

WILL THE POOR OF TODAY BE THE POOR OF TOMORROW? THE DETERMINANTS OF POVERTY AND VULNERABILITY IN CARTAGENA, COLOMBIA

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ABSTRACT

This paper examines the evolution and causes of poverty in Cartagena, Colombia, during the period 2002-2005. We use a probabilistic model (probit) to identify the individual characteristics that explain the incidence of poverty in the city. We also examine the concept of vulnerability, defined as the possibility that future levels of consumption may be below the poverty line. We find that poverty by income has diminished but continues to affect a significant proportion of the local population. Labor variables and household structure (for example, the presence of children) are the most important factors in explaining the incidence of poverty in Cartagena. However, vulnerability is greater than poverty itself, so that most of the city's population face a latent risk that their living conditions may worsen.

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Key words: poverty, vulnerability, probit model, household consumption, Cartagena, Colombia.

JEL Classifications: C4, I3, R1.

RESUMEN

Este estudio examina la evolución y las causas de la pobreza en Cartagena, Colombia, durante el periodo 2002-2005. Empleamos un modelo probabilístico (probit) para identificar las características individuales que explican la incidencia de la pobreza en la ciudad. Igualmente se estudia la vulnerabilidad, entendida como la posibilidad de que las personas puedan tener en el futuro un consumo inferior a la línea de pobreza. Los resultados indican que la pobreza por ingresos ha disminuido en la ciudad pero sigue afectando a un porcentaje significativo de la población local. Las variables laborales y de composición del hogar (por ejemplo, la presencia de niños) son las más importantes para explicar la incidencia de la pobreza en Cartagena. Por su parte, la vulnerabilidad es mayor que la pobreza, lo que representa un riesgo latente de que empeore la condición de vida de miles de habitantes de la ciudad.

Palabras clave: Pobreza, vulnerabilidad, modelos de elección binaria, consumo de los hogares, Cartagena de Indias.

Clasificaciones JEL: C4, I3, R1.

I. INTRODUCTION

The eradication human poverty is not only a desirable objective in Cartagena, where it affects more than half the population. It is an imperative in order to construct a more prosperous, equitable society in the future.

In Cartagena, partial references and the fragmented, often voluntaristic perception that prevails in the analysis of poverty and inequality, have given way recently to more numerous empirical exercises and measurements by social researchers. Despite these advances, however, much research is still concentrated in the mea-

surement of poverty and vulnerability, rather than in the analysis of their structural—not necessarily economic—determinants. In the last few years, the city has apparently succeeded in reducing the number of individuals living in poverty, although this assertion is the subject of some controversy. However, the questions of who and why, and how effective is public policy in reducing marginality, have been practically absent in the agenda of local research centers. In fact many aspects of poverty that must be known to in order to gauge the real options offered by public policies have received little or no attention. These include, among others, social mobility, property rights, the creation of social capital, and the distribution of assets, opportunities and income.

This essay examines two aspects of poverty in Cartagena: first, why certain characteristics of individuals and their families increase the risk of becoming poor, and, second, the extent of vulnerability, a dynamic, unstable aspect of poverty that cannot be ignored in designing public policies.

In the first part we examine some stylized facts of poverty in Cartagena, beginning with a brief review of trends of the local economy and the resulting changes in labor markets that generate social inequalities. This section also includes a profile of poverty, both individual and by neighborhoods.

In the second section we discuss the microeconomic factors (based on the characteristics of individuals and households) that explain the risks of falling into poverty in Cartagena. We use a probabilistic model with results projected for the period 2002-2005. This model also explores some determinants of poverty in neighborhoods, particularly through the way in which informal work, the racial and migrant characteristics, and human capital (measured by the level of education) explain the incidence of poverty.

Based on our findings, the third part examines the persistence of poverty in Cartagena and measures the size and characteristics of vulnerability. In the last section some conclusions are presented.

II. SOME STYLIZED FACTS OF POVERTY

Amartya Sen and Jeffrey Sachs have pointed out, in their more recent works, one of the greatest paradoxes of the world today: countries are much richer than at any time in history but, at the same time, large groups of people are «seriously impoverished.» (Sen, 2007, p.165; Sachs, 2006, pp. 60-66)

Both authors criticize the simple theories so often used when examining poverty. They represent, according to Sen, a sort of political tyranny that «searches the causes of disaster not in bad governance but in citizens' "culture" (Sen, 2007, p.151), while Sachs calls attention to the falacy that «poverty is a result of corrupt leadership and retrograde cultures that impede modern development.» (Sachs, 2006, p. 97)

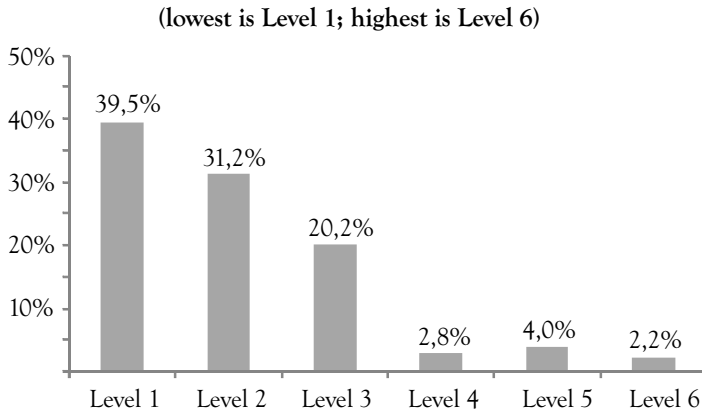
Sen and Sachs propose to widen the dimensions of the analysis of poverty by looking initially at how the benefits of prosperity are distributed and how the mechanisms of creation and distribution of wealth work within a framework of cooperation and respect for liberties. Sachs specifically argues that poverty is the result of a number of factors, such as low volume of capital, insufficient degree of specialization and technological assimilation, and high rates of fertility. These factors explain why benefits go to those who are skillful in market activities, while the poor –who are usually disconnected from these– do not have the required human capital to participate in the opportunities offered by markets.

