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**THE CONVERGENT/DIVERGENT ECONOMIC TRAJECTORIES
OF PUERTO RICO AND THE UNITED STATES**

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Table of Contents

Introduction	1
1. Puerto Rico in perspective: some basic comparisons with the United States.....	2
2. Puerto Rico's convergent/divergent output trajectories.....	7
3. Phase I (1947-1971): the initial convergent trajectory	10
4. Phase II (1971-1986): the divergent phase	19
5. Phase III (1986-2002): the return to convergence	25
6. Trade and convergence	29
7. Puerto Rico and the future path of convergence towards the United States	36
Annex	40
References	48



Introduction

As with other developing economies, during the 'Golden Age of Capitalism' Puerto Rico registered high rates of economic growth (see Table 1 below)¹, accompanied by rising levels of productivity reflecting a process of convergence relative to the United States. This impressive performance gave credence to the comparison with the Newly Industrialised Countries (NICs) labelling Puerto Rico as the 'fifth tiger.'²

Period	World	OECD	Developing Nations	United States	Puerto Rico
1950-1973	n.a.	5.9	5.5	4.2	6.7
1966-1973	5.1	4.8	6.9	4.0	6.9
1974-1980	3.4	2.9	5.0	2.5	3.4
1981-1990	3.2	3.1	3.3	3.2	4.3
1991-1997	2.2	1.9	5.0	2.8	3.9
1993-2002	3.5	2.7	5.1	3.4	4.8

Source: Davidson (2003), NBER (2004); Planning Board of Puerto Rico (2003)

In the early 1970s, fortunes were reversed and Puerto Rico experienced a period of economic decline leading to a widening gap with the United States that lasted well into the middle of the 1980s. The hallmarks of this period included, among others, a significant fall of the investment coefficient and a doubling of the rate of unemployment. The overall economic and social effects were mitigated in part by the existence of 'safety valves' such as migration and unilateral transfers from the United States that offset losses in income and employment. Starting in 1986, the Puerto Rican economy looked poised for another period of growth and convergence that appeared sustainable even if the mixed performance signals brought about by 2003 were taken into account.

The first phase was underpinned by the significant increase in the formation of gross fixed capital. The expansion of domestic investment was encouraged by a tax incentives policy that ultimately benefited the development of Puerto Rican industry³.

¹ The Golden Age of Capitalism includes the period 1950-1973. It is important to note that during this period 'convergence' was the norm rather than the exception. In this sense, Maddison (1991) writes: 'A major characteristic of capitalist development has been the post-war convergence in levels per capita income and productivity between these advanced countries'. The expression 'fifth tiger' is borrowed from Baumol and Wolff (1996).

² The four East Asian tigers are: Hong Kong, Singapore, Taiwan and South Korea.

³ It can be argued that this first phase can be explained by a simple Keynesian model for a closed economy.

It is generally argued that 'Operation Bootstrap' or 'industrialisation by invitation' was the core economic strategy followed in this period and that the following period of decline resulted from the failure of these policies to 'adjust to the realities of increasing global competition'⁴.

Contrarily the paper sustains that, while it can be argued that the first stage of 'Operation Bootstrap' was implemented in Phase I, it is in fact in the phase of decline and divergence (i.e., Phase II) that 'industrialisation by invitation' was developed to its full extent.

Furthermore it asserts that these policies failed to provide the adequate stimuli to growth and that this explains in part the contraction in economic activity. Indeed, during this phase economic policy encouraged, via federal and national tax incentives, a foreign capital-based manufacturing and services sector which was allowed to repatriate its profits back to the United States. As a result this period saw a widening gap between the income produced and that available in Puerto Rico. At the same time there was a marked shift in the distribution of wealth towards foreign-owned assets and a rise in the rate of unemployment.

The third phase was marked by the roughly steady growth of the United States, and the increase in the investment coefficient driven by the construction sector whose effects on total output were not fully felt due to a slowdown in productivity growth. At the same time the data indicates that part of the economic recovery was led by an expansion in the wage bill. The third phase can be termed a wage-led phase.

This paper analyses the trajectories of convergence and divergence between Puerto Rico and the economy of the United States, focusing on output convergence. It is structured in seven sections. Following the introduction, the first section provides an overall and general social and economic picture of Puerto Rico in relation to the United States. The second section highlights the main features of the three phases of convergence/divergence for both economies. The third, fourth and fifth sections analyse in greater detail the convergence/divergence phases I to III trying to identify the possible elements that account for the narrowing or widening output gap. The sixth section examines the relationship between trade and convergence. The last section attempts to highlight key current trends that may impact on the process of convergence of Puerto Rico relative to the United States.

1. Puerto Rico in perspective: some basic comparisons with the United States

The Commonwealth of Puerto Rico covers an area of 9,104 square kilometres with a population of 3.8 million inhabitants and occupies a central position among the islands of the West Indies in the northern Caribbean. Its GDP per capita is almost three times the Caribbean average and only surpassed by that of the British Virgin Islands.

In comparison to the rest of the United States, Puerto Rico stands as a state of median size in terms of population (ranking in 27th place when compared to the rest of the states of the United States) and small in terms of square kilometres (ranking in 49th place when compared to

⁴ The expression is from Stewart (2003).

the rest of the states of the United States). It exhibits the greatest density of any state with the exception of New Jersey. Finally, in terms of its gross product Puerto Rico finds itself at the lower end of the scale (ranking in 40th place when compared to the rest of the states of the United States) (see Table 2 below).

Manufacturing and services (and within services, finance, insurance and real estate services) are the main sectors of economic activity (contributing each 45% and 54% to GNP).⁵ The agriculture sector has exhibited a small and declining share of GNP reaching 1.4%. Correspondingly manufacturing, agriculture and services account for 14%, 1.9% and 31% of total employment respectively. In terms of its export structure, Puerto Rico has a leading edge in high technological products in the United States.

	Puerto Rico	The United States
Population (000')	3 863 (rank 27)	5 619.8 a/
Size (Sq. Km)	9 104 (rank 49)	137 264 a/
Crude birth rate (2002)	15.1	14.0
Density (per Sq. Km)	425.2 (rank 3)	139.0 a/
Crude death rate (2002) (Per 1 000 inhabitants)	7.5	9.0
Infant mortality rate (Per 1 000 inhabitants)	8.0	9.0
Average life expectancy at birth	75	77
Unemployment rate (Dec. 2003)	11.4	6.0
GDP per capita (2004)	11 434.87	35 865 a/
Hourly average wage in manufacturing relative to the United States.	65-80	100
Average annual wages (2002)	19 728	36 219 b/
Productivity of non-farm employees of Puerto Rico relative to the United States (2001) a/	60	100
Note: a/ refers to the median for the United States. B/ Does not take into account Puerto Rico of the United States Virgin Islands.		
Source: UNCTAD (2002); Planning Board of Puerto Rico (2003)		

⁵ Finance, insurance and real estate contributed 16% to GNP in 2001 and 2002.

Figure 1
The United States and Puerto Rico
The outward convergence frontier
Real gross product for 1977 versus its growth rates for 1977-2001

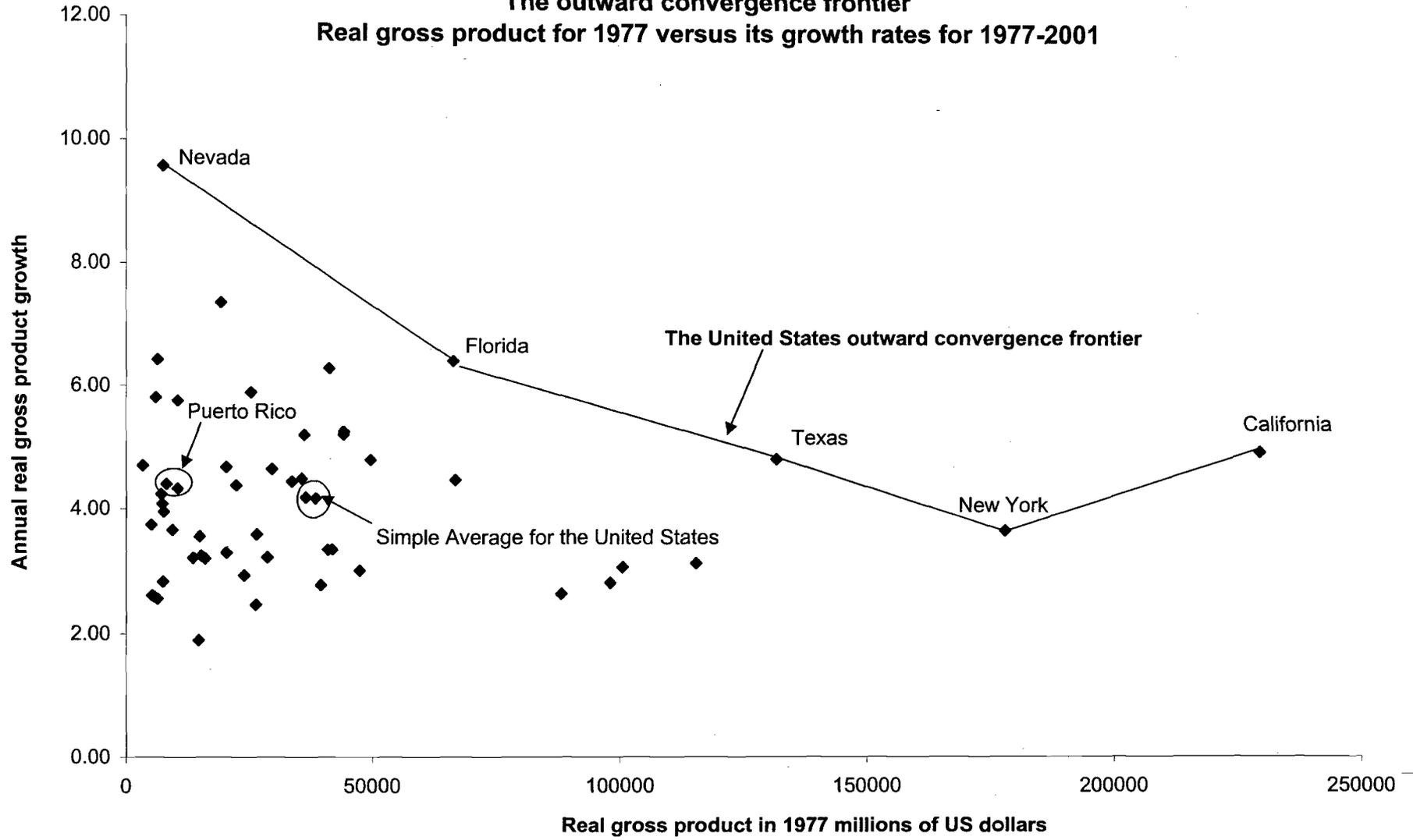
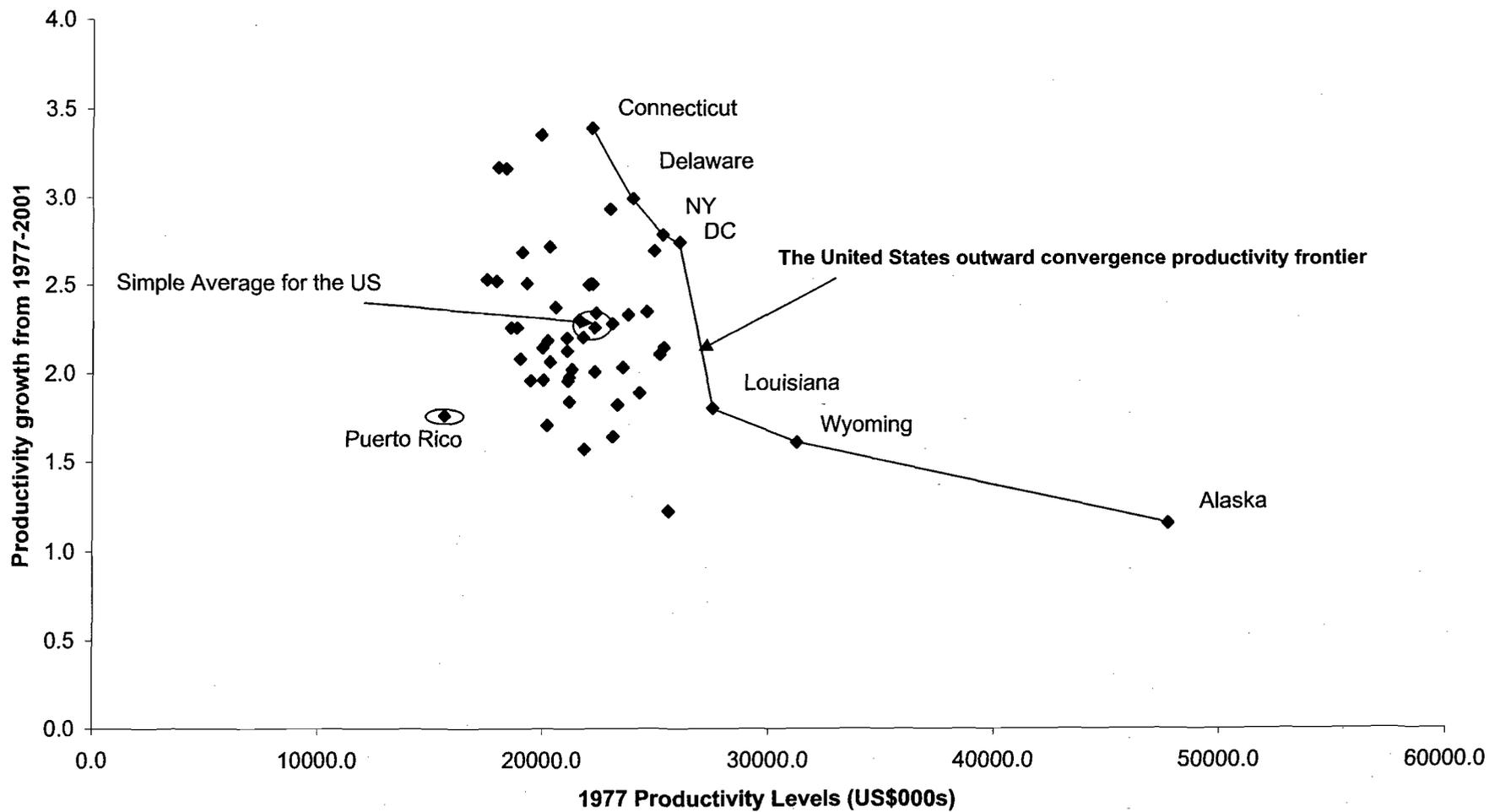


Figure 2
The United States and Puerto Rico
Productivity Convergence of Non-Farm Employees
Productivity in 1977



In terms of convergence the data shows the existence of absolute convergence for the federal states (that is, the states situated at the lower end of the output scale tend to grow faster than those situated at the higher end in order for the former to catch up with the latter).⁶ Puerto Rico however does not seem to conform to this norm.

Figure 1 above plots the relationship between real gross product measured in 1977 million dollars and real product growth for the period 1977-2001 for all the different federal states and the Commonwealth of Puerto Rico. The data show the existence of absolute convergence most clearly for the outward convergence frontier which includes Nevada and California at the extremes of the real gross product estimations. With a lower level of real gross product for 1977 than the simple average for the United States, Puerto Rico exhibits roughly the same rate of growth as that of the average for the United States. This shows that if Puerto Rico continues to maintain its historical rates of growth it will fail to generate a path of convergent growth with the United States.

Figure 2 above shows the same relationship as that of Figure 1 for productivity of non-farm employees and provides a similar diagnostic. The United States outward convergence productivity frontier is negatively shaped and the greater majority of states are situated along the frontier reflecting the existence of absolute convergence. Puerto Rico is the state that is the farthest away from the convergence frontier and one of the states combining the lowest productivity rate with the lowest rate of growth of output.

