IS PUERTO RICO CONVERGING TO THE UNITED STATES?

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Resumen

La hipótesis de convergencia sostiene que dos economías que comparten el mismo nivel de ingreso per-capita en estado-estacionario, pero tienen diferentes condiciones iniciales, tenderán a cerrar la brecha de ingreso que las separa. En este artículo, se aplica este concepto al caso de Puerto Rico. Se muestra que Puerto Rico no está convergiendo hacia los Estados Unidos, y por lo tanto Puerto Rico no puede tener el mismo ingreso per-capita en estado estacionario que los Estados de la Unión. Utilizando regresiones de determinantes de crecimiento y controlando por un set estándar de variables económicas, se muestra que el estatus político de la isla es parte de la explicación de este fenómeno.

Abstract

The convergence hypothesis sustains that two economies sharing the same steady-state value of per-capita income, but with different initial conditions, will tend to close the existing gap between them. In this paper I apply this concept to the case of Puerto Rico. I show that Puerto Rico is not converging to the United States, and therefore Puerto Rico cannot be sharing the same steady-state level of income of the States of the Union. After controlling for several economic variables, I show that the political status of Puerto Rico might be part of the explanation for this phenomenon.

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1 Introduction

During the last 50 years Puerto Rico's average annual rate of growth of real GDP per-capita has been 3.7 percent, ranking among the fastest growing economies in the world. Several authors have analyzed the economic achievements attained by Puerto Rico during this period, and drawn lessons for other economies, specially for Latin America and the Caribbean.[1]

The main purpose of this paper is, unlike previous studies, to evaluate the economic performance of Puerto Rico in comparison to the U.S. states. I do so through standard determinants of growth regressions using a panel of per-capita income growth and its determinants, for the U.S. states and Puerto Rico.

The motivation for this exercise is twofold. On the one hand, I want to place the achievements obtained by the Puerto Rican economy during the postwar period in the correct perspective. Puerto Rico is far more linked politically and economically to the U.S. than to any other country including those of Latin America and the Caribbean. The very high degree of political and economic integration between Puerto Rico and the U.S. implies that the steady-state level of per-capita income of Puerto Rico is probably closer to that of the U.S. than to that of the economies of other countries in the region. The neoclassical theory of economic growth predicts that for a given initial position, during its transition towards the steady-state, an economy will grow faster, the higher is the steady-state level of per-capita income towards which it is converging. Considering that the U.S. is the largest and richest economy in the world, it is not surprising that Puerto Rico outperformed during the postwar period other economies with possibly lower steady-state level of per-capita income. The question is then, given the convergence effect, how fast should Puerto Rico have grown?

On the other hand, the political status of Puerto Rico is still the hottest issue in Puerto Rican politics.[2] In particular, a thesis sustained by several American and Puerto Rican politicians is that the Statehood alternative should be postponed until Puerto Rico reaches a level of per- capita income closer to that of the U.S. states.

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[1] See Hausman (1994), and Baumol and Wolf (1994).

[2] On 1993 a plebiscite was held to decide the future of the island. The Commonwealth status received 48.6 percent of the votes, Statehood 46.2 percent, and independence 4.2 percent. (with a 1 percent blank vote)

This thesis is postulated in the understanding that such political transition would be easier once Puerto Rico has approached the level of economic development attained by the U.S.. From an economic point of view, such an assertion only makes sense if Puerto Rico is in fact converging to the steady-state per-capita income of the U.S.. If instead, Puerto Rico is converging to a lower level of per-capita income, nothing guarantees that the Puerto Rican economy will further reduce the distance to its giant neighbor.

The main result obtained in this study is that Puerto Rico is not converging towards the steady-state level of per-capita income of the U.S.. Estimations through different techniques of the Puerto Rican "individual effect", show that even after controlling for a set of standard determinants of growth variables, Puerto Rico remains well below the convergence frontier traced by the U.S. states. The "close but not together" relationship between Puerto Rico and the U.S. might explain why is that the Puerto Rican economy is richer than any country in the Caribbean Basin and Central America, with which it shares many characteristics, while it has less than 50 percent of Mississippi's per-capita income, the poorest state in the United States.

The consequences of this result are clear. First, in spite of the good economic performance showed, the Puerto Rican economy has been growing at a lower rate than that predicted for a continental state with the same initial level of per-capita income of Puerto Rico. This absence of absolute convergence of Puerto Rico implies that the Puerto Rican economy is not closing the income gap that separates it from the U.S.. Second, the large negative individual effect found for Puerto Rico remains significant after controlling for standard economic variables. Unobservable individual effects are usually attributed to differences in technology in a broad sense that includes differences in institutions and other factors. A reasonable candidate to explain such a difference in the case of Puerto Rico is the political status. Puerto Rico is the only no-state of the sample, and there is little doubt that the non-resolved political question is a clear source of uncertainty. Nevertheless, the effect of a change in the political status of the island on growth is not obvious. Statehood also means federal minimum wage and the end of tax incentives. In this paper, however, I provide some evidence of the beneficial effects of Statehood. A regression analysis of this century economic growth across U.S. states, reveals that territories have grown slower, all the rest equal, than states.

In any case, it is clear that any policy that allows Puerto Rico to increase its

long-run equilibrium income towards that of the United States will provide Puerto Rico with additional economic growth during the transition to a higher steady state. By reducing the political uncertainty and building a more permanent economic relationship with the United States, the transition from commonwealth status to statehood might be the way for Puerto Rico to achieve a superior path of economic growth.

Section 2 of this chapter provides a brief description of the Puerto Rican economy. Section 3 discusses the convergence hypothesis and provides a brief summary of the empirical evidence arising from panel regression analysis. Section 4 presents the empirical evidence, main contribution of this paper. Section 5 concludes.

2 The Puerto Rican Economy During the Post-War

After World War II, Puerto Rico implemented policies in order to move from an agricultural economy to an industrial one. A first stage of economic reforms, from the early 1940's to 1949, focused mainly in a program of land reform, development of infrastructure, and reorganization of institutions. A second stage of economic reforms comprised under the name "Operation Bootstrap" were set in place from 1945 to 1953. This second phase was oriented to increase industrial production by attracting private capital specially from American investors, through privatization of government owned enterprises and tax incentives.[3]

No major economic reforms were undertaken after 1953. From then on, the Puerto Rican government adapted its policies, specially those regarding tax incentives, in a way to satisfy American investors needs and to keep them coming to the island. In the following 35 years subsidiaries of American corporations established in Puerto Rico increasing the contribution of manufacturing to GNP from 15 percent in 1950 to more than 50 percent in 1990.

In 1952, the Commonwealth of Puerto Rico was established. This gave political status to the increasingly significant question of economic integration with the United States. The political status of the country and its relationship with the United States is still the hottest issue in Puerto Rican politics.

The purpose of this section is to provide a simple description of the economic

[3]See Dietz (1986) for a detailed description of these policies.

performance of Puerto Rico during the postwar period. I will show that the performance of the Puerto Rican economy was outstanding in terms of growth and other economic indicators at least until the early 1970's. It was during that period that Puerto Rico was able to reduce the output gap with the U.S. and become an industrialized economy, with economic and social indicators comparable to more developed economies. After the oil shock in 1973 the Puerto Rican economy seems to have entered into a slowdown period from which it has not been able to get out.

Figure 1 shows Puerto Rican real GDP per capita from 1955 to 1994. Puerto Rico has managed to increase its per-capita GDP at an average rate of 3.7 percent per year between 1955 and 1994. This growth has not been steady. Until 1972, per-capita GDP grew at an average annual rate of 5.9 percent, out-performing most of the other middle-income economies in the world. However, after 1972, the Puerto Rican economy grew at a discrete 2.1 percent per year in per-capita terms, with a low 0.4 percent between 1973 and 1983.

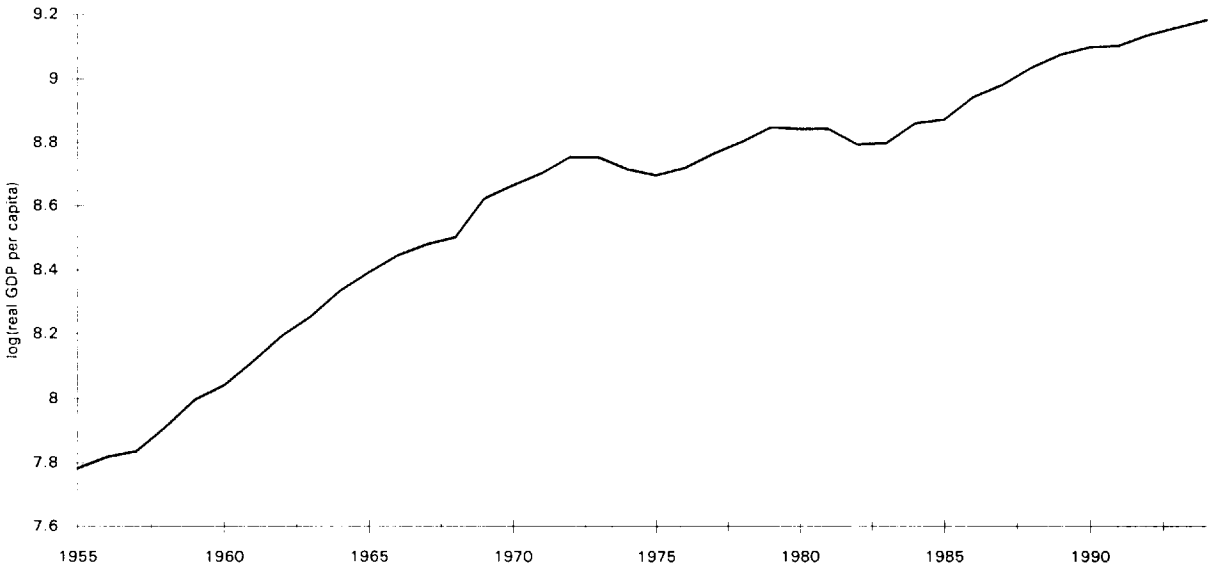

Figure 1: Puerto Rico: Real GDP per capita
(International prices of 1985)

"Operation Bootstrap" was designed in order to increase industrial production by attracting capital from external investors. It was believed that after a first stage of intensive use of external sources, domestic capital would follow up completing the

transition towards an industrial economy. The policies implemented were successful, at least, in increasing total investment. Figure 2 shows total investment as a share of GDP from 1955 to 1994. The average rate of investment was 29.2 percent between 1955 and 1972. It dropped to 17.0 percent between 1973 and 1983, and further down to 14.3 from 1984 to 1994. The external sources of funds, mainly from mainland, represented 40.7 percent of total sources in 1955, reaching almost 80 percent by 1980. The internal sources of investment have been mainly depreciation reserves and government savings, with negative private savings.

