# Growth in France: 1950-2030

## The innovation challenge

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# Aknowledgements

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# Summary

***Economic performances raise fears of a decline in relation to the United States and the emerging countries.***

France's disappointing economic track record in recent years provides legitimate grounds for concern. Growth in the country has been both significantly lower than in the past. A it appears that it has been lower than in the other developed countries as well, especially the United States. Between 1980 and 2003, France grew at an average annual rate of 2.1%, as compared with 3% for the US. After the "new economy" bubble burst in 2000, the US once again proved more resilient to shocks, reverting to strong growth in 2003, while at the same time, France was lagging behind by 2.6%. As a result of this process, standards of living in France have fallen in relation to the US: the French economy has been characterized by persistent unemployment, unlike the American one, which has managed to combine strong productivity gains with the creation of many jobs over the past decade. Consequently, the theme of "decline", according to which the countries of "old Europe" are unsuited to the context of globalization and innovation-driven competition, an area in which the US and some emerging countries are set to become leaders, has resurfaced.

***The desire to close the technology gap is thwarted by the vicious circle of weak growth and postponed reforms.***

In 2000, with the Lisbon agenda, the countries of the European Union (EU) appeared willing to boost the underpinnings of innovation-driven growth, in particular by stepping up investment in knowledge and infrastructure. Nevertheless, the fact that some investments have not worked out, combined with implementation-related difficulties, has led the EU to redirect the goals set down in Lisbon. In France, the combination of economic difficulties and structural problems has created a vicious circle where households' loss of confidence and companies' pessimistic expectations have blocked prospects for change. In this context, the necessary adjustments require increasingly urgent reforms that are becoming ever harder to implement.

Our study of growth in France over a very long period – 1950-2030 – identifies the sources of present difficulties and the necessary changes. We analyse the determinants of potential growth using a unified approach for the past and a thirty-year perspective for the future. We also systematically compare France with the United States, a country whose dynamism is based on innovation-driven growth.

***France has experienced weak growth since the late 1970s, and as a result, the country has stopped catching up with the US in terms of living standards and will now lag further behind unless it manages to take up the new American challenge of innovation-driven growth.***

The long timeframe lets us dispel the illusion that the growth slowdown in France is a recent development. In fact, it dates back to the early 1990s and thus cannot be entirely due to the macroeconomic difficulties following German reunification and the US economic recovery. France's "thirty glorious years" ran out of steam in the late 1960s and could not cope with the shocks of the 1970s. France stopped growing faster than the US after the first oil price shock, and living standards in France have been declining compared with those in the US for the past twenty years. Likewise, the unemployment rate has risen over the past thirty years. The main conclusion of our analysis is that France has not managed to shift from the catching-up phase of the "thirty glorious years", based on adapting to American methods of mass production, to a new post-war growth model. Although the French economy has evolved, it has not taken up the "new American challenge" of innovation-driven growth. Unlike the United States, France has not managed to find new sources of productivity growth. It invests less in knowledge, as reflected by the more limited diffusion of technological advances in the economy and a more limited capacity for innovation. Moreover, the French economy does not provide a favourable climate for the development of the new companies, particularly in the high-tech and service sectors.

***France's productive structure has not moved as far towards high technology and services.***

The comparison with the United States shows that France's productive structure has been much less geared to high-tech and services over the past twenty years. The construction of Europe has played an ambiguous role in this process. European integration has indeed offered an ideal framework for the internationalization of the French economy from the late 1960s onwards, but this framework does not seem to have facilitated a shift in specialization towards the most innovative sectors. Rather, the establishment of the European single market has enabled French companies to deepen their specialization in sectors that rely heavily on economies of scale, like the automobile industry.

***The inertia of France's productive model has limited the country's growth prospects.***

The inertia of France's productive model limits its prospects for growth and improvements in living standards. Various studies have emphasized the role that dynamic growth could play in solving major problems, such as persistently high unemployment or growing budget deficits. Notwithstanding, the scenarios for potential growth trends that we have studied suggest that a growth rate of 3%, which

would make it possible to reduce unemployment and cut budget deficits, is out of reach.

***Potential growth of 2.1% between now and 2030 requires appropriate policies for optimizing human resource utilization and boosting productivity.***

The underlying scenario only points to mediocre growth of 1.2% between now and 2030. According to our scenario, France can reasonably count on a potential growth rate of 2.1% over the next thirty years. Yet this average performance can only be achieved if appropriate economic policies are implemented. Growth of more than one point over the trend implies that France tackles the two major problems undermining its performance: insufficient productivity gains and unfavourable demographics, which will translate into a drop in the working population from 2008 onwards. Accordingly, our scenario posits the introduction of policies to increase the working population and reforms making it possible to stimulate innovation and the diffusion of technology. Yet such structural policies are difficult to implement, for they modify the institutional framework that defines incentives and constraints for economic actors. The study focuses on immigration policy, efforts to combat unemployment, and changes in research and higher education.

***Innovation-driven growth releasing the process of creative destruction in order to stimulate creation and ensure the diffusion of innovation.***

Introducing innovation-driven growth not only requires speeding up the pace of technological progress but also ensuring its rapid diffusion throughout the economy. Speeding up the pace of innovation implies stimulating the creative capacities of the French economy. There is a need to step up investment in research and higher education, but also to revamp the innovation system. The diffusion of new technologies depends on investments in adequate infrastructures and incentives for private individuals and companies to adopt innovative practices. This in turn explains the importance of the second driving force of innovation-driven growth: the destruction of obsolete productive capacities, stimulated by competition on markets for goods and services. The process of creative destruction must be working in order to allow the development of new activities, possibly to the detriment of existing firms. Yet this process seems to be at a stand in France.

***This perspective must apply to both the job and good and services market so as to facilitate the creation of activities and reduce unemployment.***

An inkling of the logjam in the process of creative destruction can be seen in the debates on unemployment and the functioning of the job market, which are often based on the implicit hypothesis that the quantity of jobs is fixed and that the priority

is therefore to defend existing jobs. However, a certain amount of flexibility on the job market supports the creation of activities and can be compatible with efforts to ensure the security of professional careers. The heavily regulated market for goods also remains an obstacle to the emergence of new activities. In addition, it limits price cuts for new products or services, thus slowing their diffusion. International comparisons on the diffusion of information and communication technologies show that lack of competition is one reason why France has lagged behind.

***Some European countries have developed their model of innovation-driven growth, which ensures the security of professional careers rather than existing jobs.***

The US is not the only country that has managed to change over to innovation-driven growth. We have established an indicator of innovation-driven growth where Sweden outranks the United States, followed by Denmark, the United Kingdom, Finland and the Netherlands. These countries, which enjoy high standards of living, have managed to fight unemployment and step up their investments in knowledge. The countries of continental Europe, and in particular France, are in a less favourable position, with slightly lower living standards but above all high unemployment rates and less spending on knowledge. The European countries that have started down the path of innovation-driven growth, in particular the Scandinavian nations, have stimulated the process of creative destruction and adapted their system of social protection to combat the new inequalities. These experiences suggest that France could considerably increase its growth potential by means of adequate reforms.

***A new role for Europe.***

Thinking on ways and means of promoting innovation-driven growth in France must take the European dimension into account. In the field of the organization of production and research, which are at the heart of the innovation challenge that France must take up, there is a need to go beyond the integration rationale of the single market. Although this rationale has been effective in boosting mass production and productivity gains in France's traditional areas of specialization, it has not helped to guide France towards high-tech sectors and the growth markets of the 21st century. Concrete implementation of the Lisbon strategy, which would provide a means of turning Europe into an attractive area for production and innovation, must do a better job of meshing domestic and EU policies. National efforts must fit into a European framework, which must be not only stable but also dynamic. Thinking on the European model, often done from a defensive standpoint, must take fuller account of the innovation dimension if it is to offer a viable alternative to the American model and the emergence of Asian powers.

# Introduction

France's disappointing economic track record in recent years provides legitimate grounds for concern. Growth rates in France are both considerably lower than in the past and lower than corresponding rates in other developed countries, including above all the United States. Between 1980 and 2003, France grew at an average annual rate of 2.1% as compared with 3% for the US: After the bubble of the "new economy" burst in 2000, the US also showed greater resilience to shocks. Growth only really fell off for one year, returning to high levels in 2003, a year in which the difference with France came to 2.6% in America's favour. More fundamentally, for ten years or so, the US economy has managed to combine strong productivity gains and the creation of many jobs. The contrast with the sluggish economies of continental Europe is one reason why France is perceived as one of the countries of the "old Europe" doomed to decline.

During the last decade of the 20th century, the debate on the transatlantic performance gap primarily focused on America's remarkable capability for innovation and on the conditions for the emergence of a new economy. Europe was above all worried about its capacity to catch up with the American leader. In 2000, with the Lisbon agenda, it appeared willing to commit itself to a knowledge-based economy in order to stimulate the growth process. The aim was to revitalize the European economy, particularly through increased spending on knowledge and infrastructure. Subsequently, the economic situation worsened and some investments in the future were called into question, imperiling the Lisbon goals. However, on the threshold of the 21st century, Europe is afraid that it may lose new sectors of its activities to certain emerging countries that have an impressive track record, including in the high-tech industrial sectors. The stakes for Europe and France therefore appear fundamental: maintaining the living standards of the French, whereas the population is ageing and the working population is set to decline from 2008 onwards.

There is no shortage of analyses to explain the economic lethargy of Europe, and in particular France. Some emphasize macroeconomic aspects and the role of monetary and budgetary policy, while others stress structural conditions and

obstacles preventing the European countries from changing over to specializing in high-tech sectors and sophisticated sectors. Others underscore the role of national policies, while still others propose strengthening Europe's capacity for action. The value of the different leads put forward, at both the national and European level, depends on a proper analysis of the moving forces of growth for the developed countries which, in the context of globalization, must cope with America's strong capability for innovation and with rapid changes in the comparative advantages of some emerging countries.

In the early 1990s, at a time when the process of globalization was starting to change the terms of competition on many markets, the notion of competitiveness was often used to compare national economies. If competitiveness gained acceptance as a performance yardstick while its economic meaning was still being debated, it was precisely because it highlighted the capacity of economies to cope with international competition. However, analyses have reaffirmed with growing forcefulness that the fundamental performance yardstick for a national economy is not market share but rather the capacity to raise citizens' standards of living. This in turn has led to renew interest in analyzing the determinants of growth and more particularly the moving forces of productivity.

This study of growth in France covers a very long period – 1950-2030 – and includes forecasts. This explains the reasons for studying the determinants of potential growth, which make it possible to use a unified approach for the past and the future. A second choice has to do with the systematic comparisons between France and the United States. The US was chosen because it has managed to re-establish its technological leadership, forging a model of *innovation-driven growth.* The first part of the analysis relies on this comparison to examine the moving forces and breaks in growth in France over some fifty years. It shows that France has not really changed its growth trajectory, marked by a catching-up model since the "thirty glorious years". The second part proposes growth scenarios up to the year 2030 to identify the fields where a shift in public policy is needed. The third part reverts to the difficulties in implementing these policies, comparing France with other European countries. This last part also takes up the question of the EU's role in promoting innovation-driven growth.

# 1. From catching up with the US to the new American challenge

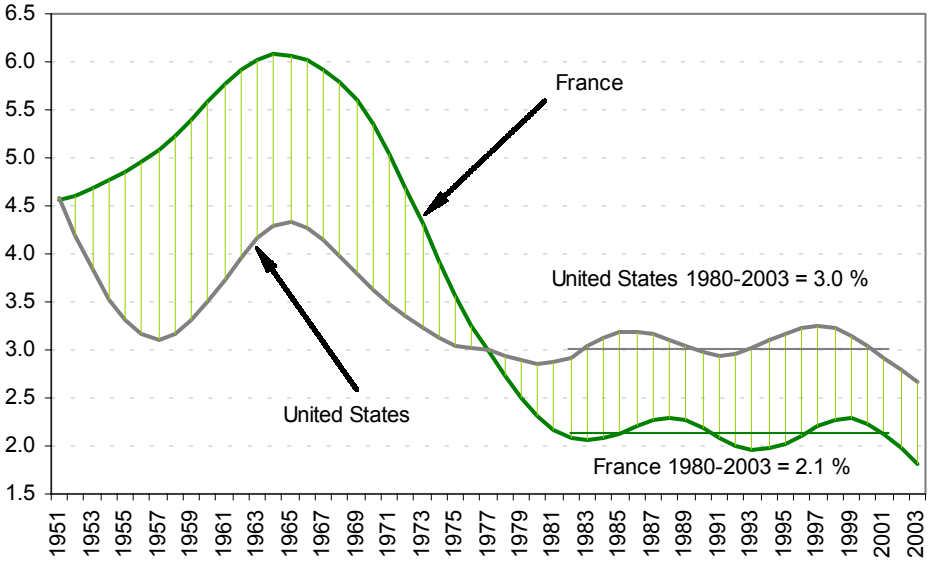
During the post-war period, France experienced strong growth, helping it to catch up with the United States in terms of living standards. However, this remarkable momentum petered out in the 1970s. France's growth during the "thirty glorious years" was partly based on the successful adoption of American innovations, particularly with regard to organization in sectors where mass production allowed huge productivity gains. Yet "'follow-the-leader' growth cannot continue indefinitely" (Cohen 2004). This reason why the gap is no longer narrowing has long been underestimated in explanations of France's disappointing economic performance since the 1980s. Since the 1990s, the "American challenge" of the 1960s[1], which France took up, has been replaced by a "new American challenge" (Sachwald 2000a, 2001). This first part examines the moving forces of French growth over a period of some fifty years, with a view to specifying the nature of this new challenge, namely *innovation-driven growth.*

**The track record of the French economy - 1950-2003**

A long-term analysis of the French economy makes it possible to identify a series of clearly differentiated phases[2]. A period of strong growth, which began immediately following the Second World War and ended with the first oil price shock, was followed, between 1973 and 1982, by a period of worsening performance and a slowdown in growth, then, since 1983, by a period of slow growth (**figure 1**).

[1] As analysed by J.-J. Servan-Schreiber (1967).
[2] The analysis deals with time series to eliminate the effects of economic cycles.

**Figure 1**
**Underlying trends for the growth of total added value in France and the United States**
*(Hodrick-Prescott Filter, as a %)*




*Source: Authors' calculations based on the OECD data.*

The seventies were a difficult decade for most of the industrialized economies, which had to adjust to the sudden price changes triggered by the oil price shocks of 1973 and 1978-1979. France was particularly hard hit, in any case worse than the United States. The pace of growth in France fell from a yearly average of nearly 5.4% between 1950 and 1973 to 2.3% between 1974 and 1982, as against a decline of 3.7% to 2.3% in the US. Thus, the growth slowdown on both sides of the Atlantic was not symmetrical (**table 1**).

