



**Potential growth in the EU and the global economy:
New analytical insights & prospects from ageing and catching-up**

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Three essays

“Potential growth and structural changes: the European case”

Mario Amendola, Bernhard Böhm, Jean-Luc Gaffard, Lionel Nesta,
Lionello Punzo and Francesco Saraceno

“Convergence and foreign direct investments in an enlarged European Union:
What can we learn from the experience of Cohesion countries for the Central
and Eastern European countries”

Sandrine Levasseur

“World growth and international capital flows in the XXIst century”

Michel Aglietta, Vladimir Borgy, Jean Chateau, Michel Juillard,
Jacques Le Cacheux, Gilles Le Garrec and Vincent Touzé

General introduction

Jérôme Creel and Jean-Paul Fitoussi

Last year's International Collaboration Project had helped to highlight several key determinants of potential growth in the European Union (EU): basing upon growth accounting techniques, the main difference between the EU and the US had been shown not to rest on total factor productivity levels but, rather, on inputs per capita and, more specifically, on low employment levels in the EU. With this peculiar result in mind, investigating the bad employment performance of the EU had been the second step of last year's Project: the main result had been that EU policymaking design was flawed and that prospects for growth would be improving only insofar as institutions like fiscal policy, the EU budget and monetary policy would be reformed. Finally, we had investigated the consequences of the last EU enlargement on the EU newcomers and on the other EU members. We had shown that the weight of these newcomers was so low that these countries could not be considered as a burden for the EU.

Despite strong institutional turmoil in 2005, the EU has not been able to reform her institutions so far. In spring 2005, two countries – France and the Netherlands – rejected the “Constitutional Treaty” which was intended to give Europe clearer, more transparent and more democratic institutions. The French and Dutch ‘No’ to the referenda gave a sudden stop to the institutional debate and, more broadly, to the “construction of Europe”.

At the end of 2005, the difficulties encountered to give the EU her budget testified for the gloomy prospects of EU institutions. Long and harsh discussions on the UK's rebate – obtained in the Eighties, before the UK became a wealthy country – and the logic of “fair return”¹ have had continuous poisonous effects on the EU future: they have diverted public attention from the medium-term funding allocations to EU policies and to the fairest way of contributing financially to them.

At the same time, the European Central Bank (ECB) has modified her nominal Repo rate for the first time since June 2003. Arguing that inflation pressures were looming and that GDP in

¹ Mrs. Thatcher, claiming in 1979 that “(she) wanted (her) money back”, stands as a good example. For a comprehensive analysis, see J. Le Cacheux, “European Budget: the poisonous budget rebate debate”, *Studies and Research no.41*, Fondation Notre Europe, 2005 [<http://www.notre-europe.asso.fr/IMG/pdf/Etud41-en.pdf>].

Europe were expected to be growth-oriented, the ECB raised the rate by 0.25 point. Though quite a low variation, it could be interpreted as a first step in the direction of monetary restrictiveness that may harm future growth prospects, most notably in Germany where the investment rate is already in a trough.

As for national fiscal policies, they are still fettered by the dispositions of the Stability and Growth Pact, although the latter was reformed in March 2005. This reform has restated the primary objective of fiscal policy: a fiscal-target amounting to a maximum public deficit of 3% of GDP and a debt-target of 60% of GDP. However, in the short run, these targets are now assessed with more flexibility than in the past: a broader set of “relevant factors” can be invoked to justify that the deficit limit has been exceeded. Among these “relevant factors”, one finds some reforms or specific expenditures which are intended to boost future growth: public expenditures in R&D and in education as well as public investment²; but also so-called “structural reforms” (pension reforms, reforms of the welfare state, of labor markets, etc.). At least one obvious drawback with this “new” Stability and Growth Pact is that it does not leave sufficient margins for maneuver at the time-horizon needed to implement a new growth strategy hinging on innovation, R&D and education. As a matter of fact, the efficiency of these expenditures or of these reforms is always long to come and, meanwhile, governments implementing these strategies have to constrain other expenditures or to increase taxes, unless growth has rapidly resumed.

Thus policymaking design in the EU has not dramatically changed over the recent period; and as we argued in last year’s Project, fiscal and monetary policies still pose a considerable challenge for the return of EU growth towards her potential.

This reasoning does not abide by the current consensus in the EU; the consensus opposes the “imitation regime” and the “innovative regime”. The former has been followed by Europe for at least three decades during which EU countries have been catching up with the United States (US). In this regime, macroeconomic policies have to be aimed only at managing aggregate demand, while microeconomic management has to be limited to regulating firms and to promoting “national champions” in key sectors. Once countries have moved closer to the technology frontier, they aim at moving from the “imitation regime” to the “innovative regime”: innovation being the main engine of growth, reliance on new organizational forms,

² The “new” Pact rejected the principle of adopting a Golden Rule of Public Finance in the EU: removing some types of public expenditures (say, public investment) from the deficit target is forbidden.

greater mobility, greater labor market flexibility is crucial. As for macroeconomic public management, it has to be aimed at stability: stability makes firms' environment more secure and less uncertain.

The basis for such a dichotomy hinges extensively on an accessible steady state; it assumes equilibrium. The first essay of the Project, "**Potential growth and structural changes: the European case**", has questioned the transition from one regime to the other. Rather than relying on steady-state dynamics, it has been devoted to a characterization of out-of-equilibrium evolutions of the economy. The rate at which an economy can grow without inflationary pressures – the so-called potential growth rate – depends on the potential productivity growth. However, out of equilibrium, the dynamics of productivity is driven not only by long run, exogenous forces of technological progress and invention. It also reflects the process of transformation of the productive structure and the ability of agents and institutions to organize and to carry out this process within constraints set by economy-wide institutional features. Thus, the economy's past and ongoing history contributes to determining its growth performance.

Irregularity, seen as the effect of adjustments to real distortions more than the reflection of stochastic disturbances, is essential in the determination of the potential growth rate. Oscillations can no longer be treated simply as deviations from a fixed trend – the potential growth rate – determined beforehand by technology and institutions only. Rather, they are one way in which an out-of-equilibrium growth process materializes. Co-ordination failures affect productivity, investment and employment, all variables typically endogenous to a growth process. The chains of various events taking place in the shorter run exert an influence upon the economy's potential rate of growth. Thus, discretionary economic policies – aimed at regulating existing dynamic mechanisms or at supplementing them with compensating mechanisms – are required to interact dynamically so as to correct distortions resulting from an external shock, and thus re-establishing the internal consistency of the economy to render smooth evolution viable again.

Among the various empirical outcomes of this first essay, we may emphasize one in particular. EU economies have been classified *vis-à-vis* the US and Japan as regards their growth-path dependence. Growth regimes have been characterized by the comparison between gross capital formation and value-added, both evaluated in terms of employee: successive shifts in growth regime, between one with too much investment with respect to the

value added and another, at the opposite, with too few investment, are meant to reveal the existence of recurrent distortions in the time structure of productive capacity, which are analyzed as the main cause of a declining potential growth rate. In the US case, data support the view of not-so-frequent regime shifts that testify for an overall stable behavior. Adopting a sectoral view, reallocation issues between domestic sectors are shown to be less important than coordination issues in explaining the differences in global performances between the US and European countries. It is therefore clear that, in this context, European countries necessitate more flexible policies than what they are in fact. Despite very low interest rates in Europe, past monetary policies, coupled with rigid and limited fiscal policies, have hampered the transition from one growth regime to another, more innovative one.