Figure 2: Puerto Rico: Investment Share of GDP

Such an important participation of external sources in capital formation implies a drain of income from the Puerto Rican economy to the mainland in the form of repatriated returns. This effect must generate an important difference between GDP and GNP. Figure 3 shows Gross National Product as a percentage of GDP from 1955 to 1994. The figure shows that the share of output belonging to Puerto Ricans has steadily decreased from more than 100 percent in the early 1950's to less than 70 percent in 1994.

The income effectively received by the Puerto Ricans would have been even smaller, had Puerto Rico not received a large amount of transfers from the Federal Government. Figure 4 shows the amount of net federal transfers, both to individuals

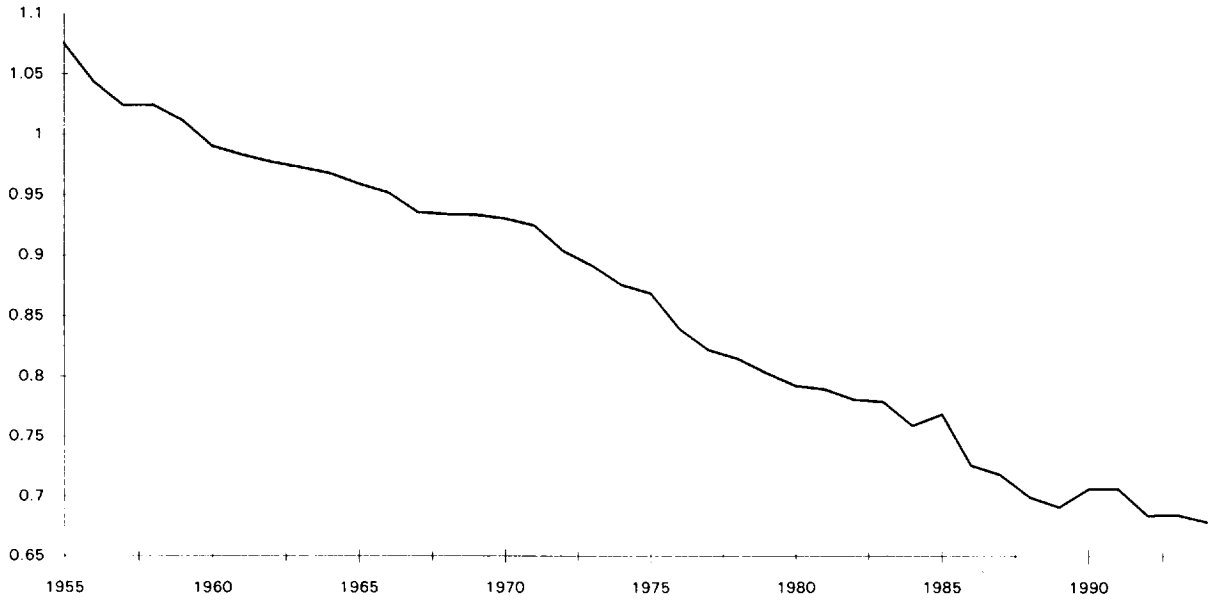

Figure 3: Puerto Rico: Gross National Product
(percentage of GDP)

and to the Puerto Rican government, in per-capita dollars of 1985 and as a percentage of per-capita GNP. The figure shows that these transfers have amounted, in average, to almost 22 percent of per-capita GNP since 1974. It is important to notice that even though Puerto Rico receives less federal transfers in per-capita terms than any State, they represent a larger share of per-capita income because of the much lower per-capita income level of the island. This huge amount of transfers has been often blamed for the lack of private savings generated by Puerto Ricans.[4] It has been argued that federal transfers have financed consumption, specially since from 1974 direct benefits to individuals, mainly in the form of social security and food stamps, account for more than 70 percent of total federal aid. In fact, by the late 1980's consumption was already over 95 percent of GNP, and by 1990 disposable personal income exceeded GNP.

Another notable characteristic of Puerto Rico is the totally external orientation of its economy. Figure 5 shows a standard indicator of the degree of openness of the Puerto Rican economy. The figure shows that by the late 1980's, exports plus imports amounted to almost 140 percent of GDP. It is also worthy noting that this trade is

[4]See Curet (1986), and Dietz (1986).

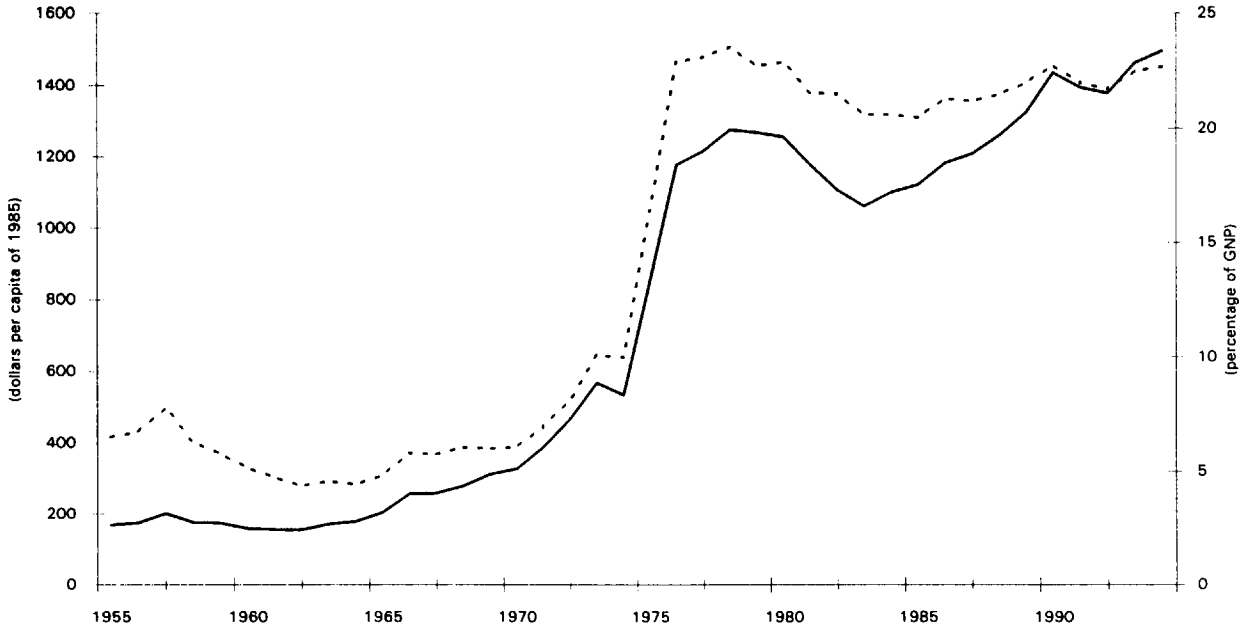

Figure 4: Puerto Rico: Federal Government Net Transfers

largely concentrated with the U.S.. More than 90 percent of exports are sent to the mainland and almost 70 percent of imports come from the U.S.. This concentration of international trade reflects what it has been argued is one of the main problems of the Puerto Rican way to development. Namely, that American firms attracted through tax incentives to the island have constituted themselves in export enclaves, with almost no forward or backward linkages with the Puerto Rican economy.[5] These firms would import raw materials put them together and export final products directly to the mainland building almost no interactions with the local economy.

In addition to the tax incentives offered by "Operation Bootstrap", low wages were a significant incentive for American corporations with operations in the island. Taylor (1957) calculated that wages 25 percent higher than those prevailing by 1953 would have been enough to offset the tax advantages and discourage most of the American firms moving to the island. Puerto Rican average wages were only 30 percent of American's by 1955, almost 60 percent in the mid 1980's, and they are 75 percent today. Partially responsible for this increase in relative wages in the island has been the minimum wage legislation. In 1977 the Federal minimum wage started

[5]See Madera (1982), and Dietz (1986).

Figure 5: Puerto Rico: Oppenness (Exports plus Imports)
(share of GDP)

to be applied in Puerto Rico, with several exceptions for determined industries. By 1981 almost all Puerto Rican economy was subject to the federal minimum wage.

Despite this disproportionate minimum wage there is no evidence that this legislation has had any effect on unemployment. Unemployment rates have always been high in Puerto Rico ranging from a low 10.3 percent in 1970 to a high 23.4 in 1983. The average unemployment rate for the postwar period has been 16 percent. This unemployment rate is particularly high if one considers that the participation rate in Puerto Rico has been less than 45 percent since 1980, that unemployed Puerto Ricans have the choice to move to the mainland, and that the government of Puerto Rico has been employing more than 20 percent of total employment since 1980.

In spite of all the problems that the Puerto Rican way to development might have had, one thing has been surely accomplished. Puerto Rico has been able to move closer, in terms of per-capita output, to richer and more developed economies. In particular, the Puerto Rican economy has narrowed at some extent the income gap with the U.S.. This catch-up effect has often been described as a consequence of the beneficial effects achieved by the cooperation between a developed and an underdeveloped economy.

Baumol and Wolf (1994) first elaborated on the catch-up effect experienced by Puerto Rico during the post-war era. They show that labor productivity in Puerto Rico grew from less than 25 percent of the U.S. level in 1950 to 75 percent in 1990. A similar pattern is observed for per-capita GDP, although it is less pronounced. They also pointed out that several social and economic indicators for Puerto Rico demonstrate that the Puerto Rican economy has experienced development in many areas that is comparable to that of richer economies. They conclude that Puerto Rico's postwar history demonstrates how much can be accomplished when a rich, developed economy cooperates and interacts with one that is initially far less developed. Using a growth accounting analysis, they found that the existence of an educated labor force was the primary reason for Puerto Rico's rapid economic growth during the postwar period, explaining over a third of the increase in per-capita GDP. The catch-up effect explains between 16 and 38 percent of the growth, Puerto Rico's investment rate another 16-21 percent, and its trade openness and scientific manpower accounts for much of the remainder.

