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The Two Faces of Janus: Institutions, Policy Regimes and Macroeconomic Performance in Greece

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# The two faces of Janus: institutions, policy regimes and macroeconomic performance in Greece

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## 1. INTRODUCTION

One of the main messages from the recent literature on macroeconomic policy is that policy regimes and institutions matter for long-run economic performance. Both growth and inflation depend crucially on the success of political and economic institutions in providing commitment and coordination mechanisms that lead to high and productive investment rates but low inflation expectations.

The post-war experience of the Greek economy is of particular interest to those seeking to gather evidence about the consequences of a change in policy regime. Greece displays much sharper institutional and regime changes than the rest of the OECD, and experienced a radical turnaround in macroeconomic performance. Until 1974, the economic performance of Greece was one of the most impressive in post-war Europe. Following the second oil shock and admission to the EC, Greece then entered a period of persistent stagflation from which it has yet to recover.

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I have benefited from the extremely helpful comments of David Begg and my discussants Francesco Giavazzi and Guy Laroque. The members of the Economic Policy Panel, Apostolis Philippopoulos and participants in a seminar at the Athens School of Economics have also provided useful comments. Financial support from the SPES programme of the European Union, through the Centre for Economic Research in Athens and CEPR, is also gratefully acknowledged.

# Greece

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macroeconomic performance

## SUMMARY

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The clear change in policy regime in Greece around 1974 offers an opportunity to assess the extent to which economic performance depends on institutional underpinning. For twenty years up to 1974, Greece enjoyed rapid growth, high investment and low inflation; during the next twenty years, growth and investment collapsed and inflation became high and persistent.

I describe the political background to such clear institutional change, and the nature of the two economic regimes: the first providing coordination and commitment mechanisms to sustain adequate returns for high investment, the second failing to do so. The same change in political climate after 1974 raised public sector deficits and debt, fuelling a trade deficit and monetary expansion. Entry to the EC did not cause the economic slowdown in Greece, but transfers from the EC did mask the underlying problem, delaying necessary adjustment. Recent attempts to reverse Greece's fortunes are in the right direction but as yet inadequate.

— George Alogoskoufis

Like Janus, post-war Greece has thus displayed two faces. During 1954–73 average annual output growth was 7%, but annual inflation only 4%. Annual growth exceeded the OECD average by about two percentage points, yet inflation was the same as the OECD average. In the twenty years after 1974, the situation changed dramatically (Figure 1). Growth slowed in the late 1970s and collapsed after 1980. Inflation shot up and remained stubbornly high. Average annual growth during 1974–93 was only 2%, slightly below the OECD average. Average inflation was 18%, over ten percentage points above the OECD average. In the post-1973 period, Greece also suffered from periodic balance of payments crises during 1973/4, 1980/1, 1984/5 and 1989/90 (Figure 2). These developments are summarized in Table 1.

What caused the transformation from 'success story' to 'problem economy'? Do the lessons apply in other countries? How can Greece get out of the vicious circle? This paper investigates answers to these questions, focusing on the character of policy regimes and their institutional underpinning. Three key aspects of Greek experience need to be explained: the slowdown of economic growth after 1974 and its virtual collapse after 1979; the deterioration in the balance of payments; and the failure to control inflation in the 1980s when inflation fell sharply elsewhere in the OECD.

Greece is an interesting case for several reasons. First, it displays much larger differences than the rest of the OECD between the golden era of the 1950s and 1960s and the later period (Figure 1), allowing sharper tests of hypotheses about

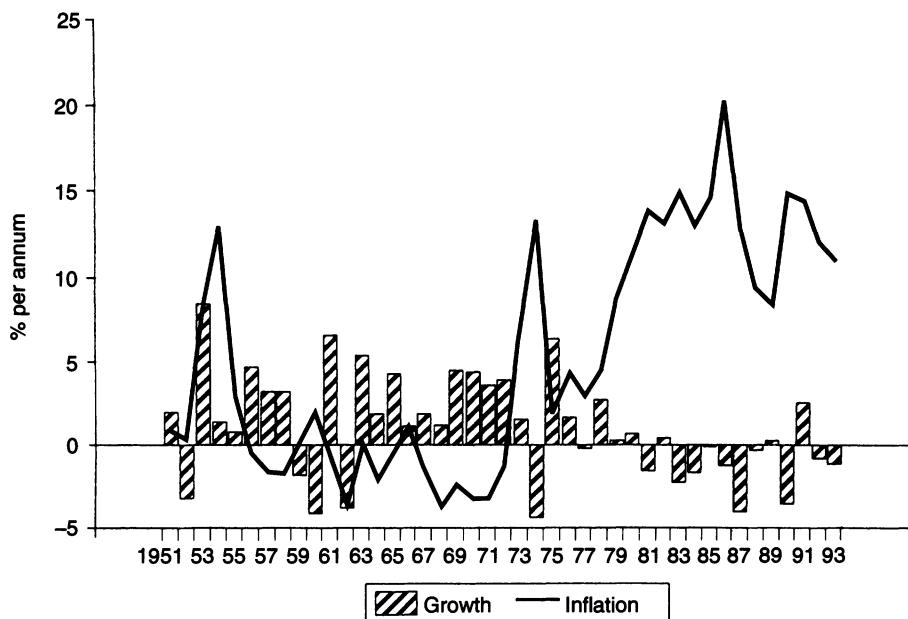
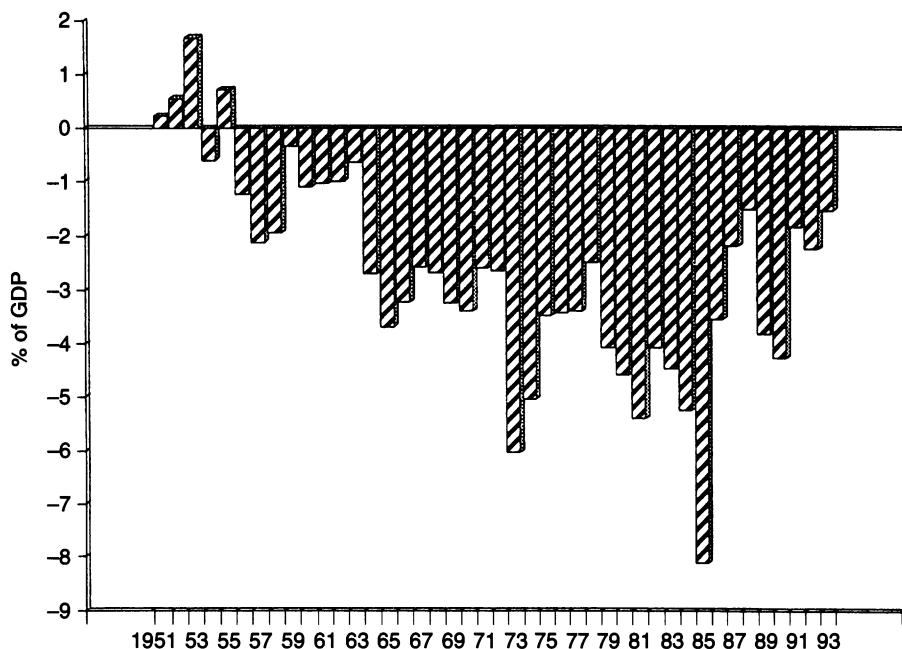


Figure 1. Difference in growth and inflation between Greece and the OECD, 1951–93



**Figure 2. Current account: Greece, 1951–93**

the growth slowdown and inflation. Second, Greece shares many features of two other southern European economies, Spain and Portugal, which have displayed a more impressive macroeconomic performance, especially since the mid-1980s. These three economies experienced a relatively smooth transition from dictatorship to democracy in the mid-1970s and all entered the EC in the 1980s. Despite having these things in common, the three countries have pursued different institutional paths, which may allow interesting inferences to be drawn.

Given the experience of other OECD countries in general, and of Spain and Portugal in particular, deteriorating Greek performance cannot be solely external in origin; nor can it simply reflect transition from authoritarian to democratic political regimes. And it has persisted too long to be interpreted merely as the result of a temporary shock, such as an oil shock or a shock in short-run

**Table 1. From non-inflationary growth to persistent stagflation: Greece, 1954–93**

	1954–73	1974–93
Average annual GDP growth (%)	7.1	2.1
Average annual price inflation (%)	3.8	18.1
Average current account surplus (% of GDP)	-2.1	-4.5

Source: OECD, *Economic Outlook*, various issues.

macroeconomic management. Persistent low growth and high inflation must reflect something deeper. I will argue that the deterioration in Greek economic performance after 1974 reflected a sharp change in economic policy regime in the early 1970s.

The regime before 1974 was characterized by commitment and coordination mechanisms that led to high investment and growth but low inflation, fostering private investment by guaranteeing property rights in the constitution and the law, by the tax laws and their implementation, and by direct state control of labour unions. These mechanisms guaranteed high returns to capital accumulation. The drachma's participation in Bretton Woods also provided a stable and predictable monetary standard and a measure of fiscal discipline. In addition, through market liberalization in the early 1950s and through the powerful Currency Committee that allocated credit, the system provided two effective coordination mechanisms that allocated resources and savings effectively.

The pre-1974 regime was politically autocratic, and degenerated into dictatorship in 1967, after which many of its elements were carried to unsustainable extremes. Thus, the economic regime broke down completely following the restoration of democracy in 1974. The regime that took its place failed to sustain the commitment and coordination mechanisms that guaranteed high returns to the accumulation of capital. In addition, after the collapse of Bretton Woods, no institution, domestic or international, succeeded in guaranteeing a stable monetary standard. Labour unions acquired power that for a long time was not mitigated by institutional checks and balances. The public demanded redistribution and an expansion of the economic role of the state, but no mechanisms were put in place to sustain efficiency. Distortionary taxation and indebtedness rose to finance redistribution and the larger state. The post-1974 regime created distortions that not only discouraged private investment but also caused a reduction in the social return on the investment actually undertaken. These distortions included the financial system, fiscal policy, the labour market, the 'natural' monopolies and public enterprises, public administration, investment grants and EC transfers.

In the rest of the paper, this thesis is documented through both formal econometric evidence and descriptive statistics. Section 2 contains a brief history of post-war Greece.<sup>1</sup> Section 3 describes the two institutional regimes in more detail. Section 4 examines the halt of economic growth, and studies the effects of the two economic regimes on aggregate investment and growth. Section 5 examines the impact of EC entry, in conjunction with developments in aggregate demand. I address the relation between fiscal deficits and debts, EC transfers, and the balance of payments. Section 6 considers the impact of the monetary and exchange rate

<sup>1</sup> For a brief history of modern Greece, see Clogg (1986). For its economic history, see Freris (1986) and OECD, *Economic Surveys* (various years).

regime on inflation and unemployment. Section 7 considers recent developments and prospects for the Greek economy. Section 8 offers conclusions.

## 2. A BRIEF HISTORY OF GREECE

Following its liberation from occupation in 1944, Greece entered a period of political instability that eventually led to civil war between left and right during 1946–9. The government forces, with the support of the UK and the USA, emerged victorious, but the divisions and hatred caused by the war were to haunt Greece for many years to come.

During the civil war, parliamentary institutions proved rather resilient. Between 1946 and 1950 Greece was ruled by a coalition of the two main political parties, the People's Party (right) and the Liberals (centre), under a Liberal Prime Minister. Greece was a founding member of the Committee of European Economic Cooperation, which led to the establishment of the OECD. To conform with the rules for dispensation of Marshall Aid, Greek governments had to draft comprehensive medium- to long-run plans, the first systematic attempts to promote economic development and financial stability. Some of the economic institutions that have played a significant role in post-war Greece were created at that time. A key example was the Currency Committee, a powerful ministerial committee that decided the volume and distribution of bank credit. Another key aspect of economic policy was the participation of the drachma in Bretton Woods.

Following elections in 1950, there were two and a half years of weak coalitions, another inconclusive election, a constitutional reform and a change in the electoral system. Finally, the Greek Rally (evolved from the People's Party), led by Papagos, a former Field Marshal, comprehensively won the elections of 1952, giving Greece its first strong government since the end of the Second World War. This government, under the leadership of a key economic minister, Spyros Markezinis, set the foundations for a revival of the economy. It lifted many price and import controls, drastically devalued the drachma in 1953 and reduced interest rates. It also introduced accelerated depreciation for tax purposes, legislation to protect and attract foreign capital, and measures to control the bureaucracy. However, labour and credit markets remained under firm government control. After the 1953 devaluation,<sup>2</sup> the currency was pegged at 30 drachmas per US dollar, a rate that survived until 1973.

Papagos died in October 1955. His successor, Constantine Karamanlis, reconstituted (and renamed) the party and won new elections in February 1956.

<sup>2</sup> The 50% devaluation in 1953 is seen by many (e.g. Halikias, 1976) as a key policy decision of the post-war period. Subsequent inflation was short lived, and it allowed liberalization of imports and economic activity in general.

He ruled Greece for seven years between 1956 and 1963 then departed for Paris after electoral defeat. His governments took significant steps to consolidate Greece's economic revival. They followed conservative fiscal and monetary policies, re-establishing confidence in the currency and the commercial banking system, gave strong emphasis to road building and the improvement of economic infrastructure, and took steps to encourage industrialization through tax and credit policies.

