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## Natural Increase and Net Migration of Coffee Region Populations in Puerto Rico, 1960-70

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### INTRODUCTION

Migration is a major process whereby people respond to spatial differentials in income and other opportunities. This study concerns estimates of natural increase and net migration in the population of the Coffee Region of Puerto Rico, an area of relatively low income, during the period April 1, 1960 to April 1, 1970. The main purpose of this report is to make available immediately some preliminary findings obtained in a broader research project<sup>2</sup> being conducted in this traditional major crop area of the Island by the Agricultural Experiment Station. Much current interest exists in knowing more about the determinants of population change in this Region because this important farming area is faced with a decreasing population.

### PROCEDURE

The residual method was used in this study to measure net migration between the 1960 and 1970 Censuses of Population.<sup>3</sup> This technique basically provides two major approaches, the "vital statistics" and "survival" methods, to estimate balance of population movements into and out of a particular area. The first method, perhaps the most widely used where reliable vital statistics are available, employs birth and death data to estimate the natural increase or decrease (excess or deficit of births over deaths) in population. The second method uses life tables to estimate birth and mortality statistics to estimate natality.

The method employing vital statistics has been applied in this analysis. Detailed information is not available presently from the last census enumer-

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<sup>2</sup> Population, Family-Size Farms, and Plantation-Type Farms in the Coffee Region of Puerto Rico.

<sup>3</sup> Siegel, J. S. and Hamilton, C. H. Some Considerations in the Use of the Residual Method of Estimating Net Migration, *J. Amer. Statist. Assoc.*, 47: 475-500, 1952.

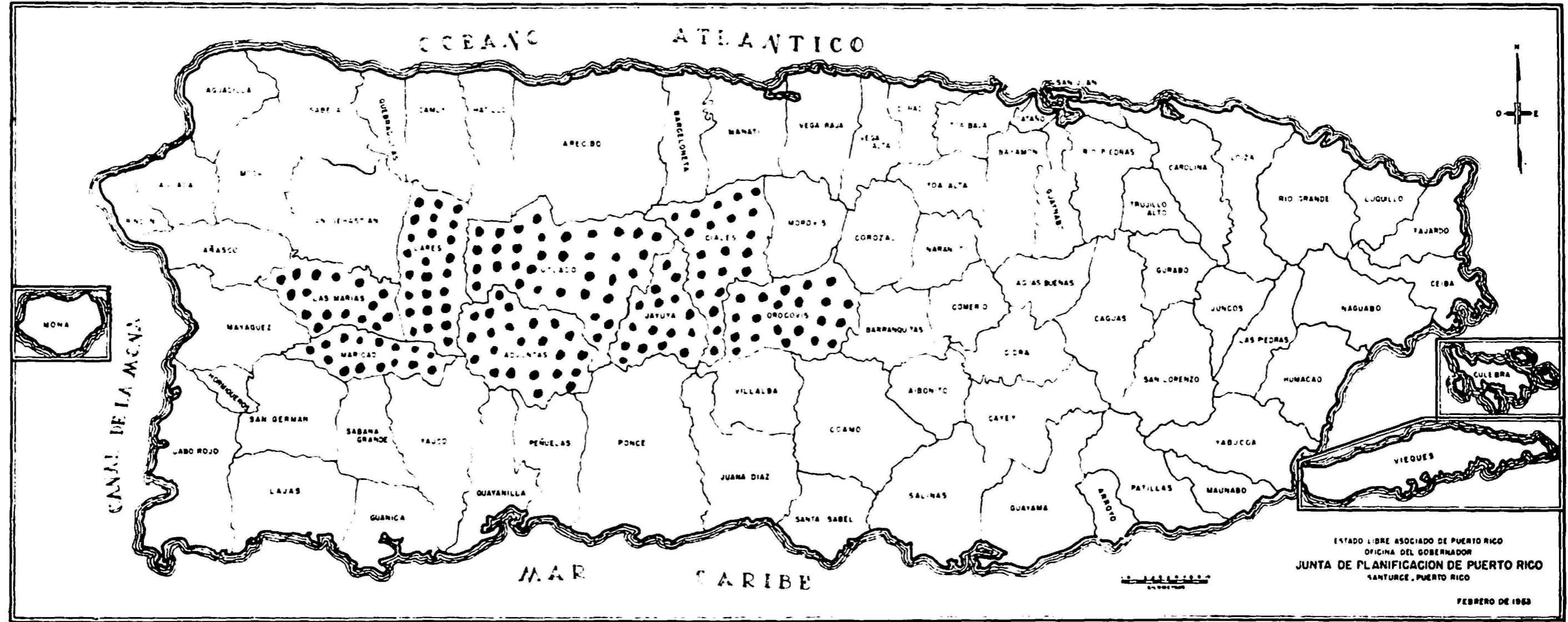


FIG. 1.—Map of Puerto Rico showing the eight municipalities (dotted area) in which coffee is the main crop. This area includes the towns of Adjuntas, Ciales, Jayuya, Lares, Las Marías, Maricao, Orocovis, and Utuado.