**Table 1**
**Growth gaps between France and the United States, by period**
*(Annual average)*

| | Real GDP Growth | | Growth gaps |
|---|---|---|---|
| | France | United States | |
| 1950-1973 | 5,4% | 3,7% | **1,6%** |
| 1974-1982 | 2,3% | 2,3% | **0,0%** |
| 1983-1993 | 2,1% | 2,9% | **-0,8%** |
| 1994-2003 | 2,3% | 3,3% | **-1,0%** |
| 2000 | 4,7% | 3,8% | **0,9%** |
| 2001 | 1,8% | 0,3% | **1,6%** |
| 2002 | 1,0% | 2,4% | **-1,5%** |
| 2003 | 0,5% | 3,1% | **-2,6%** |
| *2004e* | *2,0%* | *4,7%* | ***-2,7%*** |

*Source: Authors' calculations and OECD estimate (e).*

The slowdown in France was partly due to the reduced potential for catching up after the period of strong growth[3]. Above and beyond cyclical economic difficulties, the new direction taken by the French economy can be explained by the fact that the intensive post-war growth model had run out of steam, as reflected by a slowdown in labour productivity gains, falling investment, declining returns on capital and rising inflation. After the 1970s, the new phase that began in 1983 was characterized by the stabilization of growth at a record low level. Conversely, the US economy took off again following the upheaval of the 1970s. Thus, from 1983 onwards, the growth gap in France's favour turned into a growth deficit (**table 1**).

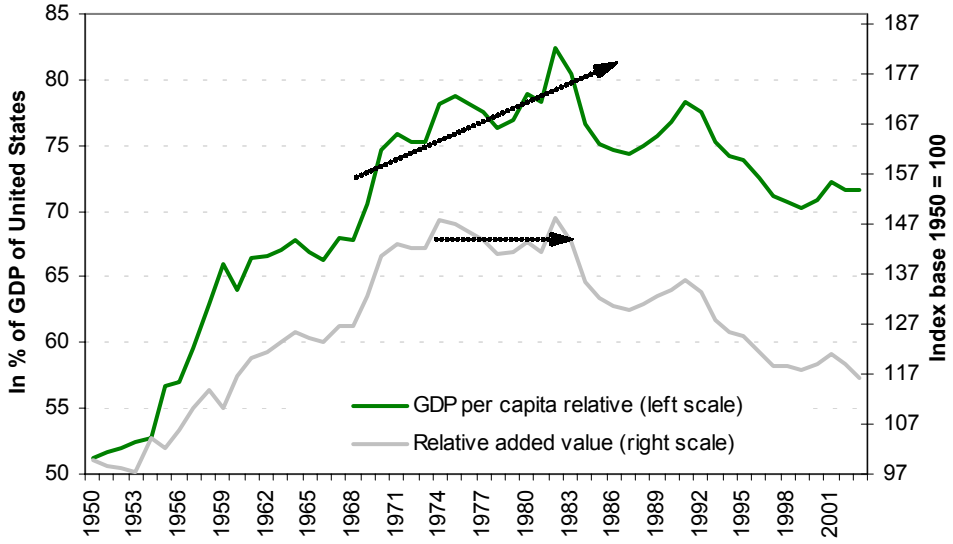
During the last decade of the 20th century, this new transatlantic gap widened even faster. A new break came in 1993, linked to the newfound dynamism of the US economy and not exclusively to the continued worsening of the situation in France or external shocks[4]. Between 1994 and 2003, the growth gap reached 1% in America's favour. **Table 1** shows that the US economy coped better with shocks linked to the cyclical economic situation. After the Internet bubble burst, growth only slackened off for one year in the United States, picking up again in 2003, a year in which the gap with France reached 2.6%.

One of the main consequences of the slow growth in France for the past twenty years or so has been the reversal of the historic trend towards narrowing the living standards gap with America. The comparative development of living standards over the long term, presented in **figure 2**, shows that strong growth in France made it possible to come closer to American living standards between 1950 and 1982. Per capita gross domestic product (GDP), which accounted for 51% of the corresponding figure for the US in 1950, amounted to 82% in 1982. Since then, the income gap has begun to widen once again and in 2002 per capita GDP in France represented only 71% of per capita GDP in America – the same level as in 1970.

[3] The concept of *catching* up is based on the hypothesis that the further away an economy is from the maximum level of development, the faster technological progress will be, for the costs of adapting and diffusing a known technology are less than the costs of innovation that push the technological frontier outwards.
[4] In particular German reunification.

**Figure 2**

**Gaps in living standards between France and the United States and changes in relative added value**

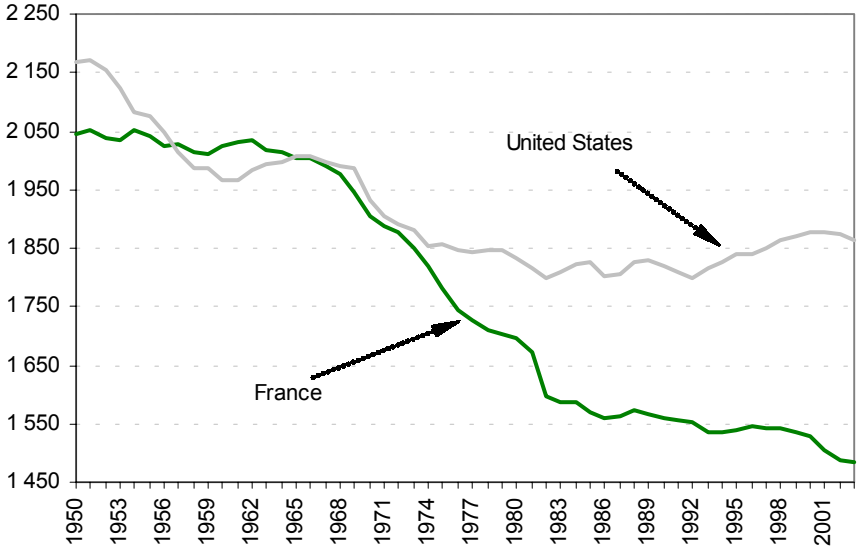



*Source: Authors' calculations based on the OECD and CHELEM database.*

The relative development of production in France as compared with production in the United States, depicted by the second curve of **figure 2**, confirms the data in table 1 by showing that France has grown at a slower pace from 1974 onwards. It continued to narrow the living standard gap owing to a demographic effect: population growth, which has been slower in France than in the US, has had a mechanically favourable impact on per capita GDP.

On the other hand, trends for the working population have curbed France's capacity to grow ever since the 1980s. The low rate of activity is largely responsible for the growth gap with the United States, above all in the 1980s (Blanchet 2004). Moreover, France has considerably reduced working hours per full-time employee ever since the 1980s (**figure 3**). These changes have resulted in a slow rise in the total number of hours worked. Many analyses have underscored the role of the modest increase in the quantity of labour utilized in production to explain why France has grown at such a slow pace (OECD 2003, Didier 2003, Sapir 2003, Blanchard 2004).

**Figure 3**
**Hours worked per annum, by worker, in France and in the United States**




*Source: Ark, Inklaar et McGurkin (2003b).*

*The underpinnings of the growth of the "thirty glorious years"*

As far as growth is concerned, the French economy has experienced three major breaks over the past fifty years: 1974, 1982 and 1993, which mark the transition from one type of growth dynamic to another.

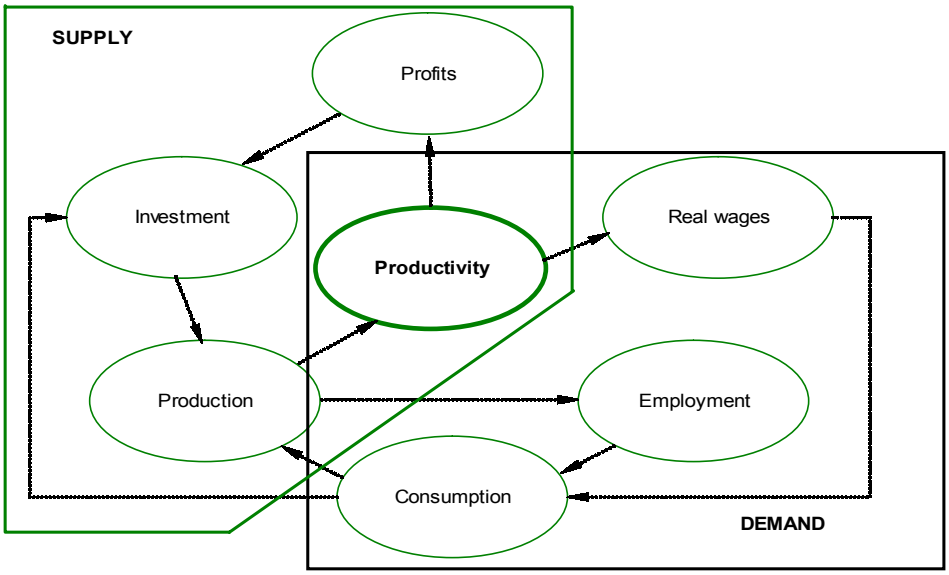
Growth in the catching-up period was based on a combination of specific economic and social factors. Several characteristics should be emphasized: increasing accumulation of capital and capital intensity; new practices in terms of work organization, which corresponded to the adaptation of American methods[5]; and high productivity gains.

Dynamic investment growth and increasing capital intensity, the replacement of labour by capital, new principles for the organization of production, and the expansion of economy-of-scale intensive sectors generated significant productivity gains. These sectors, like the automobile industry, spearheaded efforts to catch up with the United States by combining considerable investments with the adoption of production methods introduced before the war on the other side of the Atlantic. These factors combined to create a virtuous circle of growth that linked the dynamic

of productivity gains to demand (**figure 4**).

The coherence of the Fordist system was based on two factors: first, the capacity to generate productivity gains, which itself depended on production growth by means of the implementation of economies of scale, and second, the capacity to distribute these gains and thus stimulates demand[6]. In France, that was not yet very open to international trade, any endogenous drop in productivity gains was enough to halt this growth.

**Figure 4**
**Virtuous circle of the Fordist growth**




*Intensive growth runs out of steam in the 1970s*

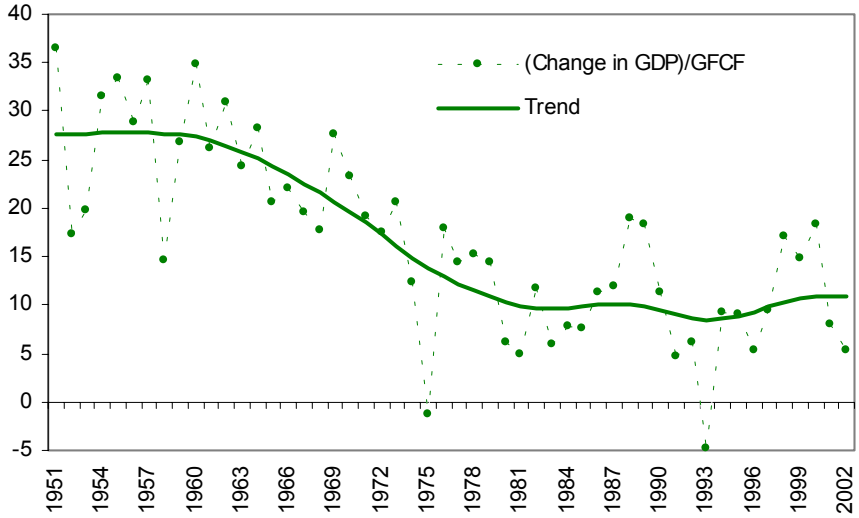
The dynamic process that began immediately following the war ground to a halt in the 1970s without France managing to return to a virtuous circle of growth and strong productivity gains. The 1970s were characterized by a drop in productivity and a slowdown in the pace of investments.

Investment efficiency – measured by the variation in GDP in relation to net fixed capital formation (NFCF) – fell sharply between the 1960s and 1970s (**figure 5**).

[5] For this process and its modalities, see Kogut (1993) and Djelic (1998).
[6] *Cf.* in particular Boyer and Petit (1981), Boyer and Coriat (1987) and Vidal (2003).

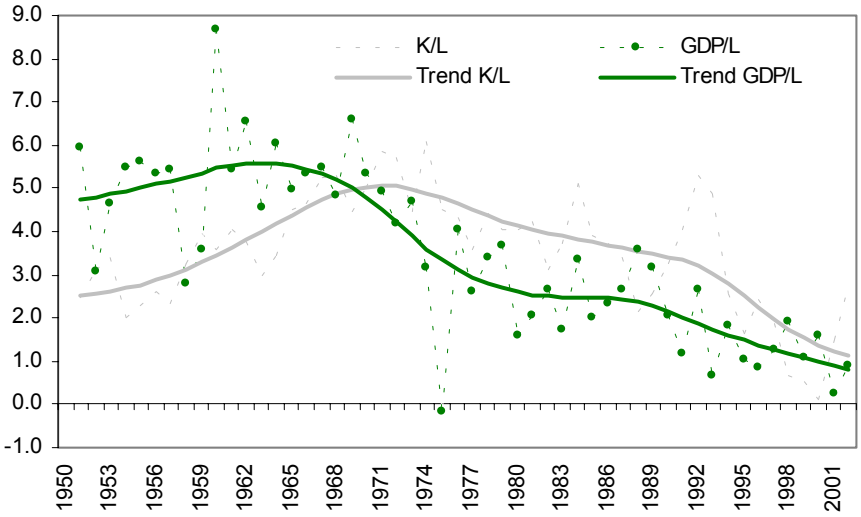
Productivity gains also declined, and the growth of capital intensity slowed after the oil price shocks (**figure 6**). The weak productivity gains and the limited efficiency of investments caused profits to fall and curbed growth. In this context, the decision-making variables governing corporate investment changed: market expansion came to be less important than cost and profit trends.

**Figure 5**
**Effectiveness of the investments, 1951-2002**
*(as a % of the GFCF)*




*Source: Authors' calculations based on the OECD data.*

**Figure 6**
**Capital intensity (K/L) and labour productivity (GDP/L) in France, 1950-2002**
*(annual variation, as a %)*




*Source: Authors' calculations based on the OECD data.*

Declining productivity gains are one of the main reasons why the intensive growth of the 1960s petered out. The many studies devoted to growth in France since the

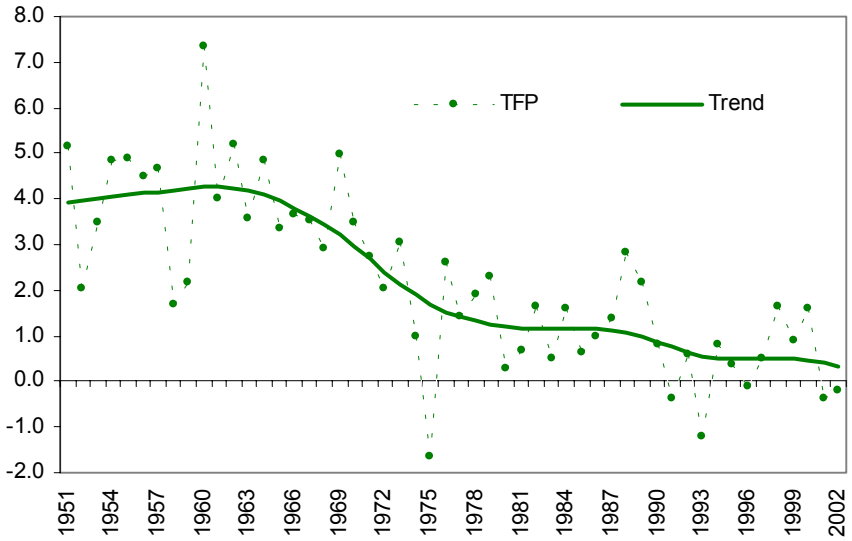
1970s have put forward several non-exclusive explanations that should be combined. The gradual saturation of demand for standardized goods and the rapid expansion of demand for differentiated products cut into the profits of the key sectors of the "thirty glorious years". Moreover, from the late 1960s onwards, the rejection of Taylorism limited opportunities to increase labour productivity in these same industries. Finally, the replacement of labour by capital may have been exaggerated in the light of the potential productivity gains. As a result, excessive investments generated diminishing returns on capital (**figure 5**).