From a social point of view the overall picture of Puerto Rico's standing relative to the rest of the United States is somewhat different. Puerto Rico's performance in terms of its social indicators suggests that it has reached similar standards as those prevailing in the United States in terms of crude birth and death rates per 1 000 inhabitants (15 and 8 per 1000 inhabitants, respectively). The infant mortality rates have also converged and stand at 8 per 1000 inhabitants for both economies (see Table 2 above). The rate of unemployment is much higher in Puerto Rico than in the United States and wages are markedly lower in Puerto Rico. Average annual wages for Puerto Rico in 2002 represent 56% of those earned in the United States (see Table 2 above). Additional evidence provided by Stewart (2003) on the manufacturing sector show that hourly earnings in the manufacturing sector in Puerto Rico average between 65% and 80% of that of the United States.

⁶ The literature distinguishes two concepts of convergence. These are termed sigma and beta convergence. Sigma convergence refers to a decline in the dispersion across a group of countries or regions over time. Sigma convergence can be measured by the standard deviation say of GDP per capita or by a coefficient of variation (defined as the ratio of the standard deviation over the mean). Beta convergence refers to the relationship between the rate of growth of a variable over time (say GDP) and the level of that variable for a given year. The existence of sigma convergence between a lower and higher level income countries implies that there is a process of catching-up between the former and the latter. That is, the lower income level countries grow at a faster rate than the higher level income ones. Sigma convergence is compatible with absolute convergence (see, Barro and Sala-i-Martin, 1995, pp.26-28 and 383-386). More recently some authors have explored the possibility of simultaneous convergence and divergence. See, Elmslie and Milberg (1996) and Carter (2004). Lefort (2002) explains the lack of conditional convergence between Puerto Rico and the United States on the basis of differing steady-state value of per-capita income, which in turn is explained by the political status of Puerto Rico.

2. Puerto Rico's convergent/divergent output trajectories

Puerto Rico's path of output convergence/divergence in relation to the United States is characterised by three phases. These are encapsulated in the time periods, 1947-1971; 1971-1986 and 1986-2002 (see Table 3 below).

These three phases are illustrated in Figure 3 which shows the ratio of Puerto Rico's GNP per capita relative to that of the United States. Puerto Rico's GNP represented 16% of that of the United States in 1947 and rose to 35% during Phase I (1947-1971). In 1986, at the end of Phase II (1971-1986), the GNP convergence indicators declined to 25% and in 2002, at the end of Phase III, (1986-2002) it had risen again to 33%. However, the convergence levels of Phase III never reached those attained in Phase I.

As expected Phase I was the one that recorded the highest rate of growth followed by Phase III. Phase II registered the lowest rate of GNP growth. In terms of volatility Figure 4, which shows a 10-year rolling coefficient of variation for GNP growth, also shows that Phase I was the least volatile and Phase II the one that exhibited the highest degree of volatility.

Table 3
Convergence and macroeconomic indicators
1947-2002

	Phase I 1947-1971	Phase II 1971-1986	Phase III 1986-2002
GNP convergence mean a/	16.7-34.9	34.9-25.4	25.4-32.2
GNP convergence standard deviation	2.4	2.8	1.3
(GDP-GNP)/GNP (In percentages)	0	23	47
Non-farm productivity convergence a/	n.a.	0.44-0.34	0.34-0.61
Government Consumption as % GNP	13.71	21.39	26.89
Gross fixed capital formation as % of GNP	21.0	17.0	21.9
External sales as % of GNP	53.1	68.3	90.3
Openness as % of GNP	130.8	177.3	244.3
Coefficient of correlation between the rate of growth of GNP and external sales	0.33	0.45	0.37
Note: GDP is the Gross Domestic Product and GNP is the Gross National Product. n.a.= not available. a/ Includes the first and last data points of the corresponding phases. Source: On the basis of official information			

Figure 3
GNP Convergence
Puerto Rico's GNP per capita as a percentage of that of the United States
1947 - 2002

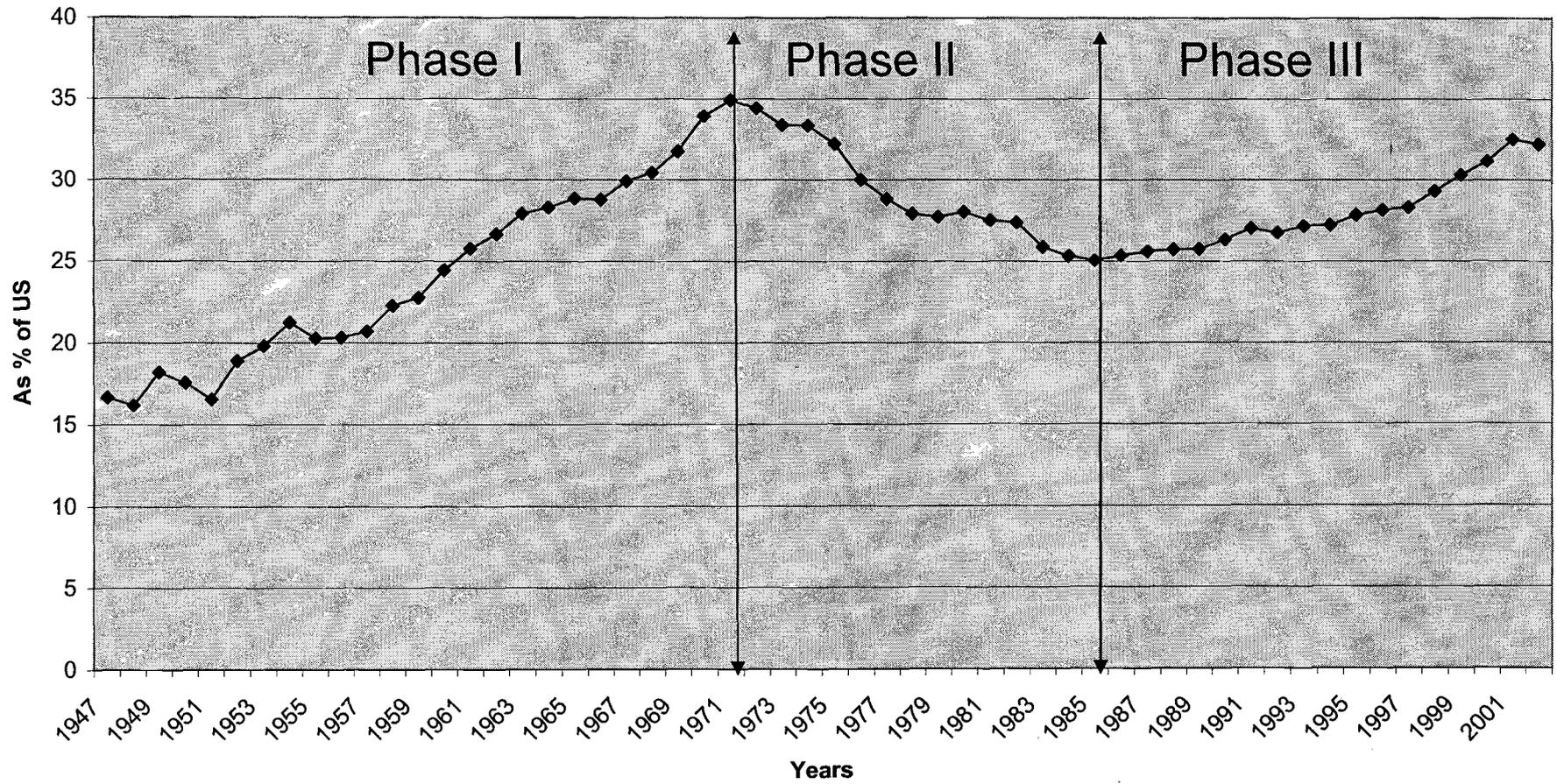
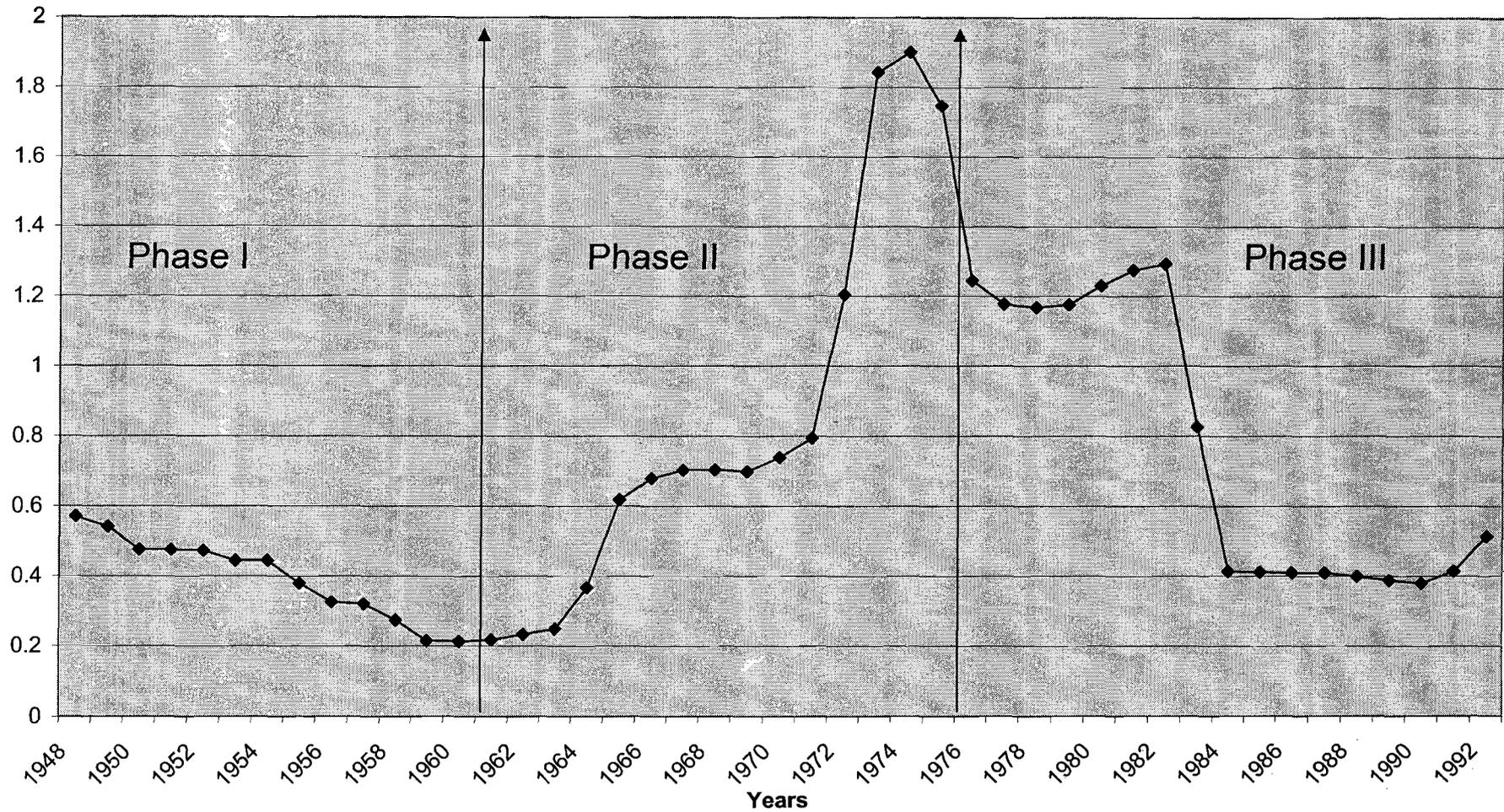


Figure 4
Ten-year rolling coefficient of variation
1948 - 1992



N.B.: Each observation is the average of a ten year period so that for example the observation for 1992 includes 1992 to 2002.

3. Phase I (1947-1971): the initial convergent trajectory

During Phase I, the control of economic and, in part, political affairs shifted from the United States to Puerto Rican officials. Following its consolidation at the end of the 1940s, the Partido Popular Democrático (PPD) dominated the political arena for over 28 years, which represents most of the period under consideration. Economic policy underwent through two stages⁷. The first (1940-1946) was marked by significant government intervention including the adoption of an import substitution strategy, the nationalisation of selected firms, land reform efforts and government orientation of production (Padin, 2003). In 1947 this economic strategy gave way to one which privileged market mechanisms over State intervention. According to Padin (2003) current historiography is divided as to whether the change in economic strategy was driven by a class of practical and independent managers or was imposed from the outside by external conditions.

Throughout this period 'Operation Bootstrap' guided the orientation of economic policy.
⁸ As stated by Bonilla and Campos (1982, pp.133-134):

"Bootstrap strategists argued that the intolerable population pressures on resources constituted the root obstacle to economic advance and the necessary modernization of Puerto Rico. Their prescription was to find a low-cost approach to channel the movement of redundant Puerto Rican workers abroad while drawing energetic entrepreneurs to the Island from the United States. The necessary economic and social operations envisioned in Bootstrap were to be carried out through the agency of a newly designed political structure, the commonwealth"⁹

It was conceived as a two-stage strategy. In the first stage Puerto Rico would provide the social capital and the required infrastructure (Holbik and Swan, 1975; Cabán, 2002). These would be financed through the sale of bonds in the United States capital market and local taxes. Government expenditures and policies would provide, in turn, an important stimulus to the expansion of private investment, which took, in fact, a leading role during this phase. In the second stage, American firms would 'be induced to locate through industrial sites through an elaborate incentives programme. The incentives included: tax concessions, grants, subsidised rentals and utility rates and low wage rates' (Holbik and Swan, 1975, p.16).

The first stage of the strategy was accompanied by significant government capital expenditures (education, transportation, housing, communications, irrigation) to provide a basis

⁷ In 1968, Luis Ferré of the New Progressive Party broke the powerhold of the Partido Popular Democrático.

⁸ This strategy is also known as 'industrialisation by invitation' and was implemented under the governorship of Luis Muñoz Marín. This approach was originally developed by Arthur Lewis who saw the need for industrialization as a response to the existence of surplus labor in agriculture. Due to the small size of the Caribbean markets, Lewis thought that industrialization could generate the demand necessary to absorb surplus labor if manufacturing output was oriented to both the domestic and export market and if Caribbean countries formed a Customs Union. The strategy for industrialization was termed 'industrialization by invitation' because as pointed by Lewis "...what should rather be done is to try to persuade existing suppliers, with established distribution channels in Latin America, to open factories in the islands to supply their trade" (Ibid., p. 862).

⁹ The Commonwealth of Puerto Rico was established in 1952.

for the development of private enterprise.¹⁰ This policy continued well into the 1960s as the focus of expenditure centred on roads and education (Holbik and Swan, 1975).

Stewart (2003) develops a similar argument: 'Government-owned corporations in Puerto Rico had already been more prevalent than in the states through state ownership of the ports, power, industrial factory space (by the Puerto Rico Industrial Development Company created in 1942)¹¹ and agricultural land (by the Land Authority). Public ownership increased in the late 1960s when the government acquired several large tourist hotels and sugar refineries in an attempt to avoid layoffs in these distressed industries. In 1974, the government acquired the local telephone network and major shipping interests (forming Navieras de Puerto Rico) in an attempt to improve service and reduce rates'.

Current government expenditure did not expand *pari passu* and remained at a low level. As shown in Table 3 above the ratio of government consumption to GDP reached 13.71% in Phase I and roughly doubled in phases II and III (21.39% and 26.89%). To put it in comparative perspective, both Puerto Rico and the United States had in 1947 roughly the same ratio of government expenditures to output (12% and 13%, respectively). In Phase I, the United States' ratio of government consumption to output was systematically higher than that of Puerto Rico. In Phases II and III the opposite phenomenon occurs (see Figure 6 above).

A similar conclusion is drawn computing the ratio of transfer payments to personal income. This measure of the size and scope of the government equalled 10% in 1947 and rose 5 percentage points to 15% in 1971, that is, by the end of Phase I. In Phase II the ratio doubled to 30%. This provides a solid basis on which to argue that government intervention was more relevant to the Puerto Rican development model in Phase II rather than in Phase I.