The institutional characteristics of this period, which survived through to 1974, suggest a regime anything but *laissez-faire*. 'State corporatist' would be a better description. A large number of government agencies were created, union activity was heavily controlled and the banking system was tightly regulated through the Currency Committee and the Bank of Greece. Bank credit was channelled to large enterprises and investment projects at low interest rates. However, the role of the state in the economy was very small, outside the areas of public administration, banking, electricity and telecommunications. Most prices were determined freely, although the prices of 'necessities' were subject to controls. In an era of low inflation, these controls did not seem to be particularly distorting. In foreign trade, domestic firms enjoyed significant protection, despite the gradual phasing out of tariffs, following participation in GATT and Greece's association agreement with the EC. Labour unions were controlled by the government, a significant factor behind uneventful industrial relations and wage moderation. Business taxes were low, and provisions for the protection of property rights and accelerated depreciation ensured confidence and a high rate of return on investment. These institutional characteristics were among the crucial determinants of Greece's high growth rate during 1954–73.

Karamanlis was succeeded by the Centre Union party (an evolution from the Liberal Party) of George Papandreu. The new government, which proved short-lived, gave more emphasis to a modest income redistribution, the welfare state and educational reform, but otherwise left the previous institutional arrangements unchanged. Papandreu resigned in 1965 after a clash with the monarch. A series of unstable minority governments succeeded him until in 1967 a coup led to a military dictatorship that lasted until 1974. The economic regime that prevailed during the dictatorship was essentially a continuation of that under the democratic governments of the 1950s and the 1960s.<sup>3</sup>

However, during the dictatorship some aspects of the institutional regime were driven to unsustainable extremes. Demand was also expanded excessively. By 1969 the economy was operating near full capacity, and bottlenecks emerged. Administrative controls prevented any immediate effect on wages and prices.



<sup>3</sup> From a different perspective, Mouzelis (1978) notes 'the colonels accepted the pre-existing model of capital accumulation and simply sought to remove all obstacles to its full development'.

Thus, the inflationary shock of 1973, following the collapse of Bretton Woods and the rise in commodity prices, hit a Greek economy operating at high capacity levels with repressed inflation. As a result, the rise in inflation in 1973 was particularly pronounced. The prosperity that previously had resulted in a measure of tolerance for the dictatorship was put into doubt, and the sudden fall in living standards fuelled civic unrest which, reinforced by the colonels' unsuccessful involvement in Cyprus, led to the downfall of the dictatorship.

The restoration of democracy in 1974 saw Karamanlis make a triumphant re-entry to Greek politics and rule for another seven years. The party he founded, New Democracy (a grandchild of the People's Party), remains one of the two major parties in Greece. However, the institutional changes that took place during his second seven-year term resulted in a completely different regime than the one that had existed prior to 1974. The peg to the dollar was abandoned in favour of an accommodating crawling peg exchange rate. The need for large defence expenditures, and the popular demand for a larger state and income redistribution, led to large increases in government expenditure, real wages and business taxes. Given lax fiscal and monetary policies, price controls were used extensively, at the same time as the emergence of powerful labour unions led to high wage increases. The role of the state in the economy was expanded significantly, through widespread nationalizations. The second largest banking group was nationalized through a constitutionally dubious procedure that raised allegations of unconstitutional treatment of the property rights of existing shareholders. A number of public enterprises and organizations were created in energy, development finance, commercial property and export promotion.

The policies of the post-1974 Karamanlis governments, as well as the widening appeal of the socialists (PASOK), under Andreas Papandreou, the son of the premier of the 1960s, caused nervousness in the business community (the Confederation of Greek Industries at one point accused Karamanlis, a conservative politician, of 'social-mania'). Budgetary difficulties also caused significant reductions in public infrastructure investment.<sup>4</sup> The most important economic achievement of Karamanlis in this period was Greece's entry into the EC in 1981, after which he engineered his election as President of the Republic, which led to the election of PASOK in 1981.

The early Papandreou governments gave even more emphasis to nationalization and income redistribution. A number of ailing firms were also nationalized, through the Industrial Reconstruction Organization, a state holding company that has since recorded huge losses. Wages were indexed and price controls were

<sup>4</sup> Inefficiencies created by the pervasive role of the state are documented in OECD (1987). From a different perspective, Katseli (1990) reaches similar conclusions, in particular in regard to state corporatism, soft budget constraints, ineffective market signals, thin financial markets and rigid labour markets.

strengthened. Public deficits and debts started getting out of control, and in 1985 the government was forced into a complete U-turn in the face of a balance of payments crisis. The drachma was devalued and a two-year wage freeze imposed. The first steps towards liberalizing the financial system and capital flows were also taken during that period. However, the fiscal deficit remained largely uncontrolled. Public deficits and debts soared, and another balance of payments crisis ensued in 1989/90.

Papandreu lost three consecutive elections by large margins between 1989 and 1990, but because of changes he had brought about in the electoral system (proportional representation), New Democracy, led by Constantine Mitsotakis, got a majority of only one deputy in Parliament. The Mitsotakis governments attempted to stabilize the public finances and implement structural reform through privatization and liberalization of the economy. During 1990 and 1991 the government proved rather slow and ineffective on all three fronts. In 1992, under a third Minister of National Economy, Stephanos Manos, bolder steps towards tackling the deficits were taken, and there was a first attempt to restructure the economy, with measures that ensured full liberalization of prices, deregulation, tight control of government enterprises, social security reform, privatization and infrastructure investment.<sup>5</sup> This progress on the fiscal front was partly reversed in 1993, as new elections loomed. In October 1993, another Papandreu government, elected with a large majority, abandoned or reversed many of the structural reforms of 1990–3 and did not proceed further with fiscal consolidation.

### 3. THE POLITICAL AND ECONOMIC REGIMES

The main conclusion of this examination of post-war Greece is that the country experienced two distinct institutional regimes. Until 1974 the Greek state was powerful and autocratic, both politically and economically. Political and civil rights were restricted, and the government had effective control over labour unions, and direct control of banking and finance. Budgetary policies were tight and monetary policies constrained by the Bretton Woods system. In a sense, the relative (and, during the dictatorship, absolute) restriction of political and civic freedoms may have made possible the ‘success’ of corporatist and centralized economic management.

After 1974 the Greek political system was fully liberalized. Political and civil rights became almost completely unrestricted and labour unions acquired

<sup>5</sup> The path from relaxation of policy in 1988, through the efforts of the New Democracy government to control fiscal deficits and proceed with liberalization, privatization and structural reform, is examined in OECD, *Surveys of Greece*, 1991, 1992 and 1993. The 1993 survey contains a comprehensive review of structural adjustment in the early 1990s.

significant power. The drive for equity, after years of political suppression, led to high business taxation and a large expansion of the role of the state.

One should distinguish two subperiods in the post-1974 economic regime. The first corresponds to the years 1974–9, when expectations were still affected by the past; it was not clear that the change in policy regime was permanent. There was a strong recovery in investment and growth, after the first oil shock, and inflation, although higher than in the rest of the OECD, was brought under control.

After 1979 things took a turn for the worse. The second oil shock and the prospect, then the reality, of a socialist government shook the confidence of investors. There was a second wave of nationalizations and wage increases, monetary and fiscal policies became looser, and comprehensive wage indexation was introduced. Deficits ratcheted up after 1981, as both the outgoing conservatives and the incoming socialists tried to spend their way out of electoral trouble.

An important additional element was Greece's entry into the EC. Trade liberalization had been happening gradually since the 1960s, following Greece's association agreement with the EC. However, non-tariff protection remained quite high. Many authors (e.g. Giannitsis, 1988) argue that eventual entry was a large shock, as the average nominal protection rate was reduced from 45% in 1975 to 35% in 1985. In my view this had little to do with the deterioration in Greece's economic performance. Effective protection hardly declined during the 1980s, if taxes and subsidies are taken into account (Katseli, 1990). Greece enjoyed a lengthy transition to EC requirements, and it was only towards the end of the 1980s that protection for domestic industry was effectively reduced. Had it not been for the domestic regime changes and policies that undermined confidence, EC entry could have been extremely beneficial, as in Portugal and Spain. EC entry coincided with a worsening of macroeconomic performance not because of trade liberalization, but because of internal distortions such as the increase in real unit labour costs, the rise in the tax burden, and the loosening of fiscal and monetary policies. What was important was the significant EC transfers to Greece, which helped hide the root causes of the problems by relaxing the external constraint and allowing domestic consumption to keep rising, despite the growth slowdown.

### **3.1. Why the change in political regime?**

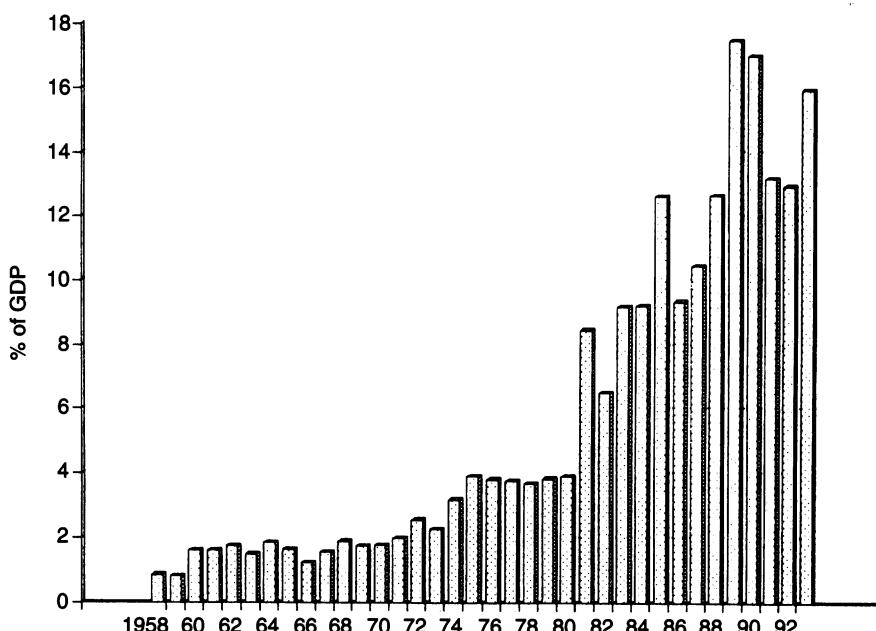
Why was there such a dramatic change in regime? Restoration of democracy in 1974 did not appear a revolutionary change in itself. Power was effectively handed over to representatives of the old political order. The problem was that the regime that applied after the civil war, despite its economic successes, never acquired deep roots because of its relatively short life, the suppression of political and union rights that accompanied it, and its degeneration into dictatorship. The value system that underpinned it – discipline, hard work, 'national ideals', religion, anti-communism

– was undermined by the excesses of the dictators. Moreover, supporters of the left, defeated in the civil war and then treated like second-class citizens, could no longer be ignored in the climate that prevailed after 1974. In fact, the restoration of democracy, as in Portugal and Spain, was widely considered an ideological victory of the left.

Given the fragility of the restored democracy, it was natural that Karamanlis, a shrewd politician, would conform with the prevailing ideological climate, accommodating the popular demand for redistribution and an expanded role for the state. Together with the collapse of Bretton Woods, this led to a completely different institutional setting for economic policy. The emphasis on redistribution and the increased role of the state were given a further boost by Andreas Papandreou and his party, which emerged as the main opposition force in 1977, on the basis of a ticket that promised a ‘third road to socialism’.

