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PATTERNS OF REGIONAL DISPARITIES IN PANAMA

By

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ABSTRACT

PATTERNS OF REGIONAL DISPARITIES
IN PANAMA

By

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This study is concerned with regional disparities within and between districts of Panama for 1980 addressing the relationship between income distribution inequalities and certain variables of development. To measure this relationship three dependent variables of inequalities and six independent variables of development were chosen. Regression analyses were performed between each index of inequality and the variables of development.

The results showed that regional disparities in income were present in 1980 at the district level. These inequalities varied according to the measure of inequality used. In addition, the Gini coefficient seems to reveal a general unequal distribution of income.

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CHAPTER I

INTRODUCTION

One of the most important goals of developed and developing countries has been to achieve higher levels of development. In many cases, principally in less developed countries, this development has brought increasing disparities within and between regions. This situation is complicated due to the fact that the meaning of development is difficult to define since development constitutes a broad process that implies economic, social and political factors.

Referring to the complex connotations that the word development may suggest, Todaro states that:

> We may conclude that development is both a physical reality and a state of mind in which society has, through some combination of social, economic and institutional processes, secured the means for obtaining a better life." (1985, 87)

Giving further implications to the meaning of development, Hirschman (1966) also sees development as a process, which depends on the ability to use resources that are unevenly distributed, not perceived as being present or simply ineffectively used. In the case of developing countries like Panama it has been noticed that resources have not been used in an effective way, a situation that may induce to disparities.

Seers (1969), addressing the same topic, believes that three questions must be posed in order to see whether or not a country has successfully reached a particular stage of development: namely, what has been happening to poverty, unemployment and inequality within a country. He concludes that development is present in a country when there is a decrease of these three aspects. He also emphasizes that even though per capita income may have risen, a country should not be called developed if one or more of the factors mentioned above is getting worse.

Even though an increase of economic growth may be an indicator of the level of development, it does not necessarily mean an improvement in the socio-economic conditions of the population. It has been observed that in some Third World countries, economic growth has only favored certain groups of the population. Van Ginneken and Park (1984) have stated that there are some countries where the conditions of the poor population has not become better, on the contrary, they still are as poor as they were before.

In 1980, the Republic of Panama was considered one of the countries within Latin America with a relatively high standard of living. Its economically active population earned higher wages, compared to other Latin American countries, and they also were more educated.

This country also had a dynamic economy based principally in agricultural activities and other activities related to industry, commerce, and services. Furthermore,

this country also has important sources of income which include activities related to the Panama Canal, banking businesses, the free trade area of Colon and the "Petroterminal" of Panama (a pipeline that transships oil from Alaska, mainly to the eastern part of the United States).

All these activities helped Panama build a stronger economy during the 1970's and 1980's. Panama, however, has serious problems of concentration and distribution of economic and social activities in certain parts of the country. For example, the median family income in 1980 for the provinces within the Metropolitan Region was $313, while for the rest of the country was $152.5. In addition, 63.7% of the secondary and tertiary activities are performed in the Metropolitan Region of Panama city and Colon, an area formed by the provinces of Panama and Colon. This region concentrates 53.6% of the total population of the country. The rest of the country is primarily engaged in activities related to the primary sector, with a few regional urban centers with incipient activities related to the tertiary sector.

The concentration of activities in one region implies a strong tendency for inequalities of income to exist within the country. Since the distribution of income can be considered as a measure of inequalities and because it may vary according to the economic activities performed in the different regions of the country, it is important to know

how this factor is spatially distributed throughout the country and whether this distribution is related to the level of development.

Statement of the Purpose

The purpose of this study is to examine the relationship between income distribution inequalities and selected factors of development in Panama in 1980. This study attempts to show that there are significant relationships between regional disparities in income and factors of development.

This relationship will be examined by 1) using different measures of inequality and development; 2) investigating which measures of inequality are more reflective of development; and 3) by seeing what the pattern of the relationship is between development and inequalities of income distribution.

I expect to find that 1) there are going to be differences in income inequalities between districts; 2) these income inequalities will vary according to the measure of development and inequality used; 3) this variation will be revealed at the district level and 4) the pattern of the relationship between inequalities and development at the district scale will be non-linear.

Review of Literature

The fact that during the process of development countries suffer regional disparities is well recognized in the literature. These regional disparities constitute a problem in developed as well as developing countries (Mera 1975).

In the case of developing countries, regional disparities seem to be greater because these countries present particular patterns of development. For developing countries usually one region acquires a predominant high level of economic development while the rest of the regions are left behind. These increasing regional disparities can grow over time in what has been called "the backwash" effects by Myrdal (1957). He refers to the existence of a more advanced region called "north" (characterizing the "First" world, developed countries) with high productivity and income as the result of an increase of savings and investment. This region will also be highly urbanized, with a concentration of administrative and manufacturing activities. On the other hand, there is a less developed region called "south" (start for the "Third" world, less developed countries or Southern Hemisphere) which is characterized by low incomes and activities related to the primary sector (principally agriculture). The "north" region will also attract the most qualified people from the "south" because of the opportunities that it offers, increasing the existing disparities. But it is expected that a demand of

products in the more developed region will, ultimately have a "spread effect" resulting in more development within the less developed region.

A similar argument has been posited by Hirschman (1966) in what he called "polarization and trickling down effects" where the "north" region will develop, and where the "south" region will benefit by way of the development of the "north" region. But this equilibrium can be reached only if there is complementarity between them. In other words, the "north" region must invest in the "south" and also consume products from it. But if this does not happen there may be an increase of disparity over time.

This problem of regional disparity has also been called the "center-periphery" relationship by Prebish (Chilcote 1984). In this case, there is a "center" which is highly industrialized and technologically advanced, and there are the periphery areas that are underdeveloped. As the center becomes more developed, principally in activities related to secondary and tertiary sectors, it will dominate the periphery areas as most of the products consumed by the periphery are imported from the center. As a result of this dependence there is a deformation and stagnation of the periphery areas.

Differences in regional disparities of development between less developed and more developed areas are also considered to be related to Location Theory. Accordingly, some regions will have a concentration of activities in

regard to others, due to the advantageous location they offer for activities such as manufacture, services, etc. Thus, regional disparities seem to be related to a difference in activities that are performed in one economic region in respect to the others. These disparities are also related to a lack of transport, absence of administrative capital or the combination of both factors which retards development in less developed regions (Mera 1975).

Williamson agrees that regional disparities within a country may increase as some regions become economically more developed. This is related to the fact that:

> Regions within nations do not typically possess equal capacity for growth, and when development begins in some of these islands, regional barriers may be too great to communicate the growth stimulus to other less fortunate regions. (1965, 5)

This situation implies that even though regional development is present in one or more regions within a country, other regions will have a lack of this development as a result of disparities in resource endowment and investment.

The relationship between regional inequalities and development can be conceptually seen in the following way. At first, regional disparities will tend to increase with development. But, it is expected that once an unknown level of development is reached inequalities should decrease. Thus, regions with very little development will have low inequalities. With an increase in development these regional

disparities will increase, followed by a decrease in inequalities as regions become more fully developed. Consequently, it is expected that this relationship between regional inequalities and development will present a curvilinear pattern, where regions with the lowest development will have low inequalities; regions with higher, but still relatively low development will have higher inequalities; and regions with the highest development will have lower inequalities. Figure 1 shows a generic form of this relationship.

Inequalities will be low at the beginning of the curve because there is little development; primary sector activities dominate. As development increases there will be an increase in inequalities because activities such as industry, commerce and services are emerging and contributing to concentrations of investments. Once a higher level of development is reached, inequalities will decrease as the whole region enjoys the benefits of development. This hypothetical relationship, as mentioned above, has been accepted by authors such as Myrdal (1957) and Hirschman (1966). Both agree that regional disparity might diminish either through government intervention or because an increase in development in the more developed areas may cause some problems such as high cost of land and labor, as well as water and electricity shortages among others, forcing the population to look for other places to live. This situation will push toward a decentralization of

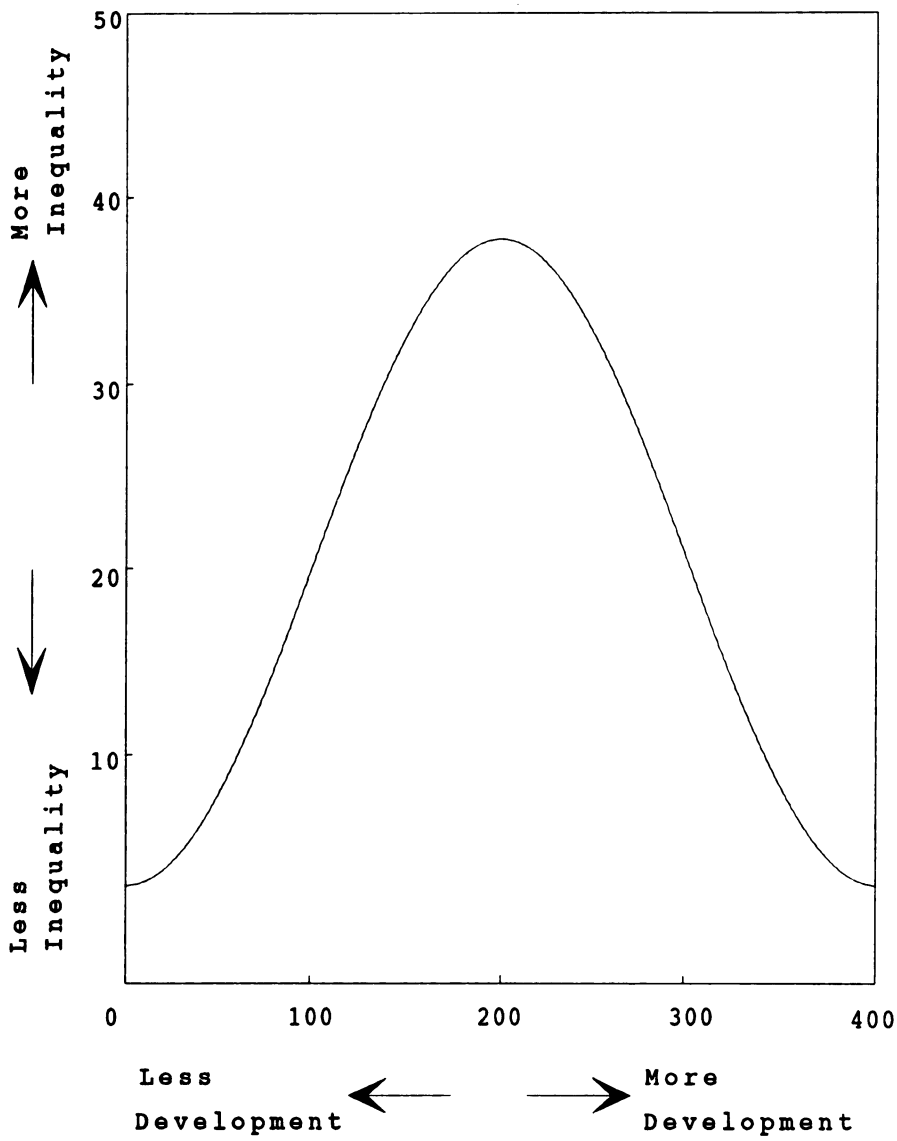

Figure 1 Relationship between Development and inequalities

economic activities from the more developed areas. Along the same lines, Hicks (1959) also considers that with increasing development there will be a decrease of inequalities between the more developed regions and less developed regions.

Since regional inequalities present a curvilinear relationship with development, and these regional inequalities affect the income of these regions, it can be assumed that the relationship between inequalities in income distribution and development will be also curvilinear. Research related to this curvilinear relationship was presented by Kuznets (1955). He observed that, in the case of developed countries, income inequalities widened from the pre-industrial to the industrial period, stabilized, and then became narrower in the later stages of development. Since then, other studies, related to this curvilinear relationship, have been offered using both developed and developing countries.

Chenery, for example, found that there is a rise in income as the population moves from an early stage of development characterized by agricultural production to industrialized production (in Todaro 1985). But, he also argued that this rise in income would also bring about more regional disparities.

Ahluwalia (1976a, b) also found support for the hypothesis that income distribution inequalities increase in the early stages of development and decrease in later stages. In addition, at the international level Bornschier

(1978) showed that less developed countries with an economic system mostly based on agricultural activities present higher disparities in income distribution than more developed countries. Williamson (1965) obtained a curvilinear relationship between inequalities of income distribution and development which statistically he described with an "inverted U" curve.

Thus, for this study the notion of the existence of a curvilinear relationship between inequalities of income distribution and factors of development is stated. In addition, this curvilinear relationship will be tested using the districts within one country, Panama, instead of using many countries as was done by Williamson (1965), Adelman and Morris (1973), Papanek and Kyn (1986) and Ram (1988) among others.

CHAPTER II

STUDY AREA AND DATA SOURCES

Study Area

The Republic of Panama is the study area for this research. This country is located in Central America, near the Equatorial zone.

The population of Panama, according to the Census of 1980, was 1,805,287. This country was chosen as the study area because of its characteristic of being a less developed country. It also has a political and administrative structure with a centralized type of government which is located in Panama city, its capital, which controls policy decisions to a very great extent for the whole economy. Other reasons for choosing this country as the area of study are that data on income were available and accessible to the researcher who is also quite familiar with Panama.

The Republic of Panama is divided into administrative divisions called provinces. Provinces are divided into smaller administrative units called districts, and districts are sub-divided in smaller units called *corregimientos*. In addition, there is the indigenous region of San Blas which functions as an administrative jurisdiction under special laws, but in the census it is listed (and is thus considered) as another district within the province of

Colon. According to the census of 1980 the Republic of Panama was divided in 9 provinces, 65 districts and 505 *corregimientos* and the region of San Blas. For the purpose of this study the administrative units used were the 65 districts of Panama and the indigenous region of San Blas (See Table 1 and Figure 2).

Economic History of Panama

The roots of regional disparities in the Republic of Panama can be found in the period of colonization. The region, discovered by the Spaniards in 1501, soon became an important center for the organization and distribution of expeditions to other regions of the American continent because this was the shortest way known between the Atlantic and the Pacific Oceans. A decisive factor that had influence in the later development of the country was the fact that this relative importance was concentrated in only one region located in the central area of Panama. This region with a narrow strait became even more important with the discovery of the Pacific Ocean in 1513. By as early as 1525 it was thought of as a possible waterway to connect the Atlantic and Pacific Oceans, especially due to the existence of the Chagres River. This region was known later on as the Transisthmican Region.

During all of the colonial period (1501 to 1821) the Transisthmican Region was the center of trading activities, with important cities like Panama, Nombre De Dios and

Table 1.--Political division of the Republic of Panama by district: 1980

Number	Name	Number	Name
1	Bocas del Toro	34	Ocu
2	Changuinola	35	Parita
3	Chiriqui Grande	36	Pese
4	Aguadulce	37	Santa Maria
5	Anton	38	Guarare
6	La Pintada	39	Las Tablas
7	Nata	40	Los Santos
8	Ola	41	Macaracas
9	Penonome	42	Pedasi
10	Colon	43	Pocri
11	Chagres	44	Tonosi
12	Donoso	45	Arraijan
13	Portobelo	46	Balboa
14	Santa Isabel	47	Capira
15	San Blas	48	Chame
16	Alanje	49	Chepo
17	Baru	50	Chiman
18	Boqueron	51	La Chorrera
19	Boquete	52	Panama
20	Bugaba	53	San Carlos
21	David	54	San Miguelito
22	Dolega	55	Taboga
23	Gualaca	56	Atalaya
24	Remedios	57	Calobre
25	Renacimiento	58	Canazas
26	San Felix	59	La Mesa
27	San Lorenzo	60	Las Palmas
28	Tole	61	Montijo
29	Chepigana	62	Rio de Jesus
30	Pinogana	63	San Francisco
31	Chitre	64	Santa Fe
32	Las Minas	65	Santiago
33	Los Pozos	66	Sona

* Reference number for Figure 2

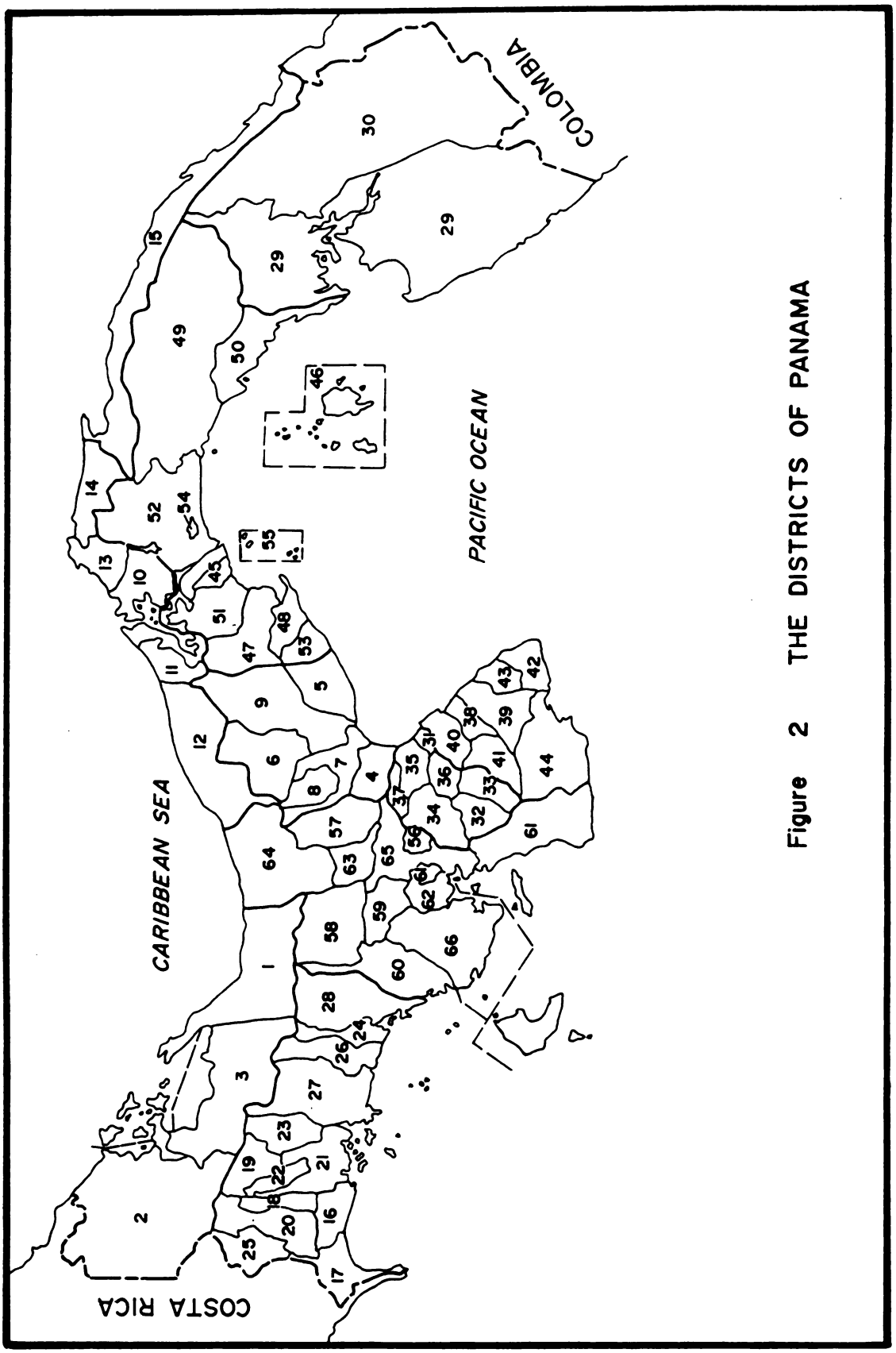

Figure 2 THE DISTRICTS OF PANAMA

Portobelo. The rest of the country was populated by small towns with activities related to agriculture and cattle raising.