We now examine the more important facts affecting poverty in Cartagena in the short and medium runs. To do so, we review recent trends in the local labor market, examine changes in income distribution during the last ten years, and draw a profile of poverty in Cartagena using the data available for individuals and neighborhoods.

A. Poverty and the Economy of Cartagena: A General View

One of the outstanding characteristics of Cartagena's economy in recent years has been the inelastic response of the unemployment rate to the changes in economic conditions. Although it is true that the number of jobs has increased –an indication that the local economy has pulled itself out of the severe recession of 1999– the unemployment rate has stayed at relatively high levels and the jobs created have not kept pace with population growth (Graph 1). While net employment– the diference in the rates of growth of employment and unemployment –went up by 1.1% between 2000 and 2005, the number of people of working age increased by 6.6%. In fact, the growth of employment in Cartagena has been spearheaded by the informal sector. Between 2000 and 2005, the work force increased by 8.8%. However, jobs in the formal sector decreased by 0.5%. In other words, job opportunities are created by individuals themselves and not by the formal sector.

GRAPH 1
Distribution of Households by Socio-economic Level in Cartagena, 2007



Sources: Cartagena Planning Office and authors' calculations.

One of the main characteristics of the labor market in Cartagena is that it is biased against the poor: unemployment affects mainly those workers with a low level of human capital, for whom job opportunities are more limited. In other words, there are persistent inequalities of employment in the Cartagena labor market.

Low labor incomes are the most important determinant of poverty in the city. According to standard economic theory, the capacity of individuals to generate income depends on their productive characteristics (quantity and quality of human capital plus special skills), on their preferences for paid work (through reserve salaries, for example), and on the opportunities offered them in the labor market (gauged by the unemployment rate and the degree of labor participation). However, the differences observed in these variables show that poverty not only has a quantitative element (e.g., gaps in human capital levels); they are also qualitative (e.g., gender, race, etc.). This means that poor and non poor are treated differently in the labor market.

By way of illustration, our calculations for the period 2002-2005, after the deep impact of the 1999 downturn, indicate that unemployment among people who did not finish high school was four times (24%) higher than unemployment

among those who finished at least one year of graduate school (6%). College graduates had a rate of unemployment similar to the average during the same period (15%). During those four years, unemployment among women (21.3%) was twice as among men (11.5%). Finally, the poor have a lower probability than the non-poor of finding a job. The employment rate of poor household heads is 1.5 times lower than that of heads of non-poor households (31.7% vs 46.4%).

A second dimension of Cartagena's economy is its highly skewed income distribution. Recent economic literature indicates that growth undoubtedly is an essential factor in the reduction of poverty, but also that the structure and changes in the distribution of income are important too: the way in which poor people obtain earnings in the process of growth depends, among other factors, on the growth of productive employment, the acquisition and expansion of household assets, and the transfer of state revenues (Ravallion and Chen, 2003).

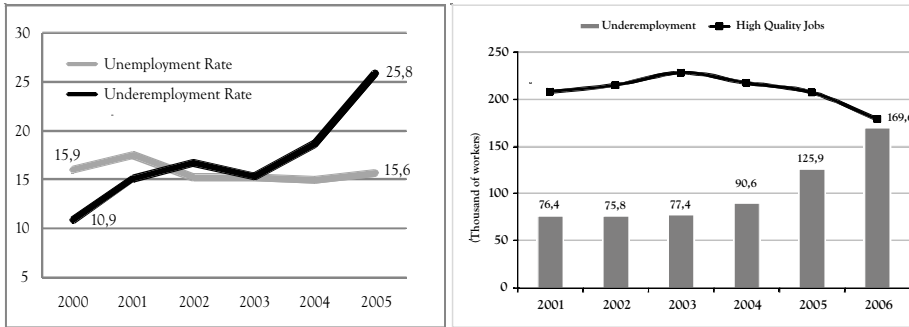
As will be seen in the next section, income-derived poverty affects more than half the population. In the period 2002-2005, inequalities in the distribution of income became more acute. In 2002 the average income of the richest individuals in Cartagena was 84 times higher than the average income of the poorest; in 2005 this difference had increased to 176 times. During the same period the average income of the poor diminished 34% while that of the richest grew by 1%. This is significant because it shows that the poorest fringe of the population has not significantly recovered after the recession of the late nineties. In 2007, more than 70% of total population belonged to the lowest socioeconomic group. Similarly, the greater concentration of income indicates that growth does not benefit much those at the lower end of the distribution. Between 1995 and 2005, the Gini coefficient increased seven points, from 0.38 to 0.45 (Graph 2).