An interpretation of their findings in terms of neoclassical growth theory could be that by substantially increasing the ability of Puerto Rico to accumulate physical and human capital, the development strategy initiated after the War, might have moved the economy's long-run expected income towards that of the United States, initiating a process of convergence that provides significant explanations for the high rate of growth that the Puerto Rican economy experienced for a relatively long period of time. In the following sections of this paper I will investigate the extent and duration of this process of convergence.

3 A Quick Look at the Convergence Hypothesis

This section offers a quick review of the main implications of the neoclassical theory of growth in terms of convergence, and summarizes the empirical literature in this subject.

A large number of growth models developed following the pioneering work of Solow (1956) and Swan (1956) are built on a neoclassical production function exhibiting diminishing returns to capital. As a consequence of the diminishing returns to capital, each economy approaches a unique long-run equilibrium or steady state. During the transition towards this steady state, other things being equal, the rate

of return in the economy and hence the rate of capital accumulation is inversely related to the initial per-capita stock of capital.[6] Because of the diminishing returns to capital, the rate of per-capita accumulation of capital decreases as the stock of capital increases approaching the steady-state value. As a consequence, the further away an economy is from its own steady state in terms of per-capita income, the higher is the rate of growth predicted by the theory for this economy. This prediction is the basis of the concept of convergence.

In the simplest neoclassical growth model, the steady-state level of per-capita income is determined by the technology available, the rate of population growth, the depreciation rate and the savings rate. Therefore, only if a group of countries share the same technology, preferences and other relevant parameters, will their economies be expected to have the same long-run level of per-capita income or steady-state. In general, the level of technology can be affected by government policies and regulations that distort the markets and by the degree of integration with other economies with superior technology. The savings rate can be considered to be exogenous, or can be endogenously determined by the underlying preference parameters.[7] After completing its transitional dynamics, an economy reaches its long-run level of per-capita income when the different per-capita variables start growing at the same constant rate of growth given by the rate of exogenous technological progress. At that point, the economy is said to be in its steady state, and its level of per-capita income is known to be the steady state level.[8]

Consider a group of economics that because of cultural, political or physical proximity share the same steady-state value of per-capita income. The neoclassical model of growth predicts that the countries with lower initial levels of per-capita income will have higher rates of per-capita income growth. This is known as the absolute convergence hypothesis. Poorer economies will tend to converge or catch up to richer ones, in per-capita terms, if their economies differ only because of initial

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[6]See Sala-i-Martin (1994) for a discussion. For a more formal analysis of the concepts covered in this section, see Barro and Sala-i-Martin (1994).

[7]The first case corresponds to the Solow-Swan model, while the second and more general is the Ramsey-Cass-Koopmans model.

[8]In the simplest case, if the rate of exogenous technological progress is zero, the steady-state rate of growth of per-capita income is zero. In a more general case, the per-capita income keeps growing at the exogenous rate, and the rate of growth of per-effective worker income is zero.

conditions.

However, even the simplest of the neoclassical growth models, the Solow-Swan model, requires a restatement of this implication if all economies do not share the same steady state. In particular, if different countries have different saving rates, population growth rates, or different technologies, the theory only predicts that the rate of growth of per-capita income of a specific economy will be negatively related to the distance from its own steady-state.[9] Different economies will close the gap between their actual state, measured as the level of GDP per capita, and their long-run steady-state at a rate that is proportional to the size of this gap. Notwithstanding, after controlling for differences in steady-states, it can be shown that economies with low initial levels of per-capita income will grow at a higher rate in per capita terms, than those with high initial levels. This concept is called conditional convergence after the revisions of the convergence hypothesis by Barro and Sala-i-Martin (1992), and Mankiw, Romer and Weil (1992).

The speed of convergence is an important parameter to be assessed, not only as a theoretical curiosity, but also because of its economic implications. A low speed of convergence implies that countries spend much of the time far away from their steady-states. A speed of convergence of 2.5 percent suggests that the average time that an economy spends to cover half of the distance to its steady-state is around 30 years. Therefore, medium-term growth rates will be dominated by the transitional dynamics, being only marginally affected by changes in the steady-state positions. In contrast, high speeds of convergence imply that economies spend much of the time in the vicinity of their steady-state. Therefore, short-run rates of growth are strongly affected by shocks to steady-states and by the long-term steady-state growth rate.

There have been many attempts to estimate the speed at which economies approach their steady-states in the empirical growth literature. Since Romer (1986) there is consensus on the absence of evidence in favor of the absolute convergence hypothesis at a global level. Regressions using large samples of countries show that rates of growth of per-capita income are usually positively correlated, with initial levels. There have been two approaches used to deal with the differences among steady-states across countries. The first one involves restricting the sample of economies to a group that, presumably, is homogeneous enough to share a common steady-state.

[9]In models with endogenous determination of saving rates, different economies may differ in their preference parameters and discount rates.

In this case, we are measuring local absolute convergence. The second approach has been to deal with a cross section of heterogeneous countries, and control the estimation of the speed of convergence using a set of variables that proxy for the difference in the steady-state positions across countries. This is called the global conditional convergence.

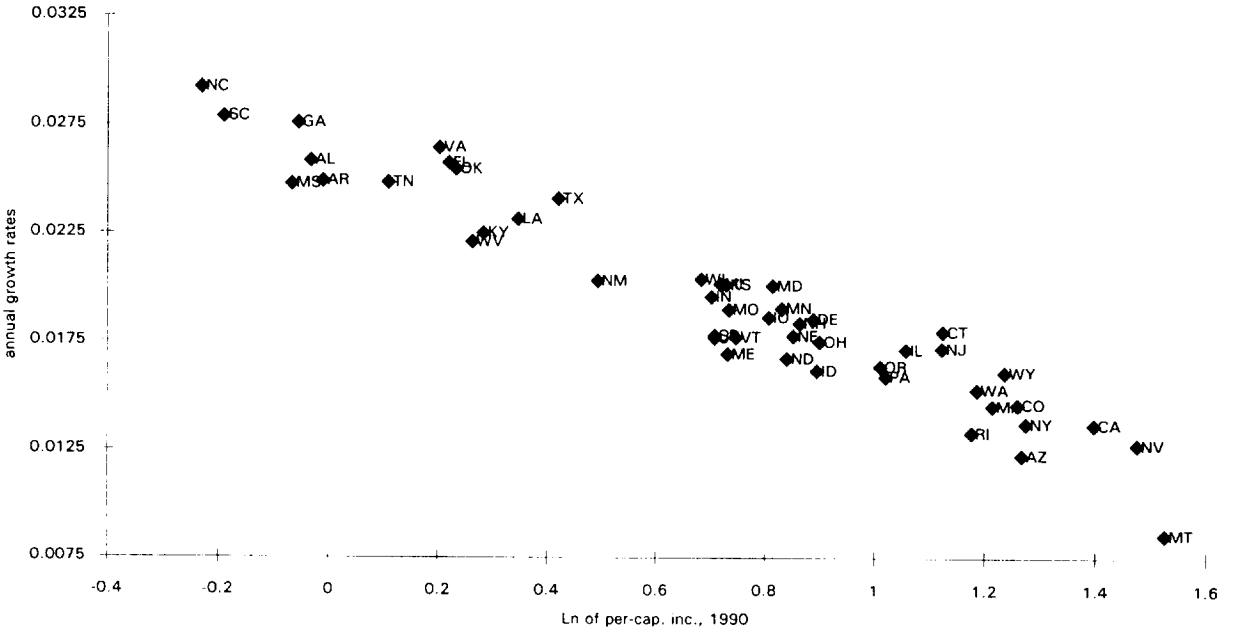


Figure 6: Convergence Across the United States
(per-capita income growth: 1900-1980)

Following the local absolute convergence approach, Barro and Sala-i-Martin (1992), in their analysis for the contiguous 48 U.S. states, found a speed of convergence of around 2 percent per year. Figure 6 reproduces well-known graphical evidence from that paper of the convergence experienced by the continental U.S. states during this century. The figure shows that the poorest states at the beginning of the century, the Carolinas, Mississippi, Georgia and Alabama, have been growing on average twice as fast as richer states. Consequently, the dispersion of per-capita incomes across states has been dramatically reduced pair wise and absolutely. For example, while South Carolina, the poorest state, had 22.4 percent of the per-capita income of New York in 1929, by 1990 this ratio had become 71.8 percent. Mississippi was the poorest state in 1940. It had 22 percent of the per-capita income of Delaware, the richest state of America then. By 1990, Mississippi, still the poorest state, already had 50 percent of

the income of the richest state, now Connecticut. In 50 years, Mississippi has been able to reduce by half the distance that separates it from the richest states. Given the degree of cultural and economic integration among the different U.S. states, the convergence effect must be the main reason that Mississippi grew at a rate twice as high, on average, as that of the much richer Northeastern states during the last 50 years. Figure 6 is also useful illustration of the so-called convergence frontier. The imaginary line connecting North Carolina in the upper left of the figure and California in the lower right corner gives an approximate idea of the position that economies sharing the same convergence rate and steady-state level must have. Therefore, the fact that most states are aligned over this frontier gives an idea of the high degree of homogeneity displayed by the continental U.S. states.

Under the global conditional convergence approach, differences in steady-states across countries are controlled including, among others, the investment ratio to GDP, measures of distortions like government consumption and black market premium, measures of political instability, and measures of the quality and quantity of human capital. In a series of regressions using cross-sectional and pooled-panel approaches, the estimates obtained for the speed of convergence have fluctuated between 2.5 and 3 percent per year.[10] A rate of convergence that fluctuates between 5 and 9 percent has been found in studies that apply econometric techniques that correct for unobservable differences across countries (i.e. individual effects) arising from differences in the technology available.[11] The main finding of the cross-country empirical growth literature seems to be that there exists a global conditional speed of convergence ranging from the 2 or 3 percent per-year of the Barro estimates to the almost 10 percent recently obtained using dynamic panel techniques. The literature also suggests the existence of local absolute convergence of approximately the same magnitude in several regions.