Already, by 1821, when Panama achieved its independence from Spain, and annexed itself voluntarily to Colombia, it presented a clear economic dichotomy between the Metropolitan Region and the rural remainder of the country. Within this Transisthmican Region, including the cities of Panama and Colon, was also concentrated most of the wealth of the country.

Another historical event that contributed to the growing regional disparities between the Transisthmican Region and the rest of the country was the discovery of gold in California in 1848. A need for a fast route across the Isthmus of Panama, in order to travel to California, stimulated the building of a railroad across the Transisthmican Region. This railroad was built from 1850 to 1855 from the Atlantic to the Pacific coast bringing further economic growth to this region. Most of the revenue obtained by the railroad came from the transportation of gold bullion from the California mines (Mack, 1944). But, the completion of the first transcontinental railroad across The United States in 1869 diminished the importance of the Panama railroad.

The work to build a canal to connect the Atlantic with the Pacific Ocean began during the last part of the nineteenth century. This enterprise was begun by the French

in 1880 and finished by the Americans in 1914. With the canal in operation, the canal and related tertiary activities supported more than three quarters of the economy of the Transisthmican Region. By 1910 the provinces of Colon and Panama produced 85.4% of all the income of the entire country. The province of Bocas del Toro had 9.3%, while the provinces of Veraguas, Chiriqui, Cocle and Herrera produced only 5.3% of the income (Jaen Suarez 1985). The province of Bocas del Toro had higher income than the rest of the provinces in the interior of the country, because of the banana export companies located in that region.

While the Metropolitan Region developed its infrastructure rapidly the rest of the country remained either stagnated or only slightly improved until the middle of the twentieth century. Socioeconomic factors showed similar concentration. For example, most of the districts outside of the Metropolitan area had a high percentage of illiterate people.

The Republic of Panama is still confronting the problem of regional disparities. The Metropolitan Region continues to be the most developed region of the country having a high concentration of tertiary activities (services, commerce, banking and the canal) and secondary activities. This history and concentration of economic activity has given a cosmopolitan character to the Metropolitan Region. Even though the rest of the country has had a slight improvement in the infrastructure, with some cities containing certain

secondary and tertiary activities, the main economic activity outside the Metropolitan Region is still agriculture.

In summary, Panama is characterized by a geographic polarization with a region with a high percentage of urban population having a dynamic economy, and another region with a high percentage of rural population and a traditional and stagnant economy. This dualism within the economy, the contrast between agricultural activities and a more modern sector, makes Panama a useful country with in which one can observe inequality in income distribution.

Data Sources

The income data for this analysis are from the census of 1980 at the district level (see Figure 2). This census was edited by the *Contraloria General de la Republica de Panama*, a census bureau office in charge of the compilation of national data.

The income data will be used to derive three indexes of inequality. The income data consisted of the number of households within each district grouped according to amount of monthly income they received. Ten categories were available, ranging from $75.00 and less, up to $1000.00 and more. This specific set of data was obtained from unpublished material located in the *Departamento de Estadistica y Censo* (Department of Statistics and Census).

Table 2 presents an example of the household income distribution data for the district of San Miguelito.

Using the number of households and the income categories a Lorenz curve was obtained for *each* of the sixty six districts in Panama. The Lorenz curve in this case represents the cumulative percentage of families and cumulative percentage of income. These curves serve as the bases of three indexes of inequality: the Gini Coefficient (Gini), the income share received by the poorest 20% of the population (IS20) and the income share received by the poorest 40% of the population (IS40).

The independent variable data base came from different sources. Data for median income by family were obtained from the census of 1980. Population in agricultural activities, literacy, school enrollment, and population growth were obtained from Volumes I, III and V of the *Censos Nacionales de Panama de 1980* (National Census of Panama from 1980). The data for agriculture land under private ownership were collected from the *Cuarto Censo Nacional Agropecuario de 1981* (National Agricultural Census of Panama from 1981).

Table 2.-- Example household income distribution data for the district of San Miguelito

Range	Number of Families
< $75	1519
$75 - 99	528
$100 - 124	1240
$125 - 174	2712
$175 - 249	4931
$250 - 399	6474
$400 - 599	4908
$600 - 799	2417
$800 - 999	1326
> $1000	1819
Total	27874

CHAPTER III

VARIABLES AND METHODOLOGY

This chapter is concerned with variables that are used to measure development. It also addresses the methodology used to obtain measures of inequalities with the purpose of studying the relationship between income distribution and development.

Measures of Development

For this study certain variables were chosen to represent the level of development within the country. Each one of these variables is considered a measure of development. These variables are level of income, median years of education, percentage of population engaged in agricultural activities, population growth and land ownership. These variables were chosen based on the criteria that they are considered to be good indicators of the socio-economic conditions of the population. In addition, most of these variables have been used in one way or another in the literature and they are considered as appropriate variables used to measure development. Finally, they are available from the sources presented in the previous chapter.

Income

In this study the level of family income is used as a measure of development. Although this is one of the most accessible variables used as a measure of development, there is debate among authors about what measure or measures of income is best utilized as a measure of development. Lecaillon *et al.* (1984), for example, recommended that the following types of income data should be used: data on income for one country and one year collected either by households, economic active population or individuals. Berry and Soligo (1980) consider individual income as the natural unit. But, they also emphasized that because individuals live together in families, or households, most information on income is obtained at the household level. Therefore, in this study median family income will be used.

Education

The relationship between the level of development and education represents an important feature which has been emphasized throughout the years. The level of development a country has can be measured by the level of education of its population. As education spreads throughout a country there are more opportunities for the population to be more educated, a situation that will help them to find better jobs as well as learn new technology to improve all branches of the economy. In addition, a well educated population will

have more knowledge about health and other social aspects. Thus, a country where most of its population is educated will achieve higher levels of development than a country whose population is not educated. Since education plays an important role in development, it is expected that the level of education will be also related to differences in inequalities of income.

Several studies have shown that differences in income inequalities can be related to differences in the level of education. Ahluwalia (1976a), for example, used the literacy rate as a measure of the basic education level of the population, and secondary school enrollment rate as a measure of the degree of educational achievement. He found a positive relationship between per capita GNP and these two variables. His results showed that secondary school enrollment affects positively the income share of the middle groups (middle forty percent of income share), whereas literacy affects positively the lower income group in the population (lowest forty percent). He explained this situation by arguing that lower income groups, principally in developing countries, are excluded from secondary schooling.

An important fact about education is also mentioned by Berry and Soligo (1980). They affirmed that the education students receive in the present will affect the distribution of income and therefore the labor force in the future. Although this factor plays an important role in the

distribution of income, this lagged relationship is beyond the scope of this thesis.

In a country like Panama education constitutes an important factor that needs to be examined. Therefore, in this study the percentage of literate and the percentage of children between 6 and 15 years old enrolled in school will be used as indicators of development. Specifically, literacy is used as a measure of development because it reveals how minimally educated the population within each district is. In addition, school enrollment is used because it reveals how important education is viewed to be since this factor is considered more of a characteristic in high developed areas than in lower developed ones.

Population in Agricultural Activities

The distribution of the population in agricultural activities is another variable commonly used as a measure of development. Since the discovery of agriculture, this activity has constituted one of the most important economic activities in human life. As other economic activities came to be performed, agricultural activities were also affected because the population started to move from this "traditional" activity to the more "modern" activities. Thus, in this case, as the level of development increases there will be less population engaged in agricultural activities.

Even though agricultural activities tend to decrease with development this activity can not totally disappear, since the base of the subsistence of the population is usually in the amount of food that is produced for consumption. An increase in development also implies an improvement in technology for the agricultural sector and an increase in food production. Therefore, the amount of population engaged in agricultural activities may decrease with development but also development will affect the way this economic activity is performed.

In most developing countries, a decrease in the population engaged in agricultural activities will be an indicator of development. Thus, the relationship between this factor of development and income distribution inequalities is an important aspect that needs to be addressed.

According to Sundrum (1990), the traditional or agricultural sector usually has a lower level of income than the modern sector. Whereas the modern sector is affected by market forces, in the traditional sector income distribution is more affected by social forces which tend to keep income differences within a narrow range. As a result of this situation, income distribution is likely to be less unequal in the traditional sector than in the modern sector. Sundrum observed that the agricultural share of the labor force changed inversely with per capita income in each decade, and also that this share declined. Sundrum expressed that:

> An interesting feature is that the decline of this share [agricultural share] over time has followed a logistic pattern, being slow in countries at a low level of development, then becoming faster at the middle stages of development and again becoming slow in the most developed countries. (1990, 178)

Sundrum also mentioned that these two sectors of production (the traditional and modern sector) in developing countries have a low labor productivity and therefore, lower levels of income than those found in developed countries.

For this study the percentage of population employed in agricultural activities will be used as one of the independent variables used to test the relationship between income distribution inequalities and development. This variable was chosen because the amount of people engaged in agricultural activities is inversely related to development, a situation that necessitates looking at how income distribution inequality is affected by a decrease in agriculture activities.

Population Growth

Population growth is another variable mentioned in the literature related to development. The argument for the use of this variable is that populations have had a tendency to grow where there is a greater variety of economic activities that can be performed and where there are better jobs and more opportunities to improve the economic status of the population. In addition, the discovery of new technology and an improvement in the health conditions and other social

conditions help people to live longer and, more important to the present argument, to have more children with a resulting increase in the growth of population. But, as a country reaches higher levels of development and more new technology is discovered related to population controls, there is also a tendency to have less children. This is most often explained by the fact that families will strive for a higher standard of living. Since population growth is considered a measure of development, and development is related to the distribution of income in a country, this variable will be used to establish the relationship between development and inequalities of income.

Using regression results, Ahluwalia asserted that, "Our estimated results unambiguously show that high growth rates of population [were] systematically associated with greater income inequality" (1976a, 325-326). He based his hypothesis on two explanations suggested by the literature. First, higher growth rates occur in low income strata. This situation leads to a slower growth of per-capita income for the poorer population as compared to the high income population, with a consequent increase of inequalities. Second, high growth rates may increase income inequalities. These high growth rates lead to an excess of labor supply in an area where the population is already engaged in a restricted number of low income jobs. In addition, higher growth rates will create more burdens on the head of households because there will be more individuals dependent

on the income that is brought into the household with a consequent diminishing of savings.

For this study population growth was chosen as an independent variable based on the assumption that high population growth will increase income inequalities and that those districts with high growth are usually the less developed ones.

Land Ownership

Land ownership constitutes an important resource for the development of a country. The way this land is used and distributed within the population can affect development either in a positive or negative way. For example, high concentration of land ownership in a few hands or the fragmentation of land in very small portions could provoke serious imbalances which will affect the economic and social structure of a country.

In addition, the form of the tenancy of the land may be an indicator of development because as a country develops it is expected that people will try to legally own the land, instead of only renting or having the right of the land generally transmitted from generation to generation by simple possession. Thus, land ownership can be considered as a measure of development.

The relationship between land ownership as a measure of development and inequalities of income distribution has been suggested by Lecaillon *et al.* (1984) and Quan and Koo (1985)

among others. Lecaillon, *et al.* (1984) discussed how the surplus of population in rural areas provokes a fragmentation of the land. They argued that, with time, this fragmentation would result in two different groups: landless peasants and big land owners. Peasants with very small pieces of land will be forced to sell their lands and usually land owners are the people who get them.

Due to the fact that in agricultural areas accessibility to land also means accessibility to employment and income, Lecaillon *et al.* also divided the economically active population in those areas into two groups: farmers and agricultural laborers. He described farmers as people who, whether they are landowners or tenants, are responsible for a piece of land which they work all year around. On the other hand, agricultural laborers do not have or own the land, and they work according to the demand of labor. This means that they will be employed in agriculture only during certain periods of time. At other periods they may be unemployed. Therefore, their income depends on the days they work and these may be very few. This situation of higher concentration of land holdings will bring more income inequalities and land distribution problems.

Because data for the concentration of land among the population was not available at the district level, the variable of agricultural land under private ownership will be used instead in an attempt to analyze the influence that this variable has on income inequalities. Thus, in this

study the percentage of agricultural land under private ownership will be used as a measure of development.

Table 3 summarizes the definition of each of these independent variables.

Measures of Inequalities

As mentioned earlier, in order to develop the three indexes of inequalities used in this study a preliminary step was necessary. This step was to construct a Lorenz Curve for each of the districts of Panama. The Lorenz Curve is defined as:

> A simple graphical method used for comparing a given DISTRIBUTION with a perfectly even one, with a view to establishing the degree of concentration or segregation shown by the distribution. (Small and Whiterick 1990, 137-138)

Another similar but more general definition of the Lorenz curve was mentioned by Gastwirth: "The Lorenz curve plots the percentage of total income earned by various portions of the population when the population is ordered by the size of their incomes" (1971, 1037).

To obtain a Lorenz Curve, for each district, it was necessary to plot the cumulative percentage of families on the y axis and the cumulative percentage of income on the x axis in an ascending order. This curve is compared to the 45^{o} line which represents equality and is reached only if the distribution of income is perfectly even with the distribution of families. Thus, the nearer the curve is to

Table 3.--Independent variables used in this study

Variables	Definition
Median family income	Median household income by district in 1980
Population employed in Agricultural Activities	Percentage of population employed in agriculture, cattle raising, hunting, fishing and wood extraction in 1980
Literacy	Percentage of population able to read and write
School enrollment	Percentage of the population between 6 and 15 years enrolled in elementary and junior high school
Population growth	Growth of population from 1970 to 1980 as a percentage of 1970
Agricultural land under private ownership	Percentage of agricultural land under private ownership

this equality line, the diagonal line, the less income inequalities there will be within a district. A Lorenz curve was obtained for *each* of the sixty six districts of the country.

An example of the construction of a Lorenz curve can be developed from the data displayed in Table 4 for the district of San Miguelito. First, it was necessary to obtain the middle for each one of the range distribution. In

Table 4.-- Income distribution data used to obtain the Gini coefficient, IS20 and IS40 for the district of San Miguelito

Range	Middle	Families	Income	Cumulative % of Families	Cumulative % of income
< $75	70	1519	106330	4.757	10.415
$75 - 99	87	528	45936	11.283	30.282
$100-124	112	1240	138880	19.954	45.043
$125-174	150	2712	406800	37.562	66.441
$175-249	212	4931	1045372	60.788	84.768
$250-399	324	6474	2097576	78.478	93.902
$400-599	499	4908	2449092	88.208	97.456
$600-799	699	2417	1689483	92.656	98.670
$800-999	899	1326	1192074	94.550	99.071
> $1000	1250	1819	22737500	100.000	100.000

addition, the number of families distributed within the different range of income also was obtained. In 1980 there were 1,519 families in the district of San Miguelito with an income of less than seventy five dollars. The number of families within each income range was multiplied by the

middle income value of each interval of income; this give us the total income per each category. For example, in the category of less than seventy five dollars there was 106,330 of income which is the result of the multiplication between the numbers of families within that category and the middle income. The mid-point of the "less than $75" range was arbitrarily set to $70. (Similarly the "over $1000" mid-point was set to $1250.)