B. Poverty in Households and Neighborhoods

From a microeconomic point of view, poverty is associated with certain characteristics of people and households. The risk of being poor is explained by variables such as age, sex, marital status, race and whether the individual is a recent immigrant.

Other than these individual aspects, there are also some relevant household variables that determine the incidence of poverty: family size and the presence of children; the characteristics of the head of the household, such as the level of

GRAPH 2
Annual Unemployment and Underemployment rates in Cartagena,
2000 – 2006



Source: DANE, Continuous Household Survey.

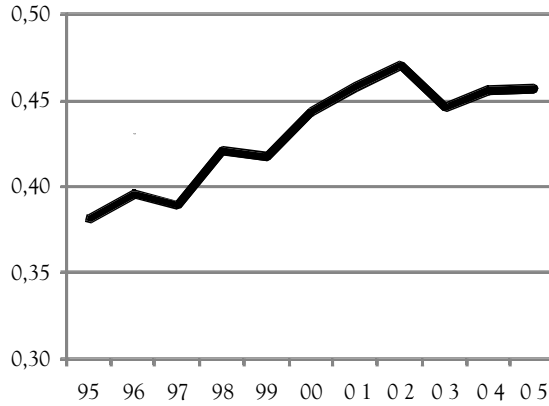
education; the ratio of employed to inactive members, and the size of productive and financial assets. Some studies also examine the characteristics of the urban/rural areas of residence (Nuñez and Espinosa, 2005; Espinosa and Albis, 2005a and 2005b).

Others argue that the area of residence –the *barrio* or *comuna*¹ in the case of Cartagena– is related to poverty. In a study of poverty in some Cartagena *barrios*, Perez and Salazar (2007), citing Fong and Shibuya (2000), point out that the urbanization process usually brings about the separation of poor populations –what is known as economic segregation. From this point of view, it is rational for the poor to settle in those areas allowed by their economic possibilities.

Graphs 3 and 4 draw a socio-economic profile of Cartagena's households in 2005 in order to analyze the most common characteristics of poor (and non-poor) households. To examine the presence of these characteristics, we divided the population in deciles according to household income level. These calculations mostly profile a typically poor household. One telling result, however, is that

¹ A *barrio* or neighborhood is the smallest territorial division of the City of Cartagena. A group of *barrios* form a *comuna* (or, more properly, a *Unidad Comunera de Gobierno*, UCG). Groups of *comunas*, in turn, form *localidades*. Cartagena has 15 UCG's and three *localidades*. In this study, a total of 164 *barrios* were included.

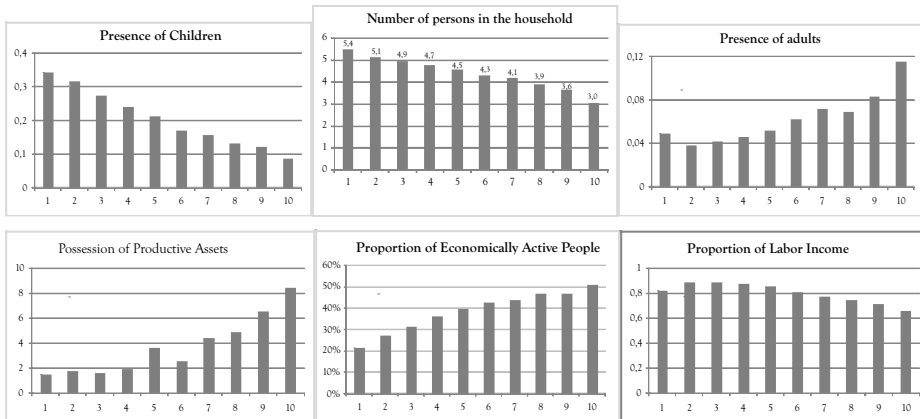
GRAPH 3
Evolution of Income Inequality in Cartagena (Gini Coefficient), 1995 – 2005



Source: DANE, Continuous Household Survey, 2005, and authors' calculations.

GRAPH 4
Socioeconomic Characteristics of Households in Cartagena according to their Income Level, 2005

(deciles)



Source: DANE, Continuous Household Survey, 2005, and authors' calculations.

great differences in the ownership of capital between poor and non-poor households (and between the poorest and the rich) put the former at a disadvantage in situations of risk provoked by external factors (economic, environmental, health, among others).

The income potential of Cartagena's households –measured by the employment rate– is 2.4 times higher in the top income decile than in the poorest. For each child in a high-income household there are three in a poor one, a situation that demands more resources to cover the needs of this dependent population. The possibility of reducing economic dependence –measured by the number of adults in the household– is lower among vulnerable families. In rich families there is an average of 2.5 more adults than in poor families, and the former have six times more productive assets and a lower dependence on labor income, which allows less hours of work (more leisure time and well-being).

To these characteristics one must add the differences between household heads in both types of families. The head of a high-income household has twice as much human capital than that of a poor one, and even when a typical head of a poor household is young, he or she has a higher probability of being unemployed. The heads of poor households usually have to face the processes of depreciation of human capital due to their low probability of finding high-productivity jobs.