Technological change no doubt played a role as well. The reduction of the gap with the United States weakened the potential to catch up, as reflected by slower growth of the total factor productivity (TFP). **Figure 7** shows that this slowdown started back in the late 1960s; however, as the situation was even more unfavourable in the US, TFP growth in France remained above the US level until the late 1970s. Since the 1980s, however, France has been characterized by structurally weak productivity gains (**figures 6 and 7**).

Low productivity gains cut into profits. Declining profitability limited new investments. In this context, job creation slowed significantly. Rising unemployment drove wages down[7] and helped ensure that French companies remained cost-effective. These trends led to a significant drop in salaries' share of added value in the 1980s and up until the early 1990s (Plihon 2003). In the 1990s, various measures enhanced labour market flexibility (fixed-term contracts, temping, etc.). They were somewhat effective in helping to reconstitute profits but failed to stimulate domestic demand, as a result of which the virtuous sequences of events seen in the past failed to materialize.

[7] Development retraced by the Philips curve, whose point of equilibrium has shifted downwards.

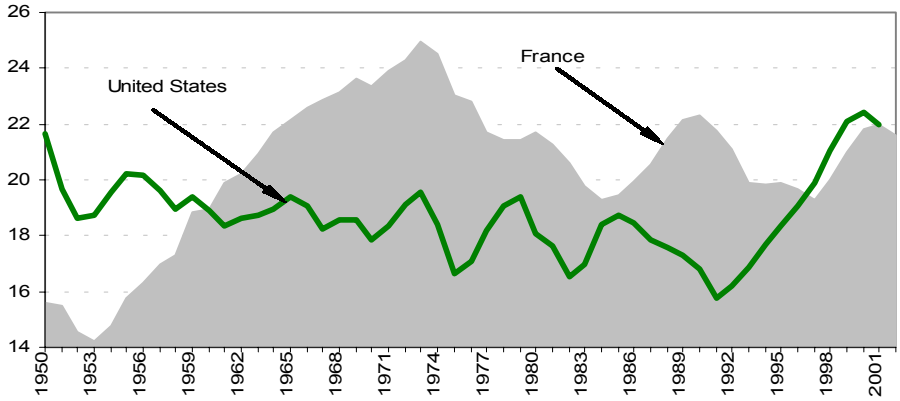
**Figure 7**
**Total factor productivity in France, 1951-2002**
*(annual variation, as a %)*




*Source: Authors' calculations based on the OECD data.*

Despite the fact that investment picked up in the 1980s when economic conditions were favourable (**figure 8**), France has not been able to find a new path to sustainable growth. Moreover, starting in the late 1980s, French companies considerably stepped up their foreign direct investment (FDI) and the relative attractiveness of investment in France became an increasingly important factor in their decision-making. In the 1990s, French companies invested heavily in the US, which was a particularly attractive market. The context of globalization has thus amplified the consequences of the contrast between the performances of the French and American economies.

**Figure 8**
**Investment rates in France and the United States, 1950-2002**
*(as a % of GDP)*




*Source: Authors' calculations based on the OECD data.*

**Innovation-driven growth, a new "American challenge"**

France's mediocre economic track record since the 1980s stems from its inability to change over to a new system of growth.

As in the 1970s, macroeconomic difficulties were due to a combination of internal factors and exogenous shocks. For instance, the drop in investment from 1990 onwards was probably aggravated by the repercussions of German reunification and the ensuing high interest rate policies. Yet above and beyond macroeconomic trends, various indicators show that, unlike the US, France has not yet moved to innovation-driven growth.

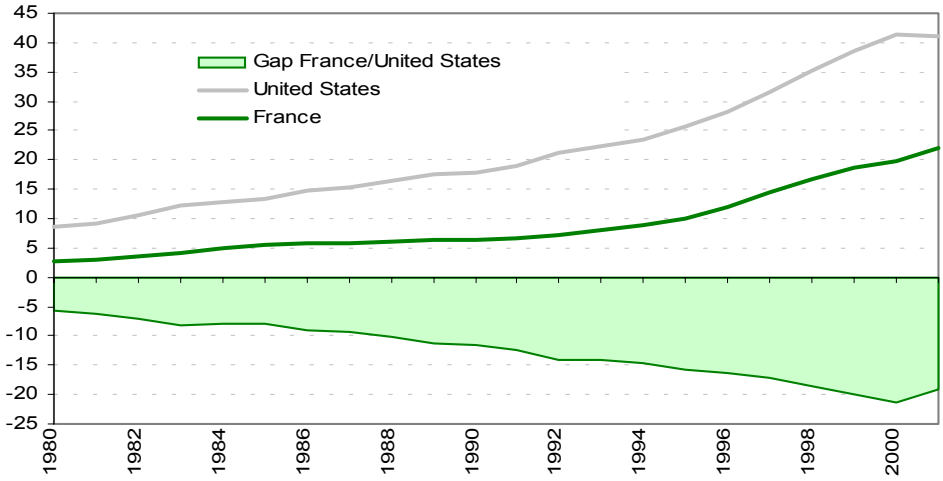
The lower investment volume is one of the reasons why the two economies featured different growth paths during the last decade of the 20th century. Yet innovation-driven growth in the US has also been based on qualitative changes in the factors of production and the organization of the American economy. And here as well, the gap with France has widened, as the overall economic context in France was less favourable to the diffusion of the new technologies.

*ICTs' contribution to growth in the US and France*

In the 1990s, investment picked up in the US, but the nature of this investment is also part of the reason for the performance gap between the two sides of the Atlantic. **Figure 9** shows that the gap between the share of information and communication technologies (ICTs) out of overall investment in France and the US has widened over the past twenty years or so.

Insufficient investment in ICTs has limited the growth of the stock of this type of capital goods, which are characterized by rapid obsolescence. France has therefore lagged behind in disseminating the new technologies offering productivity gains. The gap between France and the US widened at a faster clip in the 1990s, and by 2001 ICTs accounted for twice as large a share of capital stock in the economy in the US as in France.

**Figure 9**
**Share of Information and Communication Technologies in GFCF**




*Source: Authors' calculations based on the OECD data.*

**Box 1.**

**ICTs and growth in the US**

Initially, the diffusion of ICTs did not have a very visible effect on the American economy (the "Solow paradox"). Many studies have been done on the impact of ICTs on labour productivity, total factor productivity and added value growth in the US. The steady and rapid increase in ICT investments from the second half of the 1990s onwards is thought to be one of the main reasons for the faster growth and productivity increases in the US[1]. Schreyer (2000) shows for example that ICT expenditure accounted for 0.28 point of GDP out of the 3.4 points of growth between 1980 and 1985; 0.32 points out of 3.2% between 1986 and 1990 and 0.42 points out of 3% between 1990 and 1996. According to the study by Jorgenson and Stiroh (2000), ICTs played an even more pivotal role in 1999.

In the United States, these technologies have had a particularly strong impact on labour productivity not only in the ICT-producing sectors but also in some service sectors, such as finance and trade (Ark, Inklaar and McGuckin 2003). Computers and the Internet have led to a restructuring of production networks as well as supplier-producer relations and producer-client relations (Fernald and Ramnath 2004). Consequently, even though several studies have relativized the impact of ICTs on the US economy[2], it would appear that their spread has boosted growth and productivity.

Gordon (2003b) considers that in years to come, the potential for major ICT innovations is low. In his view, current innovations (digital photography incorporated into cellphones or in PDAs, wifi) do not bring productivity gains but instead increased ease of use for consumers.

1. See Jorgenson and Stiroh (2000), Schreyer (2000), Jorgenson (2001), Colecchia and Schreyer (2001) and Olinier and Sichel (2001).
2. See Gordon (2000), Cette, Mairesse and Kogoglu (2003) and Brender and Pisani (1999).

France is not a major ICT producer[8] apart from the telecommunications sector but has also lagged behind in the utilization of these technologies, even though it is narrowing the gap. In 2000, it was bringing up the rear, particularly in terms of Internet access per 1,000 inhabitants (10 times less than in the US and the same as in Spain), the number of households with microcomputers (27% of households as against over 50% in the US, 45% in Germany or the UK), the number of computers in schools (6 computers per 100 students in France and in Germany as compared with 27 in the US and 15 in the UK), and in terms of broadband Internet access (OECD 2002).

There are several reasons why France lagged behind in diffusing ICTs during the 1990s: insufficient investment, particularly in ICTs, but also the small share of the ICT-producing sectors out of the overall economy, and the high cost of Internet access[9].

Melka *et al.* (2003) consider that ICTs account for between 0.27 and 0.4 points of GDP as far as growth in France is concerned. Granted, ICTs' contribution to productivity gains per employee increased between the first and second halves of the 1990s, between 12 to 20% of productivity gains, which themselves increased from 1.8 to 2.2% between the beginning and the end of the decade. Yet the US did even better: between 1990 and 1995, ICTs accounted for 38% of productivity gains, which increased by 1.3% per year, and for 45% between 1995 and 2000, at a period when productivity increased by 2.3% per year. Ark, Inklaar and McGuckin (2003) show that ICT-intensive sectors, in particular trade and finance, are primarily responsible for the existing overall productivity gap between the US and France. Thus, the widest gaps are in services, not industry.

*Investments in knowledge: quantity and quality*

France's lag with regard to the diffusion of ICTs reflects a more general situation, which is characterized by a relatively low level of spending on knowledge and more

[8] In 2000, the ICT sectors represented 11.5% of added value for non-farm sectors in the US as against 8% in France (equivalent to the EU average of 14%, the OECD average being 9.5%).
[9] Cette, Mairesse and Kocoglu (2004) mention the level of franc-dollar parity, which could have had a marginal added impact by penalizing French ICT importers.

particularly research and development (R&D) and education[10]. Yet the quantitative aspect must not hide the qualitative problems, which are linked to the allocation of public spending on research and education and to the organization of research in France.

The full utilization of ICTs and their impact on productivity depend to a large extent on the educational level, skills and flexibility of the workforce. The lack of skills of the working population and the population in general is an obstacle to their production and utilization. At the company level, the skills level is a key determinant of the efficiency of the introduction of new technologies into the production process. The majority of macroeconomic studies confirm the complementary nature of technology and skills as far as productivity gains are concerned. On the demand side, product and service innovations have a better chance of succeeding if consumers have a sufficiently high level of training and education to grasp their usefulness and optimize their utilization.

At the macroeconomic level, it seems that the countries where highly skilled workers account for a large share of overall employment are also the ones that spend the most on ICTs. An analysis of the degree structure of the working population (**table 2**) shows that the share of the working population that has completed higher education is lower in France than not only in the US but also in various European countries. This weakness is a handicap when it comes to facilitating the diffusion of technological progress and boosting productivity growth.

**Table 2**
**Educational level of the population aged 25-64**
*(as a %, 2000)*

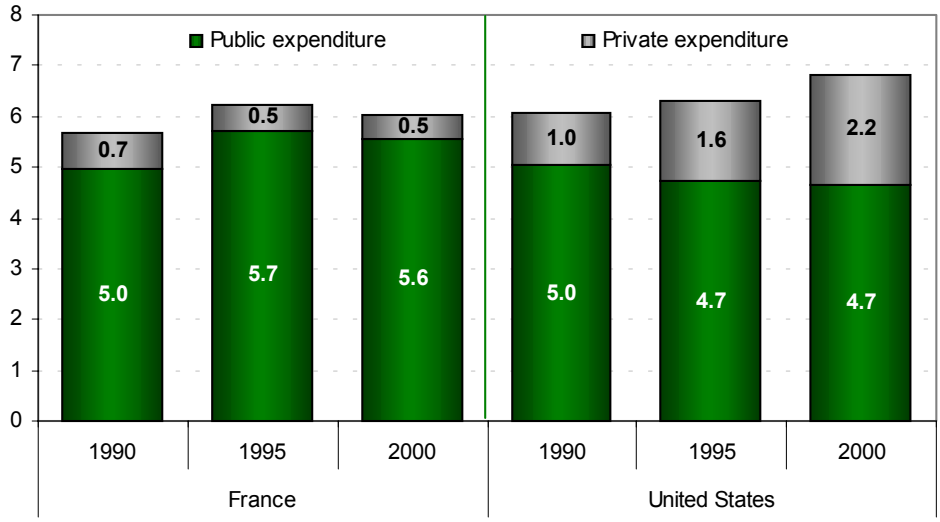
| | Primary education and high school | Secondary Education | Higher education |
|---|---|---|---|
| France | 36.1 | 40.6 | 23.0 |
| United Kingdom | 37.1 | 36.9 | 26.0 |
| Germany | 17.4 | 59.4 | 23.2 |
| Ireland | 42.4 | 22.0 | 35.6 |
| Finland | 26.2 | 41.5 | 32.3 |
| Sweden | 19.4 | 49.0 | 31.6 |
| United States | 12.3 | 50.3 | 37.3 |

*Source*: *OECD*.

[10] Two recent reports explain this diagnostic in detail (Paillard 2002), Aghion and Cohen (2004).

This situation is due to trends with regard to spending on education and the allocation thereof, which has made higher education the poor relation to the state education system. **Figure 10** highlights the decline in public spending and the stagnation with regard to private-sector expenditure. Public spending, expressed as a percentage of GDP, peaked in the mid-1990s before falling off. This has not been the case in the US, where spending on education has increased steadily. Moreover, there is a sharp contrast between the two countries as far as the origin of spending is concerned: the share of private spending is much larger (and steadily increasing) in the US, whereas it is marginal (and stagnating) in France. Finally, a relatively small share of French expenditure on education goes for higher education. This bias in favour of primary and secondary education is more typical of a catching-up economy than an economy on the technological frontier[11].

**Figure 10**
**Spending on Education in France and the United States**
*(as a % of GDP)*



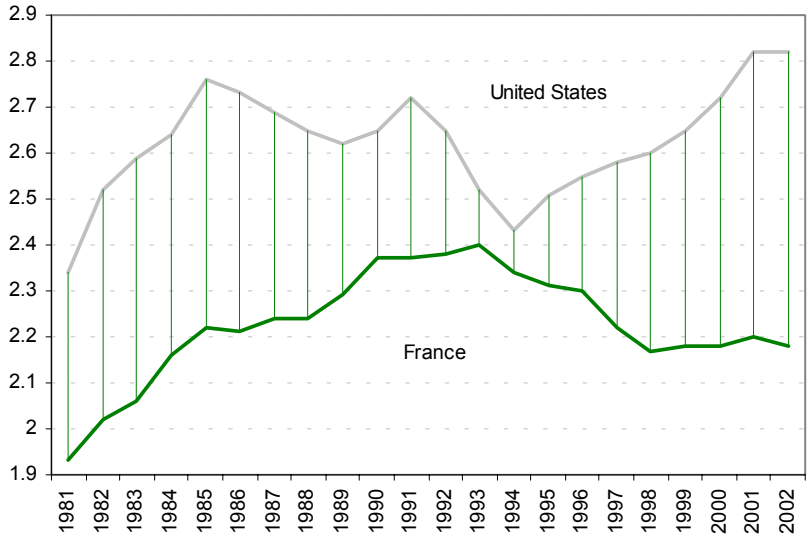

*Source: Authors' calculations based on the OECD data.*

France also spends less on research than the US. Whereas the gap had tended to narrow during the first half of the 1990s[12], it started to widen again in 1995 (**figure 11**). Yet investing in R&D is particularly important when it comes to obtaining productivity gains in high-tech sectors. R&D spending has less of an impact on low-

[11] A recent report by the Council for Economic Analysis underscores this topic (Aghion and Cohzen 2004), but a previous report (Boyer and Didier 1998) had already stressed the growing unsuitability of the entire innovation system in France.
[12] Owing to the drop in US spending, primarily in the military sector.

tech sectors, where other elements combine to improve total factor productivity[13]. In these industries, the gap with the leader itself provides a catching-up margin, whereas in high-tech sectors catching up requires a major R&D effort[14].