Notwithstanding the arguments and evidence here presented it must be pointed out that the role of government during this period remains an issue of controversy.

G. Lewis (1963) has questioned the importance of government intervention even during the so-called 'statist intervention' era stating that state enterprises accounted for only 1.2% of total net income and that to term the Puerto Rican model under the New Deal one of 'State Socialism' was 'an extravagant example of poetic license' (G. Lewis, 1963).

It has also been stated that government institutions were too weak to fulfil their developmental role. This has been pointed out with respect to two of the leading sources of long-term capital for industry, the Government Development Bank (1942) and the Reconstruction

¹⁰ Holbik and Swan (1975, p.25) write: "Heavy expenditures were made in subsequent years on education, transport, housing, telephones, irrigation, and power. A permanent improvement programme was established outside the budgetary process to ensure steady progress. By 1967, the economy had developed to the point that it could support a \$69 million programme to finance expenditures of \$14 million in industrial and tourist facilities, \$11.4 million for new schools, \$10.8 million for new housing, \$9 million for land purchases, and \$7.4 million for rural water supplies. In addition, a highway allocation of \$7 million was to be lent by a New York bank in a project that would reach \$40 million, the largest single credit transaction ever handled by Puerto Rico". The expenditure in infrastructure can also be seen as a component of social tranquility required for the success of Operation Bootstrap.

¹¹ The Industrial Development Company was specifically charged with 'promoting the industrialisation of Puerto Rico'. See Lewis (1949).

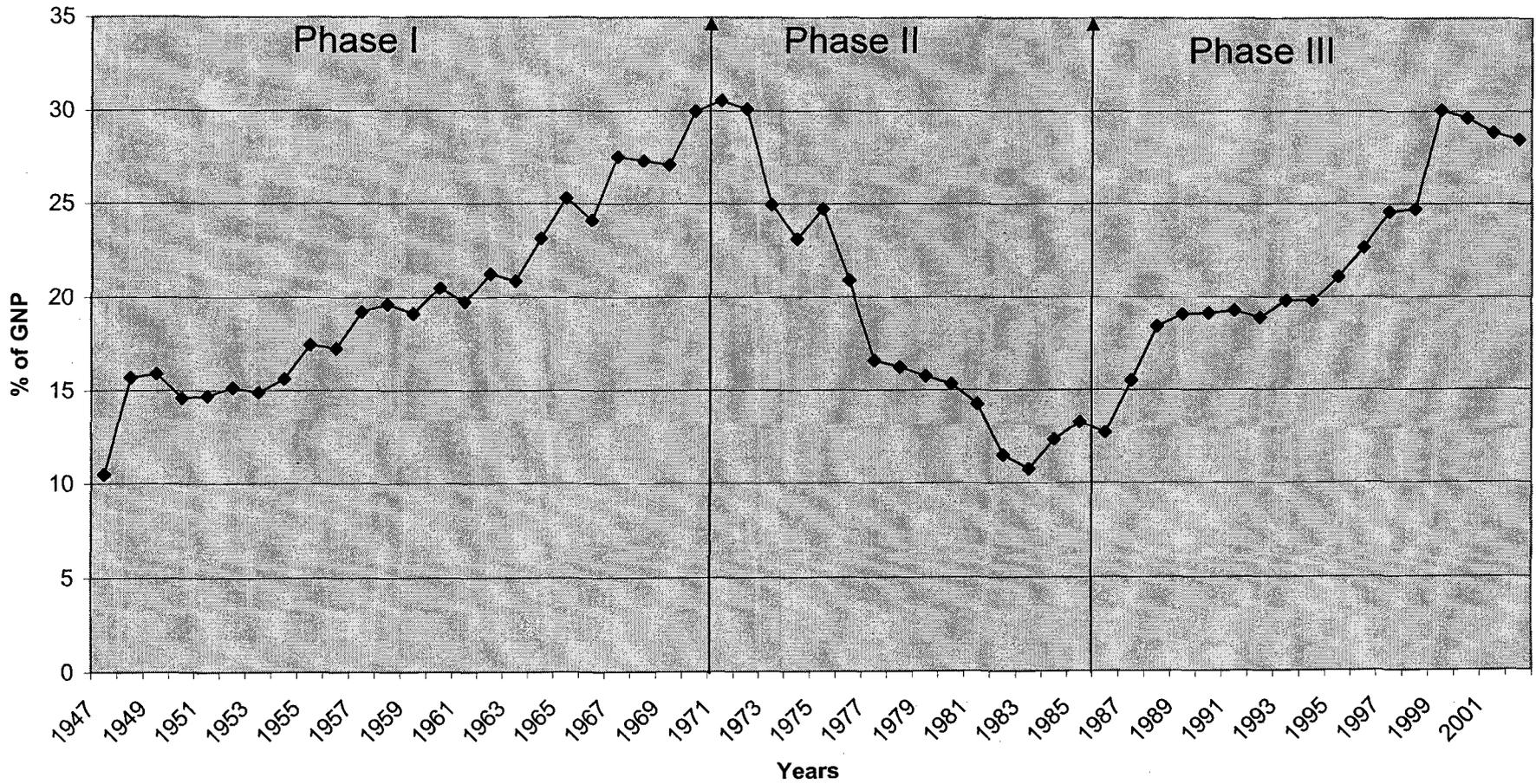
Finance Corporation attest.¹² According to Padin (2003, p.294) the Development Bank had a 'marginal role in financing public infrastructure' Padin sustains that during the period 1950-1967, 75% of all long-term investment went into housing while the rest was distributed between the United States and the Puerto Rican government (15% and 17%). As a result, the financing of long-term investment was an insignificant part of the bank's asset sheet and 'the modest loan activity, 33%, of its portfolio shows no clear commitment to industrialisation –a mere 16% of bank assets were in the form of industrial development finance, the purported priority of the government's development program'. (Ibid, p. 294)

Besides government intervention, the development of private enterprise was further enhanced by a policy of tax incentives deliberately aimed at encouraging domestic investment. One such example is the 1948 law granting tax incentives.

The 1948 law exempted new industries established in 1947 from income, property and excise taxes in Puerto Rico. The level of exemption granted was established at 100% until 1959 and 75%, 50% and 25% in the following three years (Lewis, 1949). As Lewis saw it the law benefited only: '(a) Puerto Rican capitalists who establish new industries; (b) U.S. capitalists who move from the U.S. to Puerto Rico; (c) by a special provision of the U.S. but who derives 80% of his income from Puerto Rico, including 50% from active conduct of a business in Puerto Rico (probably a rare species)...Tax exemption thus benefits the small American capitalist who is willing to transfer to Puerto Rico, and the large American capitalist who is willing to use his Puerto Rico profits to expand his assets in Puerto Rico. But it would not help a large American corporation which built a branch plant in Puerto Rico and wished to use the income to declare dividends to its American shareholders'. Thus the tax laws and incentives benefited domestic investment.

¹² The Reconstruction Finance Corporation was a United States federal agency and had an office in Puerto Rico.

Figure 5
Puerto Rico
Gross formation of fixed capital as a percentage of GNP
1947 - 2002



The effect of these policies is clearly seen in the trend of the investment coefficient which stood at 8% of GDP in 1940 and rose steadily to 31% in 1971 (see Table 3)¹³ and which in fact acted as the main force behind the process of economic growth

Eye inspection of Figures 3 and 5 reveals that the different phases of convergence correspond closely to the variations in the investment coefficient. The results of a simple cointegration analysis between our convergence variable and the investment coefficient validate the existing strong linkage between both variables (see Table 4 below).

Table 4					
Puerto Rico					
Cointegration analysis of convergence and the formation of fixed gross capital					
1947-2002					
Descriptive statistical analysis					
	Mean	Coefficient of variation	Coefficient of correlation		
LC	3.2	0.06	0.61		
LGFCF	2.9	0.11			
Unit root tests					
	Lag	Test statistic	ADF 95% critical value		
LC	5	-1.90	-3.50		
LGFCF	5	-1.82	-3.50		
Δ LC	3	-2.31*	-2.92		
Δ LGFCF	5	-3.36	-2.92		
Cointegration test results					
H_0	H_a	Optimal lag	Johansen Statistic	95% CV	90% CV
$r=0$	$r=1$	4	15.83	15.81	13.81
$r<0$	$r=2$	4	7.78	9.16	7.53
Cointegrating equation					
$LC = 1.69 + 0.56 LGFCF$ <p style="text-align: center;">(0.36) (0.12)</p>					
Note: LC = logarithm of convergence. LGFCF= logarithm of gross fixed capital formation. * = significant at the 95% confidence level. ADF= augmented Dickey Fuller statistic. The Dickey Fuller regressions testing for unit roots contain a trend when applied to variables in levels. Δ = first difference. H_0 and H_a = null and alternative hypothesis. CV= critical value. Source: On the basis of official sources.					

Cointegration provides an empirical analysis of long-run economic relations that take into account the potential non-stationary properties of the data. That is, it captures the fact that the time series processes may not have a constant mean or a bounded variance. The standard method to allow for non-stationarity in the estimation of long-run economic relations is to apply

¹³ Lefort pp.4-5 also notes the rise in investment although he attributes it to the importance of external sources in capital formation which was complemented by domestic capital.

cointegration methods. The first step of this method requires verifying that the relevant variables have compatible orders of integration.¹⁴ This task is here done through the application of the conventional and the augmented Dickey-Fuller tests.

Once such compatibility is checked, the next step consists of estimating the number of stationary linear combinations (so-called cointegration vectors) of the relevant variables. If no such combination is identified the variables are said to be not cointegrated; in other words there is no stable long-run linear relation between them.

On the other hand, if at least one such combination exists, the variables are said to be cointegrated and the estimated coefficients are interpreted as the long-run linear multipliers of the relevant regressors. To estimate the number, if any, of such cointegrating vectors we applied Johansen's methods.¹⁵ It is necessary to first specify a vector autoregressive (VAR) system with the set of relevant variables and then to estimate the number of long-run equilibrium relationships between them.

The results presented in Table 4 show that both the convergence and the investment coefficient ratios series are correlated. The correlation coefficient is 0.61. In addition there is a long-run relationship between both variables as the Johansen Statistic derived from running the cointegrating equation between convergence and gross capital formation could not reject the existence of a long-run relationship at the 5% confidence level. The results also show that an increase of 1% in the investment coefficient ratio leads to a half percentage point increase in the convergence ratio.

The dynamics underpinning the behaviour of the investment coefficient are explained mainly by construction activities and to a lesser extent by machinery and equipment. For the period 1947-1971 construction activities represented 61% of total investment while machinery and equipment stood at 33% of the total.

The decomposition of construction into its public and private component shows that the government accounted for 19% of total investment in construction whereas 35% of the total was in private hands (see Table 5 below).

While Operation Bootstrap managed to implement its first stage during this period, its second stage was only partially fulfilled.

Padin (2003) notes the absence of foreign direct investment at least during the first decade of Phase I. In this regard, he states (Ibid, pp.285-286): 'US firms attracted to Puerto Rico in the 1950s were relatively small, labor intensive operations in declining sectors with a grim future in the United States...The turn to private foreign direct investment was initially so uncertain that each new plant was celebrated with the orchestrated fanfare of a development agency fearful of losing public support for its efforts.'

¹⁴ The order of integration of a stochastic variable $X(t)$ is defined as the number of times it must be first-differenced to obtain a stationary series.

¹⁵ Simple introductions to unit-root testing and cointegration analysis may be found in Cuthbertson (1992) and Charemza and Deadman (1992) and Enders (1995).

For the following decade Morley (1980, p.183) stresses that, "The number of new factories in operation as a result of 'Operation Bootstrap' grew from 548 in 1957-1958 to 1,003 in 1964-1965 and then jumped dramatically to 1,674 in 1967-1968 when heavy capital investments were beginning to establish a foothold in the Puerto Rican economy".

It is this latter period of heavy capital investments, which matured in Phase II and brought about the consequences generally associated with 'industrialisation by invitation' namely, capital-intensive technology and assembly plant industrialisation that translated into low employment creation growth and weak linkages between United States subsidiary firms and the rest of the Puerto Rican economy. This is reflected in the fact that unemployment declined from 1960 to 1969 and began to increase thereafter.

The take-off in foreign investment at the end of the first phase responded no doubt to the change in the tax legislation as the 1948 act was replaced with a new and more comprehensive tax exemption act in 1963 and later in 1969 by the increase in the flexibility in the granting of tax incentives given to the government. The 1963 tax act granted exemptions of up to 100% on earnings ranging for a period of 10 to 17 years. Also the tax exemption period could be expanded when a firm opted for 50% exemption on earnings combined with full exemption on local taxes.

This argument is reinforced by indirect empirical evidence that shows that foreign direct investment flows had only partially expanded during this period. If as a general rule profit repatriation is a percentage of foreign direct investment flows and if the repatriation of profits is measured by the difference between the gross domestic product (GDP) (income produced in Puerto Rico) and the gross national product (GNP) (income available in Puerto Rico) then it can be easily verified that foreign direct investment began to fully expand from the middle of the 1970s, that is, during the period we have termed Phase II.

Figure 6
Government consumption as percentage of GDP
Puerto Rico and the United States
1947 - 2002

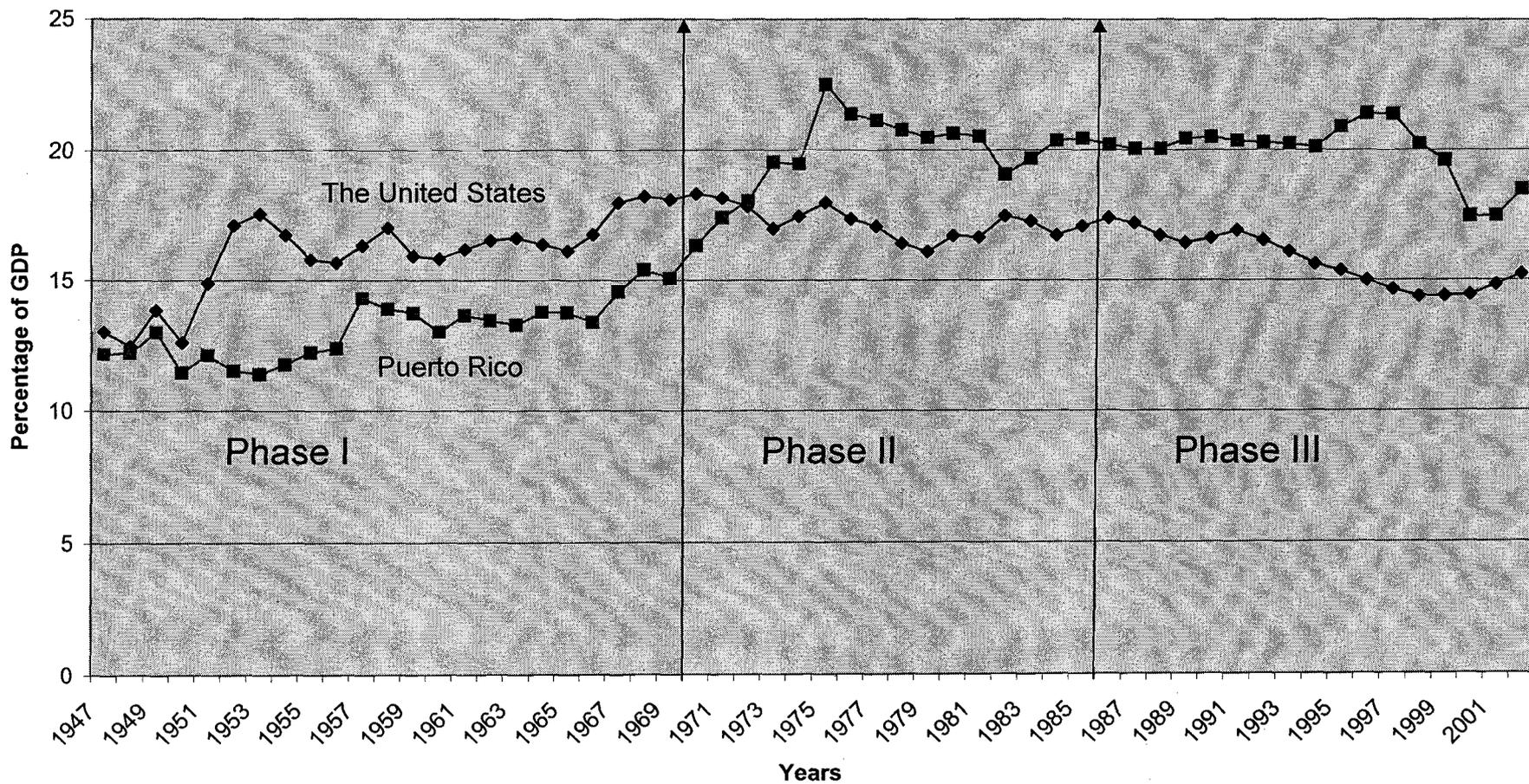


Table 5
Puerto Rico
Gross formation of fixed capital and its components
As a percent of the total
1950 – 2002