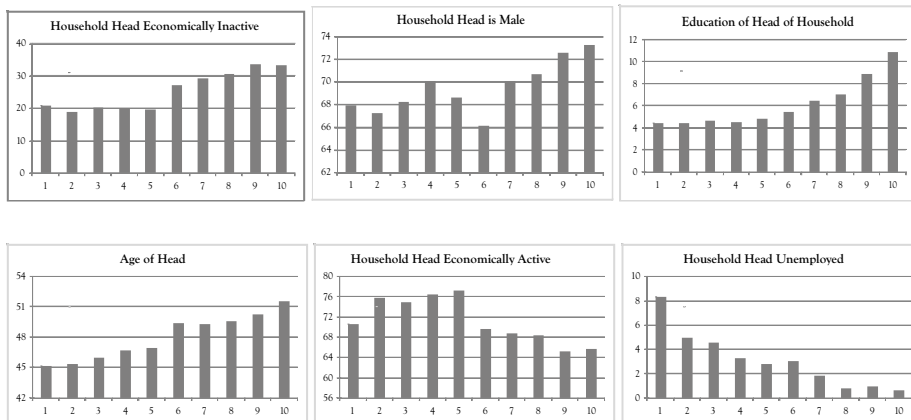
In turn, a more ample review of the data on poverty, by considering the spatial location of people, shows several significant relations: poverty in the *barrios* and *comunas* of Cartagena is correlated mainly with people's level of education, as well as with their racial characteristics and labor condition (particularly job quality). However, there is evidence of a weak linear relation between the former and being a recent migrant (Graphs 5 and 6).

According to Romero (2006), education is the essential factor in effectively reducing labor income differentials among workers. In the case of Cartagena this difference is 10% to 20% compared to Colombian cities with higher incomes. Although in all cases the difference has been falling, the greater reductions were detected in the educational level of workers (5.5%) and in the particular characteristics of each of them (4.4%).

In theory, this lag in human capital endowment can increase the salary gap when poverty is related to the racial characteristics of individuals. However, as Romero (2007) has shown, the virtuous effects of education can be offset by wage discrimination in the labor market when racial characteristics are involved.

GRAPH 5
Socioeconomic Characteristics of Heads of Households in Cartagena according to their Income Level, 2005

(deciles)



Source: DANE, Continuous Household Survey, 2005, and authors' calculations.

III. WHAT EXPLAINS THE RISK OF BEING POOR IN CARTAGENA?

A. Microeconomic Determinants of Poverty

The calculations in this paper show the high incidence of poverty in Cartagena, even if it significantly went down between 2002 and 2005, when employment and, particularly, underemployment increased. In 2008, however, 53% of households and 60.2% of individuals in the city lacked some form of income.

To find the factors that explain poverty among individuals in Cartagena, we use a probabilistic model (probit type). The model is specified as follows:

$$Y = \beta_X X + \beta_H H + E \quad (1)$$

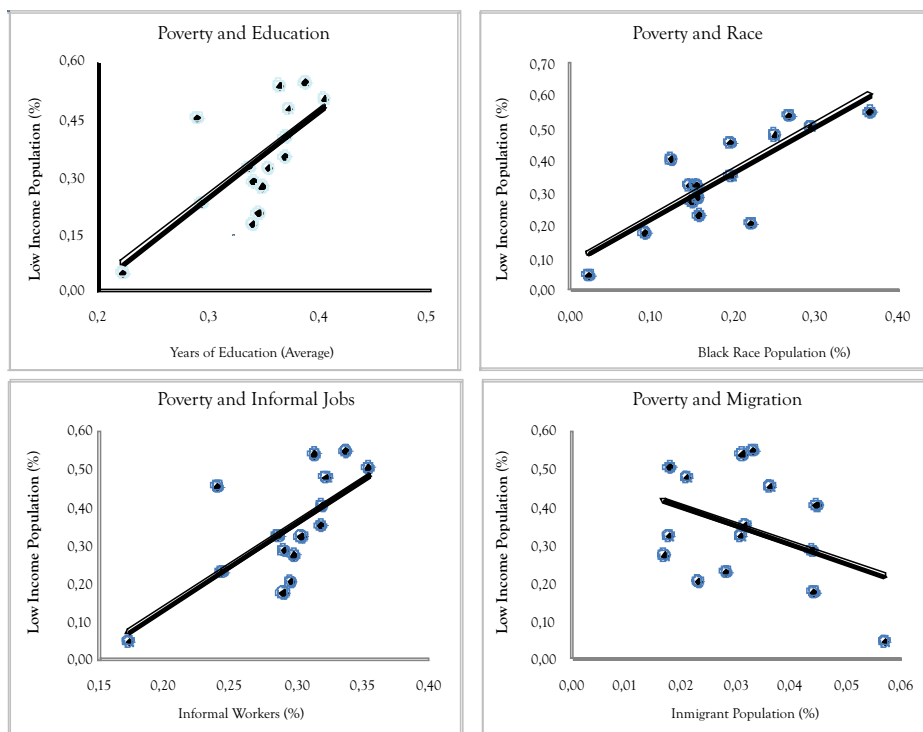
where,

Y is a dichotomic variable that represents a condition or state with a value of one when the individual is poor and zero when he is not. Poor individuals are

GRAPH 6

Relation between Poverty and other Variables in Cartagena, 2006

(comunas)



Sources: Cartagena Planning Office and authors' calculations.