The implication of these findings is that the speed of convergence has an

[10]See Barro and Sala-i-Martin (1992), and Mankiw, Romer and Weil (1992) for cross-sectional studies, and Barro and Sala-i-Martin (1994), and Barro and Lee (1994a) for pooled-panel data approach.

[11]Using the II-matrix approach Knight et al (1994) and Islam (1994) reported 5 percent for this parameter. In a recent study Caselli, Esquivel and Lefort (1994) apply a general method of moments estimator that takes care of individual effects and predetermined explanatory variables, obtaining a convergence rate of 9 percent. Evans (1994) also obtains 9 percent using a slightly different method.

important impact on the medium-term process of economic growth. Countries or states relatively homogeneous in their determinants of the steady-state, but differing in their initial conditions, converge towards each other thereby reducing their initial differences in per-capita income. The higher the speed of convergence, the faster this process will be. In a recent paper, Sachs and Warner (1995) point out that a sufficient condition for higher than average growth of poorer countries is that poorer economies follow reasonably efficient economic policies. They find strong evidence of convergence among those countries following open trade policies and with clear property rights.

In addition, for a given speed of convergence, increases in the steady state level of per-capita income at which an economy is converging will raise the per-capita income growth rate during the transition since this economy will have to cover a longer distance in the same time. For that reason, an economy that is able to increase its long-run steady-state per-capita income by improving the technology available, increasing the confidence of the public in its institutions, reducing market distortions, augmenting the quality of its labor force or opening its economy to a more developed region, will enjoy an increase in its average rate of growth due to the convergence effect.

4 Evaluating the Performance of Puerto Rico

In this section, I look at the data to evaluate the performance of the Puerto Rican economy when compared to the U.S. states, and to a sample of Latin American and Caribbean countries. In particular, I am interested in determining whether Puerto Rico is effectively closing the income gap with the U.S..

First I will provide some casual evidence in terms of relative measures of output between Puerto Rico, the U.S. and some Latin American and Caribbean nations. Secondly, I will present some more rigorous evidence in the form of growth regressions. Extending the work of Barro and Sala-i-Martin (1992), I will perform panel data regressions with a sample consisting of the 48 mainland U.S. states plus Puerto Rico and Hawaii for the period 1940 to 1990. The empirical evidence provided by these regressions shows that during this period, Puerto Rico clearly performed below the predicted growth rate implied by its initial level of per-capita income, even after controlling for with a standard set of control variables. Puerto Rico is the

only economy in the sample showing such a serious under performance. Interpreting these results in light of the neoclassical theory of growth, it is possible to argue that even though Puerto Rico narrowed in part the income gap with the U.S., it is not converging towards the per-capita income of the States. I will show some evidence that the political status of the island could be one of the reasons for this under performance. Finally, I will explain the economic growth displayed by the Puerto Rican economy in comparison to Latin American and Caribbean economies using a panel of countries.

4.1 Casual Evidence

A first exercise in order to evaluate the performance of Puerto Rico relative to other economies is to make pairwise comparisons of measures of output per-capita of different economies. I use GDP and GNP per capita measured at current international prices for Puerto Rico, the U.S.A. and a set of Latin American and Caribbean economies, obtained from the Penn World Tables version 5.6..

Figure 7 shows Puerto Rican current per-capita GDP and GNP as a percentage of the same measures for the U.S.. The figure clearly indicates that the Puerto Rican economy grew faster relatively to the American economy until 1972. Between 1955 and 1972, Puerto Rican per-capita GDP moved from 22 percent to 45 percent of American per-capita GDP. Per-capita GNP follows a similar pattern although less pronounced, increasing from 19 percent to 30 percent. The figure also shows that after 1973, the catch-up force has been practically inexistent when comparing GDP's, and it has been clearly reversed in terms of per-capita GNP. There is no clear signal that Puerto Rico is going to further reduce the output gap.

Is this the normal behavior of other economies in Latin America and the Caribbean basin? Figures 8 plot relative measures of current output per-capita for some Latin American and Caribbean countries relative to the U.S. and Puerto Rico. A quick look at figures 8, shows that most economies in the region have under performed both Puerto Rico and the U.S.. The exceptions are Dominican Republic and Chile from 1974 on. The case of Dominican Republic is especially interesting. In 1955, per-capita GDP in Dominican Republic was almost 50 percent of Puerto Rico's. From then on this ratio steadily decreased reaching less than 30 percent in 1973, as Dominicans became poorer relative to Puerto Ricans. However, from 1973 on a different picture emerges. Per- capita GDP has been growing slightly faster, in

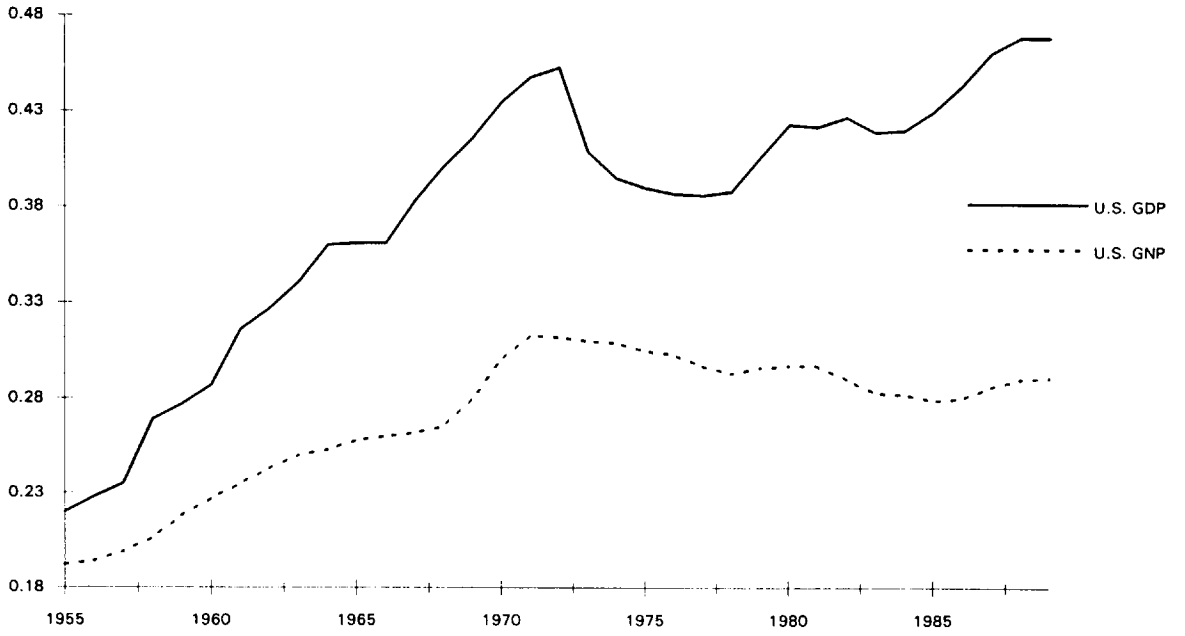


Figure 7: Relative Performance of Puerto Rico

average, in Dominican Republic. Dominican Republic per-capita GNP was around 27 percent of Puerto Rico's in 1970 reaching 40 percent in 1990. The Dominican Republic has been clearly outperforming Puerto Rico since 1973. Interestingly enough, all along the postwar period, the Dominican Republic has been slowly increasing its per- capita GDP relative to the U.S..

When compared to other Latin American and Caribbean economies, the performance of the Puerto Rican economy is good in general. All the economies in the sample became poorer compared to Puerto Rico between 1955 and 1973. All of them show a quick recovery relative to Puerto Rico after the oil shock, indicating that the Puerto Rican economy was hit particularly hard by the oil shock. After the oil shock Puerto Rico reassumes the over performance relative to most economies in the sample although less aggressively.

In summary, Puerto Rico showed an outstanding catch-up effect in the early post-war compared to the U.S., over performing all other Caribbean and Latin American economies. However, since 1973 its rate of growth or per-capita output has decreased relative to other economies in the region, and there is no clear indication that it is being able of closing the income gap with the U.S. at the same speed it used to.

