the changes in the level of population rather than the level itself. Results will change substantially as will be shown.

The paper is organized as follows. Section Two presents the model. Section Three discusses and describes the variables constructed for the urban effects. Section Four presents the results of the impact of location on growth. Section Five presents the estimation of the determinants of migration. Section Six concludes this paper.

2. The Model

This section presents a model of growth with two locations. The objective of this model is to study the impact on growth of distortions in the spatial allocation of

resources. A location is characterized by the presence of a productive public good that is subject to congestion. The starting point of the model is Braun (1993).

2.1 Optimal allocation of resources between two sectors

Assume two locations, 1 and 2. In each location there is a productive public good, rival and non-excludable, denoted by *P*. The production function in each location is[2]:

$$Y_i(t) = A_i K_i(t)^{a} L_i(t)^{1-a} \left(\frac{P_i}{L_i(t)} \right)^{g} \quad i=1, 2; \tag{1}$$

where $0 < g < 1-a$. Dividing by $L_i(t)$ we obtain the production function in per capita terms (we assume for the moment no population growth):

$$y_i(t) = A_i k_i(t)^{a} p_i(t)^{g} .$$

Capital flows freely between locations, which implies that returns are equalized. The gross return to capital in location *i* is:

$$\frac{\partial y_i}{\partial k_i} = a A_i k_i^{a-1} p_i^{g} .$$

Assuming that production technology is the same across locations, equality in returns to capital implies:

$$k_1^{a-1} p_1^{g} = k_2^{a-1} p_2^{g},$$

or,

$$\frac{k_1}{k_2} = \left(\frac{p_1}{p_2} \right)^{\frac{g}{1-a}}. \qquad (2)$$

The last equation shows that the equalization of returns to capital across locations implies that the relation of capital to labor ratios between locations depends on the relative availability of the public good.

Efficient allocation of resources

Output maximization requires the marginal product of labor to be equated across locations. Marginal product of labor differs between its social and its private value. The social marginal product of labor will consider the total impact of an additional unit of labor on production. The private measure will neglect the adverse impact on production of an additional unit of labor via congestion of the public good. The social and private marginal product of labor are:

[2] Notation used in this thesis is the standard in the literature. *Y* stands for output, *K* for capital stock, *L* for

$$\left.\frac{\partial Y_i}{\partial L_i}\right|_{social} = (1-\alpha-\gamma)A_i k_i^{\alpha} p_i^{\gamma} \text{ , and}$$

$$\left.\frac{\partial Y_i}{\partial L_i}\right|_{private} = (1-\alpha)A_i k_i^{\alpha} p_i^{\gamma} .$$

Equalization of marginal product of labor will render the same result in both cases. The condition for efficient allocation of resources will be:

$$\frac{k_1}{k_2} = \left(\frac{p_2}{p_1}\right)^{\frac{\gamma}{\alpha}} \tag{3}$$

Equations (2) and (3) can be combined to determine the optimal distribution of labor across locations:

$$\frac{L_1}{L_2} = \frac{P_1}{P_2} \tag{4}$$

Therefore, the optimal allocation of resources implies that labor should be allocated in the same proportion as the availability of the public good. In other words, congestion of the public good must be the same across locations.

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labor, *A* is the technological factor in the production function, *w* denotes wages and *r* the interest rate or the payment to capital. Lower case letters indicate the same variable as the upper case but in per-capita terms.

2.2 Households

We now analyze the consumption and location decision by households. Assume that households derive utility from the consumption of two goods: a private good, produced according to the production function (1) and a public good, M_i, provided by the government. The good M_i is a local public good, rival and non-excludable. It can be consumed only by inhabitants of location i. The good is provided freely and is subject to congestion. The latter means that the utility derived from it depends on both the amount of the good available and the number of people consuming it. I assume a utility function for households of the form:

$$U_i(t) = \int_t^{\infty} \left(\log(c(s)) + h \log(m_i(s))\right) e^{-r(s-t)} ds\,, \tag{5}$$

where

$$m_i(t) = \frac{M_i(t)}{L_i(t)}\,.$$

Consumers maximize (5) subject to the flow budget constraint:

$$\dot{a} = w - ra - c - na\,,$$

and the transversality condition:

$$\lim\left\{a(t)\exp\left[-\int_0^t (r(v)-n)dv\right]\right\} \geq 0 .$$

Utility maximization with respect to *c(t)* lead us to the first-order condition:

$$\frac{\dot{c(t)}}{c(t)} = (r - r) .$$

Integration over time of the first order condition and the flow budget constraint allows us to derive a consumption function of the form:

$$c_i(t) = r\left(a_i(t) + W_{L,i}(t)\right),$$

where

$$W_{L,i} = \int_t^\infty w(s)e^{-\bar{r}(s)(s-t)}ds$$

and

$$\bar{r}(t) = (1/t)\int_0^t r(u)du .$$

The fact that the utility function is intratemporally additive between consumption of the private good (*c(t)*) and the amenity (*m(t)*) allows us to solve for the consumption independently of the amount of amenity consumed.

The location decision

Workers choose to locate where they obtain the higher utility. The gains of migrating from location 2 to 1 at time t are given by:

$$\Delta U_{2\to 1}(t) = U_1(t) - U_2(t) = \int_t^{\infty} \log\left(\frac{c_1(s)}{c_2(s)}\right) e^{-r(s-t)} ds + h\int_t^{\infty} \log\left(\frac{m_1(s)}{m_2(s)}\right) e^{-r(s-t)} ds\,,$$

and, substituting by the consumption function:

$$\Delta U_{2\to 1}(t) = \int_t^{\infty} \log\left(\frac{a_2(s) + W_{L,1}(s)}{a_2(s) + W_{L,2}(s)}\right) e^{-r(s-t)} ds + h\int_t^{\infty} \log\left(\frac{m_1(s)}{m_2(s)}\right) e^{-r(s-t)} ds\,. \qquad (6)$$

Notice that the numerator of the first term in the right hand side of the equation is the consumption level that an inhabitant of location 2 would obtain in location 1. Therefore, the corresponding asset level is $a_2(s)$. Workers will migrate as long as (6) is positive and greater than the migration costs. Following Braun (1993), I assume that migration has a cost in terms of utility, according to a function $\Phi(.)$, which satisfies $\Phi(0)=0$ and $\Phi'(.)>0$.