### **3.2. Economic institutions and policies**

The change in political regime affected most aspects of the economy. The demand for redistribution and an expanded role for the state led successive governments to seek more instruments of economic policy, by resorting to price, wage and interest rate controls, credit controls, continual revisions of the tax and legal systems, rises in taxation, nationalization and the creation of new government agencies. These changes mostly occurred haphazardly, which did not enhance the credibility of the



**Figure 3. Central government deficit: Greece, 1958–93**

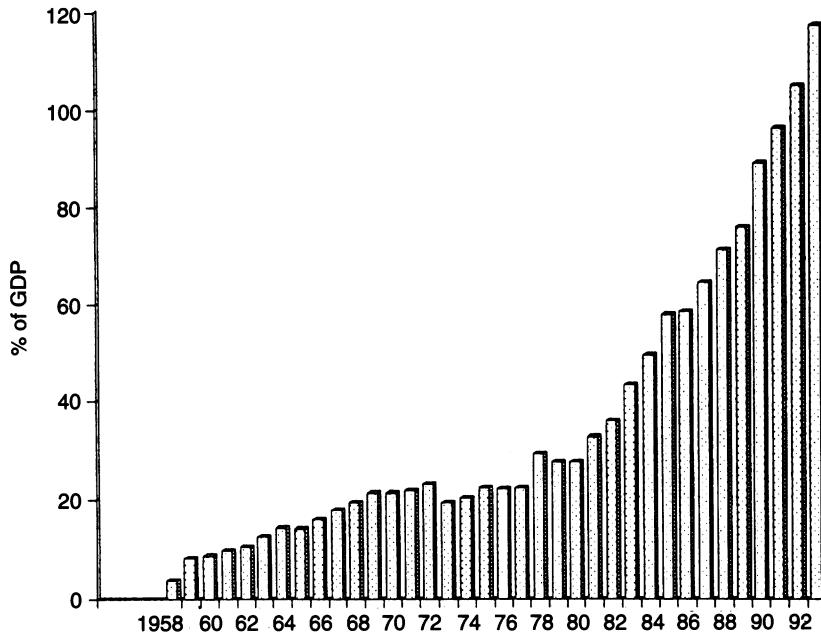


Figure 4. Central government debt: Greece, 1958–93

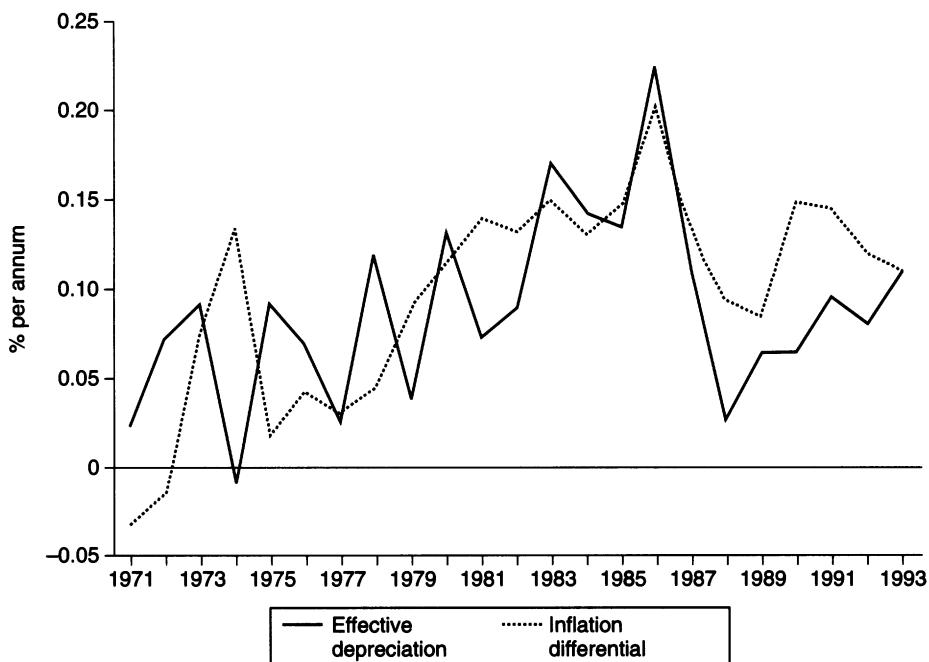
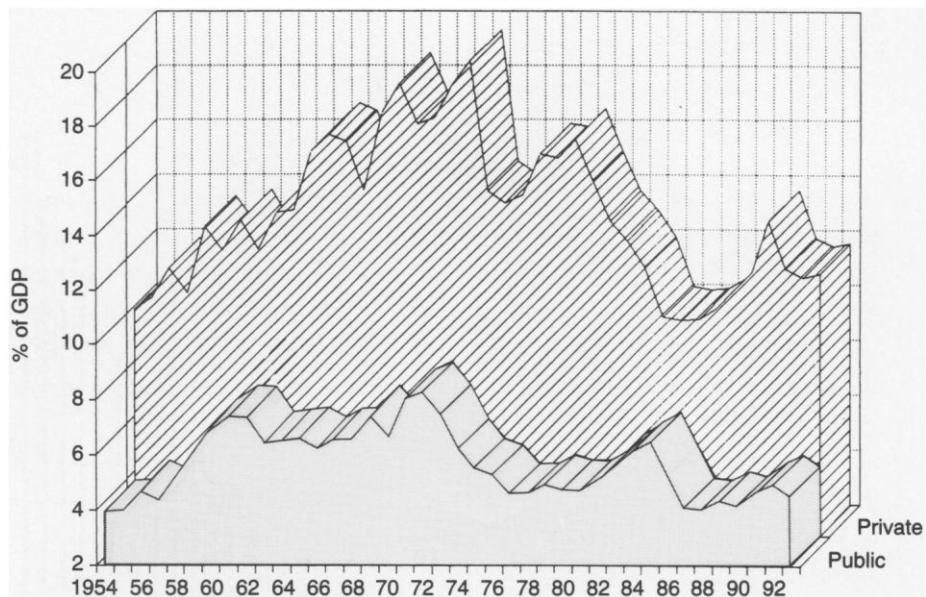
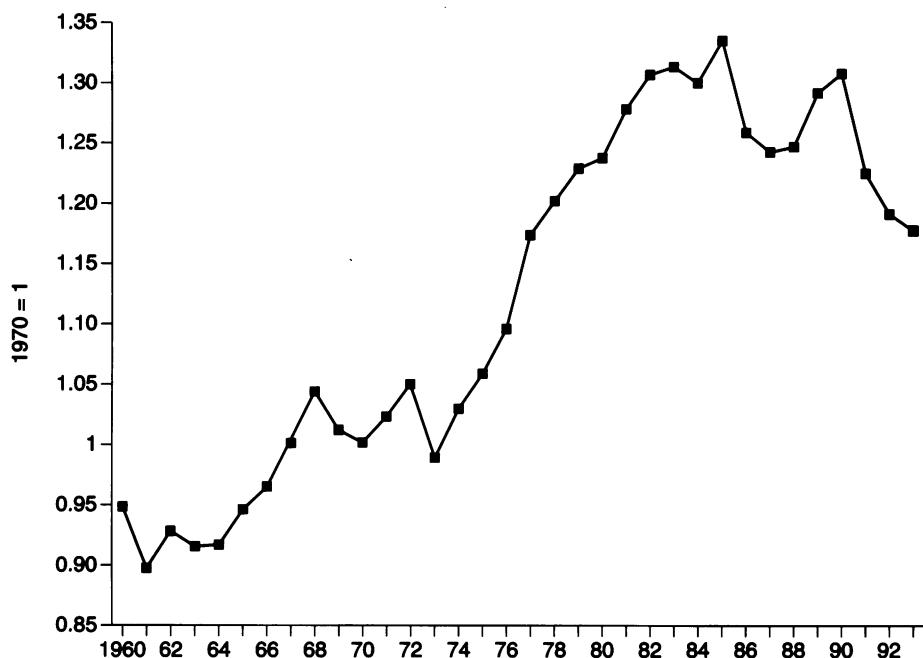


Figure 5. Depreciation and inflation differential: Greece, 1971–93



**Figure 6. Private and public investment: Greece, 1954–93**



**Figure 7. Real unit labour costs: Greece, 1960–93**

Source: OECD.

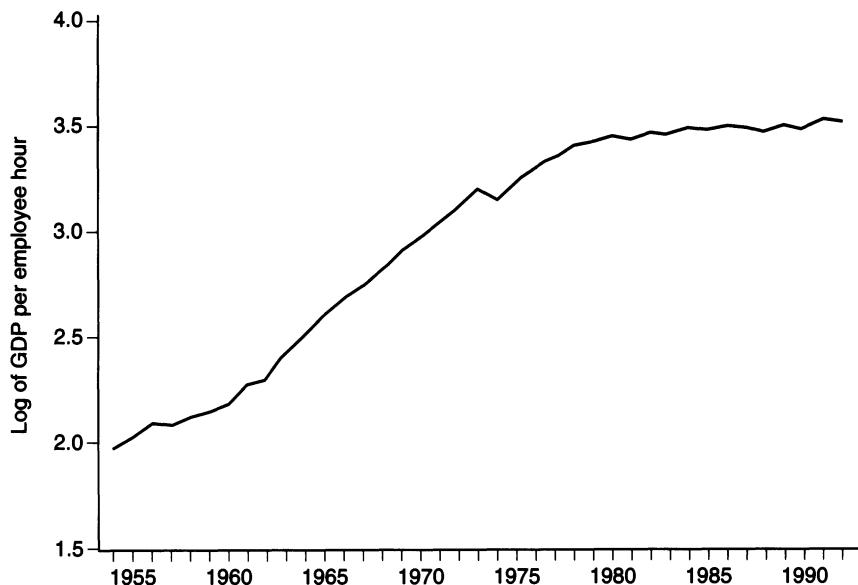
protection of property rights, the tax system and the legal system. In addition, the political polarization that emerged helped stimulate unsustainable deficits and debts (Figures 3 and 4), as governments resorted to borrowing in order to tie the hands of their successors (Tabellini and Alesina, 1990, model such a process).

The accommodation of wage demands through exchange rate policy (Figure 5) led to persistent inflation, especially after 1979 (see Alogoskoufis, 1992; Alogoskoufis and Philippopoulos, 1992). At the same time, infrastructure investment suffered whenever there were attempts to control government deficits (Figure 6). The drive for distributional equity and the rise of union power resulted in large increases in real unit labour costs (the share of labour costs in output) at the expense of profits. Real unit labour costs rose by about one-third during 1975–85 (Figure 7).

To sum up, the change in regime occurred because the previous regime was politically discredited and had reached its limits. The new regime emerged haphazardly and amid a crisis, following the events of Cyprus, the first oil shock and social unrest. It was not the result of a rational cooperative restructuring process by a strong government that sought to maintain the commitment and coordination mechanisms of the previous regime, without the political repression associated with it; nor was it preparation of the economy for the opportunities of EC entry. The new regime largely evolved as the unplanned outcome of a social struggle for income shares between various socioeconomic groups, with weak governments trying to satisfy conflicting objectives like re-election, growth, redistribution and social peace. The resulting equilibrium was unsatisfactory, but it was sustained for a long time by EC transfers that masked the underlying problems of the economy.

#### 4. ECONOMIC GROWTH AND AGGREGATE INVESTMENT

Figure 8 depicts output per employee hour in Greece. It is the most striking manifestation of the virtual halt of economic growth in Greece since the late 1970s. In itself, this picture is of course no proof of a significant change in regime. For example, exogenous growth models, such as the Solow (1956) neoclassical model, predict that growth creates the seeds of its own destruction. Capital accumulation reduces the marginal product of capital, eventually making investment unprofitable and halting capital accumulation and growth. On the other hand, endogenous growth models (Romer, 1986; Lucas, 1988) deny such decreasing aggregate returns to capital accumulation. Whereas neoclassical growth implies a tendency for countries to converge in the level of per-capita output, endogenous growth has no such implication, since differences in growth rates across countries can persist indefinitely.



**Figure 8. The halt in Greece's economic growth, 1954–92**

#### 4.1. Convergence or change in regime?

Can neoclassical convergence explain the slowdown in growth in Greece after 1974? Should the earlier period simply be viewed as 'normal' catch-up towards the income levels of its Western European neighbours, in which case no change in policy regime need be invoked to explain the turnaround after 1974? Or is endogenous growth more apposite, in which case a sustained and clear change in institutions and policy regime might generate a corresponding but permanent change in the underlying growth rate?

Since the neoclassical view implies that growth should be slowing down continuously as output levels rise, whereas endogenous growth is consistent with perpetual growth (a so-called unit root in output levels over time), Table 2 directly tests whether or not growth continually slows. Convergence implies that output growth should be negatively related to the output level in the previous year; a unit root implies that output levels are uncorrelated with growth.

Over the whole sample of annual observations 1955–92, column I shows no significant relation between growth and output once a deterministic time trend is included. Column II shows that without the trend a significant negative relation seems to apply. In themselves these results are inconclusive, since the interpretation hinges on whether or not inclusion of an exogenous time trend in economic growth is appropriate. However, column III removes this ambiguity of inference. Column III, like column II, dispenses with a time trend, but now allows the possibility of an intercept shift across the policy regimes identified in the earlier historical summary. This alone renders statistically insignificant any convergence

**Table 2. Testing for convergence versus two growth regimes, 1955–92  
(dependent variable: change in log (GDP per employee hour))**

Estimated coefficient on:	Regression version			
	I	II	III	IV
Constant	0.011 (0.079)	0.138 (0.032)	-0.057 (0.066)	0.017 (0.007)
Time trend	-0.003 (0.002)			
Log (GDP per employee hour), lagged one year	0.031 (0.038)	-0.033 (0.011)	0.022 (0.019)	
Dummy (1955–73 = 1)			0.069 (0.021)	0.048 (0.011)
Diagnostic statistics				
$R^2$	0.266	0.203	0.391	0.396
S	0.036	0.037	0.032	0.033
DW	1.985	1.719	1.990	1.959

*Note:* Standard errors in parentheses.

relationship between output growth and output levels. Column IV thus omits this insignificant term and summarizes the growth experience in Greece. During each regime, output followed a random walk (exhibited a unit root) with upward drift. This upward drift was larger during the first regime than the second, and the difference between the two is statistically very significant. Average annual growth was 6.5% before 1974, only 1.7% thereafter.

Thus, these results do not reject the hypothesis that there were two growth regimes in post-war Greece, but clearly reject the hypothesis of smooth convergence. To explain Greek economic growth, we must allow for two distinct policy regimes, possibly in the context of an endogenous growth model.

#### 4.2. Returns to capital accumulation and economic growth

The next issue to be resolved is whether aggregate returns to physical capital accumulation in Greece have actually been decreasing, constant or increasing. In a wide class of endogenous growth models, returns to physical capital accumulation are assumed constant or increasing, even though, at a firm level, capital accumulation has decreasing returns. This reflects externalities and spillovers from physical to human capital accumulation, as for example in Arrow's (1962) learning-by-doing model.