After that the percentage of families existent in each category was obtained throughout the division of families within each category and the total of families multiplied by 100. In the case of San Miguelito the percentage of families that earn less than $75.00 was obtained by dividing 1,519 by the total families in the district that was 27,874 in 1980 and multiplied by 100 giving us 5.450%. In other words 5.5% of families in the district of San Miguelito in 1980 earned less than $75.00. To obtain the percentage of income for each category the same procedure used for the percentage of families was performed. For example, 0.929% of the total income fell into the category of less than $75.00.

Finally, a Lorenz curve for the district of San Miguelito was drawn using the cumulative percent of families and the cumulative percent of income. (See Figure 3). It is important to recall that such a curve is produced for each of the sixty-six districts. These Lorenz curves were then used to derive three measures of inequality: Gini

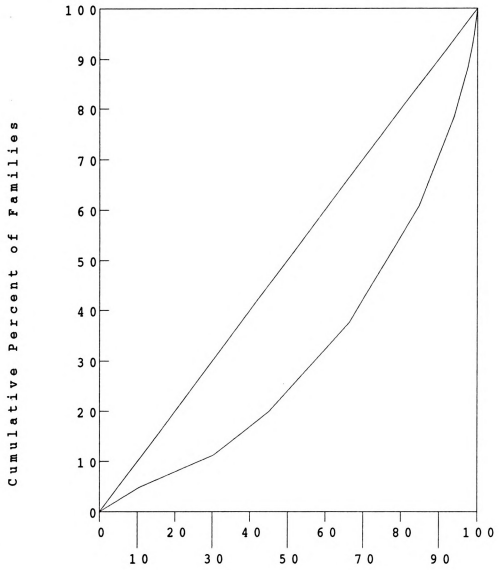

Figure 3 Lorenz Curve for the district of San Miguelito

coefficient, income share of the poorest 20% of the households (IS20) and income share of the poorest 40% of the households (IS40) for each one of the sixty six districts.

The Gini Coefficient

As introduced earlier, the Gini coefficient is a measure of inequality derived from the Lorenz curve. The Gini coefficient is defined as, "The ratio of the 'area' between the diagonal and the Lorenz curve divided by the total area of the half-square in which the curve lies" (Todaro 1985, 145). This measure goes from 0 (perfect equality) to 100 (perfect inequality). In other words, the greater the value is for the Gini coefficient, the more unequal and the higher is the concentration of a phenomenon. This measure in conjunction with the Lorenz curve is considered "...the most appropriate methods to measure and illustrate inequality" (Swindell 1989, 67). According to Todaro, countries with a highly unequal distribution of income will usually present Gini coefficients between 0.50 and 0.70; and countries with distributions that are less unequal will have distribution between 0.20 to 0.35.

To obtain the Gini coefficient the following formula can be applied:

$$\frac{A}{A + B} * 100$$

Where A corresponds to the area between the line of equality and the Lorenz curve; and B is the area below the Lorenz curve. The area B is measured with a series of polygons that are added. The area A+B is obtained by computation of the area of a right triangle. And therefore area A may be obtained by subtraction. For the example district of San Miguelito this Gini was 37.98. For this study all the Gini coefficients for each district of the country were obtained with this polygon summation using Lotus 123. The 66 Gini coefficients were plotted on a map with the purpose of showing the degree of inequalities in income that was present in 1980. (See Figure 4).

A limitation of the Gini coefficient is that this measure does not show the distribution of inequalities for specific segments of the population; for example the poor population, which are usually the most affected by unequal distribution of income. In other words, differently shaped Lorenz curves can give rise to the same "areas" and therefore the same Gini coefficients. Therefore, the Gini coefficient will be used as only one measure that shows inequalities that exists among the entire population of households within a district. Two other measures, the income share of the poorest 20% of the population (IS20) and the income share of the poorest 40% of the population (IS40), are used to focus upon specific portions of the household population.

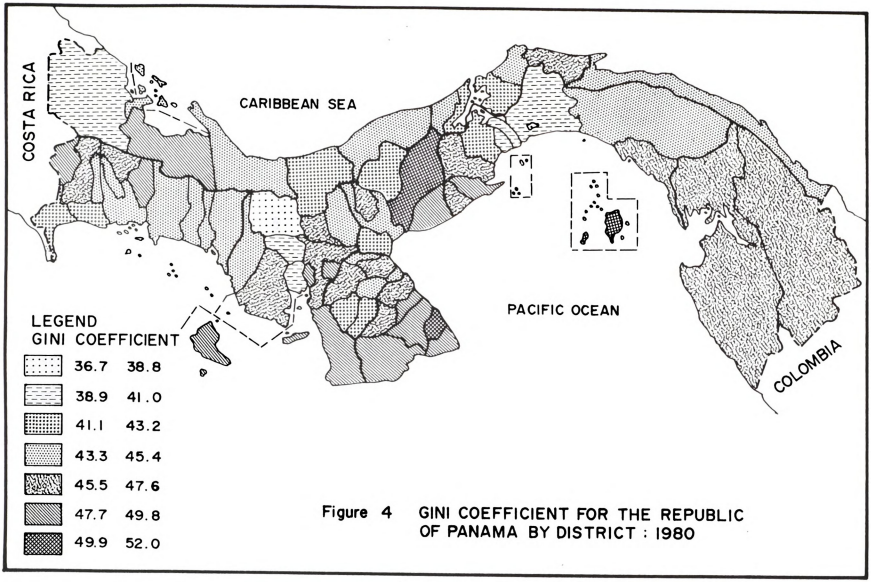

Figure 4 GINI COEFFICIENT FOR THE REPUBLIC OF PANAMA BY DISTRICT : 1980

Income Share for the Poorest Twenty and Forty Percent of the Population

As mentioned above, the income share for the poorest 20% (IS20) and 40% (IS40) of the population will be also used as a measure of inequalities. Using these two measures will permit the identification of the degree of inequality in the distribution of income in two different segments of the population. It will also show whether or not the different groups are receiving an equitable share.

These two measures of inequality were also obtained from the use of the Lorenz curve. The income share (an interval on the Y axis of the Lorenz curve) is obtained by interpolation of the poorest 20% and 40% from the X axis of the diagram. These two measures work in a reverse fashion than the Gini coefficient. In this case, the higher the number of IS20 and IS40 the more equality in the share of income a district will have. Thus, as development first begins to increase it is expected that the income share for IS20 and IS40 will be less unequally distributed.

An example of how the income share for IS20 was obtained for the district of San Miguelito is developed in the following paragraphs. To obtain this income share it was necessary to use the cumulative percentage of families and income and establish where in the cumulative percentage of families 80% was. In this case, it was between 78.478% and 88.208% (See Table 4). The two numbers that corresponded to the cumulative percent of income beside these two numbers

were also chosen. For the cumulative percent of income they were 93.902% and 97.456%. Then, the following formula was applied:

$$\frac{B}{A} * C = D$$

Where

B = corresponds to the cumulative percent of income already determined (93.902 and 97.456)

A = corresponds to the cumulative percent of families already determined (78.478 and 88.208)

C = 80 minus the lowest of the two percentages of the cumulative percent of families (78.208)

Thus,

B = 97.456 - 93.902 = 3.554

A = 88.208 - 78.478 = 9.730

C = 80 - 78.478 = 1.522

D = ?

In this case, the objective is to find D which is needed to obtain the share of income of the poorest 20% of the population. For IS20 80 is a constant.

Now, the formula is applied

$$\frac{3.554}{9.730} * 1.522 = 0.556 \qquad (D)$$

Once D is obtained this number is added to the lowest number of the two cumulative percent of income already chosen. In this case the total will be 93.902%.

Thus, the income share of the top 80%,

$$93.902 + 0.556 = 94.458$$

Finally, this number is subtracted from 100 and the result will be the income share for the poorest 20% of the population. Therefore, IS20 for the district of San Miguelito in 1980 was 5.5% which means that from the total income of this district only 5.5% is shared by IS20.

The same procedure was used to obtain the income share of the poorest 40% (IS40) with the difference that for this measure it was necessary to know within what range was the 60% of the cumulative percentage of families. For the district of San Miguelito it was between 37.562% and 60.788%. Then the formula was applied with the difference that the constant for C in the case of IS40 was 60 instead of 80.

Thus,

$$B = 84.768 - 66.441 = 18.327$$

$$A = 60.788 - 37.562 = 23.226$$

$$C = 60 - 37.562 = 22.438$$

$$\frac{18.327}{23.226} * 22.438 = 17.705 \quad (D)$$

$$66.441 + 17.705 = 84.146$$

$$100.000 - 84.146 = 15.854$$

In other words, in 1980, from the total income of the district of San Miguelito 15.9% corresponds to the income share of the poorest 40% of the population.

Figures 5 and 6 show the distribution of share of income for these two measures of inequalities by district. In viewing Figures 4, 5 and 6 it is important to recall that IS20 and IS40 operate in reverse of Gini, therefore the patterns tend to be mirror images.

Research Design

It is hypothesized that the relationship between income inequalities and development is non-linear. With variables developed above there are two general "shapes" to this non-linear relationship. Between the Gini coefficient (as a measure of inequality) and measures of development there will be an inverted U- shaped curve. While the relationship between IS20 and IS40 and development will be a U-shaped curve. Therefore, using a quadratic equation appears to be the best way to estimate these curves. Multiple regression analyses will be used to fit this relationship between each measure of inequality and each measure of development. Eighteen equations are estimated. It is expected that all the variables will fit into the second order equation

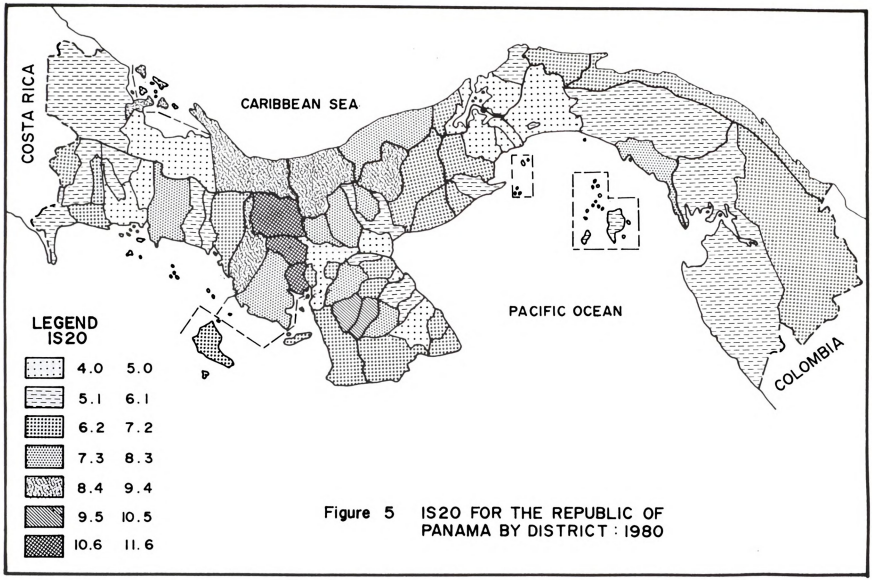

Figure 5 IS20 FOR THE REPUBLIC OF PANAMA BY DISTRICT : 1980

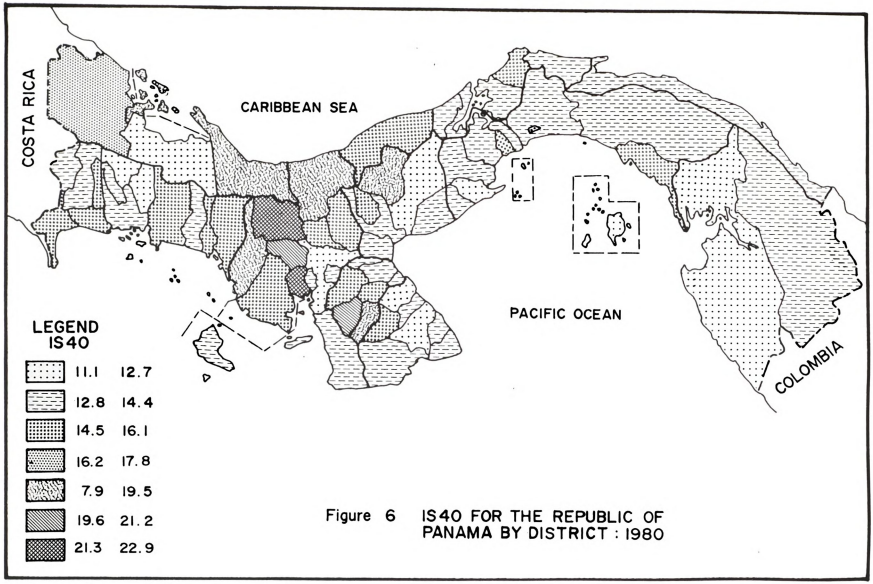

Figure 6 IS40 FOR THE REPUBLIC OF PANAMA BY DISTRICT : 1980

posited above; it is also expected that the b coefficients will produce either a U-shaped or an inverted U-shaped curve, according to the index of inequality used.

To use the quadratic equation it was necessary to transform, by squaring, the original development variables. After that, each set of independent variables was regressed against each dependent measure of inequality.

Formal Hypotheses

There is one major hypothesis for this study that will help to reveal the relationship between inequalities in the distribution of income and development. This main hypothesis, as has been mentioned above, is that there is a curvilinear relationship between income distribution and development. Low income inequalities among the population are expected to be found in those districts that are either highly underdeveloped or highly developed. While high inequalities are expected to be found in districts with a moderate level of development.

The general form of the functional relationship tested in this thesis will be as follows:

$$Y = a + b_1 X + b_2 X^2 \qquad (1)$$

Where

Y = is an index of income inequality

X = is one of the independent variables used as an indicator of development

a = constant

b_1 = regression coefficient

b_2 = regression coefficient

Thus, in the inverted U-shape relationship b_1 will be greater than zero and b_2 will be less than zero. The b_2 term is the one that gives the expected curvilinear form. Therefore, it is possible that a significant curvilinear relationship might only show b_2 as significantly different from zero.

Equation 1 is a parabola, which could, depending upon the signs of the coefficients, be "U-shaped" or "inverted U-shaped". Table 5 shows the expected signs for each of the regressions. In this research, the indexes of inequality and development used will determine which orientation the relationship will reveal. As high Gini coefficients represent high inequalities in income distribution the relationship between this index and the variables of development that will be used will produce the form of an inverted U-shape (See Figures 1 and 7). Therefore, districts with moderate development will have higher Gini coefficients, while districts with lower and higher development will have lower Gini coefficients.

Table 5.-- Expected signs for coefficients from the quadratic equation

Independent Variables (Measures of Development)	Dependent variables (Measures of inequalities)	
	Gini coefficient	Income share of the poorest 20% and 40% of households IS20 and IS40
Median family income	$b_1 > 0$ $b_2 < 0$	$b_1 < 0$ $b_2 > 0$
Population employed in agricultural activities	$b_1 > 0$ $b_2 < 0$	$b_1 < 0$ $b_2 > 0$
Literacy	$b_1 > 0$ $b_2 < 0$	$b_1 < 0$ $b_2 > 0$
School enrollment	$b_1 > 0$ $b_2 < 0$	$b_1 < 0$ $b_2 > 0$
Rate of population growth	$b_1 > 0$ $b_2 < 0$	$b_1 < 0$ $b_2 > 0$
Agricultural land privately owned	$b_1 > 0$ $b_2 < 0$	$b_1 < 0$ $b_2 > 0$

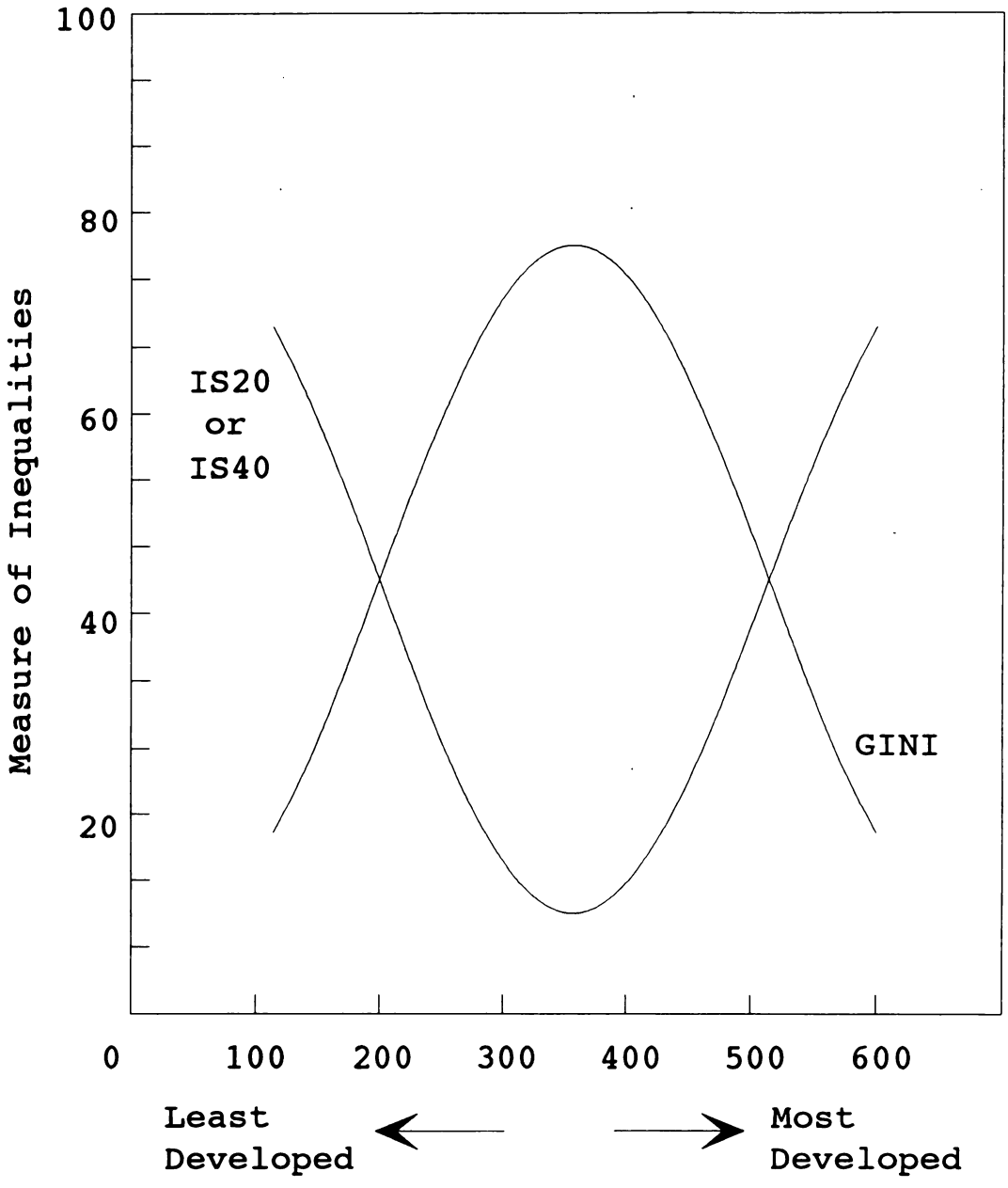

Figure 7 An example of a U-shaped and inverted U-shaped curves

For the percentage share of income received by the poorest 20% (IS20) and 40% (IS40) of households within each district, it is hypothesized that a U-shape curve will be found. These will be a U-shape instead of an inverted U-shape because high relative values of IS20 and IS40 represent lower levels of inequality; low values of IS20 and IS40 represent higher levels of inequality.