	1950- 1960	1960- 1970	1970- 1980	1980- 1990	1990- 2000	2002	1947- 1971	1971- 1986	1986- 2002
Construction	66.12	67.40	64.65	53.54	50.03	53.00	65.49	60.66	50.33
Private firms	30.82	40.48	32.53	22.25	23.81	33.53	34.53	28.10	24.41
Public firms	22.22	16.61	19.75	22.32	16.75	10.90	19.59	21.09	17.11
Government	13.06	10.31	12.37	8.98	9.48	8.57	11.28	11.47	8.81
Central (1)	10.92	7.20	8.56	5.65	6.90	6.19	8.91	7.59	6.16
Machinery and equipment	33.89	32.60	35.36	46.46	49.97	47.00	34.51	39.34	49.67
Private firms	27.75	29.45	31.32	41.78	46.96	45.17	29.12	34.98	46.35
Public firms	3.98	1.30	1.87	2.05	1.19	0.57	3.14	1.95	1.38
Government	2.17	1.85	2.17	2.62	1.82	1.27	2.26	2.42	1.94
Central (1)	1.99	1.57	1.75	2.10	1.50	0.97	2.06	1.91	1.59

Source: On the basis of information provided by the Planning Board of Puerto Rico

More precisely if the proxy for profit repatriation (i.e., the difference between GDP and GNP) is measured as a percentage of GNP, it is seen that throughout the 1940s and 1950s the ratio was negative standing at 6% of GNP on average. It turned positive in 1960 and rose steadily throughout the period. During the 1960s the ratio equalled 4.4% on average. In the following three decades, the difference of GDP and GNP to GNP increased to 17%, 37% and 48%, respectively. In 2002, it again rose to 57%.

The scant empirical data available on foreign direct investment validates this hypothesis. Between 1960 and 1967 total United States investment in Puerto Rico increased from 1.4 to 5 billion and continued to expand to 10, 15 and 20 billion in 1973, 1976 and 1978, respectively (Bonilla and Campos, 1982, p.135 and p. 136).

Finally it is noteworthy to reiterate that this was not an export-led or trade-led growth period. In fact imports and especially exports expressed as a percentage of GNP stagnated showing little correlation among GNP growth, exports or openness. Total external sales as a percentage of GNP increased from 53.1% in Phase I to 68% and 90% in Phases II and III (see Table 3 above). For its part the simple correlation coefficient between the rate of growth of GNP and total external sales shows a higher degree of association in Phase II than in Phase I (0.45 and 0.33, respectively).

4. Phase II (1971-1986): the divergent phase¹⁶

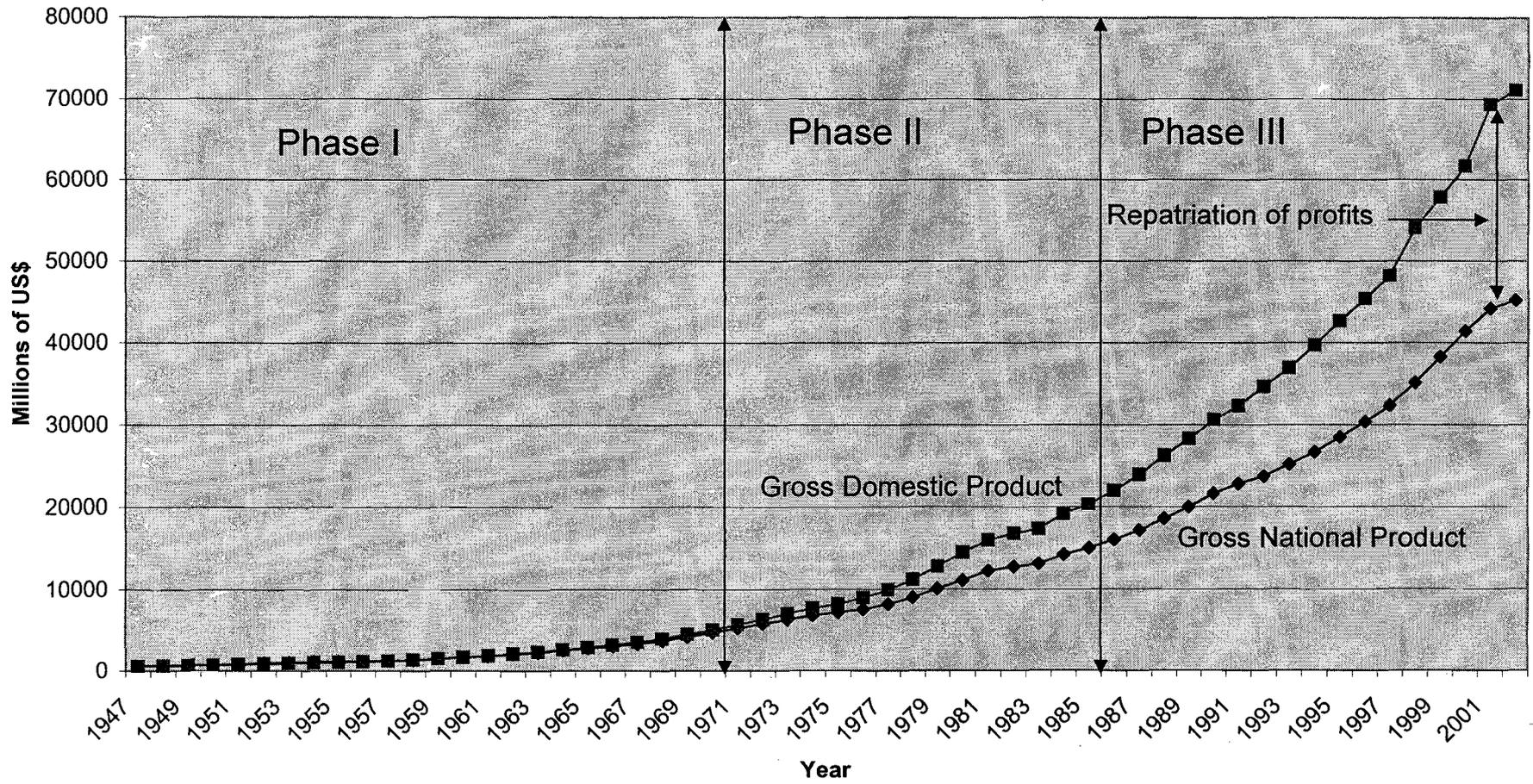
Phase II represents from our point of view the full application of the Arthur Lewis Model termed 'Industrialisation by Invitation' to Puerto Rico. During this period the three elements of industrialization by invitation, namely, fiscal incentives, foreign direct investment (FDI) promotion and attraction, and a trade policy oriented to develop selected targeted industries were articulated into a full-fledged development strategy.

The attraction of foreign direct investment was directly tied to a policy of federal and local fiscal incentives¹⁷. At the local level during Phase II, the Industrial Incentives Act (1978) sought to homogenize the existing Puerto Rican tax legislation with that of the rest of the United States. This meant the elimination of the regime of local tax exemptions, which had been in place since the late 1940s and which had provided a stimulus to the expansion of domestic investment. More importantly the 1978 Act encouraged the development of the services sector by granting a tax break of 50% to export-oriented service firms engaged in 'distribution, consulting, accounting, banking and computer systems'. According to Dietz (2001) 'this contributed to the shift in overall production toward services and the emergence of...the 'high finance' stage of industrialisation.'

¹⁶ During this phase the Partido Popular Democrático returned to power in 1973 and ruled until 1976 when it was defeated by the Partido Nuevo Progresista (1976-1985).

¹⁷ Arthur Lewis thought that the main incentive to attract foreign capital to the Caribbean was lower labor costs. Lewis sought to supplement this by a policy of fiscal incentives. The protectionist side to this development model came at a later stage. In fact, Lewis, rather than arguing in favor of protection from imports stated the case for export subsidies. As he put it (Ibid, p. 886): "Most of the industries will have to export, and if they are to do this, they must be able to compete on the world market; and if they can compete there, they will not need protection in the domestic market".

Figure 7
Puerto Rico
GNP and GDP
1947 - 2002



While fiscal incentives began to be put in place in the latter part of the 1940s, as mentioned earlier they did not necessarily fulfil their function in stimulating foreign investment or in attracting United States-based firms. An additional indication of this is the number of times the tax exemptions were amended (1948, 1954, 1963, 1978).

At the federal level, Section 931 of the United States internal revenue tax code in force until 1976, allowed United States corporations to 'exclude their profits from any US tax liability on so-called possessions income, as long as these profits were not repatriated to the US during the 'life' of the corporation'. As also noted by Dietz (2001), this law 'led to 'ghost' closings of corporations at the end of their Puerto Rican exemption period so that profits could be repatriated. These firms would be then reconstituted with a new exemption period in Puerto Rico until a subsequent ghost liquidation took place so that profits could again be remitted tax free'.

The Tax Reform Act of 1975 replaced Section 931 with Section 936. It provided a tax credit "equal to the full amount of the United States corporate income tax liability on income generated by production, trade or investment activities of an active business in a United States possession". This incentive "sheltered a large proportion of corporate income taxes generated by profits of production facilities located in Puerto Rico. The intent was to promote development of the Puerto Rico economy and the reduced costs also encouraged production of materials for export"¹⁸. Investment income was also exempted from the federal income tax provided that at least three-quarters of all profits came from trade or production activities and provided that the income was earned and invested in Puerto Rico.

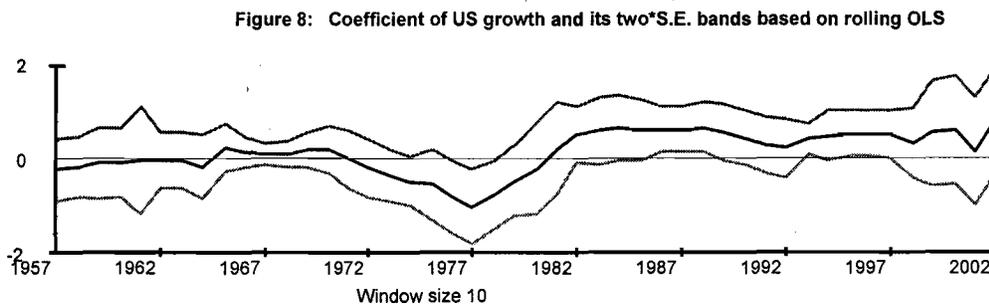
Section 936 was without doubt a significant tax incentive act as it was estimated that more than 90% of those corporations that qualified for tax exemptions under Section 936 were located in Puerto Rico. However the law also led to a concentration of industry in manufacturing and pharmaceuticals. In fact the drug and pharmaceuticals industry received half of the tax benefits granted by section 936 of the tax reform act of 1975.

For all purposes the combination of the Industrial Incentives Act (1978) and the entry in force of Section 936 of the 1976 Tax Reform Act curtailed the expansion of domestic investment and encouraged capital outflows. Nationals saw the share of non-local direct investment increase from 26% to 44% between 1970 and 1980. Also the difference between GDP (income produced in Puerto Rico) and GNP (income available in Puerto Rico) began to widen substantially during this phase. On average in Phase I, the difference between GDP and GNP in terms of GNP was nil. It increased steadily to 23% and 47% in Phases II and III (see Figure 7 above).

At the same time the development of the pharmaceutical industry, which is highly capital intensive did not favour the creation of employment. Indeed it was estimated in 1987 that the level of employment in pharmaceutical companies represented less than 3% of the total employment generated in Puerto Rico. Also they represented less than 18% of the total employment generated by companies benefiting from the tax exemptions granted in Section 936.

¹⁸ See, The Urban Institute. *Targeting Export Markets for Puerto Rico*. 1997.

These conditions set the stage for a period of economic decline and lack of convergence, the hallmark of Phase II, and which was aggravated by the first oil-OPEC shock¹⁹. During part of this period the rate of growth of Puerto Rico decreased relative to Phase I in spite of the fact that the United States' rate of growth was actually increasing. As shown in Table 3, the rate of growth of the United States increased from 5.2% and 8.5% in Phases I and II whereas that of Puerto Rico decreased from 8.3% to 6.2%. This is also shown in greater detail in Figure 11 and in the econometric results derived from running a rolling regression of Puerto Rico's growth rate on that of the United States. Choosing a window size of 10 observations, it is shown that the coefficient has a clear inflection point in 1971 and is negative, indicating an opposite movement in the rate of growth of Puerto Rico and that of the United States from 1971 to 1979 (see Figure 8 below).



It is noteworthy to remember that the absence of convergence was not uniquely in relation to the United States but also to other countries.

Padin (2003) notes the start of a marked cleavage between Puerto Rico and the four Asian NICS (Hong Kong, Singapore, South Korea and Taiwan), which provided, according to some authors (Baumol and Wolff, 1996), the basis on which to compare the post WWII development of Puerto Rico. Table 6 below shows that the GNP per capita growth and GDP growth of Puerto Rico was roughly in line with that of the rest of the NICs during the period 1960 to 1970 (5.9% and 7.1% for Puerto Rico and 6.6% and 8.7% on average for Puerto Rico and the NICs). Contrarily in the following decade the rate of economic growth of Puerto Rico fell below the average by more than four percentage points (3.0% for Puerto Rico and 7.6% for Puerto Rico and the NICs on average).

¹⁹ Note that the unfavourable economic conditions of the 1970s are viewed as an aggravating factor rather than as a triggering mechanism.

Table 6
Average annual growth for Puerto Rico and the Newly Industrialised Countries
1960-1970 and 1970-1982
In percentages

	1960-1970		1970-1982
	GNPpc	GDPa/	GDPa/
Puerto Rico	5.9	7.1	3.0
Singapore	5.5	8.8	8.5
Hong Kong	8.7	10	9.9
Taiwan	6.3	9.2	8
South Korea	6.4	8.6	8.6
Average	6.6	8.7	7.6
Difference in the average rate growth of GDP per capita of Puerto Rico and CARICOM	n.a.	3.2	0.97
Latin America b/	n.a.	5.4	4.8
Latin America c/	n.a.	5.0	4.2

Note: a/GNP in the case of Puerto Rico; b/refers to weighted GDP; c/unweighted GDP.
Source: Padin (2003); INTAL (2001).

