THE RELATIONSHIP BETWEEN URBANIZATION AND ECONOMIC DEVELOPMENT: EMPIRICAL EVIDENCE FOR DEVELOPED AND LESS-DEVELOPED COUNTRIES

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Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the degree of
DOCTOR OF PHILOSOPHY
July, 1992

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ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my thesis advisor Dr. Ronald L. Moomaw for his encouragement, advice, and inspiration throughout this research. I would also like to thank Dr. Michael J. Applegate for his help and constructive suggestions throughout this study. I am also grateful to the other committee members, Dr. Orley M. Amos Jr. and Dr. Mike Woods, for their useful suggestions and assistance.

I am also greatly indebted to my dear friend Mr. Ahmed Al-Shataywi. His assistance, comments, and proof reading throughout this thesis are sincerely appreciated.

Many thanks also go to my friends Dr. Ahmed Abo-Basha and Dr. Tariq Janda for their help and suggestions in modeling and computer work.

I have been fortunate to have as one of my best friends Mr. Jehad Aref Besiso. His friendship, concern, and mostly his moral support are highly appreciated. Finally, I am greatly indebted to all members of my family (particularly my parents) in Yemen. Without their encouragement, support, understanding, and patience, this work could hardly have been accomplished. To them all I, humbly, dedicate this study.

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LIST OF SYMBOLS AND THEIR SOURCES

UP_{it}: the urban percentage, that is total urban population divided by total population, in country i in time t. Source: from different issues of <u>World Development Report</u> (1960-1990).

MP_{it}: the metropolitan percentage, the population in areas of 100,000 or more as a percent of the total population in country i in time t. Source: MP for 1960 and 1970 are calculated from Davis, Kingsley (1969). "World Urbanization 1950-1970 Volume I: Basic Data for Cities, Countries, and Regions" <u>World Urbanization</u>, Volume I. MP for 1980 are calculated from various issues of <u>Demographic Yearbook</u> (1980-1990).

MC_{it}: the metropolitan concentration, the population in urban areas of 100,000 or more as a percent of the total urban population in country i in time t. Source: MC for 1960 and 1970 are calculated from Davis, Kingsley (1969). "World Urbanization 1950-1970 Volume I: Basic Data for Cities, Countries, and Regions" <u>World Urbanization</u>, Volume I. MC for 1980 are calculated from various issues of <u>Demographic Yearbook</u> (1980-1990).

P_{it}: the primacy measure, which is the ratio of the population of the largest city to the total urban population in country i in time t. Source: from different issues of <u>World Development Report</u> (1960-1990).

GDP/CAP_{it}: gross dometic product per capita (in 1980 U.S. Dollars) in country i in time t. Source: from Robert Barro (1991).

$AGRALAB_{it}$: percentage of labor force engaged in agriculture in country i in time t. Source: from Social Indicators of Development 1989 and from different issues of <u>World Development Report</u> (1960, 1989, and 1990).

$INDLAB_{it}$: percentage of labor force engaged in industry in country i in time t. Source: from Social Indicators of Development 1989 and from different issues of World Development Report (1960, 1989, and 1990).

$LITR_{it}$: percentage of literacy, (15 years and older) in country i in time t. Source: from Social Indicators of Development 1989 and from different issues of World Development Report (1960, 1989, and 1990).

$ASSISTR_{it}$: the ratio of foreign assistance to gross domestic product in country i in time t. Source: from Social Indicators of Development 1989 and from different issues of World Development Report (1960, 1989, and 1990).

$DASSIST_{it}$: a proxy variable for the ratio of foreign assistance to gross domestic product in country i in time t. Source: from different issues of World Development Report (1979-1990).

$TEXPR_{it}$: the ratio of total goods exports to gross domestic product in country i in time t. Source: from United Nations (1987). Handbook of International Trade and Development Statistics. New York, United Nations Publication Division 1988).

POP_{it}: the total population in country i in time t. Source: from different issues of World Development Report (1960-1987).

$DCENTR_{it}$: the dummy variable for the type of the administration structure in country i in time t. Source: from Mutlu, Servet (1989) and from various issues of World Atlas (1965-1986).

$DCAPCTY_{it}$: the dummy variable for the capital city in country i in time t. Source: from various issues of Demographic Yearbook (1960-1986).

GOV_{it}: ratio of real government consumption expenditure to real gross domestic product (average from 1960 to 1985 and from 1970 to 1985) in country i in time t. Source: from Robert Barro (1991).

$REVOL_{it}$: number of revolutions and coups per year (1960-1985) in country i in time t. Source: from Robert Barro (1991).

$PPPI60D_{it}$: magnitude of the deviation of PPPI60 from the sample mean in country i in time t. Where the PPPI60 is 1960 PPP value for the investment deflator (U.S. = 1.0). (PPP is the purchasing-power-parity numbers for investment goods). Source: from Robert Barro (1991).

$STRATP_{it}$: student teacher ratio in primary schools 1960 in country i in time t. Source: from Robert Barro (1991).

STRIKE: the number of strikes per year (1960 to 1985). Source: from Robert Barro (1991).

$(GDP/CAP)GR_{it}$: the growth rate of real gross domestic product per capita (in U.S. Dollars) in country i in time t. Source: from Robert Barro (1991).

CHAPTER I

INTRODUCTION

Statement of the Problem

In the last two decades, many studies have investigated the linkage between urbanization and economic development in both less-developed and developed countries. The term urbanization has a broad meaning. It is a phenomenon describing the process of change in the location of population of a country from rural to urban areas (due to changes in economic, political, geographical, social and cultural factors). Saad Ibrahim (1975, p. 28) states that urbanization is "a process of redistributional shifts of population from the countryside to towns and cities." For the purpose of this study, we consider four related measures of the results of urbanization: urban percentage, metropolitan percentage, metropolitan concentration, and primacy. Urban percentage is the urban population of a country as a percentage of the country's total population; metropolitan percentage is the percentage of the country's population in cities of 100,000 or more; metropolitan concentration is the population in large urban areas (e.g., in urban areas of 100,000 or more) as a percentage of the total urban population; primacy is the population of a country's largest city as a percentage of the total urban population. The main objective of this study is to investigate the linkages between these measures and economic development for the years: (1) 1960, (2) 1970, and (3) 1980. Theoretically, the relationship between urbanization and economic development can be described in terms of scale economies and income elasticities of demand for manufacturing goods. Phillip E. Graves and Robert L. Sexton (1979) suggest that urbanization and development proceed according to an S-shaped curve.

The main assumption of Graves and Sexton is that agglomeration economies of a city are first captured by manufacturing industries that are clustered around cities. Then when economic development is enhanced, transportation and communication will improve and firms and plants will spread out. So, at low levels of income, a large proportion of income is spent on food, clothing, and shelter. Countries with low per capita income will have but little manufacturing and hence little push to agglomerate. At higher levels of per capita income, the high income elasticities of demand for manufactured goods result in a larger proportion of income being spent on manufactured goods. Since the production of these manufactured goods is subject to scale economies, urbanization will increase along with the industrialization. At even higher levels of income, income elasticities indicate a shift to services. Therefore, urbanization levels (particularly in large cities) decrease since services are less concentrated.

The Objectives of the Study

The main aim of this study is to gain a better understanding of the linkage between urbanization (as measured by urban percentage, metropolitan percentage, metropolitan concentration, and primacy) and economic development. More specifically, it is to determine whether these measures of urbanization are correlated with economic development. Economic development will be measured by such variables as gross domestic product per capita, the sectoral composition of the labor force, the ratio of total goods exports to gross domestic product, the ratio of foreign assistance to gross domestic product, and the literacy rate. This study introduces two determinants of urbanization that have not been tested before: total goods exports and foreign assistance variables. The dependent variables are the previously discussed urban percentage, metropolitan percentage, metropolitan concentration, and primacy. Urban percentage and primacy are defined according to the definitions of each country as provided to the United Nations. Metropolitan percentage and metropolitan concentration are calculated from different issues of the Demographic Yearbook and from Kingsley Davis (1969). To recall, metropolitan percentage relates the population in cities of 100,000 or more to the country's total population, and metropolitan concentration relates the urban population in areas of 100,000 or more to the total urban population.

The empirical work (based on data from both developed and less-developed countries) will show how economic development affects urbanization. In particular, this study tests the hypothesis that economic development leads to urban concentration. Among other things, it examines whether economic theory can explain the current level of urban concentration (in a few large urban areas) that dominates the urban structure in many countries.

Finally, this study (chapter VI) adapts Robert Barro's (1991) cross-sectional growth model for both developed and less-developed countries. It tests the impact of urbanization on economic growth as measured by the growth rate of real gross domestic product per capita.

To accomplish these objectives, a cross-section model will be constructed. First, the model will be applied for 1960, second for 1970, third for 1980, and fourth for the three years (1960, 1970, and 1980) pooled together.

We also use dummy variables to examine: (1) if the functions have shifted between 1960, 1970, and 1980 and (2) how urbanization differs from one region to another.

Organization of the Study. The study is organized as follows. Chapter II presents a literature review. It begins with a review of various theories and models of both urban economic models (e.g., economic-base model and central place theory) and economic development models (such as the John Fei and Gustav Ranis's model and Todaro's models), and finally agglomeration economies. Chapter III reviews some of the empirical work about urban percentage and then discusses the limitation of this empirical work. The chapter also examines a model of urban percentage that includes many independent variables such as the gross domestic product per capita, labor in agriculture, labor in industry, ratio of total export to gross domestic product, literacy rate, and the extent of foreign assistance. The purpose of this model is to investigate the impact of these independent variables upon the urban percentage. Chapter IV presents the theoretical and empirical work of the metropolitan percentage and metropolitan concentration models--variables, data, methodology, and results. Chapter V presents the theoretical and empirical work of the primacy model--variables, data, methodology, and results. Chapter VI presents a cross-sectional model for both developed and less-developed countries that tests how the urban measures affect economic growth for the periods 1960-1985 and 1970-1985. Finally, Chapter VII presents the summary and the conclusions of this study.

CHAPTER II

SURVEY OF THE LITERATURE

Introduction

We start this chapter by reviewing the world patterns of urbanization. Table 2.1 below shows that the urban population of the world (estimated by the United Nations (UN)) was 1,374 and 1,997 million in 1970 and 1985, and the projected urban populations are 2,916 million by 2000 and 5,118 million by the year 2025. Table 2.1 also indicates that 4,049 million of the total urban population (5,117 million) in the world will be in less-developed countries, while only 1,068 million will be in developed countries by the year 2025.

The urban population in less-developed countries is growing at an unprecedented rate. For instance, a recent UN estimate of urban percentage for the developed regions is 71 percent for 1985, and the projection is 79 percent for the year 2025. In less-developed regions the estimate of urban percentage is 31 percent for 1985, and the projection is 57 percent for 2025 (World Population Monitoring 1989, p. 179). This means urbanization will continue to rise (especially for less-developed countries) for many years to come.

TABLE 2.1

TOTAL, URBAN AND RURAL POPULATION BY REGION 1970-2025
(IN MILLIONS)

	Estimates		Projections		
	1970	1985	1990	2000	2025
Total	3,698	4,854	5,292	6,251	8,467
Urban	1,374	1,997	2,260	2,916	5,118
Rural	2,323	2,856	3,301	3,334	3,347
More Dev. Regions					
Total	1,049	1,174	1,205	1,262	1,352
Urban	699	840	876	945	1,068
Rural	350	334	330	318	284
Less Dev. Regions					
Total	2,649	3,680	4,087	4,989	7,114
Urban	675	1,158	1,384	1,971	4,049
Rural	1,974	2,523	2,703	3,016	3,065

Source: World Population Monitoring 1989, p. 180.

Many scholars like Kingsley Davis and Hilda Hertz Golden, Phillip Graves and Robert Sexton, Edwin Mills and Charles Becker, David Kamerschen, and William C. Wheaton and Hisanobu Shishido, have studied the relationship between urbanization and economic development. They find a positive association. Some of them also see a positive relationship between city size and economic development. That is, not only does the urban population percentage increase as economic development proceeds, but cities become bigger. The reason is the sectoral transfer of resources from land-based primary production to manufacturing and service sectors. This happens because both manufacturing and service sectors tend to be urbanized due to agglomeration economies.

Urban Economic Models

Economic-Base Model

One of the earliest and the most widely used models of urban growth is the export-base model. Douglas C. North (1955, p. 257) points out:

> The importance of the export-base is a result of its primary role in determining the level of absolute and per capita income in a region, and therefore in determining the amount of residentary, secondary and tertiary activity that will develop. The export base has also significantly influenced the character of subsidiary industry, the distribution of population and pattern of urbanization, the character of labor force, the social and political attitudes of the region, and its sensitivity to fluctuations of income and employment.

In this model the urban economy is divided into two sectors: the primary or the export-base sector and the local or residentiary sector. The export-base model works just like the simple Keynesian model. In the Keynesian model an increase in autonomous purchases leads to increases in national income that are multiples of the original increase in purchases. Just so, an increase in the demand for primary sector activity leads to increases in local income that is greater than the original increase in the demand for export sector activity in the export-base model.

Harry W. Richardson (1979, pp. 84-86) presents two models of the export-base theory. Model (a) was used by urban planners before the Keynesians model become popular and <u>model (b)</u> is a Keynesian-type income model.

<u>Model (a)</u>

$$T = B + S \qquad (2.1)$$

$$S = aT \qquad (2.2)$$

where

T = total income,

B = base income, and

S = service income that is assumed to be a stable function of total income, and

a = a parameter to be estimated.

Substituting equation (2.2) into (2.1):

$$T = (1/1-a)B \qquad (2.3)$$

$$\text{and } \Delta T/\Delta B=(1/1-a) \qquad (2.4)$$

where

(1/1-a) is the export-base multiplier.

Similar results can be obtained by using a Keynesian-type income model.

<u>Model (b)</u>

$$Y = (E-M) + X \qquad (2.5)$$

$$E = eY \qquad (2.6)$$

$$M = mY \qquad (2.7)$$

where

Y = income,

E = domestic spending,

M = imports,

X = exports (exogenous),

e = marginal (average) propensity to spend, and

m = marginal (average) propensity to import.

Substituting equations (2.6), and (2.7) into (2.5):

$$Y = eY - mY + X \qquad (2.8)$$

$$Y = (1/1-e+m)X \qquad (2.9)$$

and $$\Delta Y/\Delta X = (1/1-e+m) \qquad (2.10)$$

where (1/1-e+m) is the export-base multiplier.

As in model (a), regional income is a multiple of exports (the export-base) provided that marginal propensity to spend locally (e-m) is less than 1.

The export-base model shows that the growth of the urban economy and hence the urban area is crucially dependent upon the growth of the city's export sector, which in turn depends upon forces completely outside the city's economy. This means that if there are no changes in export demand, then the economy will stagnate. The base model is usually formulated with income, employment, or sales revenue as the dependent variable. However, some economists, such as Wilbur R. Thompson (1968), use population as the dependent variable.

The export-base model has some advantages such as: (1) it is easy to apply to a region or a city for either short-run changes in activity or for long-run growth analysis; (2) it is good and inexpensive for a quick estimate about the impact (or change) in a region (or a city) that does not need a lot of details.

The approach, however, has many limitations. One, the model is not designed to explain the concentration of urban areas. Two, the adaption of Keynesian theory to an urban area may not be valid. In an interdependent national economy, where resources are highly mobile, there is no guarantee that an increased demand for a city's export may not lead to migration of factors to the source of demand for the product. In other words, unless one can guarantee resource immobility or very high cost of migration, one can imagine a case in which resources will move to the source of demand rather than stay at the production site. Three, another problem is the implicit assumption of excess capacity in the export sector or of an immediate increase in productive capacity to accommodate any increase in export demand. Unless this is the case, there is no reason to believe that the urban economy can respond to increased demand for exports. Richardson (1979, p. 88) indicates that "A familiar objection to the export-base models is that they ignore capacity constraints and other supply-side features." H. Blumenfeld (1955), G. Green (1966), and Richardson (1979) emphasize that the relationship between the export demand and the local activities is one of simultaneity and interdependence. This means that the growth of a region (or a city) depends not only on the export demand but also on the efficiency of the local service industries that determine how successfully the city competes for mobile exporting industry.

Finally, there is a debate about the validity of the model as a short-run or as a long-run model. While North

(1955) emphasizes that the export-base model is good for the long run since it explains the economic growth of the region, Charles M. Tiebout (1956, p. 169) notes that "For long-run growth, merely to look at exports as the key factor in explaining regional growth is no more adequate than merely looking at investment at the national level." In Tiebout's view, the model can explain the short-run fluctuation of the region's economy but not the long-run. Tiebout also argues that even in the short run other factors of the local economy, such as business investment, government expenditure or residential construction, may be just as important as exports in determining total regional income.

There has been empirical work on this matter, but the issue has not been resolved. For instance, James E. Mcnulty (1977) constructs a cross-sectional study for 41 Standard Metropolitan Statistical Areas (SMSAs) in the Southeastern United States. His conclusion is that the export-base theory fits the facts very well in the long run and very poorly in the short run (p. 367). Shelby D. Gerking and Andrew M. Isserman (1981) indicate that Mcnulty misinterpreted his results; they do not support his long-lags hypothesis. Also they emphasize that the method of defining basic and nonbasic sectors is very important in determining the validity of the export-base theory for a long run or a short run. Their definition of the basic sector includes not only export demand but federal government expenditure, certain forms of transfer payments, and expenditures by tourists. Their results present evidence to support the short-run version of the export-base theory.

Central Place Theory. Central place theory was developed in 1930s by Walter Christaller to explain the main determinants of the distribution of cities. It is based on the assumption that distance plays a significant role in the organization of human settlements. It assumes that the main function of a city is to provide goods and services to its population and those of its hinterland. Central place theory assumes a broad homogeneous plain, with uniform transport features in all directions, uniform distribution of population, same tastes and preferences, scattered raw material, free entry, and perfect knowledge. Given these assumptions, a few cities will contain a wide variety of activities ranging from low- to high-order services (or industries). Thus, places that provide high-order services will (a) be more central, (b) be widely spaced, (c) serve a large area, and (d) consequently be more populated. Cities containing only lower-order goods will be smaller and more widely distributed. (Edwin S. Mills and Bruce W. Hamilton 1989, P. Klemmer 1978, and H. O. Nourse 1978).

When August Lösch's book Economics of Location was translated in 1954, it helped English-speaking economists to understand central place theory (Mills and Hamilton 1989, p. 10). Based on Christaller's central place theory, Lösch developed another system of central places with a more sophisticated economic rationale (what he calls as an 'ideal economic region'), but with similar results. Richardson (1979 p. 73) indicates that Lösch's system is more general than Christaller's central place theory in two points. First, unlike Christaller's theory, towns of same size do not necessarily supply identical services. That is, lower-order cities do not have exactly the same type of goods as cities of the same rank. Second, Lösch's system was not bounded by distribution of services but included all activities along a hierarchical continuum. Unlike in Christaller's model, the number of city functions is not a perfect predictor of city sizes in Lösch's model.

Central place theory is not a universal or general model for several reasons. One, cost differentials, which are important factors in urban concentration, are omitted. Two, the assumption of a homogeneous plain, radial transportation, ubiquitous resources and exclusive markets is far from reality. For instance, car dealers usually cluster around each other since this is convenient for customers. So, dealers are not distributed evenly over space as the theory assumes. Three, the theory accounts for industry economies of scale (localization economies), but does not include external economies (urbanization economies), which may be an important factor of urban concentration. Four, in assuming ubiquitous resources, the theory cannot account for migration of factors during the process of urbanization. Yet the migration process may account for the spatial distribution of population among urban places more than anything else. Finally, political factors, such as a location of a capital, may affect the spatial distribution of cities.

Pareto Distribution

The distribution of city sizes in a country also has been described by the Pareto distribution. Following Mills and Hamilton (1989, p. 74), we present the general form of the Pareto distribution:

$$G(X) = AX^{-b} \tag{2.11}$$

where

$G(X)$ = the rank of an urban area with X people,

A = constant to be estimated from the data,

b = constant that usually is estimated to be about 1.

Substituting b = 1 in equation (2.11):

$$G(X) = AX^{-1} \tag{2.12}$$

Multiplying both sides by X, then,

$$XG(X) = A. \tag{2.13}$$

This equation, which is the rank-size rule, states that the product of an urban area's rank and its population, X, is a constant equal to the population of the largest urban area. Thus, the second-largest urban area is half the size of the largest, and the third-largest urban area is one-third the size of largest, and so on.

The rank size rule is not based on any theory, it is just an empirical observation about the urban system of advanced countries and accepted by some geographers as the normal form that the size distribution of cities takes.

Even though the rank-size rule fits most advanced countries, the case may not be the same for developing countries where primate cities--a few large urban areas--dominate the structure of urbanization. Brain J. L. Berry (1960, p. 587) explains two factors that may lead to primate cities in developing countries. The first factor is the colonialism that caused concentration of economic opportunities in capital city or in a very few ports, which in turn lead to migration of population to these cities for jobs and hence reinforced primacy. The second factor is political- administrative controls. That is, governments may concentrate their administrative organizations and exercise their political power from one city, creating a large city (primate city).

Economic-Development Models. Many development economists have studied the persistence of rural-urban migration in less-developed countries even in the presence of high rates of urban unemployment. For instance, Fei and Ranis (1964) divide the economy into two sectors: one is a large traditional agricultural sector in which institutional forces determine the wage rates, and the other is a small modern sector in which competitive conditions determine the input prices. Because of the existence of dual labor markets, labor migrates from the low-wage rural (agricultural) sector to the high-wage urban sector. Hence, this accelerates the urbanization process through rural-urban migration. As long as there is an earning differential, rural-urban migration will continue; the greater the differential, the greater will be the migration towards the urban centers.

Michael Todaro's model (1969) also divides the economy into two sectors: rural and urban. In his model, Todaro assumes that urban wages are higher than rural wages. He also introduces a probability of getting a job at the urban wage; the expected urban wage is the relevant one to compare with the rural wage. The decision to migrate from rural to urban areas depends on two variables: (1) the urban-rural wage differential and (2) the probability of getting a job in the urban area.

Todaro explains that including the probability notion in the model is very important, because the time required to get an urban job is an important consideration. For instance, if the current urban real wage is significantly higher than the expected rural wage, but the person (migrant) might have to wait a year or two to get a job, then this expected delay will influence his decision as to whether he should leave his farm. With the introduction of expectations, Todaro is able to explain the simultaneous existence of high rates of unemployment in urban areas and high rates of rural-urban migration in less-developed countries.

Todaro (1971) also investigates rural-urban migration and employment in Africa. In this model, he examines the economic basis (e.g., wide disparities between expected urban and rural real incomes) for rural-urban migration in spite of rising levels of urban unemployment. He comes to the same conclusion as in his previous study, namely that rural-urban migration will continue as long as there are differentials in rural and urban expected wages.

Although Todaro's analysis does not deal directly with urban concentration, it does link urban concentration (urbanization) to economic development in less-developed countries. This linkage implies a positive impact of economic development upon urbanization in general, and upon urban concentration (in both large urban areas and primacy) in particular.

While Fei and Ranis, Todaro, Gerald M. Desmond, Mills and Becker, and Mills and Hamilton see urbanization as a result of economic development, others argue that the causal relationship between economic development and urbanization is not one way. For instance, Bert F. Hoselitz (1953) believes that large urban areas and primate cities of developing countries play a significant role in the process of economic development. Hoselitz (1953, p. 196) states:

> the town, and especially the large city, has still another advantage for the location and expansion of nonagricultural enterprises in the greater variety of skills and occupational specialists which can be found there. This factor has the tendency of minimizing bottlenecks due to shortages of certain skilled persons and faciliting horizontal and vertical expansion of existing nonagricultural

enterprises.

Hoselitz emphasizes that large urban places provide the environment of intellectual development and the acceptance of new ideas and environment that is conductive to change. Also he argues that large urban places provide more interaction, new source of ideas, and an escape from traditional beliefs which hinder economic development. So, all these factors (in Hoselitz's view) help economic development. And, finally, large urban areas and big cities act as a catalyst to economic development by providing markets for the products of the surrounding rural areas, thus transmitting growth incentives to them.

Stanislaw H. Wellisz (1971, p. 39) notes:

> The positive associations of urbanization with industrialization and economic growth are well known. Cities provide concentrations of population from which industrial labor may be drawn; they also contain a greater variety of skills and resources than do rural areas. Even more important perhaps, urbanization promotes values favorable to entrepreneurship and industrial growth; in particular, cities typically tend to favor a propensity to analyze traditional institutions and to innovate and accept change since, in a relatively impersonal and fragmented setting of urban life, the all-embracing bonds of traditional community systems are difficult to maintain.

Wellisz indicates that the positive association between urbanization and GNP per capita and GNP growth should be taken as a welcome sign of development and as an indicator of more rapid progress in the future.

Davis and Golden (1954) correlate the level of economic development and urbanization for a sample of 70 countries. They use the correlation to calculate an expected degree of urbanization for each level of development. Those countries that have a degree of urbanization greater than their level of development are considered overurbanized. They attribute the overurbanization of some developing countries (e.g., Egypt and South Korea) to rural-urban migration. Davis and Golden (p. 11) note:

> we know that the growth of cities has been mainly a result of rural-urban migration, which has contributed at times far more to urban numbers than the natural increase in cities could ever contribute.

They consider overurbanization as a positive phenomenon. They expect it to be a temporary phenomenon because either (a) the rate of urbanization will fall off sharply or (b) industrialization will gain a new impetus stimulated by the overurbanization. Davis and Golden (p. 23) state:

> Behind much of our reasoning is the assumption that urbanization is not only an excellent index of economic development and social modernization but also itself a stimulus to such change.

They explain many factors which cities contribute to economic development. First, the city is an efficient mode of human settlement because it reduces the friction of space and becomes one great factory. Second, as transportation and communication improve, the city exports goods and services to its hinterland and promotes its urbanization. Third, the city increases efficiency in the accumulation of capital and personnel for purpose of formal education, public health, science, and art. Fourth, the requirements of urban living force innovations, which the countryside would never make, such as in traffic and sanitation. In their conclusion (p. 24) they note:

> the city makes its own peculiar contribution to the process of economic development. It is no accident that urbanization and industrialization have gone hand-in-hand. The appearance of rapid urbanization in underdeveloped areas is therefore both a sign of change already under way and an augury of future change.

However, there are some development economists who disagree with the view that overurbanization can be a catalyst to economic development. In other words, they regard the shift of the population from rural to urban areas and the relatively rapid urban concentration of large urban areas to be undesirable; they fear that the resulting costs in economic, political, and social terms will be high. Therefore, urban concentration during the stage of rapid industrial development is a dominant problem according to some economists.