For methodological purposes, in this study the variables that represent development were defined in a manner such that all of them will behave from "worse" to "better". That is, lower levels of development is seen as "worse" and higher levels of development is seen as "better". For example, low median family income is representative of low development, while high median family income is representative of high development.

In the case of percentage of population employed in agricultural activities, a high percentage of population engaged in this sector is representative of low development and a low percentage of population in agricultural activities is seen as high development. Hence, for this variable the percentage of population which is NOT employed in agricultural activities will be used to have all the variables behaving from "worse" to "better".

For the percentage of literacy a low percentage of literate population represents low development, and a high percentage of literate population represents high development. In the same way, for school enrollment a low

percentage of population that goes to school represents low development, and a high percentage of population enrolled in school represents high development.

On the other hand, a high rate of population growth is representative of low development and a low rate is representative of high development. Finally, for agricultural land under private ownership, a low percentage of land under private ownership is representative of low development, while a high percentage is representative of high development.

Although the quadratic equation is used, it is necessary to mention that a statistical problem for the regression equations in this study has been the relatively low tolerance values presented by the variables. This indicates that there is a degree of correlation between the independent variables. This "tolerance" problem may have been caused by the fact that, in order to use the quadratic equation, the original variables were squared. It is not unusual for independent variables differing only in their exponents, to exhibit some collinearly. These equations show this problem, but to obtain the curvilinear relationship it was necessary to use them. I am assuming the degree of collinearly is not a problem. The next chapter will discuss the results.

CHAPTER IV

ANALYSIS AND RESULTS

Multiple regression analyses between each index of inequality and each index of development were obtained. All hypotheses were tested at 95% confidence level using a one tail test. The results of these statistical analyses are addressed below.

General Results

Table 6 shows the results of the regression analyses. Overall, eighteen sub-hypotheses were tested. Twelve of these were significant and six were not. Within the twelve significant sub-hypotheses six of them were significant for the two terms (coefficients b_1 and b_2), thus the null hypothesis was completely rejected for this group; one sub-hypothesis had only coefficient b_2 as significant, thus, the null hypothesis was partially rejected. In addition, five sub-hypotheses were significant but with opposite signs to what was hypothesized, thus, the null hypothesis was accepted.

It is important to mention at this point that the entire set of 66 districts was used for the regression analyses. However, from this entire set eighteen districts

Table 6.-- Expected and actual signs of the relationships

Independent variables	Expected			Actual		
	Gini	IS20	IS40	Gini	IS20	IS40
Median family income	$b_1>0$ $b_2<0$	$b_1<0$ $b_2>0$	$b_1<0$ $b_2>0$	$b_1>0+$ $b_2<0+$	$b_1<0+$ $b_2>0+$	$b_1<0+$ $b_2>0+$
Agricultural employment	$b_1>0$ $b_2<0$	$b_1<0$ $b_2>0$	$b_1<0$ $b_2>0$	$b_1>0+$ $b_2<0+$	$b_1<0$ $b_2>0@$	$b_1<0+$ $b_2>0+$
Literacy	$b_1>0$ $b_2<0$	$b_1<0$ $b_2>0$	$b_1<0$ $b_2>0$	$b_1>0*$ $b_2<0*$	$b_1>0\&$ $b_2<0\&$	$b_1>0\&$ $b_2<0\&$
School enrollment	$b_1>0$ $b_2<0$	$b_1<0$ $b_2>0$	$b_1<0$ $b_2>0$	$b_1>0*$ $b_2<0*$	$b_1>0\&$ $b_2<0\&$	$b_1>0\&$ $b_2<0\&$
Population growth	$b_1>0$ $b_2<0$	$b_1<0$ $b_2>0$	$b_1<0$ $b_2>0$	$b_1<0\&$ $b_2>0\&$	$b_1<0+$ $b_2>0+$	$b_1<0*$ $b_2>0*$
Agricultural land under private property	$b_1>0$ $b_2<0$	$b_1<0$ $b_2>0$	$b_1<0$ $b_2>0$	$b_1>0*$ $b_2<0*$	$b_1<0*$ $b_2>0*$	$b_1<0*$ $b_2>0*$

One tail test at 95% confidential level.

\+ Significant with expected signs

& Significant with opposite to expected signs

@ Significant with only coefficient b_2 with expected sign

* Not significant

were chosen to serve as examples for conclusions derived from the functions. The reason why all 66 districts are not shown in the following graphs is that the sheer number of districts (66) makes the graphs difficult to read. It is not possible to discriminate the position of the individual districts in the different graphs. Therefore, eighteen districts were chosen because they seem to be the most representative of the relationship between levels of development and income inequalities. These districts are listed in Table 7.

Analysis of the Results

As was mentioned above the results of this study presented two different groups: a group of significant relationships where the null hypotheses were rejected and another group of relationships where the null hypotheses were accepted.

Sub-Hypotheses with Expected Signs

The results obtained from the regression analysis showed support for the inverted U-shaped and the U-shaped curve for the whole country. The relationship between the indexes of development and the indexes of income inequalities (Gini coefficient, IS20 and IS40) that support the hypotheses for both coefficients b_1 and b_2 using these three measurements of inequalities were: median family

Table 7.-- Sample districts of Panama with the dependent and independent variables

District	Nº	Gini Coefficient	IS20	IS40
Changuinola	2	38.96	6.124	16.379
Ch. Grande	3	48.04	4.795	11.155
Aguadulce	4	42.34	4.728	14.050
Colon	10	43.10	4.200	13.250
Boquete	19	46.11	5.452	12.654
David	21	43.45	4.293	13.214
San Lorenzo	27	45.39	7.307	15.179
Chitre	31	43.52	4.643	13.447
Las Minas	32	41.30	9.917	19.833
Los Santos	40	47.23	5.699	12.643
Pedasi	42	49.57	6.438	13.048
Panama	52	40.71	4.281	14.006
S.Miguelito	54	37.98	5.542	15.854
Canazas	58	36.68	11.107	22.213
La Mesa	59	39.82	10.650	20.997
Santa Fe	64	42.55	9.122	18.243
Santiago	65	46.92	4.038	11.144
Sona	66	46.56	7.609	15.218

Nº	Median Family Income	Literacy	School enrollment	Agricultural employment	Population growth
2	224.9	76.3	80.3	74.2	29.5
3	167.5	27.6	34.5	84.6	15.1
4	262.3	92.1	90.3	16.1	29.4
10	286.5	95.4	91.5	6.6	22.9
19	180.0	87.6	82.8	53.1	17.4
21	280.3	92.6	89.0	13.5	35.7
27	105.9	50.1	49.9	78.7	21.3
31	249.8	92.8	91.4	11.1	33.4
32	61.9	55.5	66.8	86.7	8.1
40	144.8	84.2	82.0	45.2	15.4
42	102.9	79.9	82.2	68.9	-20.2
52	392.7	96.2	93.0	1.8	29.1
54	319.7	95.9	93.2	1.8	129.0
58	63.1	50.6	68.3	84.9	14.0
59	55.5	68.6	81.9	82.4	1.6
64	72.5	59.4	78.4	82.2	24.1
65	230.4	86.8	90.8	32.1	34.2
66	92.8	66.2	72.9	71.3	4.4

income, and percentage of population employed in agricultural activities. The relationship between the rate of population growth and IS20 also show an indication of the U-shaped curve (See Tables 8, 9 and 10 for more detail).

The results shown in Table 8 and represented in Figure 8 support the second order relationship between median family income and the Gini coefficient. In general the districts were dispersed throughout the curve, with most of them concentrated at the "top" of the curve. The functions also showed that although the districts with high median family income had lower income distribution inequalities than the districts located at the top of the curve, some of these districts with high median family income still have more income inequalities than the districts with the lowest median family income. For example, the district of Canazas (58) with a low median family income presented a lower degree of income inequality than the district of Panama (52), which has the highest median family income in the country. This situation suggests that even though the district of Panama has a high median family income, this district has not "reduced" its income inequalities with development to the same level as the district of Canazas. But the reality is that the district of Canazas has not reduced its income inequalities but is in reality an undifferentiated or early economy, (which by definition should not exhibit much income inequalities) whereas the district of Panama has already begun in its development.

Table 8.-- Regression results for Gini coefficient

Independent variables	Gini coefficient			
	a	b_1	b_2	Adjusted R^2
Median family income	41.97 (0.000)	0.0527 (0.007)	-0.0002 (0.001)	0.187
Agricultural employment	39.27 (0.000)	0.3042 (0.000)	-0.0030 (0.000)	0.296
Literacy	42.84 (0.000)	0.0470 (0.408)	-0.0002 (0.440)	0.000
School enrollment	41.22 (0.000)	0.1622 (0.281)	-0.0014 (0.236)	0.000
Population growth	46.29 (0.000)	-0.0779 (0.001)	0.0003 (0.0175)	0.142
Agricultural land under private property	45.59 (0.000)	0.0135 (0.441)	-0.0007 (0.2475)	0.013

One-tail probability levels are in parentheses

Table 9.-- Regression results for IS20

Independent variables	IS20			
	a	b_1	b_2	Adjusted R^2
Median family income	12.09 (0.000)	-0.0566 (0.000)	0.0001 (0.000)	0.689
Agricultural employment	4.68 (0.000)	-0.0064 (0.397)	0.0006 (0.010)	0.528
Literacy	-2.24 (0.415)	0.3390 (0.000)	-0.0028 (0.000)	0.430
School enrollment	-9.76 (0.023)	0.5436 (0.000)	-0.0042 (0.000)	0.330
Population growth	7.19 (0.000)	-0.0408 (0.002)	0.0002 (0.010)	0.114
Agricultural land under private property	7.487 (0.000)	-0.0001 (0.179)	0.0001 (0.456)	0.065

One tail probability levels are in parentheses

Table 10.-- Regression results for IS40

Independent Variables	IS40			
	a	b_1	b_2	Adjusted R^2
Median family income	21.94 (0.000)	-0.0849 (0.000)	0.0002 (0.000)	0.377
Agricultural employment	15.06 (0.000)	-0.1352 (0.000)	0.0019 (0.000)	0.358
Literacy	4.66 (0.166)	0.3777 (0.004)	-0.0031 (0.001)	0.219
School enrollment	-1.84 (0.401)	0.5211 (0.008)	-0.0039 (0.005)	0.087
Population growth	14.79 (0.000)	-0.0151 (0.239)	0.0001 (0.246)	0.000
Agricultural land under private property	15.29 (0.000)	-0.0377 (0.248)	0.0003 (0.336)	0.015

One-tail probability levels are in parentheses.

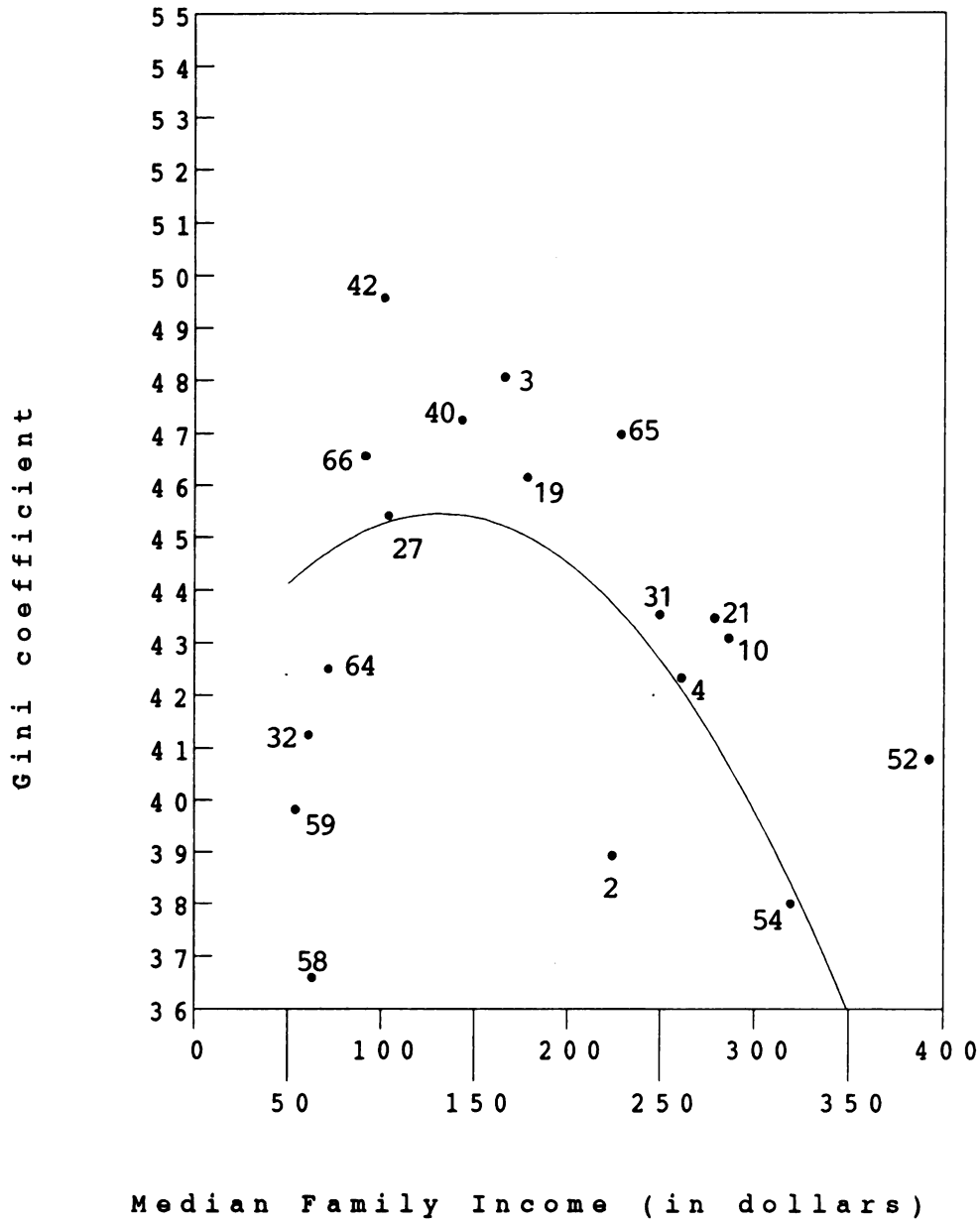

Figure 8 Relationship between median family income and Gini coefficient.

As shown in Figures 9 and 10 the relationship between median family income and both IS20 and IS40 showed that overall, the curvilinear pattern is present. A significant aspect in these relationships is that the population within IS20 received less than 12% of the total income, and for IS40 they received less than 23% of the total, a situation that indicates a disproportional distribution of income. For IS20 the districts with the lowest median family income were those located at the downward slope of the function, whereas the districts with higher median family income were located at the bottom of the curve, where it begins to move upward. This situation suggests that districts with the lowest median family income present a more proportionate share of income per family than districts with higher median family income. A possible reason for this situation is that once the process of development starts it is expected that inequalities will raise. Therefore, since districts with higher median family income are considered more developed, they will have less income share than the less developed districts. Later on with increasing development the share should be more evenly distributed.