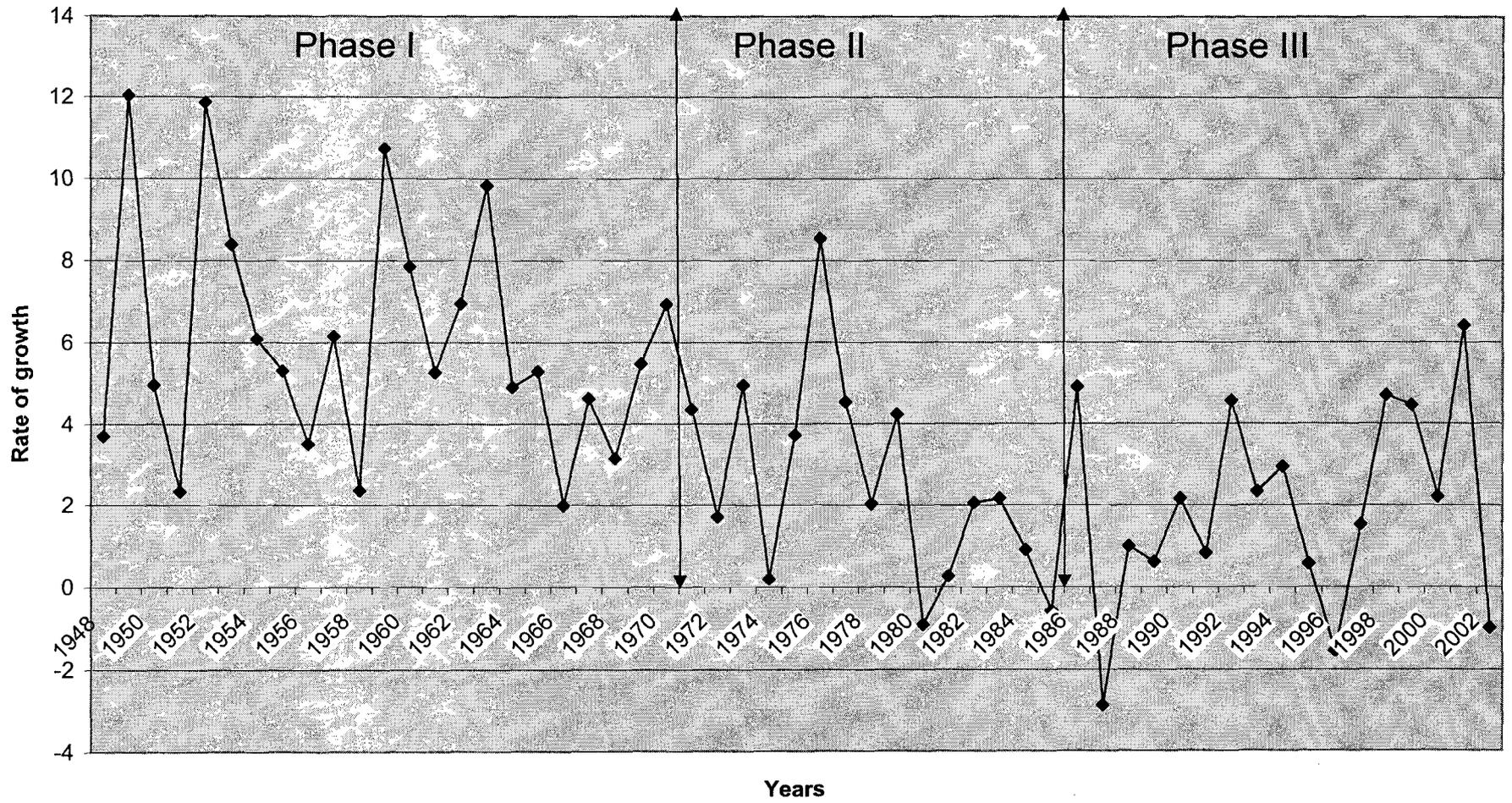
Another way to approach this phenomenon is by looking at the opposite case, that is, by comparing Puerto Rico to countries, which on average have experienced relatively lower rates of growth or levels of income. In this case the lower growth or income level countries would experience a process of convergence to the growth or income trajectory of Puerto Rico.

A comparison of Puerto Rico's GDP per capita growth to that of Caribbean Community (CARICOM) economies shows that the differences in their respective rates of growth declined from 3.2% in 1960-1970 to 0.97 for 1970-1982.

As mentioned previously this period of lack of convergence was also one of economic decline. In the early 1970s productivity and the formation of gross capital dipped. Gross formation of fixed capital as a percentage of GNP fell from the overall high of 30% reached in Phase I to 13% at the end of Phase II. The economic decline is also present when comparing the rate of growth of Puerto Rico to that of Latin America. Puerto Rico experienced a rate of economic growth higher than that of Latin America in the 1960s and a comparatively lower rate of growth in the following decade (7.1% and 5.0%; 3.0% and 4.8%, respectively).

In a similar vein, the rate of growth of productivity showed a downward trend (see Table 3 above and Figure 9 below). On average, the rate of growth of productivity declined from 5.83% to 2.58% between Phases I and II.

Figure 9
Puerto Rico
Rate of growth of productivity
1947-2002



Finally the level of employment stagnated and the rate of unemployment rose substantially. Phase I saw the creation of 152 000 jobs while Phase II saw the creation of only 92 000 jobs. Moreover the coefficient of variation of the level of employment decreased from 0.09 in Phase I to 0.02 in Phase II. The absence of a dynamic labour market was clearly reflected in a doubling of the rate of unemployment. In 1970, the rate of unemployment reached 10% and doubled to 21% in 1985 (that is, at the end of Phase II) (see Table 7 below).

Part of the socially negative effects of the stagnation in employment and the increase in the rate of unemployment were mitigated by the important increase in federal transfer payments. Net transfers to the private sector rose from 13% to 27% of GNP between 1971 and 1977.

	Phase I 1947-1971	Phase II 1971-1986	Phase III 1986-2002
Employment (000')	597.2	734.7	1028.6
Employment creation (000')	127	99	372
Productivity growth %	5.8	2.6	2.0
Unemployment rate %	10.3	21.4	13.1
Net transfer of funds as % of GNP	15	25-30	20

Source: On the basis of official data

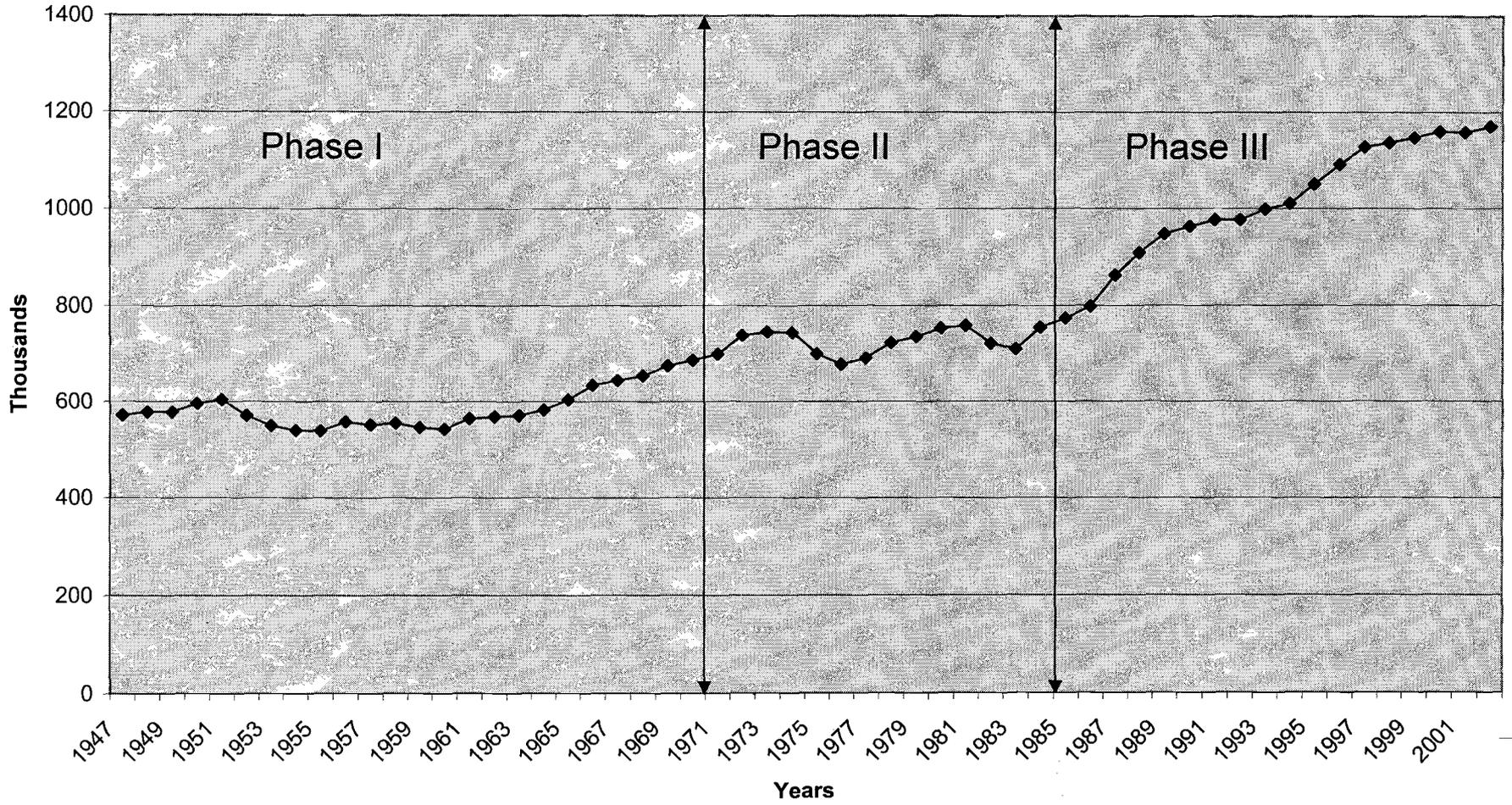
5. Phase III (1986-2002): the return to convergence²⁰

The third phase, which started in 1986, is marked by a return to a convergence path with the rest of the United States. This is partly explained by favourable external conditions that prevailed during the second half of the 1980s and throughout the 1990s.

According to the cycle dating procedure of the National Bureau of Economic Research, the United States experienced an expansion in its cycle from the fourth quarter of November 1982 to the third quarter of July 1990. From the third quarter of July 1990 until the first quarter of March 1991, the United States economy contracted but then recovered to register an unprecedented period of economic expansion and stability that lasted from the first quarter of March 1991 until the first quarter of March 2001. The following recession lasted from the first quarter of March 2001 until the fourth quarter of November 2001.

²⁰ The Partido Popular Democrático (PPD) ruled from 1985 until 1992. The Partido Nuevo Progresista (PNP) remained in power from 1992 until 2000 when Sila Calderón of the PPD was elected to the governorship of Puerto Rico. The next elections will be held in November 2004.

Figure 10
Puerto Rico
Employment (000')
1947 - 2002



Overall, from 1986 until 2002, the United States experienced 16 months in a contractionary phase of the business cycle (counting from peak to trough) that represents 22% of the total months included in the sample and indicating that during Phase III, Puerto Rico benefited from the favourable growth conditions in the United States²¹.

In addition by breaking GNP down into its different components it is seen that in Phase III, the gross formation of fixed capital as a percentage of GNP reversed its downward trend of Phase II, rising from 17% in 1986 to 30% of GNP in 1999 and settling at 28% of GNP in 2002. The effect of investment on GNP was somewhat offset by the fall back in productivity. Indeed as Table 3 shows, Phase III of the convergence path is the lowest in terms of productivity growth (6%, 3% and 2% for Phases I, II and III). Furthermore as visual inspection of Figure 8 above shows, productivity growth is clearly marked by three plateaux, which clearly correspond to the three convergence phases.

The slowdown in productivity growth reflected the failure of output to increase jointly with employment, which registered the highest expansion during the period under consideration (see Figure 9 and Table 8). The increase in employment reflected the dynamism of the construction and the government sectors. Between 1990 and 2001, employment rose from 963 000 to 1 157 000 reflecting the creation of 194 000 jobs. Of this total, the construction and public services sectors accounted for 38%. In turn the activity in the construction sector was oriented towards residential investment in the private realm and government and municipalities in the public realm.

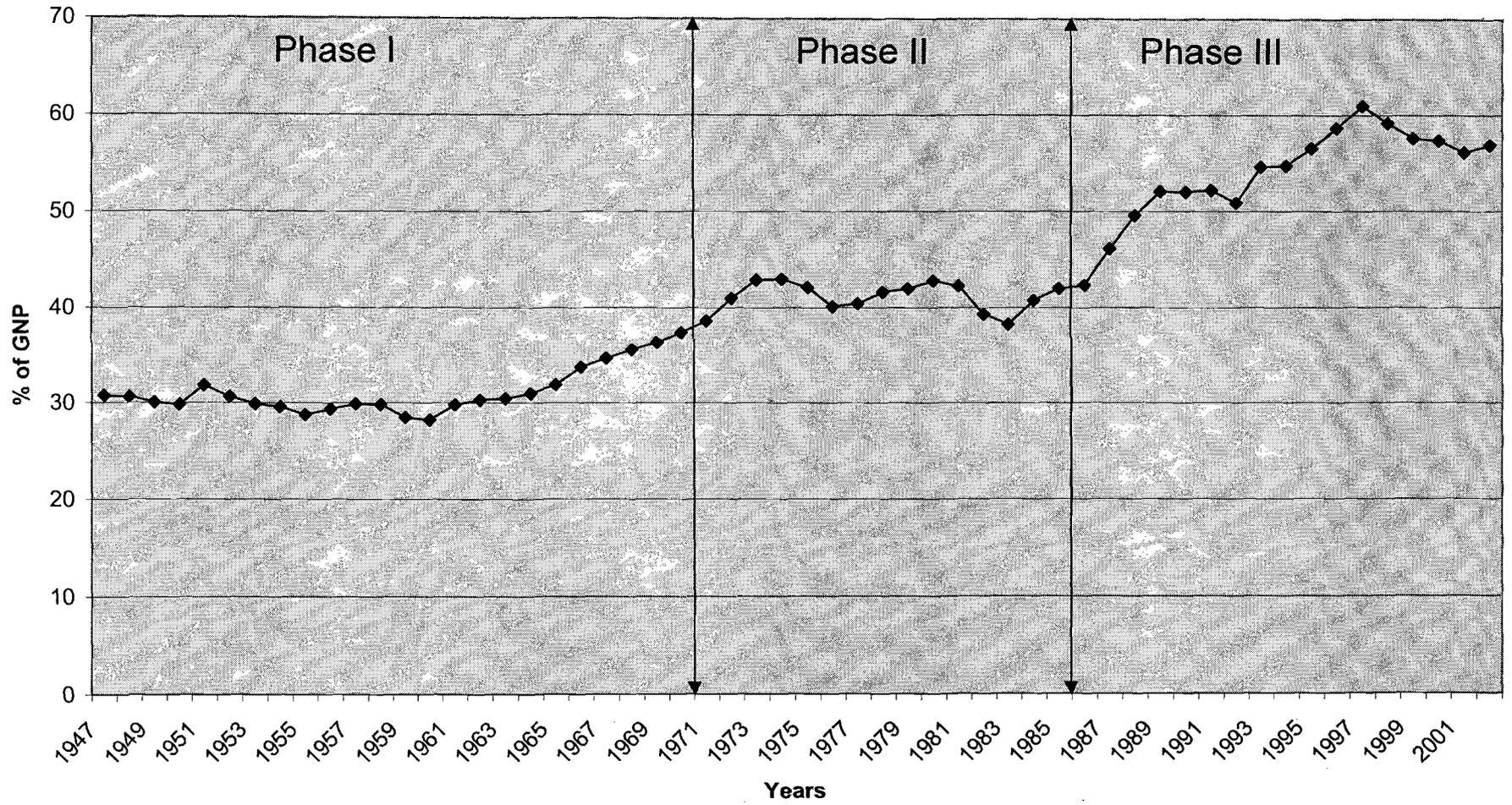
Table 8
Employment by sector of economic activity
1990 – 2001

	1990 (000')	% of total	2001 (000')	% of total	Change (000')	Contribution to the change %
Agriculture	36	3.7	22	1.9	-14	-7.2
Manufacturing	168	17.5	159	13.7	-9	-4.6
Construction	55	5.7	85	7.3	30	15.4
Transport and public utilities	60	6.2	56	4.8	-4	-2.1
Commerce	185	19.2	242	20.9	57	29.2
Financial services	30	3.1	40	3.5	10	5.1
Public services	206	21.4	251	21.7	45	23.1
Others	222	23.1	302	26.1	80	41.0
Total	962	100	1157	100	195	100

Source: On the basis of the Economist Intelligence Unit and official data

²¹ Determining whether there is business cycle synchronisation between the United States and Puerto Rico would require a comprehensive and detailed data set (such as for example a long series of quarterly GDP or GNP) that is not available for Puerto Rico.