2.3 Firms

Firms maximize profits. They hire production factors equating private marginal productivity with marginal costs.

$$w = \left.\frac{\partial Y_i}{\partial L_i}\right|_{private} = (1-a)A_i k_i^a \, p_i^g \; .$$

$$r = \frac{\partial y_i}{\partial k_i} = aA_i k_i^{a-1} p_i^g \; .$$

2.4 Government

The government finances the provision of the public good M with lump-sum taxes. The burden of taxes for an individual does not depend on her location.

2.5 Equilibrium

We adopt the reasonable assumption that the rate of population growth is the same in both of two localities. Under this condition, a stationary equilibrium is characterized by the absence of migration between locations. In addition, the factor prices (wages and return to capital) in a stationary equilibrium are constant.

In the context of various locations and capital mobility, as is the case here, it is necessary to describe the situation of ownership of assets. The characteristics of the

equilibrium will depend on this issue, as will be explained later. I assume that households in both locations hold the same amount of assets.

In a steady state, migration is zero and factor prices are constant. Therefore (6) can be written as:

$$\left[\log\left(\frac{a_2+\frac{w_1}{r}}{a_2+\frac{w_2}{r}}\right)+h\log\left(\frac{m_1}{m_2}\right)\right]\int_t^{\infty}e^{-r(s-t)}ds=0\,,$$

where time indices are not needed, given that we are in a steady state, r is the interest rate, and w_i is the wage rate in location i. For migration to be zero, the term in square brackets has to be zero[3]:

$$\left[\log\left(\frac{ra_2}{ra_2+w_2}+\frac{w_2}{ra_2+w_2}\frac{w_1}{w_2}\right)+h\log\left(\frac{m_1}{m_2}\right)\right]=0\,.$$

From the definition of marginal product of labor, we can verify that the ratio of wages equals the ratio of factor intensities between sectors:

$$\frac{w_1}{w_2}=\frac{k_1}{k_2}\,.$$

[3] The expressions are derived for the case of a worker in location 2 deciding whether to migrate to 1. It can be verified that under the conditions for zero migration found from this perspective, workers in region 1 are also indifferent about migrating to location 2.

Finally, we acknowledge the fact that capital moves freely across locations. Thus, we can insert the condition for equalization in returns to capital across locations (equation (2)), and replace m_i by its definition to derive the following condition:

$$\left(\frac{M_2}{M_1}\frac{L_1}{L_2}\right)^h = m_2 + (1-m_2)\left(\frac{P_1}{P_2}\frac{L_2}{L_1}\right)^{\frac{g}{1-a}}, \qquad (7)$$

where m_i represents the share of capital income on total income for inhabitants of region i:

$$m_i = \frac{ra_i}{ra_i + w_i}.$$

Equation (7) does not have a general closed form solution, but two cases provide powerful intuition about the equilibrium. Consider the case m=1. Here all household income comes from returns to capital. Given that location decision does not affect return to capital (because capital is perfectly mobile), migration will be determined only by availability of M, the consumption amenity. Substituting m=1 in (7), we obtain:

$$\frac{L_2}{L_1} = \frac{M_2}{M_1}. \qquad (8)$$

Population is distributed exactly to maximize consumption of the public amenity. On the other extreme, when m=0, all income comes from labor income. In this case, the decision to migrate will consider the fact that the productive public good (P) suffers from

congestion, reducing labor productivity and therefore wages in the location that receives migration. Replacing m=0 in (7) yields:

$$\frac{L_2}{L_1} = \left(\frac{M_2}{M_1}\right)^{\frac{h}{h+\frac{g}{1-a}}} \left(\frac{P_2}{P_1}\right)^{\frac{\frac{g}{1-a}}{h+\frac{g}{1-a}}}. \qquad (9)$$

In this case, households consider both the benefits from 1) increased consumption of the public amenity and 2) the effect on wages of the relative congestion of the productive public good. Equation (9) also confirms the notion that in the case of h=0, the distribution of population is:

$$\frac{L_2}{L_1} = \frac{P_2}{P_1}.$$

Given that with h=0 households perceive no benefit from consuming the public amenity, then the distribution of population is determined only by its impact on wages. In this case, the efficient allocation found in (4) is achieved. Finally, it can also be verified that when $\gamma = 0$, i.e. the public good is not productive, then location of labor is only determined by the relative availability of the public amenity, as in equation (8).

Figure 1 depicts equations (8) and (9) for the case h=0.5, a=0.3, P_2/P_1=1 and g= 0, 0.1 and 0.35. Given the relative availability of the productive public good, efficiency in production requires that L_2/L_1=1, except in the case g=0. In this case, any allocation of labor is efficient given that there is no congestion in production. The figure shows that,

when m=0, the more productive the public good, and the less distorted the allocation of labor between localities for a given relation of availability of the public amenity.

3. Sources of Data and Variables Constructed

The model presented in the previous section showed that distortions in the spatial allocation of labor can have permanent effects on the level of output in an economy. Therefore, the model proposes that a determinant of the long run level of output should be the level of distortions in the spatial allocation of resources. If we want to determine empirically the importance of this relationship in a growth framework, the variable that should be considered in the equation is a measure of this distortion.

Unfortunately, this distortion is difficult to measure directly. The variables that one would like to have are the differential burden of taxes between the capital and the rest of the country and the differential access to public services between those two locations. However, there is not enough cross-country information on this. The second best measure is the observed impact on spatial allocation of resources. In particular, it is possible to observe the evolution of population in the capital city versus the rest of the country.

The variable that we would like to have would measure the "excessive" allocation of people into the capital. In order to measure this, one could use a ratio such as the fraction of total (or urban) population living in the capital. But in a cross-country estimation, this would make sense only if the "normal" fraction of population living in the capital is the same in all countries. But this is not the case.

There are two types of variables that make countries differ in their "normal" level of population concentration in the capital city. One type is geographical factors. Small countries tend to have higher degrees of concentration in the capital, simply because there are not a lot of alternative locations. This can be verified empirically. Table 1 and Figure 2 show the relationship between the log of the ratio of capital to total population and the log of the area of the country measured in square kilometers. The relationship is negative and significant, even when the extreme cases are removed from the estimation[4].

The second argument for not using levels is that countries at different levels of development have a different "normal" level of population concentration in the capital. A consequence of development is an increase in urban population, as the importance of agriculture in the economy decreases and that of manufacture and services increases. Capital cities will naturally accommodate part of that increase in urban population and therefore its share of total population will grow in time.