In Figure 9 the districts with the highest median family income, with the exception of San Miguelito (54), had the lowest income share for IS20. A significant example is the district of Panama (52). This district had the highest median family income in the country, but its population within the IS20 received almost the same income share as the

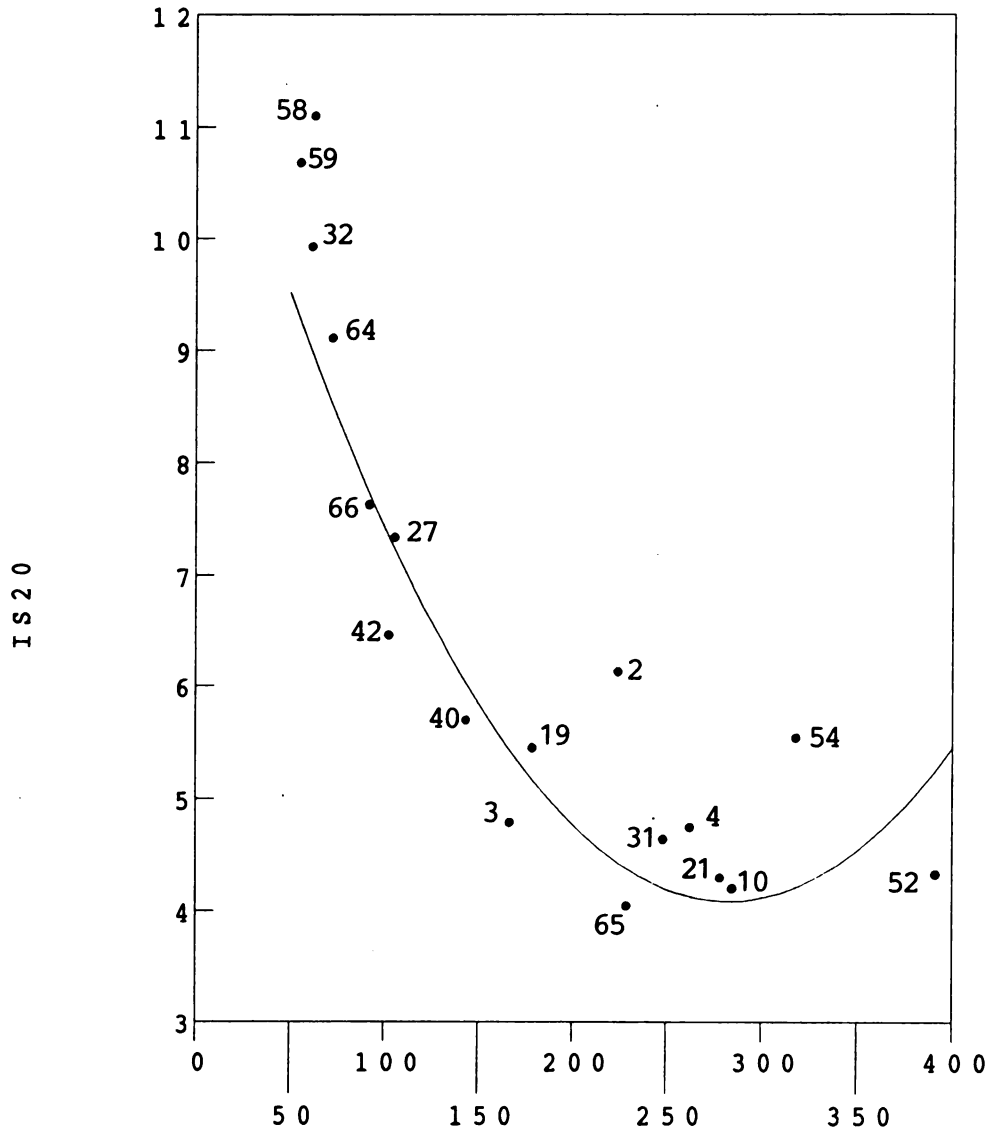

Figure 9 Relationship between median family income and IS20

districts of Colon (10) and Santiago (65) which have much lower incomes and levels of development.

A possible reason for this situation is the fact that the district of Panama and the other districts located within the "Metropolitan Region" (Colon and San Miguelito) received an unusually high percentage of migrants during the 1970's and 80's, principally people from the lowest stratum of the population, from other less developed districts. This large uneducated and unskilled population had to compete with those already there for the income that was available, driving down wages and thus driving down the income share of this portion of the population.

For IS40 the results were similar to those obtained for IS20. Some districts with high incomes have higher inequalities than others with lower incomes. For example, even though the districts of Panama (52), Colon (10), David (21) and San Miguelito (54) had low income share for IS40, their income share for this dependent variable was less unequally distributed than for districts such as Boquete (19) and Los Santos (40). These four districts mentioned above were located further along the upward slope of the curve (Figure 10).

Comparing the position of the districts in the graphs that show the relationship between median family income and the three dependent variables it is observed that the Gini coefficient showed low income distribution inequalities, principally for those districts with a high median family

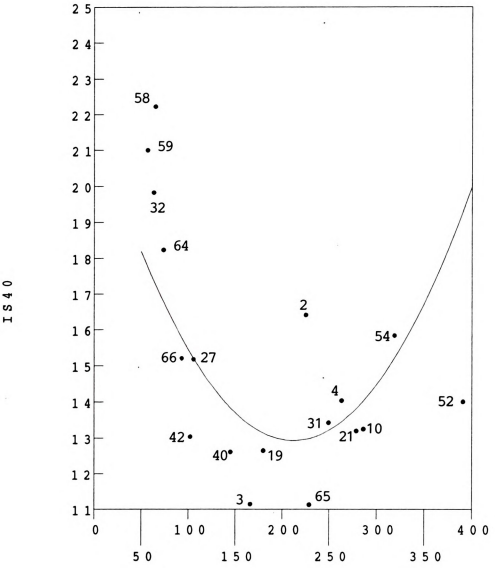

Figure 10 Relationship between median family income and IS40

income (eg. Panama and San Miguelito). While for IS20 and IS40 it was noticed that inequalities of income within these sections of the population for the same districts remain high. The results also suggest that although the curvilinear pattern is present, even the most developed districts in Panama have not yet achieved the "best" distribution of income.

The inverted U-shaped pattern is also confirmed for the relationship between Gini coefficient and the percentage of population employed in agricultural activities (Figure 11). The districts with the highest percentage of population employed in agricultural activities had the lowest Gini coefficients and most of them were clustered on the upward slope of the curve. On the other hand, the districts with the lowest percentage of population employed in agricultural activities had higher Gini coefficients and they are located on the downward slope of the curve. Finally, districts with intermediate levels of population employed in agricultural activities are located at the top of the curve.

As an example, the districts of Santiago (65) and Los Santos (40) had less percentage of population employed in agricultural activities than the districts located on the upward slope of the curve, but each also had a higher Gini coefficient, with consequently higher income inequalities.

The districts of Panama (52), Colon (10), David (21) and San Miguelito (54) according to the population employed in agricultural activities had the lowest percentage of

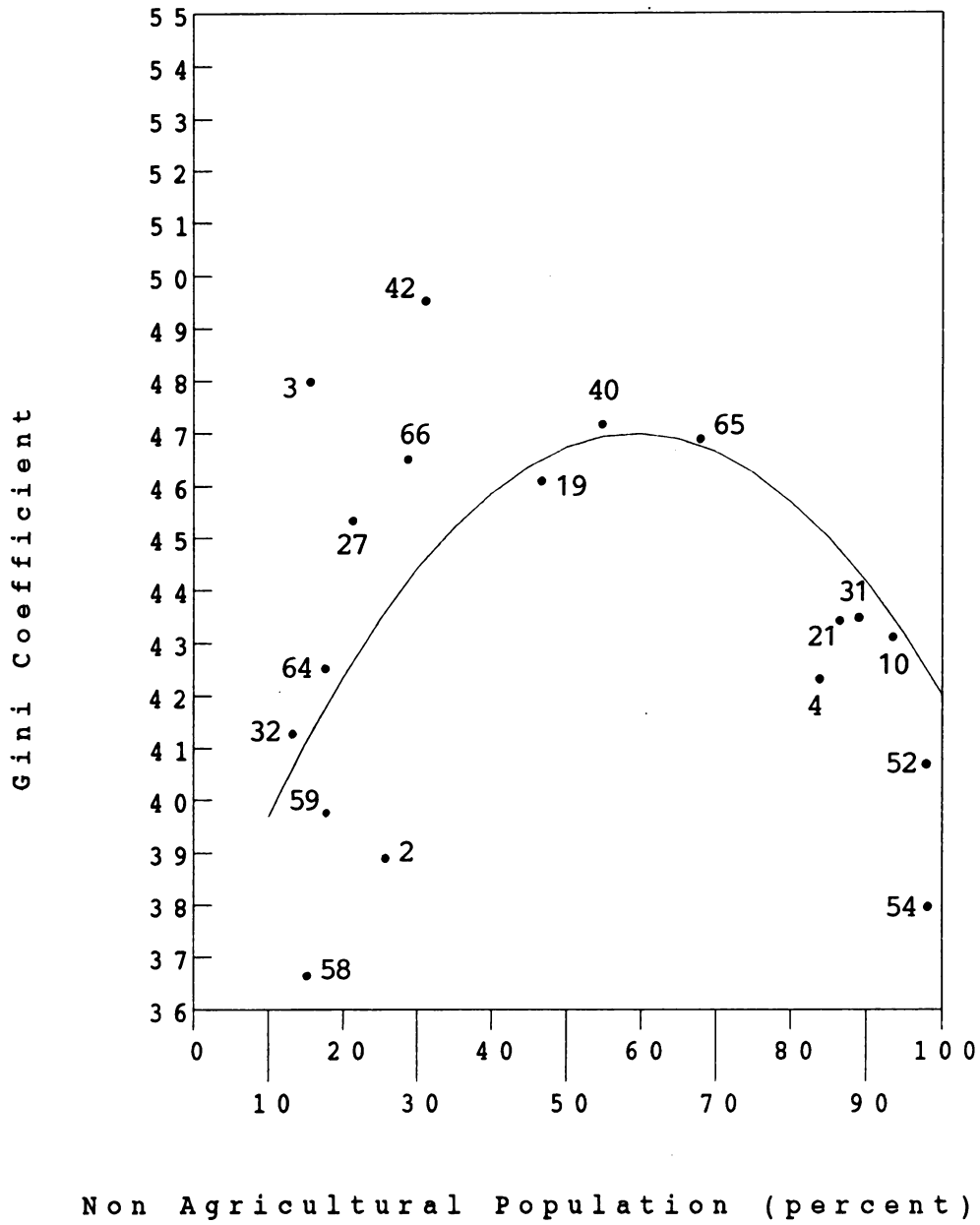

Figure 11 Relationship between population not employed in agricultural activities and Gini coefficient

population employed in these activities. Following the hypothesis it can be implied that they are the most developed districts in the country. But at the same time, their Gini coefficient were still similar and, for the district of Panama it was even higher than that for the district of Canazas (58), which is one of the least developed districts, with a high percentage of population employed in agricultural activities.

The districts of Chitre (31) and Aguadulce (4), for example, had less percentage of agricultural population and less income distribution inequalities for the Gini coefficient than would be expected after looking at the variable median family income. This situation may indicate that these districts, at least in this aspect of development, may be moving toward a greater level of development.

The low income distribution inequalities found in districts where a high percentage of the population is employed in agricultural activities may be related to the economic structure of the districts. In those districts, where most of the population work in agricultural activities, there is a very low level of income but the differences in income among them may be not that great. With the presence of other activities not related to agricultural activities there is a shift of employed population from agriculture to these other activities, principally commerce, industry and service. This situation may create a gap in

income between the population employed in agricultural activities and the rest of the population.

This gap in income within the population engaged in agricultural activities and the other economic activities is also affected by other factors such as education, migration and fertility. With an increase of secondary and tertiary activities the population employed in agricultural activities may suffer a sharp decrease, especially in areas close to urban centers.

The results of the relationship between the percentage of population employed in agricultural activities and the IS20 was significant only for coefficient b_2. In other words, only the downward slope of the curve is shown to be significant. The results also seem to indicate that most of the districts in the Republic of Panama had high income inequalities in the relationship between median family income and the distribution of income share for IS20. For example, the districts of Panama, Colon and David had the lowest percentage of population employed in agricultural activities, but at the same time these districts also had the lowest share income for the IS20 (Figure 12). The income share for IS20 in these three districts was less than 5%.

The districts of Los Santos (40), Boquete (19), Pedasi (42), Changuinola (2) and Sona (66) had, in fact, higher income shares for IS20 than for the districts with the lowest percentage of population employed in agricultural activities.

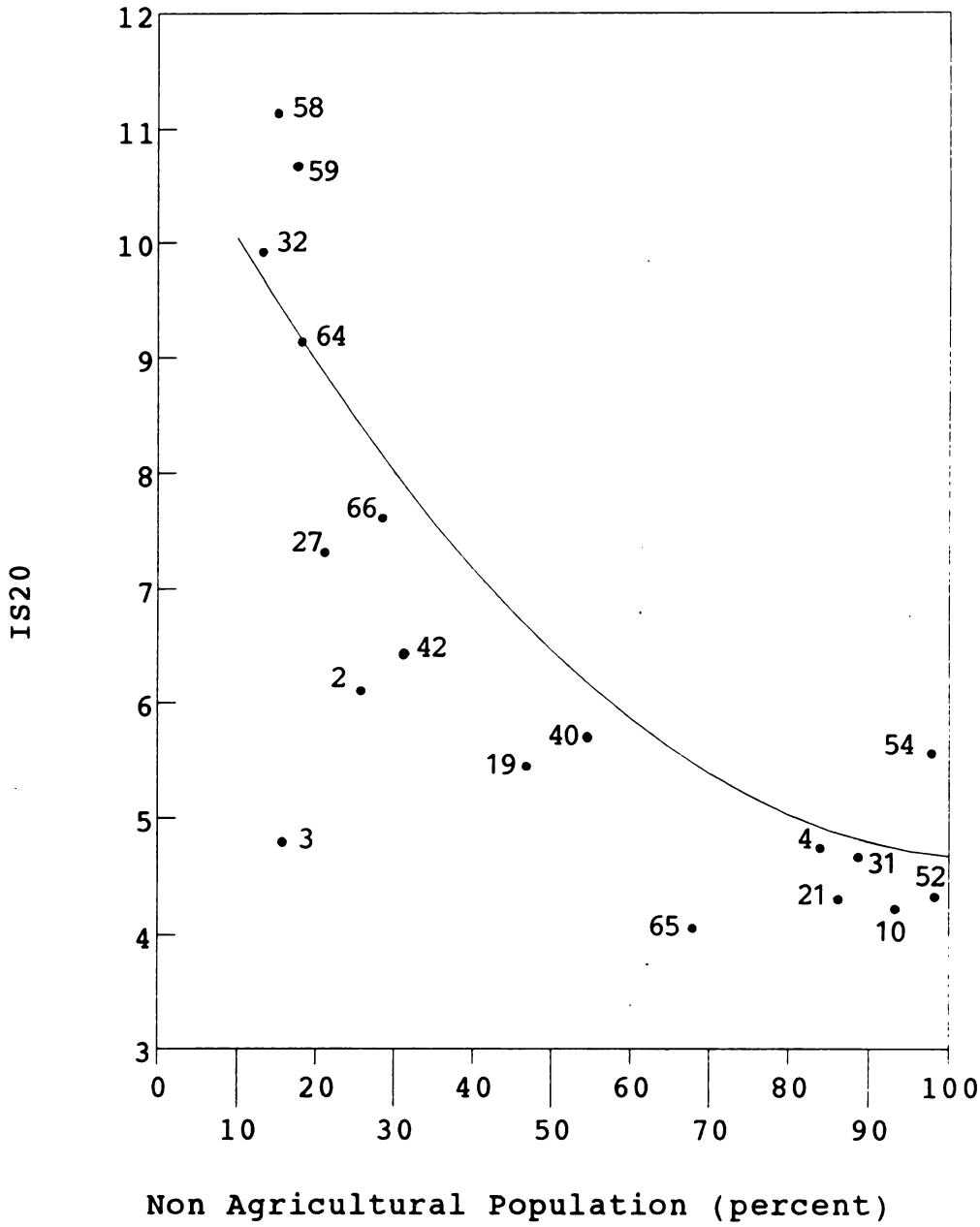

Figure 12 Relationship between population not employed in agricultural activities and IS20

The low share of income for the population within IS20 for the districts with the lowest percentage of population employed in agricultural activities may be related to migration patterns also. As is well known in developing countries like Panama, the pattern during the last three decades has been a high migration of population from rural areas to urban areas. Usually the population from these rural areas who migrate were engaged in activities related to agriculture. They are poor, landless and have a minimum level of education. Once they arrive to urban districts they have to compete with more skilled and educated people in the job market and they have to deal with a higher cost of living. In addition, the most skilled individual may get the best jobs; these immigrants end up performing the lowest paid jobs and often becoming worse off than when they were in the rural areas.

Another pattern of this migration from rural to urban areas is that the most educated population has the greatest tendency to leave. Thus, the rural areas are left without this important group of people and suffer the negative economic consequences of an uneducated work force and population.

Even though the curve for the relationship between the percentage of population employed in agricultural activities and Gini coefficient showed that in general the population with the highest non-agricultural population showed higher income inequalities, the relationship between population

employed in agricultural activities and IS20 indicates that the districts with the lowest percentage of people employed in agricultural activities have also the lowest share of income for IS20. In this case, the function showed that the most developed districts in Panama seem to have more unequal levels of income distribution.

In the case of the relationship between the percentage of population employed in agricultural activities and IS40 the curvilinear pattern is more clear and it showed a clear upward slope in contrast to the relationship between this independent variable and IS20. Both coefficients of the quadratic equation were significant (Figure 13). The district of Canazas (58) had the highest share of income for the IS40. On the curve, the districts with the lowest percentage of population employed in agricultural activities have a relative better position in relation to their income share than the position they had on the graph for the relationship between this population engaged in agricultural activities and IS20.