Figure 11
Puerto Rico
Wage share
1947 - 2002



The result of an increase in employment and the slowdown in productivity is the rising trend in the wage share. The wage share stagnated at 30% of GNP during most of Phase I rising to 38% at the end of this phase. In Phase II the wage share stood at 40% of GNP registering little deviation from that average. In Phase III, the wage share expanded substantially to reach 57% of GNP in 2002. Through national accounting identities the wage share can be broken down into the product of the real wage and the labor output ratio.

That is, by accounting identity (abstaining from intermediate inputs and indirect taxes) conventions nominal output equals:

$$(1) PY = wbY + rPK$$

Where,

P = price level

Y = level of output

b = the labor/output ratio

r = profit rate

K = capital stock

Dividing Eq. (1) by PY it is obtained that,

$$(2) 1 = (wbY)/(PY) + (rPK/PY) \Leftrightarrow 1 = (w/p) b + rK/Y$$

According to Eq (2), the normalised level of output is equal to the sum of the product of the real wage and the labour output ratio (the wage share) and the profit share. In the particular example of Puerto Rico, the empirical evidence available shows that the increase in the wage share resulted from both an increase in the labor/output ratio and the rise in the real wage (see Figure 11 above). At the same time the increase in the wage share meant the decline in the profit share. Thus in terms of distribution Phase III was favourable towards the salary earning segment of the population. As a result of the above reasoning, the convergence in Phase III is actually the product of what is termed conventionally a wage-led regime.

In analysing Phase III it is important to note that it is by far the most 'open' phase. External sales as a percentage rose from 60% to 90% of GNP in Phases II and III. Openness defined as the sum of external sales and purchases as a percentage of GNP increased from 177% to 244% of GNP between Phases I and II. However, the correlation between the rate of growth of export and that of GNP is weak suggesting a weak degree of association between both variables. The simple correlation coefficient is 0.33 for Phase III as compared to 0.45 for Phase II.

6. Trade and convergence

One of the key variables identified in the literature (see Baumol and Wolff, 1996) as promoting convergence is trade openness. As noted previously, external sales and purchases

have increased significantly during the period under study, and especially in the third phase of the convergence trajectory.

Overall available data on exports and imports for 1993 to 2002 indicate that Puerto Rico has registered a widening global trade surplus. In 1993 the trade surplus was equal to \$3.6 billion increasing to \$12.4 billion in 2002. This is due mainly to its standing trade surplus with the United States since the available trade data show a deficit with the rest of foreign countries (see Table 9 below).

However it should be taken into account that Puerto Rican authorities provide two ways of capturing trade data, origin of movement, which is captured by customs data, and post of final shipment. The customs data are not necessarily the most accurate way to record exports and imports as they only record data based on customs districts and port.

These data may underestimate exports since exports that originate in Puerto Rico may actually clear customs in another state, say Miami, and be recorded as an export of that state. As an example, at the aggregate level registered exports equal 5,363 million while exports based on an origin of movement criterion are equal to 9,896²². That is, the first method underestimates the value of exports by \$4,533 million. At the individual country level the error becomes greater as the distance between Puerto Rico and a partner country increases. As an example, in the case of Great Britain, registered exports are equal to \$731,000. On an origin of movement criterion, exports to the United Kingdom amount to \$1.5 billion (see Table 10 below).²³

²² Registered exports include goods produced in Puerto Rico and exported from Puerto Rico and goods that were not produced in Puerto Rico and were exported from Puerto Rico. The computations could have also used direct exports which are goods produced in Puerto Rico and exported from Puerto Rico. The difference is equal to US\$4,829 million. See Selected Statistics on Puerto Rico's External Trade 2002. Puerto Rico Planning Board (January 2003).

²³ This particular way of recording data, which is the 'standard way' of recording data, and the absence of a long run export data set (in terms of levels and its composition) constitute an important impediment to carry out an analysis in trade structure between the United States and Puerto Rico.

Table 9
Puerto Rico
Trade balance with the United States and other countries; number of visitors and tourist expenditure
1993 - 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Trade balance	3404.9	5098.4	4994.7	3883.5	2559.4	8475.4	9602.4	11422.9	17751.5	18187.7
United States	5713.8	7815.1	8948.8	8239.3	7869.5	14171.5	15399.3	18683.9	25781.1	27178.4
Virgin Islands	126.7	-1.7	-142.1	-229.5	-352.8	-506.6	-494.8	-589.6	-700.6	-617.4
Foreign Countries	-2435.7	-2715	-3811.9	-4126.3	-4957.2	-5189.5	-5302.1	-6671.4	-7329	-8373.3
Africa	-83.3	-91.9	-112	-159.4	-177.8	-187.8	-92.7	-180.3	-68.9	-64.3
Central America	-49.1	-39.7	-62.9	-49.5	-24.3	-16	-30.8	-41.9	-66.4	-57
North America	-241.4	-90	-224.8	-197.6	-216.1	-225.1	-510.7	-362.9	-336	-232
South America	-1056.9	-970.9	-738.5	-868.3	-1091.8	-997	-856.6	-1240	-1122	-856.3
Asia	-1020	-1311.1	-1776.7	-1657.9	-1576.9	-1282	-1484.2	-1675.6	-1299.9	-1261
Australia and the Pacific	-6.1	24.5	1.5	17.6	2.6	5.2	6.1	16.7	52.3	10.7
Caribbean	-83.5	47.3	64.1	-60.8	-236.6	-79.4	-82.9	-60.9	-255.6	-280.7
Europe	104.5	-283.2	-962.6	-1150.3	-1609.4	-2407.4	-2250.3	-3126.6	-4232.6	-5632.7
Number of visitors	3869	4022.6	4086.6	4110.2	4349.7	4670.8	4221.3	4566	4907.8	4364.1
Tourist expenditure	1628.1	1728.3	1827.6	1898.3	2046.3	2232.9	2128.5	2387.9	2728.1	2486.4

Source: Puerto Rico Planning Board (2003)

United States	0.89
United Kingdom	2.08
Germany	3.43
Holland	1.21
Japan	1.56
Dominican Republic	0.99
Italy	1.92
Belgium	1.43
France	2.10
Switzerland	0.14
Ireland	1.17
Singapore	9.67
Mexico	2.19

While origin of movement is generally taken to be the more accurate method to compute exports it is far from being a flawless method. As Coughlin and Pollard indicate (2001, p.26):

“The MISER export data are regarded as the best available data source for state exports; however, these data have some well known weaknesses. One potential important problem is that the identified export state may not be the state of manufacture, but rather the state of a broker (or wholesaler or the state where a number of shipments were consolidated.”

In what follows, trade flows are computed and are presented on an origin of movement basis when the required data is available.²⁴ Origin of movement data is provided by the Massachusetts Institute of Social and Economic Research (MISER) using the SIC classification and up to six digits of the harmonized code system. Customs district data is provided by the United States Trade Representative using SIC and SITC trade data classification and also up to 10 digits of the harmonized code system²⁵.

²⁴ The MISER data does not provide imports based on origin of movement by state. An alternative to computing exports on an origin of movement or port of final shipment is to use the exporter location criterion but is subject to the same caveats as those pointed for the origin of movement. Using exporter location, New York appears as one of the largest exporters of agricultural products (see, MISER State Export Data Explanation provided in the MISER website).

²⁵ In the trade data presented in the export and import tables below the document used customs data and when available MISER data. When denoted, the data was taken from ECLAC's Caribbean Trade Data Base.

Table 11
Puerto Rico
Direction of trade: Exports as a percentage of the total by partner country, 2001

United States	77.65
United Kingdom	3.13
Germany	2.14
Holland	1.86
Japan	1.46
Dominican Republic	1.36
Italy	1.36
Belgium	1.22
France	1.11
Switzerland	1.06
Ireland	0.59
Singapore	0.50
Mexico	0.49
South Korea	0.44
Brazil	0.20
Argentina	0.16
Panama	0.14
Colombia	0.08
Honduras	0.07
Costa Rica	0.06
Venezuela	0.05
El Salvador	0.05
Ecuador	0.05
Guatemala	0.01
Uruguay	0.01
Chile	0.01
Trade intensity indices	
United States	4.00
United Kingdom	0.61

Source: Puerto Rico Planning Board (2002)

Note: export shares were computed following the origin of movement criterion. The trade intensity index is computed following the methodology of Anderson and Norheim (1993). See also, Grimwade (1996). The trade intensity index is equal to the ratio of the share of a country's exports going to its partner country divided by the partner's country share in world imports. The trade intensity ratio is used generally to measure the degree of regional integration of two trade partners. In this document the index is used in a broader perspective.

As shown in Table 11, the main trading partner is the United States (77% of the total) followed by four European countries (United Kingdom, Germany, Holland, and Japan representing 3.1%, 2.1%, 1.9%, 1.5% of the total) and the Dominican Republic (1.4% of the total). At the product level Puerto Rico's exports are concentrated in pharmaceutical products, computer equipment and electrical machinery representing, in 2002, 70%, 9% and 2% of the

total. Computer equipment and pharmaceutical products are considered manufactures with high skill and technology intensity while electrical machinery is viewed as a manufacture with medium skill and technology intensity. In the past two decades, these products have combined a rapid growth rate (the average annual growth rate of computer exports was 12% while those of pharmaceutical products and machinery were 12% and 16%) with a high share of world exports.

Excluding fuels, which represent 5% of its total imports, Puerto Rico's import structure is also biased towards high and medium technology products. The main import products are chemicals followed by computer and electronic products, transportation equipment and machinery (43%, 7%, 8% and 4%).

The issue of whether Puerto Rican exports have contributed to growth and to convergence is not a straightforward issue or one that has been explored to its full extent. A common voiced concern is that the existing system of federal and local tax incentives led to the establishments of firms that specialised in final assembly operations adding little value added to the production process.

Within this context Dusenbury and Liner (1997) obtained the export intensity index in manufacturing of Puerto Rico relative to that of the United States and compared it to the value added index of the manufacturing sector of Puerto Rico relative to that of the United States. The export intensity index, say for the United States, was measured by the ratio of the value of exports for a given group of commodities relative to the domestic product. For its part the value added index say for Puerto Rico was proxied by the ratio of the contribution of the manufacturing sector to the gross domestic product to total manufacturing sales.

Table 12
Value added of the manufacturing sector in Puerto Rico relative to that
of the United States
1993 – 1995

Industry	Export intensity 3 year average	Value added 3 year average
Industrial machinery	1.99	0.66
Tobacco manufactures	2.66	0.64
Textile, mill products	1.98	1.03
Lumber and wood products	n.a.	0.74
Instruments and related products	2.32	0.69
Transportation equipment	n.a.	1.29
Chemicals and allied products	6.79	1.09
Food and kindred products	2.62	1.05
Electronic equipment	n.a.	0.61
All manufacturing industry	n.a.	0.97
Source: Dusenbury and Liner (1997)		

Their results show that in general the discrepancies in the value added indices between Puerto Rico and the United States are small and of the order of 1% to 6%. Contrarily the

differences in the export index are for the most part significantly greater for Puerto Rico than for the United States (at least 50% higher for Puerto Rico). The conclusion of Dusenbury and Linder (1997, p.70) is that: 'manufacturing exports are, indeed, making a contribution to the Puerto Rico economy that is significantly greater than the contribution that manufacturing exports make to the economy of the U.S. as a whole'. In this sense the development of manufacturing exports is an underpinning force of convergence towards the United States (see Table 12 above).

Additional preliminary evidence linking exports to growth and convergence was derived by applying econometric techniques to test the existence of a long-run relationship between the GNP per capita in Puerto Rico and the gross formation of fixed capital, exports and the GDP per capita for the United States. The procedure followed roughly the same steps as those used in the econometric for a long-run relationship between the gross formation of fixed capital and the convergence ratio (see Table 2). In this case, an over identifying restriction was also incorporated to test the significance of exports in the cointegrating equation.

The results presented in Table 13 below indicate at this preliminary stage that the variable external sales used as a proxy for total exports is not a significant variable and is not related in the long run to Puerto Rico's GNP per capita. As found earlier the gross formation of fixed capital and especially the United States GDP seem to play a more fundamental role.

Table 13
Cointegration analysis of GDP per capita, investment and exports
1947-2002

Unit root tests					
	Lag	Test statistic	ADF 95% critical value		
LPRGNP	2	-0.54	-3.50		
LUSGDP	5	-3.51*	-3.50		
LGFFC	3	-2.40	-3.50		
LX	2	-1.03	-3.50		
Δ LPRGNP	0	-2.99*	-2.92		
Δ LUSGDP	3	-3.00*	-2.92		
Δ LGFFC	0	-4.66*	-2.92		
Δ LX	1	-6.49*	-2.92		
Cointegration test results					
H_0	H_a	Optimal lag	Johansen Statistic	95% CV	90% CV
$r=0$	$r=1$	2	27.4	28.27	25.80
$r<1$	$r=2$	2	16.3	22.04	19.86
$r<2$	$r=3$	2	12.9	15.87	13.81
$r<3$	$r=4$	2	3.98	9.16	7.5
Cointegrating equation					
$\text{LPR} = -2.5 + 0.91 \text{LUS} + 0.29\text{LGFFC} - 0.009\text{LX}$ <p align="center"> (0.30) (0.18) (0.078) (0.24) </p>					
$\chi^2_1 = 0.0016$					
Note: LPRGNP = logarithm of GNP per capita of Puerto Rico. LUS = logarithm of GNP per capita of THE United States. LGFCF = logarithm of gross fixed capital formation. LX = logarithm of exports. * = significant at the 95% confidence level. ADF= augmented Dickey Fuller statistic. The Dickey Fuller regressions testing for unit roots contain a trend when applied to variables in levels. Δ = first difference. H_0 and H_a = null and alternative hypothesis. CV= critical value. χ^2_1 = Chi Square Statistic testing the null hypothesis that LX is equal to 0. Source: On the basis of official sources.					

7. Puerto Rico and the future path of convergence towards the United States

During the last years of Phase III the tax legislation underwent important changes whose effects are not yet visible for the last years of the sample but which could have an important effect on the convergence trajectory of Puerto Rico to the United States.

Since 1993 the United States has gradually sought to suppress the special and differential tax treatment received by Puerto Rico. In 1993 the Omnibus Budget Reconciliation Act imposed cutbacks in the programme of tax incentives for new investments by retaining the investment tax credit while imposing limits on the income-based tax credit. The latter decreased by 5 percentage points a year in 1995 –from 60% of profits in 1994 to 40% of qualified labour costs in 1998.

In 1996, Section 936 was repealed through the Small Business Job Protection Act and granted a phase-out of 10 years for current beneficiaries. The authorities have proposed an amendment to Section 956 of the federal tax code, which would allow controlled foreign corporations (CFC) to repatriate 90% of their profits to related or parent operations in the United States tax-free. The income-based option of the Omnibus Budget Reconciliation Act will remain at its 1998 level. The reduction of tax incentives is estimated to increase from \$111 million in 1996 to \$2,686 in 2006 (Dusenbury and Lines, 1997).

At the local level the authorities have sought to offset the negative effects of the 936 Section phase out. As a result they passed the Tax Incentives Act of 1998 providing an exemption from Puerto Rican taxes for approved firms²⁶. As well there are tax incentives for employment. An important change in the structure of the tax incentive system is that it “has shifted from large tax exemptions to low tax rates”²⁷ (see Table 13 above). In 2001, the authorities approved the Export Law (August 2001) in an effort to “promote the distribution of products through existing channels such as multinationals retailers and joint venture agreements”²⁸. This law raises the tax credit from 10% to 25% when buying products, which are manufactured in Puerto Rico.²⁹

²⁶ The law establishes the levy a 7% flat corporate tax.