**Figure 11**
**Research and Development spending, 1981-2002**
*(as a % of GDP)*




*Source: Authors' calculations based the OECD data.*

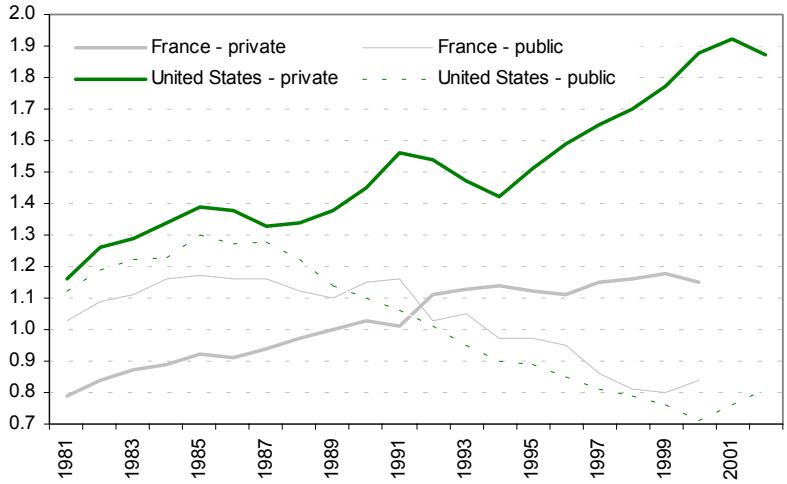
A look at the origin of R&D spending reveals that the drop in public spending has been more than offset in the US by an increase in private spending, which is not the case in France (**figure 12**). The trend in the US is linked to R&D spending in the ICT sectors, but more broadly to the development of new companies in the high-tech sectors[15].

[13] In their study, Scarpetta and Tressel (2004) divide sectors into two groups. The high-tech group embraces chemicals-pharmaceuticals, machines and equipment, automobiles, aeronautics and other types of transportation equipment.
[14] The distance with the leader is measured by the total factor productivity gap in the different industries (Scarpetta and Tressel 2004).
[15] For trends in the productive structure, see the following section.

**Figure 12**

**Public and private spending on R&D in France and the United States**

*(as a % of GDP)*




*Source: OECD data.*

This data on the allocation of research and education spending helps to explain the "French paradox" (Postel-Vinay 2002). Indeed, overall public spending is not particularly low, but international comparisons point to disappointing results in terms of scientific publications[16], patents and productivity gains.

*The role of competition*

Inadequate spending on the knowledge economy is partly due to the sectoral composition of the French economy, which is not really geared to the new technologies[17]. Yet this does not account for everything. It does not entirely explain the low level of spending on productivity and the utilization of ICTs. Nor does it explain the inertia of French sectoral production, which has not moved very far towards the new technologies or certain services. Regulations on the goods market and their impact on competition offer complementary explanations for these two phenomena.

**Table 3** shows that France's goods market has remained more regulated than those of other countries, such as the United States, the United Kingdom, the Scandinavian countries, but also Germany.

A highly regulated goods market can provide protection for existing companies and

[16] An analysis of the average number of references per publication indicates that the quality or impact of French publications is declining.

indirectly discourage them from investing in productivity to become more competitive. Accordingly, regulation can be a factor behind slow productivity growth, reduced ability to compete and, over time, loss of market share. Moreover, regulating and protecting existing companies can limit the price cuts passed on to users, consumers and producers. This resistance to price cuts, despite drops in import prices, limits purchasing power. Consequently, the lack of competition on the goods market has a negative impact on both supply and demand (Artus 2004a).

Regulation can also act as an entry barrier for new companies. In the high-tech sectors, it is precisely new companies that have the greatest potential for innovation. They are also likely to speed up the diffusion of new technologies and new organizational practices. It is well known that these start-ups were a very dynamic force in the US during the 1990s. It is also well known that start-ups are created and grow at a slower pace in Europe, precisely in the high-tech sectors (OECD 2003a, Brandt 2004). The sluggishness of start-ups in high-tech sectors has by and large been attributed to the dearth of venture capital and limited mobility of researchers in Europe. This explains public policies, particularly in France, aimed at encouraging the birth of a venture capital industry (Dubocage and Rivaud-Danset 2003). The protection of major existing groups has also played a role, and one that has perhaps not been covered in as much depth. These groups have tended to try to enter certain high-tech markets, whereas in the United States start-ups had more opportunities to make commercial breakthroughs via their innovations (Sachwald 2001).

The case of the spread of the Internet is an example of the advantages that major existing groups can enjoy and the ambiguous results that their position can have on the spread of innovation. The Minitel, which was distributed by the French national telephone provider prior to the appearance of the Internet, helped the French to become used to on-line communication and interaction, but initially also led France Télécom to prefer it to the Internet[18]. The monopoly position of France Télécom further hindered start-ups from entering the Internet market immediately.

Moreover, owing to a lack of competition, prices for mobile phones remained

[17] For details on its evolution, see the following section.
[18] For the role of the Minitel in France's transition to the Internet, see Benghozi and Licoppe (2003).

relatively high, thus discouraging their spread, especially for some innovative services.

**Table 3**
**Regulatory indicator for goods markets**
*(scale from 0 to 6)*

| | Goods Market | | *Variation in* |
|---|---|---|---|
| | *1993* | *1998* | *%* |
| United Kingdom | 3.5 | 1.0 | -71.4 |
| United States | 2.5 | 1.4 | -44.0 |
| Spain | 4.2 | 2.2 | -47.6 |
| Sweden | 4.7 | 2.2 | -53.2 |
| Germany | 4.8 | 2.4 | -50.0 |
| Finland | 5.5 | 2.6 | -52.7 |
| Denmark | 3.9 | 2.9 | -25.6 |
| Japan | 5.5 | 2.9 | -47.3 |
| Netherlands | 5.0 | 3.0 | -40.0 |
| Belgium | 4.5 | 3.1 | -31.1 |
| Austria | 4.6 | 3.2 | -30.4 |
| **France** | **5.7** | **3.9** | **-31.6** |
| Ireland | 5.1 | 4.0 | -21.6 |
| Portugal | 5.4 | 4.1 | -24.1 |
| Italy | 5.8 | 4.3 | -25.9 |
| Greece | 5.7 | 5.1 | -10.5 |

The indicator is based on the findings of a qualitative questionnaire sent to governments. It sums up the information contained in a series of indicators for seven industrial sectors: entry barriers, State capital backing, market structure, vertical integration, and price controls.
*Source: Nicoletti et al. 2002*

The emergence of a model of growth by innovation was indeed a "new American challenge" insofar as the overall technological and economic climate in the US is much more conducive to innovation, and particularly to start-ups in sectors that rely heavily on the new technologies.

### Inertia of the sectoral production structure

Ever since the transition period of the 1980s, marked by the macroeconomic imbalances generated by the exhaustion of the catching-up potential and the oil price shocks, major changes have occurred in the sectoral structure of the French economy. These correspond by and large to the changes seen in the industrialized economies in general, but have been less pronounced than in other countries. For example, the US productive structure has been more geared to services on the one hand, and to high-tech industries, on the other hand. In addition, the French export structure reflects persistent specialization in sectors dependent on economies of scale rather than high-tech sectors. Thus, France's productive structure remains marked by the heritage of the period of the "thirty glorious years" and reflects the

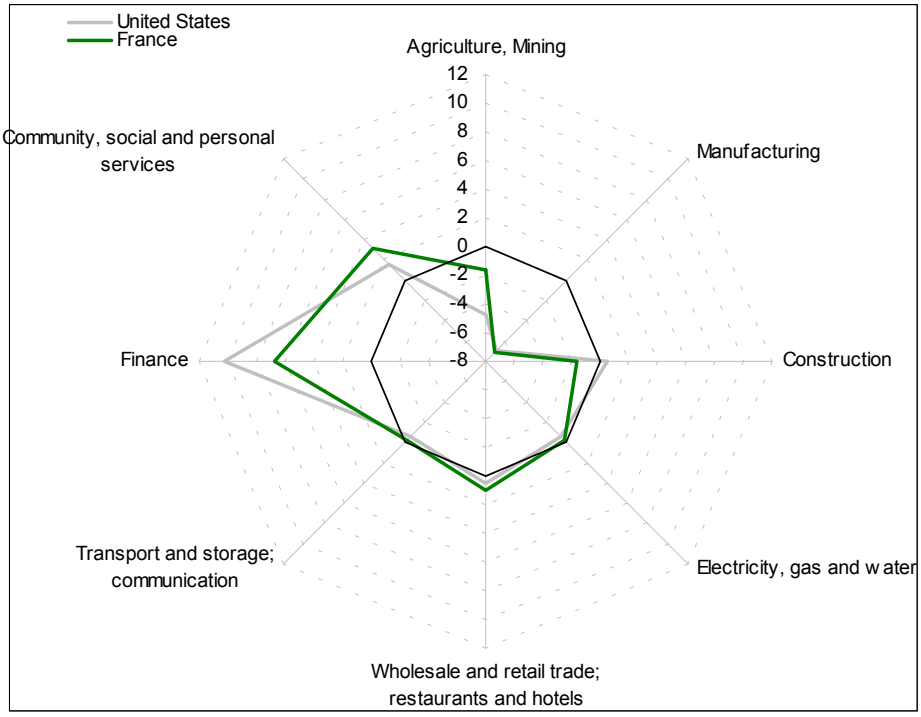
difficulties encountered in changing over to growth by innovation.

*Production structures in France and the US*

Ever since the 1980s. France and the US have witnessed a significant decline in industry's share of added value, which has been offset by an increase in the share of finance and corporate services (**figure 13**). However, "de-industrialization" has varied considerably in the two countries. The productive structure has been geared more to financial services is more pronounced in the United States, whereas in France collective services have grown more: the shares of the transportation and communication sectors, as well as trade and the hotel business, remained virtually unchanged in both countries, but agriculture has declined more in the US. Finally, the building sector has remained the same in the US but has declined in France

De-industrialization and the growth of the service sector are partly due to the outsourcing of some of these activities. The boom in this sector can also be traced to the rapid expansion of financial activities following deregulation.

**Figure 13**
**Variations in the composition of added value, in France and the US between 1981 and 2001**
*(In points of percentage)*




*Source: Authors' calculations based on the STAN-OECD database.*

In recent years, which have been marked by the shock of German reunification resulting in very constraining macroeconomic policies, and by dynamic growth in the US, sectoral gaps have widened (**table 4**). The growth differential between France and the United States is negative for all sectors except electricity, natural gas and water and for collective services. The growth gap has widened for the other sectors, including transportation and communications, which had hitherto grown at a faster clip in France. Although finance and trade have experienced positive growth in France, the pace has slowed since 1993, while these sectors have grown considerably faster in the US since 1993.

**Table 4**
**Relative accumulation of factors and sectoral growth**
*(gaps France/United States, as a %)*

| | Added Value | Capital Stock | Employment | Labor productivity | | TFP | GFCF |
|---|---|---|---|---|---|---|---|
| | | | | Per Worker | Per Hour | | |
| **TOTAL** | **-1.50** | **-1.50** | **-0.86** | **-0.63** | **0.26** | **-0.34** | **-6.33** |
| Agriculture, Mining | -1.50 | 1.10 | -3.31 | 2.32 | 5.13 | 0.97 | -2.86 |
| Manufacturing | -1.10 | -2.30 | -0.62 | -0.12 | 0.82 | -0.38 | -4.55 |
| Electricity, gas and water | 2.00 | -0.40 | 1.28 | 0.01 | 1.22 | 0.30 | -2.75 |
| Construction | -5.40 | -7.00 | -4.42 | 1.47 | 2.07 | -1.17 | -10.55 |
| Wholesale and retail trade; restaurants and hotels | -3.80 | -3.00 | -0.59 | -2.29 | -2.03 | -3.03 | -8.03 |
| Finance, Insurance, Real Estate and Business Services | -0.70 | -3.00 | -0.98 | 0.75 | 1.58 | -0.74 | -7.19 |
| Transport and storage; communication | -2.70 | -2.30 | -0.63 | -1.74 | -1.03 | -2.05 | -9.84 |
| Community, social and personal services | 0.50 | -5.60 | -0.05 | 0.20 | 0.39 | -1.66 | -4.08 |

*Source: Authors' calculations based on the STAN-OECD database.*

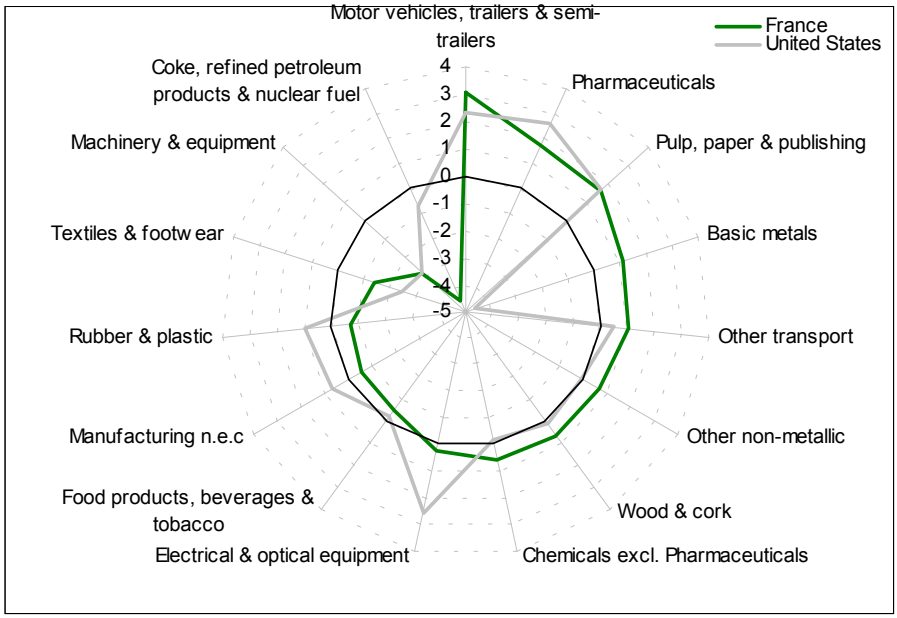
Employment trends in the various sectors reflect changes in the structure of the economy, with primary and secondary activities losing ground to tertiary activities. In all, however, fewer jobs were created in France than in the US. In sectors that have become more important over the past decade (particularly financial services), the US has recorded strong productivity gains, which is not the case for France (**table 4**).

The sectoral composition of industrial added value in the two countries shows a very clear shift away from fuels, textiles and machine manufacturing (**figure 14**). France has continued to expand its steel and mechanical industries, relatively more so than the US. Conversely, the US has developed high-tech sectors more rapidly. The chemical and pharmaceutical industries have grown in both countries, but

pharmaceuticals have experienced stronger growth in the US. However, the most remarkable development for the US has come in electrical equipment, optics and electronics, which were at the heart of the "new economy" in the 1990s. Changes in the composition of industrial production in the US have thus been much more geared to the high-tech industries.