Romer (1986) has shown that if spillovers from physical to human capital accumulation are sufficiently strong, aggregate returns to physical capital may be non-decreasing. A convenient class of models assumes constant aggregate returns

**Table 3. Returns to capital accumulation, 1956–92  
(dependent variable: change in log (GDP per employee hour))**

Estimated coefficient on:	Regression version	
	I	II
Constant	−0.008 (0.008)	−0.005 (0.007)
Change in log (capital per employee hour)	1.021 (0.147)	1.001 (0.123)
Dummy 1974		−0.082 (0.024)
Diagnostic statistics		
$R^2$	0.579	0.689
$S$	0.027	0.023
$DW$	2.003	1.894
Serial correlation: LM test	0.086	0.004
Non-linearity: Reset test	2.205	1.986

*Note:* Standard errors in parentheses.

to capital, in which case GDP and capital grow at the same rate. A model of this kind is presented in Appendix A.

It highlights two sets of factors that determine aggregate growth. First, structural and technological factors determine the productivity of physical capital. Some of these operate through human capital and include such long-term factors as health, education and training, economic and social infrastructure, and even aspects such as worker discipline. A second set of factors operates through the share of physical capital accumulation in GDP. Growth may slow because of a fall either in investment as a proportion of GDP or in the productivity of capital – for example, because of distortions that reduce human capital per worker or total factor productivity.

Does this conform with Greek experience? To test for returns to capital accumulation in Greece, I regress the growth of output per employee hour on the growth of capital per employee hour. If the resulting coefficient is smaller (larger) than one, aggregate returns to capital are decreasing (increasing). A unit coefficient implies constant returns to capital.<sup>6</sup>

Table 3 does not reject the hypothesis of constant returns to capital in Greece; nor is this affected by the regime shift. Thus, the output growth rate is determined solely by the rate of physical capital accumulation. With a relatively constant aggregate productivity of physical capital and a relatively constant depreciation rate, the main determinant of output growth is the gross investment rate. This is

<sup>6</sup> This method can be justified if productivity shocks follow a random walk.

**Table 4. Investment and growth, 1956–92  
(dependent variable: change in log GDP)**

Estimated coefficient on:	Regression version		
	I	II	III
Constant	−0.057 (0.028)	−0.058 (0.025)	−0.002 (0.028)
Gross investment/GDP	0.515 (0.142)	0.536 (0.124)	0.320 (0.129)
Gross investment/GDP (1975–92)			−0.160 (0.050)
Dummy 1974		−0.089 (0.026)	−0.010 (0.023)
Diagnostic statistics			
$R^2$	0.274	0.461	0.589
$S$	0.029	0.026	0.023
$DW$	1.804	1.733	2.154
Serial correlation: LM test	0.072	0.153	0.495
Non-linearity: Reset test	1.054	1.073	2.395

*Note:* Standard errors in parentheses.

indeed borne out by the data. Using annual data since 1956, the correlation coefficient between the share of investment in GDP and GDP growth is remarkably high (almost 50%). Investment rates collapsed after the late 1970s – the period in which GDP growth also came to a halt.

Table 4 shows the basic relation between growth and investment suggested by the model of constant aggregate returns to capital. The constant in these regressions can be viewed as an estimate of the depreciation rate, while the coefficient of gross investment can be viewed as an estimate of the average (and marginal) social productivity of capital (inverse of the capital–output ratio). The estimates in columns I and II make sense. The annual depreciation rate of physical capital is estimated at about 6%, while the capital–output ratio is estimated at around 1.9 (inverse of 0.515 or 0.536).

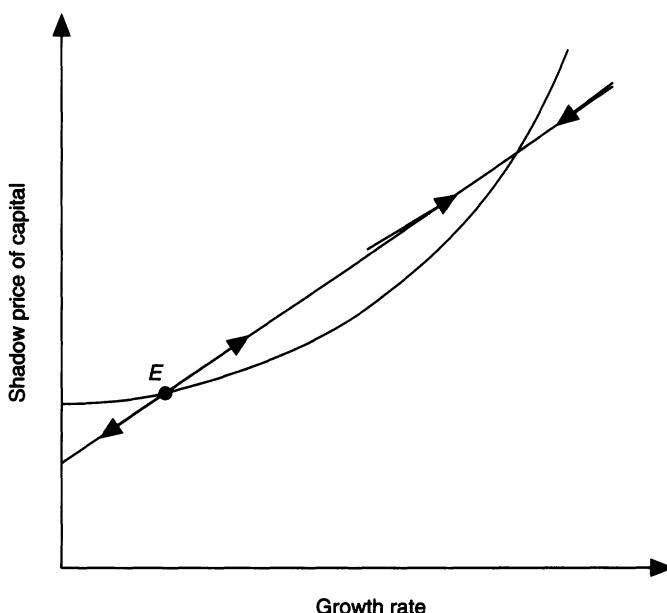
Column III tests for the stability of these estimates by allowing different capital–output ratios in the two regimes. Table 4 finds a sharp drop in the productivity of new capital goods after 1975. The (incremental) capital–output ratio before the 1980s is estimated at 3.1 (inverse of 0.320). After the mid-1970s it doubled, to 6.25 (inverse of 0.16). Not only did investment rates fall after 1974, but new investment also became socially less productive.

Investment rates fell from 22% of GDP on average during 1956–73, to 18% during 1975–92. This alone would have reduced annual growth by 1.3 percentage points. The productivity of new investment was cut in half after the mid-1970s, reducing annual growth by a further 3.5 percentage points. These two factors

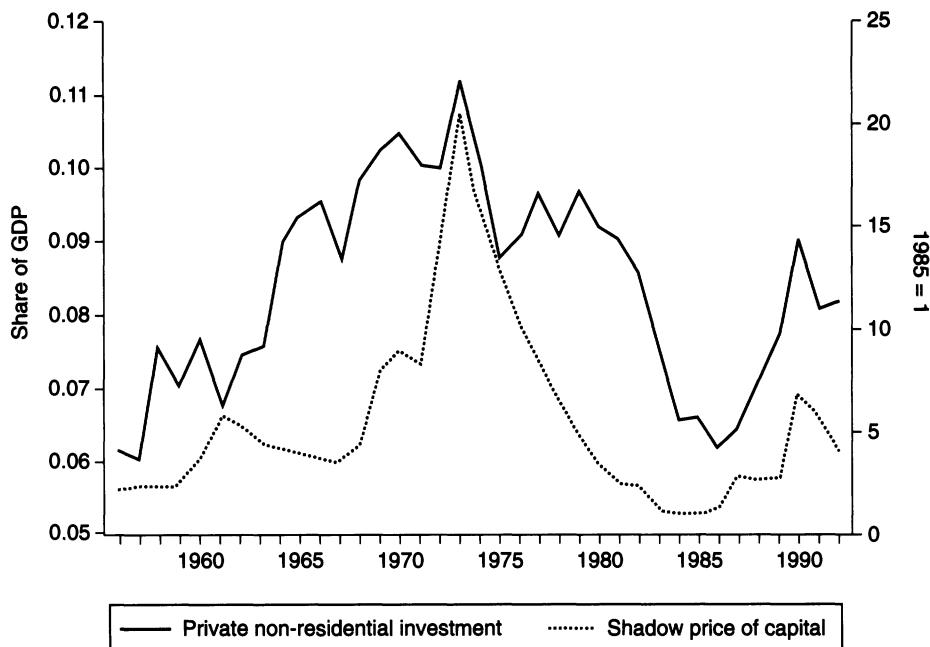
account almost fully for the reduction in the annual growth by 5 percentage points between 1956–73 and 1975–92.

#### 4.3. Investment and growth in a small open economy

It remains to examine the determinants of investment and growth in a small open economy like Greece. Appendix B discusses a formal model of investment and growth in a small open economy, based on Alogoskoufis and van der Ploeg (1990). Firms choose investment to maximize their net present value, and this maximization is subject to convex adjustment costs for investment (installation costs) and constant aggregate returns to capital accumulation. The ratio of gross investment to installed capital, and thus the growth rate of output, then rises with the shadow price, in terms of the price of investment goods, of a unit of installed capital. The closest empirical counterpart to such a concept is the ratio of the stock market value of firms to the value of their capital stock (Hayashi, 1982). The shadow price of a unit of installed capital is in fact equal to the present discounted value of its future marginal products. This depends negatively on the real interest rate, but positively on the marginal product of capital in production and the adjustment costs in installing a given flow of investment. The last factor has a positive impact because the installation cost of a unit of capital is lower when the capital stock is higher. Obviously, the growth rate and the shadow price of capital



**Figure 9. Growth and the shadow price of capital**



**Figure 10. Investment and the shadow price of capital: Greece, 1956–92**

are determined jointly, and depend on the marginal products of capital, real interest rates, the depreciation rate and business taxes.

This joint determination is shown in Figure 9. The straight line depicts the relation between the growth rate and the shadow price of a unit of installed capital. The higher the shadow price of installed capital, the higher is investment and therefore the growth rate, since higher installation costs are compensated by a higher value of installed capital. The curved line depicts the shadow price of installed capital as the present value of its future marginal products. Its position depends on the real interest rate, the marginal product of capital, the depreciation rate and the installation costs of new investment. The shadow price of installed capital and the growth rate are determined at the intersection of the two curves. Only the first intersection is a stable equilibrium. Consider a fall in the present value of future marginal products of capital, because of a reduction in the expected productivity of capital, an increase in business taxes, or an increase in the real interest rate. The curve in Figure 9 shifts downwards. In the new equilibrium, the growth rate is lower, since the investment rate falls in line with the reduction in the present value of the marginal product of capital.

Qualitatively, the predictions of this model accord with the Greek experience. The change in regime caused a permanent reduction in the present discounted productivity of capital, causing a fall in investment and growth. Figure 10 presents relevant evidence, showing the GDP share of business fixed investment (total

**Table 5. Growth and the shadow price of capital, 1956–92  
(dependent variable: change in log GDP)**

Estimated coefficient on:	Regression version	
	I	II
Constant	0.032 (0.008)	0.056 (0.007)
Shadow price of capital	0.003 (0.001)	0.002 (0.001)
1975–92		−0.040 (0.007)
Dummy 1974	−0.115 (0.032)	−0.125 (0.024)
Diagnostic statistics		
$R^2$	0.289	0.619
$S$	0.029	0.022
$DW$	1.202	2.243
Serial correlation: LM test	4.854	0.823
Non-linearity: Reset test	1.879	4.360

*Note:* Standard errors in parentheses.

private investment minus investment in housing) and an estimate of the shadow price of installed capital, namely the stock market index deflated by the investment goods price index and normalized to unity in 1985. The positive correlation between this shadow price of installed capital and private non-residential investment is indeed remarkable. The correlation coefficient is 69%, and remains as high as 63% for total private investment (which includes housing), and 62% for total investment in Greece.

Table 5 presents estimates of the relation between growth and the shadow price of installed capital, predicted by the preceding theory. The effects of the shadow price of installed capital on growth are statistically significant and accord with the model. When one allows for the extraordinary effects of 1974 and the drop in the social productivity of investment since 1975, more than 60% of the variance of growth rates is accounted for by the model. It appears on the basis of this evidence that the reduction in the shadow price of capital, caused by distortions that decreased its marginal productivity and increased its cost, was a significant factor in the halt of economic growth in Greece.

#### 4.4. Aggregate investment and the change in regime

The evidence so far suggests that the fall in investment rates does not seem to be due to decreasing returns to capital accumulation. The regime change identified in section 3, in conjunction with the analysis above, has led us to the relation between growth, aggregate investment and the shadow price of capital. I now investigate

which aspects of the regime change had adverse effects on the present value of future marginal products of capital.

**4.4.1. The change in the labour market regime.** After 1974, two major changes occurred in the labour market, both related to political developments. First, new labour unions emerged, the stronger of which were affiliated to, if not controlled by, the two communist parties and the socialist party. This was a major change from the previous regime, where, following the defeat of left-wing forces in the civil war, organized labour was controlled by the government, mainly through bans on ‘unions that admittedly propagate anti-national or communist ideas or act in ways that harm the interests of workers’. These controls were applied through the Confederation of Greek Workers (GSEE). Until the end of the dictatorship, GSEE and the labour movement remained firmly under government control. Strikes were banned during the dictatorship. In the new climate prevailing after 1974, unions became much more assertive. As we saw earlier, real wages increased substantially and real unit labour costs rose by 30% between 1974 and 1985.

Why would the attempt of unions to increase labour’s share cause lower investment (and possibly lower productivity of investment as well)? The non-cooperative equilibria analysed by Lancaster (1973), Grout (1984) and van der Ploeg (1987) help us understand. Given adjustment costs and irreversibilities in the investment process, labour unions can induce firms to invest more by promising to restrain wage demands. While such restraint is exercised, firms keep investing, growth is high and real wages can rise in line with productivity. This appeared to be the case in Greece before 1974. Government control of GSEE served as a powerful commitment mechanism that guaranteed high investment and growth.