The major concern is the "excessive" growth of cities relative to the rest of urban areas. For instance, Todaro is very concerned about large cities or what is called the overurbanization problem in many underdeveloped countries. Todaro (1979) discusses the problem of overurbanization and some of his arguments are that (1) wages are too high in urban areas; (2) government policy has an urban bias; (3) the public sector is concentrated in large cities (e.g., government buildings, large hospitals, and universities are all located in big cities); and (4) capital goods are subsidized in big cities. Todaro's view is that government policies should be directed toward the improvement of rural areas, small towns, and small cities. But Todaro ignores the fact that agglomeration economies (e.g., higher productivity and cheaper services) may be realized in large urban areas. In other words, policies that try to reduce the size of large urban areas (as suggested by Todaro) may result in decreasing the higher productivity and increasing the cost of services in these areas.

Agglomeration Economies. Urban economists use neoclassical production theory to analyze productivity differentials across cities and regions. One source of productivity differentials is agglomeration economies, which refer to the advantages of size and concentration. Mills and Hamilton (1989) discuss the agglomeration-economies concept and indicate that agglomeration economies, in part, mean the advantages of spatial concentration resulting from scale economies. They indicate that scale economies exist not only in the private sector, but in mixed public/private or regulated sectors, such as transportation, communications, and public utilities. Also scale economies may exist in public sector activities, such as police protection, education, waste disposal, and water supply.

Business agglomeration economies are a result of indivisibilities and specialization in the use of factors of production and production processes that occur when firms locate in clusters. Raymond Vernon (1972) discusses the role of external economies in the location of manufacturing plants in large cities. He attempts to explain why, in spite of increasing congestion and rising costs, many manufacturing operations remained in the New York Area. Vernon describes many factors that lead to externalities such as: (1) sharing common facilities; (2) tapping the facilities quickly; (3) face-to-face contact; and finally, (4) uncertainty, and information costs. For instance, many aspects of doing business such as marketing, purchasing, administration, and dealings with government agencies and banks require personal contacts and face-to-face communication. Thus, despite the increased trend toward the dispersal of company headquarters, many company headquarters are located in large cities in many developed countries.

L. A. Sveikauskas (1975) estimates the relationship between productivity and city size for the United States. He shows that, a doubling of city size is associated with a 5.98 percent in labor productivity. Ronald L. Moomaw (1981) criticizes Sveikauskas' estimate and argues that the increase in productivity is only about 3.0 percent with each doubling of city size. Moomaw indicates that Sveikauskas's main problem is his omission of the capital intensity variable, which obviously is positively related to productivity.

William Wheaton and Hisanobu Shishido (1981) estimate the effect of the level of economic development on a measure of urban concentration in 38 developed and developing countries. The model of Wheaton and Shishido is based on the theoretical work of Lösch (1954), Martin J. Beckman

(1958), and Edwin Mills and Michael R. Lav (1964). That is, the model is based on the theory of market areas and has two main assumptions. First, efficient optimal economic behavior determines the patterns of cities in the long run. Second, there is a trade-off between unit transportation cost and unit production. As the number of production locations increases, there will be savings in the cost of transportation. At the same time, as the market and therefore production volume of each center decreases, there will be an increase in unit production costs. Thus, commodities with high transport cost and modest economies will be produced locally.

Lösch's model predicts that a hierarchy of cities will emerge. At the top of this hierarchy are cities that produce goods with large scale. Going down the hierarchy, there are a large number of cities that produce a limited number of goods with smaller scale economies. Wheaton and Shishido suggest a trade-off between the production efficiency of urban concentration and the transport savings associated with spatial dispersal. They emphasize that the degree of urban decentralization depends upon three conditions: (1) the degree of scale economies; (2) the size of the market; and (3) the spatial diffusion of the market and transport cost (p. 22). Wheaton and Shishido (p. 22) state:

> if the distribution of cities in a country follows the laws of economic efficiency, greater scale economies should result in more urban concentration, while a larger and/or more dispersed market should

lead to urban decentralization.

They explain this relationship as follows: the degree of scale economies in production is related to increasing returns in plant sites or specific locations. When a country becomes more capital intensive (e.g., developed countries), then capital will be used more than labor (the efficient production for a plant increases), which in turn, explains the trends in different countries of a given commodity production. Efficient production depends upon the degree of capital intensity in production. That is, as capital intensity increases, then fixed cost increases relative to variable costs and the efficient output of a plant increases. This means that labor-intensive commodities have low scale economies. Wheaton and Shishido use non-agricultural gross national product per capita (GNP/CAP) as a proxy for the degree of scale economies, reasoning that data on international capital is not available on a consistent basis. The general form of their model is:

$$S = 1/(B_1+B_2e^{B3GNP/CAP}) \qquad (2.14)$$

where

S = the efficient level of output for an urban area,

GNP/CAP = gross national product per capita,

and B_1, B_2, B_3 are parameters.

The model states that at some critical stage of development, urban production increases very rapidly and eventually levels off. The second factor that affects urban concentration is the country's market. The larger the market, the greater the number of production centers. In order to relate market size and the efficient level of city production, to the degree of urban concentration, Wheaton and Shishido assume that the number of production centers (or degree of urban decentralization) is the country's total market size divided by the efficient size of production for each center:

$$1/H = GNP/S = GNP(B_1+B_2e^{B_3 GNP/CAP}) \qquad (2.15)$$

where

H is the Herfindeihl Index. It is the sum of squared population shares. Or

$$H = \sum_{i=1}^{n} \frac{(Pi)^2}{(P)^2}$$

Pi = the population in city i, P is total population, and n is the number of cities.

1/H = the inverse of the H index (index of decentralization).

Another assumption based on Lösch (1954) is that urban decentralization and the amount of arable land are directly related. Countries with small, dense arable land have more concentrated urban areas than countries with diffused arable land. So, Wheaton and Shishido add the land variable, AREA. And finally, they include the central government expenditure shares, GOV, as a proxy for centralization authority. The final form of their model is:

$$1/H = GNP(B_1+B_2e^{B_3 GNP/CAP})+B_4\log(AREA)+B_5GOV \qquad (2.16)$$

The estimates of equation (2.16) are:

B_1= .000015	B_2= .0012	B_3= -.0032	B_4= 2.17	B_5= -.043
(3.34)	(6.2)	(-3.18)	(3.26)	(-.98)

and R^2 = .81 (t-statistics in parentheses)

The parameters of log (AREA), GNP/CAP, and GNP are highly significant and have the expected signs, while the coefficient of the (GOV) variable is insignificant. Wheaton and Shishido conclude that economic behavior is an important factor in determining the spatial patterns of urbanization and that any attempt to regulate this will cause cost in terms of loss of efficiency.

Summary. This chapter has outlined the major theoretical and empirical works related to the relationship between urbanization and economic development. While most studies demonstrate a positive relationship between urbanization and economic development, the issue has not been completely explored. In other words, the empirical work does not provide a clear picture of the effect of measures of economic development on urbanization. Furthermore, most of these studies are over a decade old. Also these studies did not investigate changes in the determinants of urbanization levels over time, nor how the experience of urbanization levels differs from one part of the world to another.

This study undertakes an examination of various determinants of urbanization to test the importance of economic development upon measures of urbanization for three years: (1) 1960; (2) 1970; and (3) 1980. Also the study examines the effect of time, (1960, 1970, and 1980) and regions of the world on urbanization.

Overurbanization is another important aspect of these issues. Those who favor urban concentration argue that concentration of people and firms helps economic development through economies of scale and agglomeration economies. While those who disagree with this view argue that many countries of today, particularly in less-developed countries, exceed their proper level of urbanization and consider this factor responsible for both the retardation of economic growth and the increase in social problems. Therefore, they advocate policies aimed at decentralization. It is surprising how little attention has been paid to the effect of urbanization on economic growth. This study (chapter VI) adapts Robert Barro's (1991) cross-sectional growth model for both developed and less-developed countries. In particular, it tests the impact of urban measures (urban percentage, metropolitan concentration, and primacy) on economic growth.

CHAPTER III

URBAN PERCENTAGE MODEL

Introduction

Some researchers emphasize the relationship between the urban percentage (urban population as a percent of national population) and economic development in their duscussion of urbanization and development. This chapter briefly reviews some of the past work to establish the basis for our approach. A positive association between the urban percentage (urban population as a percent of national population) and the level of income is illustrated in table 3.1. The table shows urban percentages and gross domestic product per capita (GDP/CAP) for 15 countries at various levels of development for the years 1960, 1970, and 1980. It shows a strong relationship between urban percentage and GDP/CAP. Countries with a low income (e.g., Ethiopia, Bangladesh, Nepal, and Tanzania) have low urban percentages, and countries with a middle income (e.g., Algeria, Egypt, Jordan, and Sri Lanka) have higher urban percentages. And countries with a high level of income (e.g., Spain, United Kingdom, and the United States) have even higher urban percentages than both low and middle-income countries. The data also show that the urban percentage generally increases over time.

TABLE 3.1

THE RELATIONSHIP BETWEEN URBAN PERCENTAGE AND GROSS DOMESTIC PRODUCT PER CAPITA

Country	Urban Percentage			GDP/CAP (In 1980 U.S $)		
	1960	1970	1980	1960	1970	1980
Ethiopia	6	9	14	285	341	325
Bangladesh	5	8	11	444	458	540
Nepal	3	4	5	478	506	490
Tanzania	5	7	12	208	256	353
India	18	20	22	533	576	614
Haiti	16	20	28	605	550	696
Sierra Leone	13	18	22	281	459	512
Pakistan	22	25	28	558	772	989
Egypt	38	42	45	496	671	995
Sri Lanka	18	22	27	974	971	1199
Algeria	30	40	44	1302	1551	1998
Jordan	43	51	56	1120	1421	1885
Spain	57	66	74	2425	3446	6131
U. K.	86	83	91	4970	5609	7975
U.S.A.	70	74	77	7380	8634	11404

Sources: Urban Percentage from World Development Report, (1980, pp. 148-149). GDP/CAP from Robert Barro (1991).

The level of urban percentages in 1960 are lower than in 1970, while the urban percentages in 1970 are lower than those of 1980.

Past Empirical Work

While much of the work regarding the relationship between urban percentage and economic development is theoretical and discursive, some researchers investigate the linkage empirically and find a positive relationship. Desmond (1971, p. 67) notes that "increased urbanization appears to be an inevitable concomitant of economic development." He defines urbanization as the growth of population living in urban places relative to that of the country as a whole. He indicates that the experience in Latin America, South Korea, and Taiwan supports this positive correlation. In his investigation of the impact of national and regional development policies on urbanization of South and Southeast Asia, he shows that countries with a high level of output, gross national product per capital, and consumption per capita (e.g., Singapore, Philippines, and Malaysia) have higher urban percentages than countries with a low level of economic development (e.g., Burma, Cambodia, India, and Pakistan).

Desmond (p. 68) notes that "In general terms it can be stated that nearly every phase of economic development leads directly or indirectly to greater urbanization." He explains that increases in industrial output and its share in total output form a basic part of each country's overall development plan. The demand for labor in industry and in ancillary activities encourages more growth in urban population. Also he explains how urbanization is self-reinforcing and hence contributes to development. Desmond (p. 69) also states:

> The point here is that the greater propensity of urban dwellers to save (as a result of higher incomes) and their willingness to entrust these savings to financial intermediaries attracts additional investor and entrepreneurs to these areas. So, this investment contributes to economic growth of the area, increasing job opportunities and

new in-migration.

David Kamerschen (1969) investigates the correlation between urbanization and economic development. He uses two measures of urbanization: percent of population in cities of 20,000 and more and population of the largest city as a percent of the four largest cities. Kamerschen uses the percent of the active population in nonagricultural occupations as a proxy for industrialization and gross national product per capita (GNP/CAP) as a secondary control for the level of economic development. He concludes: (1) the correlation between urbanization and industrialization is higher in less-developed than developed countries; (2) there is no positive empirical correlation between rural land pressure or "push" and overurbanization; and finally, (3) the results do not show that overurbanization hinders economic development.

Edwin Mills and Charles Becker (1986) demonstrate that after World War II, increases in urban percentage have accompanied economic development in the developed and less-developed countries. They also note that even before World War II, the linkage between urban percentage and economic development existed. Table 3.2 below presents some cross-sectional data for three groups of countries: (1) Low-income; (2) Middle-income; and (3) High-income.

The table shows that countries with a low-income have a low level of urbanization, while countries with a middle-income have a higher level of urbanization than countries with a low-income. And, for countries with a high level of income (developed countries), the level of urbanization is even higher than for low- and middle-income countries.

TABLE 3.2

THE RELATIONSHIP BETWEEN AVERAGE PERCENT URBAN AND THE GNP PER CAPITA FOR LOW-INCOME, MIDDLE-INCOME AND HIGH-INCOME COUNTRIES.

Country Group	GNP Per Capita (U.S. Dollars)	Percent Urban	Number of Countries
Low-income	260	17	32
Middle-income	1,400	45	63
High-income	10,320	78	19

Source: Mills and Becker (1986, p. 15).

Methodology

Researchers who investigate the linkage between urbanization and economic development usually use one or two independent variables as a measure (or measures) of economic development (e.g., GNP/CAP or labor in either agriculture or industry sector). A model that uses a wide range of variables to explain the variation in urbanization levels will go beyond the previous work and will shed more light on the linkage. In this chapter we construct a cross-sectional model to assess the importance of the determinants of urban percentage. The sample consists of data for both developed and less-developed countries for three years: 1960, 1970 and 1980. The variables that are included in the model follow.

Dependent Variable. The dependent variable is the urban percentage: the total urban population as a percent of the total population. We should note that there are differences in the definition of an urban place among countries. But it would be impossible to construct an urban percentage based on a consistent definition for all countries (using the small town or the urban place). Therefore, the definition of urban percentage in this study is taken directly from the World Development Report.

Independent Variables.

1. Gross Domestic Product Per Capita: GDP/CAP (not the gross national product per capita that is most widely used) is the measure of the level of economic development used because it reflects the value of domestic production. Graves and Sexton (1979) and Mills and Hamilton (1986), explain that countries with low income spend most of their income on food, but as income increases the share of income spent on food decreases due to the low income elasticity of the demand for food. At the same time, the shares of industrial goods and services increase as the income increases due to the high income elasticities of their demands. This increase in demand for industrial goods and services expands production in industry and service sectors, which in turn, leads to more demand for labor and higher wages in the urban sector than in the agriculture sector. Therefore, labor leaves agriculture for the

urban sector (that is industry and services). Thus, an increase in GDP/CAP is expected to have a positive impact on the urban percentage.

2. Percentage of Labor Force Engaged in Agriculture and Industry: The same level of GDP/CAP can be associated with different distributions of economic activity in agriculture, industry, and services. The smaller the percentage in agriculture, holding GDP/CAP constant, the greater will be the urban percentage. Similarly, services rely less on agglomeration economies than does industry. Consequently, the smaller the level of services, holding GDP/CAP and agriculture percentage constant, the greater will be the urban percentage. It follows that an increase in the percentage of labor in industry, holding GDP/CAP and agriculture percentage constant, leads to an increase in the urban percentage.

3. Percentage of Literacy: There is a relationship between the spread of literacy and urbanization. Literacy could encourage people to move from rural to urban areas. Educated people tend to go to large urban areas which have better job opportunities. In most of the developing countries, job opportunities are more available in large urban areas than in small ones. Thus, the literacy variable is expected to have a positive impact on urban percentage.

4. Development Assistance: Development assistance is defined in the World Development Report (1987, p. 278)

as follows:

> Net disbursements of ODA [Official Development Assistance] from all sources consist of loans and grants made on concessional financial terms by all bilateral official agencies and multilateral sources, with the object of promoting economic development and welfare.

The presumption is that a disproportionate part of this assistance is spent in urban areas. Perhaps this is because a disproportionate part of the infrastructure--government buildings, large hospitals, universities, manufacturers, and other facilities--is located in large urban areas and capital cities. Therefore, central governments allocate most of their foreign assistance to these large urban areas and capital cities and only a small part of this assistance goes to rural areas. The more assistance spent in urban areas, the more contracts and jobs are created, which in turn, leads to greater urbanization. So, foreign assistance (measured as the ratio of foreign assistance to gross domestic product) is expected to have a positive impact upon urban percentage. Due to the unavailability of data for many developing countries for 1960, a dummy variable is used as a proxy for the assistance variable in some regressions.

5. Total Goods Exports: The behavior of the ratio of total goods exports to GDP affects urbanization. If the ratio of total exports to GDP increases (holding GDP constant), urban percentage is expected to increase. An increase in production for export markets leads to

greater urbanization because in many countries goods exports (primary products and manufactures) take place from large urban areas. This occurs because many economic activities (e.g., capital investment of manufacture, marketing exports process, banks' services, face to face contact among countries' representatives, airports, and facilities of communication between nations) are located in urban areas. Thus, an increase in total exports (holding GDP constant) is expected to have a positive impact upon urban percentage. In other words, as the ratio of total exports to GDP increases, the urban percentage increases.

The Model. An objective of this study is to examine the relationship between urban percentage and economic development which is measured by GDP/CAP and other economic development indicators. The specification of a functional form is difficult if one does not know the nature of the relationship between urbanization measures and economic development variables a priori. We believe that the relationship between urban percentage and economic development variables is likely to be nonlinear. However, we tried both linear and nonlinear models. In general, the nonlinear model is superior in explaining the variation in urban percentage and other urbanization measures. Hence it is the one that is reported in this chapter (chapter III) and in the following two chapters (chapters IV and V).

First, the model is applied for 1960, 1970, 1980, and for the three years combined. This allows: (1) an examination of the effect of economic development indicators on urbanization levels in different years; and (2) and an examination of how the effects change when we pool the observations.[1]

To establish the relationship between urbanization (as measured by urban percentage, UP), and economic development (as measured by GDP/CAP), we first estimate a model with a single independent variable (GDP/CAP). This relationship can be described as:

$$UP_{it} = (B_0 GDP/CAP^{B1}{}_{it}) E_{it} \quad (3.1)$$

or in log linear form

$$\ln(UP_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + \ln E_{it} \quad (3.2)$$

where

UP_{it} = the urban percentage, that is total urban population divided by total population, in a country i in time t.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in a country i in time t.

B_0 is a constant, B_1 is a coefficient, t is time, and E is the error term.

Regression Results. Equation (3.2) was estimated for the three years and the results are presented in tables 3.3, 3.4, and 3.5 on the following pages.

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[1]Countries are included based on data availability except that Soviet bloc countries are excluded. See Appendix (A) for the included countries.

TABLE 3.3

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL FOR 1960 (SINGLE INDEPENDENT VARIABLE)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.065	0.057	53.597***
GDP/CAP	0.759	0.058	13.067***

Dependent Variable: Urban Percentage, UP, (1960).
R^2 = 0.66 and Adjusted R^2 = 0.66.
90 Countries (90 Observations).
*** Significant at the 0.01 Level.

TABLE 3.4

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL FOR 1970 (SINGLE INDEPENDENT VARIABLE)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.166	0.050	63.070***
GDP/CAP	0.623	0.045	13.899***

Dependent Variable: Urban Percentage, UP, (1970).
R^2 = 0.69 and Adjusted R^2 = 0.68.
90 Countries (90 Observations).
*** Significant at the 0.01 Level.

TABLE 3.5

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL FOR 1980 (SINGLE INDEPENDENT VARIABLE)

Independent Variable	Estimated Coefficient	Standard Error	T- Value
CONSTANT	3.335	0.043	78.423***
GDP/CAP	0.488	0.033	14.663***

Dependent Variable: Urban Percentage, UP, (1980).
R^2= 0.71 and Adjusted R^2 = 0.71.
90 Countries (90 Observations).

*** Significant at the 0.01 Level.

The results in tables 3.3, 3.4 and 3.5 confirm the relationship between UP and GDP/CAP illustrated in table 3.1. The coefficients of GDP/CAP for 1960, 1970, and 1980 have a significant positive impact upon urban percentage during these three years. The coefficients are 0.759, 0.623, 0.488 and the t-values are 13.067, 13.899, and 14.663 for 1960, 1970, and 1980 respectively. In the simple model, the R^2 increases over time and the elasticity of the urban percentage with respect to GDP/CAP decreases.

Adding the remaining independent variables to the single variable equation (3.1), the nonlinear multiple regression model becomes:

$$UP_{it} = (B_0 GDP/CAP^{B1}{}_{it} AGRLAB^{B2}{}_{it} INDLAB^{B3}{}_{it} LITR^{B4}{}_{it} TEXPR^{B5}{}_{it} e^{B6DASSISTit}) E_{it} \quad (3.3)$$

or in log linear form

$$\ln(UP_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + B_2 \ln(AGRLAB)_{it} + B_3 \ln(INDLAB)_{it} + B_4 \ln(LITR)_{it} + B_5 \ln(TEXPR)_{it} + B_6 (DASSIST)_{it} + \ln E_{it} \quad (3.4)$$

where

UP_{it} = the urban percentage, that is total urban population divided by total population, in a country i in time t.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in a country i in time t.

$AGRLAB_{it}$ = percentage of labor force engaged in agriculture in a country i in time t.

$INDLAB_{it}$ = percentage of labor force engaged in industry in a country i in time t.

$LITR_{it}$ = percentage of literacy, (15 years and older) in a country i in time t.

$DASSIST_{it}$ = a proxy variable for the ratio of foreign assistance to gross domestic product in a country i in time t (DASSIST =1 if a country receives assistance, otherwise DASSIST = 0).

$TEXPR_{it}$= the ratio of total goods exports to gross domestic product in a country i in time t.

B_0 is a constant, B_1, B_2,..., B_6 are the coefficients, t is time, and E is the error term.

Equation (3.4) was estimated and the results are in tables 3.6, 3.7, and 3.8.

The adjusted R^2s in tables 3.6-3.8 are greater than those for the corresponding simple regressions. For 1960, two variables are significant at the 0.01 level, one variable (DASSIST) is almost significant at 0.10 level (t-value is 1.605), while three variables are insignificant. In table 3.7 (1970), three variables are significant at the 0.01 level, and one is significant at the 0.05 level. Two variables, LITR and TEXPR, are insignificant. Finally, in table 3.8 (1980), two variables are significant at the 0.01 level, and three are significant at the 0.05 level. The LITR variable has a positive impact on the urbanization level, as it is expected, for 1980 but its t-value is just 1.57.

TABLE 3.6

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL FOR 1960 (SIX INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	1.180	0.596	1.980**
GDP/CAP	0.446	0.102	4.386***
DASSIST	0.278	0.173	1.605
AGRLAB	0.057	0.114	0.497
INDLAB	0.583	0.102	5.698***
LITR	-0.010	0.065	-0.161
TEXPR	0.014	0.061	0.231

Dependent Variable: Urban Percentage, UP, (1960).
$R^2 = 0.78$ and Adjusted $R^2 = .76$.
90 Countries (90 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

TABLE 3.7

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL FOR 1970 (SIX INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	1.721	0.987	1.744*
GDP/CAP	0.365	0.104	3.505***
DASSIST	0.274	0.156	1.758*
AGRLAB	-0.192	0.067	-2.875***
INDLAB	0.221	0.066	3.330***
LITR	0.063	0.078	0.813
TEXPR	0.071	0.055	1.284

Dependent Variable: Urban Percentage, UP, (1970).
R^2= 0.75 and Adjusted R^2 = .73.
90 Countries (90 Observations).

*** Significant at the 0.01 Level.
* Significant at the 0.10 Level.

TABLE 3.8

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL FOR 1980 (SIX INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	2.367	0.404	5.867 ***
GDP/CAP	0.312	0.076	4.112 ***
DASSIST	0.258	0.120	2.152 **
AGRLAB	-0.130	0.052	-2.488 **
INDLAB	0.130	0.052	2.509 ***
LITR	0.126	0.080	1.573

TABLE 3.8 (Continued)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
TEXPR	0.092	0.039	2.363 **

Dependent Variable: Urban Percentage, UP, (1980).
R^2 = 0.78 and Adjusted R^2 = .76.
90 Countries (90 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

The coefficient of DASSIST is significant in the equation for 1970 and 1980 and is almost significant for 1960. This variable indicates whether a country received foreign assistance as a proportion of GDP. It, of course, will be highly correlated with the status of being less-developed. To determine whether the dummy variable is performing as a proxy, the regressions for 1970 and 1980 were run using foreign assistance as a proportion of GDP--ASSISTR - in place of DASSIST. ASSISTR is also correlated with being less-developed. As a continuous variable, however, it more precisely measures the importance of foreign assistance.

These regression results are in tables 3.9 and 3.10. A comparison of tables 3.7 with 3.9 and 3.8 with 3.10 shows that replacing DASSIST with ASSISTR has little effect on the coefficients of the other variables. They tend to be slightly larger with the ASSISTR variable included; t-values also are larger. As expected, the t-values for the coefficients of ASSISTR are larger than for DASSIST. Thus, DASSIST seems to perform satisfactorily as a proxy for

ASSISTR.

In summary, as with the simple regressions, the coefficients of GDP/CAP decline over time. The coefficient of DASSIST is stable over time, the other coefficients, however, jump around, following no particular pattern. Additional discussion of the results is reserved for the next section.

TABLE 3.9

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL WITH THE ASSISTR VARIABLE FOR 1970 (SIX INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	1.399	0.964	1.451
GDP/CAP	0.391	0.098	3.981***
ASSISTR	0.021	0.007	2.918***
AGRLAB	-0.199	0.064	-3.092***
INDLAB	0.220	0.064	3.430***
LITR	0.036	0.075	0.480
TEXPR	0.093	0.054	1.703*

Dependent Variable: Urban Percentage, UP, (1970).
R^2 = 0.77 and Adjusted R^2 = 0.75.
90 Countries (90 Observations).

***Significant at the 0.01 Level.
* Significant at the 0.10 Level.

TABLE 3.10

LOGARITHMIC REGRESSION ESTIMATES OF URBAN PERCENTAGE MODEL WITH THE ASSISTR VARIABLE FOR 1980 (SIX INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	2.398	0.396	6.051***
GDP/CAP	0.315	0.074	4.267***
ASSISTR	0.014	0.006	2.568***
AGRLAB	-0.138	0.052	-2.661***
INDLAB	0.134	0.051	2.610***
LITR	0.110	0.080	1.374
TEXPR	0.098	0.039	2.525***

Dependent Variable: Urban Percentage, UP, (1980).
$R^2 = 0.78$ and Adjusted $R^2 = 0.76$.
90 Countries (90 Observations).

*** Significant at the 0.01 Level.

The Combined Model. In an attempt to get more precise estimates of the coefficients of the independent variables, we pooled the data for the three years. Pooling the data provides additional information because there is more variation in the independent variables. The model now has 270 observations for the 90 countries.

In addition to perhaps yielding more precise estimates, pooling allows other issues to be explored. One issue is whether there are fixed effects associated with each country that are not accounted for by the independent variables discussed thus far. These effects might be related to culture, geography, history, or politics. Another issue is whether recent urbanization is due to economic development or to a structural shift in the relationship between urbanization and economic development.