The approach that I take is to measure the changes in the fraction of the capital city population with respect to the total urban population. Measuring the fraction with respect to urban population controls for the fact that countries are at different levels of development and therefore, of urbanization. If urban population in a country grows, the capital city population growth is not considered the result of a distortion if the ratio of capital city to urban population remains constant. By measuring the change in the ratio, I am measuring the new distortion in the spatial allocation of resources that takes places during a certain period. When this measure is positive, the capital city is growing more

[4] The extreme cases are countries that are too small or too big. Countries that are too small are those where there is basically one location in which to live. In the sample used in this thesis these are Hong Kong and Singapore. Countries that are too big also happen to be countries with low population concentrations in their capital cities. There is no "natural" reason to remove them as in the case of countries that are too

than the average growth of other cities. In terms of Zipf's law, once the capital city becomes the largest city, it will move above the straight line predicted by this regularity.

I use two different measures for this effect. One looks at the fraction of the increase in urban population that goes into the capital city and compares it with the initial ratio of population in the capital to total urban population. The latter term indicates the fraction of new urban population that would be needed to move to the capital city in order to keep concentration constant. Therefore, the difference is "excess" migration. Formally:

$$Excess\,Migration1 = EM1 = \frac{C_1 - C_0}{U_1 - U_0} - \frac{C_0}{U_0}. \qquad (10)$$

The second measure is the change in concentration:

$$Excess\,Migration\,2 = EM\,2 = \frac{C_1}{U_1} - \frac{C_0}{U_0}. \qquad (11)$$

The difference between the two measures (EM1 and EM2) is that EM1 indicates the difference between current population concentrations (C_0/U_0) and the population concentrations where the economy would converge under the current composition of flows. In other words, EM1 gives an indication of the steady state that would be determined by the current composition of flows. EM2 is straightforward and reports the effective change in the ratio.

small, but I do this just to assure that the result is not driven by these cases. Countries in this category are

Source of Data

Data are obtained from the publication *World Urbanization Prospects, 1994 Revision*, published by United Nations. This publication compiles data on urban, rural and total population starting in 1955 and projected through 2025. Also presented are series of populations for all urban agglomerations with more than 750,000 inhabitants in 1990.

Despite the fact that the data are presented for 5 years intervals, I use the change in population over10-years periods. This is due to the fact that censuses, the true source of the data in the publication, are rarely taken at 5-year frequencies (although in some countries they are). A typical interval between censuses is 10 years. Therefore, the use of 5-year intervals does not really add new information in most cases and trying to find correlations with other data at this frequency can be misleading. A second problem with the data is that the economically meaningful unit of analysis for cities is the urban agglomeration. Some countries report the data for the "city proper," which is a definition of city based on an administrative division. Under this definition, we would talk about the population of New York City without taking into account the population in the neighboring New Jersey area. Given that I am working with changes in ratios, the problem may not be that significant if changes in the ratio of population in a "city proper" reflect similar changes in the ratio for the urban agglomeration.

Table 2 presents summary statistics for capital city population over urban and total population and EM1 and EM2 for 10-year intervals.

Australia, Brazil, Canada, China and US.

With respect to other variables, *Ethnolinguistic Fractionalization* is taken from Easterly and Levine (1997). They construct a measure that averages five variables. Three of them are alternative calculations of the probability that in each country two randomly selected people will speak different languages. The other two are measures of the fraction of the population that does not speak the official or most widely used language. This measure has a high correlation with the index of ethnolinguistic fractionalization in Taylor and Hudson (1972), widely used in the literature, but has the advantage of covering more countries.

Legal Origin classifies countries according to the type of legal system they have, which can be Common Law (English), French, Germanic, Scandinavian or Socialist. Data comes from La Porta, Lopez-de-Silanes, Schleifer and Vishny (1998).

Data for other variables come from the Barro-Lee data set. In this data set GDP and other national accounts variables are from Summers and Heston, version 5.6. See Barro (1997, 1998) for a description of the remaining variables.

4. Impact of distortions in spatial allocation of resources on growth

In this section I examine the relationship between excess migration to the capital and growth in the empirical framework developed by Barro (see Barro (1997) and Barro and Sala-i-Martin (1995)). I proceed in two steps. First, I present the relationship of the variables *EM1* and *EM2* to growth. I find a strong negative correlation between excess migration and growth. Then, I test whether the correlation remains significant when the other determinants of growth are included.

Table 3 shows the correlations between different variations of the migration variable and growth. In particular, I look at the relationship of growth to contemporaneous migration and to migration in the previous 5 years, as well as the interaction between both the contemporaneous and lagged migration variables with the initial level of concentration. I estimate a system of three equations for each specification, with one equation for each of the periods 1965-1975, 1975-1985 and 1985-1995. For the latter, since I only have data through 1990, I assume that migration behavior in the period 1990-1995 was the same as in 1985-1990. I use migration in the previous 5 years as instruments for contemporaneous migration and the estimation is done using Three Stages Least Squares (3SLS).

In all cases the relationship between excessive migration to the capital and growth is negative and strongly significant as indicated by the t-statistics. This indicates that "excessive" migration to the capital city has an adverse impact on economic growth. Adjusted R^2s (not reported) are low, ranging from –0.05 to 0.02. This indicates that the explanatory power of this variable alone is very limited.

Next I analyze the impact of this variable on growth when other determinants of growth are included. Table 4 presents the analysis of EM1. I start with a specification from Barro (1998) that explains growth over three decades as a function of initial GDP and a series of controls. These controls are: human capital measured through male schooling, government expenditures other than defense and education over GDP, changes in terms of trade, an index of rule of law, the fertility ratio, an index of democracy and its squared value, inflation and investment over GDP. The reasons for the inclusion of these variables have been largely discussed and documented by this author in a series of papers. Therefore, this is a safe starting point and a relevant test to check whether the effect studied in this paper explains a part of growth that has not been explained by other variables.

Column I shows the parameter estimates for the base specification. Of the variables mentioned, all are significant at a 5% level, with the exception of Democracy and its square. Column II presents the same specification with the sample for which there is capital city population data over the period under examination. In comparison to Column I, eight countries are dropped due to lack of data. Those countries are: Botswana, Gambia, Trinidad and Tobago, Guyana, Taiwan, Cyprus, Iceland and Malta. Column II shows that when these countries are not considered, the democracy variables are even less significant. Columns III through VI incorporate EM1 in different forms: contemporaneous, lagged and interacting with the initial level of population concentration.

The inclusion of EM1 affects the significance of the democracy variables. The relationship between these two variables is explored in the next section. In system III, the inclusion of EM1 increases the significance of the democracy variable, but not enough to

be significant at a 5% level. In all other systems, however, the significance of the democracy variable is reduced when the migration variable is included.