**Figure 14**
**Variation in the composition of industrial added value in France and the United States, 1981 - 2001**

*(In points of percentage)*




*Source: Authors' calculations based on the STAN-OECD database.*

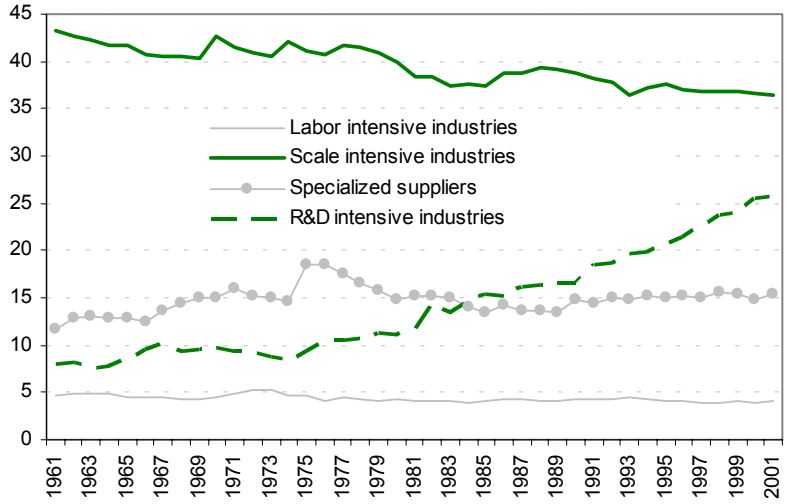
The strong expansion of the high-tech sectors is part of the reason why, despite the decline in manufacturing's share of the American economy, the US maintained its level of industrial employment during the 1990s, unlike France (Sachwald 2004a).

*Structure of French and US exports*

Industries that rely heavily on economies of scale continue to lead in terms of French industrial exports, and their share declined relatively little between the 1960s and the 1990s (**figure 15a**). Exports by R&D-intensive industries have grown in volume without exceeding one-fourth of total exports. The fact that industries that rely heavily on economies of scale continue to dominate exports reflects the inertia of

French companies in terms of export specialization[19].

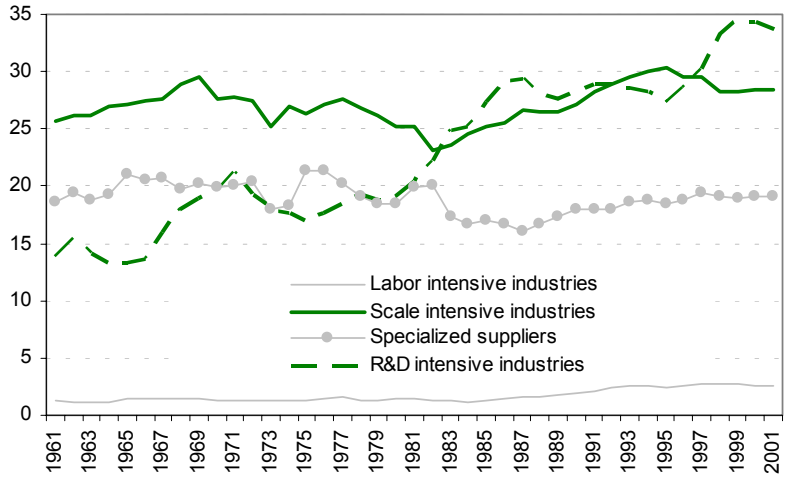
**Figure 15a**
**Structure of French industrial exports**
*(as a % of the total)*




*Source: Authors' calculations based on the OECD data.*

The relative inertia of French specialization contrasts with the development of American specialization. In the United States, the export share of R&D-intensive sectors grew steadily throughout the period under review, and these sectors have dominated US exports since the 1980s (**figure 16**).

**Figure 16**
**Structure of US industrial exports**
*(as a % of the total)*




*Source: Authors' calculations based on the OECD data.*

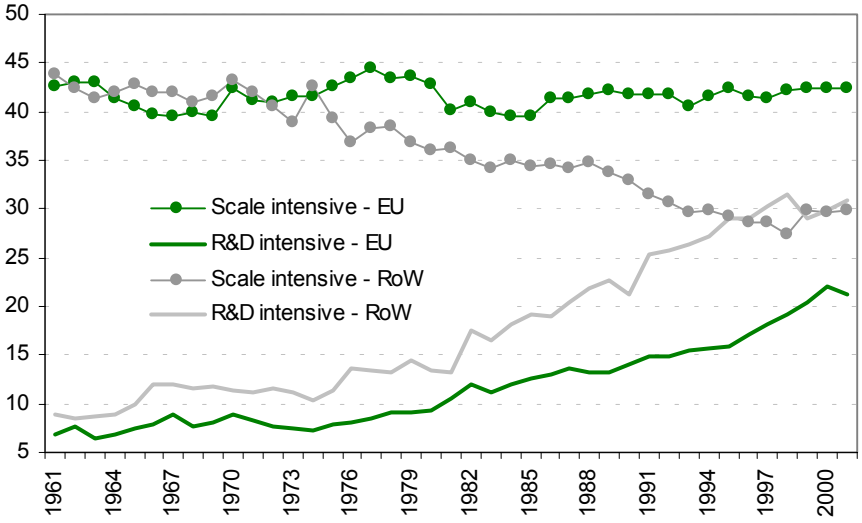
Between the 1960s and the end of the 20th century, the share of R&D-intensive

[19] The conclusions given here, which are based on changes in the sectoral composition of exports, remain the same when more precise specialization indicators are used. See for example Debonneuil and Fontagné (2003).

products out of total exports increased in both countries, but the United States specialized much more in this type of product. At the end of the 1990s, their share of French exports was 27% less than their share of US exports (see **Appendix 1**). This lesser degree of specialization in R&D-intensive products accurately reflects France's more pronounced specialization in economy-of-scale-intensive products. These products' share of French exports was 27% more than in the US. Moreover, although the share of labour-intensive exports declined, it remained far above the corresponding figure for the US (by over 50%).

Europe is France's main trading partner, which explains why the structure of French exports to the European Union (EU) is similar to the overall export structure (**figure 15b**). However, France's export structure in relation to its non-EU partners is less inert. The share of economy-of-scale-intensive industries declined during 1980-2001 to the benefit of the R&D-intensive industries, which now account for 30% of exports (**figure 15b**). These exports consist of high-tech products, but also include luxury products such as cosmetics and perfumes (**box 2**).

**Figure 15b**
**Structure of France's exports to the European Union and the rest of the world**
*(as a % of the total)*




*Source: Authors' calculations based on the OECD data.*

As can be seen, intra-European trade has a very particular profile. It mainly consists of trade in similar products between France and its partners (Fontagné and Freudenberg 1999). Nearly half of this trade consists of intra-firm trade[20], which are

[20] Some 45% of exports and 38% of imports with the EU countries in 1999 (SESSI 2002).

generated when each European subsidiary specializes in a product type that is then exported to the group's other subsidiaries. Accordingly, building a unified European area has enabled French companies to keep on specializing in certain economy-of-scale-intensive industries, particularly the automobile sector (Sachwald 1998, SESSI 2002). Intra-European trade has allowed France to specialize in the middle and top end of these industries. Intra-European trade has thus helped France to hold on to its share of world trade and support its push for quality in its traditional strong points – from automobiles to aeronautics. These performances have helped to ensure the cost-effectiveness of French exports (Langlet *et al.* 2004) and for a long time, France's share of world exports held up well (Debonneuil and Fontagné 2003). Over the past few years, however, the concentration of exports to European markets, which are less dynamic than American ones, and the new emerging zones, has helped to reduce France's share of the world market. In the new context, insufficient specialization in high-tech products and a failure to target emerging countries like China are clear handicaps (Sachwald 2004b).

**Box 2.**
**Product typology for the analysis of exports**

The OECD foreign trade series (level three of the CTCI revision 2 nomenclature) correspond to a breakdown into 239 product categories, which can be grouped together as follows:

**1. Primary products**
1.1. Agricultural
1.2. Mining
1.3. Energy
**2. Industrial products**
2.1. Natural-resource intensive
2.1.1. Agricultural
2.1.2. Mining
2.1.3. Energy
2.2. Manufacturing industry
2.2.1. Labour-intensive
2.2.2. Economy-of-scale intensive
2.2.3. Specialized suppliers (machines and equipment)
2.2.4. R&D-intensive

This classification takes into consideration the sectoral origin of products and, for industry, the determinants of competitiveness. Industry is accordingly divided into four categories: labour-intensive products, where productive processes are characterized by heavy reliance on the workforce (shoe and clothing industries, etc.), economy-of-scale-intensive products, which are capital-intensive (iron and steel, the automobile industry, etc.), "specialized suppliers", characterized by highly diversified supply (in particular capital goods); R&D-intensive products, characterized by heavy R&D spending

and the generation of innovations that benefit the entire productive system (pharmaceuticals, telecommunications, electronic components, etc.).

Care must be taken when interpreting figures relating to R&D-intensive industries because this typology does not fully match the OECD definition of high technology: R&D-intensive industries include a number of “medium/high-tech” industries, which account for a substantial share of France’s R&D-intensive exports (18% in 2001), such as perfumes and cosmetics, soaps and cleaning products, as well as disinfectants, insecticides and herbicides.

# 2. Growth scenarios for up to the year 2030

The lack of change in France's productive model limits prospects for growth and higher living standards. Weak growth is now widely perceived as a major problem. Various studies have underscored the role that dynamic growth could play in solving certain major economic difficulties, such as persistently high unemployment or swelling budget deficits. Yet it does not seem realistic to expect strong growth to solve these problems. In particular, the 3% growth rate that would make it possible to absorb unemployment and consolidate social spending seems very optimistic indeed[21].

An analysis of the scenarios put forward in this forecasting section shows that it is more reasonable for France to count on potential growth in the neighbourhood of 2% over the next thirty years. Yet this average performance can only be reached if appropriate economic policies are introduced. Indeed, France must cope with both sluggish population growth, which will lead to a drop in its working population by 2008, and insufficient productivity gains.

**Different estimates of French growth**

Working out long-term growth scenarios is risky business, given the uncertainties that hang over overall macroeconomic consistency on the one hand and changes in institutional and policy conditions on the other hand. A growth model depends not only on supply-side factors, but also on the modalities for sharing productivity gains: leisure and free time, investments, real wages and employment. This sharing is the fruit of social and political compromises that evolve over time but are very difficult to predict. Moreover, even though such changes can be predicted with reasonable accuracy, nothing guarantees that they will be sustainable. For example, income-sharing that is too biased in favour of capital income can lead to lasting weak

[21] On this rate of 3%, see Didier (2003), Blanc (2004).

consumption, whereas sharing that is skewed towards labour income can reduce investment incentives.

Most scenarios are prepared on the basis of estimates of potential GDP growth, which measures the productive capacity of an economy at a given moment on the basis of available resources, their degree of utilization and their efficiency[22].
Potential growth is defined as the variation in potential GDP between two dates. It is equal to the sum total of technological progress and the increase in the working population.

Over the very long run, growth is limited by the increase in the working population and technological progress, which constitute the two rare resources. However, there are no limits on the accumulation of capital, which can be tailored to fit the needs of the workforce and technology. Over the shorter term, potential growth can be limited by an insufficient increase in capital stock. This is the case in particular if investment has remained depressed owing to low profits. Conversely, potential growth can be temporarily stimulated by an increase in investment or employment rates. Accordingly, an investment push or an increase in the utilization period of equipment, a decline in structural unemployment or an increase in rates of activity are likely to boost potential growth above its long-term maintenance level (**box 3**). These trends cannot go on indefinitely: they result in a lasting rise in the level of production, but not in its rate of growth. In the long run, only productivity gains and demographic changes affect economic growth.

**Box 3.**
**Potential growth and actual growth**

Actual growth can be less or more than potential growth. Activity can temporarily exceed potential production, but generally at the cost of a wage-price spiral. Conversely, activity can temporarily stabilize below the potential supply of the economy in the case of a demand gap. In such a situation, sustainable growth with no danger of inflationary tensions can be higher than potential growth. For instance, the French economy grew at a rate of nearly 3% from 1997 to 2000 without any rise in prices.

[22] For a precise definition of potential growth, see Appendix 1.

Potential growth acts as a reminder: output gaps only last for a more or less short while, depending on the nature of the imbalance generated.

**The consequences of gaps between potential growth and actual growth**

| Imbalance | Actual growth > potential growth | Actual growth < potential growth |
|---|---|---|
| **Inflation** | Rising | Falling |
| **Unemployment** | Falling | Rising |
| **Government** | Improvement | Worsening |

Most calculations of potential growth over a long period estimate changes in capital accumulation and total factor productivity. They also rely on estimates of trends for population and for the working population in particular. The latter are generally more reliable than estimates pertaining to the other factors of production.

*Differing estimates of potential growth*

**Table 5** shows a selection of estimates of potential growth in France for up to the year 2030[23]. The dispersion of results is due to the different methods utilized and the underlying theoretical models. Over the medium and long term, the estimates vary considerably, ranging from 1.5% to 2.8% annual growth. Despite these divergences, these estimates all indicate that growth is set to slow down as a result of demographic trends (the ageing and stagnation – or even regression – of the working population).

**Table 5**
**France: Estimates of potential growth, 2001-2030**

| Author | Period of estimate | Estimate |
|---|---|---|
| Economic Commission for Europe (2002) | | |
| *Low* | 2003-2030 | 1.70 |
| *High* | | 2.83 |
| *Average* | | 2.27 |
| Kousnetzoff (2001) | 2001-2030 | 1.90 |
| Goldman Sachs (2003) | 2003-2030 | 1.50 |
| Bank of France (2003) | | |
| *Low* | 2004-2030 | 1.94 |
| *High* | | 2.36 |
| *Average (50/50)* | | 2.15 |

[23] The selection of estimates is based on the timeframe defined by the period 2000-2030. Artus and Kaabi (2003) estimate annual average growth for France of 1.1% (as compared with 3.7% for the US) for the period 2000-2020.

Moreover, no estimate is close to the mythical 3% growth rate capable of solving unemployment problems. Does this imply that France will never be able to grow at a rate of 3% or more? The answer is no. There are two possible scenarios: "miraculous growth" or a "double-time march". The former is, by definition, unpredictable: it could stem from an unforeseen technological boom or a large-scale inflow of immigrants that would substantially change demographic trends. The "double-time march", on the other hand, could create major macroeconomic imbalances and prove unsustainable over the long run (**box 3**). On the other hand, it is easier to imagine actual growth that is lower than potential growth, owing to a lack of demand, for example.

*Analysis of UN growth scenarios*

In order to appreciate the validity and implications of the various scenarios, we must examine the underlying hypotheses. We shall focus on the estimates made by the United Nations Economic Commission for Europe (ECE 2002) for two reasons. First, the range of estimates is sufficiently broad to encompass the other calculations set out in **table 6**: potential growth for France lies between 1.4% (low growth scenario) and 2.7% (high growth scenario). Second, the scenarios constructed by the United Nations are clear and detailed, with regard to both the dynamics of each factor of production (labour and capital) and the diffusion of technological progress (TFP).

The Economic Commission for Europe has worked out three scenarios, particularly in relation economic policy hypotheses. In the **low growth** scenario, technological progress and the increase in human capital are not greatly facilitated by public policies, and demographic hypotheses are the least favourable (population drop accompanied by substantial ageing). In the **baseline scenario**, policies are introduced to promote innovation-driven growth. Demographic trends are also more favourable (average UN trends). Finally, the **high growth** scenario presupposes a sharp increase in spending on R&D and education in order to speed up technological progress and increase human capital.