²⁷ See, Commerce in Puerto Rico. EIU. 2003.

²⁸ Promoexport and the internationalization of Puerto Rico’s Producers. Promoexport. Memo. 2003.

²⁹ See, Ley Num 110. (2001) in Nuevas Leyes para Promover el Desarrollo Económico de Puerto Rico. San Juan, Puerto Rico (2002).

Table 14
The Tax Incentives Act of 1998
Main provisions

- The Tax Incentives Act is based on a flat tax of 7% (but that can decrease to 2%) that replaces tax exemptions.
- Non-exempt firms are subject to a 39% corporate tax rate.
- Textile, leather, shoes and fish canning operations are subject to a 4% tax.
- Strategic investment may be granted a 0% tax rate.
- Elimination of the 'tollgate' tax on repatriated earnings
- High rate of deductions on expenses for job training, human resource development and research and development.
- Creation of a special fund to invest in new firms and research and development projects. The fund can use up to 5% of the income tax paid to create new firms.
- Tax incentives are granted to companies that export national products.
- The law also allows companies operating under section 936 or section 30A to qualify for tax exemptions.
- Maintains tax incentives for employment (tax deductions include 15% of their payroll and 50% of total net income) and property tax benefits (100% exemption is granted for one year and 90% for subsequent years).
- Grants a tax credit of 10% of expenditures on local products.
- New tax credit for investors buying plants that will be closing.

Source: On the basis of official information

This policy of tax incentives jointly with the structural shift to the services sector and the development of Puerto Rico's natural resource base, i.e., human capital, may define Puerto Rico's growth path in the coming years and define whether it will indeed prove to be a 'convergent path'. This will depend in part on whether Puerto Rico can address key issues pertaining to this new 'three legged' economic foundation.

The changes in tax incentives may give an advantage to CFCs in Puerto Rico since other states that have CFCs do not enjoy similar tax incentives. According to non-official sources the new policy of tax incentives has to some extent fulfilled its functions of providing the incentives for firms to maintain their working operations in Puerto Rico. However, the point has been made that the legislation for CFCs may prove to create unnecessary complications to what should be a simple and transparent investment decision. Moreover the issue of whether the tax changes can revamp a stagnant domestic industrial sector or simply deepen the growing process of substitution of local by foreign assets has not been fully contemplated or analysed.

The services sector, important as it is for growth and the process of convergence, (Armstrong and Read, 2003) lacks an adequate statistical database making it difficult to estimate its economic contribution. The exception is provided by tourism.

In the case of education, Puerto Rico stands tall relative to other small island States and countries of similar income levels. In Puerto Rico the decomposition of employed workers by years of education shows that the highest number of employees is found among those in the

labour force with over 12 years of education. Similarly, the number of degrees, including doctorates, masters, and bachelors' degrees, awarded between 1995 and 2000 rose by 26% while in science and engineering they increased by 30% over the same period. Further research also shows that, Puerto Rico awarded 1.5 more degrees in engineering per ages 20-24 relative to the United States (Stewart, 2003). In spite of these impressive numbers the quality of the potential in education has not been matched by its efficient utilisation.

ANNEX

Table 15
The United States
Gross Product by State
1977-2001 (In Millions of US dollars)

		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1	California	229668	263556	295112	328188	368508	393176	426033	484473	529380	567411	624643	685095	743472	798879	814743	831576	847879	879041	925931	973395	1045254	1125331	1213355	1330025	1359265
2	New York	178049	197362	215396	234346	259408	280337	303450	339206	366674	393637	425642	462533	479591	502245	504665	535341	551161	575585	597593	633830	663377	718686	743873	798382	826488
3	Texas	131611	151077	174517	207450	250631	265781	270935	296787	315796	299563	304651	334767	357015	388072	403286	424713	452649	482707	513882	553180	608622	641405	678808	738270	763874
4	Florida	66374	77462	88830	101411	116000	125617	139784	158762	173505	188073	207264	227234	244631	258344	269845	285518	305036	325556	344771	366318	389473	415564	442613	471623	491488
5	Illinois	115397	128721	140294	146459	159957	163603	172099	192653	205697	217857	231798	250261	263463	275846	285719	303238	317248	342322	359451	375949	400327	423175	440899	466312	475541
6	Pennsylvania	100585	112271	123181	130573	141999	145658	155326	170959	180844	190924	206710	224687	238185	249900	260591	275349	288154	301096	318765	329660	347306	365038	380233	399488	408373
7	Ohio	98054	109080	119228	123711	134930	136319	145944	164984	175922	184037	193746	207366	219267	230031	235876	250363	260891	280850	295668	306333	326451	346648	357378	370617	373708
8	New Jersey	68805	74175	82736	90471	100603	107326	119112	134575	146952	159652	176175	197565	208376	216972	224307	235456	246727	258079	271435	285738	299986	316875	332155	357453	365388
9	Michigan	88105	98053	104239	102870	113254	113200	124981	140994	151320	161101	167636	178188	186864	190842	194230	206666	222886	246812	254179	265130	279503	293173	312054	323717	320470
10	Georgia	41181	46767	52248	56947	64326	69097	77366	89467	99285	108860	117883	127655	134953	141415	148722	160814	172320	187645	203505	219520	235733	254891	276510	295539	299874
11	Massachusetts	49671	55636	61640	68168	75969	81687	90915	103971	115131	126051	139558	152331	159157	159959	161517	167334	175729	188000	197469	210127	223571	241369	257802	283072	287802
12	North Carolina	44116	50387	55304	59750	66734	69721	78405	89769	98246	106331	114732	126200	135854	141056	147473	159977	168830	182234	194634	204329	221629	241220	260628	272934	275615
13	Virginia	44051	49485	54858	60484	68045	73413	81297	92236	100732	110306	121089	131821	141823	148181	153965	161790	170754	179727	188963	199953	212105	228049	241503	260837	273070
14	Washington	35970	42027	48217	51990	57724	60755	65402	71132	74532	80491	86860	95583	104655	115482	122453	130620	138225	146308	151265	161779	175242	192031	208470	218095	222950
15	Maryland	35522	39445	43450	47280	52846	56027	61861	69761	77030	84150	92519	102728	109587	115008	117630	120734	126442	133952	139495	145061	154646	164100	173836	185049	195207
16	Indiana	47387	53268	57688	58379	63848	63547	67917	77424	81104	85655	91975	99248	106693	110788	114188	123604	131485	141735	148447	155096	162953	176110	181287	189778	189919
17	Minnesota	36276	41084	46379	49701	54624	56435	60567	69904	74422	77875	83979	90085	96246	100432	103923	111908	115420	125017	131841	141540	152334	163009	171490	186097	188050
18	Tennessee	33553	38306	42434	45357	50518	52349	57331	64496	69287	74150	81462	87835	92395	95024	102049	111844	119758	129671	136821	142051	151738	162228	170771	177401	182515
19	Missouri	41765	47062	51783	53656	58794	61620	66448	75994	79512	84975	90366	97124	102659	104803	110396	115993	119680	129957	139547	146537	155811	163425	168877	177104	181493
20	Wisconsin	40894	45741	50599	53372	57701	59460	63029	70133	74241	78087	82389	89964	95431	100448	104918	112347	119508	127187	133694	141046	148194	157735	164935	173016	177354
21	Colorado	25229	29409	33963	38446	44085	47662	50490	56032	59050	59930	63358	66736	70036	74701	79448	85844	93588	101531	109021	117118	129575	139860	152331	169341	173772
22	Connecticut	29451	33029	36740	40573	45054	48952	53937	61161	66558	72849	81432	89728	95037	98939	100395	103794	107924	112395	118645	124157	134968	142701	149010	161929	166165
23	Arizona	19230	22843	27183	30263	33429	34322	38256	44502	49295	54646	59055	63401	66005	68852	71876	79000	85483	95747	104586	112882	122273	132897	144596	153469	160687
24	Louisiana	39371	45257	52094	63975	77696	79065	77757	83801	85085	76182	77016	83694	86614	94919	95918	91243	95587	104055	112157	116867	123549	122580	133940	144984	148697
25	Alabama	26489	30425	33627	36088	40054	41418	45148	49797	53641	56083	60762	65806	68320	71560	75977	81115	84497	89740	95514	99286	104213	109672	115095	119319	121490
26	Kentucky	28508	32042	35271	36679	40629	41636	43272	48969	51668	53538	56830	61217	65056	67912	70834	76726	80882	86905	91472	95536	101535	107648	112396	117233	120266
27	Oregon	22325	25926	29114	30736	32114	31941	33929	37878	39981	42060	45022	49702	53455	57767	60602	64129	69810	75087	81092	91709	97510	102943	110374	121383	120055
28	South Carolina	20295	23286	25964	28157	31631	32916	36356	41998	44688	48427	53297	58155	62275	66076	68776	71934	75955	81515	86880	89854	95447	101384	106800	112197	115204
29	Oklahoma	23889	27103	31616	37661	45547	49495	47968	51935	53426	49019	48866	52789	54676	57780	59698	62013	65035	66979	69960	74855	79423	82189	85389	90942	93855
30	Iowa	26285	30109	32818	34016	37667	36554	36691	41006	42389	43092	45215	48750	52677	55796	57698	61104	62764	69169	71687	76976	81695	83069	85540	89654	90942
31	Kansas	20324	22620	26188	28047	31642	32998	34750	38070	40520	41337	44041	46296	48347	51467	53576	56338	58380	62206	64069	68160	72998	76648	80208	84526	87196

Table 15
The United States
Gross Product by State
1977-2001 (In Millions of US dollars)
(Continuation)

32	Nevada	7496	9108	10635	12052	13628	14242	15322	16916	18425	20037	22166	25401	28486	31643	33665	36480	39929	45022	49377	54564	59248	63786	69534	75533	79220
33	Utah	10432	12122	13872	15494	17554	18589	19893	22277	24115	24473	25202	27244	28713	31359	33658	35671	38395	42236	46290	51523	55070	59084	62635	68430	70409
34	Arkansas	14918	17337	18962	20088	22609	23187	24953	28254	29131	30443	32349	34597	36833	38362	41277	44610	47188	50921	53809	56796	59141	61298	64993	66793	67913
35	Mississippi	15990	17893	20189	21532	24203	24857	26190	29246	30669	31438	33844	36022	37657	39175	41311	44223	47384	51358	54562	56575	58743	61709	64219	66162	67125
36	District of Columbia	15205	16646	18120	19575	21413	22627	24318	26420	28384	30037	32398	35622	38183	40427	42240	44458	46596	47484	48408	48505	50546	52145	55382	59963	64459
37	Nebraska	13532	15523	17138	17897	20373	20616	21163	24088	25415	25816	26803	29011	31161	33518	35482	37593	38665	42032	44084	47772	49275	51349	53494	55649	56967
38	New Mexico	10410	11931	13599	16196	19070	19915	20561	22267	23490	22543	23164	24048	25501	27175	30862	32858	37110	41772	42170	44114	47829	48488	49221	52592	55426
39	New Hampshire	6353	7491	8488	9428	10594	11446	12696	14903	16833	18707	21530	23294	24105	23883	24948	26396	27507	29410	32388	35068	37470	40529	43360	47385	47183
40	Puerto Rico	8181.7	8996.7	10037	11064.6	12211.7	12493.5	13048.5	14183	15002.2	16014.4	17152.7	18549.8	19954.2	21619.1	23809	23696.4	25132.9	26648.9	28452.3	30357	32342.7	35110.7	38281.2	41418.6	44172.9
41	Hawaii	9390	10520	11978	13435	14524	15506	16909	18550	19991	21536	23421	26019	28811	32268	34002	35549	36308	36766	37243	37490	38537	39371	40662	42524	43710
42	West Virginia	14659	16260	17783	19068	20475	21215	20830	22770	23517	23854	24546	26354	27254	28304	29331	30901	32240	34774	36315	37220	38281	39024	40525	40926	42368
43	Delaware	5956	6607	7202	7792	8711	9334	10412	11669	13029	14110	15767	17135	19182	20294	22169	23069	23827	25122	27575	29001	31263	32693	34696	37247	40509
44	Maine	7565	8379	9273	10192	11196	12077	13139	14857	16087	17468	19367	21680	23071	23498	23635	24397	25358	26501	27987	28925	30409	32208	34102	36276	37449
45	Rhode Island	7270	8012	8895	9725	10791	11424	12319	13799	15187	16521	17866	19728	21050	21632	21758	22656	23627	24352	25703	26656	29409	30838	31895	36086	36939
46	Idaho	7050	8337	9186	9808	10527	10494	11567	12477	12977	13074	13813	15038	16707	17739	18655	20354	22758	24893	27155	28101	29388	31041	34584	36755	36905
47	Alaska	7456	9051	10816	15007	21473	23133	22254	23560	25871	18637	22025	21354	22934	24774	23021	22372	23014	23104	24791	25774	26575	24651	25550	28129	28581
48	South Dakota	5115	5983	6742	6781	7650	7720	8100	9313	9769	10242	10826	11347	12086	13018	14093	15137	16261	17240	18257	19372	19767	20570	21723	23452	24251
49	Montana	6358	7491	8245	9002	10291	10330	10642	11228	11194	11227	11598	11862	12796	13422	14075	15084	16151	16952	17537	18074	18907	19971	20566	21702	22635
50	Wyoming	5683	6900	8326	10784	13256	13059	12211	12931	13024	11226	11091	11673	12018	13427	13550	13555	14114	14400	14920	15879	16244	16420	17015	19113	20418
51	Vermont	3363	3978	4451	4930	5503	5800	6319	6988	7674	8320	9307	10457	11343	11771	11771	12570	13154	13747	13974	14662	15510	16294	17155	18124	19149
52	North Dakota	5260	6464	7257	7626	9942	9966	10030	10794	10750	9819	10193	9744	10645	11473	11634	12740	12855	13895	14529	15855	15910	17053	17093	18556	19005

Figure 12
Economic growth in Puerto Rico and the United States
1947 - 2002

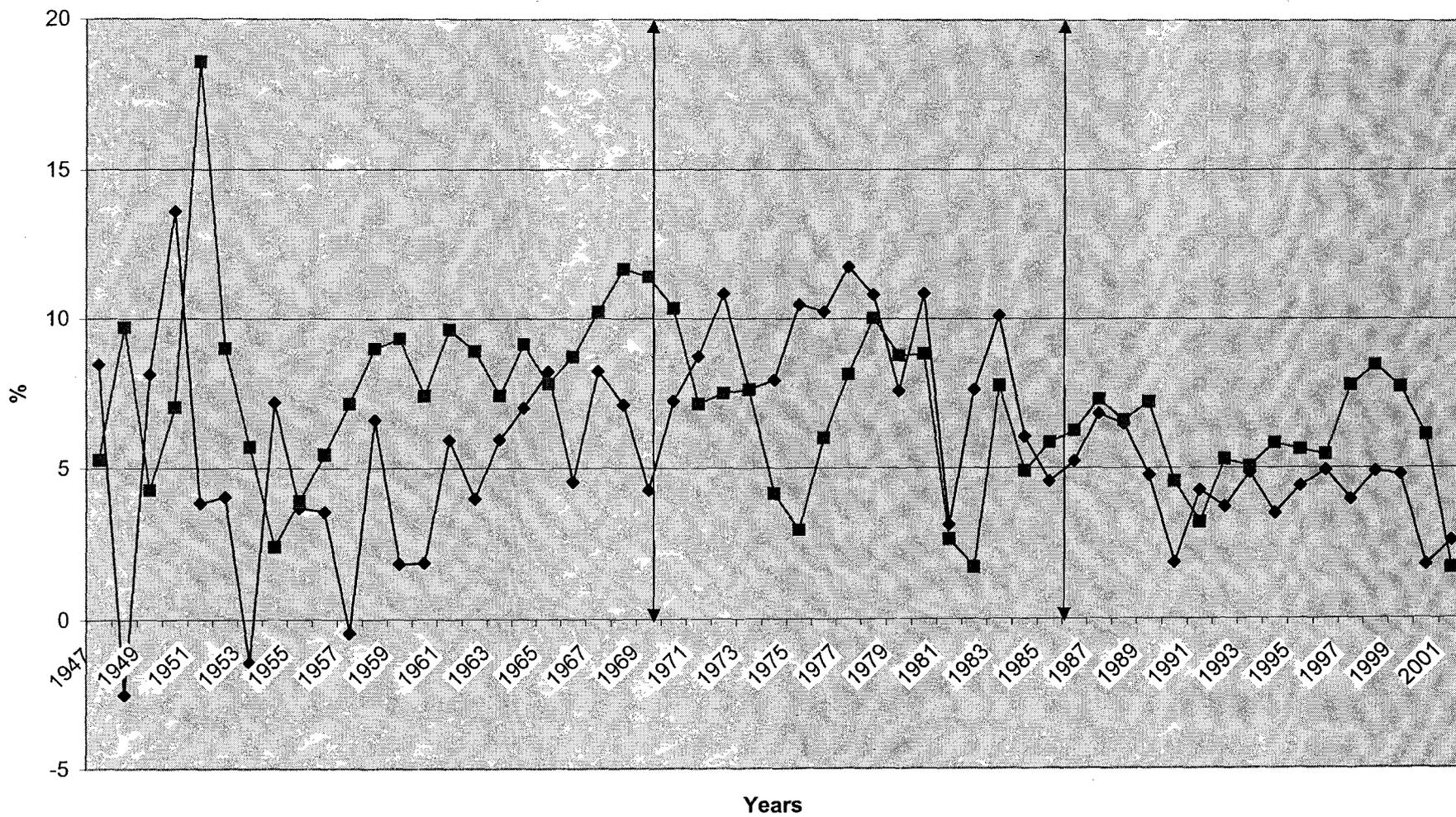


Figure 13
Puerto Rico
External sales as percentage of GNP (in constant 1954 dollars)
1947 - 2002