However, if in such a dynamic game one of the parties reneges, either because unions switch to pursuit of excessive wage demands, or because firms fail to invest and distribute higher profits as dividends, the economy may revert to a different equilibrium with little wage restraint and low investment and growth. The change in regime after 1974 seems to have resulted in a shock of this type. Wage restraint became pursuit of real wage increases far in excess of increases in productivity. This caused firms to reduce investment, which in turn led to lower growth. It is also likely that the change in the labour market regime resulted in lower human capital per worker, as labour practices became much more restrictive and strike activity and absenteeism increased. In the aggregate, this would appear as a lower average and marginal product of capital.

**4.4.2. The change in the tax regime.** Something analogous may also have occurred in taxation and the protection of property rights. Capital levies are not unknown in the economic history of many countries, and the capital levy problem is well known to economists (Persson and Tabellini, 1990; Eichengreen, 1990).

While the government sustains low taxation and protects property rights, firms have high profits and keep investing. If the government reneges, resorting to high business taxation or a capital levy, profits are insufficient to justify new investment and growth slows down. From a high investment and growth equilibrium, the economy reverts to an equilibrium with low investment and growth. The post-1974 change in regime in Greece has many such aspects. Favourable tax treatment of business was sharply reversed after 1974, with the introduction of successive capital levies and rises in business taxes which signalled that governments had abandoned the earlier commitment.

Decree 332/1974 limited distributed dividends. Decree 542/1974 raised tax rates on distributed profits and taxed a compulsory revaluation of fixed assets of firms, much of which was due to inflation. Law 11/1975 introduced taxes on fixed assets, Law 820/1978 increased taxation of dividends, and Law 1249/1982 substantially raised taxation of both distributed and retained profits. Many of these increases in profit taxes were retroactive.

These decrees and laws, and other government actions such as the effective appropriation of the second largest banking group and the largest cement producer, signalled a change in behaviour, destroying the reputation of the government as cooperating in a high-investment, high-growth equilibrium. The economy moved to an equilibrium with low investment, low profits and low growth.

**4.4.3. Other distortions.** A host of other distortions, related either to external shocks or to the change in regime, may have contributed to the drop in the aggregate investment/GDP ratio or the fall in the social productivity of capital. The oil price shocks affected all OECD economies at around the time of the regime change in Greece. Bruno and Sachs (1985) were among the first to investigate their effects on aggregate investment rates.

Apart from their effects on property rights and investment rates, nationalizations and the creation of a host of government agencies appear to have contributed to lower efficiency in production. Ailing firms were sheltered from market discipline, being subsidized by the state and operated inefficiently. This reduced the rate of return and investment rates for other firms. Most aspects of nationalized industries, old and new, were undertaken on the basis of political rather than purely economic considerations. Management was ineffective as it changed quite often; pricing policies were used for distributional and electoral objectives; unions and suppliers achieved significant privileges, extracting large rents; and political parties used these industries to find jobs for their supporters.

Until the first oil shock, the Monetary Committee provided central coordinated allocation of savings to firms and sectors that promised high investment and growth. Although criticized as inefficient, the system does not seem to have impeded rapid growth before 1974 (Halikias, 1976). By 1974, under pressure to

avoid layoffs and closures of large firms hit by the oil shock and real wage increases, government ministers in the Monetary Committee extended loans not only for investment but to cover operating deficits in nationalized industries. There was also an increase in compulsory investment by commercial banks in government paper. Thus, credit was extended to inefficient firms and the public sector, at low interest rates, while the rest of the economy faced a credit crunch. This contributed to lower investment and growth. Over time, it led to 'problematic' firms, many of which were included in the Industrial Reconstruction Organization created in the 1980s.

There is evidence that not only the quantity but the quality of public investment programmes deteriorated, especially in the 1980s. Many large infrastructure programmes like the Athens metro and the new airport were postponed in 1981. The national road network, and the telecommunications and the electricity networks, suffered from lack of investment. There was a shift in the 1980s towards the improvement of the social infrastructure, with a large proportion of the investment budget being spent on small-scale projects outside the large cities: old-age housing, local hospitals, squares and pavements formed a large part of public investment, much of it financed through EC grants and subsidies.

Since the 1970s, three types of potentially distortionary subsidy have proliferated. First, there was an active regional policy, with laws purporting to encourage regional development through grants and subsidies for firms investing in less developed regions of Greece. Second, subsidies for public enterprises and entities kept growing, even for current expenditure. Finally, there were extensive transfers from the EC after 1981. Transfers and subsidies of the general government rose from 10% of GDP in 1970 to 13% in 1979 and 24% in 1985. If not applied and monitored carefully, such transfers can result in investment projects with low or even negative social productivity, having minimal effects on economic growth.

#### **4.5. The proximate determinants of investment rates**

Have regime changes in the labour market and tax structure, and the other distortions identified above, been significant determinants of the fall in both investment and growth rates?

First, I examine whether private investment was actually affected by these changes. Since it is impossible to construct satisfactory indices capturing all aspects of the labour market and tax regimes, I use a measure of real unit labour costs (the 'wage-gap' or share of labour costs in output) as an indicator of the increased union militancy since 1974. As for taxes, I use two alternative measures: total tax revenue as a share of GDP, and income tax revenue as a share of GDP. For the oil price shocks, I use the real price of oil. To capture the increase in fiscal deficits and debts, themselves signals of future tax increases, I use seigniorage as a share of

**Table 6. Determinants of private investment/GDP ratio, 1956–92  
(dependent variable: private investment/GDP)**

Independent variable	Estimated coefficient	Standard error
Constant	0.223	0.048
Private investment/GDP, lagged a year	0.473	0.127
Total taxes/GDP	-0.142	0.055
Real unit labour costs	-0.136	0.037
Log (real oil prices)	-0.006	0.003
Dummy 1974	-0.038	0.011
Dummy 1990	0.028	0.011
Diagnostic statistics		
$R^2$	0.889	
$S$	0.010	
$DW$	2.239	
Serial correlation: LM test	2.219	
Non-linearity: White test	0.203	

GDP, a dummy variable for Greece's participation in the EC, and the share of public investment in GDP.

The econometric results are presented in Table 6, which shows the basic investment equation. The coefficient on lagged investment is compatible with any model with adjustment costs, such as that in Appendix B. Other estimated parameters accord with the major distortions and shocks that were identified in the preceding discussion. Both the increase in the tax burden and the increase in real unit labour costs exert a significant negative influence on private investment rates, as does the relative price of oil. The two dummy variables for 1974 and 1990 capture two extraordinary years of private investment. I have already discussed the crisis of 1974. 1990 was a year of investor euphoria, following the change in government. The stock market boomed too. Unfortunately, the euphoria was short-lived as the government failed to live up to expectations.

I also searched for additional suspects, augmenting the regression of Table 6 with a succession of possible extra variables. None of these extra variables was statistically significant in explaining private investment. The failed candidates were central government debt or deficits, each relative to GDP; the ratio of central bank seigniorage to GDP; a dummy variable (1981–92) for EC membership; the ratio of indirect taxes to GDP; and the share of public investment in GDP. Thus, the rise in public deficits and debts does not appear to have reduced private investment significantly; nor does the rise in seigniorage revenue, following the collapse of Bretton Woods. Once the factors in Table 6 are taken into account, there is no role for EC entry on investment. Nor did public investment lead to significant

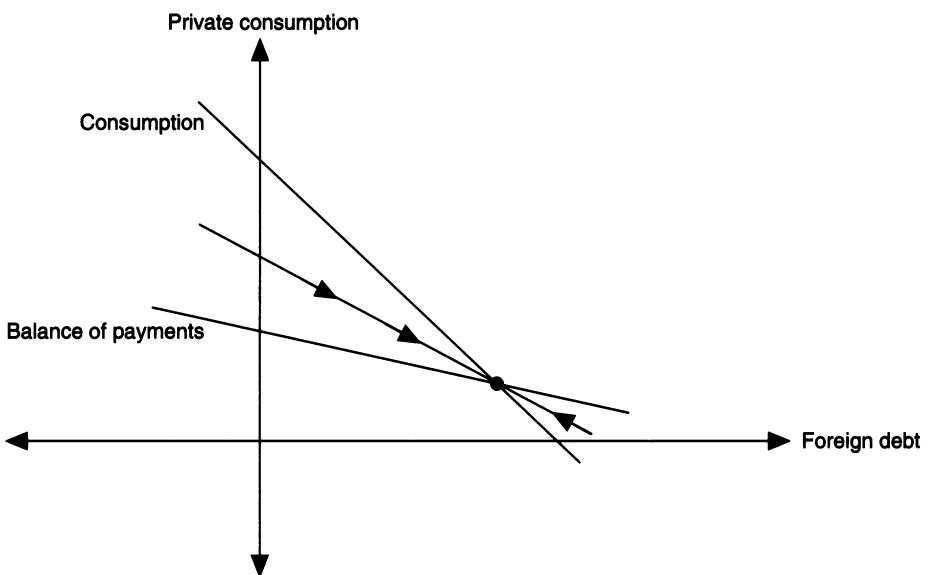
crowding in of private investment. Indirect taxes appear neither more nor less distortionary than income taxes; only total taxes matter, as in Table 6.

In conclusion, focus on the significance of the change in the labour and tax regimes appears justified on the basis of this evidence. A further significant factor seems to be the oil price shocks (which affected all OECD countries and are unlikely to explain Greece's marked differences from its OECD partners). Investment rates also seem to display significant persistence, reflecting either adaptive learning or installation lags. The effects of other distortions on the investment rate are hard to quantify. Surprisingly, given the common view that Greece's growth slowdown reflects stagnation of manufacturing after entry into the EC, there seems no econometric evidence that EC membership adversely affected investment or growth. Equally surprising, there is no evidence of adverse effects of public deficits and debts once the *current* tax burden is taken into account. These questions are too important to be left hanging in the air. I take them up again in the next section.

## 5. THE EC, FISCAL POLICY AND THE BALANCE OF PAYMENTS

Greece entered the European Economic Community in 1981, having applied in June 1975. EC entry also coincided with the explosion of public sector deficits and debts, which began in 1981, the election year, and continued throughout the 1980s. Unlike in a relatively closed economy, in a small open economy like Greece domestic savings, and hence budget deficits and debts, need not be a major determinant of investment and therefore growth (see Appendix B). International borrowing can finance domestic investment; savings decisions affect mainly the balance of payments. If this view is correct, the deterioration in Greece's balance of payments, despite the drop in investment spending, is attributable to lower national saving after the rise in public deficits and debts, rather than to a deterioration in Greece's competitiveness following the rise in relative unit labour costs or EC entry. In fact, EC entry has reduced the external imbalance via substantial transfers to the Greek economy. In so doing it may also have facilitated the persistence of fiscal deficits by relaxing the external constraint.

An intertemporal savings-investment model that allows us to investigate these issues is presented in Appendix C (see also Alogoskoufis and Christodoulakis, 1991). With overlapping generations, public debt is not neutral: higher government deficits and debt reduce national savings, causing a deterioration in the balance of payments. The equilibrium is sketched in Figure 11. Private consumption and foreign debt as a percentage of GDP are determined jointly by consumers' preferences, the world real interest rate, the growth rate, foreign transfers (EC) and fiscal policy. In this model the growth rate is determined independently of consumer preferences, foreign transfers and fiscal deficits and



**Figure 11. Private consumption and foreign debt**

debts, depending solely on investment, itself related to the labour market and tax regime, world real interest rates, and factors affecting the productivity of capital.

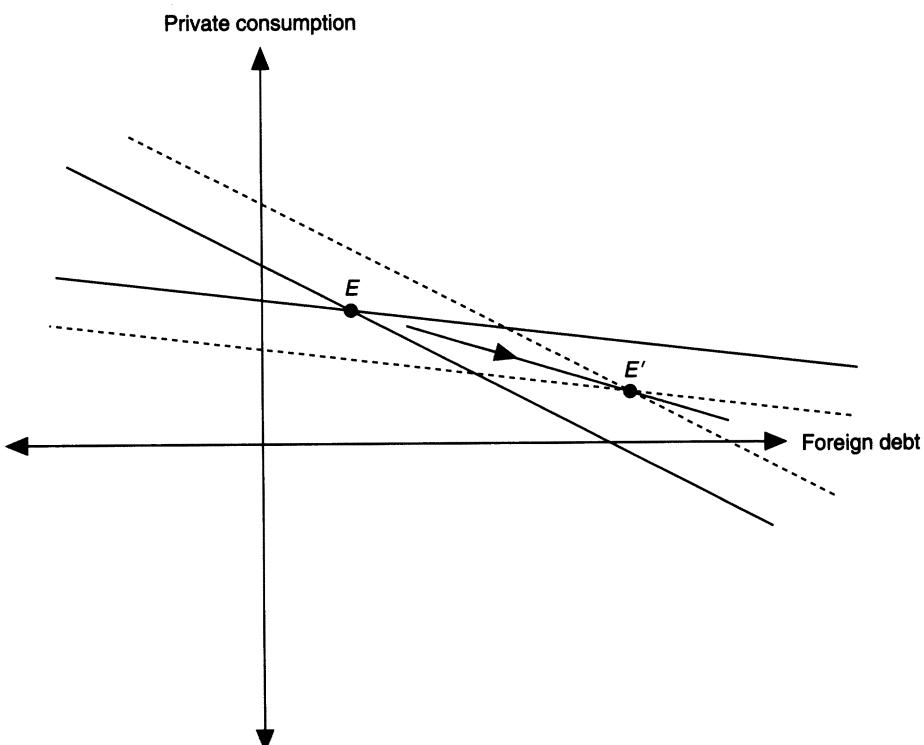
In Figure 11 the private consumption locus depicts combinations of consumption and external debt yielding a constant ratio of private consumption to GDP. The higher the foreign debt/GDP ratio, for a given ratio of capital and public debt to GDP, the lower the wealth of private consumers and the lower the sustainable share of private consumption. The balance of payments equilibrium locus is the combination of private consumption and foreign debt that maintains balance of payments, defined as constant foreign debt/GDP. The higher the foreign debt/GDP ratio, given the share of public consumption, foreign transfers, the world real interest rate and the growth rate, the lower the share of private consumption that is consistent with balance of payments equilibrium. A higher foreign debt results in higher interest payments to the rest of the world, requiring higher domestic savings in the absence of new foreign borrowing. The equilibrium is determined at the intersection of the two loci. The adjustment towards equilibrium is uniquely determined along the saddlepath depicted in between the consumption and balance of payments equilibrium loci.