The fixed effect issue is, we believe, the more pressing one. Urbanization is a complex process that is likely to vary substantially from country to country. Therefore, we intend to include dummy variables to capture the fixed effects. Including dummy variables for countries, or as we ultimately did for regions, limits the extent to which we can test for structural shifts over time. We decided to limit these tests to tests for intercept shifts. After experimentations, we determined that we did not have enough years in the data set to include a dummy variable--fixed effect--for each country. Sample results from these experimentations are in appendix (B).

Consequently, to test for fixed effects, we divide the countries in the data set geographically into regions: (1) North America, (2) Central America and Caribbean Islands, (3) South America, (4) Middle East and North Africa, (5) South Asia, (6) South East Asian Islands and East Asia, (7) Sub-Saharan Africa, (8) West Africa, (9) South Africa, (10) Europe, and (11) Australia and New Zealand. Thus, DNA, DCA, DSA, DMEAST, DSASIA, DSESASIA, DSUBAF, DWAF, DSAF, DEUR, and DANZ stand for region (1), region (2),......, and region (11) respectively.[2]

<u>Regression Results</u>

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[2]See Appendix (C)(table C.1) for a listing of the countries.

Table 3.11, 3.12, and 3.13 give the estimates of the pooled regressions with dummy variables for years. Table 3.11 has the results for the equation that uses all three years and the dummy variable, DASSIST, as a proxy for foreign assistance. Table 3.12 has the results from the equation that pools 1970 and 1980 and uses the continuous variable ASSISTR. Table 3.13 has the results from the equation that pools 1970 and 1980 and uses the proxy variable DASSIST. Qualitatively, the results in the three tables are almost identical. There are five important conclusions. One, the coefficients are generally more significant in pooled regressions than in the regressions using data from a single year. Two, the use of DASSIST rather than ASSISTR dose not result in qualitative differences. Three, coefficients are qualitatively similar regardless of whether two or three years are pooled. This suggests that the values of coefficients are somewhat stable over the period. Four, the foreign assistance variable or its proxy is significant. And five, the coefficients of the time dummies (table 3.11) demonstrate that the urban percentage function shifted down in 1970. However, the regressions in tables 3.12 and 3.13 show that the function returned to its 1960 level in 1980.

TABLE 3.11

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PERCENTAGE MODEL (1960, 1970, AND 1980) WITH TIME VARIABLES FOR 1970 AND 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	2.491	0.214	11.622***
GDP/CAP	0.347	0.056	6.184***
DASSIST	0.239	0.089	2.676***
AGRLAB	-0.173	0.039	-4.478***
INDLAB	0.225	0.038	5.922***
LITR	0.103	0.041	2.505***
TEXPR	0.059	0.031	1.913*
D70	-0.761	0.439	-1.733*
D80	0.016	0.084	0.187

Dependent Variable: Urban Percentage (UP)for 1960, 1970, and 1980.
R^2 = 0.75 and Adjusted R^2 = 0.74.
90 Countries (270 Observations).

*** Significant at the 0.01 Level.
* Significant at the 0.10 Level.

TABLE 3.12

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PERCENTAGE MODEL (1970, AND 1980) WITH ALTERNATIVE VARIABLE (ASSISTR) AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	1.358	0.601	2.261**

TABLE 3.12 (Continued)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
GDP/CAP	0.340	0.060	5.634***
ASSISTR	0.017	0.005	3.846***
AGRLAB	-0.172	0.041	-4.165***
INDLAB	0.180	0.041	4.422***
LITR	0.084	0.053	1.572
TEXPR	0.090	0.032	2.744***
D80	1.118	0.401	2.788***

Dependent Variable: Urban Percentage, UP, for 1970 and 1980.
R^2 = 0.77 and Adjusted R^2 = 0.76.
90 Countries (180 Observations).

*** Significant at the 0.01 Level.

TABLE 3.13

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PERCENTAGE MODEL (1970, AND 1980) WITH THE PROXY VARIABLE (DASSIST) AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	1.538	0.614	2.505***
GDP/CAP	0.320	0.0630	5.071***
DASSIST	0.241	0.097	2.474***
AGRLAB	-0.162	0.042	-3.839***
INDLAB	0.179	0.0417	4.281***
LITR	0.108	0.0539	2.003**

TABLE 3.13 (Continued)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
TEXPR	0.075	0.033	2.271**
D80	0.976	0.408	2.391**

Dependent Variable: Urban Percentage, UP, (1970 and 1980).
R^2 = 0.76 and Adjusted R^2 = 0.75.
90 Countries (180 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

Equation 3.4 including the time dummies and regional dummies was estimated with results shown in table 3.14. (Results using two years for the pool and alternative foreign assistance variable are in Appendix D tables D1 and D2). The results do not vary qualitatively from those in table 3.14). As in previous models, the coefficient of GDP/CAP is positive and significant. Including the regional dummies, however, reduces the size of the coefficients and its significance. The regional dummies are designed on the bases of geography, but they pick up part of the effect of GDP/CAP on urban percentage. We interpret this as follows. In the equation without fixed effects, GDP/CAP captures part of the noneconomic effects associated with underdevelopment--political, historical, cultural. The inclusion of fixed effects allows the GDP/CAP variable to more closely reflect technological and economic effects as they relate to urbanization.

TABLE 3.14

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PERCENTAGE MODEL (1960, 1970, AND 1980) WITH TIME DUMMIES FOR 1970 AND 1980 AND THE REGIONAL VARIABLES

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	1.919	0.244	7.876***
GDP/CAP	0.194	0.056	3.481***
DASSIST	-0.118	0.102	-1.163
AGRLAB	-0.136	0.037	-3.641***
INDLAB	0.186	0.036	5.185***
LITR	0.266	0.046	5.796***
TEXPR	0.080	0.031	2.535***
D70	-1.036	0.444	-2.336**
D80	-0.005	0.079	-0.059
DNA	-0.013	0.157	-0.080
DCA	0.285	0.116	2.444**
DSA	0.507	0.116	4.383***
DMEAST	0.480	0.114	4.195***
DSASIS	-0.088	0.154	-0.572
DSEASIA	-0.110	0.121	-0.914
DSUBAF	0.351	0.169	2.080**
DWAF	0.345	0.142	2.452***
DSAF	-0.205	0.138	-1.481
DANZ	0.334	0.185	1.808*

Dependent Variable: Urban Percentage (UP) for 1960, 1970, and 1980.
R^2 = 0.82 and Adjusted R^2 = 0.81.
90 Countries (270 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

Similarly, the coefficient of DASSIST becomes smaller; it also become insignificant. As we shall see the significant coefficients on regional dummies are to a large extent for variables representing regions with less-developed countries. Correlation between assistance and region may make it impossible to isolate the effect of foreign assistance when the regional dummies are included. The important effect of foreign assistance on urban percentage in earlier models may result because the assistance variable acts as a proxy for noneconomic dimension of development.

Unlike for the assistance variable, the coefficients of the labor composition variables are not much affected by the inclusion of the regional dummy variables. The coefficient of the logarithm of percent labor in agriculture is -0.14; that of percent in industry is 0.19. A one percent decrease in the percentage of labor in agriculture, holding the percentage in industry constant, increases the urban percentage. This effect is due to the substitution of services (nonagricultural and nonindustrial) labor for agricultural labor. Similarly, the coefficient of INDLAB shows substituting industrial labor for service labor leads to greater urbanization. In addition, the positive coefficient for industrial labor and the negative coefficient for agricultural labor imply that an increase in industrial labor at the expense of agricultural labor leads to an increase in urban percentage. The coefficients of these two variables are consistent with Graves and Sexton discussion of urbanization discussed in chapter II. They argue that agglomeration economies are such that increasing industrial labor has a bigger effect on urbanization than does increasing either agricultural or service labor. Our empirical contribution, however, does more than confirm their conjecture. We show that production per capita matters for urbanization; in addition, we show that the sectoral distribution of production matters.

Table 3.14 shows that the literacy rate is also an important determinant of the urban percentage. The size and significance of its coefficient is much greater than in any of the previous models. This strong effect of literacy emerges only after pooling and including the fixed effects. Literacy is another dimension of development. These results are consistent with the proposition that greater literacy is apt to increase the rate of rural to urban migration and hence the urban percentage.

The final continuous variable is exports as a proportion of GDP. Exporting requires a greater amount of urban services than does domestic trade. As expected, the coefficient of the variable is positive. Although both the literacy and exporting variables have questionable significance in the model with data for a single year, they are precisely estimated in the pooled model.

Finally, the coefficients of the regional dummy variables indicate that, other things equal, the urban percentages of Central America and the Caribbean Islands, South America, the Middle East and North Africa, Sub-Saharan Africa, West Africa, and Australia and New

Zealand are greater than the urban percentage of the European region (which is chosen as a standard for comparison). The coefficients of the dummy variables for these regions are 0.285, 0.507, 0.480, 0.351, 0.345, and 0.334. The corresponding t-values are 2.444, 4.383, 4.195, 2.080, 2.452, and 1.808 respectively (table 3.14). The average GDP/CAP (1980) of Central America and the Caribean Islands, South America, the Middle East and North Africa, Sub-Saharan African, and West Africa are 2,564, 3,202, 2,975, 445, and 731 respectively. While, the average GDP/CAP of North America, Europe, and Australia and New Zealand are 11,368, 8,301 and 7,856 respectively.[3]

Conclusion . One can conclude the following important points from the regression results in this chapter.

1. The relationship between urban percentage and economic development (as measured by GDP/CAP, ASSISTR, AGRLAB, INDLAB, LITR, and LTEXR) is very significant.
2. The coefficient of the ASSISTR or its proxy variable (DASSIST) indicates that foreign assistance in less-developed countries has a significant positive impact on the urban percentage. In many developing countries, the largest part of assistance goes to urban areas while only a small part is spent in rural areas. Thus, the more foreign assistance to less-developed countries, the more contracts and jobs are created in urban areas.

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[3]See table C.2 for the average GDP/CAP for all regions.

This leads to more demand for labor, which in turn reinforces the urbanization levels (e.g., there is an increase in in-migration).

3. The positive significant coefficients on regional dummies suggest that countries in the less-developed regions have greater urban percentages than those do countries in other regions, for a given level of the independent variables. In this sense, they may be overurbanized.

CHAPTER IV

METROPOLITAN PERCENTAGE AND METROPOLITAN CONCENTRATION MODELS

Introduction

The metropolitan percentage model examines the relationship between the percent of total population living in cities of 100,000 or more and economic development measured by gross domestic product per capita (GDP/CAP) and other variables. The metropolitan percentage model includes the same independent variables as those in the urban percentage model in chapter III.

Metropolitan concentration (MC) gets at a different aspect of urbanization. It is the percentage of the total urban population in cities of 100,000 population or more. This measure gets at the importance of large cities relative to the total urban population.

Metropolitan Percentage Model

A purpose of estimating the metropolitan percentage model is to see if its determinants differ from the determinants of urban percentage. The metropolitan percentage may be of greater interest for two reasons. One, the concern with urbanization is largely a concern with urbanization in large cities: In this regard, even the 100,000 population threshold may be too small. Two, by looking at population in cities greater than 100,000, we avoid the problem, which exists for urban percentage, of different definitions of urban in different countries.

The Model

The dependent variable is the metropolitan percentage, the population in urban areas of 100,000 or more as a percent of the total population. The independent variables in this model are the same as in the urban percentage model in chapter III. However, fewer countries are included in metropolitan percentage model (and the metropolitan concentration model in the following section) than in the urban percentage model. Due to data availability, we were able to calculate metropolitan percentage (MP) and metropolitan concentration (MC) for only 68 countries (developed and less-developed countries).

An objective of this study is to examine the relationship between concentration in large cities (as measured by MP) and economic development (as measured by GDP/CAP). To establish the relationship, we first estimate the model with one variable (GDP/CAP). Before examining the relationship between the metropolitan percentage (MP) and economic development (as measured by GDP/CAP), it is helpful to present some cross-sectional data that illustrate the relationship between MP and GDP/CAP. Table 4.1 presents data for some developed and less-developed countries. They suggest a positive relationship between MP and GDP/CAP. In a given year, lower levels of development seem to be associated with lower metropolitan percentage. Moreover, metropolitan percentage increases over time.

TABLE 4.1

THE RELATIONSHIP BETWEEN METROPOLITAN PERCENTAGE (MP) AND GROSS DOMESTIC PRODUCT PER CAPITA (GDP/CAP) IN AREAS OF 100,000 OR MORE FOR 1960, 1970, AND 1980

Country	MP			GDP/CAP (In 1980 U.S $)		
	1960	1970	1980	1960	1970	1980
Egypt	.262	.310	.315	496	671	995
Pakistan	.072	.103	.181	558	797	989
Haiti	.060	.082	.118	605	550	696
Sudan	.027	.029	.114	667	683	652
Thailand	.065	.079	.111	688	1,063	1,694
Mozambique	.027	.044	.061	798	1,020	637
Syria	.264	.308	.325	1,234	1,581	3,071
Turkey	.122	.184	.231	1,255	1,702	2,319
Nicaragua	.140	.176	.279	1,588	2,292	2,012
Peru	.150	.234	.513	1,721	2,285	2,456
Mexico	.265	.334	.390	2,157	3,063	4,333
Spain	.279	.334	.423	2,425	4,379	6,131

Sources: 1. MP (for both 1960 and 1970) is Calculated from "World Urbanization 1950-1960" by Kingsley Davis (1969).
2. MP for 1980 is Calculated from Different Issues of Demographic Yearbook (1980-1990).
3. GDP/CAP from Barro (1991).

The relationship between MP and GDP/CAP can be summarized as follows:

$$MP_{it} = (B_0 GDP/CAP^{B1}{}_{it}) E_{it} \qquad (4.1)$$

or in log linear form

$$\ln(MP_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + \ln E_{it} \qquad (4.2)$$

where

MP_{it} = the metropolitan percentage, the population in urban areas of 100,000 or more as a percent of the total population in country i in time t.
i = 1, 2, 3,..., 68, and
t = 1960, 1970, and 1980.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in country i in time t.

B_0 is a constant, B_1 is a coefficient, t is time, and E is the error term.

Regression Results. Equation (4.2) was estimated for the three years and the results are presented in tables 4.2 (1960), 4.3 (1970), and 4.4 (1980) on the following pages.

The results in tables 4.2, 4.3, and 4.4 confirm the association between MP and GDP/CAP suggested in table 4.1. GDP/CAP has a significant, positive impact on metropolitan percentage during these three years. As with urban percentage, the coefficient of GDP/CAP is smaller in each successive year. Unlike the earlier studies, however, the R^2 is little smaller for 1980 than for earlier years.

TABLE 4.2

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL (SINGLE INDEPENDENT VARIABLE) (1960)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	4.721	0.066	71.176***
GDP/CAP	0.797	0.069	11.548***

Dependent Variable: Metropolitan Percentage (MP) for 1960.
R^2 = 0.67 and Adjusted R^2 = 0.66.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.

TABLE 4.3

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL (SINGLE INDEPENDENT VARIABLE) (1970)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	4.843	0.068	71.419***
GDP/CAP	0.669	0.058	11.468***

Dependent Variable: Metropolitan Percentage (MP) for 1970.
R^2 = 0.67 and Adjusted R^2 = 0.66.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.

In the urban percentage model in chapter III, we expected the literacy rate (LITR), the ratio of total goods exports to gross domestic product (TEXPR), and the ratio of foreign assistance to gross domestic product (ASSISTR) to have a positive impact on the urban percentage. Likewise here, we expect these variables to have a positive impact on

TABLE 4.4

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL (SINGLE INDEPENDENT VARIABLE) (1980)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.027	0.070	72.262***
GDP/CAP	0.528	0.051	10.272***

Dependent Variable: Metropolitan Percentage (MP) for 1980.
$R^2 = 0.62$ and Adjusted $R^2 = 0.61$.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.

metropolitan percentage. In many countries (particularly less-developed countries) educated people migrate from both rural and small towns to large urban areas where the opportunity of getting a job with a higher wage is greater. Thus, the more educated people are, the more migrants there will be from both rural and small towns to large urban areas.

Also, we expect the TEXPR variable to have a positive impact on metropolitan percentage because most of exporting activities are concentrated in large urban areas. Therefore, an increase in the ratio of total goods exports to gross domestic product may increase the concentration of economic activities and people in large urban areas. Similarly, the ASSISTR variable is expected to have a positive impact on the metropolitan percentage.

Finally, as in the urban percentage model, we expect the coefficient of AGRLAB to be negative and the coefficient of INDLAB to be positive. An increase in agriculture labor decreases MP, while an increase in INDLAB increases MP.

Adding the variables DASSIST, LITR, TEXPR, AGRLAB, and INDLAB to equation (4.1), the equation becomes:

$$MP_{it} = (B_0 GDP/CAP^{B1}{}_{it} AGRLAB^{B2}{}_{it} INDLAB^{B3}{}_{it} LITR^{B4}{}_{it} \quad TEXPOR^{B5}{}_{it} e^{B6DASSISTit}) E_{it} \qquad (4.3)$$

or in log linear form

$$\ln(MP_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + B_2 \ln(AGRLAB)_{it} + B_3 \ln (INDLAB)_{it} + B_4 \ln(LITR)_{it} + B_5 \ln(TEXPR)_{it} + B_6 (DASSIST)_{it} + \ln E_{it} \qquad (4.4)$$

where

MP_{it} = the metropolitan percentage, the population in areas of 100,000 or more as a percent of the total population in country i in time t.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in country i in time t.

$AGRLAB_{it}$ = percentage of labor force engaged in agriculture in country i in time t.

$INDLAB_{it}$ = percentage of labor force engaged in industry in country i in time t.

$LITR_{it}$ = percentage of literacy, (15 years and older) in country i in time t.

$DASSIST_{it}$ = a proxy for the ratio of foreign assistance to GDP in country i in time t.

For instance:

DASSIST = 1 if the country receives assistance,

0 otherwise (country does not receive assistance)

$TEXPR_{it}$ = the ratio of total goods exports to gross domestic product in country i in time t.

B_0 is a constant, B_1, B_2,..., B_6 are the coefficients, t is time, and E is the error term.

The results of estimating equation (4.4) are in tables 4.5, 4.6, and 4.7.

TABLE 4.5

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL (SIX INDEPENDENT VARIABLES) FOR 1960

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	4.125	1.031	4.002 ***
GDP/CAP	0.322	0.132	2.438 **
DASSIST	0.199	0.169	1.175
AGRLAB	-0.146	0.144	-1.012
INDLAB	0.486	0.114	4.269 ***
LITR	0.153	0.074	2.070 **
TEXPR	-0.070	0.065	-1.071

Dependent Variable: Metropolitan Percentage (MP) for 1960.
R^2 = 0.82 and Adjusted R^2 = 0.80.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

The adjusted R^2s for the expanded model are higher than for the corresponding year with the single model. For 1960, one of the independent variables is significant at the 0.01 level, two are significant at the 0.05 level, and three are insignificant. For 1970, two of the independent variables are significant at the 0.01 level, one is significant at the 0.05 level, and DASSIST is almost significant at the 0.10

TABLE 4.6

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL (SIX INDEPENDENT VARIABLES) FOR 1970

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.653	0.876	6.454 ***
GDP/CAP	0.242	0.119	2.029 **
DASSIST	0.271	0.167	1.619
AGRLAB	-0.337	0.072	-4.668 ***
INDLAB	0.345	0.071	4.824 ***
LITR	0.155	0.097	1.596
TEXPR	-0.106	0.071	-1.493

Dependent Variable: Metropolitan Percentage (MP) for 1970.
$R^2 = 0.82$ and Adjusted $R^2 = 0.80$.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.10 Level.

level (t-value is 1.62). For 1980, one variable is significant at the 0.01 level, two variables are significant at the 0.05 level, two variables are significant at the 0.10 level, and the LITR variable is insignificant. AGRLAB has a negative impact on metropolitan percentage, as expected, for 1970 and 1980, but it is insignificant for 1960. INDLAB has a positive impact on metropolitan percentage, as expected, for 1960, 1970, and 1980. The coefficient of the literacy variable is significant for 1960 and is almost significant at the 0.10 level for 1970 (t-value = 1.60). An increase in the literacy rate increases metropolitan percentage, as is expected.

TABLE 4.7

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL (SIX INDEPENDENT VARIABLES) FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.720	0.701	8.163***
GDP/CAP	0.550	0.126	4.382***
DASSIST	0.384	0.183	2.095**
AGRLAB	-0.131	0.079	-1.687*
INDLAB	0.175	0.078	2.248**
LITR	-0.106	0.138	-0.758
TEXPR	-0.121	0.072	-1.680*

Dependent Variable: Metropolitan Percentage (MP) for 1980.
R^2 = 0.69 and Adjusted R^2 = 0.66.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

The surprising result in table 4.7 is the significant negative effect of the TEXPR variable.

We expected TEXPR to have a positive impact on metropolitan percentage. But the results in table 4.7 shows the contrary. A one percent increase in TEXPR decreases metropolitan percentage by 0.121. In other words, the increase in the ratio of total goods exports to GDP reduces the concentration of population in large urban areas.

The coefficient of DASSIST variable is insignificant in the equation for 1960. In the equation for 1970, it is almost significant at the 0.10 level (t-value is 1.62). But it becomes significant in the equation for 1980 (t-value is 2.10). To check whether the dummy variable is performing as a proxy for foreign assistance, the regressions for 1970 and 1980 were run using foreign assistance as a proportion of GDP--ASSISTR--in place of DASSIST. The regression results are in tables 4.8 (1970) and 4.9 (1980). A comparison of tables 4.8 with 4.6 and 4.9 with 4.7 reveals that replacing DASSIST with ASSISTR has little effect on the coefficients of the other variables. However, the t-values of GDP/CAP, AGRLAB, and INDLAB are larger with ASSISTR than those with DASSIST for both 1970 and 1980. In addition t-values of ASSISTR are larger than those for DASSIST. The results for the literacy variable in the equation for 1970 and 1980 are disappointing. Also the coefficients of TEXPR are insignificant for 1970 and 1980. To further study the determinants of metropolitan percentage we move to the pooled model.

TABLE 4.8

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL WITH THE ALTERNATIVE VARIABLE (ASSISTR) FOR 1970 (SIX INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.311	0.860	6.177***
GDP/CAP	0.309	0.116	2.669***
ASSISTR	0.024	0.009	2.717***
AGRLAB	-0.348	0.070	-4.995***
INDLAB	0.349	0.069	5.066***
LITR	0.107	0.096	1.124
TEXPR	-0.068	0.071	-0.959

Dependent Variable: Metropolitan Percentage (MP) for 1970.
R^2 = 0.83 and Adjusted R^2 = 0.81.
68 Countries (204 Observations).

*** Significant at the 0.01 Level.

TABLE. 4.9

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL WITH THE ALTERNATIVE VARIABLE (ASSISTR) FOR 1980 (SIX INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.716	0.685	8.340***
GDP/CAP	0.570	0.122	4.678***
ASSISTR	0.023	0.009	2.631***
AGRLAB	-0.145	0.078	-1.857*
INDLAB	0.182	0.077	2.373**
LITR	-0.136	0.137	-0.995
TEXPR	-0.103	0.072	-1.436

Dependent Variable: Metropolitan Percentage (MP) for 1980.
R^2 = 0.70 and Adjusted R^2 = 0.67.
68 Countries (204 Observations).

TABLE 4.9 (Continued)

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.05 Level.

The Combined Model. As in the urban percentage model in chapter III, we pool the observations of the three years (1960, 1970, and 1980) to obtain more precise coefficient estimates. In addition, a pooled model allows us to examine both the shift in the function and the fixed effects on metropolitan percentages that are related to variables (e.g., culture, geography, and politics) not included in the model.

Regression Results. Table 4.10 has the results for the equation that uses all three years and the dummy variable, DASSIST, as a proxy for foreign assistance. Table 4.11 has the results from the equation that pools the data for 1970 and 1980 and uses the continuous variable ASSISTR. Table 4.12 has the results from the equation that pools the data for 1970 and 1980 and uses the proxy variable DASSIST.

There are seven important conclusions. One, the coefficients of the independent variables are generally more significant in the pooled regressions than in those for a single year. Two, the foreign assistance variable or its proxy is significant in the three pooled equations. Three, the t-values of ASSISTR are larger than for DASSIST. Four, the coefficients and the corresponding t-values of GDP/CAP, AGRLAB, and INDLAB are little larger with ASSISTR than with DASSIST for the combined two years. Five, the TEXPR variable has a negative impact on MP (tables 4.10, 4.11, and 4.12). This result confirmed the result in table 4.7. The increase in the ratio of total goods exports to GDP reduces the concentration of population in large urban areas. Six, the coefficient of LITR is significant for the equation combining three years of data (table 4.10). However, in the equation using two year of data the coefficients are insignificant. Seven, and finally, the regression results in table 4.10 indicate that the metropolitan percentage function shifted down--not up--between 1960 and 1980.

TABLE 4.10

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL FOR THE COMBINED THREE YEARS (1960, 1970, AND 1980) WITH DUMMY VARIABLES FOR 1970 AND 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.276	0.514	10.27***
GDP/CAP	0.303	0.074	4.107***
DASSIST	0.233	0.103	2.276**
AGRLAB	-0.251	0.047	-5.325***
INDLAB	0.296	0.046	6.376***
LITR	0.163	0.055	2.980***
TEXPR	-0.097	0.041	-2.339**
D70	0.081	0.073	1.112

TABLE 4.10 (Continued)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
D80	-0.402	0.225	-1.783*

Dependent Variable: Metropolitan Percentage (MP) for 1960, 1970, and 1980.
R^2 = 0.76 and Adjusted R^2 = 0.75.
68 Countries (204 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE 4.11

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL FOR THE COMBINED TWO YEARS (1970, AND 1980) WITH A TIME DUMMY FOR 1980 AND THE ALTERNATIVE VARIABLE (ASSISTR)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.541	0.651	8.512***
GDP/CAP	0.416	0.085	4.876***
ASSISTR	0.023	0.006	3.643***
AGRLAB	-0.243	0.054	-4.531***
INDLAB	0.263	0.053	4.956***
LITR	0.049	0.081	0.602
TEXPR	-0.085	0.051	-1.653*
D80	-0.451	0.284	-1.589

Dependent Variable: Metropolitan Percentage (MP) for 1970 and 1980.
R^2 = 0.75 and Adjusted R^2 = 0.74.
68 Countries (136 Observations).