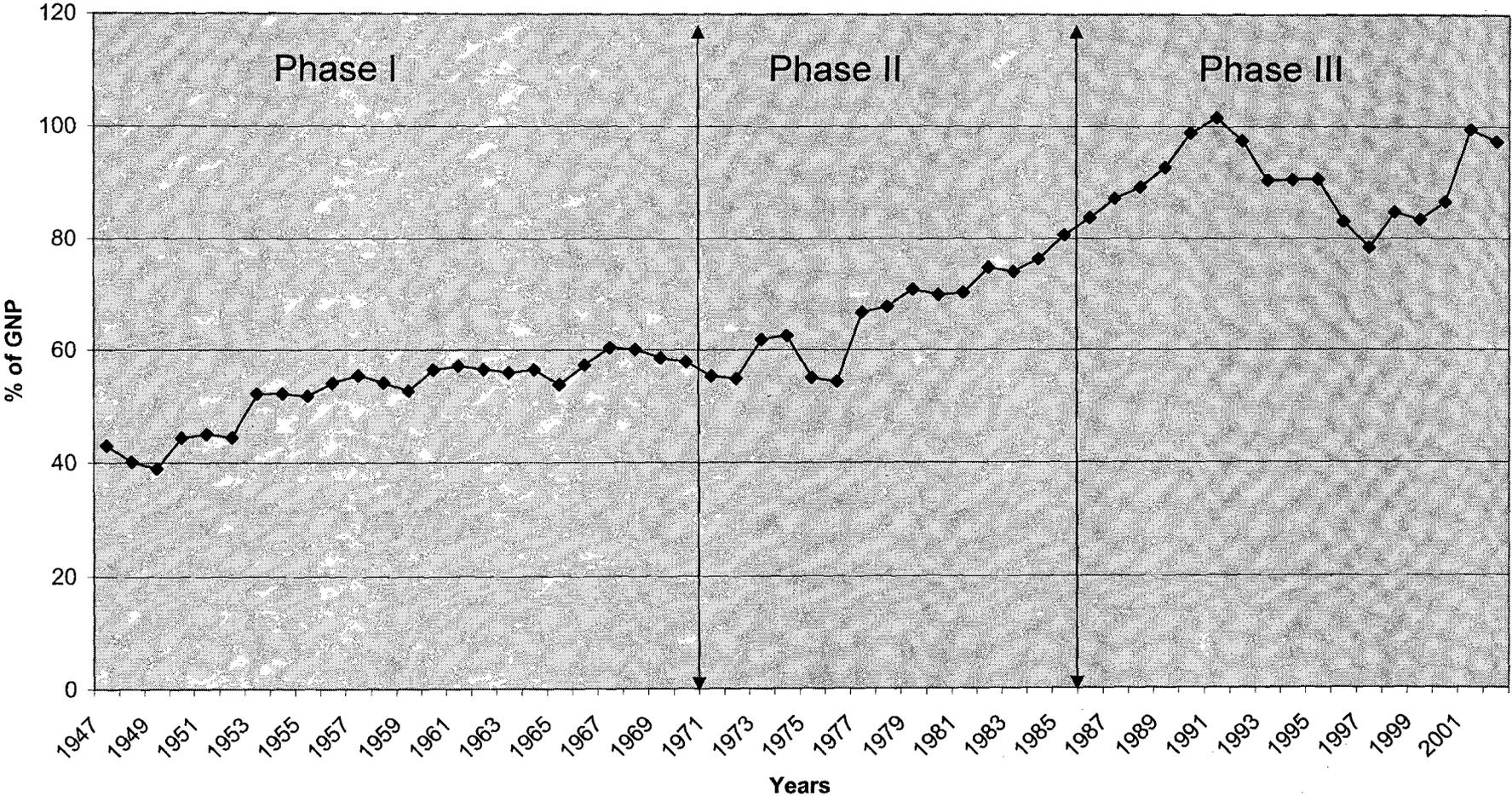


Figure 14
Distribution of Puerto Rico's exports by type of commodity, 2002

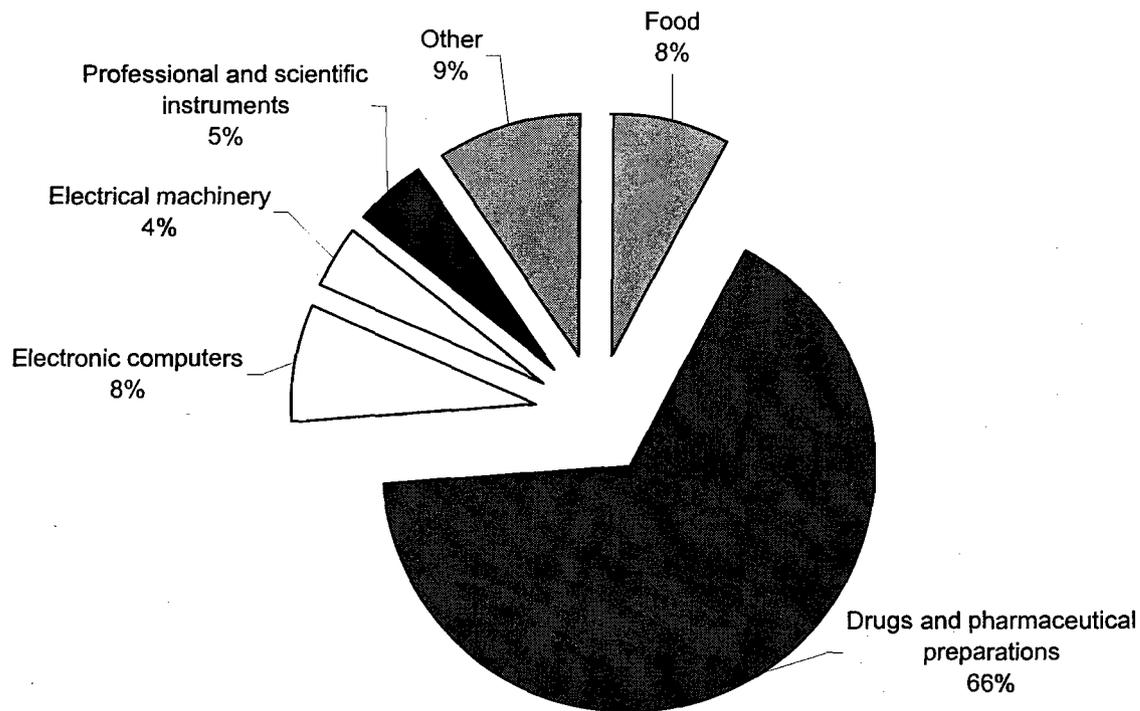


Figure 15
Distribution of Puerto Rico's imports by type of commodity, 2002

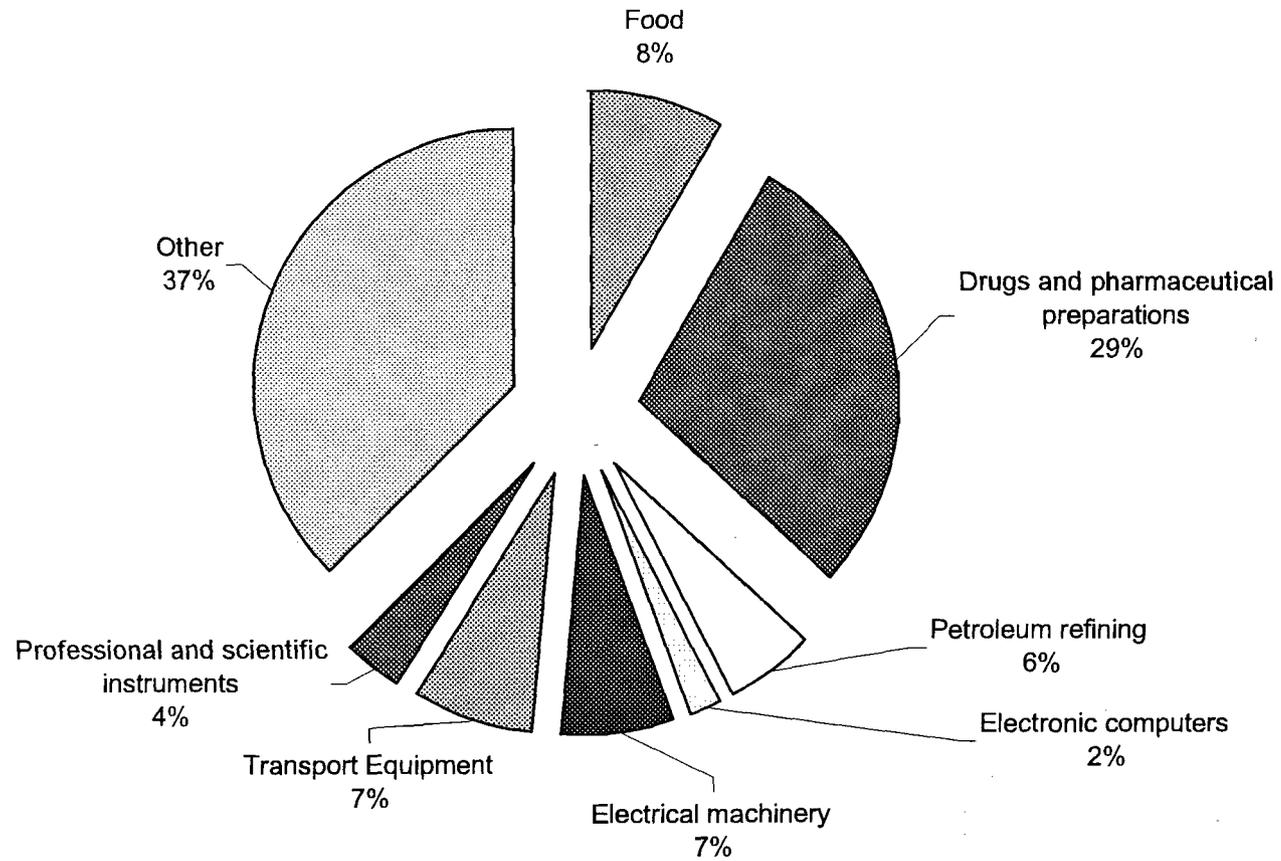
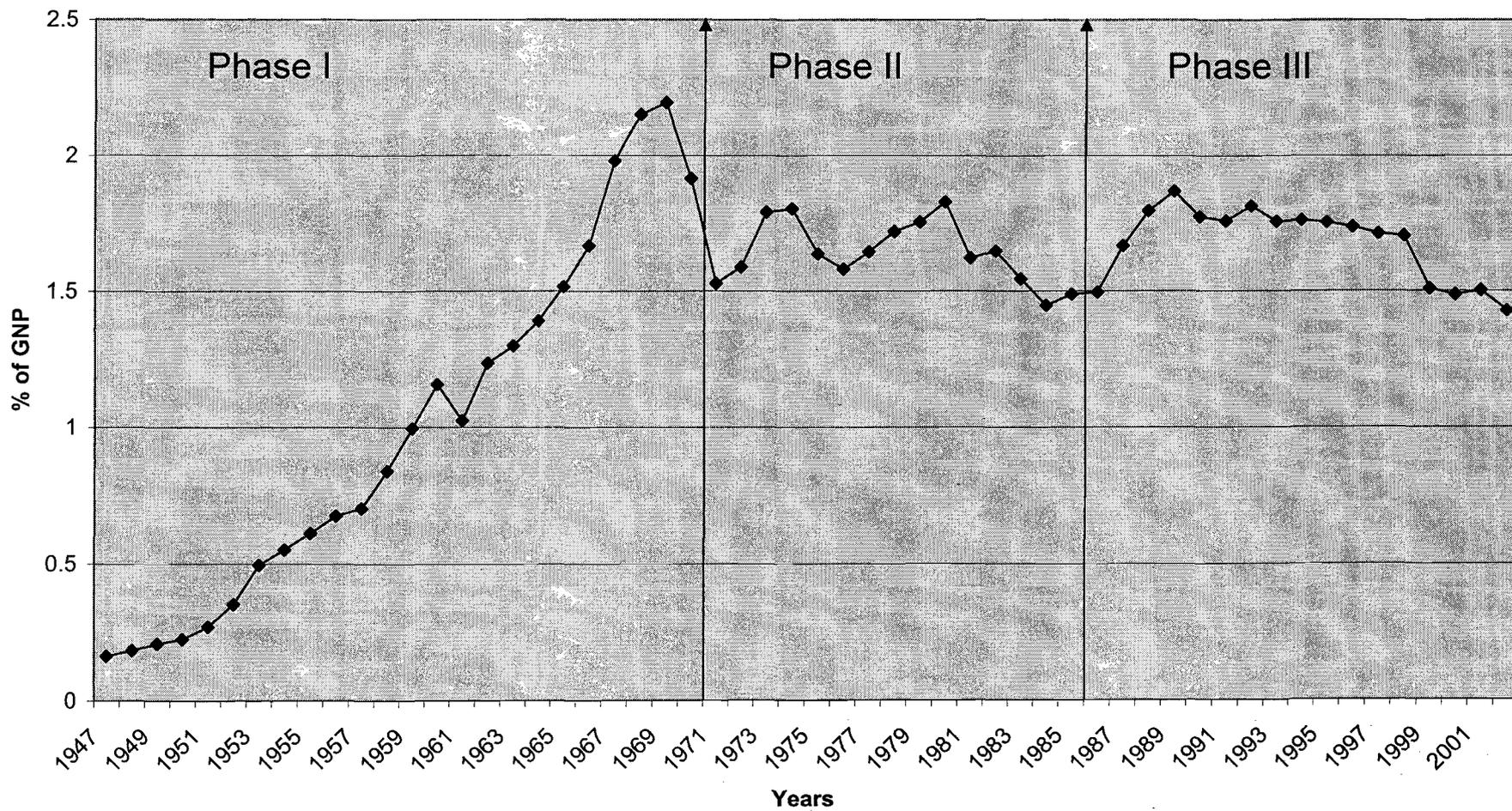


Figure 16
 Puerto Rico
 Tourism earnings as percentage of GNP
 1947 - 2002



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