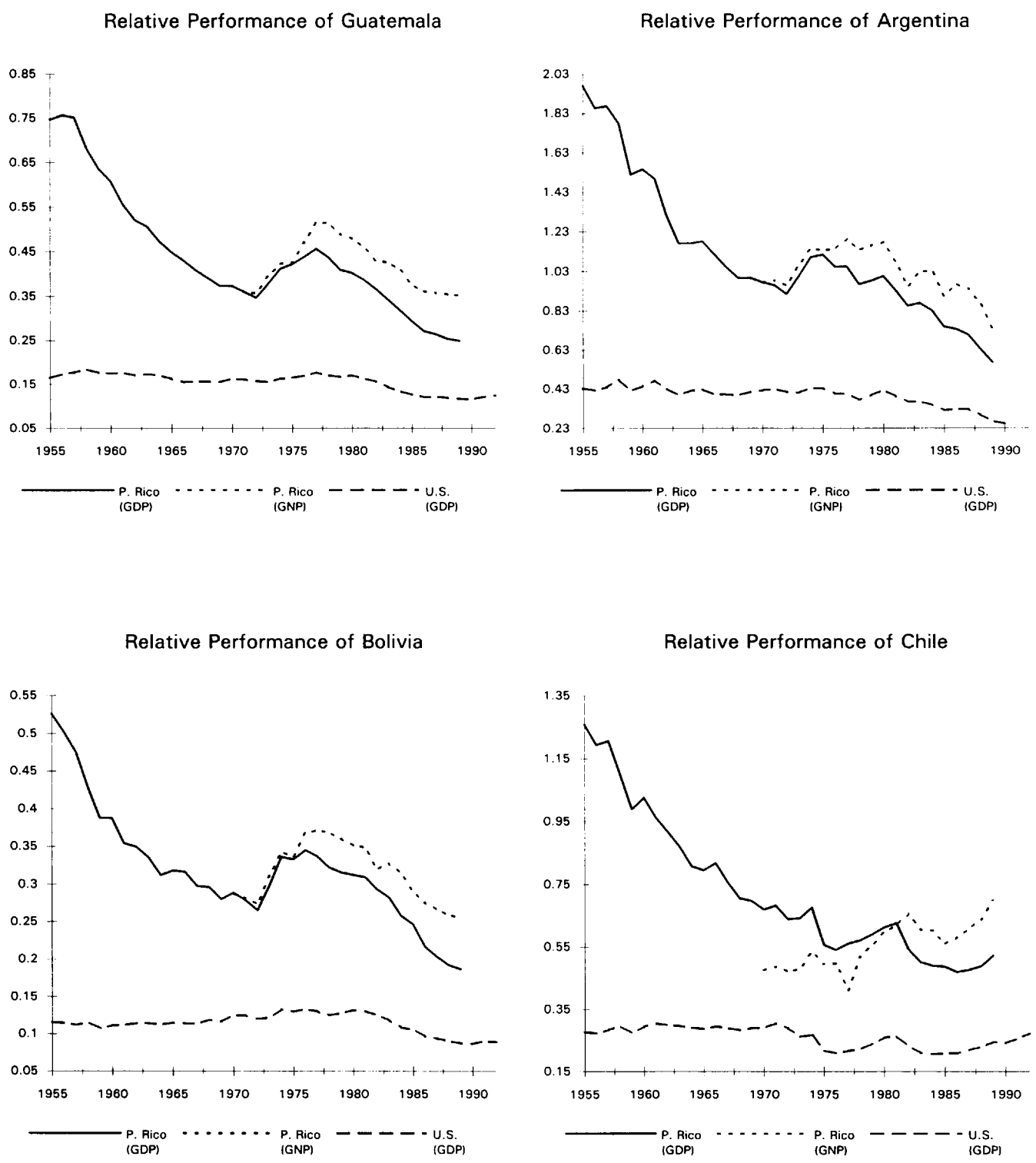
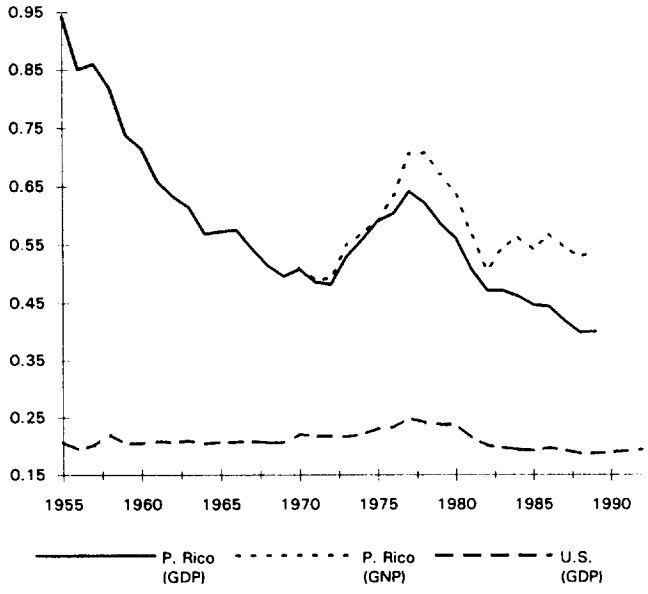
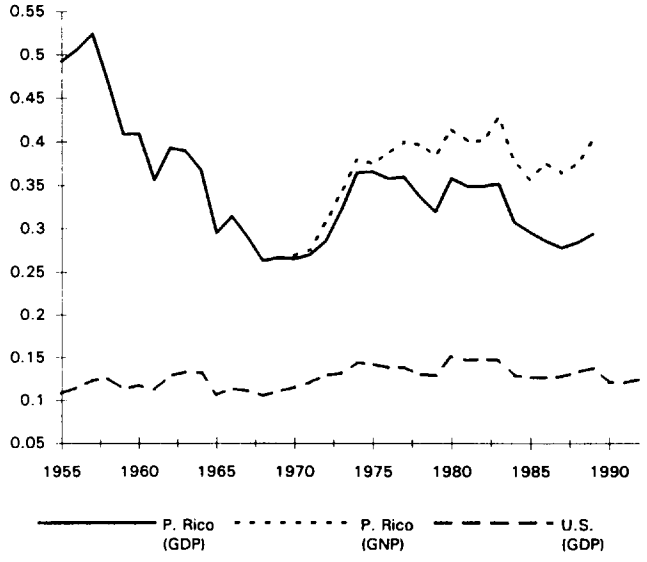


Figure 8: Relative Performance of Latinamerican Economies

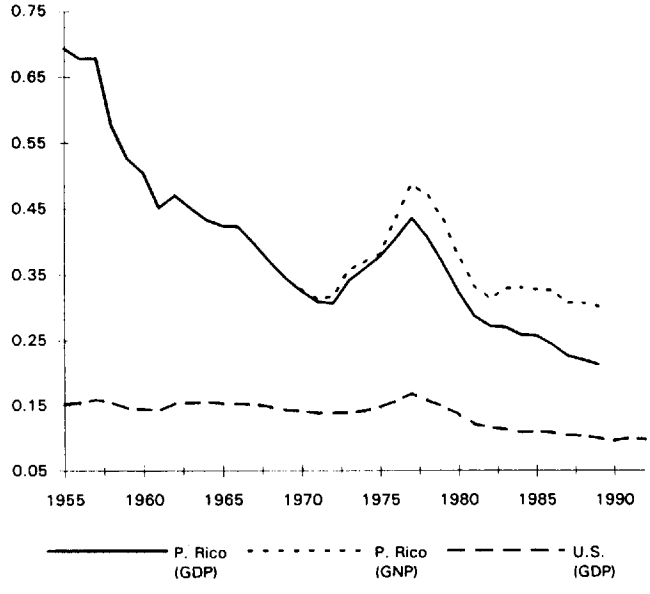
Relative Performance of Costa Rica



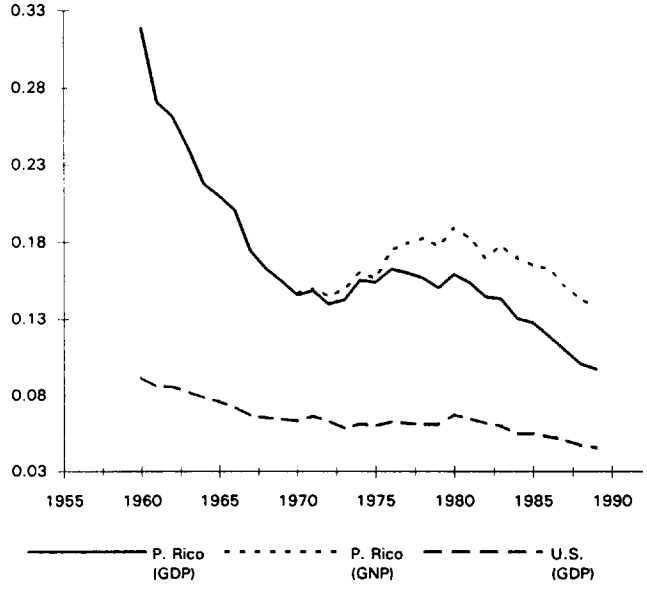
Relative Performance of Dominican Republic



Relative Performance of El Salvador



Relative Performance of Haiti



Relative Performance of Latinamerican Economies (cont.)

4.2 Panel Data Evidence

4.2.1 Estimation Procedure

It has been shown elsewhere[12] that the standard Solow-Swan and Ramsey-Cass-Koopmans models imply that the average growth rate between $t-\tau$ and t is given by

$$\frac{\ln y_{it} - \ln y_{it-\tau}}{\tau} = \beta_0 - \beta \ln y_{it-\tau} + X_{it-\tau}\delta + \eta_i + \zeta_{t-\tau} + \epsilon_{it} \qquad (1)$$

where

$$\beta = \frac{1 - e^{-\lambda\tau}}{\tau}$$

λ is the annual rate of convergence, $y_{it-\tau}$ is the per-capita income of economy i at time $t-\tau$, $X_{it-\tau}$ is a set of explanatory variables controlling for differences in steady-states, η_i is an unobservable individual effect, ζ_t is a time-specific effect, and ϵ_{it} is an error term.

A significantly negative coefficient on lagged per-capita income is consistent with the convergence prediction of the neoclassical model ofgrowth. Ceteris paribus, the further away an economy is to its steady-state, the higher will be its rate of growth of per-capita income.

4.2.2 Puerto Rico and the U.S.

The purpose of this section is to assess the central question of the paper. Namely, whether Puerto Rico is converging to the U.S. States. If Puerto Rico behaved as an American state, its per-capita income would have been converging during the last fifty years towards that of richer states. In that case the Puerto Rican economy would lay on the convergence frontier traced by the American states as shown in figure 6, displaying absolute convergence to the U.S.. In the first part of this section I study this possibility.

Absolute Convergence

I use two different procedures for testing whether Puerto Rico belongs to the American convergence frontier. The simplest one is to assume that the 49 American states share the same technology and institutions and therefore there are no major unobservable

[12]See Barro and Sala-i-Martin (1992) and (1994).

differences or individual effects among them. In this case, I can just estimate a simplified version of equation (1) through pooled ordinary least squares including a dummy variable for Puerto Rico. The equation would not include the term η_i and therefore,

$$\frac{\ln y_{it} - \ln y_{it-\tau}}{\tau} = \beta_0 - \beta \ln y_{it-\tau} + \gamma s_{it-\tau} + \alpha DUM_i + \zeta_{t-\tau} + \epsilon_{it} \qquad (2)$$

Following Barro and Sala-i-Martin (1992) I included in equation (2) as an additional explanatory variable, the variable s_{it_0} that proxies for common effects related to the sectoral composition of per-capita income for each state. The inclusion of this variable accounts for sectoral shocks that affect the performance of states with similar income composition in the same direction. As long as the initial level of per-capita income is related to the income composition, the removal of s_{it_0} would seriously bias the estimation of the convergence rate. The variable s_{it_0} is given by

$$s_{it-\tau} = \sum_{j=1}^{9} w_{ijt-\tau}[\ln y_{jt} - \ln y_{jt-\tau}]$$

where $w_{ijt-\tau}$ is the participation of sector j in state i's personal income, and y_{jt_0} is the amount of per-capita income originated in sector j at a national level.