The parameter of EM1 is negative but not significant when considered alone (systems III and IV). When it is included interacting with the initial level of concentration, however, it is significant at the 5% level. This says that migration toward the capital is more harmful to growth when the initial level of concentration is already high. Systems V and VI show these results. Both the contemporaneous and the lagged variable are significant at 5% level.

Table 5 shows the results with the alternative measure of migration. Here the results are similar to the previous case in the sense that the migration variable affects the significance of the democracy variables. But in this case, the migration variable is not significant at a 5% level.

5. Determinants of Migration

In this section I examine the determinants of capital city growth. I test the hypotheses that concentration in the capital city is explained by barriers to trade, lack of political rights or political instability.

The dependent variable is the rate of population growth in the capital city. As explained previously, there is a "natural" growth in the population of capitals, which comes from two sources. One source is the overall growth of population in the country. The second is the process of urbanization associated with economic development. To control for the first factor I use the rate of total population growth in the country. The parameter estimated for this variable should be positive and close to one. To control for

the second factor I use the level of per capita GDP during the period of study. Given that richer economies are already more urbanized, we should expect the growth rate of urban populations to be greater in countries with lower per capita income. Therefore we should expect this variable to have a negative coefficient.

Table 6 shows the results of the estimations. The estimations are done with a system of two equations, with one equation for each of the decades 1970-80 and 1980-90. Total Population growth is measured over the same interval, and the same variable in the previous five years is used as an instrument. For the GDP variable, I take the value of per capita GDP in the middle of the each period (i.e. 1975 and 1985) and instrument it with its value at the start of the time interval. Column I in Table 6 shows the estimates for these two parameters. Both have the expected sign and are strongly significant. The R^2s are high. Notice that the coefficient for Total Population growth is larger than one. This says that, at a descriptive level, capital cities tend to grow more than the rest of the country. The next specifications try to explain this phenomenon.

Before testing the hypotheses, I consider particular conditions that may facilitate or inhibit movement of people between locations, whatever the factor that ultimately determines migration. Countries with marked cultural differences between regions will be less responsive to incentives to migrate. I approximate this characteristic using the index of Ethnolinguistic Fractionalization. A second factor is government policies to control internal migration. These policies exist in Socialist countries. I control this factor using a dummy variable for Socialist legal origin.

Column II shows that Ethnolinguistic Fractionalization is significant and negative, indicating that as diversity increases in a country, migration to the capital is lower. This is consistent with the explanation above. But a more sophisticated version of the argument

is supported by the data as well. The square of the variable is positive and significant. This indicates that the relationship between migration and diversity has a U-shape, i.e. migration is high when countries are very homogeneous or very diverse, and it is low when diversity is intermediate. The reason for this is that beyond some point diversity is so high that it does not matter. There would be so many different groups that the possibilities of conflicts between them would be low. To show the extreme, for example, imagine every person claiming to belong to a different culture. Everybody else would be a potential enemy and it would be impossible to be in conflict with everybody else. A non-conflict equilibrium would naturally arise. In contrast, if there are, say, two groups, the likelihood of tensions developing is higher. The higher the tension, the lower the response of migration to the ultimate factor that causes it.

Column III incorporates the dummy variable for Socialist legal origin. It is negative, indicating that the difference in growth rates between the capital city and the total population of the country is lower in Socialist countries. However, it is not significant.

In column IV I test whether concentration in the capital city is linked to the degree of political rights. The model in section 2 related migration toward a certain location to the ability of the authority to tax or spend the tax proceeds differently across locations. One case in which the authority has the ability to do this is when the political rights of the population are low; therefore, the population has little power to control the way taxes are levied or proceeds from taxes are spent. Incentives for an authoritarian government to do this may come from the desire to gain the support of those close to it. Therefore, the lower the level of political rights, the more likely the government will expropriate the rest of the country. This is the basis of the argument of Ades and Glaeser

(1995). To measure this effect I use the index of political rights by Gastil[5]. I use a transformed version of the original index that gives a value of zero to the lowest level of political rights and one to the maximum.

A variable related to this argument is the physical area of the country. Distance increases the costs of migration. Therefore, in the absence of other factors, one would expect lower migration associated with an increase in the area of the countries. But the fact that costs of migration are high can provide a favorable environment to policies that discriminate between regions. In a small country, the ability of the government to discriminate across locations is low because if it tries to do so people will relocate. In a big country, relocating is costly, and therefore, possibilities for discrimination arise. In equilibrium, a migratory flow will exist. Thus, countries with a large physical area and a low degree of political rights would facilitate policies that discriminate between locations. In the context of the argument in this paper, this increases migration to the capital.

Column IV in table 6 shows the results of this specification. The Political Rights variable has the expected sign and is significant. The negative sign indicates that the higher the level of Political Rights, the lower the excessive growth of the capital city. This would indicate that with higher political rights discrimination against the hinterland is less likely. A similar result is obtained when an index of Civil Liberties is used instead of Political Rights. The Area variable has a positive and significant coefficient. This indicates that larger countries have larger migration flows towards the capital, which is consistent with the hypothesis of political abuse. Finally, the Socialist legal origin

[5] The same variable is labeled "democracy" in the previous section. Here I keep the original name because it gives a better idea of why it may affect migration.

variable is significant in this specification. It makes sense that it becomes significant when the Political Rights variable is present. Notice that the negative sign on the Political Rights variable indicates that for low levels of political rights migration is high. Socialist countries have low levels of political rights, but at the same time they have policies to control displacements within the country. Therefore, when Political Rights are included, Socialist countries stand as outliers, making the variable significant.

The next specification revises the importance of barriers to trade in determining concentration in the capital. The variable I use is the ratio of exports and imports of goods and services to GDP. According to Krugman and Livas (1996), the coefficient should be negative indicating that economies closed to trade tend to generate larger concentrations around the capital. This is not supported by the data. Columns I and II in Table 7 show the results. The coefficient is positive and non-significant, even when other variables are left out.

The latter result contradicts Ades and Glaeser (1995), who find a negative relationship between population in the capital and trade. Their result can be affected by the fact that when estimating levels, the fact that larger economies are more closed is dominant in the coefficient estimate. Table 8 shows the results of a simple regression log of Trade versus the log of Total Population. Trade is measured as 5-year averages while population is measured at the start of the period. The coefficient is negative and strongly significant (t-statistic of –27). Moreover, R^2s are around .50. This means that country size only can explain half of the cross-country variation in openness.