*** Significant at the 0.01 Level.
* Significant at the 0.10 Level.

The next equation (4.4) was estimated with both time and regional dummy variables. The results are presented in table 4.13. Results using two years for the pool with the alternative variable (ASSISTR) and with the proxy variable (DASSIST) are in Appendix tables D.3 and D.4 respectively. A comparison of tables D.3 and D.4 shows the use of ASSISTR or DASSIST does not have much of an effect on the other coefficients. However, a comparison of tables D.3 and D.4 with 4.13 does show some differences. The coefficients and

TABLE 4.12

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL FOR THE COMBINED TWO YEARS (1970, AND 1980) WITH A TIME DUMMY FOR 1980 AND THE PROXY VARIABLE (DASSIST)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.755	0.664	8.666***
GDP/CAP	0.371	0.088	4.217***
DASSIST	0.309	0.127	2.439**
AGRLAB	-0.230	0.055	-4.180***
INDLAB	0.257	0.054	4.732***
LITR	0.090	0.082	1.096
TEXPR	-0.114	0.052	-2.213**
D80	-0.569	0.288	-1.979**

Dependent Variable: Metropolitan Percentage (MP) for 1970 and 1980.
R^2 = 0.74 and Adjusted R^2 = 0.73.
68 Countries (136 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

the corresponding t-values of DASSIST, AGRLAB, INDLAB, LITR, and TEXPR are larger when three years are pooled (table 4.13) than those of two years (tables D.3 and D.4).

There are five important results that can be drawn from table 4.13. One, the coefficients of GDP/CAP are smaller than in equations without fixed effects, just as in the urban percentage model. This means regional dummies pick up part of the effect of GDP/CAP variable on metropolitan

TABLE 4.13

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN PERCENTAGE MODEL FOR THE COMBINED MODEL (1960, 1970, AND 1980) WITH BOTH TIME AND REGIONAL DUMMIES

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.073	0.566	8.961***
GDP/CAP	0.158	0.070	2.258***
DASSIST	0.251	0.113	2.227**
AGRLAB	-0.241	0.045	-5.320***
INDLAB	0.272	0.043	6.347***
LITR	0.253	0.065	3.898***
TEXPR	-0.105	0.043	-2.425**
D70	0.103	0.063	1.688*
D80	-0.400	0.232	-1.720*
DNA	0.222	0.153	1.452
DCA	0.470	0.130	3.608***
DSA	0.642	0.127	5.064***
DMEAST	0.697	0.128	5.464***
DSASIA	0.225	0.203	1.106

TABLE 4.13 (Continued)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
DSESASIA	0.410	0.140	2.925***
DSUBAF	0.028	0.219	0.129
DWAF	0.554	0.175	3.161***
DSAF	-0.064	0.158	-0.403
DANZ	0.365	0.180	2.030**

Dependent Variable: Metropolitan Percentage (MP) for 1960, 1970, and 1980. $R^2 = 0.84$ and Adjusted $R^2 = 0.83$. 68 Countries (204 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

percentage. Two, as compared with table 4.10 the coefficients of AGRLAB and INDLAB are not much affected by the inclusion of regional dummies. The negative coefficient of AGRLAB indicates that an increase in agricultural labor at the expense of service labor reduces the metropolitan percentage. Conversely, the positive coefficient of INDLAB indicates that an increase in industrial labor at the expense of service labor leads to an increase in metropolitan percentage. As in the urban percentage model in chapter III, the coefficients of these two variables confirm Graves and Sexton's argument discussed in Chapter II. That is, an increase in industrial labor has a greater impact on urbanization than does an increase in service labor, which relies less on agglomeration economies. Three, the literacy rate is also an important determinant of metropolitan percentage. A one percent increase in the literacy rate increases the metropolitan percentage by 0.253 percent. This positive impact of literacy rate confirms the argument that educated people migrate from rural and small towns to large urban areas. Four, the TEXPR variable has a negative coefficient. A one percent increase in TEXPR decreases the metropolitan percentage by 0.105. Five, the coefficients of regional dummies indicate that, other things equal, the metropolitan percentages of the following regions: Central America and Caribbean Islands, South America, Middle East and North Africa, South East Asian Islands and East Asia, West Africa, and Australia and New Zealand, are greater than the metropolitan percentages of the European region (which is chosen as a standard for comparison). The coefficients and (the t-values) for these regions are 0.470, 0.642, 0.697, 0.410, 0.554, and 0.365 and (3.608, 5.064, 5.464, 2.925, 3.161, and 2.030) respectively (table 4.13). Therefore, like the urban percentage model, these positive coefficients suggest that these regions are overurbanized.

Do the independent variables have different effects on MP and UP? To answer this question, we run the urban percentage model in chapter III for the same 68 countries as are in the metropolitan percentage model.

Table 4.14 presents the coefficients and the corresponding t-value for both urban percentage and metropolitan percentage models. A comparison of the coefficients and the corresponding t-values of the UP model with the coefficients and the t-values of the MP model shows the following.

1. The coefficients of the GDP/CAP variable are positive and significant for both UP and MP. However, the coefficient and the t-value for the UP equation are larger than for the MP equation. An increase in GDP/CAP by one percent, holding other variables constant, increases UP by 0.254 percent, while MP increases by 0.158 percent. The coefficient for UP is 50 percent larger than the one for MP. As GDP/CAP increases, urban population as a proportion of total population increases. But the proportion of the population in small cities (less than 100,000) increases faster than the proportion in large cities.
2. The coefficient of DASSIST is positive and significant for MP, while for UP it is insignificant. An increase in foreign assistance leads to an increase in the proportion of a nation's population in areas of 100,000 or more.
3. Table 4.14 shows that both UP and MP are negatively related to the AGRLAB variable, holding other variables constant. However, the t-value and the coefficient for MP equation are larger than for UP equation. A decrease in AGRLAB by one percent increases MP by 0.241 percent and UP by 0.131 percent.

TABLE 4.14

THE COEFFICIENTS AND THE T-VALUES OF URBAN PERCENTAGE AND METROPOLITAN PERCENTAGE MODELS WITH TIME DUMMIES FOR 1970 AND 1980 AND REGIONAL DUMMIES

Variable	Coefficient of UP	Coefficient of MP	T-Value for UP	T-Value for MP
CONSTANT	2.126	5.073	6.11***	8.961***
GDP/CAP	0.254	0.158	4.85***	2.258***
DASSIST	-0.050	0.251	-0.60	2.227**
AGRLAB	-0.131	-0.241	-2.38***	-5.320***
INDLAB	0.292	0.272	5.95***	6.347***
LITR	0.189	0.253	3.90***	3.898***
TEXPR	-0.006	-0.105	-0.19	-2.425**
D70	0.101	0.103	0.23	1.688*
D80	0.035	-0.400	0.46	-1.720*
DNA	-0.028	0.222	-0.24	1.452
DCA	0.404	0.470	3.99***	3.608***
DSA	0.470	0.642	4.80***	5.064***
DMEAST	0.520	0.697	5.10***	5.464***
DSASIA	0.038	0.225	0.25	1.106
DSEASIA	0.155	0.410	1.48	2.925***
DSUBAF	0.335	0.028	2.09**	0.129
DWAF	0.588	0.554	4.49***	3.161***
DSAF	-0.178	-0.064	-1.53	-0.403
DANZ	0.191	0.365	1.75	2.030**

R^2= 0.78 and Adjusted R^2= 0.76 for the Dependent Variable Metropolitan Percentage (MP).
R^2= 0.89 and Adjusted R^2= 0.88 for the Dependent Variable Urban Percentage (UP).
68 Countries (204 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

4. Table 4.14 also shows a strong positive relationship

between the INDLAB variable and urbanization measures (UP and MP). Yet, the impact of industrial economies on UP is greater than the impact on MP. A one percent increase in INDLAB increases UP by 0.292, while MP increases by 0.272. Therefore, despite the fact that INDLAB is an important determinant of urbanization in general, its positive impact on urban percentage is a little larger than its impact on MP.

5. The relationship between the LITR variable and UP and MP is positive and significant. However, the impact of LITR is about 20 percent larger on MP than on UP.
6. The TEXPR variable has a significant negative impact on MP and insignificant impact on UP. An increase in the ratio of total goods exports to gross domestic product decreases the urbanization level (as measured by MP). Recall that TEXPR has a significant positive impact on UP in the larger sample used in chapter III (table 3.14) where 90 countries are included.
7. The regression results in table 4.14 suggest that the MP function shifted up in 1970, then shifted down in 1980, while the UP function did not change.
8. The regression results in table 4.14 shows that both urban percentages and metropolitan percentages, other things equal, were greater in Central America and the Caribbean Islands, South America, Middle East and North Africa, West Africa, and Australia and New Zealand than in Europe. The results also show that Sub-Saharan

Africa had greater UP, other things equal, than the European region during the three years (1960, 1970, and 1980). Table 4.14 also shows that South East Asian Islands and South Asia had greater MP, other things equal, than the European region for the three years 1960, 1970, and 1980.

Metropolitan Concentration Model

Introduction. Metropolitan concentration (MC) gets at a different aspect of urbanization. It is the percentage of the total urban population in cities of 100,000 population or more. This measure gets at the importance of large cities relative to the total urban population. An objective of this study is to examine the relationship between urban concentration in large urban areas and economic development. Therefore, we first estimate the model with a single variable (GDP/CAP) to establish the relationship between metropolitan concentration and economic development.

The Model. The relationship between metropolitan concentration (MC) and economic development (as measured by GDP/CAP) to be estimated is:

$$MC_{it} = (B_0 GDP/CAP^{B1}{}_{it}) E_{it} \qquad (4.5)$$

or in log linear form

$$\ln(MC_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + \ln E_{it} \qquad (4.6)$$

where

MC_{it} = the metropolitan concentration, the population in urban areas of 100,000 or more as a percent of the total urban population in country i in time t.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in country i in time t.

B_0 is a constant, B_1 is a coefficient, t is time, and E is the error term.

Regression Results. Equation (4.6) was estimated and the results are presented in tables 4.15 (1960), 4.16 (1970), and 4.17 (1980) below.

TABLE 4.15

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN CONCENTRATION MODEL (SINGLE INDEPENDENT VARIABLE) FOR 1960

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.239	0.034	182.887***
GDP/CAP	0.055	0.035	1.553

Dependent Variable: Metropolitan Concentration (MC) for 1960.
$R^2 = 0.04$ and Adjusted $R^2 = 0.02$.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.

TABLE 4.16

LOGARITHMIC REGRESSION ESTIMATES OF THE
METROPOLITAN CONCENTRATION MODEL
(SINGLE INDEPENDENT VARIABLE)
FOR 1970

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.306	0.034	185.367***
GDP/CAP	0.067	0.029	2.284**

Dependent Variable: Metropolitan Concentration (MC) for 1970.
$R^2 = 0.07$ and Adjusted $R^2 = 0.06$.

68 Countries (68 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

TABLE 4.17

LOGARITHMIC REGRESSION ESTIMATES OF THE
METROPOLITAN CONCENTRATION MODEL
(SINGLE INDEPENDENT VARIABLE)
FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.244	0.045	139.918***
GDP/CAP	0.068	0.033	2.060**

Dependent Variable: Metropolitan Concentration (MC) for 1980.
$R^2 = 0.06$ and Adjusted $R^2 = -0.05$.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

The results in tables 4.15-4.17 demonstrate a positive relationship between metropolitan concentration and economic development. The coefficient in table 4.15 is positive and is almost significant at the 0.10 level (t-value is 1.553). However, the coefficients for the 1970 and 1980 regressions are significant. The coefficient and the (t-values) are 0.067 and 0.068 and (2.284 and 2.060) for 1970 and 1980 respectively.

As in the previous models (urban percentage and metropolitan percentage), the AGRLAB variable is expected to have a negative impact on metropolitan concentration. A decrease in agriculture labor, holding industry constant, may lead to greater concentration in areas of 100,000 or more. This occurs because the shift of labor from agricultural to the service sector. Similarly, an increase in industrial labor at the expense of either services or agriculture is expected to increase metropolitan concentration.

Based on the results of the metropolitan percentage model in chapter III, we expect the TEXPR variable to have a negative impact on metropolitan concentration. Many countries (particularly developing countries) concentrate on exports of primary products and importation of manufactured goods. The production of these export goods takes place in urban areas such as towns, ports, and cities (not necessarily big cities). Thus, as more goods are exported, more contracts and jobs are created in these urban areas which in turn lead to greater concentration of both economic activities and population. Thus, an increase in TEXPR may lead to more urban concentration in areas other than the largest cities (e.g., the degree of metropolitan concentration decreases).

As in the metropolitan percentage model, we expect LITR and ASSISTR variables to have a positive impact on MC. Adding the variables AGRLAB, INDLAB, DASSIST, LITR, and TEXPR to equation (4.5), the equation becomes:

$$MC_{it} = (B_0 GDP/CAP^{B1}{}_{it} AGLAB^{B2}{}_{it} INLAB^{B3}{}_{it} LITR^{B4}{}_{it} \quad TEXPOR^{B5}{}_{it} e^{B6DASSISTit}) E_{it} \qquad (4.7)$$

or in log linear form

$$\ln(MC_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + B_2 \ln(AGRLAB)_{it} + B_3 \ln (INDLAB)_{it} + B_4 \ln(LITR)_{it} + B_5 \ln(TEXPR)_{it} + B_6(DASSIST)_{it} + \ln E_{it} \qquad (4.8)$$

where

MC_{it} = the metropolitan concentration measure, the population in urban areas of 100,000 or more as a percent of the total urban population in country i in time t.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in country i in time t.

$AGRLAB_{it}$ = percentage of labor force engaged in agriculture in country i in time t.

$INDLAB_{it}$ = percentage of labor force engaged in industry in country i in time t.

$LITR_{it}$ = percentage of literacy, (15 years and older) in country i in time t.

$DASSIST_{it}$ = a proxy for the ratio of foreign assistance to GDP in country i in time t.

For instance:

DASSIST = 1 if the country receives assistance,
0 otherwise (country does not receive assistance)

$TEXPR_{it}$ = the ratio of total goods exports to GDP in country i in time t.

B_0 is a constant, B_1, B_2,..., B_6 are the coefficients, t is time, and E is the error term.

Equation (4.8) was estimated and the regression results are given in tables 4.18 (1960), 4.19 (1970), and 4.20 (1980).

These equations have very low adjusted R^2s and a few significant coefficients (particularly, for 1970). The only robust variable is the export variable, which has a significant negative coefficient in each equation. Its coefficients and (t-values) are -0.088, -0.124, and -0.083 and (-2.198, -2.804, and -1.805) for 1960, 1970, and 1980 respectively. These results suggest that an increase in the ratio of total goods exports to gross domestic product decreases metropolitan concentration. The coefficient of GDP/CAP for 1960 is negative and significant. An increase in economic development (as measured by GDP/CAP) decreases the urban concentration in metropolitan areas (as measured by MC). However, the impact in 1970 and 1980 is insignificant. AGRLAB, as expected, has a negative impact on MC for 1960 and 1980. An increase in agriculture labor at the expense of industry or services labor leads to a decrease in urban concentration. The coefficient of DASSIST is insignificant for 1960 and 1970. However, in 1980 the impact becomes significant. A one percent increase in foreign assistance increases MC by 0.199 percent. [As Appendix tables D.5 and D.6 show, using ASSISTR (table D.5) in place of DASSIST does not change things].

TABLE 4.18

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN CONCENTRATION MODEL (SIX INDEPENDENT VARIABLE) FOR 1960

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	8.341	0.633	13.178***
GDP/CAP	-0.157	0.081	-1.931*
DASSIST	-0.147	0.104	-1.410
AGRLAB	-0.270	0.089	-3.044***
INDLAB	-0.041	0.070	-0.583
LITR	0.029	0.045	0.628
TEXPR	-0.088	0.040	-2.198**

Dependent Variable: Metropolitan Concentration (MC) for 1960.
$R^2 = 0.24$ and Adjusted $R^2 = 0.17$.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE 4.19

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN CONCENTRATION MODEL (SIX INDEPENDENT VARIABLE) FOR 1970

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.589	0.549	13.831***
GDP/CAP	0.007	0.075	0.094
DASSIST	-0.141	0.105	-1.342
AGRLAB	-0.016	0.045	-0.364
INDLAB	-0.003	0.045	-0.056
LITR	0.056	0.061	0.926
TEXPR	-0.124	0.044	-2.804***

Dependent Variable: Metropolitan Concentration (MC) for 1970.
R^2 = 0.20 and Adjusted R^2 = 0.12.
68 Countries (68 Observations).

** Significant at the 0.01 Level.

TABLE 4.20

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN CONCENTRATION MODEL (SIX INDEPENDENT VARIABLE) FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.806	0.447	15.24***
GDP/CAP	0.051	0.080	0.638
DASSIST	0.199	0.117	1.706*
AGRLAB	-0.098	0.050	-1.944*
INDLAB	0.136	0.050	2.732***

TABLE 4.20 (Continued)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
LITR	-0.080	0.088	-0.909
TEXPR	-0.083	0.046	-1.805*

Dependent Variable: Metropolitan Concentration (MC) for 1980.
R^2 = 0.26 and Adjusted R^2 = 0.18.
68 Countries (68 Observations).

*** Significant at the 0.01 Level.
*   Significant at the 0.10 Level.

In general, tables 4.18, 4.19, and 4.20 show poor results for many independent variables. A possible reason for these insignificant results is the correlation among the independent variables. Checking this problem, we found that most of the independent variables are highly correlated. Tables 4.21, 4.22, and 4.23 show the high correlation between these independent variables. For instance, GDP/CAP has a high correlation with the four variables DASSIST, AGRLAB, INDLAB, and LITR in 1960, 1970, and 1980. Also tables 4.21, 4.22, and 4.23 show a high correlation between AGRLAB variable and both INDLAB and LITR variables for the three years. This holds true for the correlation between INDLAB and LITR variables.

TABLE 4.21

CORRELATION MATRIX INDEPENDENT VARIABLES
FOR METROPOLITAN CONCENTRATION MODEL
(1960)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR
GDP/CAP	1.00					
DASSIST	-0.79	1.00				
AGRLAB	-0.88	0.69	1.00			
INDLAB	0.87	-0.73	-0.96	1.00		
LITR	0.74	-0.55	-0.84	0.81	1.00	
TEXPR	0.25	-0.25	-0.20	0.22	0.12	1.00

TABLE 4.22

CORRELATION MATRIX INDEPENDENT VARIABLES
FOR METROPOLITAN CONCENTRATION MODEL
(1970)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR
GDP/CAP	1.00					
DASSIST	-0.84	1.00				
AGRLAB	-0.84	0.68	1.00			
INDLAB	0.76	-0.65	-0.87	1.00		
LITR	0.70	-0.52	-0.84	0.72	1.00	
TEXPR	0.51	-0.44	-0.41	0.37	0.34	1.00

TABLE 4.23

CORRELATION MATRIX INDEPENDENT VARIABLES
FOR METROPOLITAN CONCENTRATION MODEL
(1980)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR
GDP/CAP	1.00					
DASSIST	-0.88	1.00				
AGRLAB	-0.81	0.69	1.00			
INDLAB	0.71	-0.62	-0.87	1.00		
LITR	0.60	-0.48	-0.78	0.70	1.00	
TEXPR	0.56	-0.54	-0.36	0.31	0.19	1.00

The Combined Model. So far we have examined the relationship between concentration and economic development for the three years 1960, 1970, and 1980 separately. As in the previous models, we combine the data of the three years (1960, 1970, and 1980). Pooling the data provides additional information which may lead to better estimates of the effect of the economic development indicators on metropolitan concentration. Thus, the model now has 204 observations for the 68 Countries.

Regression Results. The equation including the time dummies for 1970 and 1980 was estimated and the results are in table 4.24. The coefficients of the time dummies show the metropolitan concentration function shifted up between 1960 and 1970. Between 1970 and 1980 it shifted down so that it was lower than it was in 1960. The coefficient of

AGRLAB is negative and significant. A one percent decrease

TABLE 4.24

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METROPOLITAN CONCENTRATION MODEL (1960, 1970, AND 1980) WITH DUMMY VARIABLES FOR 1970 AND 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.314	0.315	23.21***
GDP/CAP	-0.012	0.045	-0.255
DASSIST	-0.018	0.063	-0.284
AGRLAB	-0.068	0.029	-2.365**
INDLAB	0.075	0.028	2.645***
LITR	-0.002	0.034	-0.053
TEXPR	-0.096	0.025	-3.783***
D70	0.102	0.044	2.299**
D80	-0.481	0.138	-3.480***

Dependent Variable: Metropolitan Concentration (MC) for 1960, 1970, and 1980.
$R^2 = 0.17$ and Adjusted $R^2 = 0.13$.
68 Countries (204 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

in agriculture labor increases the metropolitan concentration by 0.068 percent. The coefficient of the INDLAB variable is positive and significant. A one percent increase in industry increases the metropolitan concentration by 0.075 percent. The negative effect of AGRLAB and the positive effect of INDLAB in this model are the same results we found in the previous models (urban percentage and metropolitan percentage). Also the TEXPR variable has a significant negative impact on MC, as was expected. A one percentage increase in TEXPR decreases metropolitan concentration by 0.096 percent. However, GDP/CAP, DASSIST, and LITR variables are insignificant.

As in the previous models, we run the metropolitan concentration model for the combined two years 1970 and 1980 with ASSISTR in place of DASSIST. Table D.7, in Appendix D, shows the results for the combined two years 1970 and 1980 with ASSISTR in place of DASSIST. While table D.8, in Appendix D, shows the results for the combined two years 1970 and 1980 with DASSIST. A comparison of these two tables does not show much difference, albeit, the variables AGRLAB and INDLAB are more significant with ASSISTR than those with DASSIST. In addition, the coefficient and the t-value of ASSISTR are positive and significant, while those with DASSIST are insignificant. Therefore, using either ASSISTR or its proxy (DASSIST) does not have any qualitative effect on the coefficients of the other variables.

The equation (4.8) including both time and the regional dummies was estimated and the results are in table 4.25. They indicate that the metropolitan concentrations of North America, South America, Middle East and North Africa, South East Asian Islands and East Asia, South Africa, and Australia and New Zealand are greater than the metropolitan concentrations of the European region (which is chosen as a standard for comparison). The coefficients and t-values (in parenthesis) for these regions are 0.208, 0.209, 0.211, 0.423, 0.300, and 0.234 and (2.020, 2.451, 2.455, 4.489, 2.817, and 1.935) respectively. In other words, these regions had greater metropolitan concentration in areas of 100,000 or more relative to the European and the other regions in the model.

TABLE 4.25

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METROPOLITAN CONCENTRATION MODEL (1960, 1970, AND 1980) WITH TIME DUMMIES FOR 1970 AND 1980 AND THE ELEVEN REGIONAL DUMMIES

Independent Variable	Estimated Coefficient	Standard Erro	T-Value
CONSTANT	6.990	0.381	18.36***
GDP/CAP	-0.025	0.047	-0.526
DASSIST	-0.038	0.076	-0.501
AGRLAB	-0.101	0.030	-3.333***
INDLAB	0.117	0.029	4.059***
LITR	-0.069	0.044	-1.385
TEXPR	-0.052	0.029	-1.802*
D70	0.100	0.043	2.353**
D80	-0.242	0.156	-1.546
DNA	0.208	0.103	2.020**
DCA	0.116	0.088	1.329
DSA	0.209	0.085	2.451***
DMEAST	0.211	0.086	2.455***
DSASIA	0.195	0.137	1.429

TABLE 4.25 (Continued)

Independent Variable	Estimated Coefficient	Standard Erro	T-Value
DSESASIA	0.423	0.094	4.489***
DSUBAF	-0.011	0.148	-0.075
DWAF	0.009	0.118	0.075
DSAF	0.300	0.106	2.817***
DANZ	0.234	0.121	1.935**

Dependent Variable Metropolitan concentration (MC) for 1960, 1970, and 1980.
$R^2 = 0.34$ and Adjusted $R^2 = 0.28$.
68 Countries (204 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

The coefficients of AGRLAB, INDLAB, and TEXPR are significant in the model with regional dummies. The negative coefficients of AGRLAB and the positive coefficient of INDLAB implies that an increase in industrial labor at the expense of agricultural labor leads to an increase in metropolitan concentration. As in the previous models, the coefficients of these two variables confirm Graves and Sexton's argument discussed in chapter II. An increase in industrial labor has a greater effect on urbanization than does an increase in service labor, which relies less on agglomeration economies.

Table 4.25 shows that TEXPR has a significant negative impact on MC, as expected. This result is the same result we found in the metropolitan percentage model. An increase in the ratio of the total goods exports to GDP leads to less urbanization in large urban areas (as measured by MC). The coefficient of INDLAB is positive and significant. A one percent increase in industry labor increases MC by 0.117 percent. The LITR variable is insignificant.

Table 4.25 shows that metropolitan concentration function shifted up between 1960 and 1970. Finally, the results in table 4.25 indicate that the combined model has the best estimates for the metropolitan concentration.

<u>Conclusion</u>. One can conclude the following points from the regression results in this chapter. One, GDP/CAP has a significant positive impact on MP (tables 4.2-4.14). Two, the coefficients of GDP/CAP for the single variable for the metropolitan concentration model are positive and significant (tables 4.15-4.17). However, the result in table 4.18 (with six independent variables) shows that GDP/CAP has a negative impact on MC. Three, the variables INDLAB and AGRLAB have the expected signs. That is, AGRLAB has a significant negative impact and INDLAB has a significant positive impact on metropolitan percentage and metropolitan concentration. Four, TEXPR is a very important determinant of urbanization. An increase in the ratio of total goods exports to GDP decreases the metropolitan concentration in areas of 100,000 or more (as measured by MP and MC). Five, the LITR variable has a significant positive impact on the metropolitan percentage; however, its effect on the metropolitan concentration is insignificant. Six,

less-developed regions (e.g., less-developed countries) had greater urbanization levels (as measured by MP and MC) than developed regions (e.g., developed countries) during the three years (1960, 1970, and 1980). Seven, the results of the combined cross-sectional model are the best estimates for both metropolitan percentage and metropolitan concentration models.

CHAPTER V

THE PRIMACY MODEL

Introduction

<u>Primacy</u> is the (excessive) concentration of urban population in one or two large cities. Mills and Hamilton (1989, p. 411) state that:

> The term primacy refers to the size, or allegedly excessive size, of the largest metropolitan area in a country. More generally, the term sometimes refers to the claim that several of the metropolitan areas are too large.

In his article, "Analyzing Third World Urbanization," Jan Brueckner (1990, p. 587) states that "Economic development in the third world is being accompanied by explosive urban growth." Brueckner notes that annual urban growth rates in developed countries ranged between 1.5% and 2.4% from 1950 to 1990 (projected), while third world cities grew at rates between 3.9% and 4.7% over this period. This means that during 1950-1990 period large cities (or primate cities) have been created in many developing countries.

The Model

Since we are interested in the degree to which a country exhibits primacy (that is the concentration of the urban population in one large city), a suitable primacy measure is the ratio of the population of the largest city to the total urban population.

Independent Variable

As an initial test of the relationship between primacy and economic development, we first regress primacy on gross domestic product per capita (GDP/CAP) using data for 1960, 1970, and 1980. We expect a negative impact of GDP/CAP on urban primacy. A lot of economic activities are conducted in urban areas other than primate cities. Thus, as economic development occurs (GDP/CAP increases) many economic activities (e.g., services and exporting of primary product) that rely less on agglomeration economies expand, which in turn leads to greater urbanization in areas other than primate cities. In other words, as economic development progresses in many parts of the country, the migration from both rural and small towns to primate cities become less attractive to a lot of people. Therefore, we expect that as economic development occurs (GDP/CAP increases) the degree of urban primacy decreases.