The second essay, “**Convergence and FDI in an enlarged EU: What can we learn from the experience of Cohesion countries for the CEECs?**”, has been dedicated to the convergence process within the EU. In relation to the first essay, the EU newcomers are still obviously “out-of-equilibrium” or, at least, on a transition path towards a new steady-state. Distortions in the time structure of productive capacity have dramatically changed in the Central and Eastern European Countries (CEEC) since the Soviet Bloc has broken up. The profound transformation of these economies has been huge and convergence towards EU standards has accelerated the evolutions. Where the previous essay gave theoretical insights on the transition process between two growth regimes, the present essay has gathered a very large dataset which has never been exploited systematically in the literature. This dataset describes the transformation process of these economies, giving empirical insights on the sectoral classification of foreign investments and productivity levels.

For the CEECs, there is in fact no tendency for convergence, either *vis-à-vis* EU-15 countries or within the CEECs’ group itself. Part of the explanation for this diverging pattern lies in the characteristics of investment and on the levels of foreign-direct investments (FDI). By characteristics, we mean the allocation of investments according to their geographical origin: domestic or foreign. In the latter case, it is generally shown that technological spillovers are large with multinational corporations (MNCs) adopting more up-to-date technologies than domestic ones; domestic companies then follow an imitation regime whereas MNCs introduce an innovative regime in the foreign economy. Lagging behind in terms of attractiveness of FDI or receiving FDI in sector with low potentials for growth is therefore shown to explain the current divergence of per capita GDP within the CEECs’ group as well as within the Cohesion group (Ireland, Greece, Spain and Portugal).

Very interesting results are then drawn from a sectoral decomposition of the differences in productivity level between CEECs and Cohesion countries (excluding Ireland) and Ireland. The decomposition is based on a “level effect” – measuring the impact of different labor productivity levels in a specific sector when the shares of that sector are assumed to be the same across two countries – and a “share effect” which measures the differences in the industrial structures of the two countries. Outcomes are at least twofold: first, manufacturing sectors explain the bulk of the productivity gaps *vis-à-vis* Ireland; second, the “share effect”, though small, is unevenly distributed across countries. The Czech Republic, Slovakia and Hungary are thus shown to share almost the same industrial structure as the “Celtic Tiger”, whereas Poland is lagging behind. Adopting a decomposition of the manufacturing sector according to the level of technological intensity – from low tech to medium-high tech intensity –, labor productivity gaps *vis-à-vis* Ireland in medium/low technological industries are shown to have almost totally disappeared. Productivity gaps in medium/low technological industries remain substantial but data show that two CEECs (out of the four under study) emerge as possible competitor of Ireland: the Czech Republic and Hungary.

So far, the Report has investigated the growth regimes in the largest EU-15 countries, as well as the convergence patterns of the largest CEECs, EU members since May 2004. Investment rates, FDI and labor productivity have been the key determinants to the various trends that the two first essays have disclosed. Demographic patterns are the next topic which should have major consequences on the potential growth of EU countries. In order to assess these consequences, an international dimension is required.

The third essay, “**World growth and international capital flows in the XXIst century**”, therefore broadens the EU perspective to embed the global economy. With a long-term view that complements out-of-equilibrium characterization more suited to a medium-term perspective, different scenarios are investigated with Version 2 of INGENUE model, a computable, general-equilibrium, multi-region world overlapping-generations model. The model allows for the determination of induced changes in the time profiles of world and regional aggregates, as well as for the corresponding constellation of current accounts and real exchange rate changes.

Growth in the world economy is shaped by secular trends in its most structural long-run determinants, primarily changes in the demographic structure in the different parts of the world, and the diffusion of technological progress, as expressed by trends in total factor

productivity growth. The demographic transition will imprint the first half of the XXIst century. It is a sequential and lengthy process of ageing. The developed countries, the CEECs, Russia and a decade later China, are ageing from the top of the age structure. Most of the developing world is ageing from the bottom of the pyramid. The central intuition is that if the residents of developed countries most advanced in the ageing process were to rely on financial autarky and exclusively invest their additional saving (induced by pension reforms and ageing) in their home countries, it would generate a rise in the capital-labor ratio of production, leading to a decline in the marginal productivity of capital, hence in its rate of return. Financial globalization instead allows for a process of equalizing rates of return on capital worldwide, and retired households from developed countries would benefit from additional income from their investment abroad, while numerous working-age cohorts in less-developed countries would benefit from a higher capital stock, hence a higher capital-labor ratio, therefore higher labor productivity and higher real wages. Financial globalization and international capital flows thus appear to allow for mutually advantageous, inter-temporal exchanges amongst regions of the world experiencing different timing in their ageing processes. The conditions for economic growth in the various regions of the world essentially depend on the interactions of the change in demographic structures and the process of differential convergence in total factor productivity, the latter resting on the diffusion of technological progress.

The growth regime depicted in the scenarios depends on capital migration to the fast-growing economies rather than labor migration towards ageing wealthy economies. The capital flows involved substantiate an intergenerational savings transfer to the huge number of people in countries like China and India who aspire to get access to Western standard of life. This saving-investment pattern is therefore shown to be the only way for these countries to resume a convergence process interrupted by the financial crises of the Eighties and Nineties. The virtuous growth track that would be under way remains nevertheless conditional on considerable changes in the US and Europe. As for the US, a steady increase in savings rate is required in order to reduce the current account deficit to a more sustainable level. In Europe, higher prospects for potential growth are being required. They thus pose a considerable challenge to the EU institutions: as shown in the first essay, a more active monetary policy, coupled with higher investment in R&D and education, is crucially needed.



**Potential growth in the EU and the global economy:
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First essay

Potential growth and structural changes: the European case

Mario Amendola, Bernhard Böhm, Jean-Luc Gaffard, Lionel Nesta, Lionello Punzo, Francesco Saraceno

Abstract:

The rate at which an economy can grow without inflationary pressures – the so-called potential growth rate - certainly depends on the potential productivity growth. However, out of equilibrium, the dynamics of productivity is driven not only by long run, exogenous forces of technological progress and invention. It also reflects the process of transformation of the productive structure and the ability of agents and institutions to organize and to carry out this process within constraints set by economy-wide institutional features. Thus, the economy's past and ongoing history jointly contribute to determining its current growth performance. So, the potential growth rate depends on the specific growth path that has been actually followed by the economy, rather than on the fundamentals characterising an assumed implicit steady state.

Irregularity in the economy's dynamics, seen hereafter as the manifestation of adjustment to real distortions more than the reaction to stochastic disturbances, and its level are essential in the determination of the potential growth rate. This essay presents an analytical framework that allows to identify such irregularities as they are associated with discontinuous changes in growth regimes and, moreover, to link them with the average performance of the economy as a whole. Within such framework, the higher degree of structural instability seen in large European countries may account for their poorer employment and productivity performance and their lower potential growth rate vis-à-vis the US as a benchmark. Hence, one is naturally driven to the conjecture that that bad performance might be attributed to some errors in the conduct of economic policy rather than to the "wrong" institutions.

JEL codes:

Key words: growth regime, potential growth, structural change, unemployment

1. Introduction

The issue confronting all large European economies of the Euro area, is how to recover full employment, and to maintain previously established social achievements. The common answer is growth and innovation, that is, accessing the most advanced technologies, as the way to revamp the growth process. As to how achieve this twofold goal, there is today a prevailing if not universal consensus a specific recipe, derived mainly from the unfavourable comparison with the performance of the US economy. This recipe consists in promoting the emergence of a new institutional framework aimed at enhancing potential growth rate and at reducing the non-accelerating inflation rate of unemployment (NAIRU).