ation relating to age and sex composition of the population. Reliable birth and death data is available, however, on the basis of place of residence. In essence, the vital statistics procedure identifies the portion of population change which corresponds to natural increase or decrease between two successive population counts. The residual or remaining change is attributed to net migration. Population figures reported in the last two censuses, and birth and death information by place of residence from the Division of Demographic Registry and Statistics of the Department of Health of the Commonwealth of Puerto Rico, were used as data sources.

For purpose of comparing different municipalities within a country, or within a geographic area such as the Coffee Region of Puerto Rico, the migration ratio is based on the population at the beginning of the interval. This ratio can be written as:

$$MR = \frac{[(P_1 - P_0) - (B - D)]}{P_0} \times 100$$

where:

$P_1$  = total population in the Coffee Region on April 1, 1970 reported by the Census (preliminary figures)

$P_0$  = total population in the Coffee Region on April 1, 1960 reported by the Census

$B$  = number of births occurred to residents of the Coffee Region from April 1, 1960 to April 1, 1970

$D$  = number of deaths occurred to residents of the Coffee Region from April 1, 1960 to April 1, 1970

$MR$  = is the percentage of the net migration to the population.

For purposes of this study, the Coffee Region is defined as including the eight municipalities of Lares, Jayuya, Adjuntas, Las Marías, Maricao, Orocovis, Ciales, and Utuado in the western central part of the Island (fig. 1).

#### NATURAL INCREASE AND NET MIGRATION

The total population of Puerto Rico showed an increase of about 14.4 percent from 1960 to 1970 (table 1). The population of the Coffee Region declined, however, from 156,357 in 1960 to 141,483 in 1970, a decrease of 14,874 or 9.5 percent. The decrease in population was general throughout the Region, ranging from 15.1 percent in Maricao to 0.2 percent in Orocovis.

Table 2 shows there were 50,629 births and 10,484 deaths to allow for a natural increase of 40,145 people between 1960 and 1970. Study of the components of population change indicate that there was a loss of 55,019 people in the Coffee Region of Puerto Rico during the same period due to

net out-migration (table 3). Were it not for net out-migration, the population of this region would have been approximately 200,000 people in 1970 instead of the 141,483 enumerated by the Census. The net loss through

TABLE 1.—*Population changes in the Coffee Region of Puerto Rico, 1960-70*

Municipality	Total population		Changes from 1960 to 1970	
	1960 <sup>1</sup>	1970 <sup>2</sup>	Number	Percent
Adjuntas	19,658	18,584	-1,074	-5.5
Lares	26,922	24,896	-2,026	-7.5
Jayuya	14,633	13,116	-1,517	-10.4
Las Marías	9,237	7,904	-1,333	-14.4
Maricao	6,990	5,936	-1,054	-15.1
Orocovis	20,362	20,321	-41	-0.2
Ciales	18,106	15,422	-2,684	-14.8
Utuaado	40,449	35,304	-5,145	-12.7
<b>Total Coffee Region</b>	<b>156,357</b>	<b>141,483</b>	<b>-14,874</b>	<b>-9.5</b>
<b>Total Puerto Rico</b>	<b>2,349,544</b>	<b>2,688,289</b>	<b>+338,745</b>	<b>+14.4</b>

<sup>1</sup> Source: U.S. Census of Population, 1960, Puerto Rico, U.S. Department of Commerce.

<sup>2</sup> Preliminary figures, 1970 Census.

TABLE 2.—*Births, deaths, and natural increase in the Coffee Region from April 1, 1960 to April 1, 1970<sup>1</sup>*

Municipality	Births	Deaths	Natural increase
	Number	Number	Number
Adjuntas	6,635	1,347	5,288
Lares	8,783	1,939	6,844
Jayuya	5,659	1,118	4,541
Las Marías	2,306	516	1,790
Maricao	1,917	453	1,464
Orocovis	8,022	1,256	6,766
Ciales	5,485	1,032	4,453
Utuaado	11,822	2,823	8,999
<b>Total</b>	<b>50,629</b>	<b>10,484</b>	<b>40,145</b>

<sup>1</sup> Source: Birth and death data from place of residence were obtained from the Division of Demographic Registry and Statistics of the Department of Health of Puerto Rico. Birth data was corrected for underregistration. Death registrations were considered complete.

migration, expressed as a percentage of the population living in the Region at the beginning of the decade, was 35.2 percent. Thus, for every 1,000 people living in this region at the beginning of this census decade, there

was a net loss of about 352 people. The loss in population due to net migration was general throughout the area, ranging from 14,144 people in Utuado to 2,518 in Maricao.