A significantly negative α would indicate that Puerto Rico has not been growing at the rate implied by its initial level of per-capita income had Puerto Rico and the 49 states shared the same steady- state. It would indicate, therefore, a rejection of the hypothesis that Puerto Rico has behaved like a U.S. state.

In a more general setting one could still argue for the presence of unobservable individual effects in spite of the above argued homogeneity across states, if there are differences in the set of available technologies due for instance to morphological differences across states.

The estimation problems arising from the presence of correlated individual effects in equation (1) have been extensively analyzed.[13] In general, an OLS regression of equation (1) will provide inconsistent estimates of all parameters. In particular, the estimate of λ will be biased downwards due to the obvious correlation between the lagged per-capita income and the individual effect.

Following Caselli, Esquivel and Lefort (1994), I perform general method of moments estimation of Equation (1) using the Arellano and Bond (1992) estimator. The procedure consists in eliminating the individual effects by taking differences

[13]See Caselli, Esquivel and Lefort (1994) for a review of the estimation problems and solutions.

to equation (1), and instrument the right-hand side variables using all their lagged values.[14] In the absence of serial correlation in the error term ϵ_{it}, this estimator provides consistent estimates of the parameters in equation (1).

In the case of the GMM regressions, an unusually large and negative individual effect for Puerto Rico would support the hypothesis that Puerto Rico does not behave as a typical U.S. state. Given that the individual effects are likely to be correlated with income, we should require the individual effect for Puerto Rico to be unusually large (in absolute value) after controlling for income.

I estimate different variants of equations (1) and (2) for a panel of five cross-sections, at 10-year intervals, covering the period 1940-1990. The regressions were run using ordinary least squares and general method of moments procedures. In the OLS regressions I also included regional dummies for south, midwest, and west geographical location, and a time dummy for each period. The GMM regressions were run in deviations with respect to the mean. The individual effects obtained in the GMM regressions were run against income levels using OLS.

I use personal per-capita income obtained from the Statistical Abstract of the U.S. that includes data for Puerto Rico from 1940 on. The data is net of federal transfers. Table 1 summarizes the results obtained in both sets of regressions. The convergence rate obtained using pooled least squares is 2.63 percent when including only location dummies, and 3.76 percent when time dummies are also included. The estimate of λ obtained using the general method of moments procedure is 5.48 percent and 6.05 percent per year respectively. In all cases, the standard errors are small implying significant coefficients and small confidence intervals with no overlapping regions. The coefficient obtained with the general method of moments estimator is unquestionably larger than the ones obtained via least squares.[15] The coefficient on the structural composition of income variable is always positive and significant.

The coefficient on the dummy variable for Puerto Rico included in the OLS regressions is large, negative and significant. It indicates that Puerto Rico grew during the period 1940-90, in average, at a rate between 2.2 and 3.3 percentage points lower

[14]For a more extensive description of the estimator see Arellano and Bond (1992), and Caselli, Esquivel and Lefort (1994).

[15]The difference between both set of estimates is smaller, however, than the one shown by Caselli, Esquivel and Lefort (1994) for a large sample of heterogeneous countries, indicating that the omitted variable bias is less severe for this sample.

than that of an economy with the same steady-state that the U.S. states, but with the initial per-capita income of Puerto Rico. The table also shows the coefficient of a dummy variable for Puerto Rico in the OLS regression of the individual effects on the level of income. Interpreting this coefficient in terms of growth rate under performance indicates that the extraordinarily large and negative individual effect obtained for Puerto Rico accounts for 2.38 percentage points of lower annual growth rate. These results clearly indicate that Puerto Rico does not behave like another state. The Puerto Rican economy has been growing at a much lower rate than the one implied for a state with its initial income level.

Table 1: Cross-State Regressions of per-capita Income

	Estimation Method			
Variable	OLS	OLS	GMM	GMM
β	0.7684	0.6867	0.0578	0.0546
	(0.0123)	(0.0210)	(0.0022)	(0.0024)
Inc. comp.	0.2732	0.5166		0.1684
	(0.0326)	(0.0950)		(0.0563)
DUM_{loc}	yes	yes	no	no
DUM_{time}	no	yes	yes	yes
DUM_{prico}	-0.0221	-0.0331		
	(0.0046)	(0.0047)		
λ	0.0263	0.0376	0.0548	0.0605
	(0.0016)	(0.0031)	(0.0038)	(0.0044)
ind. effects: DUM_{prico}				-0.0238
				(0.0048)

The β estimates are not comparable across estimation procedures.

To make this point clear, figure 9 shows the actual average annual rates of growth of per-capita income for the 49 states included in the sample and Puerto Rico for the 50 years period under study. The figure also plots the predicted rates of growth by the OLS regression of column 2 in table 1, the most conservative estimate of Puerto Rico's under performance. The figure clearly shows that Puerto Rico has

not been moving over the U.S. convergence frontier.

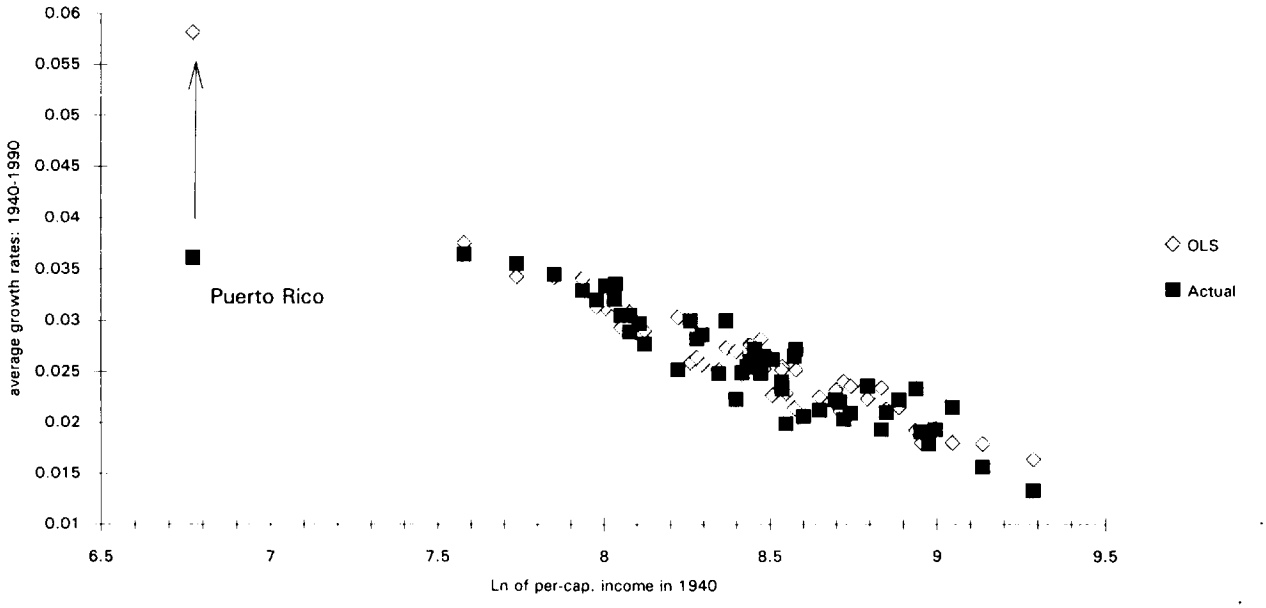


Figure 9: Puerto Rico and the U.S. Convergence Frontier

Figure 10 presents more evidence in the same direction. The figure shows the individual effects, in terms of income levels, estimated for the 49 states and Puerto Rico through the GMM regression presented in column 4 of table 1. The figure also includes the OLS regression line for the individual effects on per-capita income and a dummy for Puerto Rico. The figure makes clear that the individual effect obtained for Puerto Rico is well below the regression line. No other economy in the sample shows a deviation comparable to the one shown by Puerto Rico. In spite of the positive correlation between the individual effects and the level of income, the low initial level of per-capita income is not enough to explain the large and negative individual effect displayed by the Puerto Rican economy.

In summary, the evidence shows that during the period from 1940 to 1990, the different states converged towards the steady-state level of per-capita income at a rate between 2.6 and 6.0 percent per year. Indeed, as figure 9 clearly shows, the absolute convergence frontier is noticeable at bare eye. In the period under study, the poorer states outperformed the richer in a way proportional to the difference in initial levels of income. Even though the Puerto Rican economy grew faster than almost any other economy in the sample, the evidence indicates that the rate of growth attained was