**Table 6**
**Growth scenarios for OECD countries, 2000-2030**

| | Low growth | | | | Baseline | | | | High growth | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Capital | Labour | TFP | GDP | Capital | Labour | TFP | GDP | Capital | Labour | TFP | GDP |
| **France** | 1.70 | 0.10 | 0.60 | **1.40** | 1.90 | 0.40 | 1.00 | **2.00** | 2.00 | 0.60 | 1.50 | **2.70** |
| **United States** | 1.80 | 0.40 | 0.40 | **1.40** | 1.90 | 0.70 | 0.80 | **2.00** | 2.00 | 1.10 | 1.30 | **2.70** |
| Denmark | 1.80 | -0.20 | 0.50 | **1.10** | 2.00 | 0.10 | 1.00 | **1.80** | 2.10 | 0.30 | 1.50 | **2.60** |
| Finland | 1.80 | 0.10 | 0.90 | **1.60** | 1.90 | 0.30 | 1.40 | **2.30** | 2.00 | 0.50 | 1.90 | **3.00** |
| Germany | 2.00 | -0.10 | 0.30 | **1.00** | 2.10 | 0.10 | 0.70 | **1.70** | 2.20 | 0.40 | 1.20 | **2.40** |
| Ireland | 2.30 | 0.50 | 0.70 | **1.90** | 2.50 | 0.80 | 1.10 | **2.60** | 2.60 | 1.10 | 1.60 | **3.30** |
| Italy | 1.70 | -0.40 | -0.20 | **0.20** | 1.80 | -0.20 | 0.90 | **1.50** | 1.90 | 0.00 | 1.40 | **2.20** |
| Spain | 2.40 | -0.20 | 0.40 | **1.30** | 2.50 | 0.00 | 0.90 | **1.90** | 2.70 | 0.30 | 1.40 | **2.60** |
| Sweden | 1.40 | 0.00 | 0.80 | **1.40** | 1.50 | 0.20 | 1.30 | **2.00** | 1.60 | 0.60 | 1.90 | **2.90** |
| United Kingdom | 1.60 | -0.10 | 0.70 | **1.30** | 1.70 | 0.20 | 1.20 | **2.00** | 1.80 | 0.50 | 1.80 | **2.80** |
| Japan | 2.70 | -0.40 | 0.30 | **1.10** | 2.80 | 0.00 | 0.70 | **1.90** | 3.00 | 0.10 | 1.20 | **2.50** |

*TPF: total factor productivity* *Source: EEC (2002).*

**Table 6** yields similar conclusions for the different countries. First of all, despite some differences between scenarios, the impact of increases in the working population will be either negative or – in the best of cases – insignificant. Second, there is no significant difference between scenarios when it comes to the dynamics of capital accumulation. Given that the labour factor will increase only slightly or not at all, the increase in the utilization of production factors will play a small part (less than 1% in the majority of countries). Accordingly, stepping up TFP appears to be the only means of achieving satisfactory growth in the OECD zone. In the high-growth scenario, it accounts for nearly two-thirds of growth. As far as France is concerned, TFP is responsible for between 43 and 56% of GDP growth.

**Table 7** compares historic values and UN estimates. The first part of the tables shows historical values for the sub-periods identified above: 1950-1974, 1975-1992 and 1993-2003.

**Table 7**
**Historical trends and growth scenarios for France, 2000-2030**
*(Average annual growth, as a %)*

| | Production factors | | Technological progress | Growth | Contribution | | |
|---|---|---|---|---|---|---|---|
| | Labour | Capital | TFP | GDP | Labour | Capital | Total |
| **Historical trends** | | | | | | | |
| 1950-1974 | 0.25 | 4.20 | 3.71 | **5.37** | 0.15 | 1.51 | ***1.66*** |
| 1975-1992 | - 0.13 | 3.72 | 1.13 | **2.34** | -0.10 | 1.31 | ***1.22*** |
| 1993-2002 | 0.92 | 2.81 | 0.39 | **2.07** | 0.54 | 1.14 | ***1.68*** |
| **Scenarios** | | | | | | | |
| Low growth | 0.23 | 1.83 | 0.80 | **1.70** | 0.13 | 0.77 | ***0.90*** |
| Baseline scenario | 0.50 | 1.93 | 1.17 | **2.27** | 0.29 | 0.81 | ***1.10*** |
| High growth | 0.70 | 2.00 | 1.60 | **2.83** | 0.40 | 0.83 | ***1.23*** |
| **Scenario gaps for 1993-2002** | | | | | | | |
| Low growth | - 0.69 | - 0.98 | 0.41 | **- 0.37** | -0.40 | -0.37 | ***- 0.77*** |
| Baseline scenario | - 0.42 | - 0.88 | 0.78 | **0.20** | -0.25 | -0.33 | ***- 0.58*** |
| High growth | - 0.22 | - 0.81 | 1.21 | **0.76** | -0.13 | -0.30 | ***- 0.43*** |

The long-term trend points to a slowdown in the pace of capital accumulation (from 4.2 to 2.8% per year) and the rate of technological progress (from 3.7 to 0.4%). Changes in labour input are more uneven: following negative growth during the second period (-0.1%), annual growth between 1993 and 2002 averaged nearly 1%. GDP growth slowed from 5.4% to 2.3%, subsequently declining further to 2.1%. The sharp increase in employment during the 1990s, due to policies aimed at reducing the cost of unskilled labour, accounts for half a point of growth on its own. In the future, such an increase could only recur if the structural unemployment rate were to fall drastically and if the activity ratio were to rise considerably – two developments that would reverse past trends[24] and estimates with regard to changes in the working population. As a result, the value chosen by the UN in its low-growth growth scenario seems too optimistic. INSEE, the French statistical institute, forecasts an average annual growth rate in the working population of –0.09% for 2000-2030. Accordingly, annual employment growth of 0.23% would imply a sharp upturn in the activity ratio and a substantial drop in structural unemployment[25].

In the United Nations scenarios, the growth rate for the capital stock is one percentage point lower than the values recorded between 1993 and 2002. This hypothesis corresponds to the theoretical analysis according to which, at an advanced stage of development, as the capital stock per unit of labour is very high and returns are diminishing, growth depends on population growth and technological progress. In other words, changes in labour productivity stem from technological progress, not the accumulation of additional capital. Moreover, if the economy is at an advanced stage of demographic transition, growth will depend exclusively on technological progress. In the low-growth scenario, technological progress is diffused twice as fast as during 1993-2002, and four times as fast in the high-growth scenario. This hypothesis, which results in a growth rate of 3%, seems very optimistic.

[24] However, see Doisy (2000), who considers that equilibrium unemployment may have declined by nearly 2 points since the mid-1990s to reach a level near 8.5% in 2000. This drop reportedly reflects the decrease in social deductions and the cost of capital. He has also noted a considerable increase in the activity ratio.
[25] This point is taken up once again in the discussion of the demographic hypotheses of our scenario below.

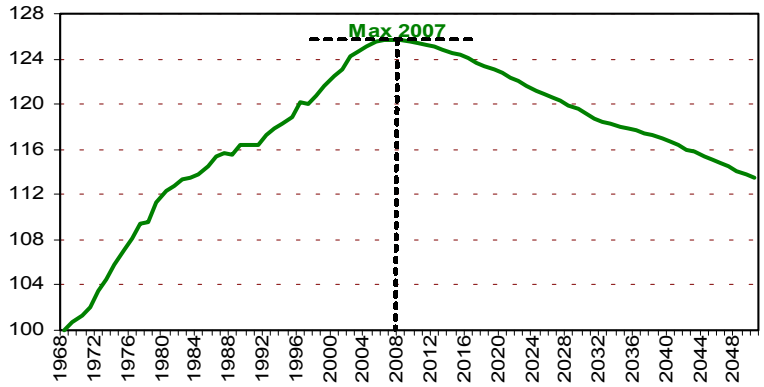
**A reasonably optimistic scenario**

Taking recent changes in production factors and technological dynamics in France into consideration, we have drawn up hypotheses to construct a thirty-year scenario of potential growth. Our approach is optimistic insofar as it predicts favourable developments with regard to the utilization of human resources and the diffusion of technological progress. Nevertheless, our scenario takes due account of foreseeable difficulties in the implementation of certain reforms, particularly on the labour market.

*Demographic hypotheses*

In an analytical framework based on a supply function, the long-term growth potential is limited by the scarcity of labour. The different estimates, set out in the previous section, are based on hypotheses concerning changes in the working population. In the traditional production function, which is used in long-term growth forecasts, the quantity of labour is broken down into the working population and the average number of hours worked. Changes in total population and its structure have an impact on growth, but they do not affect estimates of potential growth because they above all impact on the components of demand or public funds (**Appendix 3**).
On the one hand, INSEE predicts that working population will diminish from 2008 onwards (**figure 17**). Between 2008 and 2050, France's working population is expected to decline by 10%, *i.e*. 2.6 million persons, reverting to its 1983 level by 2050.

**Figure 17**
**French Working population, 1968-2050**
*(index base 1968 = 100)*




*Source: Authors' calculations based on the INSEE data.*

On the other hand, ageing will significantly alter population structure (**Appendix 3**). The share of persons over 55 out of the working population will rise, whereas the opposite was true between 1970 and 2000. Conversely, the share of the young (15-24 years) and the 25-54 age groups will decline. However, these structural changes should not significantly affect average labour productivity (Blanchet 2002).

Historically speaking, France is characterized by very low and diminishing rates of activity for those over 55 (Givord 2002). The average rate of activity, with all age groups taken into account, was also low in comparison with the other developed countries (**table A5.1**). Yet potential growth depends to a certain extent on the activity ratio, and pension funding is also partly determined by changes in dependency ratios and hence activity ratios. This is why the European Union has made increasing activity ratios one of the objectives of the Lisbon strategy. The key to achieving this goal is to start by increasing activity ratios for those in the over-55 age bracket.

The decline in the number of hours worked is a historical trend that is common to the major developed countries. Since the 1970s, however, the drop has been more pronounced in France (**figure 3**). In 2002, the French worked 14% fewer hours than the Americans. According to an OECD study (2003), the bulk of the differential in living standards (per capita GDP) with the US is due to a lower utilization of labour.

France could act on various characteristics of the working population, which depends on demographic dynamism, the migratory balance, the activity ratio and the unemployment rate. **Table 8** sets out scenarios for changes in the working population based on various hypotheses, making it possible to compare underlying trends with a maximum scenario, the one we ended up choosing for our estimate. **Table 8** indicates that the variable that is likely to have the greatest impact on the working population is raising the effective retirement age. In the maximum scenario, raising the retirement age makes it possible to increase the working population by nearly 14% by 2030. A change in childbearing behaviour would take hold much more slowly.

**Table 8**
**Scenarios for change French working population**
*(in thousands of persons)*

| | 2 000 | 2 007 | 2 012 | 2 020 | 2 030 | Total change | Annual change |
|---|---|---|---|---|---|---|---|
| **Baseline scenario** | **26 272** | **26 979** | **26 844** | **26 336** | **25 570** | **-2.7%** | **-0.1%** |
| **High growth scenario** | **26 272** | **27 633** | **28 637** | **30 142** | **30 890** | **17.6%** | **0.5%** |
| High fertility | 0 | 0 | 0 | 8 | 275 | | |
| Migratory balance 100,000 | 0 | 131 | 284 | 544 | 861 | | |
| Low unemployment | 0 | 242 | 389 | 381 | 369 | | |
| Increasing participation of women in the labour market | 0 | 15 | 55 | 149 | 282 | | |
| Raising of actual retirement age | 0 | 266 | 1 065 | 2 724 | 3 533 | | |
| **IFRI scenario** | **26 272** | **27 217** | **27 460** | **27 507** | **26 988** | **2.7%** | **0.1%** |

*Source: Authors' calculations based on Nauze-Fichet (2002).*

The high-growth scenario incorporates a positive migratory balance of 100,000 persons per year, which would make it possible to increase the working population by 5.6%. Such a balance would represent a substantial change in comparison with the last twenty years (**table 9**). France experienced strong immigration in the 1950s and 1960s, but the migratory inflow has fallen off since then. By way of comparison, a migratory balance of 115,000 persons on average during the period 1995-2000 characterized the United Kingdom, which is comparable in terms of size.

**Table 9**
**Evolution of the French migratory balance**
*(in thousands of persons)*

| | Net population increase | Migratory balance | Contribution to the population increase |
|---|---|---|---|
| 1950-1959 | 382.2 | 93.9 | 24.60% |
| 1960-1969 | 515.3 | 205.0 | 39.80% |
| 1970-1979 | 319.8 | 72.6 | 22.70% |
| 1980-1989 | 283.4 | 49.9 | 17.60% |
| 1990-1999 | 264.9 | 59.0 | 22.30% |

*Source: INSEE*

Some are in favour of a more ambitious immigration policy, which would do more to increase the growth potential because it would take a selective approach, giving preference to skilled migrants accompanied by children (Pastré 2003). Nevertheless, accepting more immigrants is a delicate political choice owing to certain electoral considerations and chauvinistic temptations. This in turn underscores the need to explain the validity of such a policy and to combine it with active steps to combat illegal immigration. The success of the policy of selective immigration and its impact on the growth potential depend to a large extent on the

capacity of immigrants to fit into French society and the latter's capacity to integrate them. To achieve this goal, the authorities would have to explain clearly that immigration does not imply job-sharing and more unemployment for the French, but rather that it is a means of combating the drop in the working population and stimulating activity[26].

Burniaux, Duval and Jaumotte (2004) feel that various reforms are needed to offset the trend towards a decline in the working population and stimulate growth. **Table 10** presents the scenarios built on their hypotheses. According to these hypotheses, the low-growth scenario forecasts a 0.3% increase in the working population. In the high-growth scenario, the combined impact of reforms to promote the participation of women, aged workers and young people could generate an annual increase in the working population of 0.6% above the underlying trend (*i.e*. a reduction of 0.12%). Applying this package of reforms would therefore make it possible to achieve a growth rate close to the high-growth scenario (**table 8**). The authors note, however, that it is unlikely that these measures will start to pay off before 2010.

**Table 10**
**OECD scenarios for changes in French labour supply**
*(as a %)*

| | 2000-2030 |
|---|---|
| **The baseline scenario: projected evolution of aggregate labour supply** | **-0.12** |
| **High Case** | |
| **Aggregate participation change in the baseline scenario (a)** | **-6.60** |
| *Impact of pension reforms (1)* | *5.12* |
| *Impact of additional incentives to women (2)* | *3.16* |
| *Impact of increasing youths participation (3)* | *2.18* |
| **Total impact of policy reforms (b) = (1)+(2)+(3)** | **10.50** |
| **Total change (a)+(b)** | **3.90** |
| **Rate of growth of aggregate labour supply including all reforms** | **13.05** |
| **Annual Rate of growth of labour supply** | **0.49** |
| **Low Case** | |
| **Aggregate participation change in the baseline scenario (a)** | **-6.60** |
| *Impact of pension reforms (1)* | *3.24* |
| *Impact of additional incentives to women (2)* | *2.46* |
| *Impact of increasing youths participation (3)* | *2.18* |
| **Total impact of policy reforms (b) = (1)+(2)+(3)** | **7.88** |
| **Total change (a)+(b)** | **1.28** |
| **Rate of growth of aggregate labour supply including all reforms** | **7.97** |
| **Annual Rate of growth of labour supply** | **0.31** |

*Source: Authors' calculations based on Burniaux, Duval and Jaumotte (2004)*

[26] For the illusion of inevitable sharing of work with the immigrants, see the case study on the outflow of more than 60,000 Cubans to Miami between May and September 1980, which led to a 7% increase in the working population (Cahuc and Zylberberg 2004).