The expected relationship between urban primacy and economic development can be summarized by the following equation:

$$P_{it} = (B_0 GDP/CAP^{B1}{}_{it}) E_{it} \quad (5.1)$$

or in log linear form

$$\ln(P_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + \ln E_{it} \quad (5.2)$$

where

P_{it} = the primacy measure, which is the ratio of the population of the largest city to the total urban population in country i in time t,

i = 1,..........., 75 and

t = 1960, 1970, and 1980.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in country i in time t.

B_0 is a constant, B_1 is the coefficient, t is time, and E is the error term.

Regression Results. Equation (5.2) was estimated and the regression results are presented in tables 5.1 (1960), 5.2 (1970), and 5.3 (1980) below.

TABLE 5.1

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL (SINGLE INDEPENDENT VARIABLES) FOR 1960

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.418	0.062	54.945***
GDP/CAP	-0.090	0.064	-1.396*

Dependent Variable: Primacy (P) for 1960.
R^2 = 0.03 and Adjusted R^2 = 0.01.
75 Countries (75 Observations).

*** Significant at the 0.01 Level
* Significant at the 0.10 Level (One Tail Test)

Tables 5.1, 5.2, and 5.3 show the expected negative relationship between urban primacy and economic development. The regression coefficients with t-values in parentheses are -0.090 (-1.396), -0.171 (-2.957), and -0.152 (-2.892) for 1960, 1970, and 1980 respectively.

TABLE 5.2

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL (SINGLE INDEPENDENT VARIABLES) FOR 1970

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.547	0.070	51.007***
GDP/CAP[a]	-0.171	0.058	-2.957***

Dependent Variable: Primacy (P) for 1970.
R^2 = 0.11 and Adjusted R^2 = 0.09.
75 Countries (75 Observations).

*** Significant at the 0.01 Level
[a] One Tail Test

TABLE 5.3

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL (SINGLE INDEPENDENT VARIABLES) FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.537	0.072	48.858***
GDP/CAP[a]	-0.152	0.053	-2.892***

Dependent Variable: Primacy (P) for 1980.
R^2 = 0.10 and Adjusted R^2 = 0.09.
75 Countries (75 Observations).

*** Significant at the 0.01 Level.
[a] One Tail Test.

One can conclude from the results in tables 5.1, 5.2, and 5.3 the following two points: First, high levels of economic development (high levels of GDP/CAP) are associated with less urban primacy. Second, the relationship between urban primacy and economic development may be weaker for 1960 than for 1970 and 1980. Now that the relationship between urban primacy and economic development has been established, a second question arises. What other factors affect urban primacy? Admittedly, the level of economic development is not the only one. The values of the R^2s of 1960, 1970, and 1980 (0.03, 0.11, and 0.10, respectively) indicate that a large portion of the variation in urban primacy can not be attributed to economic development as measured by GDP/CAP. The other variables used previously such as percentage of labor in agriculture (AGRLAB), percentage of labor in industry (INDLAB), the ratio of foreign assistant to gross domestic product (ASSISTR), the literacy rate (LITR), and the ratio of total goods exports to gross domestic product (TEXPR) are expected to have an impact upon urban primacy.

We expect the coefficient of AGRLAB to be negative. The coefficients of the variables INDLAB, LITR, and ASSISTR are expected to be positive. Industrialization is expected to have a positive impact because it relies more on agglomeration economies. Similarly, the literacy variable is expected to have a positive impact on urban primacy. In many countries (particularly less-developed countries) the opportunity of getting a job with a higher wage is in large cities. Thus, educated people migrate from rural areas and small towns to large cities. So, the increase in LITR variable may reinforce the urban primacy.

Based on the results of both metropolitan percentage and metropolitan concentration models in the previous chapter, the coefficient of TEXPR variable is expected to be a negative. Apparently many countries are exporting from small towns, ports, airports or small cities. Thus, an increase in the exporting activities may have a negative impact on the urban primacy.

Finally, the ASSISTR variable is expected to have a positive impact on the primate cities. As we have argued in chapter III, developing countries spend most of their foreign assistance on large urban areas (e.g., capital cities) and only a small part goes to rural areas and to small cities. Therefore, we expect the foreign assistance to have a positive impact on urban primacy.

In addition, three new variables are expected to affect primacy. They follow. Administration Organization: The structure of the government administration is very important in less-developed countries. For instance, Iran, Ghana, Kenya, Egypt, Yemen, Jordan, Sudan, Syria, and other countries have central governments that concentrate power, administration, businessmen, and politicians in the largest cities, (e.g., the capital city). Thus, concentration of market and social infrastructures such as government buildings, large hospitals, and universities are located in the largest cities. Therefore, these countries usually have one or two large cities (e.g., the capital city).

Mutlu (1989, p. 618) notes that:

> centralized power forms a single focus for the spatial concentration of the mutually symbiotic political, administrative, and economic elites and for the adjunct bureaucracy, leading to the concentration of the market and of the physical and social and infrastructure.

He explains that the location of illicit businesses and unemployment in the largest city will provide them with access to social services such as health, education, and many other goods and services at subsidized prices.

Henderson (1982, p. 296) states that:

> if a particular city is favored by the national government, some of this benefit will be expropriated by the landowners (residents or rentiers), some will be dissipated by inefficiencies created in markets from the attempt to indirectly restrict city sizes, and some will be dissipated by uncontrolled entry. In any case, the result will be a larger city size relative to other cities, and an increase in urban concentration.

This means that when a central government favors its capital city and offers some subsidies to the city, then people and firms prefer to be concentrated in this city which leads to a larger city.

Two new dummy variables are included in the model: the first dummy (DCENTR) is a proxy for a central government. The dummy variable has a value of one for a central government, and a value of zero otherwise (e.g., a federal government). And the second dummy (DCAPCTY) variable has a value of one if a country's largest city is the capital, and a value of zero otherwise (when the largest city is not the capital). Total population: The population variable (POP) is expected to have a negative impact on urban primacy. The more people in a country the more urban places there will be in this country. Mutlu (p. 630) notes:

> the larger the population of a country, the greater the likelihood is that the minimum threshold demand for the provision of a higher order goods will be fulfilled at more than one location.

Adding the variables AGRLAB, INDLAB, DASSIST, LITR, TEXPR, DCENTR, DCAPCTY, and POP to equation (5.1), the equation becomes:

$$P_{it} = (B_0 GDP/CAP^{B1}{}_{it} AGRLAB^{B2}{}_{it} INDLAB^{B3}{}_{it} LITR^{B4}{}_{it} TEXPR^{B5}{}_{it} POP^{B6}{}_{it} e^{B7DCENTRit+B8DCAPCTYit+B9DASSISTit}) E_{it} \quad (5.3)$$

or in log linear form

$$\ln(P_{it}) = \ln B_0 + B_1 \ln(GDP/CAP)_{it} + B_2 \ln(AGRLAB)_{it} + B_3 \ln(INDLAB)_{it} + B_4 \ln(LITR)_{it} + B_5 \ln(TEXPR)_{it} + B_6 \ln(POP)_{it} + B^7 (DCENTR)_{it} + B_8 (DCAPCTY)_{it} + B_9 (DASSIST)_{it} + \ln E_{it} \quad (5.4)$$

where

P_{it} = the primacy measure, which is the ratio of the population of the largest city to the total urban population in country i in time t.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in country i in time t.

$AGRLAB_{it}$ = percentage of labor force engaged in agriculture in country i in time t.

$INLDAB_{it}$ = percentage of labor force engaged in industry in country i in time t.

$LITR_{it}$ = percentage of literacy, (15 years and older) in country i in time t.

$DASSIST_{it}$ = a proxy for the ratio of foreign assistance to gross domestic product in country i in time t. For instance: DASSIST = 1 if the country receives assistance, 0 otherwise (country does not receive assistance).

$TEXPR_{it}$ = the ratio of total goods exports to gross domestic product in country i in time t.

POP_{it} = the total population in country i in time t.

$DCENTR_{it}$ = the dummy variable for the type of the administration structure in country i in time t. For instance, DCENTR =1 if a country has a central government, 0 otherwise (e.g., a federal government)

$DCAPCTY_{it}$ = the dummy variable for the capital city in country i in time t. For instance, DCAPCTY = 1 if a country's largest city is the capital, 0 otherwise (e.g., the capital is not the largest city)

B_0 is a constant, B_1, B_2,..., and B_9 are the coefficients, t is time, and E is the error term.

Equation (5.4) was estimated and the regression results are given in tables 5.4 (1960), 5.5 (1970), and 5.6 (1980) on the following pages.

TABLE 5.4

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL (NINE INDEPENDENT VARIABLES) FOR 1960

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	4.600	0.692	6.651 ***
GDP/CAP	-0.067	0.116	-0.580
DASSIST	0.026	0.170	0.150
AGRLAB	-0.142	0.098	-1.447
INDLAB	-0.166	0.109	-1.532
LITR	0.136	0.070	1.940 *
TEXPR	-0.115	0.065	-1.781 *
POP	-0.253	0.046	-5.482 ***
DCENTR	0.057	0.148	0.383
DCAPCTY	0.222	0.123	1.795 *

Dependent Variable: Primacy (P) for 1960.
R^2 = 0.51 and Adjusted R^2 = 0.44.
75 Countries (75 Observations).

*** Significant at the 0.01 Level.
*   Significant at the 0.10 Level.

Table 5.4 (1960) shows that the coefficients of TEXPR, and POP are significant and have the expected negative signs. The coefficient of AGRLAB has the expected sign, but its t-value is -1.447. The coefficient of LITR is positive and significant. The coefficient of DCAPCTY is also positive and significant. As it is expected, the capital city that is also the largest city has a significant positive impact on primacy. However, the variables GDP/CAP, DASSIST, DCENTR, and INDLAB are insignificant. The R^2 is 0.51.

TABLE 5.5

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL (NINE INDEPENDENT VARIABLES) FOR 1970

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.691	1.437	4.658 ***
GDP/CAP	-0.046	0.115	-0.404
DASSIST	0.097	0.168	0.577
AGRLAB	0.027	0.070	0.381
INDLAB	-0.060	0.070	-0.856
LITR	0.095	0.085	1.117
TEXPR	-0.182	0.073	-2.515 **
POP	-0.278	0.046	-6.022 ***
DCENTR	0.168	0.136	1.236
DCAPCTY	0.162	0.117	1.391

Dependent Variable: Primacy (P) for 1970.
$R^2 = 0.63$ and Adjusted $R^2 = 0.57$.
75 Countries (75 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

In table 5.5 (1970), R^2 is 0.63, but only two of the independent variables have significant coefficients. In table 5.6 (1980), R^2 is 0.52, but again only two of the coefficients are significant at the 0.01 level; one is significant at the 0.05 level. The coefficient of LITR is almost significant at the 0.10 level (t-value is 1.614).

TABLE 5.6

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL (NINE INDEPENDENT VARIABLES) FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.908	1.150	6.006 ***
GDP/CAP	-0.089	0.111	-0.801
DASSIST	0.012	0.174	0.070
AGRLAB	0.031	0.074	0.424
INDLAB	-0.028	0.073	-0.383
LITR	0.188	0.116	1.614
TEXPR	-0.155	0.073	-2.135 **
POP	-0.226	0.046	-4.914 ***
DCENTR	0.002	0.147	0.013
DCAPCTY	0.343	0.124	2.768 ***

Dependent Variable: Primacy (P) for 1980.
R^2 = 0.52 and Adjusted R^2 = 0.45.
75 Countries (75 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

As in the previous models, we run the primacy model for 1970 and 1980 with the continuous variable ASSISTR. The results are given in Appendix D (tables D.9 and D.10). The coefficient and the t-value of DCAPCTY are larger for the 1980 equation than for 1970. However, the coefficient and the t-value of POP for the 1970 equation is little larger than for 1980. The other coefficients do not show much difference.

Tables 5.5 and 5.6 show that many of the variables are insignificant. Given the reasonable R^2, a possible explanation for these poor results is the multicollinearity. Tables 5.7 (1960), 5.8 (1970), and 5.9 (1980) show this high correlation. For instance, GDP/CAP has a high correlation with the four variables DASSIST, AGRLAB, INDLAB, and LITR in 1960. Similarly, GDP/CAP has a high correlation with DASSIST, and AGRLAB for 1970 and 1980. However, the correlation between GDP/CAP and INDLAB and LITR for 1970 and 1980 are a little smaller than for 1960. Also tables 5.7, 5.8, and 5.9 show a high correlation between the AGRLAB variable and both INDLAB and LITR variables for the three years. This holds true for the correlation between INDLAB and LITR variables. Finally, the tables show a correlation between DASSIST and both AGRLAB and INDLAB for the three years.

TABLE 5.7

CORRELATION MATRIX OF INDEPENDENT VARIABLES
FOR PRIMACY MODEL (1960)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR	POP	DCENTR	DCAPCTY
GDP/CAP	1.00								
DASSIST	-0.79	1.00							
AGRLAB	-0.86	0.71	1.00						
INDLAB	0.87	-0.75	-0.96	1.00					
LITR	0.75	-0.56	-0.82	0.81	1.00				
TEXPR	0.02	-0.19	-0.24	0.13	-0.01	1.00			
POP	0.05	-0.05	-0.03	0.03	0.04	-0.09	1.00		
DCENTR	-0.41	0.31	0.34	-0.39	-0.31	0.05	-0.41	1.00	

TABLE 5.7 (Continued)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR	POP	DCENTR	DCAPCTY
DCAPCTY	-0.32	0.22	0.26	-0.26	-0.21	0.06	-0.30	0.45	1.00

TABLE 5.8

CORRELATION MATRIX OF INDEPENDENT VARIABLES
FOR PRIMACY MODEL (1970)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR	POP	DCENTR	DCAPCTY
GDP/CAP	1.00								
DASSIST	-0.74	1.00							
AGRLAB	-0.75	0.71	1.00						
INDLAB	0.66	-0.70	-0.90	1.00					
LITR	0.52	-0.53	-0.82	0.73	1.00				
TEXPR	0.31	-0.30	-0.22	0.21	0.21	1.00			
POP	-0.01	-0.03	0.01	0.03	0.01	-0.23	1.00		
DCENTR	-0.30	0.31	0.32	-0.38	-0.30	-0.09	-0.40	1.00	
DCAPCTY	-0.35	0.30	0.27	-0.18	-0.18	-0.02	-0.31	0.43	1.00

TABLE 5.9

CORRELATION MATRIX OF INDEPENDENT VARIABLES
FOR PRIMACY MODEL (1980)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR	POP	DCENTR	DCAPCTY
GDP/CAP	1.00								
DASSIST	-0.82	1.00							
AGRLAB	-0.79	0.70	1.00						
INDLAB	0.67	-0.62	-0.86	1.00					
LITR	0.60	-0.55	-0.81	0.69	1.00				
TEXPR	0.61	-0.55	-0.37	0.29	0.15	1.00			
POP	-0.03	0.01	0.05	0.01	-0.05	-0.19	1.00		

TABLE 5.9 (Continued)

	GDP/CAP	DASSIST	AGRLAB	INDLAB	LITR	TEXPR	POP	DCENTR	DCAPCTY
DCENTR	-0.34	0.31	0.30	-0.36	-0.26	-0.12	-0.39	1.00	
DCAPCTY	-0.28	0.24	0.20	-0.12	-0.10	-0.04	-0.29	0.40	1.00

<u>The Combined Model</u>. So far we have examined the relationship between urban primacy and economic development for the three years 1960, 1970, and 1980 separately. Now we pool the data and run the model. Because the multicollinearity problem is essentially a data problem, additional data (e.g., a larger sample size would provide some additional information) may reduce the variances of the estimates of the parameters of the collinear variables. In other words, the high variances of the estimates of the parameters occur because there is not enough independent variation in an independent variable to calculate with confidence the effect it has on a dependent variable.

In addition to perhaps getting more precise estimates, the pooled primacy model allows us to examine the fixed effects that are related to variables that are not accounted for by the independent variables discussed so far. These fixed effects may be associated with culture, geography, history, or politics. Therefore, we include a dummy variable, as we did in the previous models, for each region to capture these fixed effects. Also pooling the data lets us to include dummies for time (1970 and 1980).

<u>Regression Results</u>. Equation (5.4) including the time

dummies was estimated and the regression results are presented in table 5.10 on the following page. There are six important conclusions. One, the coefficients of the time dummies demonstrate that the urban primacy function shifted up between 1960 and 1970 and again between 1970 and 1980. The coefficients and the t-values in parenthesis are 1.939 (3.544) and 3.802 and (9.213) for 1970 and 1980 respectively. Two, a capital city that is also the largest city is an important determinant of urban primacy. The coefficient and the t-value of the DCAPCTY variable are 0.247 and 3.590 respectively. Three, the POP variable, as expected, has a significant negative impact on primate cities. The coefficient is -0.251 and the corresponding t-value is -9.658. A one percent increase in national population decreases primacy by 0.251 percent. Four, the TEXPR variable also has a significant negative impact on urban primacy. A one percent increase in the ratio of total goods exports to gross domestic product decreases the urban primacy by 0.130 percent. Five, the literacy rate, as expected, has a positive impact on urban primacy. A one percent increase in the rate of literacy increases urban primacy by 0.129 percent. The coefficient of GDP/CAP is negative and significant at the 0.10 level based on a one-tail test. Finally, perhaps due to the multicollinearity problem, the variables INDLAB, AGRLAB, and DASSIST are insignificant.

TABLE 5.10

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL (1960, 1970, AND 1980) WITH DUMMY VARIABLES FOR 1970 AND 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.694	0.299	12.334***
GDP/CAP[a]	-0.089	0.062	-1.438*
DASSIST	0.040	0.095	0.419
AGRLAB	0.011	0.040	0.263
INDLAB	-0.030	0.040	-0.749
LITR	0.129	0.046	2.778***
TEXPR	-0.130	0.038	-3.397***
POP	-0.251	0.026	-9.658***
DCENTR	0.074	0.082	0.905
DCAPCTY	0.247	0.069	3.590***
D70	1.939	0.547	3.544***
D80	3.802	0.413	9.213***

Dependent Variable: Primacy (P) for 1960, 1970, and 1980.
$R^2 = 0.53$ and Adjusted $R^2 = 0.50$.
75 Countries (225 Observations).

*** Significant at the 0.01 Level.
[a] One Tail Test

The next estimate added, both time and regional dummies to equation (5.4). The results are given in table 5.11 on the following page. There are four important conclusions. One, the coefficients of the regional dummy variables indicate that, other things being equal, urban primacy in North America, South America, South East Asian Islands and

East Asia, and South Africa is greater than in the European region. The coefficients and the corresponding t-values in parentheses of these regions are 0.452, 0.232, 0.406, and 0.284 and (2.586, 1.784, 2.920, and 1.835) respectively. Two, the coefficient of GDP/CAP is negative. A one percent increase in GDP/CAP reduces the urban primacy by 0.105. Three, the coefficients of TEXPR, POP, DCAPCYT, and the time dummies for 1970 and 1980 are estimated more precisely than in the other estimates. And four, the coefficients 2.421 and 4.212 and the t-values 3.901 and 8.980 for D70 and D80 respectively are positive and significant. They suggest that urban primacy function has shifted up in both 1970 and 1980.

The variables INDLAB, AGRLAB, and DASSIST may have insignificant coefficients because of multicollinearity. Thus, we omitted these variables (AGRLAB, INDLAB, and DASSIST) and reestimated the model. First, we estimated equation (5.4) with time dummies. The results are presented in table (5.12).

A comparison of the results in table 5.12 with 5.10 shows that the size and the coefficients of the variables GDP/CAP, TEXPR, POP, D70, and D80 are larger than those in table 5.10. The estimated coefficients of GDP/CAP, TEXPR, and POP jumped from -0.089, -0.130, and -0.251 (table 5.10) to -0.122, -0.140, and -0.257 (table 5.12). Similarly, the coefficients of D70 and D80 increased from 1.939 and 3.802 (table 5.10) to 2.091 and 3.927 (table 5.12) for 1970 and

TABLE 5.11

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL (1960, 1970, AND 1980) WITH TIME DUMMIES FOR 1970 AND 1980 AND REGIONAL VARIABLES

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.914	0.405	9.670***
GDP/CAP[a]	-0.105	0.067	-1.563*
DASSIST	-0.063	0.117	-0.536
AGRLAB	-0.026	0.044	-0.596
INDLAB	0.015	0.044	0.331
LITR	0.084	0.066	1.279
TEXPR	-0.163	0.044	-3.742***
POP	-0.275	0.030	-9.173***
DCENTR	0.060	0.087	0.687
DCAPCTY	0.289	0.073	3.946***
D70	2.421	0.621	3.901***
D80	4.213	0.469	8.980***
DNA	0.452	0.175	2.586***
DCA	0.168	0.132	1.272
DSA	0.232	0.130	1.784*
DMEAST	0.138	0.125	1.103
DSASIA	0.028	0.204	0.135
DSESASIA	0.406	0.139	2.920***
DSUBAF	0.156	0.216	0.724
DWAF	0.237	0.168	1.412
DSAF	0.284	0.155	1.835*
DANZ	0.152	0.200	0.763

Dependent Variable: Primacy (P) for 1960, 1970, and 1980.
R^2 = 0.57 and Adjusted R^2 = 0.52.
75 Countries (225 Observations).

*** Significant at the 0.01 Level.
* Significant at the 0.10 Level.
[a] One Tail Test

1980 respectively. Thus, one can conclude that the results in table 5.12 show strong relationships between primacy and these independent variables.

Equation (5.4) was also estimated including time and regional dummies. The results are presented in table (5.13).

TABLE 5.12

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL (1960, 1970, AND 1980) WITH DUMMY VARIABLES FOR 1970 AND 1980 (NINE INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.762	0.239	15.761***
GDP/CAP	-0.122	0.035	-3.528***
LITR	0.122	0.042	2.889***
TEXPR	-0.140	0.035	-4.054***
POP	-0.257	0.024	-10.601***
DCENTR	0.079	0.081	0.968
DCAPCTY	0.242	0.066	3.670***
D70	2.091	0.490	4.269***
D80	3.927	0.377	10.428***

Dependent Variable: Primacy (P) for 1960, 1970, and 1980.
R^2 = 0.53 and Adjusted R^2 = 0.51.
75 Countries (225 Observations).

*** Significant at the 0.01 Level.

A comparison of the results in table 5.13 with table 5.11 shows little difference. One exception is that the

TABLE 5.13

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL (1960, 1970, AND 1980) WITH TIME DUMMIES FOR 1970 AND 1980 AND REGIONAL VARIABLES

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	3.752	0.343	10.945***
GDP/CAP[a]	-0.069	0.048	-1.445*
LITR	0.092	0.060	1.542
TEXPR	-0.152	0.041	-3.733***
POP	-0.272	0.029	-9.338***
DCENTR	0.068	0.086	0.795
DCAPCTY	0.282	0.072	3.911***
D70	2.262	0.578	3.913***
D80	4.138	0.449	9.227***
DNA	0.457	0.172	2.654***
DCA	0.122	0.116	1.049
DSA	0.187	0.109	1.706*
DMEAST	0.116	0.118	0.978
DSASIA	0.004	0.199	0.020
DSESASIA	0.364	0.126	2.879***
DSUBAF	0.140	0.213	0.658
DWAF	0.202	0.161	1.257
DSAF	0.252	0.147	1.709*
DANZ	0.191	0.170	1.121

Dependent Variable: Primacy (P) for 1960, 1970, and 1980.
$R^2 = 0.57$ and Adjusted $R^2 = 0.53$.
75 Countries (225 Observations).

*** Significant at the 0.01 Level.
* Significant at the 0.01 Level. [a] One Tail Test.

size and the t-value of GDP/CAP in table 5.13 is a little lower than that in table 5.11.

Finally, we compare the results of primacy model with the metropolitan concentration model in chapter IV. We run the primacy model for the same 68 countries that are included in the metropolitan concentration model.

Equation (5.4) was estimated for both primacy and metropolitan concentration models and the results are presented in table (5.14) on the following page. A comparison of the coefficients and their corresponding t-values for the metropolitan concentration (MC) model with the coefficients and the t-values for the primacy (P) model (keeping in mind that MC relates urban population in areas of 100,000 or more to the total urban population, while P relates the population of the largest city to the total urban population) shows the following.

1. The coefficient of the GDP/CAP variable is negative but its t-value is just -1.180 for the primacy model. For MC the sign of GDP/CAP is negative but it is insignificant. This variable is significant in the primacy model with the larger sample. It might also be significant in the MC model, if we had a larger sample.
2. Table 5.14 shows MC is negatively related to the AGRLAB variable, holding other variables constant, while the effect of AGRLAB on urban primacy is insignificant.

TABLE 5.14

THE COEFFICIENTS AND THE T-VALUES OF METROPOLITAN CONCENTRATION AND URBAN PRIMACY MODELS WITH TIME DUMMIES FOR 1970 AND 1980 AND REGIONAL VARIABLES

Independent Variable	Coefficient of MC	Coefficient of P	T-Value for MC	T-Value for P
CONSTANT	6.990	4.463	18.36***	6.921***
GDP/CAP	-0.025	-0.086	-0.526	-1.180
DASSIST	-0.038	0.047	-0.501	-0.395
AGRLAB	-0.101	0.026	-3.333***	0.543
INDLAB	0.117	-0.025	4.059***	-0.546
LITR	-0.069	0.083	-1.385	1.225
TEXPR	-0.052	-0.107	-1.802*	-2.226**
D70	0.100	0.143	2.353**	2.148**
D80	-0.242	-0.378	-1.546	-1.488
DNA	0.208	0.445	2.020**	2.566***
DCA	0.116	0.044	1.329	0.325
DSA	0.209	0.160	2.451***	1.190
DMEAST	0.211	0.034	2.455***	0.244
DSASIS	0.195	-0.070	1.429	-0.314
DSEASIA	0.423	0.419	4.489***	2.550***
DSUBAF	-0.011	0.028	-0.075	0.119
DWAF	0.009	-0.016	0.075	-0.088
DSAF	0.300	0.269	2.817***	1.591
DANZ	0.234	0.202	1.935**	1.001

R^2 = 0.60 and Adjusted R^2 = 0.55 for the Dependent Variable Primacy (P).
R^2 = 0.34 and Adjusted R^2 = 0.28 for the Dependent Variable Metropolitan Concentration (MC).
68 Countries (204 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

3. The results in table 5.14 shows a strong positive relationship between the INDLAB variable and the MC

measure. Yet, the impact of industrial economies on urban primacy is insignificant. So, the INDLAB variable is a very important determinant of urban concentration in areas of 100,000 or more (as measured by MC).