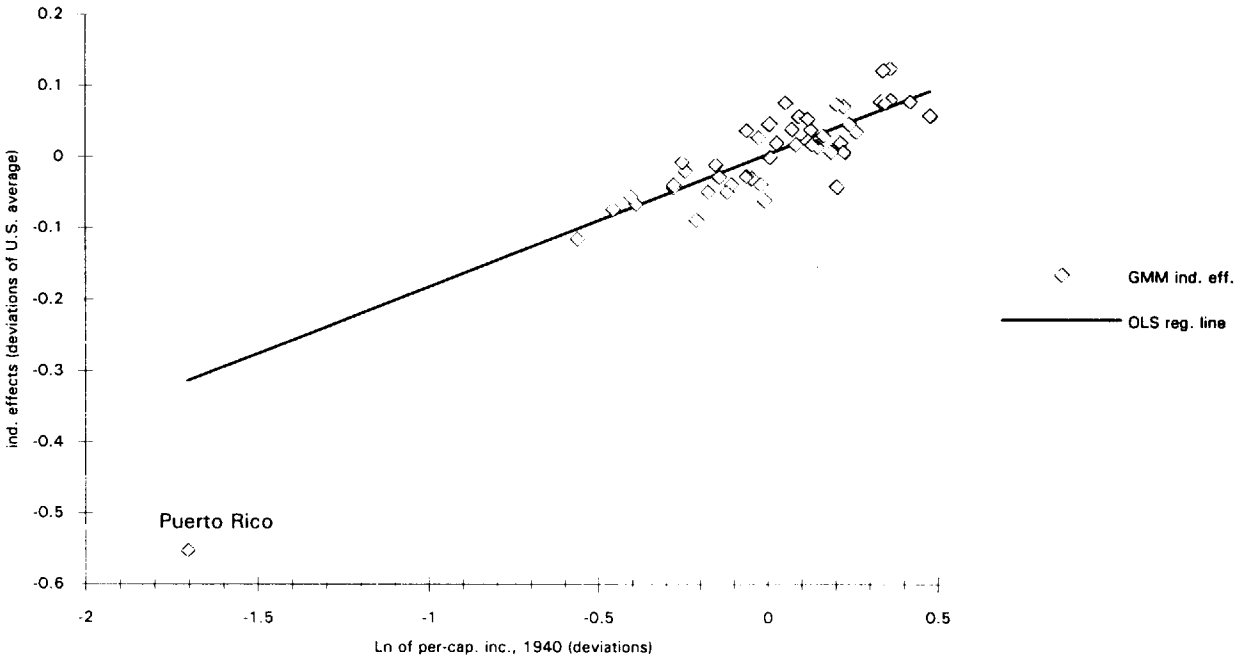


Figure 10: Puerto Rico and the U.S.: Individual Effects

not enough to allow Puerto Rico to converge towards the 49 U.S. states. Obviously, the greater is the true convergence rate operating among the U.S. states, the bigger is the Puerto Rican under performance. Table 1 indicates that after controlling for the structural composition of income, and time and location dummies, the under performance showed by the Puerto Rican economy can reach in average almost 3 percentage points per year.[16]

Explaining the Income Gap: Conditional Convergence

The results obtained in the above section show that Puerto Rico does not lay on the frontier of absolute convergence drawn by the U.S. states. There exists a gap between the rate of growth at which Puerto has been growing and what we would expect from an economy with the steady-state label of income of the U.S. states and the initial

[16]A remark needs to be done. An economy can be below the convergence frontier because it is converging at a lower rate or because it is converging to a lower steady-state than the economies on the frontier. In the above analysis I have assumed that the speed of convergence is shared by all economies in the sample. Therefore, the under performance is solely attributable to differences in the steady-states.

level of income of Puerto Rico.

Why is that Puerto Rico has not been able to grow at this higher predicted rate? The obvious reason for this behavior is that Puerto Rico does not have the same steady-state value of per-capita income that the states included in the sample under analysis. Only after controlling for a set of determinants of the long-run level of income we should expect to be able of explaining Puerto Rico's under performance. In that case, we could conclude that in order to Puerto Rico being able to close the income gap with the U.S., the variables that determine the steady-state of the Puerto Rican economy must reach levels equivalent to those attained by the U.S. states.

In this section, therefore, I attempt to explain Puerto Rico's post-war path of income growth by including in the above regressions a set of standard determinants of growth variables. Although the under performance is somewhat reduced, I still find a large and unexplained growth gap.

I estimate equations 1 and 2 including as explanatory variables beginning of period values of: the state's structural composition of income, the percentage of the population over 25 years old with high school completed or more, the per-capita level of state and local government expenditure, and the per-capita level of federal aid received by the state.

Table 2 presents the results. Controlling for the extra set of variables increases, as expected, the estimated speed of convergence to 3.77 percent and 3.14 in the OLS regressions with and without including time dummies respectively. The speed of convergence reaches 9.51 percent in the GMM regression. The coefficient for the structural composition of income variable is positive and significant in all regressions. The coefficient on the education variable is not significantly different from zero in the OLS regressions, but negative and highly significant in the GMM regressions. The negative sign obtained is consistent with the percentage of the adult population with high school completed being a proxy for the initial level of human capital and therefore reflecting initial conditions. The coefficients on government expenditure and aid from the Federal Government are significant and positive in both sets of regressions. Federal Aid has a large effect on growth with the exception of the OLS regression without including time dummies. The effect of this variable is specially large in the GMM regressions. This is interesting since the general method of moments estimation procedure takes care of potential problems of endogeneity of the explanatory variables, that might certainly arise specially in the case of this last variable.

Table 2 also shows that the under performance of Puerto Rico is still severe. There is almost no change in the OLS estimate of the Puerto Rican dummy, it is -3.24 percent when I include the time dummies. However, the individual effect obtained through the GMM estimation is somewhat smaller. The OLS dummy obtained for Puerto Rico's individual effect indicates now that the average rate of growth during the transition path was 1.1 percentage points lower than expected.

In summary, this section provides some evidence that Puerto Rico has been growing at a lower rate than the one expected for an economy with the same steady-state income of the U.S. states, and with the initial income of Puerto Rico. This result remains largely unchanged after controlling for other determinants of the steady- state level of income. The remaining gap between the actual and predicted individual effect for Puerto Rico must be attributed to some other unobservable variable. Differences in technology in a broad sense between Puerto Rico and the mainland U.S. states appear as the standard explanation for this gap. The high degree of integration of the Puerto Rican and American economies, however, makes implausible to attribute the gap to differences in the access to particular production techniques or to any other purely economic factor. A remaining candidate is the more obvious difference in political institutions. Puerto Rico is the only economy of the sample without a clear and permanent political status. The uncertainty about the future political status of the island might certainly have hurt Puerto Rico's ability to induce increases in the stock of capital at the rate predicted by the theory for an economy with initial low income and high steady-state level of income.

Does Statehood Matter?

As was mentioned above one of the possible causes for the inability of the Puerto Rican economy to converge towards the U.S. states is the different political status of the island. Statehood involves a stable legal system, a definitive institutionality, complete access to the widest market in the world, and the end to the uncertainty faced by any investor in the island with respect to the future rules of the game. Statehood could also imply that Puerto Ricans would be able to determine the nature and increase the extent of federal aid to the island. However, Statehood also implies the end of tax incentives and the full application of federal minimum wage to the island.

It is difficult, then, to assert that the under performance of the Puerto Rican economy is due even in part to the political status. In practice, all other economies

Table 2: Cross-State Regressions of per-capita Income

	Estimation Method		
Variable	OLS	OLS	GMM
β	0.7302	0.6862	0.0387
	(0.0266)	(0.0243)	(0.0012)
Inc. comp.	0.2481	0.5647	0.2894
	(0.0333)	(0.0958)	(0.0138)
H-S Grad.	0.0033	0.0137	-0.1511
	(0.0086)	(0.0106)	(0.0033)
GOV	0.0270	0.0044	0.0077
	(0.0081)	(0.0074)	(0.0005)
FAID	0.0796	0.0678	0.2274
	(0.0312)	(0.0293)	(0.0046)
DUM_{loc}	yes	no	no
DUM_{time}	no	yes	yes
DUM_{prico}	-0.0335	-0.0324	
	(0.0048)	(0.0048)	
λ	0.0314	0.0377	0.0905
	(0.0036)	(0.0035)	(0.0032)
ind. effects: DUM_{prico}		-0.0116	
			(0.0054)

The β estimates are not comparable across estimation procedures.

in the sample previously analyzed are states, and certainly the political status is not the only difference between Puerto Rico and the States. The lack of sample variation impedes to use the above results to determine the effect of Statehood in growth.

In this section I perform a test of the hypothesis that the political status of an economy affects its performance in terms of growth. In order to do that I use per-capita income data for 48 states from 1880 to 1980. These series were obtained from Barro and Sala-i-Martin (1992). The idea of the test is the following. Several of the 48 states included in this sample changed their political status from territories to states during the period of time under study. In particular, North and South Dakota, Montana and Washington became states in 1889. Idaho and Wyoming in 1890, Utah in 1896, Oklahoma in 1907, and New Mexico and Arizona in 1912. I run then a standard growth panel regression using cross-sections 20 years apart including a variable for the political status. This variable takes values between zero and one. It is 0 for all those observations for which the economy was a state the following 20 years. It is 1 if the economy was a territory. If the economy changed status during the period it takes the proportional value. For instance it is 10/20 for Montana for the period 1880-1900, since Montana became a state in 1889.

Table 3 presents the results of these regressions. Following Barro and Sala-i-Martin I included also the share of income originating in agriculture as a measure of the structural composition of income. I also included dummies for the south, west and midwest areas. The results are striking. Table 3 shows that the non-Statehood variable is negative and significant in all the regressions performed, independently of the sample period. That is, given its initial level of per-capita income, and structural composition of their income, the economies of the actual U.S. states have grown faster after they became states. Although these results must be interpreted carefully, it is clear that they highlight the existence of positive effects for growth of the Statehood status.

4.2.3 Puerto Rico, Latin America and the Caribbean

In spite of the apparent under performance of the Puerto Rican economy with respect to the U.S. states, the postwar economic history of Puerto Rico has been used as an example of successful economic development.[17]

[17]See Baumol and Wolf (1994), and Hausman (1994).

Table 3: Determining the Effect of Statehood on Growth

	Estimation period			
Variable	1880-1920	1880-1940	1880-1960	1880-1980
β	0.8052	0.6737	0.6923	0.7904
	(0.0721)	(0.0451)	(0.0500)	(0.0522)
Agric. share	-0.0370	-0.0672	-0.0576	-0.0408
	(0.0326)	(0.0110)	(0.0054)	(0.0056)
non-STATEHOOD	0.0008	-0.0202	-0.0020	-0.0021
	(0.0069)	(0.0059)	(0.0001)	(0.0001)
DUM_{loc}	yes	yes	yes	yes
λ	0.0108	0.0198	0.0184	0.0118
	(0.0045)	(0.0034)	(0.0036)	(0.0033)

In this section I use the recently available data from the Penn World Tables version 5.6. that provide data on GDP at international prices for Puerto Rico allowing the international comparisons to be made. I used the Barro and Lee (1994) sample of 97 countries plus Puerto Rico. Figure 11 clearly summarizes the successful Puerto Rican story. I have selected from the sample of 97 countries all the Latin American and Caribbean economies plus U.S.A., Canada and Puerto Rico. The figure makes clear that Puerto Rico outperformed all the economies with similar or lower per-capita income as of 1960.