The relationship between the rate of population growth and IS20 also supported the U-shaped curve. In this case, most of the districts with low rate of population growth were located at the downward slope of the curve (Figure 14). Districts with a moderate rate of population growth were located at the bottom of the U-curve with the lowest income share for IS20. Districts with the highest rate of population growth had higher share of IS20 than districts

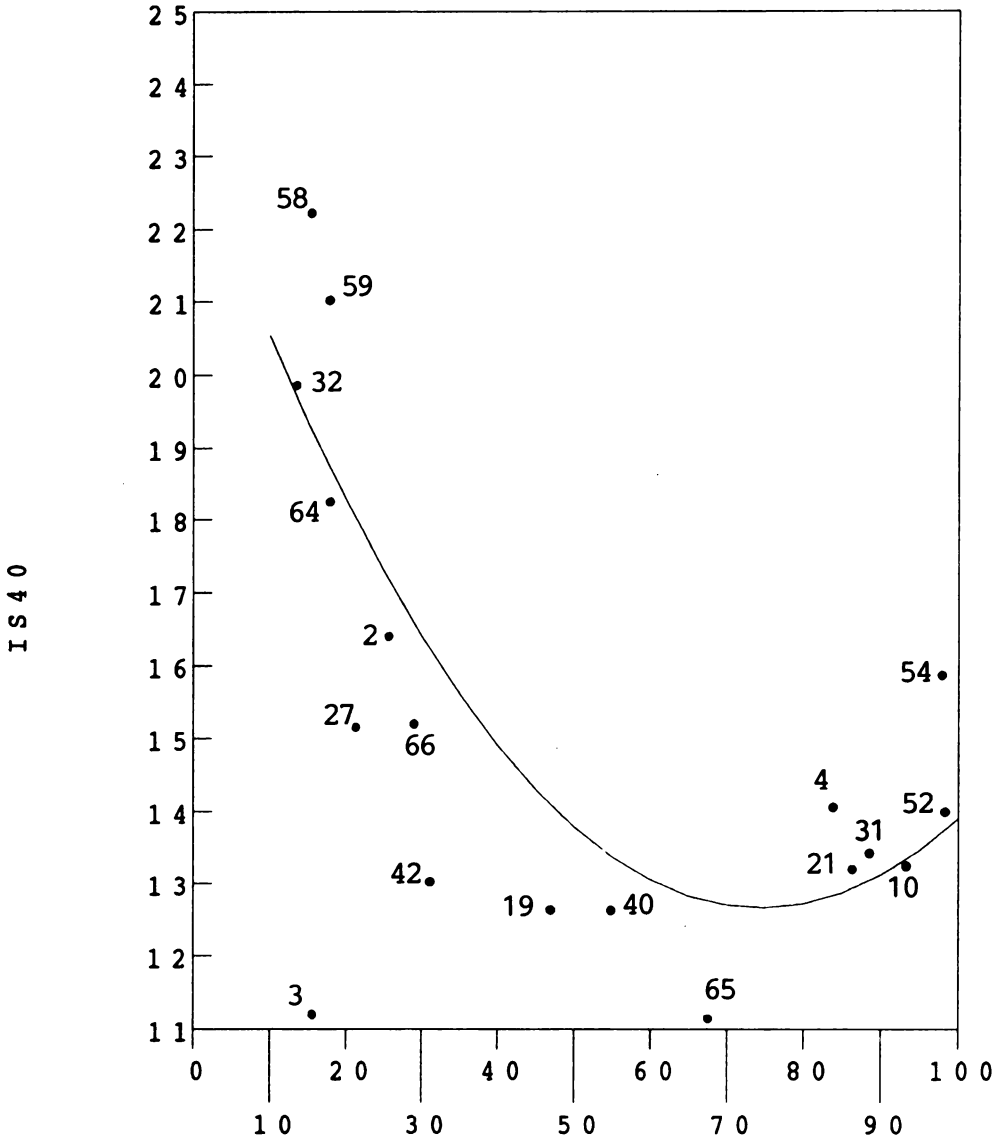

Figure 13 Relationship between population not employed in agricultural activities and IS40

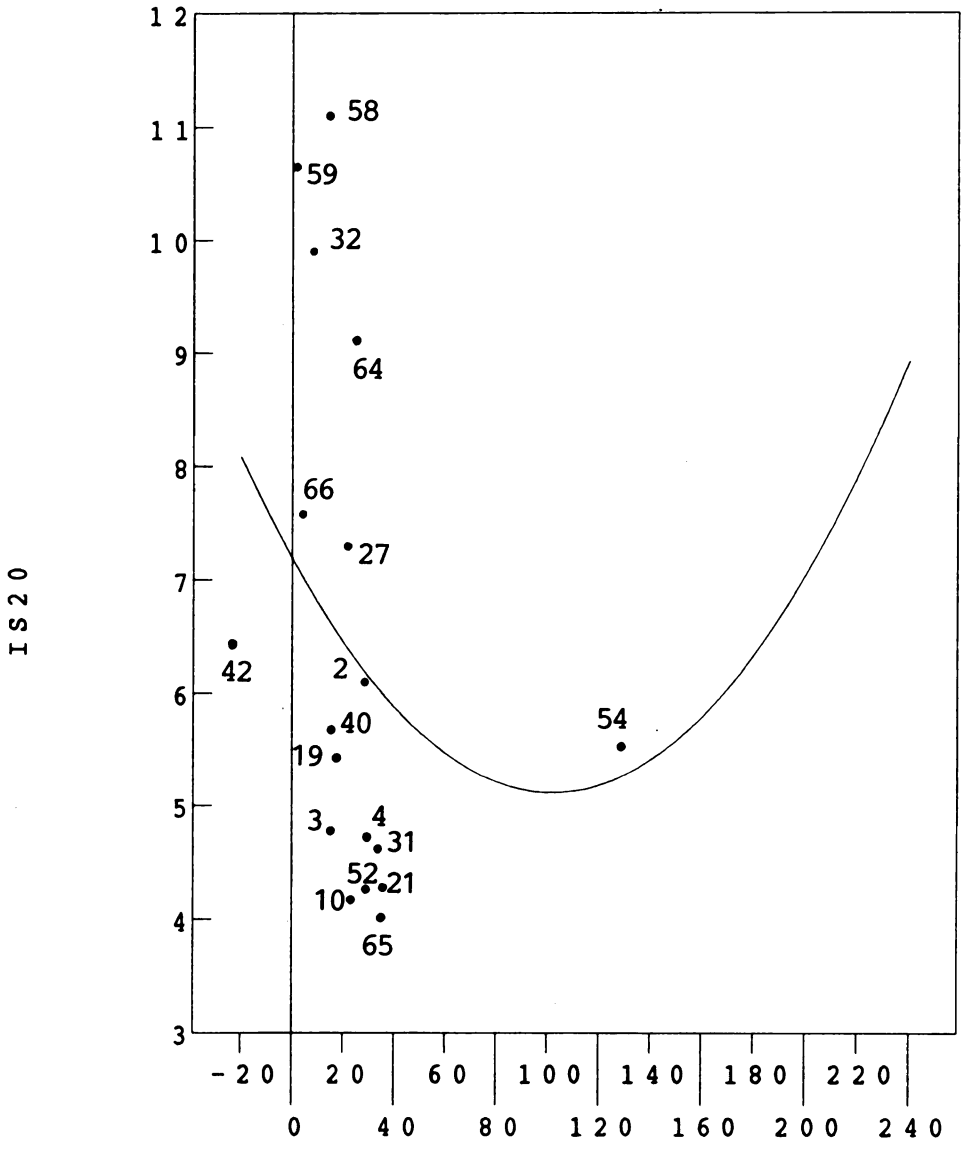

Figure 14 Relationship between rate of population growth and IS20

with a moderate rate of population growth. But these same districts also had a lower income share than districts with relatively low rate of population growth. Thus, an increase in population growth can have negative effects on the share of income for the population within the IS20.

The hypothesis for this relationship, that as the rate of population growth increases in a district, the share of income for IS20 will decrease, with a subsequent increase once the population growth decreases, was confirmed.

The results show that districts with the lowest rate of population growth had the highest income share for IS20. An important observation for this relationship is that these districts (Canazas (58), La Mesa (59), Las Minas (32) and Santa Fe (64)) are the same as those with the highest percentage of population employed in agricultural activities and the lowest median family income, variables that indicate that these districts are not very developed. On the contrary, districts that are considered more developed, according to the variables mentioned before, were the ones with the highest rate of population growth (eg. San Miguelito, Colon, David and Panama).

Although migration is not directly addressed in this study, this high rate of population growth in districts that, according to their characteristics can be considered as developed, might be attributed to migration. A possible explanation for this pattern is that those districts with the lowest rates of population growth were affected by

migration trends which have drained out the young people, resulting in negative population growth in some districts (e.g. Pedasi (42)).

An opposite situation may be true in districts that had a higher rate of population growth in which the income share within IS20 went down as a result of an increase of immigration, principally in those districts that are the capitals of provinces and that have greater urban characteristics. However, this possible relationship could not be examined more closely in this study because the information could not be found in the National Census to differentiate between migration and natural growth at the district level.

Another factor that may be affecting the results of the relationship between the rate of population growth and IS20 is fertility. Usually the poorest people have more children because they do not have as much knowledge and accessibility to methods of birth control. Because migration usually involves the population within the fertile ages, creating a movement from rural areas to semi-urban and urban areas, it is expected that the number of children will rise in semi urban and urban locations. Thus, higher fertility rates are inversely related to IS20.

Significant Functions with Signs Opposite from Expected

Within the group of sub-hypotheses, with t-values with absolute magnitude sufficiently large to consider "significant", five of them presented signs opposite to what was expected. Thus, for this group the null hypothesis was technically accepted because the significance of the b coefficient was opposite. However, they warrant discussion. Those sub-hypotheses were: the relationship between literacy and IS20 and IS40; the relationship between school enrollment and IS20 and IS40; and the relationship between the rate of population growth and Gini coefficient.

For the relationship between the variables representing education (literacy and school enrollment) and IS20 and IS40 several districts were located close to the top of the downward slope of the curve, whereas a cluster representing most of the districts was located near the bottom of the downward slope of the curve (Figures 15, 16, 17 and 18). The same pattern observed in most of the relationships between these two dependent variables and the independent variables is also present in this relationship. The districts with the highest percentages of literacy and school enrollment had the lowest income share for the population within IS20 and IS40. The opposite relationship found between literacy and school enrollment on the one hand with IS20 and IS40 on the other indicates that the poorest population does not become