The desire to improve the poor European economic performance since the mid-1980s, which was behind the Single Market Programme and more recently led to the so-called Lisbon process, did not deliver its promised results. The late 1980s like the late 1990s years have seen the two unique episodes of relatively high growth of the past two decades. Overall, growth has slowed down since the early 1980s in spite of the implementation of far-reaching reforms in both the macro-environment (e.g. the consolidation of public finances and lower inflation) and micro-environment (see the Single Market Programme, Uruguay Round and various labour market reforms).

Macroeconomic performance of the EU has been disappointing with regard to the US. Instead of growing faster than the US through assimilation of existing technologies and organisational designs as in the post-war period, EU has achieved a lower growth rate and a higher unemployment rate than the US. This gap would be the result of structural deficiencies.

According to the prevailing consensus, bad performance in Europe would be the effect of institutional mistakes that have prevented its economies from simultaneously reaching all the standard policy objectives: high growth rate, full employment, price stability and external balance. Europe would have been unable to enter the new age, i.e. the age of the so-called knowledge economy, despite huge transformations that have been taking place for many years. The consensus about this interpretation is built upon a theoretical framework that focuses on some structural properties of an economy, that is, mainly on technologies and institutional rules governing behaviours and working of its markets. Such framework maintains that macroeconomic interventions to assure stability and balanced public budgets are a preliminary step to those structural reforms that would favour innovation processes in a stable macroeconomic environment. With this belief, macro governance should consist in promoting separate and independent institutions, each one in charge of a sole objective: thus, the European Central Bank has to maintain price stability, and not be concerned with growth and employment issues; the Growth and Stability Pact is there to enforce fiscal deficit limits; and the competition policy is in the hands of the Commission with the task of promoting free trade and minimising monopolistic distortions. The structural reforms being promoted, on the other hand, are those reckoned to allow realizing a perfectly competitive market, with the focus on the labour market, whose rigidities are indicated as being the main obstacle to the smooth working of competition. This is the recipe proposed to make innovative choices, leading one up to the frontier of technological development, hence realising faster growth and full employment: the promised fruits of the so-called knowledge economy.

Being a capitalist society, Europe has always been knowledge-based. Thus the question is will Europe be able to capture the potential gains of productivity associated with the development of new technologies and market extensions. This, in the macroeconomic conventional wisdom, is made to depend as we have just mentioned of the existence of given conditions assuring the required behaviours

The substantial departures from all sorts of steady state-like behaviours exhibited by the larger European countries since the mid 70s, and by Japan from the early 90s, renders it conceptually difficult to maintain some of the fundamental propositions of conventional macroeconomic wisdom. First of all, there does not seem to be a unique attractor (an equilibrium path associated with the potential growth rate) towards which economies have been evolving, a unique path that would be defined by technological and institutional settings. Even in the long run, countries similar in terms of fundamentals (i.e. technology, preferences) do not seem to necessarily converge to the same steady state path with per capita income (a welfare measure) equalised across them. Oscillations can no longer be treated simply as deviations from a fixed trend – the potential growth rate - determined beforehand by technology and institutions only. Rather, they are one way in which an out-of-equilibrium growth process gets realised. Co-ordination failures affect productivity, investment and employment, all variables typically endogenous to a growth process. The chains of various events taking place in the shorter run exert an influence upon the economy's potential rate of growth. Thus, active economic policies - aimed at regulating existing dynamic mechanisms, or at supplementing them with compensating mechanisms - are required to interact dynamically so as to correct distortions resulting from an external shock, and thus re-establishing the internal consistency of the economy to render smooth evolution viable again. Here the principle is simple: the mix of interventions demanded is not to be implemented once and for all. It must be ready to be modified in real time, closely following and adapting to a process that, being hit by a variety of perturbations, takes on its shape and direction along the way.

The current consensus prevailing both among academic circles and policy makers is in the main justified on the ground of to the distinction between economies undergoing a catching-up process and economies already at the technology frontier (section 2). This viewpoint will be challenged with factual evidence of the growth processes in different countries, with the high likelihood of strong and pervasive phenomena structural changes (section 3). Differences of global performance among countries will be explained in terms of the properties of the

recorded histories of structural changes (section 4). In the light of these empirical results, the growth modelling framework will be revisited so as to give analytical expression to the notion of structural change. Then, an econometric model will be proposed that confirms the existence of structural changes associated with the volatility of investment (section 5). Given this new perspective, diversity in structural change phenomena will be attributed to the way in which economic policy influences the investment path (section 6). By way of conclusion, we will take up again the issue of the role of institutions (section 7).

2. The prevailing consensus

Conventional analysis of economic performance in Europe countries focus upon characterizing the properties of a certain attractor and links functionally long-run performance with the nature of technologies and institutions.

In the first three decades after the World War II, Europe realised a remarkable catching-up process, combining high growth, full employment, and high levels of social protection. Institutions and policies then developed seem to have been appropriate to the conditions of the times and have met with the success just mentioned. The key idea prevailing today, on the other hand, is that the ability of those institutions and structures to deliver growth and welfare performance has declined as the European economy was reducing its distance from the technological frontier. On the whole, those very institutions are now considered as obstacles to innovation: In short, institutions, which were appropriate for imitation, would not do for innovation.

According to this view (Acemoglu, Aghion, Zilibotti 2002, Aghion, Howitt 2005), during three decades, Europe was catching-up with the US through investment and factor accumulation, and through imitation of leading-edge technologies. This corresponded to the generalisation of an already mature technology and well-known organisational designs, previously discovered and experimented in the US. In this context, significant economies of scale associated with standardised products resulted in industry structures dominated by large firms partly protected both in product and financial markets. These firms developed long-term relations with suppliers of fund. They also offered long-term relations and job security to their workers. New entry and the competitive drive that it gave were not crucial. In this context, macroeconomic policy was aimed at only manage the aggregate demand. Microeconomic management was reduced to regulate firms operating in industries characterized as natural monopolies and to promote national champions in some other industries without really considering competition issues.

According to this view (as in Acemoglu, Aghion, Zilibotti 2002, Aghion, Howitt 2005), during three decades, Europe has been successfully catching-up with the US through investment and factor accumulation, as well as through imitation of leading-edge technologies. This had implied the generalised adoption of a mature technology and well-known organisational designs, previously discovered and well experimented in the US. In such context, significant economies of scale associated with standardised production resulted in industrial structures dominated by large firms that were partly protected both in product and financial markets. These firms developed long-term relations with financial suppliers, at the same time as offering long-term relations and job security to their workers. New entry and the competitive drive that it came with it, were not considered to be crucial. In this context, macroeconomic policy was aimed only at managing aggregate demand. Microeconomic management was limited to regulating firms operating in natural monopoly industries and to promoting national champions in other industries, without any real concern for competition issues.

Going with this view, this system was to break down as the patterns of both consumption and production shifted towards different types of goods and services, more customized and requiring a different form of industrial organisation. Briefly, “once European countries had moved closer to the technology frontier and also with the occurrence of new technological revolutions in communication and information, innovation at the frontier (would have) become the main engine of growth. This in turn called for new organisational forms, less vertically integrated firms, greater mobility, both intra- and inter-firm, greater flexibility of labour markets, a greater reliance on market finance and a higher demand for both R&D and higher education. However, these necessary changes in economic institutions and organisations have not yet occurred on a large scale in Europe and it is this delay in adjusting our institutions, which account to a large extent for our growth deficit” (Sapir Report 2003, p. 29).