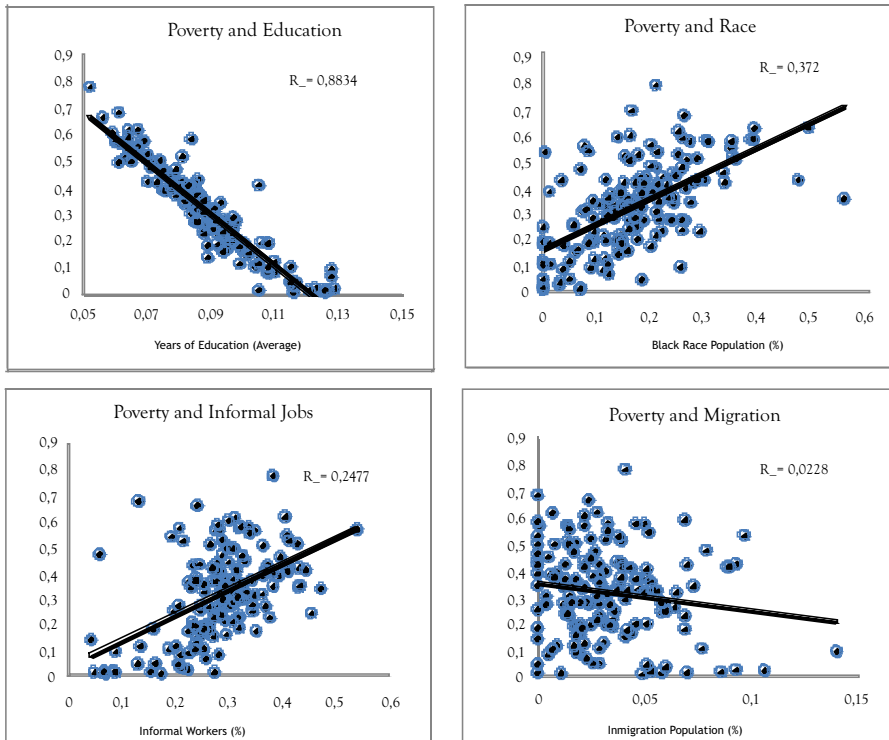
those with incomes below the poverty line (PL), defined as the minimum monthly income that can guarantee access to a socially desirable basket of goods and services,

X is a set of household characteristics, including family size, the percentage of economically active members, labor income, the presence of children and adults, and the ownership of financial and productive assets,

H represents characteristics of the head of the household (age, gender, labor and education attributes), and

GRAPH 7
Relation between Poverty and other Variables in Cartagena, 2006

(barrios)



E is an error term that captures other explanatory variables not considered in the model.

Table 1 shows the results of this exercise. For Cartagena, the proposed independent variables give a satisfactory explanation of the condition of the poor. In fact, the signs of most coefficients adjust to the expected results and, along with the degree of statistical significance, they validate the conclusions derived from the above analysis.

The variables that best explain the condition of being poor relate to employment. The most significant of these is the percentage of household members in the labor force, which explains up to 1.5 times the incidence of poverty in households of Cartagena for the period 2002-2005.

TABLE 1
Determinants of Poverty in Cartagena, 2002-2005

(individuals)

Dependent variable Poor people (Yes=1; No=0)	2002		2003		2004		2005	
	Marginal effect	Signif.	Marginal effect	Signif.	Marginal effect	Signif.	Marginal effect	Signif.
Variables related to the household								
Percentage of Economically Active Members	-119%	***	-144%	***	-149%	***	-129%	***
Household Size	2,5%	***	3,6%	***	3,5%	***	3,8%	***
Presence of Children	16,5%	***	25,6%	***	10,6%	**	32,3%	***
Presence of Adults	-2,9%		-1,8%		-4,9%		6,6%	
Possession of Financial Assets	-35%		16%				-23%	
Possession of Productive Assets	-13%	***	-11%	***	-12%	***	-10%	***
Percentage of Labor Income	54%	***	60%	***	66%	***	72%	***
Variables related to the head of the household								
Head of Household is Male	-6%	***	-9%	***	-11%	***	-18%	***
Education of Head of Household	-6%	***	-7%	***	-8%	***	-3%	***
Age of Head	-1%	***	-1%	***	-1%	***	0%	
Square of the Age of Head	0,01%	**	0,01%	**	0,01%	*	0,00%	
Head Economically Active	34%		44%	**	26%	***	15%	***
Head Unemployed	27%	*	32%	***				
Head Inactive	13%		17%		25%	***	31%	***
Number of observations	7.578		7.708		7.549		7.567	
Pseudo R2	0,385		0,422		0,444		0,315	

***Significant at 99%; **Significant at 95%; *Significant at 90%

Sources: DANE, Continuous Household Survey, and authors' calculations.

The second most important explanatory variable is dependence on labor income. In the period 2002-2005, this dependence explained at least 54% of the probability of being poor in Cartagena households. In other words, for each additional person depending on the income of the same household worker, the risk of becoming poor increased up to 72% during these years.

Other than labor variables, some additional characteristics of the household and of the household head are relevant. As Table 1 shows, the presence of children in the family and the possession of productive assets also explain the incidence of poverty in Cartagena. An additional child increases up to 32% the probability of poverty in any member of the household, while the availability of income-generating assets may decrease it up to 13% for the period under analysis.

This last result is highly suggestive. Studies of poverty usually omit the wealth-generation capacity of the «poor», which is not only represented by their level of human capital – an omission that leads to policies exclusively focused on subsidies. The results of the present study show that, in designing antipoverty strategies in Cartagena, productive assets such as rents on real estate and small businesses are more important in vulnerable households than financial assets like savings or securities, among others.