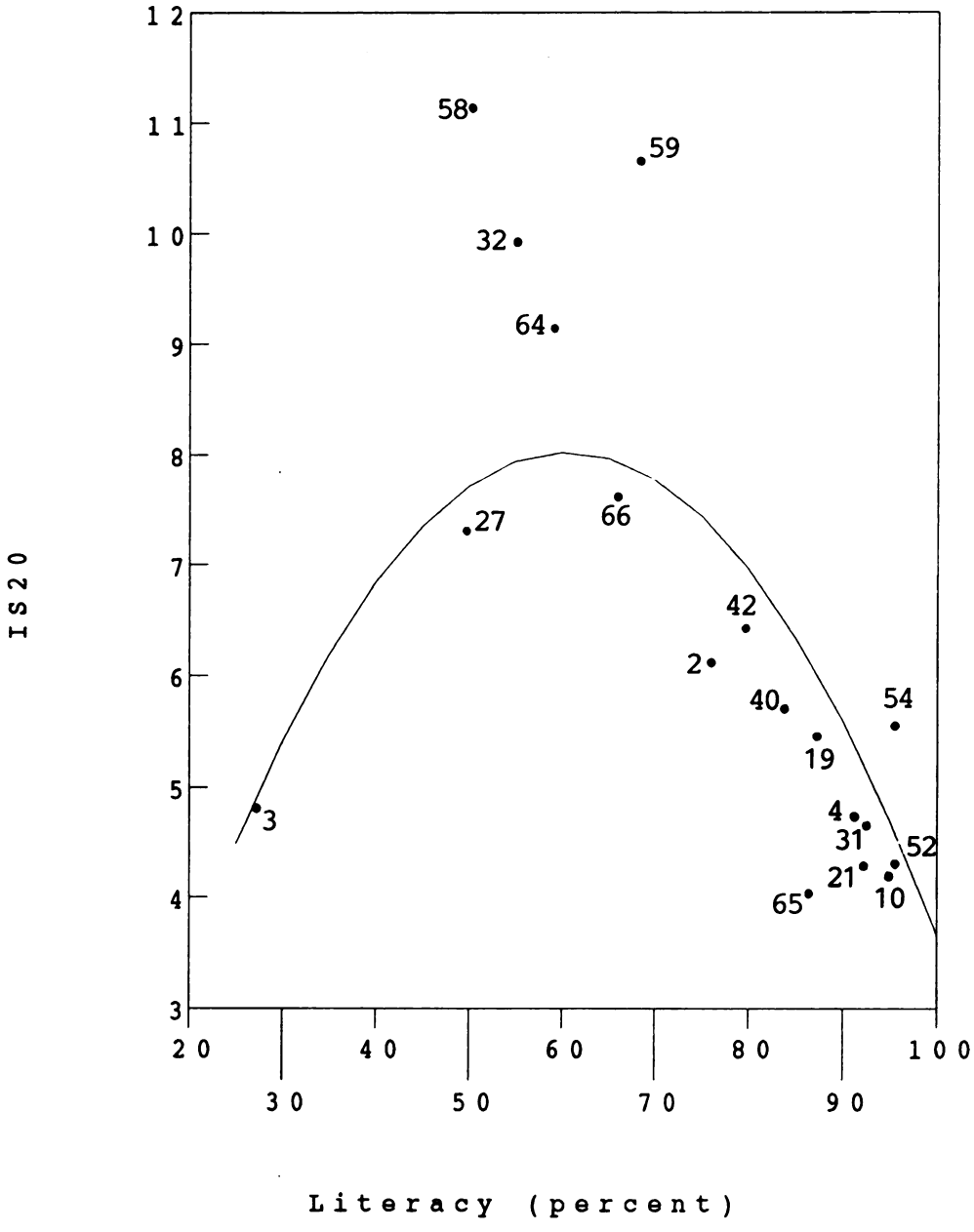

Figure 15 Relationship between literacy and IS20

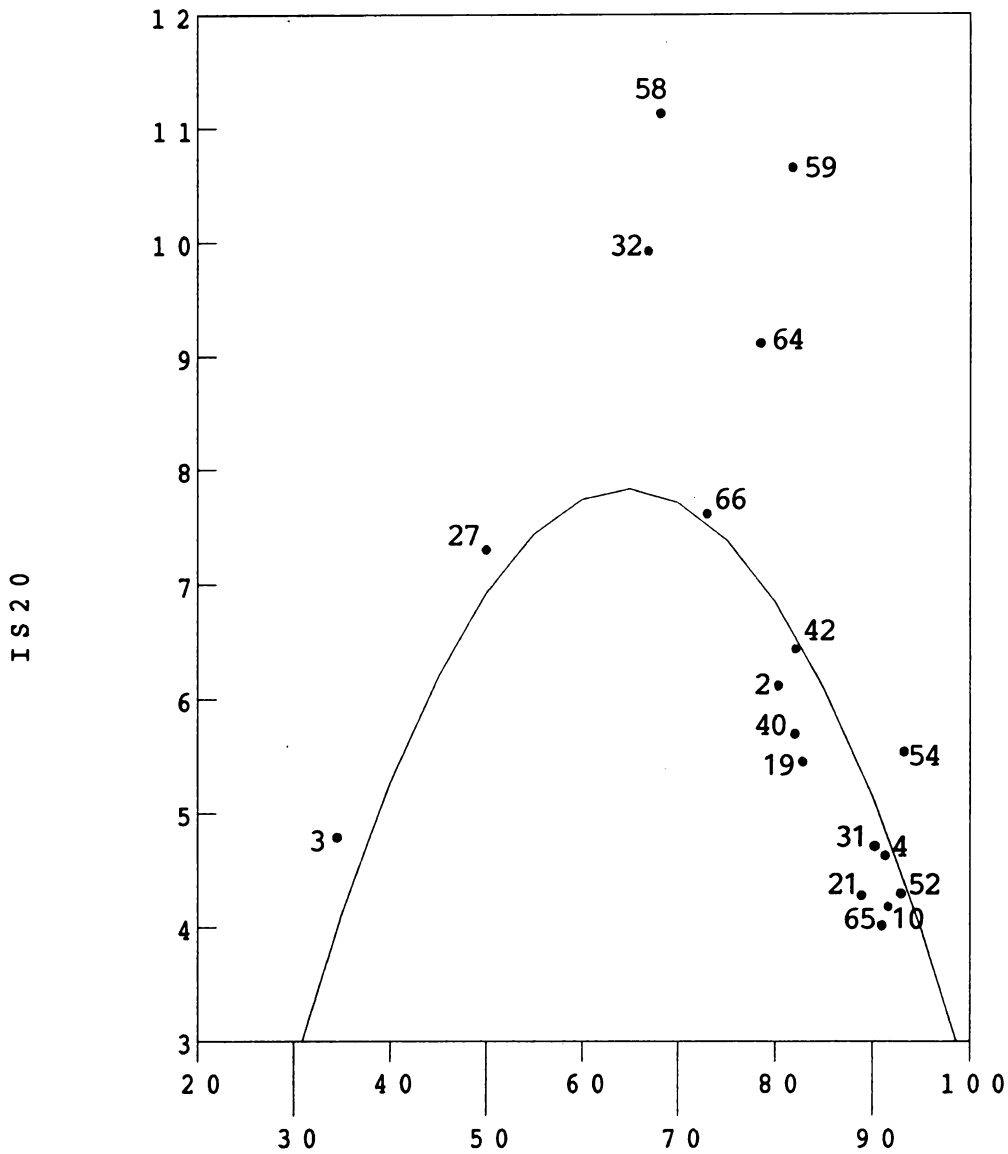

Figure 16 Relationship between school enrollment and IS20

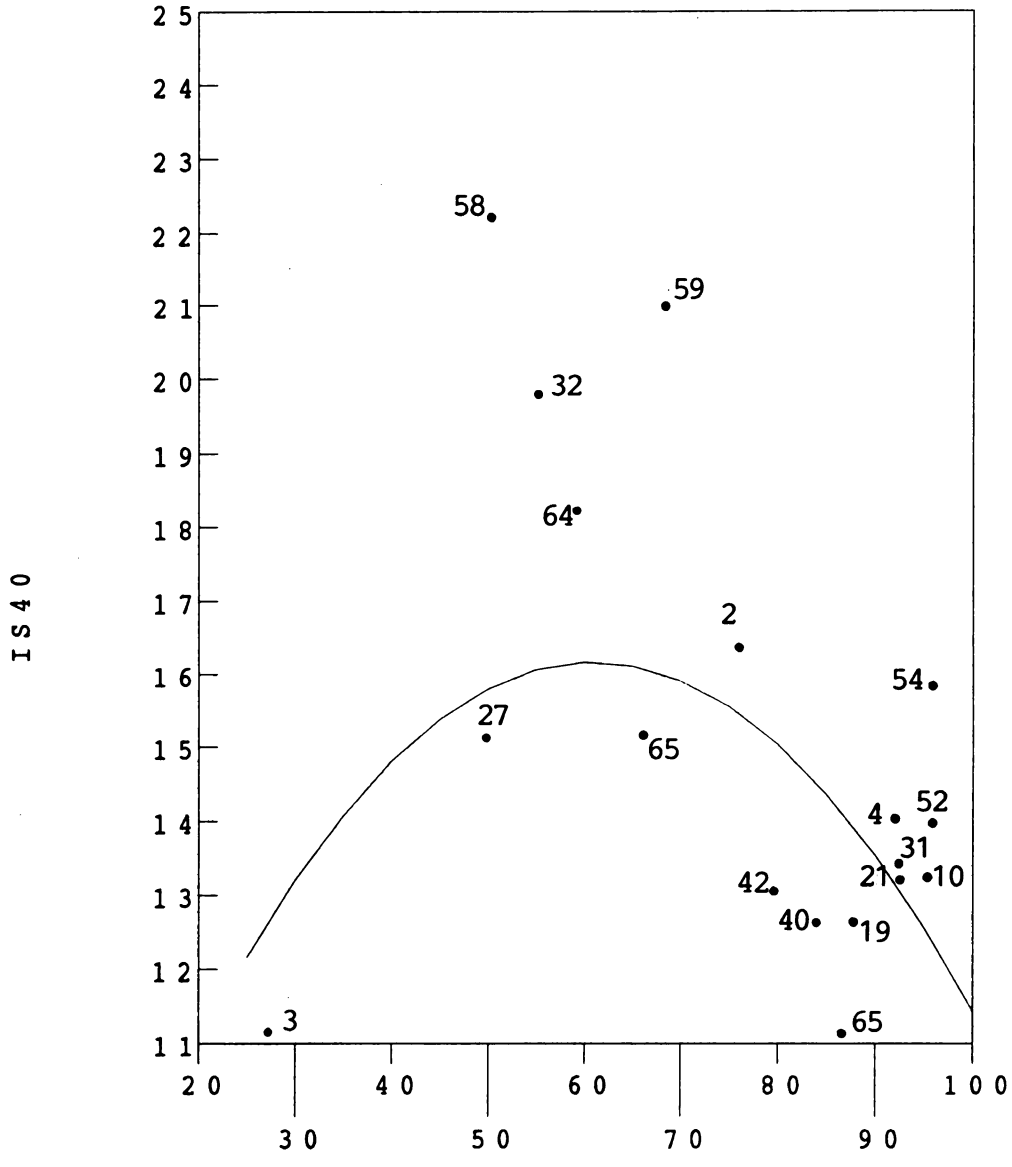

Figure 17 Relationship between literacy and IS40

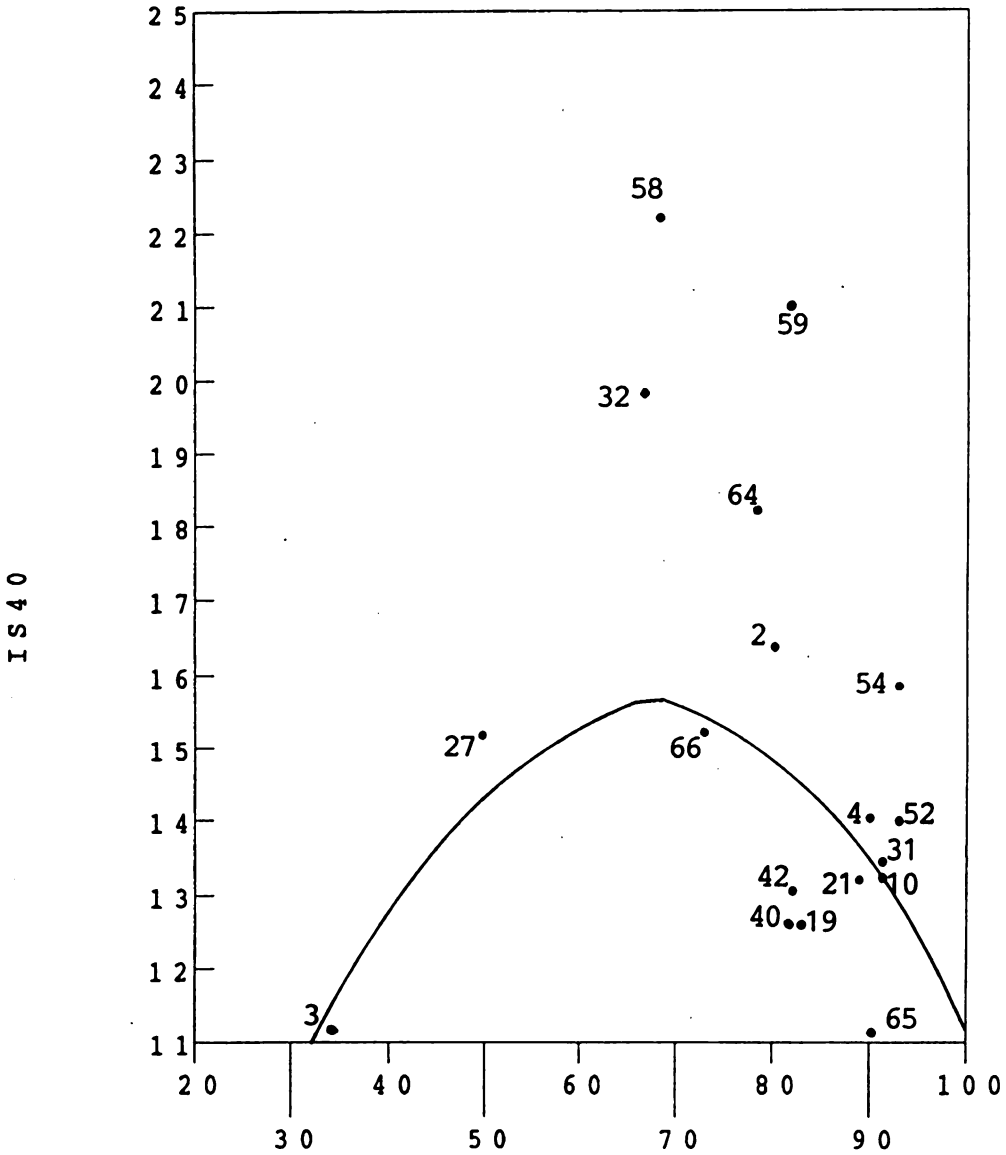

Figure 18 Relationship between school enrollment and IS40

better off with education, but, on the contrary, they seem to become worse off.

Specifically, it was observed that districts of Canazas (58), Las Minas (32) and Santa Fe (64) among others had a low percentage of literacy and school enrollment and a high share of income for IS20 and IS40. This may be related to the situation that people from rural areas who are more educated are more likely to leave their places of origin. Other districts, including Sona (66), Changuinola (2), Pedasi (42) and Los Santos (40), presented higher literacy and school enrollment than the districts mentioned above but less income share for IS20 and IS40.

The districts with one of the highest percentage of literate population and school enrollment (Colon (10), David (21), Chitre (31) and Panama (52) among others) also had the lowest share of income for the two measures of inequalities mentioned above (IS20 and IS40). Among these districts Santiago (65), David (21), Panama (52), Colon (10), Chitre (31) and Aguadulce (4) were the lowest. They are located on the downward slope, toward the bottom of the curve (Figures 15 and 16). The district of Chiriqui Grande (3) had the lowest literacy and school enrollment of the country and also very low income share for IS20 and IS40, a situation which indicates that the population in this district is still very far away from having a more equal distribution of income as compared to districts that present similar levels of education.

The results obtained in this relationship seems to indicate that even though literacy and school enrollment may play an important role in development, at least within a single country, these variables are not good indicators of development once a district has become more developed. If education affects the income share of IS20 and IS40 as was expressed before, it is expected that the income among districts with similar levels of education will be very similar. In districts where the level of development is more advanced there is a need for a better educated population. As the needs for more skillful and educated people increase in a district, to be literate or to have a minimum level of school enrollment is no longer enough in itself. Of course, migration is a natural result of education and this in turn may distort the relationship between education and development. Thus, in the future, measures of higher education are needed together with measures of the creation of job opportunities to assess the migration and educational situation.

The level of education may also contribute to an increase in income inequalities between the population that migrates from the less developed districts to the most developed districts and the population that already resides in the most developed districts. This is due to the fact that in more developed areas the competition for high skilled jobs is stronger than that for less developed areas. The people who are more educated will usually have more

opportunities to get better jobs and salaries. Therefore, disadvantages in the level and quality of education are going to be more important in more developed areas than in less developed ones. Thus, the income share of the population within IS20 and IS40 will be more negatively affected by the degree of education in more developed than in less developed areas.

The relationship between the rate of population growth and the Gini coefficient also had significant coefficients which had signs opposite to what was expected (Figure 19). The observations are not dispersed along the entire curve but most of them are clustered along the downward slope of the curve. Another small cluster was located close to the upward slope of the curve. For example, the district of Pedasi (42) had a very high Gini coefficient but negative rate of population growth.

In the literature it has been suggested that a low rate of population growth will reduce income inequalities. But in the case of a district with a negative rate of population growth, as the case of Pedasi, it is an indicator that migration has taken place possibly with an accompanying decrease in births. This situation may reflect and cause negative effects on the economy of the district because it is likely the "best" of the population are leaving and businesses within the secondary and tertiary sector will not establish themselves there. Thus, a high negative rate of

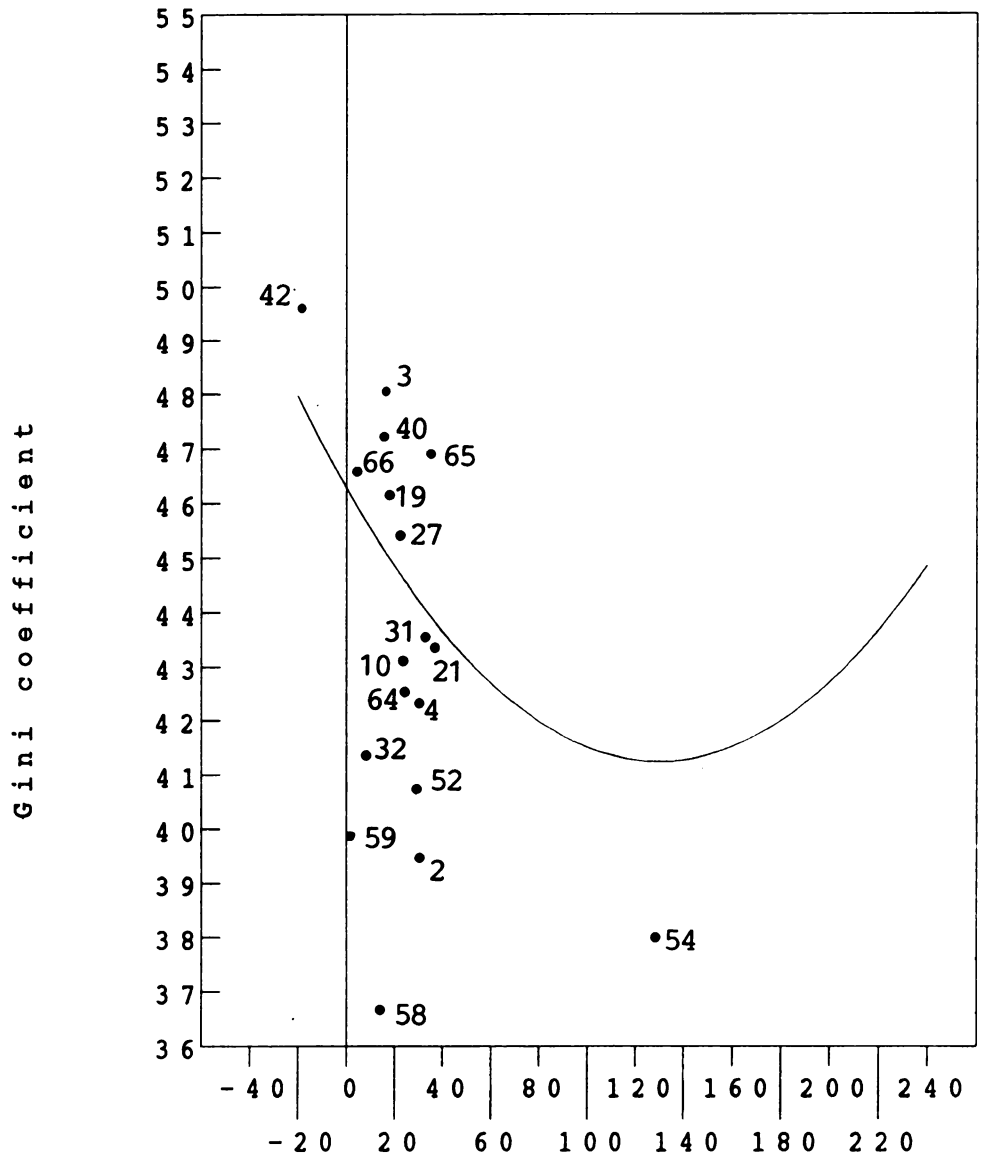

Figure 19 Relationship between rate of population growth and Gini coefficient

population growth may also lead to income inequalities within the population as was registered by Gini coefficient.

Two clusters of districts can be found with a rate of population growth between 0 and around 30, one with a high Gini coefficient (between 42.5 and 50) and a smaller one with a moderately high Gini coefficient (between 35 and 41.5). The fact that districts with similar rates of population growth have different Gini coefficients (for example La Mesa (59) and Sona (66) as well as, Canazas (58) and Boquete (19), and Changuinola (2) and Chitre (31)) leads to the suspicion that migration is affecting the results of the Gini at a national level (within the districts of Panama). Migration is more dynamic within the country, and people have a greater tendency to move from place to place to find better jobs, more land, and better social and economic conditions than originally assumed in this research.

The district of San Miguelito (54) had one of the highest rate of population growth in the country (129.0%) but its Gini coefficient was one of the lowest (37.98). This district received a significant amount of migration from other areas of the country during the 1970's and 1980's, a situation that contributed to its high population growth. Comparing the results obtained between the rate of population growth and Gini coefficient and between the rate of population growth and IS20 it may appear that although

this district has a high population growth, the population in general in this district is doing much better than the rest of the districts. But in reality this district had a lower share of income for IS20 than other districts with smaller rate of population growth. Thus, we can conclude that the Gini coefficient may present problems of interpretation because it does not capture details about the situation of the lowest income levels of the population.

In general, it can be concluded that for certain relationships the function and the estimated curve for the U-shape and the inverted U-shaped pattern can be clearly seen with its corresponding increase and decrease of income inequalities with development. But also it was observed that there was no decrease at all in income inequalities for certain districts even though they have reached a degree of development. Another important feature is that for other relationships (e.g. IS20 and Gini coefficient and the rate of population growth) although the function shows a significant relationship for both coefficients of the quadratic equation, the expected signs for the relationship were not obtained and the districts were not evenly distributed throughout the curve; on the contrary, most of the districts were concentrated in one area of the curve, possibly due to the influence of migration.

Insignificant Relationships

Six relationships were not significant in this study. These relationships are: the relationship between literacy and school enrollment and Gini coefficient; the rate of population growth and IS40; and the percentage of agricultural land under private ownership and the three measures of inequality (Gini coefficient, IS20 and IS40). The results of the regression analysis were insignificant at alpha 0.05 level. Thus, the relationship between the percentage of agricultural land under private ownership and Gini coefficient indicates that they are not interrelated. One reason why this relationship does not show the expected results may be related to the measure used. Even though the fact that the legality of the land ownership can be considered an indicator of development, in this case it seems that there are other factors related to land ownership that need to be considered to establish whether or not this variable as a measure of development is related to income inequalities. Therefore, it would be expedient to find another measurement of distribution of land ownership and to regress it against Gini coefficient.