4. The impact of the LITR variable is insignificant on both MC and P.
5. TEXPR has a significant negative impact on both MC and P. However, the size of the coefficient of primacy model is larger than for metropolitan concentration model. A one percent increase in TEXPR decreases primacy by 0.107 percent, but metropolitan concentration decreases by only 0.052 percent. In other words, the coefficients suggest that the impact of TEXPR on primacy is greater than it is on MC.
6. The regression results in table 5.14 suggest that MC function shifted up in 1970. The primacy function followed the same pattern.
7. The results in table 5.14 suggest that metropolitan concentration and urban primacy of North America, South America, South East Asian Islands and East Asia, and South Africa (t-value is just 1.59 for primacy) are greater than the metropolitan concentration and the urban primacy of the European region (which is chosen as a standard for comparison). In other words, these regions had greater urban primacy and urban concentration in areas of 100,000 or more relative to the European region. The results also show that Middle east and North Africa

and Australia and New Zealand regions had greater metropolitan concentration than the European region.

Conclusion. The regression results of primacy model in this chapter show the following important points. One, there is a negative relationship between primacy and GDP/CAP. The coefficient of GDP/CAP is negative (t-value is -1.563). A one percent increase in GDP/CAP reduces the urban primacy by 0.105 (table 5.11). The results in table 5.12 also show a strong negative relationship between urban primacy and GDP/CAP. A one percent increase in GDP/CAP decreases primacy by 0.122 (t-value is -3.528). Two, the increases in the ratio of total goods exports to gross domestic product led to a decrease in urban primacy during 1960, 1970, and 1980. Three, a capital city that is also the largest city, has a significant positive impact on primacy. Four, the POP variable has a significant negative impact on primacy. As the total population increases, other areas (e.g., small cities and towns) become more urbanized; so, the degree of urban primacy decreases. Four, the coefficients of the regional dummy variables (tables 5.11) indicate that, other things equal, the urban primacy of the following regions North America, South America, South East Asian Islands and East Asia, and South Africa is greater than the European region. Five, the coefficients and the t-values of the variable TEXPR, POP, DCAPCYT, and the time dummies for 1970 and 1980 indicate that the results of the pooled model (tables 5.10 and 5.11) are the best estimates of the urban primacy model. Pooling the data together allow the independent variables to have more variations. Therefore, the estimation of the pooled model are more precise than the single year estimation. Six and finally, the coefficients and the t-values of D70 and D80 are positive and significant (tables 5.10 and 5.11). They suggest that urban primacy function shifted up in both 1970 and 1980.

CHAPTER VI

URBANIZATION AND ECONOMIC GROWTH

Introduction

The purpose of this chapter is to examine how urbanization (urban percentage, metropolitan concentration, and urban primacy) affects economic growth--the growth rate of real GDP/CAP. As we have seen in the literature review in chapter II, some economists claim that some countries, particularly less-developed countries, are overurbanized. In other words, the level of urbanization relative to economic development is abnormal. These economists, mainly Todaro, argue that government policies have led to excessive size of large cities. For instance, wages are too high in urban areas and government buildings such as administration organizations, the exercise of political power, universities, big hospitals, and service facilities all are located in large cities. The results of these large cities are high costs in terms of economic, political, and social problems.

Brian J. Berry (1971, p. 111) notes:

> In the developing countries, and particularly in South and Southeast Asia, a conceptual rift relating to the role of cities in economic development separates two groups of urbanists and planners, the 'modernizers' and the 'traditionalists'.

He explains that the modernizers claim that concentration of economic growth in large cities is essential to get economies of scale and to build economic infrastructure. These economies of scale and economic infrastructure are conditions for the economic growth that is required to supply resources needed to beat the public deficiencies. The traditionalists, on the other hand, argue that the deficiencies are outputs of severe diseconomies of scale and of concentration of growth and development in hyperurbanized cities. Thus, in the traditionalists' view, the only solution for this hyperubanization problem is a deliberate decentralization strategy.

In general, those who favor urban concentration argue that concentration of people and firms helps economic development through economies of scale and agglomeration economies. Those who disagree with this view argue that many countries of today, particularly in less-developed countries, exceed their proper level of urbanization and consider this factor responsible for both the retardation of economic growth and the increase in social problems. Therefore, they advocate policies aimed at decentralization without reducing economic development and growth.

Acceptance or rejection of the overurbanization hypothesis (or what the planners call hyperurbanization) may have important implications for the desired level of economic development through restricting or encouraging the pattern of urbanization in many countries, particularly in less-developed nations. On one hand, a strategy that encourages urban concentration leads to a higher productivity and cheaper services for firms, which, in turn, reduces their production costs. One of the reasons that firms locate or concentrate in large urban areas is the agglomeration economies that can be derived from these large urban areas. Firm production costs are lower in large cities than small ones. This happens since large cities offer easy (that is, inexpensive) access to a rich variety of specialized inputs and markets. This is an external economy of large city size. On the other hand, a strategy that discourages urban concentration (encourages many small cities) may lead to a loss of economies of scale. For instance, applying a rural policy that discourages people from living in large cities may cause a loss in the higher productivity and the cheaper services that result from agglomeration economies in these large urban areas.

There has not been a lot of investigation (particularly empirical investigation) about the effect of urbanization on economic growth. In this chapter we add urban percentage, metropolitan concentration, and primacy as independent variables in Barro's (1991) empirical growth model. Barro's independent variables are gross domestic product per capita (GDP/CAP), secondary enrollment (SEC), primary enrollment (PRIM), government expenditure (GOV), revolution (REVOL), magnitude of the deviation of PPPI60 from the sample mean (where the PPPI60 is 1960 PPP value for the investment deflator (U.S. = 1.0) and PPP is the purchasing-power-parity numbers for investment goods), and student teacher ratio in primary schools 1960 (STRATP). Barro (1991) investigates the relationship between economic growth, measured by the growth rate of real GDP/CAP from 1960 to 1985 and from 1970 to 1985, and these independent variables for 98 countries. He finds that economic growth is positively related to the initial human capital (proxied by 1960 school enrollment rates), and to the measures of political stability, but negatively related to the market distortions, the initial (1960) level of GDP/CAP, and the share of government consumption in Gross Domestic Product. He also finds that economic growth rates are insignificantly correlated to the share of public investment.

The Model

Based on Barro's model, we estimate a cross-sectional model for 71 countries (developed and less-developed countries) for the periods of 1960-1985 and 1970-1985 (we did not have urbanization data for all the countries in Barro's sample). We regress the growth rate of real GDP/CAP, the dependent variable, on urban measures (urban percentage, metropolitan concentration, and primacy), and the independent variables (GDP/CAP, SEC, PRIM, GOV, REVOL, PPI60D, and STRATP) from Barro's model. Since this study is concerned with the relationship between urban measures and economic growth, we discuss here only the coefficients of urban measures. Results for Barro's variables are similar to those he obtained. In Appendix D (Tables D.11 and D.12) we show that we get essentially the same results as Barro does, although for a smaller sample of countries, when we exclude the urbanization variables.

<u>The Linear Multiple Regression Model</u>.

$$(GDP/CAP)GR_{it} = B_0+B_1GDP/CAP_{it}+B_2SEC_{it}+B_3PRIM_{it}+B_4GOV_{it} +B_5REVOL_{it}+B_6STRATP_{it}+B_7PPI60D_{it}+B_8P_{it}+B_9MC_{it} +B_{10}UP_{it}+E_{it} \quad (6.1)$$

where

$(GDP/CAP)GR_{it}$ = the growth rate of real gross domestic product per capita (in U.S. Dollars) in country i in time t.

GDP/CAP_{it} = gross domestic product per capita (in 1980 U.S. Dollars) in country i in time t.

P_{it} = primacy, which is the ratio of the population of the largest city to the total urban population in country i in time t.

MC_{it} = the metropolitan concentration, which is percentage of urban population living in cities of 100,000 or more (the urban population in cities of 100,000 or more divided by the total urban population), in country i in time t.

UP_{it} = the urban percentage, which is total urban population over total population, in country i in time t.

GOV_{it} = ratio of real government consumption expenditure to real gross domestic product (average from 1960 to 1985 and from 1970 to 1985) in country i in time t.

$REVOL_{it}$ = number of revolutions and coups per year (1960-85) in country i in time t.

$PPI60D_{it}$ = magnitude of the deviation of PPPI60 from the sample mean in country i in time t. Where the PPPI60 is 1960 PPP value for the investment deflator (U.S. = 1.0). (PPP is the purchasing- power-parity numbers for investment goods).

$STRATP_{it}$ = student teacher ratio in primary schools 1960 in country i in time t.

B_0 is the constant, B_1, B_2,..., and B_{10} are the coefficients, t is time, and E is the error term.

Regression Results. Equation 6.1 was estimated and the results are given in table 6.1. The table presents the regression coefficients for both the urban measures and the independent variables from Barro's model (equation 10 in Barro's model) for the period 1960-1985 for 71 countries.

In table 6.1 the regression for 1960-1985 indicates that economic growth, measured by growth rate of GDP/CAP, is negatively related to primacy, holding other variables constant. This significant negative relationship, (t-value = -2.16), between economic growth and urban primacy means that primate cities have a negative impact on economic

TABLE 6.1

REGRESSION ESTIMATES OF URBAN MEASURES (URBAN PERCENTAGE, METROPOLITAN CONCENTRATION, AND PRIMACY) ON THE GROWTH RATE OF REAL GROSS DOMESTIC PRODUCT PER CAPITA (GDP/CAP)GR FOR 1960-1985

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	0.0321	0.0108	2.9583***
GDP/CAP60	-0.0052	0.0017	-3.1199***
SEC60	0.0319	0.0139	2.2902**
PRIM60	0.0239	0.0078	3.0628***
P60	-0.0221	0.0102	-2.1611**
MC60	0.0200	0.0121	1.6571*
UP60	-0.0138	0.0140	-0.9878
STRATP	-0.0003	0.0001	-1.7422*
GOV6	-0.0718	0.0313	-2.2956**
REVOL	-0.0181	0.0077	-2.3750**
ASSASS	-0.0028	0.0033	-0.8653
PPI60D	-0.0042	0.0050	-0.8522

Dependent Variable: Growth Rate of Real Gross Domestic Product Per Capita (GDP/CAP)GR for 1960-1985.
R^2 = 0.51 and the adjusted R^2 = 0.42.
71 Countries (71 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

growth. An increase in the initial (1960) urban primacy index by one percentage point reduces the growth rate of GDP/CAP by 0.022 per year. Table 6.1 also shows that economic growth is positively related to metropolitan concentration, holding other variables constant. The coefficient of metropolitan concentration is 0.020 (t-value = 1.66). This means that an increase in the initial (1960) metropolitan concentration by one percentage point increases the growth rate of GDP/CAP (1960-1985) by 0.020 per year. And finally, table 6.1 shows that the relationship between economic growth and urban percentage is insignificant.

Equation (4) in Barro's model including urban measures was estimated for the period 1970-1985 for 71 countries. The results are in table 6.2. They again show a strong negative relationship (t-value is -2.99) between primacy and growth rate of GDP/CAP. That is, an increase in initial (1970) primacy by one percentage point lowers the growth rate of GDP/CAP by 0.040 percent per year. However, the results do not show a strong positive relationship between metropolitan concentration and economic growth (t-value is just 1.26). And finally, the results in table 6.2 show that the relationship between total urban percentage and economic growth is again statistically insignificant.

TABLE 6.2

REGRESSION ESTIMATES OF URBAN MEASURES (URBAN PERCENTAGE, METROPOLITAN CONCENTRATION, AND PRIMACY) ON THE GROWTH RATE OF REAL GROSS DOMESTIC PRODUCT PER CAPITA (GDP/CAP)GR FOR 1970-1985

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	0.0327	0.0136	2.4031**
GDP/CAP60	-0.0026	0.0057	-0.4564

TABLE 6.2

Independent Variable	Estimated Coefficient	Standard Error	T-Value
GDP/CAP70	-0.0037	0.0041	-0.9031
SEC60	0.0448	0.0183	2.4474**
PRIM60	0.0212	0.0104	2.0458**
P70	-0.0403	0.0135	-2.9932***
MC70	0.0204	0.0162	1.2612
UP70	-0.0113	0.0178	-0.6368
GOV7	-0.0901	0.0398	-2.2664**
REVOL	-0.0284	0.0102	-2.7958***
ASSASS	-0.0044	0.0043	-1.0461
PPI60D	-0.0063	0.0067	-0.9303

Dependent Variable: Growth Rate of Real Gross Domestic. Product Per Capita (GDP/CAP)GR for 1970-1985.
R^2 = 0.47 and the adjusted R^2 = 0.37.
71 Countries (71 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

Comparing the results in table 6.1 with table 6.2 shows that the negative correlation between economic growth and primacy became stronger in 1970-1985 than it was 1960-1985 (both the t-value and the coefficient for 1970-1985 are greater than those for 1960-1985). However, this does not holds true for the positive relationship between metropolitan concentration and economic growth (t-value is only 1.26).

For further investigation about the relationship between urban measures and economic growth, we decided to examine other regressions in Barro's model.

Equation (6.1) was estimated for the period 1970-1985 for 71 countries. Since we regress growth rate of GDP/CAP for 1970-1985 on urban measures for 1970, we replaced GDP/CAP60, SEC60, and PRIM60 by GDP/CAP70, SEC70, and PRIM70 (the other independent variables are the same). The results are in table 6.3. As in the previous regressions, they show a strong negative correlation between economic growth and primacy. That is, an increase in initial (1970) primacy by one percentage point decreases economic growth by 0.041 percent. The results also show a significant positive relationship between metropolitan concentration and economic growth (t-value is 1.97). An increase in initial (1970) metropolitan concentration by one percentage point increases the growth rate of GDP/CAP (1970-1985) by 0.030 percent. The results in table 6.3 show again that the relationship between urban percentage and economic growth is insignificant.

The results in table 6.3 also indicate that the negative correlation between economic growth and primacy became stronger in 1970-1985 than it was 1960-1985 (both the t-value and the coefficient for 1970-1985 are greater than those for the earlier models). This holds true, for the relationship between metropolitan concentration and economic growth.

TABLE 6.3

REGRESSION ESTIMATES OF URBAN MEASURES (URBAN PERCENTAGE, METROPOLITAN CONCENTRATION, AND PRIMACY) ON THE GROWTH RATE OF REAL GROSS DOMESTIC PRODUCT PER CAPITA (GDP/CAP)GR FOR 1970-1985 (WITH GDP/APC70, SEC70, AND PRIM70)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	0.0436	0.0149	2.9183***
GDP/CAP70	-0.0061	0.0016	-3.8152***
SEC70	0.0527	0.0150	3.5085***
PRIM70	0.0179	0.0110	1.6246
P70	-0.0407	0.0123	-3.3042***
MC70	0.0296	0.0150	1.9732**
UP70	-0.0233	0.0173	-1.3480
STRATP	-0.0004	0.0002	-2.3224**
GOV7	-0.0947	0.0366	-2.5839***
REVOL	-0.0209	0.0098	-2.1365**
ASSASS	-0.0069	0.0040	-1.7345*
PPI60D	-0.0068	0.0063	-1.0901

Dependent Variable: Growth Rate of Real Gross Domestic Product Per Capita (GDP/CAP)GR for 1970-1985.
$R^2 = 0.54$ and the adjusted $R^2 = 0.46$.
71 Countries (71 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

Finally, equation (1) and (10) in Barro's model were estimated with the variable STRIKE added to the equation. STRIKE is the number of strikes per year (1960 to 1985). The results for the urban measures are given in table 6.4.

TABLE 6.4

REGRESSION ESTIMATES OF URBAN MEASURES (URBAN PERCENTAGE, METROPOLITAN CONCENTRATION, AND PRIMACY) FOR 1960-1985 AND 1970-1985 (WITH THE VARIABLE STRIKE ADDED TO THE EQUATIONS)++

Urban Measure	Coeff. of Equation (1) (1960-1985)	Coeff. of Equation (10) (1970-1985)
P	-0.024 (-2.31)+	-0.042 (-3.52)+
MC	0.022 (1.80)+	0.373 (2.48)+
UP	-0.011 (-0.80)+	-0.066 (-0.97)+

Dependent Variable: Growth Rate of Real Gross Domestic Product Per Capita (GDP/CAP)GR.
\+ (t-values in parentheses).
++ MP was also added to the equations and it was insignificant. Its inclusion did not affect the coefficients of the other variables.

Table 6.4 shows that primacy has a significant negative impact on economic growth for both periods 1960-1985 and 1970-1985. Similarly, MC has a significant positive effect on economic growth for the two periods. An increase in initial (1960) primacy decreases the real growth rate of GDP/CAP, but an increase in metropolitan concentration in areas of 100,000 or more increases economic growth. The table also shows that the negative relationship between primacy and economic growth become stronger for the 1970-1985 equation than for the 1960-1985 equation. This holds true for the positive relationship between MC and economic growth. However, the relationship between UP and economic growth is insignificant for both periods. Thus, as in the previous regressions, primacy has a significant negative effect on economic growth and metropolitan concentration has a significant positive effect on economic growth. The urban percentage is insignificant.

<u>Conclusion</u>. The finding in our estimation for the two periods (1960-1985 and 1970-1985) has two important results:

(1) the significant positive relationship between metropolitan concentration and economic growth, holding other variables constant, means that an (1960 and 1970) increase in initial metropolitan concentration in large urban areas (areas of 100,000 or more) enhances economic growth (measured by growth rate of real GDP/CAP). In other words, the concentration of people and firms in large urban areas does not hinder economic growth but helps it.

(2) The inverse relationship between economic growth and primacy indicates that primate cities do reduce economic growth. That is, an increase in initial (1960 and 1970) urban primacy does lower the growth rate of GDP/CAP. We have seen in the primacy model in Chapter V that when largest city is the capital of the country, primacy is greater. In other words, primate cities (particularly in less-developed countries) have contributed to the overurbanization problem in the third world. This in turn, has a negative impact on economic growth which the regression results in tables 6.1, 6.2, 6.3 and 6.4 in this chapter indicate. This result confirms Todaro's concern about the problem of overurbanization in

less-developed countries. That is, primate cities indeed have a negative impact on economic development (as measured by the growth rate of GDP/CAP). It is not the concentration of population in large cities that causes growth problem. Rather, it is the concentration of the urban population into a single city. The reason may be that metropolitan concentration responds to economic and technological forces--employment distribution--whereas primacy appears to have a weaker response to these forces. At the same time, primacy responds to political forces as seen in the effect of capital cities in primacy.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary

Economic development is a factor which affects urbanization. This study investigated the relationship between urbanization and economic development. Urbanization is measured by four indexes: (1) urban percentage (UP), (2) metropolitan percentage (MP), (3) metropolitan concentration (MC), and (4) primacy (P). Economic development is measured by Gross Domestic Product Per Capita (GDP/CAP) and other variables such as labor's share in both agriculture (AGRLAB) and industry (INDLAB), the ratio of total goods exports to gross domestic product (TEXPR), the ratio of foreign assistance to gross domestic product (ASSISTR), and the literacy rate (LITR).

The purpose of this study is three-fold. First, to investigate the relationship between urbanization and economic development and to determine empirically the significant impact of economic development indicators on urbanization levels for the years 1960, 1970, and 1980. Second, to examine the shifts in the functions and to test how the fixed effects that are related to variables (culture, geography, history, or politics) not included in the models affect urbanization. Third, to examine the impact of urbanization measures on economic growth which is measured by growth rate of GDP/CAP).

To accomplish this purpose, a cross-section model (that includes many variables) for both developed and less-developed countries was constructed using data for 1960, 1970, and 1980. In this model, dummy variables were added as proxies for both time and regions. The time dummies test for the changes in the function's form over time, while the regional dummies capture the fixed effects that are related to variables not included in the model.

Finally, based on Barro's (1991) cross-sectional growth model for both developed and less-developed countries, we examined the impact of urbanization measures on economic growth (as measured by growth rate of real GDP/CAP) for 71 developed and less-developed countries for the two periods 1960-1985 and 1970-1985.

Conclusions

The present study leads to a number of conclusions. They are summarized as follows.

1. The economic development indicators [gross domestic product per capita (GDP/CAP), the ratio of foreign assistance to gross domestic product (ASSISTR) or its proxy (DASSIST), literacy rate (LITR), and labor in industry (INDLAB) have a significant positive impact on both urban percentage and metropolitan percentage. This

conclusion can be drawn from the regression results in chapter III (tables 3.3-3.14) and from chapter IV (tables 4.2-4.14).

2. Labor in agriculture (AGRLAB) has a significant negative impact on urbanization (as measured by urban percentage, metropolitan percentage, and metropolitan concentration). The results in tables 3.7-3.14, 4.6-4.13, 4.18, 4.24, and 4.25 show this conclusion.
3. The results in chapter III and IV show that foreign assistance is a very important determinant of urban percentage and metropolitan percentage. Its effect is similar to the effect of the GDP/CAP variable, as increases in foreign assistance leads to greater urbanization levels (as measured by UP and MP).
4. The results in chapter III show that TEXPR has a positive impact on urban percentage (tables 3.8-3.14). However, the results in tables 4.7, 4.10-4.14, 4.18-4.22, 5.4-5.6, and 5.10-5.14 show that the TEXPR variable has a significant negative impact on metropolitan percentage, metropolitan concentration, and primacy. Thus, while an increase in TEXPR increases the urban percentage, TEXPR decreases the urban concentration in large urban areas (as measured by MP and MC) and primate cities.
5. The regression estimates in chapter V (tables 5.2, 5.3, 5.11, and 5.12) show that GDP/CAP has a negative impact on urban primacy. As economic development progresses

(GDP/CAP increases) many economic activities (e.g., services and exporting of primary product) that rely less on agglomeration economies expands which in turn leads to greater urbanization in areas other than primate cities. Similarly, the POP variable has a significant negative impact on primacy (tables 5.4, 5.6, 5.10-5.13). As the total population increases, other places (e.g., small cities and towns) become more urbanized; so, the degree of urban primacy decreases. The time dummies for 1970 and 1980 show that urban primacy function shifted up in both 1970 and 1980 (tables 5.10-5.13). The results in chapter V (tables 5.4, 5.6, and 6.10-5.13) also show that largest city that is also the capital city has a significant positive impact on primacy. This suggests that other political factors affect primacy.

6. In general, less-developed regions (e.g., less-developed countries), other things equal, experienced higher urbanization levels (as measured by urban percentage, metropolitan percentage, metropolitan concentration and urban primacy) than do developed regions. In other words, the less-developed countries are overurbanized relative to the developed countries. When economic development was low, urbanization level was low too; however, as economic development proceeds (e.g., GDP/CAP increases, shift of labor from agriculture to the urban sectors, migration of educated people to urban areas)

urbanization levels increases. In addition to that, other forces such as political, historical, geographical reinforced the urbanization levels (particularly in large urban areas and primate cities) in less-developed countries.

7. The regression results (tables 6.1-6.4) in chapter VI include two important findings. First, there is a negative relationship between urban primacy and economic growth (as measured by the growth rate of real GDP/CAP) for the two periods 1960-1985 and 1970-1985. An increase in urban primacy reduces economic growth. This finding supports the concern of some economists (mainly Todaro) about the problem of overurbanization in less-developed countries. Second, the empirical results also showed that metropolitan concentration in areas of 100,000 or more has a positive impact on economic growth for the same two periods (1960-1985 and 1970-1985). In other words, urban concentration in areas of 100,000 or more does not hinder economic growth but even helps it.

The results in chapter VI lead us to the conclusion that primate cities have a negative impact on economic growth, while metropolitan concentration in areas of 100,000 or more has a positive impact on economic growth. On the one hand, the finding supports the critics who claim that urban concentration in one or two large cities hinders economic growth (particularly in less-developed countries). On the other hand, the results support urban concentration in areas of 100,000 or more (as measured by MC). Therefore, this conclusion leads to a very important policy implication. A policy of decentralization of urban primacy would be a proper measure to undertake, while a policy of concentration in areas of 100,000 or more would also be appropriate measure to undertake.

In sum, the available empirical analyses presented in chapter VI showed that primate cities are less productive and that the primate cities are likely to be less productive relative to others (cities of 100,000 or more). Therefore, a decentralization policy of investment and population distribution over the country (e.g., the development of smaller cities) is encouraged particularly in less-developed countries since it increases the growth rate of real GDP/CAP.

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APPENDIX A

LIST OF COUNTRIES FOR ALL MODELS

LIST OF COUNTRIES

Number	Country	Countries Excluded from Models+			
		UPM	(MPM and MCM)	PM	EGM
1	ALGERIA				
2	ANGOLA		+		+
3	ARGENTINA				
4	AUSTRALIA				
5	AUSTRIA				
6	BANGLADESH		+	+	+
7	BELGIUM		+		+
8	BENIN		+	+	+
9	BOLIVIA				
10	BRAZIL				
11	CAMEROON				
12	CANADA				
13	CHAD		+	+	+
14	CHILE				
15	COLOMBIA				
16	CONGO		+	+	+
17	COSTA RICA				
18	COTE D'IVOIRE				
19	DENMARK				
20	DOMINICAN REP.				
21	ECUADOR				
22	EGYPT				
23	EL SALVADOR				
24	ETHIOPIA				
25	FINLAND				
26	FRANCE				
27	GERMANY, FED				
28	GHANA				
29	GREECE		+	+	+
30	GUATEMALA				
31	HAITI				
32	HONDURAS				
33	INDIA				
34	INDONESIA				
35	IRAN				
36	IRAQ				
37	IRELAND				
38	ITALY				
39	JAMAICA				
40	JAPAN				
41	JORDAN				
42	KENYA				
43	SOUTH KOREA				
44	KUWAIT	+	+		+
45	MADAGASCAR				
46	MALAWI		+		

APPENDIX A (Continue)

Number	Country	Countries Excluded from Models+		
		UPM (MPM and MCM)	PM	EGM
47	MALAYSIA	+		
48	MALI			
49	MAURITANIA	+	+	+
50	MEXICO			
51	MOROCCO			
52	MOZAMBIQUE			
53	NEPAL			
54	NETHERLANDS			
55	NEW ZEALAND			
56	NICARAGUA			
57	NIGER	+	+	+
58	NIGERIA			
59	NORWAY			
60	PAKISTAN			
61	PANAMA			
62	PAPUA NEW GUINEA	+	+	+
63	PARAGUAY			
64	PERU			
65	PHILIPPINES			
66	SAUDI ARABIA			
67	SENEGAL			
68	SIERRA LEONE			
69	SOMALIA	+	+	+
70	SOUTH AFRICA			
71	SPAIN			
72	SRI LANKA	+	+	+
73	SUDAN			
74	SWEDEN			
75	SWITZERLAND			
76	SYRIA			
77	TANZANIA	+		+
78	THAILAND			
79	TOGO	+	+	+
80	TRINIDAD & TOBAGO	+	+	+
81	TUNISIA			
82	TURKEY			
83	UGANDA			
84	UNITED KINGDOM			
85	UNITED STATES			
86	URUGUAY			
87	VENEZUELA	+	+	+
88	YEMEN (FORMER N. YEMEN)	+	+	+
89	ZAIRE	+	+	+
90	ZAMBIA	+	+	

APPENDIX A (Continue)

Number	Country	Countries Excluded from Models+ UPM	(MPM and MCM)	PM	EGM
91	ZIMBABWE		+		+

UPM Urban Percentage Model.
MPM Metropolitan Concentration Model.
MCM Metropolitan Concentration Model.
PM Primacy Model.
EGM Economic Growth Model.