In this sense, a peculiar fact of Cartagena is the existence of inequalities in the possession of productive assets. Only 2.1% of poor households own at least one productive asset, while the percentage of non-poor households that own productive assets is three times higher. In practice, assets play an important role in the diversification of the household's risk of facing external shocks (such as economic downturns) and are particularly useful to compensate temporary lower income due to the loss of employment, among other consequences of such shocks.

An additional conclusion is that the probability that an individual will be poor increases from 83% to 94% if he or she belongs to a household where the head is a woman. This is characteristic of one-parent households, where the absence of employment and income put the well being of the family at risk. It also shows that the probability of finding work is lower for women with the same characteristics as men.

For some authors, the low income of women is the consequence of labor market insertion patterns. For example, Hersch (1991) argues that household chores have a negative effect on women's income due to the reduction in the amount of labor time available for the labor market, a situation that generates lower salaries. In turn, Becker (1985) says that household responsibilities can directly affect female productivity due to the reduction of physical energy or effort available.

The level of education of the head of the household is another significant factor in explaining poverty. One additional year of education of the head reduces up to 6% the possibility of being poor for any of the household members. The above analysis underlines the positive aspects of increasing the level of school education of the poor, so that they may escape the trap of poverty induced by the lack of human capital accumulated at present by most household heads in the city. In this sense, a policy priority should be the reduction of those inequalities that make poverty in Cartagena a structural problem. For example, household heads in the richest decile of the distribution have more than double the number of school years (10.8) as household heads in the poorest decile.

Finally, though its incidence may be lower than that of the variables described above, household size also helps explain poverty in Cartagena. It represents 2% to 3.7% of the probability of being poor. In other words, an increase of one member of the family raises its risk of falling into poverty because the same resources have to be distributed among more individuals. Poor households are significantly larger than non-poor households, a fact that would explain the impact of this variable. During the period analyzed, family size in the poorest ten percent of Cartagena's households was 1.75 times larger than in the richest ten percent.

B. Poverty in the *barrios*

To expand our analysis of poverty in Cartagena, we estimated a regression for the year 2006, using the data provided by the Beneficiary Identification System (known by its Spanish acronym SISBEN). SISBEN is a system for identifying people who, being classified as poor, are eligible for various government subsidies. The data used for this exercise were compiled by the Cartagena Planning Office and by the Continuous Household Survey carried out by the National Statistical Bureau (DANE by its Spanish acronym). Although this database is less ample than that used in the previous estimation exercise, it may be of use in establishing the degree of explanation of some variables not considered in the analysis of individuals. In our case we will focus on poverty in 164 neighborhoods spread throughout the city.

Some significant variables are informal work, school level, race (for example, if being of African descent is significant), and whether the person is a recent migrant or not. The latter two are very relevant because Cartagena is the Colom-

bian city with the largest population of African descent (Romero, 2007). Also, in 2007, among the main cities of the Colombian Caribbean, it was the third with the largest refugee population displaced by violence in other parts of Colombia (CICR, 2008).

Table 2 shows the estimation of the determinants of poverty in Cartagena's *barrios*. The dependent variable is the percentage of poor individuals, defined as those whose income is below the median (the percentage of people below the poverty line is not useful in this case, since in this database, by its nature, one

TABLE 2
Determinants of Poverty in Cartagena
(neighborhoods)

Variables	Estimative 1	Estimative 2	Estimative 3
Constant	1,10	96,2	9,68
	[0,00]	[0,00]	[0,00]
Migrants (%)	0,49	0,42	0,42
	[0,039]**	[0,07]***	[0,07]**
Education (years of school)	-9,24	-0,77	-7,72
	[0,00]*	[0,00]*	[0,00]*
Informality (% informal workers)	-0,01	0,59	0,64
	[0,887]	[0,04]**	[0,02]**
Race (% Afrocolombian members)	0,11	0,10	
	[0,06]***	[0,07]***	
Education*Informality		-0,07	-0,07
		[0,02]**	[0,01]**
Education*Race			0,01
			[0,07]**
Prob > F	0,000	0,000	0,000
R-squared	0,891	0,895	0,894
Number of Observations	164	164	164

*Significant at 90%; ** Significant at 95%; *** Significant at 99%

Sources: Cartagena Planning Office and authors' calculations.

hundred percent were poor using this criterion). Except for the level of education, which is taken as the average number of years of schooling, the independent variables are expressed as rates of immigrant population, informal workers, and Afro Colombians.

The variables that best explain changes in the incidence of poverty in Cartagena's *barrios* are schooling and the condition of immigrant. The Afro Colombian factor was statistically significant, but the level of confidence in the predictions is lower than in the others.

It must be stressed that the explanatory capacity of education rises when it interacts with other variables such as informality and race. This exercise was carried out to determine which variable has a predominant effect on poverty. As shown in Table 2, when education and informality are considered jointly, the resulting sign is negative, indicating that more human capital can reduce poverty, even if there persists a high incidence of informality in the labor market.

On the other hand, the positive sign for the interaction between education and race and their effects on poverty is a disturbing result: in spite of a greater accumulation of human capital, the incidence of poverty is increasing for Afro Colombians as a whole. This validates Romero's (2007) finding that race can become a determinant of wage discrimination and, therefore, increase the risk that these households will fall into poverty.