In relative terms, the highest net out-migration took place in Jayuya and Ciales with 41.4 and 39.4 percent, respectively, of their 1960 population. Maricao showed a net loss in population of 36.0 percent, Las Marías 33.8 percent, Orocovis 33.4 percent, Adjuntas 32.4 percent, and Lares 32.9 percent. Utuado, the largest municipality of the Region, had a net out-migration of 35.0 percent of the population it had at the beginning of the census decade.

The phenomenon of heavy out-migration is not new to the Coffee Region. During the 1950-60 decade, for instance, the net out-migration from this

TABLE 3.—*Total population, natural increase and net migration from April 1, 1960 to April 1, 1970 in the Coffee Region of Puerto Rico*

Municipalities in which coffee is the predominating crop	Population April 1, 1970	Population April 1, 1960	Natural increase	Net migration	
	$P_1$	$P_0$	$B-D$	Number	Percent
Adjuntas	18,584	19,658	5,288	-6,362	-32.4
Lares	24,896	26,922	6,844	-8,870	-32.9
Jayuya	13,116	14,633	4,541	-6,058	-41.4
Las Marías	7,904	9,237	1,790	-3,123	-33.8
Maricao	5,936	6,990	1,464	-2,518	-36.0
Orocovis	20,321	20,362	6,766	-6,807	-33.4
Ciales	15,422	18,106	4,453	-7,137	-39.4
Utuado	35,304	40,449	8,999	-14,144	-35.0
Total	141,483	156,357	40,145	-55,019	-35.2

region was 67,703 people,<sup>4</sup> or 37 percent of the 1950 population. Thus, the total out-migration in the Coffee Region from 1950 to 1970 was about 122,722 people. Expressed as a ratio of the 1950 population (172,968 people), in 20 years the Region had a 71.1 percent net out-migration.

The high pattern of reproduction is another outstanding characteristic of the population of the Region. The average annual rate of natural increase was about 30 per thousand population from 1955 to 1965 (fig. 2).

With this high rate of natural increase due to a low death rate and a persistently high level of reproduction, it can not be expected that traditional coffee farming could provide an adequate level of living for the people if all remain in the area of birth. The tremendous population explosion of the area has been accompanied by successive waves of out-migration. Stated in other terms, the adjustment process between population

<sup>4</sup> Calero, Reinaldo, *Análisis de Algunos Cambios Recientes en la Población de Puerto Rico*, *Bulletín 183, Agr. Exp. Sta., Univ. P.R., 1964.*

growth and natural resources is occurring through the device of heavy out-migration rather than through rural development and improvement in agriculture.

Rehabilitation of the Coffee Region requires consideration of the high pattern of reproduction that might have been advantageous under the traditional extensive type of coffee farming, but not for an intensive, highly technological agriculture. This suggests need for a new outlook to adjustments in farming and in the social environment of the area.