This interpretation translates into the following key conditions for removing the poor record of jobs’ creation in Europe. To the extent that rivalries among firms and strong fluctuations in their market shares make it easier to innovate at the frontier, the new growth paradigm mandates to eliminate all obstacles to rivalry and a free entry. A regulatory environment must encourage start-up firms, be conducive to the challenging of established positions, and stimulate entry like exit.

To the extent that selection among projects as well as among more or less skilled managers is needed for sustain innovation at the frontier, the new growth paradigm would require developing stock markets and promoting its own mode of governance so as to guarantee the ability for innovators to appropriate a large fraction of revenues from their innovation.

Finally, to the extent that microeconomic instability, and hence hiring and firing of employees are the main aspects of an innovation process, the new growth paradigm would require to facilitate matching supply and demand for the different skills in different industries and different localisations and enabling firms to hire and fire employment more easily. This in a nutshell will be the cure for the poor record of jobs' creation in Europe.

In this context, far from being the result of a well managed process of change, macro-stability (in the sense of low inflation and balanced budget) appears as its pre-condition. Then, macro-stability is regarded as the result of obeying to a set of rules or behaviours achieving monetary stability and fiscal discipline, rules given once for all, being supposedly efficient whatever the time moment they are applied.

Implicit in the above argument is the assumption that a unique attractor be associated with each set of technologies and institutions toward the economy is supposed to converge³. Several attractors may exist, though, which implies that economies have to choose among them, e.g., between low growth with high unemployment or else high growth and low unemployment.

Accordingly, current bad performance of the economies of large countries in Europe are imputed a shift in the steady state generated by to the fact that institutions inherited from the catching-up period would no longer be suited to innovation requirements. Within this framework, which is typical of standard growth analysis, investment is basically factor demand that is technically determined with productivity gains exogenously or endogenously given. Thus, falling productivity gains due to the wrong or un-matching institutions automatically would generate a falling in investment as well as in employment.

Indeed, according the most extreme defenders of this common consensus, “a critical point has been reached in a number of European countries, not so much because of overall macroeconomic performance (the current slowdown is milder than the previous one) but because of budgetary problems (including the adverse consequences of labour markets

³ However this analysis contradicts the standard model that focuses on perfect competition and flexible prices as a condition of a successful catching-up process.

rigidities for the financing of valuable benefits such as pensions and health care as well as for long-run living standards) and the feeling that ‘globalisation’ is making the burden of labour rigidities unbearable” (EEAG Report 2004 p. 3). This is taken to render all the more necessary and urgent the carrying out of structural reforms in the labour markets. In this direction, the only obstacle is assumed to be a political one: the main beneficiaries of the existing system have the capacity of blockading reforms reducing or even eliminating their rent revenues. So, at stake is the need to identify a set of policies to reduce unemployment that could face a sensibly lower political opposition. “This includes liberalising product markets; introducing a simple ‘firing tax’ that would be paid to the worker as severance payment instead of the current system of legal procedures; replacing welfare payments for the poor with in-work benefits such as earned income tax credits; and ensuring that the search activity of the unemployed be tightly monitored with sanctions in the form of reduced benefits of search if not active” (ibid. p. 3). Moreover, if measures to improve the Stability and Growth Pact are insufficient or hard to carry out, the EU member states should introduce an institutional reform consisting in delegating “the actual decision-making regarding variations of actual public deficits or specific taxes around levels determined by the Parliament to an independent Fiscal policy Committee” (ibid. p. 7).

The viewpoint synthesised above, can and must be challenged first from an empirical and historical viewpoint. Reconstruction and catching-up cannot be assimilated to any process of steady growth. Most of the difficulties that European economies faced in this period, are those met by any economies engaged in an innovation process properly defined as an out-of-equilibrium process: they are linked to changes in the structure of productive capacity that bring about co-ordination issues. On the other hand, macroeconomic policy in this same period is far from being simply aggregate demand management. It was also, and mainly, policy that successfully managed the supply side of the economy thanks to an appropriate management of productive (financial and human) resources (Hicks, 1959). Finally, during the two last decades, structural reforms and the adoption of fixed policy rules have not prevented increasing unemployment and productivity slowdown in the European countries.

3. Challenging the consensus: the evidence of structural changes

The current consensus about the actual causes of low growth with high unemployment in large European countries is questioned by the observation of the structural instability prevailing in those countries both at the macro and at the sectoral levels. Such instability

cannot be reduced to natural or potential output fluctuations, which on their turn will be due to stochastic disturbances.

Hence, the key issues to be addressed might do not revolve around the existence and the possibility of convergence towards some pre-determined path of equilibrium growth. They are about the nature of growth regimes in the history of those economies and their relevant stability features. We have to recall some theory, here.

While conventional growth theories focus upon equilibrium paths, reckoned as steady states, sequential growth theories focus on out-of-equilibrium paths. In parallel, current econometric techniques estimate long run steady states interpreted as potential growth rates, while sequential theories look for statistical investigations aimed at identifying the manifold variety of growth patterns and linking them to the average performance of the whole economy.

Böhm and Punzo (2001) go along a similar statistical investigation with a basically preliminary classificatory exercise. As explained in the Appendix 1, they bring in a descriptive framework (called the Framework Space, FS) where real economies may appear not to comply to any standard growth model or be stable about any specific qualitative behaviour. On the contrary, they may alternate between different regimes (a tantamount for growth models) which are defined in terms of the relative behaviours of the two growth variables in intensive form of the standard theories (productivity and investment growth rates, both per employed). Given a partition of dynamics into a finite set of regimes, a string of visited regimes defines a growth pattern⁴. Such patterns (or trajectories defined in the space of regimes) and paths (or regimes) coincide only if there is a stationary solution in the conventional state space and this is an attractor. Changes in regime are interpreted as instances of structural change, and such changes may or may not be related one with another in a specific sequence.

Therefore, the shorter run fluctuating view presented in this way, contrasts with the prevailing long run picture of the growth phenomenon where a time-stable (often, averaged) state (or else a finite set of them, local attractors) is sought for. The focus of the foregoing narrative upon intensive features is meant to isolate what are believed to be qualitative properties, those on which in fact growth theory concentrates when doing cross-country analysis.

⁴ Record being kept of the time spent in each such regime, that defines a relative stability property (see Day 1993, 1994, 1998). We call it a string with reference to the code representation proposed in Brida, Puchet and Punzo 2001.

In analysing and comparing histories, the exercise that can be carried on, is to look for prevailing patterns (if there are any) and for emerging instances of structural or regime fluctuations. As we shall see later, an index can be attached to each of them, indicating the degree of embodied irregularity. The relation between such index and the potential growth rate as usually calculated may give insights about the determination of the latter.

Making use of this framework, and taking stock of a mobile panorama of employment, productivity and accumulation trends, rather than purely quantitative differences we pin down differences in what we will call country growth regimes, as well as in their dynamic patterns (i.e. structural fluctuations). Such diversity is closely related to the nature and profile of the accumulation process.

In fact, the central stylised fact revealed by international comparisons is the diversity of evolution of countries though they have been confronted with the same kind of shocks and had access to the same technology: Moreover the EU countries are markedly different from the US (set of figures 1). As for the latter economy, there is no clear trace of significant changes in growth regime during the last two decades, one of them in particular –regime 6 - seems to be prevailing over time (and across disaggregated sectors of that economy) exhibiting a (unusual) degree of stability. Quite at the opposite, most of the European countries as well as Japan exhibit *wild and recurrent changes in growth regimes*.