Migration will increase poverty, depending on the characteristics of the displacement. The incidence of poverty can be greater if migration is of a speculative type (evidence of which are the higher expectations of better living conditions as part of the search for employment) rather than if it is hired labor (evidence of which is the known salary at the place of destination).

In 2007 there were in Cartagena nearly 45,000 refugees. These are groups that usually fall into multiple poverty traps. Daniels (2006) argues that the predominance of women as heads in these households—45%, or twice the average for Colombia as a whole—increases vulnerability due to their «social and cultural conditions of inequality with respect to men» (Daniels, 2006, p.32).

According to the International Red Cross, in Cartagena there are significant differences between displaced and resident populations in the most critical levels of poverty. About 75% of households that migrate because of violence live below the indigence line, meaning that they suffer from hunger. In the poorest homes of nonrefugees this proportion reaches 62% (CRI, 2008).

Finally, the rate of informality did not satisfactorily explain the variations of poverty in Cartagena, although informality is associated with lower income and

higher labor risk (the correlation coefficient between poverty and informality is 0.7, relatively strong and positive). However, since the model seeks to capture the changes in the levels of poverty in the *barrios* of Cartagena, and given that there is little difference (variance) in the informality data (informality is widely spread in Cartagena), this variable had little explanatory significance.

IV. VULNERABILITY: HOW PERSISTENT IS POVERTY IN CARTAGENA AND WHAT ARE THE RISKS OF THOSE WHO ARE NOT POOR?

People who are poor today are not always the poor of tomorrow. For this reason, the concept of vulnerability in poverty analyses is associated with risk. A person is vulnerable when there is a high probability that in the future he or she will become or will remain poor, so that consumption will be below the poverty line. In other words, it could be that the non-poor may become poor (sensitivity to poverty), or that today's poor may remain so in the future (persistence of poverty).

In this sense, Morduch (1994, p. 221) argues that «...transitory poverty [associated with sensitivity to poverty] is often given by a failure to find protection against stochastic elements in the economic environment...». Stochastic elements usually consist of unexpected shocks –from complex processes, such as economic downturns, to the most simple, such as sudden illness– undergone by households, which result not only in lack of health and nutrition, but also in lowering the probability of maintaining stable levels of consumption («smooth consumption»).

In Colombia, Núñez and Espinosa (2005), following Chaudhuri, Jalan and Surayadi (2002), estimated the extent of vulnerability and identified a group of characteristics that make poverty in a household highly probable. The region where the household is located, the percentage of household members who are children, and the level of schooling attained by the head of the household are all factors that affect average vulnerability. According to Núñez and Espinosa, a significant percentage of the population with a high probability of being poor in the future (35.9% of Colombian homes in 2003) was currently poor. On the other hand, 3.1% of homes were non-poor with a high probability of falling into poverty in the future, so that, in total, 39% were vulnerable. They also estimated that 21% of Colombian households suffer from chronic poverty (persistent) while 14.7% of poor households show a low probability to remain in poverty (transitory poor).

A. Methodology

As stated before, vulnerability can be defined as the ex-ante risk that, at a given time, a non-poor household may fall into poverty in the future, or that a household that is at present poor will remain poor in the future (Núñez and Espinosa, 2005).

This can be expressed as follows:

$$R_{ft} = \Pr(C_{f,t+1} \leq lp) \quad (2)$$

Where,

R_{ft} is the vulnerability (or risk of becoming or remaining poor) of household f at moment t ;

$C_{f,t+1}$ is the level of consumption of household f during the period following t , and

lp is the poverty line, that is, the money value of the minimum monthly basket of goods needed for the subsistence of the household.

To calculate vulnerability we must estimate the expected value of consumption by the members of the household, and to analyze its dynamics in time we must also estimate its degree of volatility. The latter can be done if there are time series for the same household during a fixed period of time. However, since the only available data for Cartagena are those of cross-sectional surveys of households carried out by DANE, we chose to follow Núñez and Espinosa's (2005) approach.

Thus, the expected value of consumption per capita is:

$$\hat{E} [\ln C_f | X_f] = X_f \beta \quad (3)$$

where,

X_f is a set of characteristics of the household members, and

β is a vector of parameters associated to each observable characteristic. In other words, the beta vector contains information on the local economy, the structure of which we consider stable in time.

In turn, the volatility of expected consumption is:

$$\hat{V} = [\ln C_f | X_f] = \sigma_{ef}^2 = X_f \theta \quad (4)$$

where σ_{ef}^2 is the error variance.

Given that the levels of consumption per capita follow a normal distribution, vulnerability – the probability that a household f will be poor in the period $t + 1$ – is estimated as:

$$\hat{v} = \Pr(\ln C_f < \ln C_c | X_f) = \lambda \quad (5)$$

B. Results

Table 3 shows the incidence of vulnerability in Cartagena. As shown in (2) and (5), poverty is the inability of household members to attain a level of consumption above the poverty line, while vulnerability is present when households have a probability higher than 0.5 ($v > 0.5$) of remaining or becoming poor.

Between 2002 and 2005 an average 90.2% of the poor population had a high probability of remaining poor in the future, while 31.8% of the non-poor population had a high risk of falling into poverty. In the aggregate, during these four years 70.9% of the population of Cartagena was vulnerable. Thus, vulnerability has a higher incidence than poverty in Cartagena for the period. This suggests, initially, that government action should focus not only on aiding those who already are poor, but should also include those who are on the razor's edge.