The next two columns test for the political instability argument. Column III measures political instability by an index that averages Revolutions and Political Assassinations. The variables average over the decade the number of revolutions per year

and the political assassinations per million inhabitants per year. This variable is normalized to range from zero to one. Data is obtained from the Barro-Lee data set, which in turn compiles information from Banks (1994). The coefficient of the variable is significantly negative. This says that the more politically unstable the country, the less concentration around the capital city.

This finding goes against Ades' and Glaeser's hypothesis and finding. They use a different measure of political instability, also from Banks (1994), that averages revolutions and coups in a country. I tried different combinations of the proxies for political instability provided in Banks. The variables tested are Political Assassinations, Coups, Revolutions and War, which is a dummy variable that takes a value of one if the country was involved in an external war in a given year. Of all of them and the combination used by Ades and Glaeser only one has a positive non-significant coefficient, Coups. All other variables have negative coefficients and one of them, War, which is reported on Column IV, is significant. The conclusion is that situations of conflict deter internal migration.

Finally, Column V in the table indicates that political instability remains significant when the Political Rights variable is included. This indicates that its significance does not rely on capturing similar information than the political rights variable. Thus, the conclusion is that unstable democracies generate the lower concentration in the capital. Democracy –or the presence of a high degree of political rights— ensures that the hinterland will not be expropriated, while political instability deters internal migration.

The next step is to find the direct channels through which the incentives for migration materialize. As mentioned earlier, the spatial structure of taxes and

expenditures would be the natural variable to examine. However, they are not available. A next best alternative is Total Government Consumption. The assumption is that if the government has power to exploit the hinterland, it will use that power to the maximum. Therefore, holding everything else constant, a big government will be a signal of an unfair structure of taxes and expenses in space.

Column I in Table 9 presents the results of the estimation that includes the share of total government consumption over GDP. The sign is positive but it is not significant. The ideal measure to use would be one that reflects the funds that government can dispose of and allocate in space at will. The decomposition of government expenses at a cross-country level is limited. Among the available decomposed data, one could argue that Defense Expenditure is a type of expense on which the government may have less discretion on its distribution in space. Defense considerations would require the allocation of resources to certain strategic zones. Column II in table 9 uses a measure of government consumption that excludes Defense Expenses. The coefficient is positive and significant. When Defense Expenditures are excluded, the sample varies due to the non-availability of this information for a few countries. This is the case for socialist countries, in particular; thus, the dummy variable is excluded. Column III repeats the estimation in Column I with the same sample as Column II, in order to confirm that the significance of the new government expenditure definition is not due to a change in the sample[6].

The finding indicates that higher government consumption implies higher growth in the capital. Here government consumption is used as a manifestation of the lack of political rights. The implicit hypothesis is that the lower the political rights the greater the

[6] The countries excluded are Guinea, Mozambique, Somalia, China, Hungary and Poland for both periods and Angola for the first period only.

size of the government. This correlation is confirmed by the data. Table 10 shows that there is a negative correlation between political rights and size of government. This correlation was estimated using instrumental variables to allow for the possibility of simultaneous determination of both variables. The instrument was the value of the democracy index at the start of the period.

A big government, however, can attract people beyond the fact that it may reflect an unfair composition of taxes and expenses in space. It may attract people just because the decision over how to spend a larger amount of resources is concentrated in that place. The larger the amount of government resources, the higher the expected value of exerting influence. Holding everything else constant, particularly political rights and the level of development of the country, then bigger governments generate bigger capital cities. The last column in Table 9 shows that this is supported by the data. Both variables, political rights and the level of development, when considered together, are significant in explaining the growth of capital cities.

6. Conclusions

This paper provides evidence that distortions in the spatial allocation of resources affect growth. The paper develops a model under which government decisions on the spatial distribution of public goods can distort resource allocation and have a permanent adverse impact on output. Empirically, I find that my measure of distortions in the spatial allocation of resources is negatively correlated with growth. In an estimation of growth determinants the strength of the result is reduced, but some forms of the measure of distortions remain significant when other determinants of growth are included.

The second part of the empirical portion of this paper examines the determinants of migration to the capital city of countries. I test three alternative hypotheses for concentration of population around the capital: 1) Barriers to trade, 2) Political Instability and 3) Low degree of Political Rights. In two of these three cases, I find results that differ from previous studies.

First, I find that migration is affected by the level of cultural diversity of a country. Countries that are either homogeneous or very diverse show higher migration to the capital than those with intermediate levels of diversity. With respect to the test of hypotheses, I find that trade barriers do not explain concentration of population in capitals. The variable has the opposite sign and is not significant. This result differs from previous findings of a negative correlation between size of capital cities and trade. These findings seem to be affected by the fact that they come from estimations of levels of population in capitals rather than rates of growth, as is the case in this paper.

The second hypothesis is also rejected. Political instability does not cause population to concentrate in the capital. On the contrary, using several measures of

political instability I find that the correlation is negative; that is, internal turmoil deters population from concentrating in the capital.

With respect to the third hypothesis, my estimations do not reject that population concentration in the capital is caused by low levels of political rights. The argument is that when people in a country does have enough political rights, the government will tend to expropriate the hinterland benefiting their constituents in the capital. This provides an incentive for people to migrate to the capital. I find a significant negative correlation between Political Rights and Concentration of population in the capital. Moreover, the bigger the area of the country, the higher the rates of growth of population in the capital. This is consistent with the latter hypothesis. In big countries, the hypothesis of the government taxing the hinterland is more plausible.

Finally, I look for channels by which political variables ultimately affect the migration decisions. I find that government consumption excluding defense expenditures is positively correlated with increase in concentration of population in the capital. This is indirect evidence in favor of the argument that what explains concentration in the capital is the ability of the government to discriminate between the capital and the rest of the country through its expenditure policy.

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Table 1: Correlation between Area and Concentration of Population in the Capital

Dependent Variable: Log of the Ratio of the Population of the Capital to Total Population in the Country

	Full Sample		Extreme Cases Excluded	
	1955	*1990*	*1955*	*1990*
Log(Area)	-0.4167	-0.2100	-0.2902	-0.1131
	(-6.90)	(-5.86)	(-3.72)	(-2.93)
R^2	.34	.22	.14	.08
Adjusted R^2	.34	.21	.13	.07
Number of Observations	93	124	86	117

Notes: Estimated with OLS. t-statistics in parenthesis.