To consider structural change as the basis for the diverse stability properties of the various countries, we take advantage of one feature of the *FS*: it naturally accommodates a disaggregated descriptive statistics. So, in the following we will look at the set of figures showing the multi-sector histories of the US, some of the EU countries, and Japan (set of figures 2). Each figure is a *movie* with photograms taken at *given dates* (here determined by the phases of the business cycle) and they show the distribution of growth paths of the sectors of a given economy.

A glance across the set of figures shows how hard it is to support analysis based upon the assumption of the existence of a single attractor, both within a single country (given the high dispersion of sectors across regimes) as well as across countries, and the high time variability of the same distribution at both levels. Steady state-like behaviours, if they make it to emerge in aggregative analysis, must be the result of a twofold optical deformation, aggregation over sectors and averaging over time.

Also, we see confirmed a property of regime stability definitely more pronounced for the US compared to the European countries, thus confirming on its turn stability in the new regime redefinition at the centre of our interpretative scheme. Looking in fact the movie of the US economy, we find sector paths dispersion that, with a moderate variability over time and special episodes, still depicts a cloud basically lingering in the first quadrant of the FS, some episodes of sector invasion of the 2nd quadrant being limited to small groups and for a limited time period. The aggregate pictures previously shown are therefore good synthetic approximations of this more detailed, structurally dynamic representation.

Measuring structural instability via some index of the distance between barycentres of the clouds of sectoral paths (see appendix), it appears that France, Germany, Italy, Netherlands and even United Kingdom exhibit a stronger instability than the US (table hereafter and figures 3).

Table. Mean Distance Between Barycentres

Country	Mean Distance
Denmark	0.0319
Finland	0.0608
France	0.0341
Germany	0.0531
Italy	0.0400
Netherlands	0.0427
United Kingdom	0.0714
United States	0.0273

The contrast with the histories of any of the European countries' could not be more evident. No similar behaviour is a there, higher variability and greater mobility of the sector distribution lie behind their higher regime instability in the aggregate. This said, we can address the question whether, nevertheless, there is some observed tendency among EU countries, or a subset of them, to approach (converge) to similar dynamics, defined in the *broader sense* of regime dynamics. From this point of view, indeed, it seems to emerge that at least for two countries, Germany and France, this has been happening over the time span covered by the graphs, up to the end of the 90s starting with the second half of the seventies. This, in other word, seems to have been happening after the end of the Golden Age, while as said, Europe generally speaking was seeing its distance from the US increasing. Taking a look at the whole cloud of sector paths distribution, after a common start and with a phase led by France, the two countries seem to persist on a fluctuation between various regimes. Given the

contrast with the US movie above, this can be taken as evidence of the existence of a similar structural cycle with a sequence of alternating regimes: thus, convergence in our broader sense, to a regime pattern or fluctuations rather than to a single path. This seems to be confirmed by the sharp contrast with pictures like e.g. that of Italy, where the regime pattern seems to exhibit entirely different properties, both as to sequence and phasing. Japan’s movie adds to the variety of the regime experiences that have to be considered.

4. Structural instability and global performance

One is naturally led to conjecture that the higher degree of structural instability seen in the large European countries, may account for their poorer employment and productivity performance and their lower potential growth rate vis-à-vis the US (Gaffard, Punzo 2005). Within the present framework, the widespread, and apparently increasing, instability in terms of regimes observed across sectors like across countries, may account for the their differentiated performance as seen through key variables like the potential growth rate or the unemployment rate.

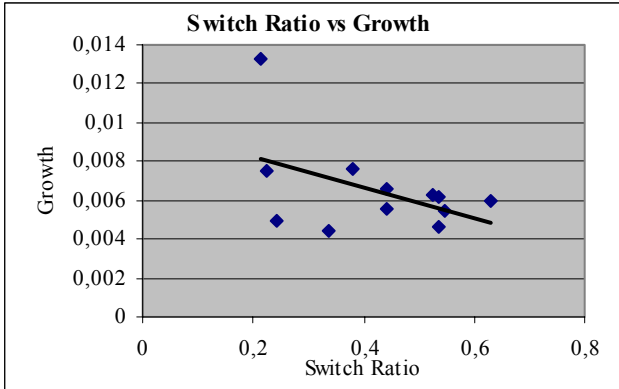
A quick glance at the graphs shows that a reduction in the average growth rate of productivity goes hand-in-hand with deeper structural fluctuations.

A simple exercise shows that the economies exhibiting higher growth rate of the GDP are also those that manifest weaker volatility of investment measured by the ratio of standard deviation to mean (appendix table 1).

Plotting the index of instability against the variation of the employment rate or the variation of productivity gains, we get the expected negative correlation between structural instability and global performances (figures 4).

Plotting the growth rate against a switch ratio (i.e. the ratio of the number of times the 45° line is crossed to the number of observations) we get a negative correlation between a form of volatility (a regime switching) and the global performance (figure 5 hereafter) (appendix 4).

Figure 5



Using the evolution of barycentres as an indicator of structural changes implies, of course, the loss of relevant information about the behaviour of the various sectors. Thus, to complete the analysis, we compute the standard deviation of the distribution $\sigma_{g_v}(t)$ and $\sigma_{g_i}(t)$. Then, we have built the phase diagram $\sigma_{g_v}(t)/\sigma_{g_i}(t)$. We can observe a sort of close loop within a limited range of values in the US case that does not show up for any other country (figures 6). This could be considered as supporting evidence of a more stable behaviour.

The previous analysis does not give information about what happened to single sectors along the way. Similar dispersions of these standard deviations may be compatible with very different time profiles of the *sectoral paths* in the phase space. Simply looking at the evolution of clouds shows that, in the case of the US, such clouds remain quite dispersed around the origin, while in the case of large European countries almost all sectors move together up and down from $g_i > g_v$ to $g_v > g_i$ and vice-versa. This suggests the existence, in the latter case, of a dominant macroeconomic structural cycle.

On the other hand, computation of $\sigma_{g_v}(s)$ and $\sigma_{g_i}(s)$ does not indicate real behavioural differences at sector levels among the different countries (figures 7). The computation of the ratio between the dispersion over time of employment in sector s and its mean value $\sigma_e(s)/m_e(s)$ gives similar results: there is no real differences in terms of employment mobility among the different countries (figure 8). *Hence, we take this as supporting the view that reallocation issues seem to be less important than co-ordination issues in explaining the differences in global performances.*

Summing-up. These investigations show that high regime instability across sectors makes an economy a natural candidate to exhibit low potential growth rates and high NAIRU. Given such empirical relation, the commonly entertained view is no longer acceptable, that imputes poor performance entirely to changes in the nature of technical progress that were not supported by a new adequate institutional framework.

5. Towards a new model of economic growth

The empirical analysis carried on above requires an analytical background capable to take into account the features of an economy where traverse behaviour is endemic.

The first model to be considered in the background is the Kaldor's model of economic growth (Kaldor 1961). As is well known, the main difference between Solow and Kaldor models is that, in the former investment is nothing but factor demand univocally determined once

productivity growth rate is given, while in the latter there are two *coupled and simultaneous* equations, investment depending on productivity and productivity depending on investment. It is the specific form chosen for the so-called technical progress function (the productivity equation) that led Kaldor to describe only a steady state. In any other formulation of such equation, economic dynamics is much more complex and can be characterized by the changes in growth regimes previously analysed.