In view of the difficulties involved in implementing the reforms needed to act on the trends at work, we have opted for a relatively optimistic middle-of-the-road scenario for changes in the working population. The new immigration policies and the raising of the effective retirement age would be introduced gradually and would only add 0.1% per year to the working population (**table 8**). More active policies, if successfully implemented, would bring this rate closer to the more optimistic scenarios of **table 10**.

*Hypotheses with regard to technological progress*

The various available estimates all predict an increase in the pace of technological progress. Kousnetzoff (2001) and Doisy (2000) expect TFP to grow by 1.2% and 1.3%, respectively, which is close to the values postulated in the UN's medium-growth scenario. A rate of 1.2% corresponds to TFP growth three times higher than what France experienced during the 1990s (**table 7**). Achieving such growth would therefore imply a real effort to facilitate the diffusion of technological progress, particularly in sectors that have lagged behind, in particular services[27]. Yet three reasons suggest that an average TFP growth rate of 1.2% per year over the next thirty years is not unrealistic.

First of all, there is no denying that the 0.4% growth during the 1990s was artificially low because of the sharp rise in unskilled work at the end of the decade. This rise was primarily due to the policy of lightening social security contributions on low wages. However, the sharp increase in the growth content of unskilled work mechanically reduces total factor productivity (TFP) (Ménard 2004).

Next, it seems reasonable to expect more rapid diffusion of ICTs and a tendency towards convergence with the United States, in particular thanks to the drop in the price of Internet hookups and the increase in the cost-benefit ratio of equipment. France should be able to catch up in terms of the diffusion of ICTs[28], making it possible to enhance their impact on labour productivity and total factor productivity

[27] The work done by Accardo, Bouscharain and Jlassi (1999) shows a clear break in trends for technological progress since 1993. Since this date, there has been a statistically significant drop in the TFP trend for the tertiary sectors. However, manufacturing sectors bely this movement, as they are up sharply since 1993.
[28] As set out in the first part.

(Gust and Marquez 2000). Nevertheless, these favourable changes imply substantial efforts to increase the average educational level of labour and to facilitate the diffusion of these technologies[29].

Finally, one main reason to expect an increase in the pace of technological change is precisely that France is considering reforming its research and innovation policy. This change must entail a certain increase in means, but also modified research structures, which could in particular facilitate interaction between public research and private research. The various projects under discussion are more or less radical, but many also envisage an increase in interaction between higher education and research[30]. The various reforms that are being debated are designed to not only increase France's investments in knowledge but also and perhaps above all, enhance their efficiency[31].

In view of the various elements pointing to a possible increase in the pace of technological progress, we feel that it is reasonable to opt for a TFP growth rate of 1.2% per year in our scenario.

*Ifri's estimate*

The discussion of the above hypotheses showed that the increase in the rates of activity, the number of hours worked, immigration and the raising of the retirement age can have a significant yet limited impact on France's potential for growth. Our scenario predicts that the diffusion of technological progress over the next thirty years will play a relatively more important role.

The result of the estimates is set out in **table 11**, which also includes previous performance and an estimate of the growth trend, making it possible to specify the characteristics of our own scenario.

The medium-growth scenario is based on the baseline scenario for changes in the

[29] See the analysis in the part on innovation-driven growth below
[30] For the discussion and quantification of the different scenarios for changes in the French research and innovation system, see FutuRIS (2004).
[31] And thus help to solve the problems identified in the first part.

working population (**table 8**), on an estimate for growth of capital stock (**Appendix 3**) and on the hypothesis of faster technological progress. This hypothesis factors in the doubling of the pace of technological progress that was observed between 1993 and 2002.

**Table 11**
**Historical trends and Ifri's growth scenario for France, 2000-2030**
*(Average annual growth, as a %)*

| | Production factors | | Technological progress | Growth | Contribution | | |
|---|---|---|---|---|---|---|---|
| | Labour | Capital | TFP | GDP | Labour | Capital | Total |
| **Historical trends** | | | | | | | |
| 1950-1974 | 0.25 | 4.20 | 3.71 | **5.37** | 0.15 | 1.51 | ***1.66*** |
| 1975-1992 | - 0.13 | 3.72 | 1.13 | **2.34** | - 0.10 | 1.31 | ***1.22*** |
| 1993-2002 | 0.92 | 2.81 | 0.39 | **2.07** | 0.54 | 1.14 | ***1.68*** |
| **Scenarios** | | | | | | | |
| Baseline scenario | - 0.10 | 1.23 | 0.80 | **1.23** | - 0.06 | 0.49 | ***0.43*** |
| **IFRI Scenario** | **0.10** | **2.10** | **1.20** | **2.10** | **0.06** | **0.84** | ***0.90*** |
| **Scenario gaps for 1993-2002** | | | | | | | |
| Baseline scenario | - 1.02 | - 1.58 | 0.41 | **-0.83** | - 0.60 | - 0.65 | ***- 1.24*** |
| Scénario IFRI | - 0.82 | - 0.71 | 0.81 | **0.03** | - 0.48 | - 0.30 | ***- 0.78*** |

It is justified for two reasons. First, the increase in the content of growth in employment, which is due to incentives for hiring unskilled workers during the 1990s, has mechanically reduced total factor productivity[32]. Second, 0.8% growth corresponds to the low UN estimate and the estimate for TFP growth calculated by the Banque de France (Lecat 2004). This underlying scenario yields a potential growth rate of 1.2%, *i.e*. a rate close to the estimate by Artus and Kaabi (2003), who postulate annual growth of 1.1% between 2000 and 2020.

If the trends at work since 1993 merely continued, this would generate annual growth of 1.2%. Our own scenario reflects considerably faster growth – of 2.1% per year. The discussion of the above hypotheses has underscored the fact that such a performance implies increasing the utilization of labour and above all accelerating the diffusion of technological progress.

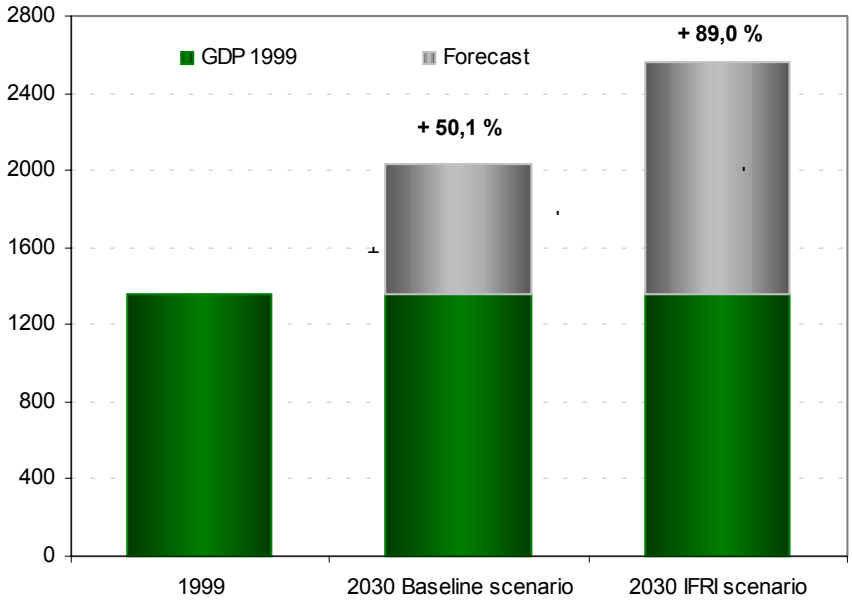
**Figure 18** shows that the different scenarios (**table 11**) have very different long-run consequences for the size of the French economy: a growth difference of 0.75% in

[32] This line of reason was developed above in the discussion on TFP hypotheses.

relation to the underlying trend, accumulated over a thirty-year period, generates a significant difference of nearly 40% of GDP.

International comparisons show that, even when our scenario is selected, the French economy is due to shrink in relation to the major emerging countries, namely China, India and Brazil. By the year 2020, France will still be among the top ten world economies, but will be far behind the United States and China. It will also have been undertaken by India, and will be the same in size as the Brazilian economy[33].

**Figure 18**
**The size of the French economy in 2030 according to the different scenarios**
*(in billions of 1995 euros)*




*Source: Authors' calculations.*

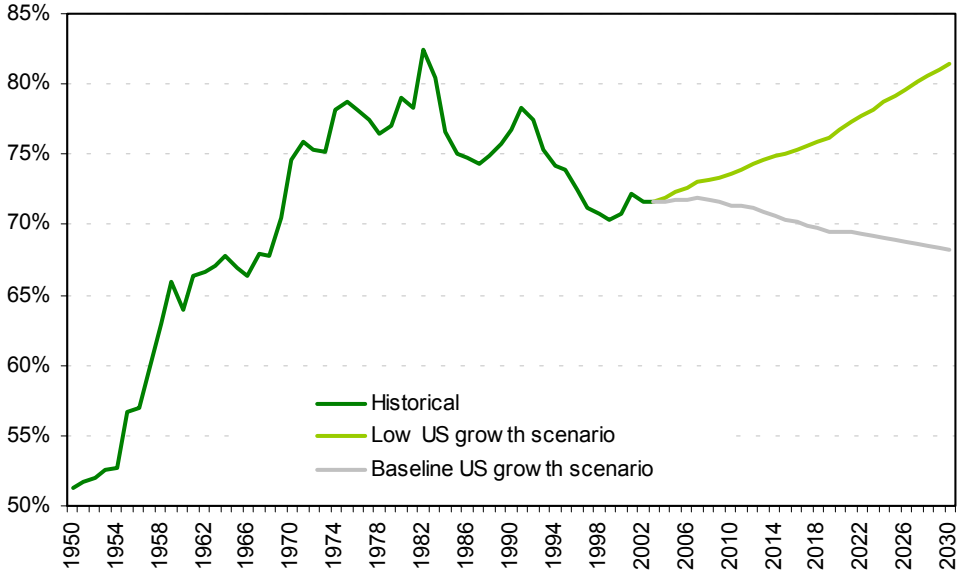
**Is catching up with the United States out of reach?**

Will the faster diffusion of technological progress in our scenario allow France to narrow the living standard gap with the United States, which has remained the same for a quarter of a century? The answer to this question depends on how dynamic US growth is over the next thirty years.

[33] On the basis of estimates by Goldman Sachs (2003), calculated using the nominal exchange rate for 2003, not purchasing power parity.

Combining the UN's estimates for GDP and population growth in the United States (**table 6**) and our scenario for France (**table 12**) could only generate a new catching-up period if the pace of technological progress in the US slows down significantly. If TFP in the US were to drop from 1.2% per year (the average between 1993 and 2002) to 0.8% (medium-growth scenario), France would reverse the trend. In this case, France's living standards relative to the US would return to the 1981 level by 2030 (**figure 19**). On the other hand, if technological progress continues to spread at such a rate in the US, the gap in living standards will keep on widening at France's expense.

**Figure 19**
**Prospects for catching up with United States living standards according to the different scenarios**




*Source: Authors' calculations.*

The scenario for a new catching-up phase therefore depends on the hypotheses for productivity in the US used in the UN scenarios (**table 6**). Yet recent developments and US estimates suggest to the contrary that the rise in US productivity is a lasting trend[34]. The 10-year growth estimates used by the US in calculating medium- and long-term budgetary forecasts (CBO 2004) predict that TFP will grow by 1.3% over the next ten years (**table 12**).

[34] Artus (2004b) considers that the United States should see strong growth in labour productivity over the next few years.

**Table 12**
**Historical trends and potential growth in the United States**
*(annual average, as a %)*

| | GDP | TFP | Employment | Capital |
|---|---|---|---|---|
| 1950-1973 | 4.2 | 2.0 | 1.6 | 3.6 |
| 1974-1981 | 2.5 | 0.8 | 2.6 | 4.4 |
| 1982-1990 | 3.3 | 0.9 | 1.6 | 3.6 |
| 1991-1995 | 2.4 | 1.2 | 1.2 | 2.5 |
| 1996-2003 | 3.3 | 1.5 | 1.3 | 4.5 |
| 1950-2003 | 3.5 | 1.5 | 1.6 | 3.8 |
| **2004-2014** | **3.0** | **1.3** | **0.8** | **4.0** |

*Source: CBO (2004)*

As can be seen, the UN **high-growth scenario** is close to the CBO's forecasts as far as budgetary forecasting is concerned: the UN predicts cumulative growth of 38.4% between 2004 and 2014, as compared with 38.3% for the CBO. It would thus appear legitimate to take this scenario as the basic scenario for US growth – as is the case in **figure 19**.

The dynamism of the US economy rules out a shift to a new phase of catching up with the United States, barring a growth scenario that would combine hypotheses that are extremely favourable for both the working population and technological progress. The most optimistic hypotheses concerning changes in the working population (**tables 8 and 10**) indicate that a successful reform process could increase potential growth to 2.5%[35]. Accordingly, achieving 3% growth presupposes an acceleration in the pace of technological process that seems extremely unlikely at present. Moreover, all hypotheses more favourable than our scenario imply the implementation of reforms that are blocked at present. The last past takes up this question, namely, the political economics of reform.

[35] According to the method for calculating potential growth indicated in Appendix 1 and with XXX = 0.6.

# 3. Increasing France's potential for growth

Ever since the oil price shock of 1973, that is, one generation, France has never really returned to a period of strong growth. The unemployment rate has worsened, falling only during the upside of economic cycles. The interaction of economic difficulties and structural problems has created a vicious circle, where households' loss of confidence and companies' pessimistic expectations have combined to block prospects for change and undermine France's potential for growth. In this context, the necessary adjustments have turned into a pressing need for reforms, which however have become increasingly difficult to implement.

A comparative analysis of the performance of France and the US, like the exercise of potential growth scenarios, indicates that the difference between the two economies stems from both the inadequate mobilization of human resources and the inability to take advantage of technological progress. The increase in America's growth potential since the end of the 1980s is largely due to the accelerating pace of technological progress, which has been accompanied by a shift in the productive structure towards services and high-tech industries. Since the 1980s, France has seen less change in its productive structures, with less growth in high-tech activities and ITC-based services. Our analysis suggests that the lack of mobility in terms of productive structures is one symptom of the French economy's inability to forge a new growth model.

Another interpretation suggests that the growth difference may be due to a choice: the French economy has been capable of generating significant productivity gains, but has used them in part to shorten working hours (Blanchard 2004). If the French worked as much as the Americans, the gap in terms of living standards would be considerably smaller. The low rate of activity and the drop in working hours are thus an implicit pro-leisure choice. This interpretation overlooks the fact that the shorter working hours in France, like the low rate of activity, are partly due to the scope and

persistence of unemployment, which has weighed heavy on the choices made by individuals and and the choice of public policies. The latter have tended to discourage labour supply, and in the 1990s sought to promote "employment-rich growth". Reliance on early retirement or the reduction of the legal workweek to 35 hours was thus partly intended to respond to the problem of unemployment, through "job-sharing" (Cotis 2004). This has by and large proved to be an illusion: increasing the rate of activity and reducing the unemployment rate are non-contradictory priorities for public action (Cahuc and Zylberberg 2004).