Table 2: Descriptive Statistics of Data on Capital Cities and Migration

	Mean	Median	Std. dev.	Maximum	Minimum	Observ.
Capital/Urban						
1960	0.31	0.29	0.20	1	0.004	93
1970	0.32	0.29	0.20	1	0.010	93
1980	0.32	0.31	0.20	1	0.015	93
1990	0.33	0.31	0.20	1	0.014	93
Capital/Total						
1960	0.12	0.08	0.15	1	0.002	93
1970	0.13	0.10	0.15	1	0.005	93
1980	0.15	0.12	0.15	1	0.008	93
1990	0.17	0.13	0.16	1	0.009	93
EM1						
1970-1960	-0.002	0.014	0.15	0.29	-0.51	93
1980-1970	-0.001	0.008	0.21	0.58	-1.25	93
1990-1980	0.008	0.000	0.25	1.18	-0.87	93
EM2						
1970-1960	0.005	0.004	0.05	0.12	-0.10	93
1980-1970	0.003	0.003	0.05	0.19	-0.21	93
1990-1980	0.004	0.000	0.05	0.16	-0.09	93

Source: Author's calculations based on data from United Nations (1995)

Table 3: Correlation between Migration Variables and Growth

Variable	Parameter	t-statistic	Number of Observations		
			1965-75	1975-85	1985-95
EM1	-0.015	-19.17	91	93	87
EM1 lagged	-0.011	-26.03	91	93	87
*EM1**(C_0/U_0)	-0.052	-23.01	91	93	87
*EM1**(C_0/U_0) *lagged*	-0.035	-31.06	91	93	87
EM2	-0.087	-16.59	91	93	87
EM2 lagged	-0.097	-21.89	91	93	87
*EM2**(C_0/U_0)	-0.142	-13.01	91	93	87
*EM2**(C_0/U_0) *lagged*	-0.154	-16.26	91	93	87

Notes: All parameters are obtained from a system of three equations with one equation for each of the periods 1965-1975, 1975-1985 and 1985-1995. The estimation procedure is 3SLS, where the instruments are the same variable measured for the previous five-year period. All equations include a constant.

Table 4: Impact of Migration on Growth I

Dependent variable: Rate of Growth of GDP per capita

	I	II	III		IV	V	VI
Log(Initial GDP)	0.1215	0.1247	0.1205	0.1412	0.1419	0.1443	0.1404
	(4.51)	(4.71)	(4.58)	(6.34)	(6.39)	(6.55)	(6.31)
Log(GDP) Square	-0.0094	-0.0096	-0.0093	-0.0107	-0.0108	-0.0109	-0.0107
	(-5.27)	(-5.47)	(-5.34)	(-7.38)	(-7.43)	(-7.59)	(-7.35)
Male Schooling	0.0070	0.0078	0.0082	0.0081	0.0081	0.0077	0.0078
	(4.08)	(4.60)	(4.84)	(4.86)	(4.89)	(4.76)	(4.78)
Govt. Consump.	-0.1495	-0.1415	-0.1377	-0.1286	-0.1302	-0.1296	-0.1328
	(-6.42)	(-5.89)	(-5.78)	(-6.15)	(-6.25)	(-6.23)	(-6.34)
Terms of Trade	0.1623	0.1626	0.1651	0.1570	0.1589	0.1594	0.1572
	(5.80)	(5.90)	(5.99)	(5.72)	(5.82)	(5.75)	(5.77)
Rule of Law	0.0170	0.0157	0.0161	0.0129	0.0132	0.0133	0.0137
	(3.12)	(2.55)	(2.63)	(2.19)	(2.25)	(2.26)	(2.33)
Log(Fertility)	-0.0254	-0.0277	-0.0271	-0.0270	-0.0269	-0.0274	-0.0267
	(-5.38)	(-5.79)	(-5.70)	(-5.69)	(-5.64)	(-5.83)	(-5.63)
Democracy	0.0542 *	0.0405 *	0.0460 *				
	(1.83)	(1.40)	(1.61)				
Democracy Sq.	-0.0480 *	-0.0386 *	-0.0440 *				
	(-1.85)	(-1.53)	(-1.75)				
Inflation	-0.0360	-0.0285	-0.0278	-0.0277	-0.0286	-0.0289	-0.0293
	(-3.54)	(-3.01)	(-2.97)	(-2.72)	(-2.80)	(-2.83)	(-2.87)
Investment	0.0584	0.0537	0.0560	0.0612	0.0584	0.0584	0.0558
	(2.65)	(2.36)	(2.46)	(2.65)	(2.55)	(2.55)	(2.43)
EM1			-0.0073 *	-0.0082 *			
			(-1.34)	(-1.49)			
EM1 *lagged*					-0.0079 *		
					(-1.70)		
EM1*(C_0/U_0)						-0.0375	
						(-1.99)	
EM1*(C_0/U_0) *lagged*							-0.0284
							(-1.98)
Observations	79, 87, 84	75, 80, 76	75, 80, 76	78, 80, 76	78, 80, 76	78, 80, 76	78, 80, 76
R Square	.66, .48, .42	.71, .48, .46	.71, .48, .47	.69, .50, .45	.69, .52, .44	.69, .50, .45	.69, .52, .45
Adjusted R^2	.61, .41, .34	.69, .40, .37	.66, .38, .37	.64, .43, .37	.64, .45, .36	.65, .43, .36	.64, .45, .36

*: Not significant at 5%, but significant at 10% or less.

Notes: All parameters are obtained from a system of three equations with one equation for each of the periods 1965-1975, 1975-1985 and 1985-1995. The estimation procedure is 3SLS, where the instruments are the same variable measured for the previous five-year period, except inflation, where instrument is colonial origin. All equations include a constant. t-statistics in parenthesis.

Table 5**: Impact of Migration on Growth II**

Dependent variable: Rate of Growth of GDP per capita

	VII		VIII	
Log(Initial GDP)	0.1215	0.1439	0.1221	0.1411
	(4.66)	(6.53)	(4.62)	(6.30)
Log(GDP) Square	-0.0093	-0.0109	-0.0094	-0.0107
	(-5.41)	(-7.57)	(-5.37)	(-7.32)
Male Schooling	0.0077	0.0077	0.0079	0.0077
	(4.68)	(4.70)	(4.72)	(4.68)
Govt. Consumption	-0.1349	-0.1327	-0.1418	-0.1339
	(-5.69)	(-6.36)	(-5.98)	(-6.33)
Terms of Trade	0.1654	0.1558	0.1650	0.1567
	(5.99)	(5.65)	(5.96)	(5.68)
Rule of Law Index	0.0164	0.0136	0.0167	0.0136
	(2.71)	(2.31)	(2.73)	(2.29)
Log(Fertility)	-0.0285	-0.0281	-0.0278	-0.0277
	(-6.07)	(-5.98)	(-5.87)	(-5.86)
Democracy	0.0464 *		0.0402 *	
	(1.61)		(1.40)	
Democracy Square	-0.0449 *		-0.0396 *	
	(-1.78)		(-1.57)	
Inflation	-0.0280	-0.0281	-0.0284	-0.0291
	(-2.99)	(-2.75)	(-3.03)	(-2.84)
Investment	0.0473	0.0518	0.0471	0.0513
	(2.09)	(2.24)	(2.06)	(2.21)
EM2*(C_0/U_0)	-0.1510 *	-0.1524 *		
	(-1.65)	(-1.45)		
EM2*(C_0/U_0) *lagged*			-0.1709 *	-0.1667 *
			(-1.53)	(-1.50)
R Square	.71, .47, .49	.69, .50, .45	.71, .49, .47	.68, .52, .44
Adjusted R Square	.66, .37, .40	.64, .43, .37	.65, .40, .37	.63, .45, .36
Observations	75, 80, 76	78, 80, 76	75, 80, 76	78, 80, 76