The extent of vulnerability in Cartagena in 2002 is similar to that in the Colombian Caribbean as a whole (73.3% in 2003), although during the four years examined in this paper its incidence in the city fell by 11% (some 55,000 people).

This result can be explained, according to the findings of the last section, by recent changes in Cartagena's labor market. According to DANE, between 2002 and 2005 the employed population increased by nearly 42,000. However, 88% (some 38,000) of these new jobs is explained by the growth of underemployment (largely low quality), especially self employment.

Some authors, like Tenjo (2001), argue that the low employability of the poor may be due to discrimination in the form of differential payments to inputs of

TABLE 3
Incidence of Vulnerability in Cartagena, 2002 - 2005

	Vulnerable plus/ poor Total poors	Vulnerable Not poor / Not poor	Incidence of vulnerability	Number of poor	Total population	Number of vulnerables
2002	91,7%	36,9%	75,8%	616.929	869.471	658.912
2003	90,9%	30,3%	70,8%	596.392	891.662	631.587
2004	91,8%	29,1%	72,5%	637.750	921.517	668.031
2005	86,5%	31,0%	64,4%	568.226	943.553	607.867

Sources: DANE, Continuous Household Survey, and authors' calculations.

poor workers (human capital, for example). These factors not only affect payments, but also work opportunities and especially the number of hours worked. One of the reasons that justify this kind of treatment is the so-called statistical discrimination, which poses difficulties to businessmen when they have to evaluate the labor credentials of members of poor households (Tenjo, 2001, p.3).

Vulnerability, like poverty, is intimately associated with the characteristics of households. In fact, poor and vulnerable homes present similar characteristics, such as a low percentage of employed members, a high percentage of unemployed and low levels of education (Table 4). Actually, labor variables are, according to the estimation carried out in the last section, the most important determinants of poverty in the Cartagena. This similarity suggests possible economies of scope in policies aimed at reducing or eradicating poverty based on production increases and employment generation, which would help reduce the vulnerability of individuals at risk of becoming poor.

In addition to these labor and education variables, poor and vulnerable non-poor households have certain characteristics in common: high number of children under 12 that deter the participation of women in the labor force, and few adults over 64 that may contribute (for example, via retirement pensions or real estate rentals) to a higher household income.

The poor who are vulnerable and the chronically poor (because there is a low probability that they will escape this situation in the short run) typically live in large households with a high number of children and few active working individuals who have a higher risk of losing their jobs. Although the heads of these households are the youngest of the three groups examined—non-vulnerable, vulnerable poor and vulnerable non-poor—they are part of households with few productive assets and a high dependence on labor income.

V. CONCLUSION

A first conclusion of this research is that poverty by income decreased steeply in Cartagena in the period 2002-2005. The boom that ensued after the 1998 recession generated more jobs and a slight decrease in the unemployment rate; by 2005 there were nearly 50,000 less poor than in 2002. However, poverty continues to be particularly high and government action to eradicate it faces in the next few years the challenge of promoting a high and sustained rate of economic growth.

TABLE 4
Characteristics of Vulnerability in Cartagena Households

	Proportion of economically active members	Number of members	Proportion of children < 12 years	Proportion of adults	Dependant on labor income	Education of head of household (in years)	Age of head	Productive assets	Male household head	Unemployed household head
Non vulnerable (NV)	48,8%	4,0	9,9%	9,4%	72,2%	12	51	4,9%	72,8%	0,3%
Vulnerable Not poor (VNP)	31,5%	4,0	21,0%	5,6%	72,9%	8	49	4,4%	63,9%	3,4%
Vulnerable poor (VP)	29,8%	5,0	28,1%	3,5%	88,9%	7	46	1,3%	68,8%	3,9%
NV/VNP	1,55	1,00	0,47	1,68	0,99	1,50	1,04	1,11	1,14	0,09
VNP/VP	1,06	0,80	0,75	1,60	0,82	1,14	1,07	3,38	0,93	0,87

Sources: DANE, Continuous Household Survey, and authors' calculations.

Given the large differences in the capital endowments of poor and non-poor households, the city government should induce changes in the distribution of some assets, particularly human capital.

The variables that best explain poverty in Cartagena are, in order of importance: employment situation, demographic variables (associated with the presence of children and the size of the household) and human capital. Given the significance of labor variables, sustainable productive policies (based on people's generation of micro and small size enterprises) should have a significant impact in the reduction of poverty and vulnerability in the city.

The results of this research also suggest that, in designing strategies for the reduction of poverty in vulnerable households, it is more important to look at productive rather than financial assets.

In Cartagena, vulnerability is more widespread than poverty. There should be government actions to lift people from poverty, but there should also be policies to help people avoid falling into poverty. Vulnerability is strongly associated with the factors that characterize poverty: employment situation, education of the head of household, size of household, and others. For this reason there may be decreasing marginal costs in strategies for the reduction and eradication of poverty through the promotion of small businesses and the generation of employment opportunities which would help reduce the vulnerability of those at risk of becoming poor.

Finally, the chronically poor should also be part of any government strategy. Chronically poor households are characterized by their large size and by a greater number of children, along with a low percentage of employed people. The results of this research indicate that, although the heads of these households are the youngest in the groups examined—a feature which, in theory, raises the probability of finding jobs—their low human capital increases their vulnerability.

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