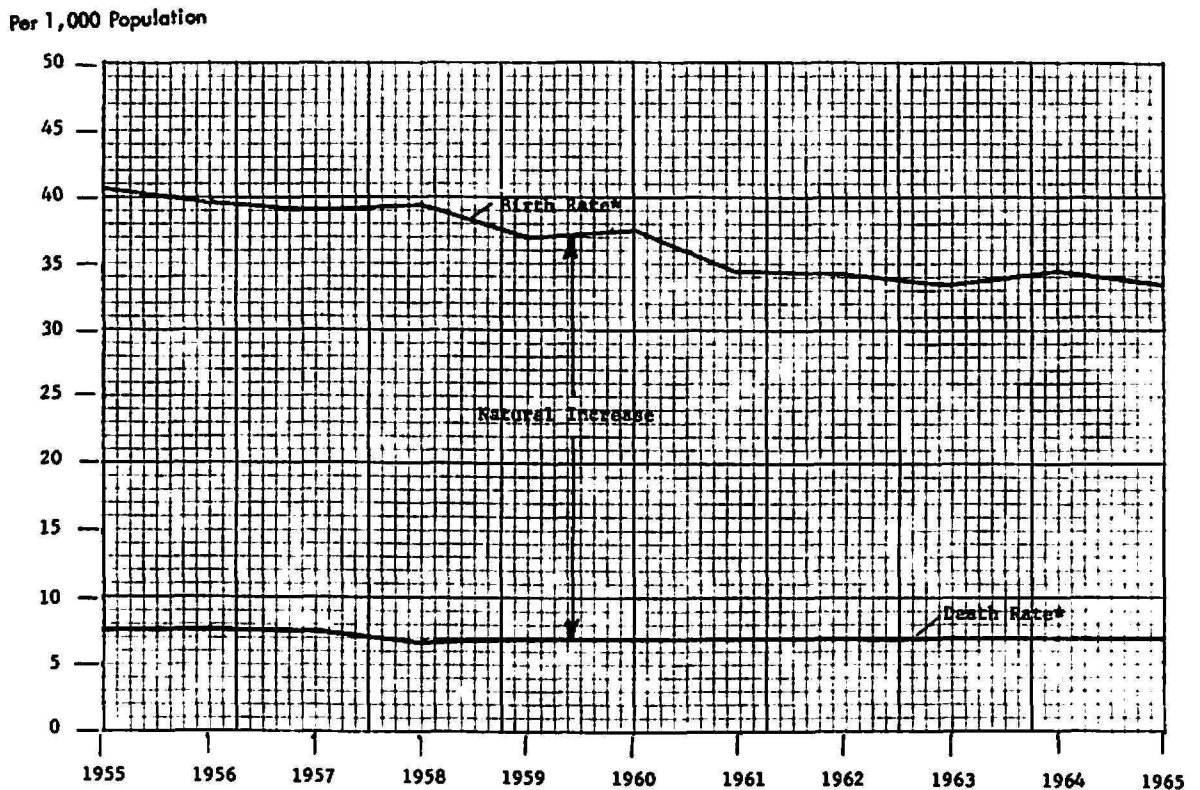


FIG. 2.—Birth and death rates in the Coffee Region, Puerto Rico, 1955-65.\*

#### SUMMARY

This paper presents data showing the volume of net migration in the Coffee Region of Puerto Rico from April 1, 1960 to April 1, 1970. Population figures used for the estimates were derived from the last two census counts, and birth and death data classified by place of residence from the Division of Demographic Registry and Vital Statistics of the Department of Health of Puerto Rico.

Preliminary results indicate that the Coffee Region of the Island had a net out-migration of 55,019 people from April 1, 1960 to April 1, 1970.

\* Annual population estimates and birth and death statistics were obtained from the Division of Demographic Registry and Vital Statistics of the Department of Health of Puerto Rico.

During this same period, however, there were 50,629 births and 10,484 deaths to allow for a natural increase of 40,145 people.

The population of this region would have been about 200,000 people if it had not been for out-migration, instead of the 141,483 enumerated by the Census in 1970. The net loss through out-migration, expressed as a ratio of the population living in this region in 1960, was 35.2 percent. Net out-migration was general throughout the Coffee Region: Each of its municipalities showed heavy net out-migration, ranging from a total of 14,114 people in Utuado to 2,518 in Maricao.

It must be noted that heavy out-migration is not a new development in in this major crop area. Net out-migration from the Region during the 1950-60 decade was 67,703 people, or about 37 percent of the 1950 population. From 1950 to 1970, out-migration amounted to 71.1 percent of the 1950 population.

#### RESUMEN

El propósito de este trabajo es determinar la migración neta de la Región Cafetalera de abril 1 de 1960 a abril 1 de 1970. Para hacer los estimados se utilizaron las cifras poblacionales que aparecen en los dos últimos censos y los datos sobre los nacimientos y defunciones, clasificados según el lugar de residencia y registrados en la División del Registro Demográfico y Estadísticas Vitales del Departamento de Salud de Puerto Rico.

Los resultados preliminares obtenidos revelan que hubo una emigración neta de 55,019 personas de la Región Cafetalera entre las fechas de abril 1 de 1960 y abril 1 de 1970. Sin embargo, durante el mismo periodo se registraron en el área 50,629 nacimientos y 10,484 defunciones, lo que dejaría un incremento natural de 40,145 personas en la población. Es decir, de no haber sido por la emigración la población de esta región hubiera sido de alrededor de 200,000 personas en vez de las 141,483 que fue la que enumeró el Censo del 1970. La pérdida relativa a causa de la emigración fue de 35.2 por ciento de la población registrada para esa área en el 1960. La pérdida poblacional por razones de emigración fue general para toda la Región Cafetalera. Todos los municipios registraron pérdidas por emigración, variando de 14,144 personas en Utuado a 2,518 en Maricao.

Debe señalarse, sin embargo, que este fenómeno no es nuevo para la Región Cafetalera. Por ejemplo, la pérdida poblacional por emigración en la década del 1950 fue de 67,703, o sea, el 37 por ciento de la población del 1950. Por lo tanto, del 1950 al 1970 hubo una pérdida neta por emigración de 122,722 personas, lo que representa el 71.1 por ciento de la población registrada para la Región en 1950.