Can this model explain the deteriorating Greek current account since the 1970s? I argue that the key lies in the increase in fiscal deficits and debts. Two factors that worked in the opposite direction were the slowdown in investment and growth, analysed in the previous section, and the increase in EC transfers. EC transfers increased the current account and private consumption relative to what they would otherwise have been.

### 5.1. Fiscal deficits and debts

Figure 12 allows us to examine the effect of a rise in government consumption that leads to an increase in public debt. The balance of payments equilibrium locus shifts down (higher government spending must be offset by lower private consumption to maintain balance of payments equilibrium), but the consumption locus shifts up (it now requires higher consumption to maintain the consumption/GDP ratio at each level of foreign debt). In the new equilibrium, the private consumption/GDP ratio is lower and external debt higher: taxes have to be raised to stabilize the long-run public debt/GDP ratio. However, in the short term, as the economy converges along the saddlepath to the new steady state  $E'$ , private consumption initially falls by less than the amount eventually required at  $E'$ . This induces current account deficits and the accumulation of external debt. As external debt accumulates, consumer wealth and hence the consumption/GDP ratio fall, and the balance of payments improves.

The eventual return to external balance may be quite slow. In addition, if fiscal policy does not ensure eventual stabilization of the public debt/GDP ratio, equilibrium will not be restored. Consumption smoothing of the type described above will only lead to stabilization of net private assets as a share of GDP. If the public debt component of net private assets is unstable, then foreign debt will also



**Figure 12. A deficit-financed rise in public consumption**

**Table 7. Recent developments in Greek fiscal policy, 1978–93: general government (% of GDP)**

	Outlays		Total receipts	Deficit	
	Total	Of which, interest		Total	Primary
1978	31.6	1.7	29.9	1.7	0.0
1979	32.9	2.1	30.4	2.5	0.4
1980	33.1	2.4	30.2	2.9	0.5
1981	39.1	3.3	28.8	10.2	7.0
1982	39.7	2.6	32.0	7.7	5.0
1983	41.7	3.7	33.2	8.6	4.8
1984	44.4	4.6	34.3	10.1	5.5
1985	48.3	5.4	34.3	14.0	8.6
1986	47.6	5.8	35.1	12.5	6.7
1987	47.6	7.2	36.0	11.7	4.5
1988	47.5	7.8	33.8	13.7	5.9
1989	49.4	8.3	32.8	16.6	8.3
1990	53.3	12.0	35.2	18.1	6.1
1991	50.8	11.6	36.4	14.4	2.8
1992	50.6	10.4	39.6	11.0	0.6
1993	52.7	13.2	39.8	12.8	−0.3

Source: OECD, *Economic Outlook*, June 1994.

be unstable and balance of payments disequilibria will persist. Until the mid-1970s, Greek governments followed the so-called 'golden rule' of fiscal policy, allowing deficits only in the government investment budget. After 1978 they began to break this rule, especially in election years (see Table 7).

The rise in general government debt during the 1980s was mainly due to large primary deficits. The Papandreu governments engineered an expansion of the welfare state and grants and subsidies, which was mainly financed through domestic and external borrowing and EC transfers. The primary deficit of general government averaged 6.2% during 1981–90, peaking in election years, such as 1981, 1985 and 1989. The fiscal adjustment effort had transformed the primary deficit into a surplus by 1993, but the debt/GDP ratio continues to rise.

The continued rise in public debt since 1990 mainly reflects interest payments on the debt. Real interest rates increased partly because of financial liberalization and the consequent influences of conditions elsewhere in Europe, such as German unification, and partly because of a domestic switch from lax to tight money in an attempt to bring inflation under control.

Despite these fiscal developments, neither the balance of payments nor private consumption has shown the pattern one would have expected. In particular, with continuously rising public debt/GDP, one would have expected continuously rising external debt/GDP, inducing an external crisis that forced more drastic fiscal adjustment; and steady falls in private consumption/GDP, inducing political

**Table 8. EC transfers to Greece (% of GDP)**

1981	0.4	1985	2.6	1989	4.8
1982	1.4	1986	3.5	1990	4.4
1983	2.4	1987	3.6	1991	5.7
1984	2.1	1988	3.6	1992	5.2

Source: Bank of Greece.

demands for fiscal adjustment. In fact, in Greece we saw neither of these (aside from two brief balance of payments crises in 1985 and 1989/90).

### 5.2. The role of EC transfers

The missing piece of the puzzle seems to have been EC transfers, which as a share of GDP rose tenfold from 0.4% in 1981 to over 5% by 1990. Their evolution is depicted in Table 8. In terms of Figures 11 and 12, a rise in EC transfers shifts the balance of payments equilibrium locus upwards. This effect alone tends to increase private consumption, but to lower foreign debt. In the short run, following the rise in transfers, consumption jumps upwards on to a new adjustment path. Thus, the trade deficit worsens but the current account improves, since the rise in private consumption is less than the rise in transfers. External debt starts falling as a share of GDP. Hence rising assets of domestic consumers sustain rising consumption. EC transfers thus created a type of 'Dutch' disease: an improved current account and higher private consumption, but lower net exports.

### 5.3. Interactions between EC transfers and fiscal policy

This analysis suggests that the deterioration in Greece's balance of payments in the 1980s is mainly due to domestic fiscal policy. EC transfers relieved the pressure on the balance of payments and helped sustain private consumption, despite the growth slowdown and the rising tax burden. EC transfers may have had fewer benefits than is usually believed. By relaxing the external constraint and allowing high private consumption, they seem to have delayed the necessary fiscal and wage adjustment, and crowded out the traded goods sector, via both looser fiscal policy and higher real wages (lower competitiveness).

The decline in Greek manufacturing, documented by Giannitsis (1988), Hassid and Katsos (1992) and OECD (1993), and the growing trade imbalance are mainly due to the indirect effects of the sizeable transfers from abroad, not to trade liberalization *per se*, a conclusion that reinforces the earlier claim of Maroulis (1986) that chronic deficits in Greece's balance of trade reflect a large surplus on invisibles and transfers arising from emigrants' remittances, receipts from tourism and recent EC transfers. Moreover, since until recently EC transfers were largely unconditional, they did not create incentives to counteract the relaxation of the external constraint.

EC transfers may also have caused more serious distortions. The programmes funded by these transfers – the CAP, training, regional assistance – were not well designed and may not have made a positive contribution to the efficiency of the economy. These microeconomic distortions are additional to the macroeconomic distortion I have highlighted. Similarly, the extended transition that Greece was granted, before having to conform to EU trade and financial market liberalization, delayed the adjustment of the Greek state and of domestic firms.

## 6. INFLATION, UNEMPLOYMENT AND MONETARY POLICY

I finally turn to the other aspect of Greece's deteriorating economic performance: the rise in inflation. The rise in budget deficits in the 1980s was accompanied by a rise in average inflation, which led to faster depreciation of the Greek drachma in the crawling peg (Figure 5). Seigniorage as a share of GDP also rose (Figure 13). During 1954–73 central bank seigniorage (change in the monetary base) averaged 1.9% of GDP; average inflation was 3.8%. After 1974 seigniorage rose to 3% of GDP on average; average inflation rose to 18.3%.

The rise in inflation can also be seen from another angle: the attempts by post-1974 governments to fine tune the economy in the face of rising unemployment rates. Concern for unemployment was enshrined in the 1975 constitution, which included a clause that defined the responsibility of the government for maintaining full employment; the previous constitution of 1952 contained no such clause.

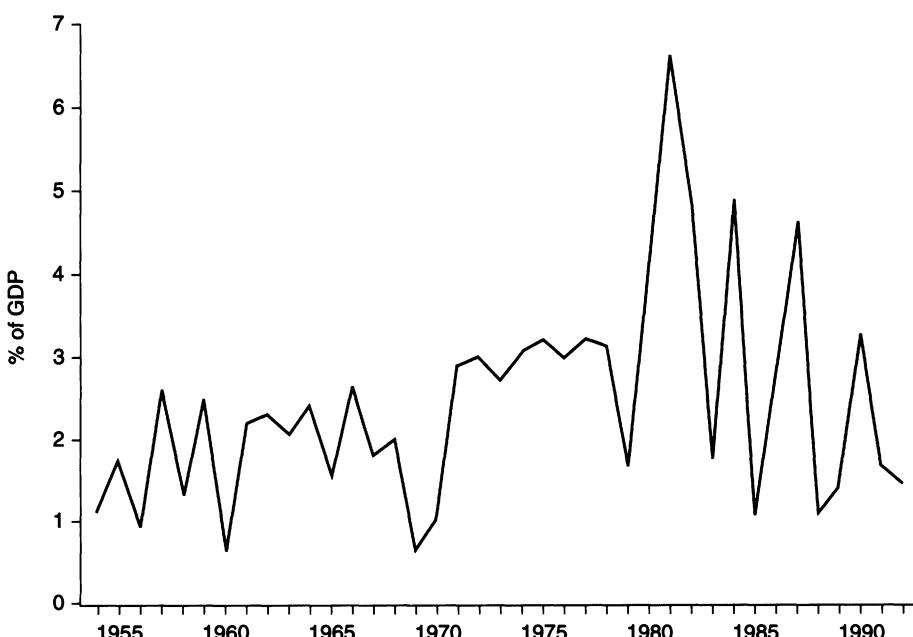


Figure 13. Central bank seigniorage: Greece, 1954–92

After the drachma devaluation of 1953, Greece participated fully in the Bretton Woods system of fixed exchange rates until 1972. The drachma was made convertible for current transactions in May 1959, shortly after convertibility in the rest of Western Europe. As Figure 1 demonstrates, between 1955 and the collapse of Bretton Woods in 1972, Greece enjoyed extremely low inflation, below the OECD average.

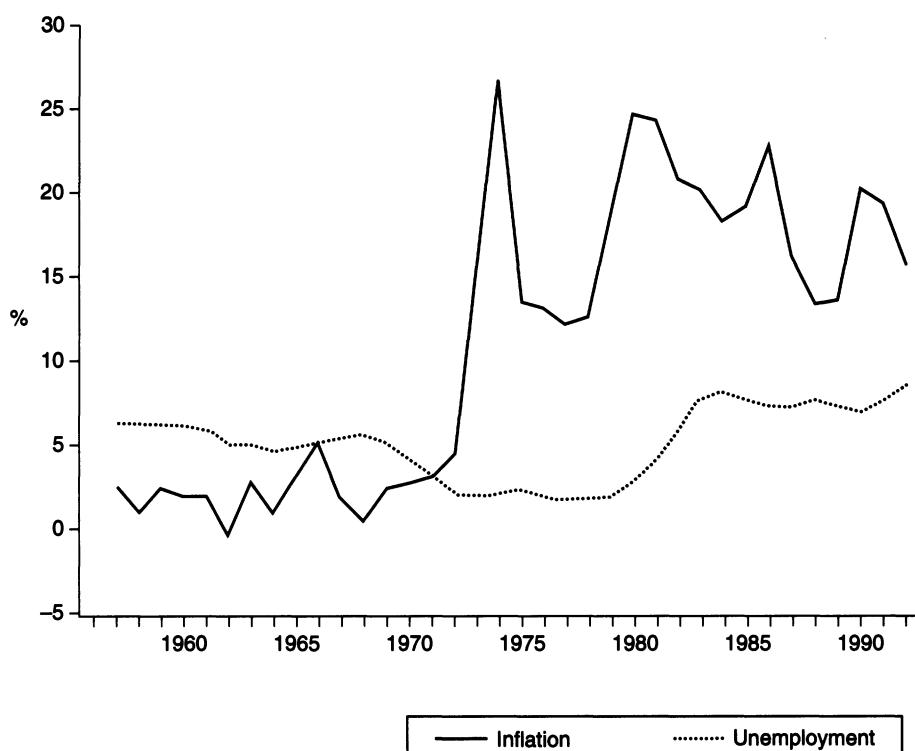
After 1972, Greece was not part of European attempts at monetary cooperation and exchange rate stability, but rather followed an independent ‘crawling peg’ exchange rate policy, accommodating inflation differentials with its trading partners. Its inflation rate has since soared. Monetary independence has led to persistently high inflation, without visible benefits for economic growth, unemployment or the current account.