Standard growth theory does not investigate in depth the relationship between investment and productivity; as the latter is substantially given by exogenous technical coefficients, the relationship is one way, from productivity growth to investment decisions. In fact, the richness of such a relationship fully emerges only when the economy goes through transitions between steady states, typically associated with disequilibria in at least one market. Actual productivity will then cease to be a purely technological phenomenon, to become the result of a complex set of influences, among which investment is crucial.

Another possible reference framework is the Neo-Austrian model, initially proposed by Hicks (1973), and more recently developed by Amendola and Gaffard (1998, 2003).

In the words of Neo-Austrian analysis, the typical dynamics of an economy can be characterised by two predominant phases: a phase in which there exists a bias towards construction of the productive capacity (i.e. in the FS, corresponding to regime 6) when the growth rate of investment per employee exceeds the growth rate of productivity, and a phase in which the bias is towards the utilisation (regimes 2 or 3), productivity gains going hand-in-hand with comparatively lower investment growth rate. In fact, the pattern previously identified offers support to this analytical approach that focuses on the temporal dimension of the production process and *its qualitative articulation in interconnected phases*.

While changes in fundamentals (and in the institutional rules that influence those fundamentals) would only introduce a shift along the main diagonal (where the growth rate of labour productivity is equal to the growth rate of investment per employee), that is, a change in the productivity growth rate (i.e. in the property of a unique attractor), only maladjustments and persistent distortions in the structure of productive capacity can account for structural fluctuations and hence a *correspondingly decreasing average* growth rate. As a matter of fact, successive shifts in growth regime, between one characterised by *excessive* investment with respect to value added and another characterised, at the opposite, *by too little of it*, reveal the *underlying presence* of recurrent distortions in the time structure of the productive capacity,

and this would be at the root of the decline in the value of the potential growth rate. Thus we have to find the determinants of such volatility.

The Neo-Austrian approach revolves around three analytical hypotheses: (a) production is characterized by irreversibilities (complementarity) and time-to-build; (b) expectations are generally backward looking, an assumption justified by the complexity of transition paths, and by the ensuing burden associated with the computation of a rational expectations equilibrium; (c) markets do not necessarily clear, and as in the temporary equilibrium tradition, rationing occurs. The joint effect of this set of hypotheses is the characterization of transition as a sequence of disequilibria, whose shape crucially depends on institutional and policy variables. Using this model it is for example easy to show how the productivity gains associated to technological improvements are not inevitable, but require adequate investment and the institutional environment necessary for this investment to be successful. Lacking these conditions, the transition may lead to low activity outcomes and explain for example the ‘productivity paradox’ of the 1970s and 1980s (Amendola, Gaffard and Saraceno, 2005). In the Neo Austrian framework investment decisions depend on demand expectations (in turn determined by current and past conditions), on monetary conditions, that may be seen as a broad approximation to the existence of credit constraints, and on prices (and wages). On the other hand productivity depends on demand conditions, on investment, on wages and prices, and on the structure of productive capacity.

In what follows, which is an attempt to pursue along this line of thought, most of these elements play a role in identifying the two relationships that appear in the framework space.

We consider two basic relationships, one is a productivity function, the other is an investment function. The estimation of parameters of a simple growth model consisting of these two equations has shown a reasonable degree of association between productivity growth and investment intensity growth, governed by exogenously given price variables. Applying a clear separation between regimes where the investment growth variable exceeds productivity growth and where the opposite is the case has improved the degree of explanation. Although testing for equality of individual parameters across regimes can often not reject equality, we find that simultaneous testing of all parameters always rejects equality clearly. The separation between the two regimes appears to be relevant (Böhm 2005 b).

By using smooth transition regression models, given the set of linearly specified equations, we re-specify the model thereby trying to improve upon the statistical properties (see appendix 5). With French data, testing the productivity equation and the investment intensity

growth equation and after various experiments the trend has been selected as transition variable for the productivity equation and the third order lagged intensity for the investment equation. In the productivity growth equation we observe a slowly changing set of parameters of the lagged dependent variable as well as wage and price changes. In the investment equation the parameters of the lagged logs of investment intensity turn out to be relevant only after the late eighties with some interruptions: the transition function jumps after 1989 and stays close to a value of one with some interruptions in 1994 and 1998 (Böhm 2005 a.).

When investigating how both dependent variables react to shocks to this small non linear system, a fact previously described comes out very neatly, i.e. that the amplitude of cycles is much greater in the investment than in productivity growth (ibid.).

This econometric investigation brings to the surface the existence of a path dependency phenomenon, when lagged investment intensity growth plays an essential role in the evolution profile. By the way, it is not really amazing that the rate of interest does not play such a role: insofar as successive investments must be regarded as a bundle of complements, a drastic change in investment spending, which would occur in a given period, will be determined by the available liquidity rather than by the cost of capital.

6. Economic policy, investment volatility, and potential growth

In fact, we have to explain why regime instability may occur, and in fact it does occur. We *maintain* that it cannot result from the *misalignment* between new technology and old institutions. We have to look at the impact of co-ordination failures associated with out of equilibrium behaviours and affecting the profile of investment path.

Most European countries, and notably France, Germany and Italy, experienced fairly irregular growth from the late 70s onwards. As we have seen, this took the form of alternating growth regimes, itself the likely consequence of co-ordination failures.

The 80s, as the major shortcoming of economic policy, have seen the emergence of tight real constraints, which implied that any recovery would generate inflation pressures and boost inflation expectations. This was taken to point toward restrictive monetary policies. In reality, the lack of productive resources following the first negative (oil prices), then positive (technological) supply shocks has to be deemed responsible for stagflation. Restrictive monetary policies implemented with the aim of drastically bringing down a rate of inflation already perceived too high, had the joint effect of rendering the productive resource

constraints even more severe. Abrupt switches in growth regimes, as appear in the investment - productivity framework space, have been their typical outcome. On the whole, such structural instability factored out into a productivity slowdown, diminishing potential growth and a rising NAIRU. To interpret this crucial episode of the recent economic history in the developed countries, we think there is no need to call for an exogenous decrease in productivity gains that would have been misinterpreted or not immediately perceived, with a consequent fall in potential growth and increase of the NAIRU.

Later, during the 1980s and the 1990s, bringing down inflation became the explicit goal of monetary policy in Europe. A stable price level and above all a strong exchange rate (particularly in France) became primary policy objectives, to be pursued with a restrictive monetary policy, and eventually a lower inflation process did prevail. This led to a remarkable nominal convergence. But what was the impact of monetary stability on economic growth? Evidence points out to lower investment and lower growth rate as the main effects of such a stabilisation. Liquidity constraints remained high on one side of the Atlantic, while being more relaxed on the other. In the EU-area to come, against the need for a more intense accumulation of capital, investment was instead sacrificed, with the consequence of progressively lowering the notional growth rate that could be compatible with a non-accelerating inflation. Economic policies proved to be inappropriate to the point of being actually responsible for the ensuing, both irregular and slow, growth performance.

As a matter of fact, accumulation and the restructuring of productive capacity following a supply shock are characterized by co-ordination problems concerning in the first place the production process but extending to the whole economic activity (Amendola and Gaffard 1998, 2003). The main feature of the problem is the insufficient investment in productive capacity relative to the requirements of an economy facing technological changes to be maintained in a quasi-steady state at full employment. In a fully co-ordinated economy, the required investment would be immediately and spontaneously carried out without inflation or unemployment. In situations other than this ideal one, an external intervention is necessary to control inflation pressures and to absorb unemployment. The main problem to be dealt with, is to provide the flow of productive resources required over time and thus to keep a balanced structure of productive capacity, progressively eliminating market imbalances. The process of restructuring of productive capacity necessarily results in inflationary pressures (and/or deficits in the trade balance in open economies) because the goods in which wages will be spent cannot be provided out of the product of the labour that is newly employed.