In order to identify sources of growth for Puerto Rico, I ran panel regressions built using cross-sections of 98 countries (included Puerto Rico) at five year intervals from 1960 to 1990. I included as explanatory variables some of the most commons control variables used in the standard literature on empirical growth. For education I use the percentage of the population over 25 years old with secondary school completed. I also included fertility rates, investment rates, government expenditure ratios, black market premium, and number of revolutions. Table 4 summarizes the results. As before, I ran regressions using a standard OLS procedure and a GMM estimation. The convergence rates are 2.28 percent an 9.49 percent respectively. The estimated coefficients for the education variable are positive and significant, but small. The coefficients on all other variables are reported in table 4 as well. They are similar

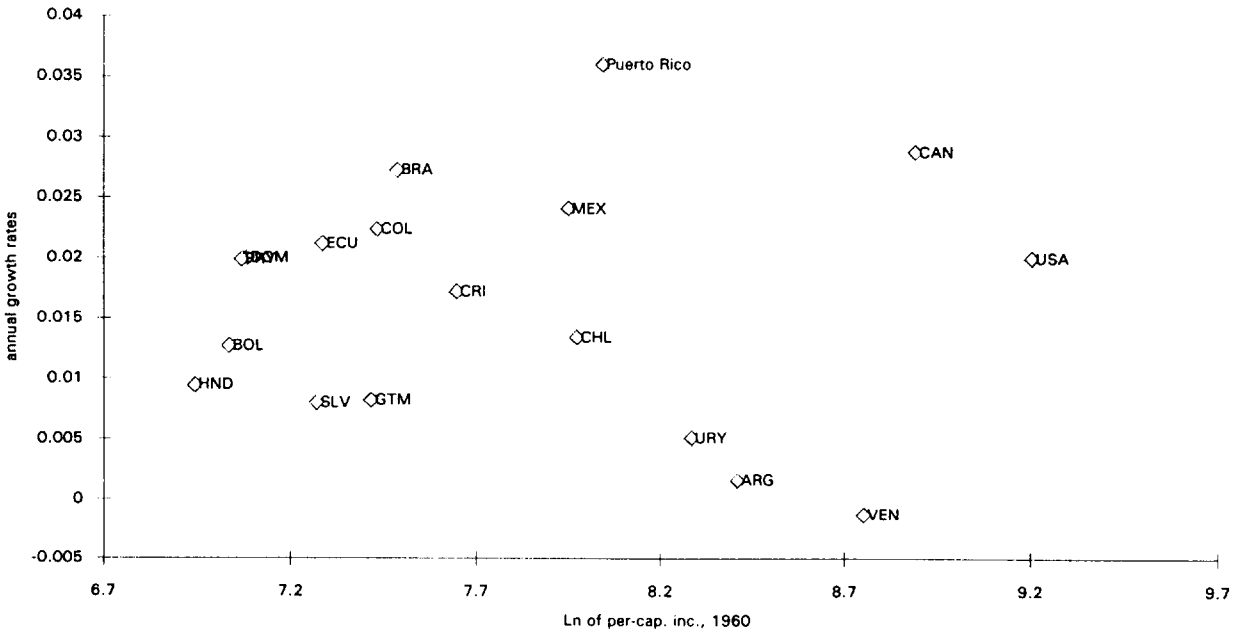


Figure 11: Puerto Rico and Latin America: Growth rates

to those obtained in previous studies.

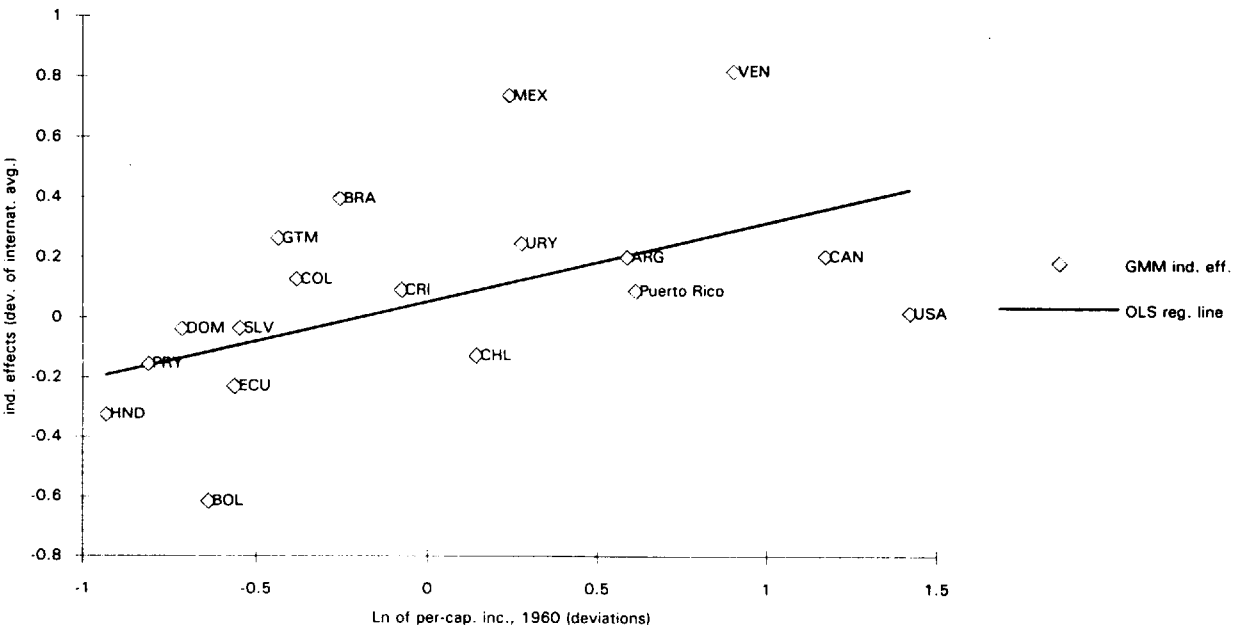


Figure 12: Puerto Rico and Latin America: Individual Effects

The results for Puerto Rico and Latin America and the Caribbean are sum-

Table 4: Cross-Country Regressions of per-capita GDP

	Estimation Method	
Variable	OLS	GMM
β	0.0781	0.0310
	(0.0029)	(0.0086)
educ.	0.0049	0.0154
	(0.0021)	(0.0076)
fertility rate	0.0591	-0.0596
	(0.0141)	(0.0550)
I/GDP	0.1311	0.1334
	(0.0224)	(0.0362)
G/GDP	-0.0481	0.1219
	(0.0198)	(0.1433)
ln(1+BMP)	-0.0231	-0.0348
	(0.0043)	(0.0118)
revolutions	0.0086	0.0064
	(0.0054)	(0.0137)
λ	0.0247	0.1170
	(0.0037)	(0.0276)

marized through figure 12. The figure presents individual effects obtained in the determinants of growth GMM regression presented in table 4 column 2, for the sample and period previously described. The figure shows that Puerto Rico does not present a particularly large individual effect. That is, most of Puerto Rico's good performance is explained for the accumulation process through investment, its human capital, its initial position and other variables. Once we take in consideration those determinants of the economy steady-state, there is no much left unexplained. The relatively low individual effect (lower than the one for the U.S.) indicates that most of the relative performance of Puerto Rico when compared to a broad set of countries is explained by its relatively high steady-state level of per-capita income, which is captured by the control variables included in the regressions.

5 Summary and Conclusions

The relationship between Puerto Rico and the U.S. implies that Puerto Rico is economically, politically and geographically in a unique position. This paper shows that the development strategy pursued by Puerto Rico during the last 50 years has been, at most, only partially successful in exploiting all the economic possibilities arising from that unique position. Puerto Rico has been growing at a rate around 2 percentage points lower than the one we could expect from an economy in its situation.

Simple simulations performed using the convergence rates obtained in this paper show that the per-capita income level of Puerto Rico could have been almost twice its actual value by 1994, completely closing the income gap with the poorest States, had Puerto Rico been converging towards Mississippi's actual income level since 1945.

In contrast the evidence found in this paper indicates that Puerto Rico is converging to a lower steady-state that the one the U.S. states are converging. Unless Puerto Rico's steady-state level of income increases substantially, the Puerto Rican economy will not be able to close the income gap with the U.S. ever. In this sense, there is no meaningful economic reason for postponing the decision about the political status of Puerto Rico.

The convergence to a lower steady-state than the US states implies that the income gap will not be closed just by waiting for that to happen. Although growth theory does not provide a recipe for faster growth, it says that provided that Puerto Rico manages to improve the variables that determine its long-run equilibrium income, the convergence effect guarantees a higher rate of growth during the transition towards the new steady-state. Statehood might be able to do so by reducing the political uncertainty and increasing in a more natural way that tax incentives, the flow of investment from the mainland.

Nevertheless, Puerto Rico has partially enjoyed the benefits of its proximity to the U.S.. This paper has shown that Puerto Rico outperformed, at least until the oil shock, most Latin American and Caribbean countries. No other country in the region, with the exception of Dominican Republic has been able to reduce the income gap with the U.S..

There are several examples of the positive effects of a cooperative relationship between a less developed economy and a rich developed country or region. Middle-

income European economies like Spain in the 60's, and Greece, Ireland and Portugal have been profiting from their geographical position for a long time, gradually closing the gap with the richest European economies. The most important political and economic accomplishment of these economies in the last 40 years has been their entry to the European Economic Community, by increasing the advantages of the geographical proximity to a richer economic region. As shown by Larre and Torres (1991), the combination of market reforms and integration into the European Economic Community have allowed Spain and Portugal to outperform richer European countries in the last ten to fifteen years. More recently, other countries in the world have been eager to enjoy the benefits of a close relationship with a richer economy. Mexico and Chile have pursued political and economic strategies that have culminated in their incorporation into NAFTA, as a way to increase their exposure to a larger and more developed economy.

All these examples, however, are minor cases of economic cooperation when compared to the potential for Puerto Rico. Through the Statehood process, Puerto Rico will become an integral part of the largest and richest economy in the world, fully enjoying the economic benefits of the catch-up process. The Statehood status is also a way to terminate definitively the political uncertainty associated with Commonwealth status. As long as the transition towards Statehood allows Puerto Rico to improve any of the determinants of its long-run economic performance, the convergence effect will guarantee a higher rate of economic growth during the transition.

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