This accords with modern theories of inflation (Kydland and Prescott, 1977; Barro and Gordon, 1983) suggesting that, whereas the proximate cause of inflation persistence is excess monetary growth, the deeper determinants are distortions in the labour, product and capital markets that provide incentives for this monetary growth. Governments seek to offset distortions through unanticipated inflation, but this becomes anticipated by the private sector. Actual inflation becomes high, but, being anticipated, it cannot correct the distortions that are of concern to governments. In Greece, acceleration in the rate of money creation appeared a cheap way to finance enlarged government, while avoiding some of the economic distortions and political backlash associated with higher tax rates or more interest-bearing government debt. Initially unanticipated, monetization is not immediately reflected in inflation or debt interest (Dornbusch, 1988); the government has much to gain and little to lose. But as the policy becomes anticipated, nominal interest rates rise and savings by the government evaporate.

Similar problems arise from high unemployment or current account deficits. If wage increases are low, the government has an incentive to devalue the currency to reduce relative unit labour costs, unemployment and the trade account deficit. However, once anticipated, devaluation is reflected in wage and price setting, and has no effect on the real exchange rate, the unemployment rate or the current account. Its main effect will be an increase in inflation.<sup>7</sup>

Thus, in an economy such as Greece, facing substantial real distortions, monetary sovereignty may increase inflation. Previously, Greece had enjoyed the institutional constraint of Bretton Woods, and inflationary expectations had been contained, even in the face of an overheating economy in 1971/2. When the institutional constraint of Bretton Woods was removed, inflation and, subsequently, inflationary expectations soared. Did the worsening of the inflation

<sup>7</sup> See Alogoskoufis (1990) for a model of this process in Greece. Alogoskoufis and Philippopoulos (1992) investigate the effects of exchange rate regimes and preferences of political parties on inflation expectations.



**Figure 14. Inflation and unemployment rates: Greece, 1957–92**

**Table 9. Wages, inflation expectations and the exchange rate regime, 1958–92  
(dependent variable: change in log (hourly earnings))**

Estimated coefficient on:	Regression version		
	I	II	III
Constant	0.109 (0.016)	0.125 (0.018)	0.134 (0.018)
Inflation, lagged one year	0.443 (0.151)	0.359 (0.174)	0.728 (0.082)
Unemployment rate, lagged one year	-0.882 (0.265)	-1.159 (0.295)	-1.325 (0.306)
Managed exchange rates (1973–92 = 1)	0.063 (0.024)	0.065 (0.028)	
Incomes policy (1986–7 = 1)	-0.084 (0.024)		
Diagnostic statistics			
$R^2$	0.850	0.789	0.752
$S$	0.030	0.035	0.038
$DW$	2.094	1.831	1.952
Serial correlation: LM test	0.483	0.123	0.000
Non-linearity: White test	1.077	1.214	3.537

performance result in lower unemployment? Figure 14 shows that the answer is no. The rise in inflation was accompanied by a rise in unemployment after 1981.

Finally, Table 9 provides estimates of an expectations-augmented wage equation, in which wage inflation depends on expected inflation and labour market tightness (unemployment lagged once). The expectations of inflation are proxied by lagged inflation and a dummy variable for the nature of the exchange rate regime (which affects how long inflation is likely to persist). The results support the view that the shift from a fixed to a managed exchange rate regime shifted inflationary expectations of wage setters by about six percentage points, for a given lagged inflation rate. As expected, a rise in unemployment reduces wage growth with a one year lag.

In conclusion, the change in monetary regime, due in part to the collapse of Bretton Woods and in part to the Greek wage explosion, is the main cause of the rise in both the level and persistence of Greek inflation. There was no corresponding reduction in unemployment, or increase in investment and growth.

## 7. WHERE IS GREECE HEADING NOW?

Why did Portugal and Spain do so much better than Greece after EC entry? Where is Greece heading now? These questions require an answer in this penultimate section.

### 7.1. Greece, Portugal and Spain since EC entry

Table 10 compares macroeconomic performance in Greece, Portugal and Spain before and after EC entry. All three experienced a growth slowdown after 1974. Whereas in Greece the slowdown started around the time of EC entry, in Portugal and Spain EC entry was followed by an impressive turnaround in growth. All three economies also displayed a significant deterioration in inflation performance after 1974. However, whereas Portuguese and Spanish inflation fell significantly around EC entry in 1986, inflation in Greece persisted. Greece failed to make the necessary adjustments to allow its participation in the Exchange Rate Mechanism of the EMS. Finally, a similar pattern emerges in the balance of payments. Greece's deteriorated around EC entry in 1981, whereas that of Portugal and Spain improved, despite the increase in investment that both countries experienced. Portugal and Spain did not relax fiscal policy when EC transfers started flowing in. Thus, their experience is compatible with the analysis in Figures 11 and 12.

These patterns are consistent with the interpretation offered in this paper. It is domestic policy regimes and not trade liberalization that are to blame for the worse growth and balance of payments performance of Greece. Greece, Portugal and Spain have had many similarities in recent years. All three benefited from the restoration of democracy in the mid-1970s, but faced pressures for income

**Table 10. Comparative macroeconomic performance: Greece, Portugal and Spain, 1954–93**

		Greece	Portugal	Spain
GDP growth (%)	1954–73	7.1	6.1	6.1
	1974–93	2.1	2.6	2.3
	1974–9	3.8	3.0	2.2
	1980–4	1.1	1.3	1.3
	1985–9	2.4	4.3	4.3
	1990–3	0.8	1.8	1.4
Inflation (%)	1954–73	3.8	4.0	6.7
	1974–93	18.1	17.8	11.7
	1974–9	16.2	23.3	17.9
	1980–4	21.8	22.7	13.6
	1985–9	17.2	12.6	6.9
	1990–3	17.6	10.0	5.8
Current account	1960–73	–3.4	...	0.0
	1974–93	–4.5	–3.1	–1.5
	1974–9	–4.4	–4.7	–1.8
	1980–4	–5.7	–7.8	–1.5
	1985–9	–4.6	0.9	–0.1
	1990–3	–2.8	0.0	–2.7

Source: OECD, *Economic Outlook*, June 1994.

redistribution that led to inflation, slower growth and balance of payments problems during 1975–84. However, whereas Portugal and Spain began adapting their institutions and policies in anticipation of EC entry, Greece delayed. Even after EC accession, Greece went for long grace periods, not rapid liberalization, and opted for an accommodating crawling peg rather than the ERM. Unlike Portugal and Spain, it used EC transfers to delay rather than promote fiscal and structural adjustment.

## 7.2. Greece in the 1990s

A number of the distortions in Greece highlighted in this paper began to be corrected after 1990. First, the labour market regime has improved, with greater cooperation between unions and employers' federations. In both 1990 and 1993 there were two-year contracts and modest wage increases. Government intervention in collective bargaining agreements is now minimal. Impediments to part-time work have been removed. Second, the tax regime has been simplified, and both business and personal tax rates were reduced in 1992; these were only partly reversed in 1994 by the new government. Financial liberalization has proceeded quickly in recent years, as has deregulation in goods and services markets. Price controls are no longer used. Many loss-making firms in the public sector have been liquidated or sold off. Significant improvements have also taken

place in infrastructure investment, with emphasis on fewer and larger projects with discernible positive externalities. Monetary financing of the fiscal deficit has been reduced in accord with the provision of the Maastricht treaty. As a result, the rate of depreciation of the drachma has slowed, and this has led to a reduction of inflation to around 11% in 1994.

However, these reforms need time to gain credibility, and need to be reinforced by another round of fiscal consolidation. Further liberalization and privatization is needed in banking, transport, telecommunications, energy, health and education. EC transfers are due to increase in the next few years. Fortunately, there is now more conditionality and a better monitoring of the projects thus financed. This should reduce the macroeconomic and microeconomic distortions caused by such transfers.

The critical mass of reforms that would help restore confidence has not yet been completed. Unless this happens soon, it is doubtful whether Greece will return quickly to high investment and high growth, and benefit from the single market and the monetary unification process.

## 8. CONCLUSIONS

My analysis suggests that the change in regime that took place because of the tension between political and economic institutions after the mid-1970s has contributed greatly to the worsening of Greece's macroeconomic performance. The collapse of Bretton Woods and the two oil shocks had a negative impact in Greece as elsewhere, but domestic institutional developments made matters much worse.

The first was the failure of labour market reform after 1974 to maintain sufficient commitment mechanisms to guarantee adequate returns to private investors. The switch from the suppression of labour unions to a regime of full accommodation of union demands led to large increases in real unit labour costs during 1975–85, depressing investment and growth. In conjunction with the collapse of Bretton Woods, it led to an accommodating regime for monetary and exchange rate policy that made inflation persist.

The second domestic institutional development was the loss of credibility of the tax authorities *vis-à-vis* investors and firms. This followed a significant increase in the tax burden in order to finance an expansion of the role of the state. It depressed domestic private investment, especially as some of the tax increases were retroactive levies on business profits.

A number of other microeconomic distortions are likely causes of slower growth. Slow growth was due not only to lower investment, but also to a fall in the social productivity of capital. The impact of such distortions is more difficult to document formally at the aggregate level.

The large increase in public sector deficits and debts after the late 1970s was significant in halting economic growth. It also caused the deterioration in the balance of payments and the loosening of monetary policy. Trade liberalization following EC entry was not directly responsible for the slowdown in growth. However, EC transfers contributed to the squeeze in tradables by substituting for exports in the current account. They also allowed loose fiscal policy and the increase in real unit labour costs to persist longer, by relaxing the external constraint. The change in monetary regime and the evolution of fiscal policy contributed to a loss of confidence in the internal and external value of the currency, which through the process of wage and price setting resulted in persistent inflation.

Since 1990 there have been attempts to deal with many of these distortions, and a slow process of adjustment of both the labour market and tax regimes has taken place. In 1991 and again in 1994 there were two-year labour contracts with only limited wage indexation. Long-term contracts may provide a commitment mechanism in the labour market. In addition, there were attempts to control budget deficits and thus stop the inexorable rise in the tax burden. Large primary fiscal deficits have disappeared, nationalizations have given way to a few privatizations, price controls have been relaxed, and the labour market has been partially liberalized. Monetary financing of the state has been reduced and monetary policy in general has become tighter. However, these attempts have not been sufficiently bold to help reverse expectations and lead to a new wave of investment and growth. The attempts at disinflation have also been too gradual.

Under these circumstances, it appears unlikely that Greece will soon return to a high growth, non-inflationary path. That would require another wave of reforms to lend credibility to attempts to tackle distortions that discourage private investment and generate expectations of high inflation. Such a change in regime should include a shift in the role of the state away from direct production and towards effective regulation, and the adoption of strict rules in the budgetary process to remove the partisan and electoral influences that have contributed to the explosion of public debt. Finally, the central bank should be granted independence. The convergence process envisaged in the Maastricht treaty, despite its weaknesses, could, if applied properly, help Greece in this endeavour.

I began by arguing that the experience of Greece could help us better understand the role of institutions and policy regimes in economic performance. I hope to have demonstrated that the post-war Greek experience can be understood only with reference to the sharp change in economic regime that occurred around 1974. And if the institutional underpinning and policy regime have important effects on economic policy, increasingly the analysis of economic policy and performance will have to address more comprehensively the political and social forces shaping these institutions.

## Discussion

### Francesco Giavazzi

Bocconi University, IGIER and CEPR

Alogoskoufis argues that the sharp deterioration in Greece's economic performance since the early 1970s is the result of the change in political institutions that occurred in 1974, when the military dictatorship collapsed and the country returned to democracy. I remain less than fully convinced. The paper makes no attempt to disentangle the effects of common versus Greek-specific shocks. All OECD countries in the early 1970s were hit by common external shocks and, as a result, experienced a slowdown in growth and productivity: Greece was no exception. Moreover, Greek productivity growth appears to start diverging from the rest of the OECD in the 1980s, not the 1970s. Between 1960 and 1973 (see Crafts, 1992), Greece ranked second after Japan in the growth rates of both labour and total factor productivity; between 1974 and 1979 it still ranked second in terms of labour productivity, and slipped to number four in total factor productivity. The big change occurs after 1980, when Greece becomes unambiguously the worst performer in the OECD. Thus the data suggest that the break in Greece's economic performance occurred in the 1980s, not in the mid-1970s.

The reference to the effects of the struggle for income shares between various socioeconomic groups in the presence of weak governments is also unconvincing. In Italy, in the same years, the violent actions of the Red Brigades made the front pages almost daily, while the *scala mobile* froze real wages. Still, between 1978 and 1980, Italy experienced an investment boom unparalleled in the post-war period.

The Greek political system post-1974 is one with clear winners and losers, with neither hung parliaments nor coalition governments. In at least two cases, in the 1970s and in the early 1980s, two different parties had very large parliamentary majorities and the possibility of implementing whatever programme they chose. This is not a regime one would associate with weak governments.

Were nationalizations perceived as a breach of property rights? With few exceptions, the Greek nationalizations of 1975–7 resulted from the state and the Organization for the Restructuring of Firms taking over insolvent private firms.

Instead I find convincing and appealing the argument that the large resource transfers that Greece received from Brussels after joining the EC in 1981 helped conceal the extent of economic problems and allowed politicians to postpone much-needed reforms.