The central bank has, then, a choice to make. It may try to curb inflation as soon as possible, with the consequence of exacerbating the initial, negative impact of the shock on output and employment. In this case, the investment necessary to accomplish the innovation process cannot be realized. We have less production and less demand for labour. This may in fact result in a lower inflation or even in price deflation and cumulative unemployment. This is, actually, the recent experience of the main European countries, as the result of policies implemented to comply with the Maastricht rules while the European Central Bank (ECB) only pursuing the target of price stability. In conclusion, restrictive monetary policy has been one of the major obstacles of a successful transition to the a new growth steady state because it has been at the root of an inappropriate volatility of investment spending. Moreover, targeting (and realising) a too low rate of inflation has made it impossible to reduce real interest rates and so favouring the growth process.

Here, it is worth mentioning what happened on the both sides of Atlantic at the end of the 90s. So far as the corporate sector is concerned, the common belief that the United States experienced a much bigger bubble than the euro area is false. During the late 1990s, European companies went on an even bigger borrowing and investment binge than did corporate America. Total corporate investment (capital and financial) in the euro area rose from 14% of GDP in 1997 to 24% in 2000, eclipsing America investment boom. European firms' corporate-financing gap (investment minus internal funds) rose from 4% of GDP in 1997 to a record 14% in 2000 and most of that was met by debt rather than equity finance. Corporate debt has risen much more dramatically than in America, from 60% of GDP in 1997 to 76% in 2002. This legacy of over-borrowing and over-investment is currently holding back growth in the euro zone.

Alternatively, the central bank might have opted for an accommodating monetary policy with the acceptance of a transitory inflation in order to enhance the growth process in the future, then simultaneously re-absorbing inflation and unemployment. In this case, the possibility of keeping a balanced structure of productive capacity would have helped re-establishing the coordination of economic activity and making the innovation process viable, with positive results in terms of productivity and employment (Amendola and Gaffard 1998, 2003).

In fact, if we look again at the European experience, a substantial loosening of monetary conditions in late 1980s and then late 1990s has preceded the two sole episodes of relatively high growth of those decades.

Monetary policy seems to have been the major factor, though not the only one, behind recent European growth, with Europe really facing a structural change. While European policy makers (and distinguished scholars) like to blame all the euro area's economic woes on inflexible labour markets and high taxes, the more important difference between EU and the US with respect to their relative performances is that over the past three years the US has taken advantage of much looser monetary and fiscal policy bolstering consumer spending. Adjusting for the impact of the economic cycle (deficits widen in downturns as tax revenues shrink), the US structural budget has shifted from a surplus of 1% of GDP in 2000 to an estimated deficit of 4% this year. Over the same period, the euro area has seen no net fiscal stimulus. Interest rates have fallen by 5.5 percentage points in US twice, the fall in Euro area. A weaker dollar is also helping to boost the US's exports and company profits. The combined stimulus has helped to cushion what otherwise could have proved a much steeper downturn in the United States.

Of course current poor performance of the European economies cannot be attributed to current monetary policy that involves very low real interest rate. But it must be underlined underlined that the present state of these economies bears a strong mark from what happened in their past, i.e. to the previous investment decisions that have *indeed* been constrained by tight monetary policies. Path dependency is essential. When monetary policy only targeting inflation creates undue constraints on investment, the growth rate of output compatible with zero inflation will be lower and lower, and the NAIRU will be progressively increase along business cycles. It is clearly this that happened to the large European countries during the last decade of the twentieth century.

As a matter of fact, structural reforms, whether relevant or not, open a transition phase whose main feature is a higher unemployment rate and lower nominal (and real) wage rate. Instead of enhancing the potential growth rate, such reforms, may aggravate investment volatility and feed structural fluctuations, which reduce the potential growth rate and increase the NAIRU. Thus, even when and if some of these reforms were necessary, they must be carried out when a suitable macroeconomic policy will be carried out and generate a sustainable recovery.

Out of equilibrium, the nature of the initial shock matters definitely less than the co-ordination issues arising as its consequence and the way the latter are dealt with. The fluctuations that characterise the out-of-equilibrium evolution of the economy, in other words, are not so much due to technology or changes in preferences as they reflect the co-ordination problems arising in a process of structural change. To reduce the amplitude of those fluctuations, representing

at times a threat to the very viability of the change undertaken, policy interventions have to deal with those issues. One suspects that this was not the case in large European countries, both for political and doctrinal reasons.

7. Conclusion

Reference to the comparison of the US and Europe's performances, which is today the leitmotiv of all arguments on economic policy, confirms a scenario focusing upon co-ordination failures that we have drawn.

On the one hand, the poor growth and productivity performance in Western Europe is the result of a slowed down process of accumulation (characterised also by strong fluctuations) due to a tight monetary policy, and more generally to wrong policy management. On the other hand, a stable and substantial rate of investment is behind the positive productivity trend in the U.S. Ex post, this is an obvious explanation of the difference. But behind those different accumulation processes, different co-ordination mechanisms have been at work, one actually sustaining this process, the other failing to do so. Different co-ordination involve the harmonisation over time of all the magnitudes involved in the adjustment process.

No doubt, institutions do matter. However, they have to be considered in relation to the adjustment process required by structural changes, rather than in relation to a pre-assumed performance in the long run. "Their role has to be altogether redefined, to be one of helping reducing the irregularity in the growth process generated by e.g. technology shocks and generally innovation, rather than in determining the growth trend. They do contribute to the latter by accomplishing the former task. Effective institutional systems contribute to regular dynamic patterns, not those that just incorporate stronger incentives for growth. The reason is that *innovation* in its variety of forms is by its very nature a break up and implies a discontinuity: e.g. a break up in the existing production structure and markets. It brings about adjustment costs and specific problems of coordination between economic activities. Depending upon the way these new problems are dealt with, an economy's growth is more or less regular and accordingly the productivity and output gains ripped out of innovation greater or smaller. The challenge is to render the technological and institutional evolution as gradual as possible. This being their appropriate role, economic policy need only go the same way" (Gaffard, Punzo, 2005).