*: Not significant at 5%, but significant at 10% or less.

Notes: All parameters are obtained from a system of three equations with one equation for each of the periods 1965-1975, 1975-1985 and 1985-1995. The estimation procedure is 3SLS, where the instruments are the same variable measured for the previous five-year period, except inflation, where instrument is colonial origin. All equations include a constant. t-statistics in parenthesis.

Table 6: Determinants of Migration I

Dependent Variable: Rate of Population growth in the Capital City

	I	II	III	IV
Log(GDP)	-0.1263	-0.0939	-0.1058	-0.1001
	(-5.97)	(-3.87)	(-4.24)	(-3.80)
Population Growth	1.1756	1.1933	1.1070	0.5712
	(8.86)	(8.55)	(7.62)	(3.58)
Area				1.91e-5
				(2.11)
Ethnoling. Frac.		-0.7050	-0.6727	-0.7753
		(-2.57)	(-2.46)	(-2.90)
Ethnoling. Frac. Square		0.9743	0.9127	1.0649
		(3.02)	(2.82)	(3.41)
Political Rights				-0.1798
				(-2.93)
Socialist Legal Origin			-0.0830 **	-0.2716
			(-1.09)	(-3.17)
R^2	.52, .59	.56, .62	.56, .63	.55, .67
Adjusted R^2	.51, .58	.54, .60	.53, .61	.51, .64
Number of Observations	89, 89	89, 89	89, 89	88, 88

**: Not significant at 10%.

Notes: All parameters are obtained from a system of two equations with one equation for each of the periods 1970-80 and 1980-90. The estimation procedure is 3SLS, where the instruments for Per-Capita GDP, Total Population Growth, Political Rights and Government Expenditures are the same variable measured for the previous five-year period. Area, Ethnolinguistic Fractionalization and Socialist Legal Origin are considered exogenous. All equations include a constant. t-statistics in parenthesis.

Table 7: Determinants of Migration II

Dependent Variable: Rate of Population growth in the Capital City

	I	II	III	IV	V
Log(GDP)	-0.1021 (3.80)	-0.1241 (-5.14)	-0.1187 (-4.16)	-0.1079 (-4.21)	-0.0925 (-2.86)
Population Growth	1.1133 (6.28)	1.1065 (6.20)	1.1330 (6.31)	1.2306 (6.98)	0.7664 (3.34)
Area					1.40e-5 ** (1.60)
Ethnoling. Frac.	-0.5296 * (-1.94)		-0.5047 * (-1.89)	-0.4512 * (-1.70)	-0.4592 * (-1.66)
Ethnoling. Frac. Square	0.7320 (2.28)		0.7379 (2.35)	0.6647 (2.11)	0.6384 * (1.94)
Political Rights					-0.2992 (-2.70)
Socialist Legal Origin					-0.3316 (-2.66)
Trade over GDP	0.0706 ** (0.91)	0.1058 ** (1.36)			
Revolutions and Political Assassinations			-0.4190 (-2.06)		-0.5029 (-2.31)
War				-0.1620 (-2.21)	
R^2	.54, .64	.50, .62	.57, .60	.56, .63	.61, .61
Adjusted R^2	.52, .62	.48, .61	.54, .57	.53, .61	.56, .56
Number of Observations	86, 86	86, 86	82, 88	84, 89	81, 87

*: Not significant at 5%, but significant at 10% or less.
**: Not significant at 10%

Notes: All parameters are obtained from a system of two equations with one equation for each of the periods 1970-80 and 1980-90. The estimation procedure is 3SLS, where the instruments for Per-Capita GDP, Total Population Growth, Political Rights, Trade, Revolutions and Political Assassinations and War are the same variable measured for the previous five-year period. Area, Ethnolinguistic Fractionalization and Socialist Legal Origin are considered exogenous. All equations include a constant. t-statistics in parenthesis.

Table 8: Relation Trade versus Total Population

Dependent variable: Log of the average share of trade over GDP for five-year periods

	Coefficient	t-statistic	R^2	Adjusted R^2
Log(Population)	-0.2524	-26.9		
Constants:				
1960-64	1.3109	14.8	0.47	0.46
1965-69	1.3480	15.0	0.52	0.51
1970-74	1.4954	16.6	0.55	0.54
1975-79	1.6640	18.3	0.51	0.51
1980-84	1.7205	19.0	0.49	0.48
1985-89	1.6883	18.5	0.46	0.45

Notes: Independent variable: Log of Total Population in the country at the start of the 5-year period.

Table 9: Determinants of Migration III

Dependent Variable: Rate of Population growth in the Capital City

	I	II	III	IV
Log(GDP)	-0.1258	-0.0804	-0.0971	-0.0495
	(-4.50)	(-3.27)	(-4.04)	(-1.87)
Population Growth	0.7322	0.9897	0.9352	1.0201
	(4.84)	(7.07)	(6.40)	(6.07)
Area	1.72e-5 *	2.39e-5	2.40e-5	2.46e-5
	(1.89)	(2.75)	(2.64)	(2.84)
Ethnoling. Frac.	-0.7343	-0.6796	-0.7524	-0.7208
	(-2.74)	(2.89)	(-3.11)	(-3.10)
Ethnoling. Frac. Square	1.0205	0.8974	1.0172	0.9102
	(3.27)	(3.25)	(3.61)	(3.33)
Political Rights				-0.1340
				(-1.92)
Socialist Legal Origin	-0.1776			
	(-2.17)			
Govt. Consumption over GDP	0.1316 **		0.230 **	
	(0.50)		(0.91)	
Govt. Consumption minus Defense Exp. over GDP		0.7158		0.7847
		(2.50)		(2.86)
R^2	.53, .66	.57, .70	.57, .67	.60, .69
Adjusted R^2	.50, .63	.54, .68	.54, .65	.56, .66
Number of Observations	88, 88	81, 82	81, 82	81, 82

*: Not significant at 5%, but significant at 10% or less.
**: Not significant at 10%

Notes: All parameters are obtained from a system of two equations with one equation for each of the periods 1970-80 and 1980-90. The estimation procedure is 3SLS, where the instruments for Per-Capita GDP, Total Population Growth, Political Rights and Government Expenditures are the same variable measured for the previous five-year period. Area, Ethnolinguistic Fractionalization and Socialist Legal Origin are considered exogenous. All equations include a constant. t-statistics in parenthesis.