APPENDIX B

TABLES (B.1 TO B.4) OF THE REGRESSION ESTIMATES OF THE COMBINED MODELS WITH BOTH COUNTRY DUMMIES AND TIME DUMMIES FOR 1970 AND 1980

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PERCENTAGE MODEL (1960, 1970 and 1980) WITH BOTH COUNTRY DUMMIES AND TIME DUMMIES FOR 1970 AND 1980

Parameter Variable	Standard Estimate	Error	T for H0: Parameter=0	Prob >|T|
GDP/CAP	-0.077	0.065	-1.196	0.2334
AGRLAB	-0.071	0.039	-1.815	0.0713
INDLAB	0.119	0.038	3.097	0.0023
LITR	0.160	0.037	4.312	0.0001
TEXPR	0.010	0.029	0.343	0.7321
D70	-0.661	0.445	-1.485	0.1395
D80	-0.393	0.200	-1.961	0.0514
DC1	3.578	0.207	17.307	0.0001
DC2	2.714	0.218	12.429	0.0001
DC3	4.033	0.170	23.765	0.0001
DC4	4.077	0.198	20.564	0.0001
DC5	3.602	0.200	18.042	0.0001
DC6	2.088	0.211	9.900	0.0001
DC7	4.002	0.216	18.499	0.0001
DC8	2.910	0.217	13.396	0.0001
DC9	3.385	0.181	18.653	0.0001
DC10	3.827	0.170	22.547	0.0001
DC11	3.091	0.220	14.025	0.0001
DC12	3.971	0.211	18.801	0.0001
DC13	2.624	0.224	11.738	0.0001
DC14	4.031	0.179	22.483	0.0001
DC15	3.799	0.171	22.215	0.0001
DC16	3.445	0.204	16.880	0.0001
DC17	3.486	0.189	18.404	0.0001
DC18	3.486	0.245	14.251	0.0001
DC19	4.040	0.211	19.185	0.0001
DC20	3.506	0.190	18.428	0.0001
DC21	3.471	0.180	19.301	0.0001
DC22	3.595	0.194	18.534	0.0001
DC23	3.509	0.192	18.313	0.0001
DC24	2.288	0.231	9.910	0.0001
DC25	3.585	0.208	17.217	0.0001
DC26	3.903	0.201	19.466	0.0001
DC27	4.011	0.064	19.436	0.0001
DC28	3.151	0.212	14.85	0.0001
DC29	3.689	0.179	20.585	0.0001
DC30	3.437	0.192	17.871	0.0001
DC31	3.064	0.210	14.586	0.0001
DC32	3.212	0.202	15.928	0.0001
DC33	2.945	0.182	16.203	0.0001
DC34	2.760	0.191	14.427	0.0001
DC35	3.631	0.193	18.785	0.0001
DC36	3.925	0.209	18.785	0.0001

TABLE B.1 (Continue)

Parameter Variable	Standard Estimate	T for H0: Error	Parameter=0	Prob >|T|
DC37	3.624	0.201	8.028	0.0001
DC38	3.819	0.190	20.098	0.0001
DC39	3.432	0.190	18.083	0.0001
DC40	3.934	0.184	21.371	0.0001
DC41	3.697	0.157	23.511	0.0001
DC42	2.374	0.222	10.685	0.0001
DC43	3.465	0.166	20.821	0.0001
DC44	2.689	0.217	12.416	0.0001
DC45	1.862	0.234	7.962	0.0001
DC46	3.204	0.211	15.207	0.0001
DC47	3.014	0.258	11.694	0.0001
DC48	2.565	0.239	10.746	0.0001
DC49	3.882	0.174	22.365	0.0001
DC50	3.496	0.201	17.407	0.0001
DC51	2.023	0.209	9.678	0.0001
DC52	1.794	0.245	7.322	0.0001
DC53	4.063	0.213	19.096	0.0001
DC54	4.353	0.205	21.213	0.0001
DC55	3.702	0.188	19.732	0.0001
DC56	2.708	0.286	9.463	0.0001
DC57	2.948	0.209	14.079	0.0001
DC58	3.645	0.212	17.215	0.0001
DC59	3.187	0.187	17.065	0.0001
DC60	3.630	0.177	20.513	0.0001
DC61	1.857	0.176	10.567	0.0001
DC62	3.407	0.172	19.734	0.0001
DC63	3.831	0.184	20.813	0.0001
DC64	3.296	0.179	18.410	0.0001
DC65	4.124	0.273	15.118	0.0001
DC66	3.648	0.239	15.283	0.0001
DC67	2.896	0.235	12.333	0.0001
DC68	3.374	0.238	14.170	0.0001
DC69	3.641	0.190	19.208	0.0001
DC70	3.889	0.175	22.231	0.0001
DC71	2.807	0.180	15.558	0.0001
DC72	2.793	0.214	13.042	0.0001
DC73	4.003	0.211	18.945	0.0001
DC74	3.618	0.216	16.716	0.0001
DC75	3.609	0.180	20.091	0.0001
DC76	2.133	0.242	8.815	0.0001
DC77	2.586	0.198	13.030	0.0001
DC78	2.689	0.226	11.893	0.0001
DC79	3.286	0.211	15.579	0.0001
DC80	3.628	0.188	19.258	0.0001
DC81	3.548	0.180	19.693	0.0001
DC82	1.925	0.236	8.153	0.0001
DC83	4.029	0.199	20.195	0.0001
DC84	3.930	0.196	20.007	0.0001

TABLE B.1 (Continue)

Parameter Variable	Standard Estimate	T for H0: Error	Parameter=0	Prob >|T|
DC85	4.106	0.171	23.944	0.0001
DC86	4.150	0.220	18.879	0.0001
DC87	2.164	0.216	9.998	0.0001
DC88	3.077	0.231	13.294	0.0001
DC89	3.373	0.234	14.390	0.0001
DC90	2.677	0.211	12.656	0.0001

Dependent Variable: Urban Percentage (UP) for 1970, 1960, and 1980. $R^2 = 0.99$ and Adjusted $R^2 = 0.99$.
90 Countries (225 Observations).

Note:

(1) DC1 is a Dummy Variable for Country One (e.g., Algeria), DC2 for country Two, and ...so on.
(2) The Constant is Omitted in order to Include All Countries.

TABLE B.2

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METROPOLITAN PERCENTAGE MODEL (1960, 1970 AND 1980) WITH BOTH COUNTRY DUMMIES AND TIME FOR 1970 AND 1980

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
GDP/CAP	0.002	0.007	0.261	0.7945
AGRLAB	-0.252	0.044	-5.716	0.0001
INDLAB	0.377	0.055	6.832	0.0001
LITR	0.001	0.001	0.972	0.3333
TEXPR	0.350	0.021	5.327	0.0001
D70	-0.537	0.144	-3.731	0.0003
D80	0.016	0.001	16.522	0.0001
DC1	-0.442	0.607	-0.729	0.4679
DC2	0.478	0.609	0.785	0.4342
DC3	-0.054	0.614	-0.088	0.9297
DC4	-0.394	0.613	-0.642	0.5225
DC5	-0.506	0.605	-0.836	0.4052
DC6	0.440	0.604	0.728	0.4683
DC7	-1.593	0.610	-2.612	0.0103
DC8	-0.43	0.614	-0.703	0.4833
DC9	0.131	0.606	0.217	0.8287
DC10	0.021	0.606	0.035	0.9718
DC11	-0.411	0.608	-0.677	0.4999
DC12	-0.976	0.618	-1.579	0.1173
DC13	-0.682	0.614	-1.112	0.2688
DC14	-0.934	0.609	-1.534	0.1279
DC15	-0.407	0.607	-0.671	0.5038
DC16	-0.067	0.607	-0.110	0.9126
DC17	-1.158	0.608	-1.905	0.0595
DC18	-1.174	0.606	-1.936	0.0555
DC19	-0.923	0.611	-1.511	0.1336
DC20	-0.355	0.612	-0.580	0.5631
DC21	-0.218	0.616	-0.354	0.7239
DC22	-1.297	0.610	-2.127	0.0357
DC23	-0.493	0.606	-0.814	0.4174
DC24	-0.619	0.606	-1.022	0.3091
DC25	-1.137	0.608	-1.871	0.0641
DC26	0.052	0.603	0.087	0.9309
DC27	-0.367	0.606	-0.606	0.5458
DC28	-0.340	0.607	-0.560	0.5767
DC29	-0.362	0.607	-0.596	0.5523
DC30	-0.579	0.610	-0.950	0.3443
DC31	-0.399	0.610	-0.655	0.5141
DC32	-0.808	0.610	-1.323	0.1886
DC33	0.358	0.608	0.588	0.5575
DC34	-0.017	0.604	-0.029	0.9773
DC35	-1.167	0.610	-1.917	0.0579
DC36	1.616	0.600	2.691	0.0083

TABLE B.2 (Continue)

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
DC37	-0.618	0.614	-1.006	0.3167
DC38	-0.647	0.608	-1.063	0.2901
DC39	0.557	0.604	0.922	0.3586
DC40	-0.561	0.608	-0.922	0.3584
DC41	-1.484	0.605	-2.453	0.0158
DC42	-0.426	0.609	-0.699	0.4861
DC43	-0.872	0.618	-1.411	0.1611
DC44	-0.780	0.615	-1.269	0.2072
DC45	-0.481	0.606	-0.793	0.4293
DC46	-1.003	0.605	-1.658	0.1003
DC47	-1.076	0.613	-1.756	0.0819
DC48	-0.789	0.604	-1.305	0.1948
DC49	0.225	0.605	0.372	0.7105
DC50	-0.069	0.605	-0.114	0.9095
DC51	-0.560	0.607	-0.923	0.3579
DC52	-0.403	0.606	-0.666	0.5071
DC53	-1.342	0.609	-2.204	0.0297
DC54	-0.381	0.610	-0.625	0.5333
DC55	-2.217	0.612	-3.625	0.0004
DC56	-0.520	0.610	-0.853	0.3958
DC57	0.359	0.606	0.592	0.5551
DC58	-1.660	0.608	-2.731	0.0074
DC59	-1.190	0.617	-1.929	0.0564
DC60	-1.004	0.618	-1.624	0.1074
DC61	0.186	0.606	0.307	0.7595
DC62	-0.581	0.609	-0.954	0.3425
DC63	-0.596	0.607	-0.981	0.3287
DC64	0.110	0.604	0.183	0.8553
DC65	-2.327	0.613	-3.794	0.0002
DC66	-0.184	0.624	-0.296	0.7681
DC67	0.204	09913	0.332	0.7404
DC68	0.257	0.699	0.444	0.6581

Dependent Variable: Metropolitan Percentage (MP) for 1970, 1960, and 1980. R^2= 0.99 and Adjusted R^2 = 0.98
68 Countries (204 Observations)

For Definitions of the Dummies See Note Table B.1.

TABLE B.3

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METROPOLITAN CONCENTRATION MODEL (1960, 1970 AND 1980) WITH BOTH COUNTRY DUMMIES AND TIME FOR 1970 AND 1980

Parameter Variable	Standard Estimate	T for H0: Error	Parameter=0	Prob > |T|
GDP/CAP	-0.0042	0.0059	-0.007	0.9944
AGRLAB	-0.1257	0.0401	-3.136	0.0022
INDLAB	-0.0250	0.0500	-0.500	0.6182
LITR	-0.0001	0.0006	-0.243	0.8082
TEXPR	-0.1400	0.0191	-3.365	0.0001
D70	-0.3487	0.1304	-2.675	0.0087
D80	0.0177	0.0009	19.950	0.0001
DC1	-0.5565	0.5501	-1.012	0.3139
DC2	0.5581	0.5518	1.012	0.3141
DC3	0.0532	0.5568	0.095	0.9241
DC4	-0.0487	0.5555	-0.088	0.9303
DC5	-0.0538	0.5482	-0.098	0.9220
DC6	0.2137	0.5470	0.391	0.6969
DC7	-0.8376	0.5523	-1.517	0.1323
DC8	-0.2958	0.5563	-0.532	0.5961
DC9	-0.1623	0.5488	-0.296	0.7680
DC10	-0.1610	0.5487	-0.293	0.7698
DC11	-0.3495	0.5504	-0.635	0.5269
DC12	-1.2720	0.5598	-2.272	0.0251
DC13	-0.7325	0.5560	-1.317	0.1905
DC14	-1.2021	0.5512	-2.181	0.0314
DC15	-0.3186	0.5496	-0.580	0.5633
DC16	-0.3284	0.5501	-0.597	0.5518
DC17	-1.3052	0.5505	-2.371	0.0195
DC18	-0.0761	0.5491	-0.139	0.8900
DC19	-1.0225	0.5532	-1.848	0.0674
DC20	-0.2344	0.5540	-0.423	0.6731
DC21	-0.0880	0.5575	-0.158	0.8749
DC22	-1.0802	0.5522	-1.956	0.0531
DC23	-0.4890	0.5487	-0.891	0.3749
DC24	-0.2653	0.5488	-0.483	0.298
DC25	-0.9428	0.5504	-1.713	0.0897
DC26	0.5442	0.5459	0.997	0.3211
DC27	0.1002	0.5485	0.183	0.8554
DC28	-0.1280	0.5494	-0.233	0.8162
DC29	-0.4501	0.5501	-0.818	0.4151
DC30	-0.5696	0.5525	-1.031	0.3049
DC31	-0.1249	0.5525	-0.226	0.8216
DC32	-0.3888	0.5529	-0.703	0.4834
DC33	0.2188	0.5503	0.398	0.6916
DC34	0.2293	0.5472	0.419	0.6760
DC35	-0.3137	0.5526	-0.568	0.5714
DC36	1.6991	0.5438	3.125	0.0023

TABLE B.3 (Continue)

Parameter Variable	Standard Estimate	T for H0: Error	Parameter=0	Prob > |T|
DC37	-0.4686	0.5565	-0.842	0.4016
DC38	0.3197	0.5509	0.580	0.5629
DC39	0.3310	0.5473	0.605	0.5466
DC40	-0.5377	0.5510	-0.976	0.3313
DC41	0.3818	0.5481	0.697	0.4876
DC42	1.1867	0.5519	2.150	0.0338
DC43	-0.6078	0.5597	-1.086	0.2800
DC44	-0.6116	0.5569	-1.098	0.2746
DC45	-0.6531	0.5490	-1.190	0.2369
DC46	-0.5400	0.5479	-0.986	0.3265
DC47	-0.7351	0.5551	-1.324	0.1882
DC48	0.2561	0.5474	0.468	0.6408
DC49	0.0354	0.5479	0.065	0.9487
DC50	0.0335	0.5480	0.061	0.9514
DC51	-0.6165	0.5493	-1.122	0.2643
DC52	0.0134	0.5486	0.024	0.9806
DC53	-0.9219	0.5516	-1.671	0.0976
DC54	-0.6468	0.5523	-1.171	0.2441
DC55	-1.4500	0.5539	-2.618	0.0101
DC56	-0.3494	0.5523	-0.633	0.5284
DC57	0.3483	0.5490	0.634	0.5272
DC58	-0.6560	0.5504	-1.192	0.2360
DC59	-0.8790	0.5587	-1.573	0.1186
DC60	-0.4244	0.5598	-0.758	0.4500
DC61	0.2149	0.5485	0.392	0.6960
DC62	-0.1813	0.5516	-0.329	0.7431
DC63	-0.6404	0.5497	-1.165	0.2466
DC64	0.1590	0.5470	0.291	0.7719
DC65	-0.9095	0.5555	-1.637	0.1045
DC66	0.4114	0.5647	0.729	0.4679
DC67	0.6469	0.5553	1.165	0.2467
DC68	0.1782	0.5500	0.324	0.7465

Dependent Variable: Metropolitan Concentration (MC) for 1960, 1970, and 1980. R^2= 0.99 and Adjusted R^2 = 0.99. 68 Countries (204 Observations).

For Definitions of the Dummies See Note Table B.1.

TABLE B.4

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED PRIMACY MODEL (1960, 1970 AND 1980) WITH BOTH COUNTRY DUMMIES AND TIME FOR 1970 AND 1980

Parameter Variable	Standard Estimate	T for H0: Error	Parameter=0	Prob > |T|
GDP/CAP	-0.044	0.084	-0.525	0.6005
AGRLAB	-0.012	0.074	-0.831	0.7901
INDLAB	0.013	0.081	0.921	0.8521
LITR	0.051	0.071	0.717	0.4743
TEXPR	-0.008	0.046	-0.173	0.8626
D70	4.704	0.697	6.747	0.0001
D80	2.392	2.546	0.940	0.3490
DCENTR	0.057	0.122	0.387	0.7430
DCAPCTY	0.418	0.150	2.801	0.0058
LPOP	0.154	0.188	0.822	0.4123
DC1	2.214	0.656	3.373	0.0010
DC2	3.397	0.515	6.598	0.0001
DC3	3.063	0.670	4.576	0.0001
DC4	2.949	0.528	5.590	0.0001
DC5	3.219	0.499	6.496	0.0001
DC6	2.533	0.521	4.891	0.0001
DC7	3.409	0.388	8.781	0.0001
DC8	2.098	0.884	2.381	0.0186
DC9	3.023	0.483	6.256	0.0001
DC10	3.027	0.629	4.810	0.0001
DC11	3.008	0.516	5.835	0.0001
DC12	2.234	0.652	3.430	0.0008
DC13	3.775	0.282	13.399	0.0001
DC14	2.870	0.519	5.527	0.0001
DC15	3.054	0.446	6.848	0.0001
DC16	3.290	0.406	8.107	0.0001
DC17	3.243	0.402	8.057	0.0001
DC18	2.764	0.788	3.510	0.0006
DC19	2.677	0.384	6.978	0.0001
DC20	2.708	0.818	3.312	0.0012
DC21	2.720	0.432	6.292	0.0001
DC22	2.288	0.816	2.805	0.0057
DC23	2.322	0.810	2.868	0.0048
DC24	2.646	0.575	4.605	0.0001
DC25	3.081	0.447	6.895	0.0001
DC26	3.314	0.451	7.342	0.0001
DC27	3.036	0.354	8.588	0.0001
DC28	0.980	1.238	0.792	0.4296
DC29	1.955	0.994	1.966	0.0513
DC30	2.519	0.748	3.366	0.0010
DC31	3.048	0.564	5.407	0.0001
DC32	3.424	0.372	9.207	0.0001
DC33	1.658	0.825	2.010	0.0464
DC34	3.846	0.298	12.895	0.0001

TABLE B.4 (Continue)

Variable	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
DC35	1.843	0.938	1.964	0.0515
DC36	3.228	0.297	10.879	0.0001
DC37	3.153	0.610	5.168	0.0001
DC38	2.720	0.718	3.789	0.0002
DC39	4.110	0.319	12.894	0.0001
DC40	3.083	0.493	6.248	0.0001
DC41	3.173	0.461	6.876	0.0001
DC42	2.386	0.584	4.089	0.0001
DC43	2.987	0.543	5.499	0.0001
DC44	2.465	0.801	3.078	0.0025
DC45	2.792	0.631	4.426	0.0001
DC46	3.698	0.558	6.628	0.0001
DC47	3.086	0.615	5.019	0.0001
DC48	1.607	0.603	2.663	0.0086
DC49	3.343	0.314	10.630	0.0001
DC50	3.314	0.287	11.565	0.0001
DC51	1.734	0.928	1.867	0.0639
DC52	2.875	0.414	6.949	0.0001
DC53	2.293	0.871	2.634	0.0094
DC54	3.747	0.248	15.087	0.0001
DC55	3.339	0.294	11.372	0.0001
DC56	2.929	0.578	5.064	0.0001
DC57	3.003	0.722	4.158	0.0001
DC58	2.347	0.569	4.127	0.0001
DC59	3.546	0.504	7.034	0.0001
DC60	3.307	0.450	7.345	0.0001
DC61	2.278	0.644	3.537	0.0005
DC62	1.838	0.728	2.525	0.0126
DC63	2.723	0.652	4.176	0.0001
DC64	2.273	0.522	4.356	0.0001
DC65	2.826	0.433	6.531	0.0001
DC66	2.864	0.470	6.093	0.0001
DC67	2.925	0.663	4.410	0.0001
DC68	3.141	0.754	4.164	0.0001
DC69	2.955	0.464	6.363	0.0001
DC70	2.609	0.704	3.706	0.0003
DC71	3.118	0.581	5.364	0.0001
DC72	2.225	0.835	2.664	0.0086
DC73	1.764	1.007	1.751	0.0821
DC74	3.557	0.323	11.005	0.0001
DC75	2.582	0.464	5.563	0.0001

Dependent Variable: Primacy (P) for 1960, 1970 and 1980.
$R^2 = 0.99$ and Adjusted $R^2 = 0.99$.
75 Countries (225 Observations).

For Definitions of the Dummies See Note Table B.1.

APPENDIX C

TABLE C.1 LIST OF COUNTRIES BY REGION

TABLE C.2 AVERAGE GDP/CAP, 1980,

FOR THE ELEVEN REGIONS

A LIST OF COUNTRIES BY REGION

No.	Country	Region
1	CANADA	North America
2	UNITED STATES	North America
3	MEXICO	Central America and Caribbean Islands
4	GUATEMALA	Central America and Caribbean Islands
5	EL SALVADOR	Central America and Caribbean Islands
6	HONDURAS	Central America and Caribbean Islands
7	NICARAGUA	Central America and Caribbean Islands
8	COSTA RICA	Central America and Caribbean Islands
9	PANAMA	Central America and Caribbean Islands
10	JAMAICA	Central America and Caribbean Islands
11	HAITI	Central America and Caribbean Islands
12	DOMINICAN REPUBLIC	Central America and Caribbean Islands
13	TRINIDAD AND TOBAGO	Central America and Caribbean Islands
14	COLOMBIA	South America
15	VENEZUELA	South America
16	ARGENTINA	South America
17	BOLIVIA	South America
18	BRAZIL	South America
19	CHILE	South America
20	PARAGUAY	South America
21	PERU	South America
22	URUGUAY	South America
23	ECUADOR	South America
24	EGYPT	Middle East and North Africa
25	IRAN	Middle East and North Africa
26	IRAQ	Middle East and North Africa
27	JORDAN	Middle East and North Africa
28	SYRIA	Middle East and North Africa
29	TURKEY	Middle East and North Africa
30	N. YEMEN	Middle East and North Africa
31	SAUDI ARABIA	Middle East and North Africa
32	ALGERIA	Middle East and North Africa
33	MOROCCO	Middle East and North Africa
34	TUNISIA	Middle East and North Africa
35	BANGLADESH	South Asia
36	INDIA	South Asia
37	NEPAL	South Asia
38	PAKISTAN	South Asia
39	SRI LANKA	South Asia

TABLE C.1 (Continue)

No.	Country	Region
40	INDONESIA	
41	MALAYSIA	
42	PHILIPPINES	South East Asian Islands
43	THAILAND	And East Asia
44	PAPUA NEW GUINEA	
45	KOREA	
46	JAPAN	
47	MAURITANIA	
48	MALI	
49	NIGER	
50	CHAD	Sub-Saharan Africa
51	SUDAN	
52	ETHIOPIA	
53	SOMALIA	
54	CAMEROON	
55	NIGERIA	
56	CONGO	
57	ANGOLA	
58	BENIN	
59	SENEGAL	West Africa
60	COTE D'IVOIRE	
61	GHANA	
62	TOGO	
63	SIERRA LEONE	
64	SOUTH AFRICA	
65	TANZANIA	
66	ZAIRE	
67	ZAMBIA	
68	ZIMBABWE	South Africa
69	MADAGASCAR	
70	MOZAMBIQUE	
71	UGANDA	
72	KENYA	
73	MALAWI	
74	SPAIN	
75	ITALY	
76	GREECE	
77	UNITED KINGDOM	
78	GERMANY	
79	SWITZERLAND	
80	FRANCE	
81	AUSTRIA	Europe
82	NORWAY	
83	SWEDEN	
84	FINLAND	

TABLE C.1 (Continue)

No.	Country	Region
85	DENMARK	Europe
86	IRELAND	
87	NETHERLANDS	
88	BELGIUM	
89	AUSTRALIA	Australia and New Zealand
90	NEW ZEALAND	

TABLE C.2

THE AVERAGE GROSS DOMESTIC PRODUCT PER CAPITA (GDP/CAP), 1980, FOR THE ELEVEN REGIONS

No.	Region	Average GDP/CAP for 1980
1	North America	11,368
2	Europe	8,301
3	Australia and New Zealand	7,856
4	South America	3,202
5	Middle East and North Africa	2,975
6	South East Asian Islands And East Asia	2,776
7	Central America and Caribbean Islands	2,564
8	South Africa	907
9	South Asia	766
10	West Africa	731
11	Sub-Saharan Africa	445

Sources: the Average GDP/CAP is Calculated from Robert Barro (1991).

APPENDIX D

TABLES (D.1 TO D.18) OF THE REGRESSION ESTIMATES OF THE RATIO OF FOREIGN ASSISTANCE TO GROSS DOMESTIC PRODUCT (ASSISTR) AND THE REGRESSION ESTIMATES OF EQUATION ONE AND TEN IN BARRO'S MODEL

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PERCENTAGE MODEL (1970 AND 1980) WITH ALTERNATIVE VARIABLE (ASSISTR), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	0.591	0.611	0.968
GDP/CAP	0.217	0.060	3.661***
ASSISTR	0.003	0.005	0.600
AGRLAB	-0.132	0.039	-3.346***
INDLAB	0.160	0.038	4.259***
LITR	0.320	0.059	5.389***
TEXPR	0.081	0.033	2.471***
D80	1.029	0.409	2.515***
DNA	-0.024	0.160	-0.147
DCA	0.196	0.121	1.627*
DSA	0.381	0.121	3.142***
DMEAST	0.431	0.118	3.653***
DSASIA	-0.080	0.160	-0.503
DSESASIA	-0.206	0.125	-1.655*
DSUBAF	0.453	0.180	2.515***
DWAF	0.365	0.153	2.383**
DSAF	-0.173	0.146	-1.181
DANZ	0.330	0.215	1.540

Dependent Variable: Urban Percentage, UP (1970 and 1980).
$R^2 = 0.85$ and Adjusted $R^2 = 0.83$.
90 Countries (180 Observations).

***Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.2

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PERCENTAGE MODEL (1970 AND 1980) WITH PROXY VARIABLE (DASSIST), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	0.712	0.161	1.168*
GDP/CAP	0.172	0.061	2.897***
DASSIST	-0.098	0.105	-0.928
AGRLAB	-0.131	0.039	-3.342 ***
INDLAB	0.160	0.037	4.270***
LITR	0.331	0.059	5.648***
TEXPR	0.077	0.033	2.350**
D80	0.983	0.407	2.416**
DNA	-0.028	0.160	-0.174
DCA	0.283	0.120	2.366**
DSA	0.480	0.117	4.088***
DMEAST	0.481	0.115	4.1832***
DSASIA	-0.040	0.160	-0.252
DSESASIA	-0.143	0.121	-1.182
DSUBAF	0.490	0.179	2.739***
DWAF	0.422	0.151	2.784***
DSAF	-0.148	0.146	-1.016
DANZ	0.317	0.215	1.4773

Dependent Variable: Urban Percentage, UP (1970 and 1980).
R^2 = 0.85 and Adjusted R^2 = 0.83.
90 Countries (180 Observations).

***Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.3

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METRO-POLITAN PERCENTAGE MODEL (1970 and 1980) WITH ALTERNATIVE VARIABLE (ASSISTR), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.379	0.772	6.967***
GDP/CAP	0.218	0.086	2.537***
ASSISTR	-0.010	0.008	-1.211
AGRLAB	-0.222	0.056	-3.989***
INDLAB	0.261	0.053	4.947***
LITR	0.180	0.102	1.760*
TEXPR	-0.112	0.056	-1.981**
D80	-0.524	0.310	-1.691*
DNA	0.278	0.188	1.481
DCA	0.509	0.169	3.006***
DSA	0.714	0.170	4.195***
DMEAST	0.676	0.160	4.214***
DSASIA	0.344	0.257	1.341
DSESASIA	0.459	0.177	2.586***
DSUBAF	0.072	0.275	0.262
DWAF	0.592	0.220	2.698***
DSAF	-0.003	0.197	-0.015
DANZ	0.492	0.250	1.973**

Dependent Variable: Metropolitan Percentage, MP (1970 and 1980). $R^2 = 0.83$ and Adjusted $R^2 = 0.80$.
68 Countries (136 Observations).

***Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.4

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METROPOLITAN PERCENTAGE MODEL (1970 AND 1980) WITH PROXY VARIABLE (DASSIST), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	5.426	0.768	7.068***
GDP/CAP	0.200	0.085	2.355**
DASSIST	-0.231	0.140	-1.644*
AGRLAB	-0.224	0.055	-4.042***
INDLAB	0.260	0.052	4.968***
LITR	0.175	0.100	1.742*
TEXPR	-0.108	0.055	-1.958**
D80	-0.514	0.306	-1.678*
DNA	0.267	0.187	1.432
DCA	0.517	0.160	3.231***
DSA	0.719	0.156	4.600***
DMEAST	0.663	0.150	4.399***
DSASIA	0.334	0.253	1.320
DSESASIA	0.444	0.169	2.619***
DSUBAF	0.056	0.271	0.206
DWAF	0.579	0.211	2.741***
DSAF	-0.017	0.195	-0.086
DANZ	0.465	0.249	1.869*

Dependent Variable: Metropolitan Percentage, MP (1970 and 1980). R^2= 0.83 and Adjusted R^2 = 0.81.
68 Countries (136 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.5

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METRO-POLITAN CONCENTRATION MODEL (1970 AND 1980) WITH ALTERNATIVE VARIABLE (ASSISTR), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.174	0.518	13.84***
GDP/CAP	0.026	0.058	0.444
ASSISTR	0.002	0.005	0.363
AGRLAB	-0.096	0.037	-2.573***
INDLAB	0.123	0.035	3.467***
LITR	0.120	0.069	1.738*
TEXPR	-0.055	0.038	-1.441
D80	-0.359	0.208	-1.724*
DNA	0.227	0.126	1.805*
DCA	0.157	0.114	1.377
DSA	0.240	0.114	2.104**
DMEAST	0.254	0.108	2.363**
DSASIA	0.159	0.172	0.922
DSESASIA	0.440	0.119	3.692***
DSUBAF	-0.010	0.185	-0.059
DWAF	0.035	0.147	0.241
DSAF	0.303	0.133	2.288**
DANZ	0.350	0.168	2.088**

Dependent Variable: Metropolitan Concentration (UC) for 1970 and 1980. $R^2 = 0.37$ and Adjusted $R^2 = 0.28$.
68 Countries (136 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.6

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METRO-POLITAN CONCENTRATION MODEL (1970 AND 1980) WITH PROXY VARIABLE (DASSIST), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.233	0.518	13.960***
GDP/CAP	0.003	0.057	0.051
DASSIST	-0.035	0.095	-0.366
AGRLAB	-0.097	0.037	-2.595***
INDLAB	0.123	0.035	3.484***
LITR	0.111	0.068	1.641*
TEXPR	-0.059	0.037	-1.589
D80	-0.378	0.207	-1.829*
DNA	0.229	0.126	1.819*
DCA	0.195	0.108	1.806*
DSA	0.285	0.105	2.701***
DMEAST	0.281	0.102	2.765***
DSASIA	0.177	0.170	1.041
DSESASIA	0.464	0.114	4.055***
DSUBAF	0.006	0.183	0.030
DWAF	0.064	0.143	0.450
DSAF	0.313	0.131	2.383**
DANZ	0.345	0.168	2.053**

Dependent Variable: Metropolitan Concentration (UC) for 1970 and 1980. $R^2 = 0.37$ and Adjusted $R^2 = 0.28$.
68 Countries (136 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.7

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN CONCENTRATION MODEL FOR THE COMBINED TWO YEARS (1970, AND 1980) WITH THE ALTERNATIVE VARIABLE (ASSISTR) AND TIME'S DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.308	0.416	17.570***
GDP/CAP	0.065	0.055	1.187
ASSISTR	0.007	0.004	1.671*
AGRLAB	-0.066	0.034	-1.920*
INDLAB	0.073	0.034	2.165**
LITR	-0.035	0.052	-0.667
TEXPR	-0.088	0.033	-2.678***
D80	-0.558	0.181	-3.081***

Dependent Variable: Metropolitan Concentration (MC) for 1970 and 1980. $R^2 = 0.19$ and Adjusted $R^2 = 0.14$.
68 Countries (136 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.8

LOGARITHMIC REGRESSION ESTIMATES OF THE METROPOLITAN CONCENTRATION MODEL FOR THE COMBINED TWO YEARS (1970, AND 1980) WITH THE PROXY VARIABLE (DASSIST) AND TIME'S DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.415	0.417	17.780***
GDP/CAP	0.036	0.055	0.653
DASSIST	0.045	0.079	0.566
AGRLAB	-0.059	0.035	-1.709*
INDLAB	0.071	0.034	2.069**
LITR	-0.014	0.052	-0.276
TEXPR	-0.100	0.032	-3.103***
D80	-0.612	0.181	-3.387***

Dependent Variable: Metropolitan Concentration (MC) for 1970 and 1980. $R^2 = 0.17$ and Adjusted $R^2 = 0.13$.
68 Countries (136 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.9

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL WITH THE ALTERNATIVE VARIABLE (ASSISTR) FOR 1970 (NINE INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.695	1.429	4.685***
GDP/CAP	-0.042	0.117	-0.360
ASSISTR	0.006	0.011	0.590
AGRLAB	0.026	0.071	0.361
INDLAB	-0.060	0.070	-0.850
LITR	0.092	0.087	1.058
TEXPR	-0.182	0.072	-2.522**
POP	-0.276	0.047	-5.907***
DCENTR	0.169	0.136	1.241
DCAPCTY	0.166	0.117	1.421

Dependent Variable: Primacy (P) for 1970.
$R^2 = 0.63$ and Adjusted $R^2 = 0.57$.
75 Countries (75 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

TABLE D.10

LOGARITHMIC REGRESSION ESTIMATES OF THE URBAN PRIMACY MODEL WITH THE ALTERNATIVE VARIABLE (ASSISTR) FOR 1980 (NINE INDEPENDENT VARIABLES)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.585	1.117	5.894***
GDP/CAP	-0.040	0.110	-0.359
ASSISTR	0.045	0.040	1.110
AGRLAB	0.021	0.074	0.292
INDLAB	-0.030	0.072	-0.415
LITR	0.155	0.118	1.312
TEXPR	-0.143	0.068	-2.100**
POP	-0.208	0.047	-4.456***
DCENTR	0.002	0.146	0.013
DCAPCTY	0.348	0.123	2.831***

Dependent Variable: Primacy (P) for 1980.
R^2 = 0.53 and Adjusted R^2 = 0.46.
75 Countries (75 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

TABLE D.11

REGRESSION ESTIMATES OF THE GROWTH RATE OF REAL GROSS DOMESTIC PRODUCT PER CAPITA (GDP/CAP)GR FOR 1960-1985 (EQUATION TEN IN BARRO'S MODEL)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	0.0382	0.0094	4.0640***
GDP/CAP60	-0.0057	0.0016	-3.6867***
SEC60	0.0367	0.0134	2.7325***
PRIM60	0.0178	0.0072	2.4601**
STRATP	-0.0002	0.0001	-1.6905*
GOV6	-0.0925	0.0308	-2.9998***
REVOL	-0.0182	0.0076	-2.4008**
ASSASS	-0.0033	0.0032	-1.039
PI60D	-0.0038	0.0050	-0.7573

Dependent Variable: (GDP/CAP)GR for 1960-1985.
R^2 = 0.46 and Adjusted R^2 = 0.39.
71 Countries (71 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.12

REGRESSION ESTIMATES OF THE GROWTH RATE OF REAL GROSS DOMESTIC PRODUCT PER CAPITA (GDP/CAP) FOR 1970-1985 (EQUATION ONE IN BARRO'S MODEL)

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	0.0300	0.0115	2.6093***
GDP/CAP60	-0.0054	0.0059	-0.9252
GDP/CAP70	-0.0009	0.0042	-0.2112
SEC60	0.042	0.019	2.2416**
PRIM60	0.0174	0.0101	1.7021*
GOV7	-0.1079	0.0411	-2.6261***
REVOL	-0.0294	0.0105	-2.8112***
ASSASS	-0.0040	0.0043	-0.9198
PPI60D	-0.0078	0.0070	-1.1260

Dependent Variable: (GDP/CAP)GR for 1970-1985.
R^2 = 0.39 and Adjusted R^2 = 0.311.
71 Countries (71 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.
* Significant at the 0.10 Level.

TABLE D.13

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METROPOLITAN CONCENTRATION MODEL (1970 AND 1980) WITH THE ALTERNATIVE VARIABLE (ASSISTR) AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.525	0.528	14.251***
GDP/CAP	0.015	0.069	0.213
ASSISTR	0.004	0.005	0.781
AGRLAB	-0.046	0.044	-1.048
INDLAB	0.069	0.043	1.597
LITR	-0.017	0.066	-0.264
TEXPR	-0.114	0.042	-2.738***
D80	-0.862	0.230	-3.748***

Dependent Variable: Metropolitan Concentration (MC) for 1970 and 1980. R^2= 0.20 and Adjusted R^2 = 0.15.
68 Countries (204 Observations).

*** Significant at the 0.01 Level.

TABLE D.14

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED METROPOLITAN CONCENTRATION MODEL (1970 AND 1980) WITH THE PROXY VARIABLE (DASSIST) AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.639	0.526	14.534***
GDP/CAP	-0.020	0.070	-0.291
DASSIST	-0.026	0.100	-0.263
AGRLAB	-0.038	0.043	-0.878
INDLAB	0.066	0.043	1.529
LITR	0.004	0.065	0.068
TEXPR	-0.126	0.041	-3.095***
D80	-0.916	0.228	-4.024***

Dependent Variable: Metropolitan Concentration (MC) for 1970 and 1980. $R^2 = 0.19$ and Adjusted $R^2 = 0.15$.
68 Countries (204 Observations).

*** Significant at the 0.01 Level.

TABLE D.15

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL FOR TWO YEARS (1970, AND 1980) WITH THE ALTERNATIVE VARIABLE (ASSISTR) AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.078	0.940	6.463***
GDP/CAP	-0.040	0.072	-0.564
ASSISTR	0.010	0.008	1.282
AGRLAB	0.030	0.050	0.602
INDLAB	-0.047	0.049	-0.953
LITR	0.117	0.067	1.748*
TEXPR	-0.162	0.047	-3.486***
POP	-0.246	0.031	-8.016***
DCENTR	0.089	0.098	0.905
DCAPCTY	0.262	0.084	3.138***
D80	1.466	0.564	2.601***

Dependent Variable: Primacy (P) for 1970 and 1980.
$R^2 = 0.56$ and Adjusted $R^2 = 0.53$.
75 Countries (225 Observations).

*** Significant at the 0.01 Level.
*   Significant at the 0.10 Level.

TABLE D.16

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL FOR TWO YEARS (1970, AND 1980) WITH THE PROXY VARIABLE (DASSIST) AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	6.026	0.997	6.043***
GDP/CAP	-0.046	0.077	-0.601
DASSIST	0.079	0.118	0.668
AGRLAB	0.034	0.050	0.668
INDLAB	-0.050	0.050	-1.005
LITR	0.122	0.068	1.792*
TEXPR	-0.157	0.050	-3.170***
POP	-0.247	0.032	-7.777***
DCENTR	0.089	0.099	0.899
DCAPCTY	0.259	0.084	3.088***
D80	1.469	0.569	2.581***

Dependent Variable: Primacy (P) for 1970 and 1980.
R^2 = 0.56 and Adjusted R^2 = 0.53.
75 Countries (225 Observations).

*** Significant at the 0.01 Level.
* Significant at the 0.10 Level.

TABLE D.17

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL (1970, AND 1980) WITH THE ALTERNATIVE VARIABLE (ASSISTR), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.510	1.219	6.162***
GDP/CAP	-0.025	0.078	-0.318
ASSISTR	0.007	0.009	0.772
AGRLAB	-0.011	0.057	-0.191
INDLAB	0.005	0.056	0.091
LITR	0.030	0.101	0.293
TEXPR	-0.226	0.059	-3.823***
POP	-0.276	0.037	-7.500***
DCENTR	0.069	0.108	0.636
DCAPCTY	0.286	0.090	3.165***
D80	1.064	0.698	1.524
DNA	0.252	0.215	1.177
DCA	0.068	0.159	0.428
DSA	0.113	0.156	0.725
DMEAST	0.049	0.151	0.324
DSASIA	-0.130	0.264	-0.491
DSESASIA	0.390	0.168	2.314**
DSUBAF	0.038	0.274	0.139
DWAF	0.221	0.207	1.068
DSAF	0.265	0.191	1.385
DANZ	0.177	0.277	0.639

Dependent Variable: Primacy (P) for 1970 and 1980.
R^2= 0.60 and Adjusted R^2= 0.54.
75 Countries (150 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

TABLE D.18

LOGARITHMIC REGRESSION ESTIMATES OF THE COMBINED URBAN PRIMACY MODEL (1970 AND 1980) WITH THE PROXY VARIABLE (DASSIST), REGIONAL DUMMIES, AND A TIME DUMMY FOR 1980

Independent Variable	Estimated Coefficient	Standard Error	T-Value
CONSTANT	7.511	1.240	6.059***
GDP/CAP	-0.051	0.087	-0.591
DASSIST	-0.015	0.149	-0.102
AGRLAB	-0.012	0.057	-0.208
INDLAB	0.005	0.057	0.084
LITR	0.035	0.102	0.347
TEXPR	-0.222	0.059	-3.739***
POP	-0.278	0.037	-7.427***
DCENTR	0.061	0.109	0.563
DCAPCTY	0.286	0.091	3.152***
D80	1.092	0.699	1.563
DNA	0.261	0.215	1.213
DCA	0.117	0.166	0.708
DSA	0.172	0.165	1.042
DMEAST	0.084	0.153	0.544
DSASIA	-0.103	0.267	-0.385
DSESASIA	0.428	0.174	2.458**
DSUBAF	0.062	0.274	0.224
DWAF	0.251	0.212	1.186
DSAF	0.284	0.192	1.483
DANZ	0.168	0.279	0.603

Dependent Variable: Primacy (P) for 1980.
R^2= 0.60 and Adjusted R^2= 0.54.
75 Countries (150 Observations).

*** Significant at the 0.01 Level.
** Significant at the 0.05 Level.

APPENDIX E

LIST OF COUNTRIES WITH CENTRAL GOVERNMENTS, NONCENTRAL (E.G., FEDERAL) GOVERNMENTS, AND CAPITAL CITY THAT IS THE LARGEST CITY

COUNTRIES THAT HAVE CENTRAL GOVERNMENTS AND THE CAPITAL CITY IS THE LARGEST CITY

NO.	COUNTRY	CENTRAL[a]			CAPCITY[b]		
		1960	1970	1980	1960	1970	1980
1	ALGERIA	1	1	1	1	1	1
2	ANGOLA	1	1	1	1	1	1
3	ARGENTINA	1	1	1	1	1	1
4	AUSTRALIA	0	0	0	0	0	0
5	AUSTRIA	0	0	0	1	1	1
6	BELGIUM	0	0	0	0	0	0
7	BOLIVIA	1	1	1	0	1	1
8	BRAZIL	0	0	0	0	0	0
9	CAMEROON	1	1	1	0	0	0
10	CANADA	0	0	0	0	0	0
11	CHILE	1	1	1	1	1	1
12	COLOMBIA	1	1	1	1	1	1
13	COSTA RICA	1	1	1	1	1	1
14	COTE D'IVOIRE	1	1	1	1	1	1
15	DENMARK	1	1	1	1	1	1
16	DOMINICAN REP.	1	1	1	1	1	1
17	ECUADOR	1	1	1	0	0	0
18	EGYPT	1	1	1	1	1	1
19	EL SALVADOR	1	1	1	1	1	1
20	ETHIOPIA	1	1	1	1	1	1
21	FINLAND	1	1	1	1	1	1
22	FRANCE	1	1	1	1	1	1
23	GERMANY, FED	0	0	0	0	0	0
24	GHANA	1	1	1	1	1	1
25	GUATEMALA	1	1	1	1	1	1
26	HAITI	1	1	1	1	1	1
27	HONDURAS	1	1	1	1	1	1
28	INDIA	0	0	0	0	0	0
29	INDONESIA	1	1	1	1	1	1
30	IRAN	1	1	1	1	1	1
31	IRAQ	1	1	1	1	1	1
32	IRELAND	1	1	1	1	1	1
33	ITALY	0	0	0	1	1	1
34	JAMAICA	1	1	1	1	1	1
35	JAPAN	1	1	1	1	1	1
36	JORDAN	1	1	1	1	1	1
37	KENYA	1	1	1	1	1	1
38	SOUTH KOREA	1	1	1	1	1	1
39	KUWAIT	1	1	1	1	0	0
40	MADAGASCAR	1	1	1	1	1	1
41	MALAWI	1	1	1	1	1	0
42	MALAYSIA	0	0	0	1	1	1
43	MALI	1	1	1	1	1	1

TABLE E (Continue)

NO.	COUNTRY	CENTRAL[a]			CAPCITY[b]		
		1960	1970	1980	1960	1970	1980
44	MEXICO	0	0	0	1	1	1
45	MOROCCO	1	1	1	0	0	0
46	MOZAMBIQUE	1	1	1	1	1	1
47	NEPAL	1	1	1	1	1	1
48	NETHERLANDS	1	1	1	1	1	1
49	NEW ZEALAND	1	1	1	0	0	0
50	NICARAGUA	1	1	1	1	1	1
51	NIGERIA	0	0	0	1	1	1
52	NORWAY	1	1	1	1	1	1
53	PAKISTAN	1	1	1	1	0	0
54	PANAMA	1	1	1	1	1	1
55	PARAGUAY	1	1	1	1	1	1
56	PERU	1	1	1	1	1	1
57	PHILIPPINES	1	1	1	0	0	0
58	SAUDI ARABIA	1	1	1	1	1	1
59	SENEGAL	1	1	1	1	1	1
60	SIERRA LEONE	1	1	1	1	1	1
61	SOUTH AFRICA	1	1	1	0	0	0
62	SPAIN	1	1	1	1	1	1
63	SUDAN	1	1	1	1	1	1
64	SWEDEN	1	1	1	1	1	1
65	SWITZERLAND	0	0	0	0	0	0
66	SYRIA	1	1	1	1	1	1
67	TANZANIA	1	1	1	1	1	1
68	THAILAND	1	1	1	1	1	1
69	TUNISIA	1	1	1	1	1	1
70	TURKEY	1	1	1	0	0	0
71	UGANDA	1	1	1	1	1	1
72	UNITED KINGDOM	1	1	1	1	1	1
73	UNITED STATES	0	0	0	0	0	0
74	URUGUAY	1	1	1	1	1	1
75	ZIMBABWE	1	1	1	1	1	1

[a]CNTRAL = 1 Central Government.
0 Otherwise (e.g., Federal Gevernment).

Source: Mutlu, Servet (1989) and from different issues of World Atlas.

[b]CAPCITY = 1 Capital City is the Largest City.
0 Otherwise (e.g., Capital City is not the Largest City.

Source: Different Issues of Demographic Yearbook (1960-1980).

APPENDIX F

THE CALCULATED METROPOLITAN PERCENTAGE AND METROPOLITAN CONCENTRATION MEASURES FOR THE 68 COUNTRIES FOR 1960, 1970, AND 1980

METROPOLITAN PERCENTAGE (MP) AND METROPOLITAN CONCENTRATION (MC) FOR 1960, 1970 AND 1980

No.	Country	Metropolitan Concentration (MC)			Metropolitan Percentage (MP)		
		1960	1970	1980	1960	1970	1980
1	ALGERIA	.526	.357	.493	.164	.136	.200
2	ARGENTINA	.802	.867	.672	.537	.611	.556
3	AUSTRALIA	.714	.731	.816	.579	.647	.683
4	AUSTRIA	.752	.712	.536	.376	.363	.295
5	BOLIVIA	.508	.599	.691	.116	.152	.318
6	BRAZIL	.567	.633	.676	.256	.339	.456
7	CAMEROON	.394	.459	.321	.033	.059	.126
8	CANADA	.628	.660	.729	.431	.493	.552
9	CHILE	.488	.502	.652	.316	.370	.527
10	COLOMBIA	.522	.700	.687	.242	.385	.441
11	COSTA RICA	.631	.680	.369	.220	.246	.166
12	COTE D'IVOIRE	.352	.398	.500	.056	.115	.140
13	DENMARK	.462	.475	.418	.342	.383	.353
14	DOMINICAN REP.	.340	.475	.553	.121	.176	.279
15	ECUADOR	.532	.569	.601	.176	.214	.295
16	EGYPT	.692	.710	.723	.262	.310	.315
17	EL SALVADOR	.255	.341	.473	.097	.136	.203
18	ETHIOPIA	.424	.478	.407	.027	.032	.046
19	FINLAND	.361	.356	.590	.202	.243	.353
20	FRANCE	.553	.628	.566	.339	.427	.418
21	GERMANY, FED	.663	.660	.406	.514	.543	.342
22	GHANA	.471	.526	.438	.109	.179	.135
23	GUATEMALA	.406	.407	.510	.124	.149	.190
24	HAITI	.408	.467	.626	.060	.082	.159
25	HONDURAS	.379	.401	.578	.082	.104	.212
26	INDIA	.502	.797	.548	.090	.100	.125
27	INDONESIA	.650	.678	.600	.097	.121	.133
28	IRAN	.539	.586	.751	.178	.230	.377
29	IRAQ	.545	.711	.629	.214	.309	.812
30	IRELAND	.599	.608	.346	.274	.308	.192
31	ITALY	.506	.572	.651	.242	.295	.286
32	JAMAICA	.792	.770	.198	.231	.277	.312
33	JAPAN	.660	.677	.765	.419	.563	.584
34	JORDAN	.337	.446	.752	.133	.196	.335
35	KENYA	.716	.779	.470	.054	.072	.086
36	SOUTH KOREA	.816	.832	.988	.228	.325	.556
37	MADAGASCAR	.429	.485	.274	.046	.063	.052
38	MALI	.526	.525	.371	.031	.045	.066
39	MEXICO	.522	.582	.771	.265	.339	.512
40	MOROCCO	.650	.678	.924	.189	.240	.388
41	MOZAMBIQUE	.742	.800	.559	.027	.044	.073
42	NEPAL	.800	.646	.246	.022	.040	.080
43	NETHERLANDS	.563	.626	.456	.380	.452	.403
44	NEW ZEALAND	.533	.696	.458	.338	.459	.291
45	NICARAGUA	.355	.403	.433	.140	.176	.226

APPENDIX F (Continued)

No.	Country	Metropolitan Concentration (MC)			Metropolitan Percentage (MP)		
		1960	1970	1980	1960	1970	1980
46	NIGERIA	.321	.334	.281	.054	.070	.076
47	NORWAY	.417	.465	.330	.203	.255	.233
48	PAKISTAN	.558	.479	.645	.072	.103	.181
49	PANAMA	.612	.642	.600	.254	.300	.279
50	PARAGUAY	.517	.522	.500	.178	.187	.214
51	PERU	.366	.508	.819	.150	.234	.521
52	PHILIPPINES	.664	.691	.794	.143	.160	.164
53	SAUDI ARABIA	.476	.800	.549	.077	.135	.316
54	SENEGAL	.490	.555	.597	.115	.152	.201
55	SIERRA LEONE	.424	.483	.531	.048	.069	.129
56	SOUTH AFRICA	.591	.629	.686	.265	.317	.284
57	SPAIN	.517	.569	.462	.279	.334	.423
58	SUDAN	.373	.345	.479	.027	.290	.114
59	SWEDEN	.412	.495	.501	.251	.327	.416
60	SWITZERLAND	.537	.560	.600	.291	.334	.342
61	SYRIA	.714	.587	.694	.264	.308	.325
62	THAILAND	.568	.606	.680	.065	.079	.111
63	TUNISIA	.421	.512	.622	.156	.222	.117
64	TURKEY	.459	.652	.834	.122	.184	.367
65	UGANDA	.532	.531	.436	.020	.038	.170
66	UNITED KINGDOM	.928	.907	.720	.726	.717	.564
67	UNITED STATES	.723	.775	.690	.505	.583	.673
68	URUGUAY	.527	.629	.485	.379	.530	.426

Note: (1) MC and MP For 1960 and 1970 are Calculated from Davis, Kingsley (1969). "World Urbanization 1950- 1970 Volume I: Basic Data for Cities, Countries, and Regions" World Urbanization, Volume I.

(2) MC and MP for 1980 from Various Issues Demographic Yearbook (1972-1986).

(3) MP and MC for 1980 for some countries are calculated according to the political definition of an urban area with 100,000 or more due to the unavailability of data for the urban agglomeration economy (definition). Also MP and MC are not exactly for 1980 for all countries (e.g., for some countries, MP and MC are for two or three years up or down from 1980).

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