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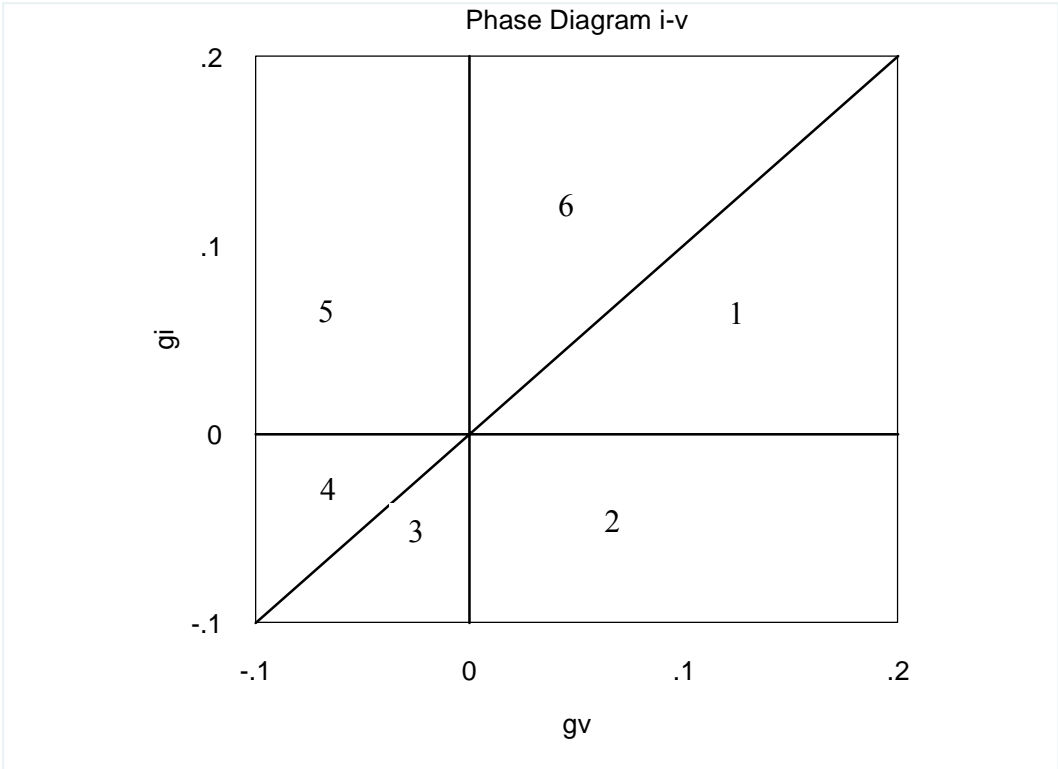
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Appendix 1

The Framework Space

Our analytical framework is based upon variables (gross capital formation, value added and employment), which are relevant in the growth literature. They are manipulated so as to obtain growth rates from levels, often taken sectorally and/or regionally disaggregated. The rate of growth of value added and the rate of growth of gross fixed capital formation, both evaluated in terms of employee or per operative. Taken together, they are employed to index a growth path, of the economy as a whole or of a single sector, depending upon the level of data aggregation chosen. Such a path is a state in a plane endowed with axes called the Innovation and Accumulation axes, in the conventional order. On the former we write the growth rate of the GDP or sectoral value added per person employed, one of several possible indicators of productivity growth. The vertical axis records the investment pace again per person employed.



A trajectory in this plane is a sequence of dated states: the growth paths of conventional theories. States are dated according to a certain clock; this chosen, a state represents the average growth path of an economy over the corresponding date. The novelty in comparison to the conventional approaches is that a path is observed here via two variables. In addition, the dynamic evolution is reconstructed patching together a set of growth paths, and a trajectory looks like a segmented trend. Trajectories and paths coincide only if any of the latter is a stationary solution *and* an attractor.

Finally, a *regime* is a set of growth paths that are generated by the same standard model. Invoking standard explanations of growth and productivity dynamics, six such regimes can be distinguished, plus one special Harrodian generalised path, or corridor. A ratio between the two growth rates exactly one corresponds to all paths belonging to this Harrodian set. This set and the other semi-axes, are used to induce a partition of the co-ordinate plane into dynamical regimes. In the regime 1, corresponding to the area below the Harrodian corridor in the first quadrant, all paths show positive productivity growth rates exceeding positive investment growth rates. The set above the corridor, where productivity falls behind investment growth, is the regime 6. With the quadrants numbered clockwise, beginning with the regime 1 - and observing that the positive and the negative quadrants are further subdivided by the Harrodian corridor - a classification is obtained: with no. 2 associated with negative investment growth rates but positive productivity growth, while the remaining three regimes are mirror images of those just described. It is only when the co-ordinate plane is endowed with such theory-induced partition that it makes sense to call it Framework Space. Dynamics that takes place across regimes can be associated with structural change, for it is the 'model of growth' that is changing, not just its quantitative properties.

Appendix 2

Empirics of growth: the data

A sector or global path is traced as a sequence of dated states, or pairs of co-ordinate values in the Framework Space. States are dated according to a ‘clock’, a device defining conventionally the relevant time horizon. The criteria to carry this out are here the macroeconomic business cycle, measured by the time span between peak and trough values of the GDP growth rate. This ‘clock’ is employed to generate a uniform periodisation across sector dynamics.

An automated procedure to detect these peaks and trough in GDP series is used. Algorithms have been written in STATA programming code.

Dating Algorithm

The first non-parametric procedure consists in determining graphically the relevant peaks and troughs. Although not sufficient, this procedure can prove very fruitful as a primary filter. For the most part, non-parametric procedures in turning point dating are based on recognition pattern algorithms (Bry and Boschan, 1977). Such algorithms need to perform the following tasks:

1. Outliers should be disregarded: outliers are defined as values below or above three times the standard deviations.
2. Irregular movements in the series should be excluded.
3. Determination of a potential set of turning points.
4. A procedure for ensuring that peaks and troughs alternate.
5. A set of rules that re-combine the turning points established after steps three and four in order to satisfy pre-determined criteria concerning the duration and amplitude of phases and complete cycles.

The predetermined criteria involved in the fifth step of this previous algorithm are referred to as *censoring rules*. The main censoring rules concern the duration of phases and cycles. We did not impose a minimal duration censoring rules on business cycle length (peak to peak), but we impose that a phase (expansion or recession) be at least six month (2 quarters). Moreover, we have considered some other censoring rules have been considered. Particularly, in the presence of a double turning point, the highest (lowest) turning point has been chosen.

Data used

We use OECD Economic Outlook quarterly series 77 available online at [. Series for Italy were completed from OECD Main Economic Indicator series for investments. We interpolated between observed when values were unobserved, but did not extrapolate.](#)

Table 1
Mean and Standard Deviations of Annual Growth Rate of GDP, Employment and Investment, by country (1961-2005)

	Mean Annual Growth Rate (%)			Standard deviation of Annual Growth rate (%)			Coefficient of variation (σ/μ)		
	GDP	EMP	INV	GDP	EMP	INV	GDP	EMP	INV
Australia	3.50	1.90	4.60	2.50	1.60	7.40	0.71	0.84	1.61
Belgium	2.80	0.40	3.00	2.00	1.00	6.90	0.71	2.50	2.30
Canada	3.30	2.10	4.80	2.20	1.80	9.80	0.67	0.86	2.04
Denmark	1.90	0.50	3.80	2.20	1.30	12.10	1.16	2.60	3.18
Finland	3.10	0.30	1.50	3.00	2.40	12.60	0.97	8.00	8.40
France	2.70	0.50	3.30	1.70	0.90	5.20	0.63	1.80	1.58
Germany	2.50	0.30	1.30	2.10	1.30	6.40	0.84	4.33	4.92
Ireland	4.90	1.30	4.80	3.00	2.30	14.20	0.61	1.77	2.96
Italy	2.80	0.20	1.50	2.30	1.30	4.30	0.82	6.50	2.87
Japan	4.30	0.80	5.40	3.60	0.90	8.80	0.84	1.13	1.63
Netherlands	3.00	1.20	2.70	2.20	1.20	7.40	0.73	1.00	2.74
Portugal	3.70	1.00	2.70	3.20	1.90	8.90	0.86	1.90	3.30
Switzerland	1.50	0.70	1.70	2.40	1.80	4.60	1.60	2.57	2.71
United Kingdom	2.40	0.20	3.40	1.80	1.60	6.50	0.75	8.00	1.91
United States	3.30	1.70	5.20	2.10	1.30	6.90	0.64	0.76	1.33