Traditional trade theory suggests that, when a country joins a free-trade area, growth may suffer: integration may reveal the extent to which the country was uncompetitive and may require costly reallocations of output and employment. The argument here is different: EC transfers – which in some years amounted to 5% of GDP – not only introduced significant microeconomic distortions into agriculture and into the labour market: by relaxing the external constraint and allowing high private consumption, they helped delay the necessary fiscal and wage adjustments. In turn, looser fiscal policy and higher real wages crowded out the traded goods sector.

The inefficiency of EC transfers to Greece seems to continue. Commenting on the use of EC structural funds, the *Financial Times* (1994, no. 32, p. 494) writes ‘The European Commission has placed a temporary block on disbursements of Greece’s share [of structural funds]. A Commission official said Greece’s public works ministry had failed to convince Brussels that it had implemented reforms needed to ensure the money would be wisely spent.’ I wish that the paper had analysed the use of EC funds transferred to Greece in greater detail.

## Guy Laroque

INSEE, Paris

The study by George Alogoskoufis is very ambitious. In this short paper, he analyses the macroeconomic evolution of Greece in the past forty years. He then puts forward an explanation of the main feature of the time path of GNP: a change of regime assigned to the internal political event that took place in 1974. In the process, the paper reviews the history of post-war Greece, its internal politics, labour market, tax law and monetary regulations. There are a lot of interesting facts, and I learned much about Greece while preparing this discussion.

I have no doubt there is some truth in his thesis: the major institutional changes with which Greece experimented in the mid-1970s played some part in the observed decline of its growth rate. However, as always in economic policy exercises, the proof of the assertion (are these political events exogenous to the growth process?) and, more importantly, the quantification of the thesis (what share of the decline is due to these events?) are very hard to provide. The road taken by the author is to posit a number of strong assumptions, coming from simplified theoretical models, and to test some of them on aggregate annual data. I am afraid that I would rather have had a more microeconomic approach, using some sectorial evidence. I would also have liked a more thorough analysis of the effects of the oil shock, perhaps along some of the lines used in the host of ‘productivity decline’ studies (e.g. Nordhaus, 1980).

One possible way to control, albeit imperfectly, for international events such as the oil shock would be to compare the situation of Greece with that of similar economies with differing political experiences. In this respect, Table 10, which shows some summary statistics for Greece, Portugal and Spain, is inconclusive. We

do see that Greece differs significantly from the two other economies only in the period starting in 1985. The author interprets this fact as confirmation of his thesis: the changes of political regimes experienced by Portugal and Spain at the beginning of the 1970s had some similarities with the ones in Greece and may have produced similar effects. However, in my opinion, this is a test without power: the figures would also look alike in the three countries during 1975–85 if the main driving force was the oil shock. On the whole, I am left rather unconvinced by the econometric arguments.<sup>8</sup>

The argument of the paper has the following main steps: first, the aggregate production for the Greek economy is linear in the stock of capital, a feature that may be rationalized with externalities. Therefore, the rate of growth of GNP is equal to the rate of the stock of capital: the post-1974 decline is traced through an investment equation where taxes and real unit labour costs are the main explanatory variables. I have two main remarks on the procedure.

### **The production function**

The constant returns assumption is investigated in Table 3, which presents the results of a linear regression of the change in  $\log(Y/H)$  on the change in  $\log(K/H)$ , where  $Y$  is GNP,  $K$  the stock of capital and  $H$  the number of worked hours. In other words, the implicit production function is:

$$[Y_t/H_t] = [K_t/H_t]^\alpha \exp(\lambda t + \mu + \epsilon_t)$$

where  $\alpha = 1$  under the null hypothesis,  $\lambda$  and  $\mu$  are constants, and  $\epsilon_t$  follows a random walk. Table 3 indeed indicates that the hypothesis  $\alpha = 1$  is not rejected by the data on an annual sample from 1956 to 1992. I have two comments on the results of Table 3.

First, the long-run macroeconomic production function, which is the object of interest, links potential output to the stock of capital. To recover this function, one has to evaluate the movements of potential output, correcting for short-run changes in capacity utilization. It is well known that, in the short run through the accelerator effect, investment is strongly correlated with changes in output: in the absence of correction for capacity utilization, the estimate of  $\alpha$  is likely to be biased upwards. The effect of the introduction of a dummy for the recession year of 1974, as shown by Table 3, seems to confirm this intuition.

Second, the regression is done on a per hour worked basis, while the basic time series under study is total GNP. It would be of interest to know more about the

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<sup>8</sup> The text on which my discussion is based does not contain any equations, but alludes to three appendices which I have not seen. It is probable that some of my misunderstandings, for which I want to apologize to the author, are due to unwarranted inferences drawn from the literary exposition.

demographic evolution and the change in composition of the labour force. What is the magnitude of these changes, and what is their timing? I would guess that both the baby boom and the probable increase in education level would contribute to an increase in the growth rate of GNP. This would, if anything, magnify the 1974 break.

### The structural breaks

My main difficulty with Table 3, which probably points to a basic misunderstanding of the logic followed by the author, is that this table does not test for a structural change in 1974 of the production function. For instance, it seems natural to ask whether a change in the drift of technical progress in 1974 would not account for most of the phenomenon to be explained.

More importantly, even if one takes for granted that there are no structural breaks in the production function, it would be useful to check that the breaks can be found in the right-hand side variables of the investment equation of Table 6. It would be nice to evaluate the impact of the institutional changes described on real unit labour costs and taxes, and to see that they are of the right order of magnitude.

## General discussion

Dani Rodrik questioned the break point in regimes; like Giavazzi, he thought 1981 was more plausible than 1974. Assaf Razin pointed out that Janus may have three faces rather than two: one before 1973, one between 1973 and 1982, and the third after 1982. George de Menil also supported the view that there are three faces rather than two.

Juan Dolado expressed concerns regarding the econometric aspects of the paper. He was unconvinced about the unit root and failure of neoclassical convergence. George de Menil questioned the stability of the investment equation. Michael Burda thought that a sectorial analysis was missing. A sectorial reallocation, like the Dutch Disease, could have played a role in explaining the aggregate data. Tourism was a candidate for such an explanation. Hans-Werner Sinn thought that EC transfers might be explicitly included in a model of endogenous growth.

Riccardo Faini stressed the political aspect. There might have been a change from a commitment equilibrium to a non-commitment equilibrium where union power may have been important; but a clearer link should be shown. Rick van der Ploeg agreed with the idea of a breakdown of the commitment mechanism and also pointed out that seigniorage may have been an important form of government funding.

David Begg wondered if EC membership may have been a force for discipline for the local governments in Greece; external agencies are usually a source of helpful conditionality when domestic commitment is limited. George de Menil also agreed with the view that EC membership may have been important. He wanted to have seen a comparison between Spain, Portugal and Greece, since these economies were similar in the 1970s. It was insufficient to claim, as the paper did, that Spain and Portugal had been successful in investing EC transfers rather than using them to fund deficits and paper over the cracks. The key issue is why this was the case. Furthermore, he stressed that the government sector should have been incorporated into the analysis: the government may have absorbed the unemployed, and thereby reduced unemployment.

## APPENDIX A. RETURNS TO CAPITAL ACCUMULATION AND ECONOMIC GROWTH

Consider a small open economy whose firms are price takers in product and asset markets. Domestic prices and interest rates are set by the law of one price and uncovered interest parity respectively. Firm  $i$  produces output with constant returns to capital and labour:  $\gamma_{it} = AK_{it}^a(h_iL_{it})^{1-a}$  where  $\gamma$  is output,  $K$  capital,  $L$  the number of workers, and  $h$  human capital per worker, which is assumed the same for all firms. Following Arrow (1962) and Romer (1986), suppose  $h_i$  increases with aggregate capital  $K_t$  and public infrastructure  $G_t$ : thus  $L_i h_i = G_t^b K_t^{1-b}$ . Constant returns in human capital formation are crucial for the model's properties.

Suppose public infrastructure is a constant fraction  $g$  of GDP, so that  $G_t = g\gamma_t$ . Substituting for human capital in the production function, and aggregating across firms,

$$\gamma_t = \bar{A}K_t \quad \text{where} \quad \bar{A} = \{Ag^{b(1-a)}\}^c \quad \text{and} \quad c = \{1 - b(1 - a)\}^{-1} \quad (\text{A1})$$

Aggregate output is linear in aggregate capital. Both grow at the same rate. Given a constant depreciation rate  $d$ , gross investment  $I_t = \dot{K}_t + dK_t$ , whence

$$\dot{\gamma}_t/\gamma_t = \dot{K}_t/K_t = (I_t/K_t) - d = (\bar{A}I_t/\gamma_t) - d \quad (\text{A2})$$

Table 3 tests the linear production function (A1). Table 4 tests the relationship between growth and gross investment implied by (A2).

## APPENDIX B. ADJUSTMENT COSTS AND THE RATE OF INVESTMENT

In continuous time, firm  $i$  chooses a plan for employment and investment over the entire future taking the path of real wages  $w_t$  and interest rates  $r_t$  as given. Instantaneous profits are  $\gamma_{it} - w_i L_{it} - \{1 + (\phi/2)(I_{it}/K_{it})^2\}I_{it}$  where  $\phi$  is a positive constant and  $\phi(I_{it}/K_{it})$  the marginal adjustment cost of investment. Maximizing the present value of profits over the entire future subject to the constant returns production function for  $\gamma_{it}$  and the capital accumulation equation  $\dot{K}_{it} = I_{it} - dk_{it}$  (where  $d$  is the constant depreciation rate), the first-order conditions are

$$w_t = (1 - a)Ak_u^a h_t^{1-a} \quad \text{where } k_u = K_u/L_u \quad (\text{B1})$$

$$q_u = 1 + \phi(I_u/K_u) = 1 + \phi(\dot{K}_u/K_u - d) \quad (\text{B2})$$

$$(r_t + d - \dot{q}_u/q_u)q_u = aAk_u^{a-1}h_t^{1-a} + (\phi/2)(\dot{K}_u/K_u + d)^2 \quad (\text{B3})$$

(B1) equates the real wage and marginal product of labour, (B2) equates the shadow value of installed capital  $q$  to the cost of purchase and installation, and (B3) equates the user cost of capital to its instantaneous yield both in physical output and in reducing the burden of future adjustment. Aggregating across firms,

$$w_t = (1 - a)\bar{A}k_t \quad (\text{B4})$$

$$q_t = 1 + \phi(gr + d) \quad (\text{B5})$$

$$(r^* + d - \dot{q}_t/q_t)q_t = a\bar{A} + (\phi/2)(gr + d)^2 \quad (\text{B6})$$

where  $gr$  is the rate of output growth and, in a small open economy with perfect capital mobility, we assume that the real exchange rate is constant, whence interest parity implies  $r_t = r^*$ , the world real interest rate.

The pair of equations (B5) and (B6) can be solved for the shadow price of new capital  $q$  and the growth rate  $gr$  depicted in Figure 9. (B5) is the upward-sloping straight line. The particular solution of (B6) for  $\dot{q} = 0$  is the upward-sloping curve. Only one of the two equilibria is saddlepath stable. Since neither  $q$  nor  $gr$  is predetermined, only the equilibrium at  $E$  uniquely determines  $q$  and  $gr$ . Henceforth, the other equilibrium is ignored.

In this endogenous growth model, the equilibrium growth rate increases with the share of infrastructure in GDP, but falls with the level of world real interest rates and with the rates of adjustment cost and depreciation. By fixing interest rates at world levels, interest parity makes growth independent of domestic savings behaviour. Growth depends only on the technological, institutional and policy determinants of the marginal product of capital, on the depreciation rate and on the world interest rate.

## APPENDIX C. FISCAL POLICY, FOREIGN TRANSFERS AND EXTERNAL BALANCE

A continuous time OLG model of the Blanchard–Yaari–Weil variety (see Alogoskoufis and Christodoulakis, 1991) implies in the aggregate for a small open economy

$$\dot{c}_t = (r^* - \rho + n - gr)c_t - n\rho(q\bar{A}^{-1} + b_t - f_t) \quad (\text{C1})$$

$$\dot{b}_t = (r^* - gr)b_t + g_t - v_t \quad (\text{C2})$$

$$\dot{f}_t = (r^* - gr)f_t + c_t + g_t + (gr + d)\bar{A}^{-1} - 1 - e_t \quad (\text{C3})$$

where  $c_t$  is the share of private consumption in GDP,  $\rho$  the pure rate of time preference,  $n$  the rate of increase in households,  $b_t$  the ratio of public debt to GDP,  $f_t$  the ratio of foreign debt to GDP,  $q\bar{A}^{-1}$  the equity capital to GDP ratio,  $g_t$  the ratio of government consumption to GDP,  $v_t$  the ratio of tax revenue to GDP, and  $e_t$  the ratio of foreign transfers to GDP.

(C1) is the aggregate consumption locus, (C2) the government budget constraint, and (C3) the external constraint. Assuming the government stabilizes the ratio of public debt to GDP,

$$b = (v - g)/(r^* - gr) \quad (\text{C4})$$

For constant  $b$ , equilibrium is determined by analysing the pair of differential equations (C1) and (C3). The former determines the private consumption locus in Figure 11, the latter the balance of payments locus.

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