Table 10**: Relation Government Expenditure and Political Rights**

Dependent variable: Share of Government Consumption over GDP and Share of Government Consumption minus Defense Expenditure over GDP

	Coefficient	t-statistic	R^2	Adjusted R^2
Government Consumption				
Political Rights	-0.1280	-4.36		
Constants:				
1970-80	0.432	23.1	0.09	0.08
1980-90	0.469	24.7	0.17	0.17
Government Consumption minus Defense Expenditure				
Political Rights	-0.0687	-2.40		
Constants:				
1970-80	0.340	17.9	0.05	0.04
1980-90	0.357	19.2	0.09	0.08

Independent Variable: Average of Index of Political Rights over the decade. Instrumented with the same variable at the start of the period.

Figure 1: Equilibrium Distribution of Labor (L_2/L_1) given Relative Availability of the Public Amenity (M_2/M_1). (Case η=0.5, α=0.3, P_2/P_1=1)

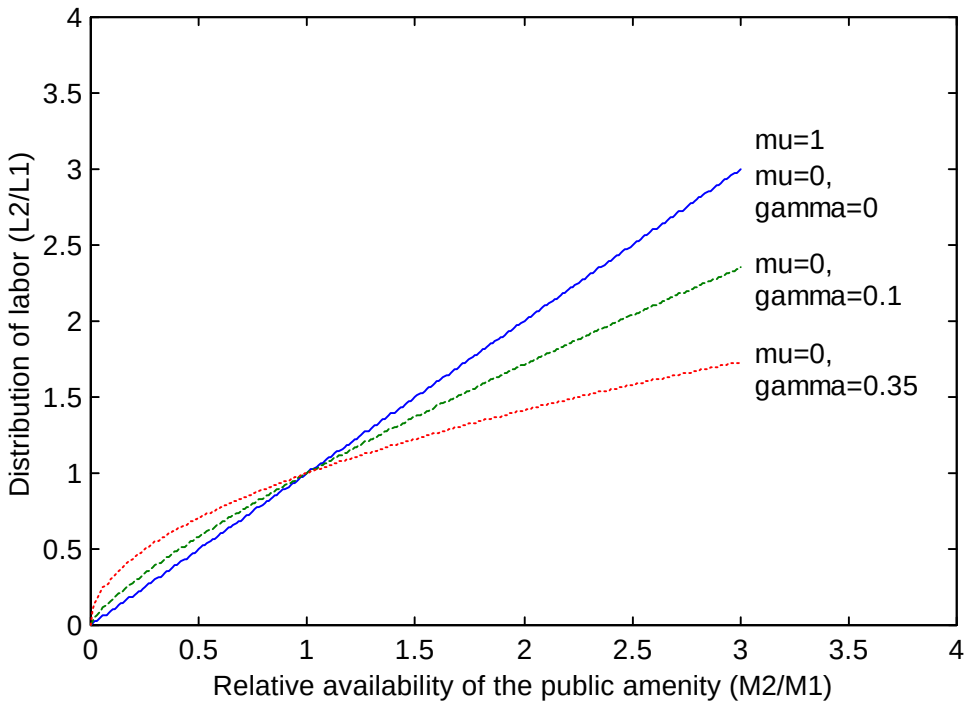
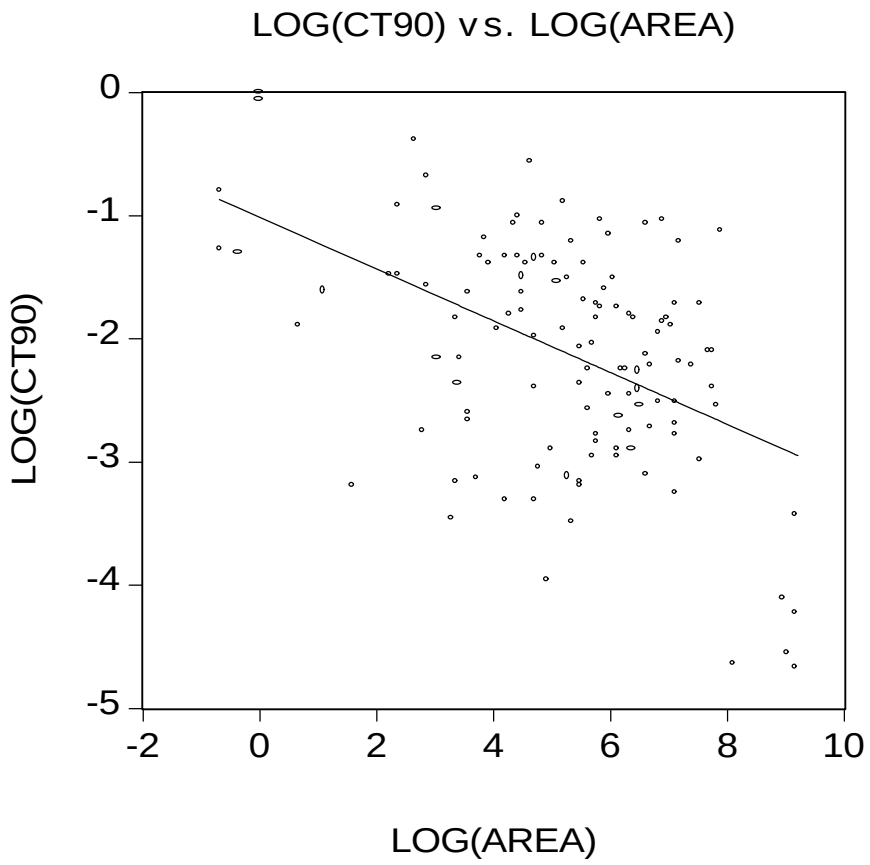


Figure 2: Population in the capital as a fraction of Total Population in 1990 (CT90) against Area of the country (both in logs).



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