On the other hand, the percentage of agricultural land under private ownership presents a significant negative relationship with IS20, and no relationship with IS40. In the case of IS20 an increase in the amount of farmland privately owned also increases the share of income of this percentage of the population. In addition the weakness of

the relationship for both measures of inequalities indicates that data on farmland privately owned are not robust enough to support the relationship between income distribution inequalities and whether and/or how the land is owned.

To summarize, the results showed that there is an indication of an inverted U-shaped curve between income distribution measured by Gini and development in Panama. In addition, the relationship between IS20 and IS40 and development also presents the expected results of a U-shaped curve for most of the independent variables.

The relationship between median family income and agricultural employment and the three measures of inequality had, overall, the highest adjusted R^2. Even though for the other relationships between the independent variables and the dependent variables the adjusted R^2 was low, the results of the relationships were significant for Gini and population growth, as well as for IS20 and literacy, school enrollment, and population growth. For IS40 the relationship between the dependent variable and literacy and school enrollment were also significant (See Tables 8, 9 and 10).

It is also important to mention that the best results for this study were obtained for the relationship between IS20 and the independent variables. From six regressions performed two were significant with the expected signs (median family income and population growth), one had the expected signs and coefficient b_2 was significant (agricultural employment) and two were significant with

opposite signs to what was expected (literacy and school enrollment). The second best results were shown for the relationship between IS40 and four of the independent variables. In this case, two of the relationships were significant with the expected signs (median family income and agricultural employment) while two were significant but with opposite signs to what was expected (literacy and school enrollment). For the Gini coefficient two were significant with expected signs (median family income and agricultural employment), and one was significant with the opposite sign (population growth) (See Table 6).

CHAPTER V

CONCLUSIONS

This study concludes that there are significant regional income disparities in the Republic of Panama at the district level. The relationships between this income distribution inequality and some factors of development were analyzed. Several conclusions can be drawn.

First, different facets of development such as the level of median family income and population in agricultural activities, in general, showed that income inequalities were less in districts that were either underdeveloped or the most developed according to these two variables. Therefore, the hypothesized relationship between development and income inequality is confirmed for these variables. An important finding was that districts with very low development showed less inequalities in the distribution of income than districts with the highest development. This situation is an indication that even the most developed districts in the country still are not fully developed or developed enough where inequalities had decreased to the point of showing less inequalities than many less developed areas.

Thus, for the case of a developing country like Panama there is a curvilinear pattern. But it has not yet reached its complete maturity. An important feature is the fact that

the range of difference in the levels of income between underdeveloped and developed districts is very wide. A situation is observed for the position of the districts on the curve: districts with low and high median family income also have lower inequalities than district with moderate income. This is due to the fact that the most developed district areas usually are located within the Metropolitan Region, where the base of the economy is more related to the secondary and tertiary sector, whereas in the less developed districts the base is related to the primary sector. Thus, the level of income received by the population living in the Metropolitan area is sometimes more than two times the amount of income the population in the less developed districts receives, resulting in great levels of income inequalities between districts.

Looking at the range of the level of income for the different districts and the level of development, it is observed that as development increases the income level increases and in general, inequalities in the distribution of income decreases.

Second, the relationship between income distribution and the variables of development chosen for this study seem to show differences according to the measure of inequality used. The Gini coefficient, for example, showed that the most developed districts have a lower degree of inequalities than less developed districts. But it also showed some developed districts like Panama with a slightly greater

inequality of distribution of income than that of the least developed districts (e.g. Canazas). Of course, these two study areas have very different dynamics in their economic and social structure, a situation that is reflected in the results of the Gini.

The results obtained by the Gini, in general, do not seem to present a high level of income disparities when development is present, but the income share for the poorest 20% and 40% of the population gave more specific results. Although the expectation that districts with a higher level of development would have low income distribution inequalities was statistically confirmed, these results showed that the share of income for these two segments of the population was more unequal in those districts with a medium high and high development (with the exception of the district of San Miguelito) as compared to the less developed districts. This situation implies that development is very relative in a developing country like Panama, and that even though the general tendency is toward a decrease of inequalities with development, still there are factors that may affect the distribution share of income for certain groups of the population, principally the poor ones. In addition, the relationship between the population employed in agricultural activities and the share of income for the poorest 20% and 40% also showed that districts with the lowest percentage of population employed in agricultural

activities also had the lowest share of income for the poorest 20%. This implies that other forces may be at work.

In addition, districts with the highest levels of literacy rate and school enrollment had the lowest income share for the poorest 20% and 40%. This may due to a concentration of rural and uneducated population in the more developed and urban districts, due to migration, and with the consequent effects on the income share of these districts.

Third, of the three measures of inequalities, IS20 and IS40 more clearly showed the income distribution inequalities. They produced better results for the median family income and population engaged in agricultural activities when used in the regressions. Therefore, it is necessary for future studies to select an additional whole range of variables that can help better reveal the relationship between income distribution inequalities and development, principally when one wants to focus upon the situation of the poorest segments of the population.

In particular, the variables of literacy and percentage of school enrollment seem to be extremely deficient as variables. Literacy is no longer an adequate measure of development; being able to read and write is assumed in the modern world and can no longer differentiate a developed and a developing country. The percentage of school enrollment is also deficient because this variable looks to the future, and thus, has no significance to the work force under

study. A better measure for future studies may be the percentage of the labor force which has either a high school and/or a university degree. This measure stresses the need that exists in a modern industrial/computerized world for an educated labor force as well as being aplicable to the work force under study. Thus, there is a need for countries to recognize this fact and develop statistics of this kind rather than the literacy rate which has, for all predictable purposes, ceased to be relevant.

The interaction of intrinsic forces present in developing countries like Panama such as migration patterns (principally between districts) also plays an important role in the study of the relationship between income distribution inequalities and development. These forces can affect the economy of the more developed districts and, as a consequence, their distribution of income. Both, high skill laborers and those with no skill tend to migrate principally to larger metropolitan areas. This is due to the fact that there is a need for more skilled laborers but, at the same time, there is also a need for cheap labor. The result would be a higher proportion of inequalities in more developed areas when compared to less developed areas since the former areas receive the unskilled laborers from the latter. This situation may explain why most of the highly developed districts also showed less income share for the poorest 20% and 40% of the population as compared to other less developed districts.

Limitations

Although this study addresses the relationship between development and income inequalities using several variables to represent development, other variables such as migration and fertility, which can affect development, could not be obtained. Another limitation in this study was a lack of adequate data for land ownership. Even though a surrogate variable, percentage of farmland under private ownership, was used, the results were not very promising. A further limitation can be seen in the results obtained from the education data. As noted above, the variables used (literacy and school enrollment) were inadequate in determining the level of development of a district due to the fact that the higher levels of development in a country are probably better reflected in higher education measures.

Recommendations

For further study it is recommended that another variable for education should be included to see if the results are different from those obtained with literacy and school enrollment. A good measure may be the percentage of people in college. This suggestion is based on the consideration that the two variables mentioned above did not really show what the level of education is; therefore, it seems likely that using college level will be a better variable to measure development.

In the case of the relationship between the rate of population growth and the three measures of inequalities, more studies should be done over time. This thesis uses only one year as a reference, but several years might reveal more of development dynamics. In addition, future studies should also include a variable that measures natural growth (e.g. fertility) in order to analyze the influence of this variable.

Another variable that needs to be restructured for future studies is the percentage of farmland privately owned. It would be instructive to find out how much land is owned by the different strata of the population over different years and how the distribution of land affects the income share, particularly within the two poorest categories of the distribution (income share for the poorest 20% and 40% of the population).

Finally, the key to obtaining a better distribution of income among the population in a developing country like Panama may not only be present in the level of development that a district has, but in the way this development is achieved. By giving more opportunities to the population to have access to a better education, employment and other social conditions these inequalities may be diminished in the long run. Therefore, other studies regarding development policy, poverty in urban and rural areas as well as economic and social regional disparities are recommended.

BIBLIOGRAPHY

BIBLIOGRAPY

Adelman, Irma., and C.T. Morris. *Economic growth and social equity in developing countries*. Stanford, California: Stanford University Press, 1973.

Adelman, Irma., and Sherman Robinson. *Income Distribution Policy in Developing Countries: A case Study of Korea*. Stanford: Stanford University Press, 1978.

Ahluwalia, Montek S. "Inequality, Poverty and Development." *Journal of Development Economic* 3 (1976a): 307-342.

_____. "Income Distribution and Development: Some Stylized Facts." *American Economic Review* 66, N° 2 (1976b): 128-135.

Amos, Orley M. "Unbalanced Regional Growth and Regional Income Inequality in the Latter Stages of Development." *Regional Science and Urban Economics* 18 (1988): 549-566.

Berry, Albert., and Ronald Soligo., eds. *Economic Policy and Income Distribution in Colombia*. Boulder, Colorado: Westview Press, 1980.

Bornschier, Volker. "World Economy, Level Development and Income Distribution: An Integration of Different Approaches to the Explanation of Income Inequality." *World Development* 11, N° 1 (1983): 11-20.

Browman, Mary J. "A Graphical Analysis of Personal Income Distribution in The United States." *The American Economic Review* 35, N° 4 (Sep, 1945): 607-628.

Brown, Lawrence A. "Reflections on Third World Development: Ground Level Reality, Exogenous Forces and Conventional Paradigms." *Economic Geography* 64, N° 3 (July, 1988): 255-277.

Chakravarty, Satya R. "Extended Gini Indices of Inequality" *International Economic Review* 29, N° 1 (February, 1988): 147-156.

Chilcote, Ronald H. *Theories of Development and Underdevelopment*. Boulder: Westview Press, 1984.

Cline, William R. "Distribution and Development. A survey of Literature." *Journal of Development Economics* 1 (1975): 359-400.

Cook, Cristopher J. "Commodity Price Distortions and Intraagricultural Income Distribution in Colombia." *The Journal of Developing Areas* 22 (January, 1988): 219-238.

Contraloria General de la Republica de Panama. Direccion de Estadistica y Censo. *Censos Nacionales de 1980*. Volumenes I, III y V. [National Census of 1980. Volumes I, III and IV]. Panama:Departamento de Informacion y Divulgacion, 1980.

_____. Censos Nacionales de 1980. Cuarto Censo Nacional Agropecuario. 17 al 24 de mayo de 1981. Volumen I. Produccion Agricola.[Census of Agricultural Production. Volume I]. Panama, 1980.

Darden, J.T., and A.S. Tabachneck. "Algorithm 8: Graphic and mathematical descriptions of inequality, dissimilarity, segregation, or concentration." *Environment and Planning* 12 (1980): 227-234.

Dookeran, Winston. "The Distribution of Income in Trinidad y Tobago." *Review of Income and Wealth* 27 (June, 1981): 195-206.

Gastwirth, Joseph L. "Notes and Comments. A General Definition of The Lorenz Curve." *Econometrica* 39, N° 6 (November, 1971): 1037-1039.

Gerstle, Mack. *The Land Divided. A History of THE PANAMA CANAL and other Isthmian Canal Projects*. New York: Alfred A. Knopf, 1944.

Ginneken, Vouter van., and Jong-goo Park. *Generating Internationally Comparable Income Distribution Estimates*. Geneva: International Labour Office, 1984.

Hicks, J.R. *Essays in World Economics*. Oxford: Oxford University Press, 1959.

Higgins, Benjamin. *Economic Development. Principles, Problems and Policies*. New York: W.W. Norton & Company Inc, 1959.

Hirschman, Albert O. *The Strategy of Economic Development*. 10th printing. New Heaven and London: Yale University Press, 1966.

Instituto Geografico Nacional "Tommy Guardia". *Atlas Nacional de la Republica de Panama*. Tercera Edicion [National Atlas of the Republic of Panama]. Panama: Impreso Instituto Geografico Nacional Tommy Guardia, 1988.

Jaen Suarez, Omar. *Geografia de Panama. Tomo I*. [Geography of Panama. Volume I]. Panama: Imprenta del Banco Nacional de Panama, 1985.

Jones Richard C. "Regional Income Inequalities and Government Investment in Venezuela." *The Journal of Developing Areas* 16, (April, 1982), 373-390.

Kuznets, Simon. "Economic Growth and Income Inequality." *The American Economic Review* 45, N° 1 (March, 1955): 1-28.

Lecaillon, Jacques; Paukert, Felix; Morrison, Christian; and Germidis, Dimitri. *Income Distribution and Economic Development an Analytical Survey*. Geneva: International Labour Office, 1984.

Lewis, W.A. "Economic development with unlimited supplies of labor." *The Manchester School* 22, 139-191.

Mahler, Vincent A. "Income Distribution within Nations. Problems of Cross-National Comparison." *Comparative Political Studies* 22, N° 1 (April, 1989):3-32.

Meier, Gerald M. *Leading Issues in Development Economies*. Selected Materials and Commentary. New York: University Press, 1964.

Meier, Gerald M., and Dudley Seers. eds. *Pioneers in Development: A World Bank Publication*. New York: Oxford University Press, 1985.

Mera, Koichi. *Income Distribution and Regional Development*. Japan: University of Tokyo Press, 1975.

Murphy, D. C. "Calculation of Gini and Theil Inequality Coefficients for Irish Households Incomes in 1973 and 1980." *The Economic and Social Review* 16, N° 3 (April, 1985): 225-249.

Myrdal, Gunnar. *Rich Lands and Poor. The Road to World Prosperity*. New York: Harper & Brothers Publishers, 1957.

Nugent, Jeffrey B. "An Alternative Source of Measurement Error as an Explanation for the Inverted-U Hypothesis." *Economic Development and Cultural Change* 31, N° 2 (Jan, 1983): 385-396.

Nugent, Jeffrey B., and Fayez A. Tarawneh. "The Anatomy of Changes in Income Distribution and Poverty among Mexico's Economically Active Population between 1950 and 1970." *The Journal of Developing Areas* 17 (January, 1983): 197-226.

Papanek, Gustav F., and Oldrich Kyn. "The Effect on Income Distribution of Development. The Growth Rate and Economic Strategy." *Journal of Development Economics* 23 (1986): 55-65.

Pryor, Federic L. "Changes in Income Distribution in Poor Agricultural Nations: Malawi and Madagascar." *Economic Development and Cultural Change* 39, N° 1 (Oct, 1990): 23-45.

Quan, Nguyen T., and Anthony Y.C. Koo. "Concentration of Land Holdings: An Empirical Exploration of Kuznets' conjecture." *Journal of Development Economics* 18, (1985): 101-117

Ram, Rati. "Economic Development and Income Inequality: Further Evidence on the U-Curve Hypothesis." *World Development* 16, N° 11 (1988): 1371-1376.

Randolph, Susan. "The Kuznets Process in Malaysia." *The Journal of Developing Areas* 25,(Oct, 1990): 15-32.

Robinson, Sherman. "Income Distribution in Developing Countries: Toward an Adequate Long- Run Model of Income Distribution and Economic Development." *American Economic Association* 66, N° 2 (May, 1976): 122-127.

_____. "A Note on the U-Hypothesis Relating Income Inequality and Economic Development." *The American* Economic Review 66, N° 3 (June, 1976): 437-440.

Rossi, Jose W. "Income Distribution in Brazil: A Regional Approach." *The Journal of Development Studies* 17, N° 2 (January, 1981): 226-234.

Sahota, Gian Singh. *Poverty Theory and Policy. A study of Panama*. Baltimore and London: The Johnsons Hopkins University Press, 1990.

Seers, Dudley. "The Meaning of Development." *International Development Review* 2 (1977): 2-7.

Slater, David. "Underdevelopment and Spatial Inequality. Approaches to the Problems of Regional Planning in the Third World." *Progress in Planning* 4, N° (1975): 97-167.

Slottje, D. J.; R. L. Basmann; and M. Nieswiadomy. "On the empirical relationship between several well known inequality measures." *Journal of Econometrics* 42, (1989): 49-66.

Small, John., and Michael Witherick. *A Modern Dictionary of Geography*. Second Edition. London: Edward Arnold, a division of Hodder and Stoughton Limited, 1990.

Smith, Courtland L. "Patterns of Wealth Concentration." *Human Organization* 50, N° 1 (1991): 50-60.

Smith, David M. *Where the Grass is Greener. Living in an unequal world*. Baltimore: The Johns Hopkins University Press, 1982.

Sopher, David E. "A Measure of Disparity." *The Professional Geographer* 26, N° 4 (Nov, 1974): 389-392.

Stewart, Charles T. Jr., and Jin-Hsia Lee. "Urban Concentration and Sectoral Income Distribution." *The Journal of Developing Areas* 20 (April, 1986): 357-368.

Sundrum, R.M. *Income distribution in less developed countries*. London and New York: Routledge, 1990.

Swindell, K.; Baba, J.M.; and Mortimore, M.J., eds. *Inequality and Development: Case Studies from the Third World*. London: Macmilla, 1989.

Todaro, Michael F. *Economic Development in the Third World* 3rd ed. New York: Longman: 1985.

Weisskoff, Richard, and Edward N. Wolff. "Structure of Income Inequality in Puerto Rico." *Economics* 9, (1981): 205-228.

Williamson, J.G. "Regional Inequality and the Process of National Development: A description of Patterns." *Economic Development and Cultural Change* 13, (July, 1965): 3-44.