The two types of explanation for the difference between France's and America's performance are in fact complementary. The growth scenarios examined here show clearly that increasing the quantity of labour utilised by the economy would strengthen France's potential for growth, albeit to a lesser extent than the acceleration of technological progress. For example, raising the retirement age could be particularly effective, but recent events stress the need for caution with regard to the implementation of measures to increase the utilization of human resources by the French economy. Such a step would imply a change in perspective for public policies, which means that incentives to offer more work or start up companies would be strengthened. Moreover, increasing the rate of activity, like increasing immigration, would appear more palatable in the event of a decline in structural unemployment. In fact, these various changes presuppose breaking the vicious circle in which the French economy is stuck, where the mistrust of the various economic actors blocks reforms and encourages Malthusian behaviour. A better understanding of the stakes involved and the underpinnings of innovation-driven growth could facilitate the introduction of public policies capable of breaking this vicious circle.

**The two driving forces of innovation-driven growth**

Introducing a model of innovation-driven growth requires not only speeding up the pace of technological progress but also ensuring that it is rapidly diffused in the economy. In turn, the diffusion of technological progress in the economy presupposes that the process of creative destruction is hardy enough to ensure the

development of new and innovative undertakings, possibly at the expense of existing firms. Accordingly, innovation-driven growth presupposes an increase in not only the **capacity for creation**, but also in the **capacity for destruction**. Contemporary analysis emphasizes the notion of the mobility of companies and personnel, which itself stresses the capacity for reallocating resources from the activities destroyed by competition.

The first driving force of innovation-driven growth, *i.e.* creation, must be consolidated. Current debates on research in France underscore not only the investment gap in terms of R&D and higher education, but also the need to restructure and better evaluate research activities. Unless there is a break, the Lisbon goal of increasing R&D's share of GDP to 3% over the next twenty years will not be reached. Yet above and beyond this quantitative objective, France must make major choices with regard to research priorities and the productivity of its innovation system. The brainstorming process launched at the beginning of 2004, in which the various actors of the system are to participate, as well as the preparation of a law on the organization of research, have created the conditions for making some of these important choices[36].

France, like most of the European countries, has been slow to develop information technologies and may not be able to catch up, apart from niches where successes are possible. However, the fact that it is not a major ICT producer must not prevent it from being an innovative user of these technologies. From the point of view of their diffusion, the major factors are investments in adequate infrastructures and incentives for private individuals and companies to adopt the new technologies. This in turn explains the importance of the second driving force of innovation-driven growth, *i.e*. destruction, stimulated by competition on markets for goods and services. Both price cuts and pressure to adopt new methods depend on the intensity of competition.

Falling prices for computers have been one reason why such goods have spread faster in the United States, particularly in the service sector. In Europe, case studies

[36] On these debates, see in particular FutuRIS (2004), as well as the site <www.operation-futuris.org>.

illustrate the complementary role of increased competitive pressure in the adoption of new technologies and new organizational methods by companies. The remarkable productivity advances made by the French automobile industry in the 1990s coincided with the opening up to Japanese competition and the privatization of Renault. More generally, the arrival of new companies that are better able to develop in the United States facilitate innovation and the diffusion of new technologies in all sectors. As far as public policies are concerned, the aim is not only to try to promote venture capital, but also to increase competition in order to favour the newcomers and encourage job creation in these new companies. This process is just as valid for the development of services as for the new technologies. As we have seen, different service sectors create more jobs and are more productive in the United States than in France[37].

Declining prices for ICTs and certain manufactured goods also increase consumers' real income, as do price drops for goods whose production has been completely or partly relocated to the emerging countries. Relocation expands the process of creative destruction to the world scale; production in low-wage countries destroys certain activities in the rich countries, obliging them to enhance their capacity for innovation (Sachwald 2004a).

Globalization and the diffusion of innovation affect growth and consumers favourably, but their impact on the destruction of companies entails costs that tend to be greatest for the least skilled categories of personnel and in certain regions. Consequently, with innovation-driven growth, the pivotal role of the destruction of capacities that have become less productive poses the problem of adjustment. Economic policies must strike a balance between companies' need for flexibility and wage-earners' desire for income security. From this point of view, the answer to the adjustment problem must be twofold. In the short run, the most relevant response for the least skilled who lose their job consists of enabling them to find another job as quickly as possible. In some cases, continuing professional training is not very effective, especially when trainees are more fragile or older (Cahuc and Zylberberg 2004). Consequently, the mobility of low-skilled workers must be guaranteed by

[37] See the section devoted to changes in the productive structure in France and the United States.

means of a well-functioning job market and effective support for job-hunters. An effort must be made to ensure that efforts to protect jobs do not have a perverse effect by discouraging hiring or by encouraging companies to rely on insecure jobs. In the medium or long term, the key to helping the workforce adjust to the knowledge economy is raising the educational level of the working population, which is than in other advanced countries. On the whole, stimulating the process of creative destruction must be accompanied by greater security for professional careers.

**European models of innovation-driven growth**

In the 1980s, the United States interpreted the emergence of the Asian industrial powers, and particularly Japan, as a sign of its economic decline. However, analyses of national characteristics over the past twenty years reveal that the Japanese and American production systems are each particularly well suited to one type of competition: for Japan, competition in the manufacturing sectors, where innovation is incremental and where corporate competitiveness is based on quality; for the United States, competition via radical innovation. This explains the renewed technological and industrial leadership of the United States in the 1990s, when the diffusion of the Internet opened up a new potential for innovation in industry and services.

At the beginning of the 21st century, this clash between incremental innovation and radical innovation remains somewhat relevant, but does not help us to clearly understand the position of the European economies. Competition by innovation has spread far and wide for two reasons. First, the utilization of recent generic technologies, from biotechnologies to digitization, and exploitation of the tremendous potential of networks, have expanded the reservoir of accessible innovations. Second, the fact that the emerging countries are better able to compete implies that the most advanced countries should concentrate on the most knowledge-intensive production. For the European countries, there is a potential for catching up with the United States in certain areas, but also competitive pressure from the emerging countries, which are upgrading their technological capacities.

In this context, the European countries are challenged to enhance their potential for innovation and gear their productive structures towards high technologies and sophisticated services. The many analyses of the US experience underscore that these structural changes entail substantial institutional changes. Indeed, innovation, just like manufacturing quality, presupposes a favourable economic and cultural environment. There is an "ecology of innovation". Is the European milieu unfavourable? Is it overly protective of workers, but also sometimes of guaranteed income for long-standing companies that were very successful in the sectors that made the "thirty glorious years" such a success? European comparisons suggest that this conclusion is a bit hasty since as some European countries seem to have managed to combine innovation with social protection.

The analysis of the diversity of the European economies does not date back to the emergence of the "new economy". Several typologies have been worked out to encompass this diversity, not only between the United Kingdom and continental Europe, but also between the social democratic countries of the North and the catching-up countries of the South. These comparisons have fundamentally sought to show that there are several types of "capitalism" and that different systems are internally coherent and can achieve good economic performances on the basis of different configurations[38]. For example, certain national characteristics that hinder the smooth functioning of markets, such as the labour market, can complement institutions that seek to invest over the long run in training wage-earners. The concentration of barriers to competition can also be complementary in promoting investment in sectors where a country finds itself in a catching-up phase. Finally, the financial system and the modalities of corporate governance can benefit some sectors more than others[39]. Consequently, each of the systems can perform well in a given environment yet prove unsuited to another environment, for example if changes have occurred with regard to technology or international competition. The question of adaptation and the capacity for change are thus very important. In this respect, the US economy and some European economies have proved better able to adapt than France over the last twenty years. For instance, in Europe some countries have been able to reduce their unemployment rate substantially, while

[38] See in particular Albert (1991), Hall and Soskice (2001), Amable (2003).
[39] For comparisons between Germany and the United Kingdom in particular, see Mayer (2001).

unemployment in France has risen decade after decade since the 1970s.

**Table 13** ranks the developed countries according to an indicator of potential innovation-driven growth. This indicator was drawn up on the basis of a principal factor analysis presented in **Appendix 3**. It takes into consideration those characteristics that seem important for potential growth, namely, utilization of the country's human resources on the one hand, and capacity to increase innovation and productivity on the other hand. It also incorporates living standards in relation to the United States, taking account of past performance. The relative living standard provides a rather accurate picture of growth in the different countries over the past decade.

**Table 13**
**Indicator of potential growth by innovation**

| Country | Indicator | Rang |
|---|---|---|
| Sweden | 3.33 | 1 |
| United States | 2.30 | 2 |
| Denmark | 2.17 | 3 |
| United Kingdom | 1.40 | 4 |
| Finland | 1.38 | 5 |
| Netherlands | 1.33 | 6 |
| Germany | 0.53 | 7 |
| Austria | 0.18 | 8 |
| Belgium | -0.04 | 9 |
| France | -0.46 | 10 |
| Ireland | -1.32 | 11 |
| Spain | -2.05 | 12 |
| Portugal | -2.06 | 13 |
| Italy | -2.48 | 14 |
| Greece | -4.22 | 15 |

**Table 13** reveals that when due account is taken of both utilization of human resources and investment in knowledge. Sweden is the highest-ranking country, leading the United States and Denmark. An analysis of the different variables of the indicator (see **Appendix 5**) confirms that the Scandinavian countries have accumulated good track records in terms of living standards, investment in knowledge and unemployment[40]. It is interesting to note that these countries also have high activity ratios. The United Kingdom, Finland and the Netherlands form a second group at the top of the list. The indicator of innovation-driven growth is

considerably lower for Germany, and lower still for France. The position of the two major countries of continental Europe is reflected by worse performances than the Scandinavian and Anglo-Saxon countries for all variables. Germany is ahead of France because it has higher R&D spending, more readily available broadband Internet and less regulated markets than France.

These results confirm France's handicaps, as already analysed in the first part[41]. The exercise allows us to identify those European countries that have done the best job of steering their economies down the path of innovation-driven growth, without necessarily giving up their tradition of social protection. They have, however, implemented substantial reforms, especially to facilitate the mobility of persons, and have invested heavily in ICTs.

Some European countries have managed to stimulate the process of creative destruction that is conducive to innovation-driven growth, while reducing unemployment and overhauling their system of social protection. On the contrary, France remains mired in the vicious circle of low growth, and its track record with regard to innovation is not improving. As a result, it appears stuck in the "trap of non-convergence", incapable of moving closer to the leaders because its economic institutions are still geared to a catching-up strategy based on investment rather than an innovation-based strategy[42].

The European economies must not necessarily copy American economic institutions and may develop different varieties of innovation-driven growth. However, in order to do so, they must make a real effort to adapt because the fact that they have succeeded in certain sectors, in a certain technological and economic context, does not guarantee that the same public policies will succeed in a different context. This perspective should make it possible to tackle the political economics of the necessary reforms in France in a more positive spirit and reassure France as to its capacity to redirect its growth pattern.

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[40] Finland's unemployment rate fell sharply at the end of the 1990s, but remains high at 9%.
[41] Moreover, the indicators designed to assess the position of the different countries in relation to the Lisbon goals yield similar rankings.

**What role for the European Union?**

European authorities have been concerned about Europe's potential for growth ever since the end of the phase of catching up with the United States. "Eurosclerosis" in the early 1980s triggered a brainstorming process that led to the blueprint for the single market. This project, which was implemented at the end of the decade, was designed to both relaunch the building of Europe and enable companies to take advantage of economies of scale by operating on a continental scale rather than on still compartmentalized national markets. Continuing efforts to build Europe therefore acted as a powerful driving force in the process of opening up and deregulating the European economies. A large-scale thrust got under way, driven by financial-sector reforms and increasingly open markets for goods. The reforms went the furthest in areas where the countries had delegated the process to Brussels. At the end of the 1990s, the project for a single currency was successfully implemented as a complement to the single market, representing a major new step in the construction of Europe.

Today, Europe's role in the economic sphere is often challenged. Some feel that the extension of this role has gone too far and threatens the capacity of the European countries to conduct economic policy. This criticism has in particular emerged from the debates on the stability pact and the EC's role in overseeing various economic policies[43]. Critical remarks have also been made with regard to European competition policy, particularly in France. Other analyses focus on the inadequacy of the means and instruments of governance available to the Union for conducting ambitious policies (Pisani-Ferry 2004). Support for research, which was to be one of the main elements of the so-called "Lisbon strategy", designed to make the European Union "the most competitive and dynamic knowledge-based economy in the world", suffers from a lack of means. Moreover, a recent EC report suggested reallocating part of the European budget to R&D and university education (Sapir 2003). The question of means also arises in relation to the construction of the trans-European infrastructure network, which would make it possible to better integrate

[42] Acemoglu *et al.* (2003) propose a formalized analysis of this trap where the developed countries cannot manage to move closer to the leader.
[43] For two types of critiques in this debate, see Fitoussi and Saraceno (2004) and Alesina and Perotti (2004).

isolated regions, relieve congestion in advanced regions and consolidate research infrastructures by linking the poles of excellence that Europe plans to support.

The debates on European economic governance are useful and thinking done on the stability pact could provide an opportunity for reviewing the issue of macroeconomic coordination with a view to better supporting growth. Yet the Union could also help to promote innovation-driven growth within the EU zone. In the field of the organization of production and innovation, which are at the heart of the innovation challenge, the aim is to go beyond the integration rationale of the single market.

The advent of the single market has enabled European companies to achieve economies of scale, which have been particularly efficient in some sectors in which France has specialized, such as the automobile industry. The European innovation policy also fits into this rationale, with EU research projects that have enabled academic institutions and companies to pool resources and set up European networks. In some fields, European projects have also made it possible to achieve economies of scale by facilitating the development of common standards. The adoption of the GSM standard can be mentioned as one success produced by this approach; it has facilitated the spread of mobile phones and boosted the competitive ability of the European firms in the field[44]. In high-tech sectors, however, European firms have often sought partners across the Atlantic rather than in Europe. European research cooperation has been marked by the desire to share risks and increase project size, whereas transatlantic cooperation seems to focus more on resource complementarity and the search for access to the technological frontier. Moreover, the European companies that have conducted joint R&D projects with American partners are particularly innovative[45]. The migration of some corporate laboratories across the Atlantic dovetails with this same dynamic of access to the technological frontier. Support for joint research projects does not make a joint research policy, and there is a need to give thought to restructuring research conducted by European countries to increase coordination. This should have

[44] GSM (Global System for Mobile Communication) is a digital cellular radio network initially designed by the European Conference of Administrations of Posts and Telecommunications (CETP) in 1982.
[45] According to patent indicators, in particular (Sachwald 2000b, Miotti and Sachwald 2003).

implications in terms of resources, as various reports have already underscored, but also with regard to organization and accountability. This type of brainstorming is already under way, with the notion of European poles of excellence that would have high international visibility.

The key to real implementation of the Lisbon strategy, designed to make Europe an attractive place for production and innovation, is better integration of national and EU policies. National structural policies must be developed in order to strengthen the growth potential of the European countries. In this respect, our analysis revealed that France could considerably improve its track record and its capacity to move towards innovation-driven growth. Yet these national efforts must dovetail with a European framework that must be both stable and more dynamic. The ambition could be to make Europe attractive globally by forging an original model of innovation-driven growth. Reflection on the European model, often conducted from a defensive perspective, must incorporate this innovation dimension if it is to offer a viable alternative to the American model and the emergence of the Asian powers.

# Conclusion

The living standards of the French have risen less rapidly than those of the Americans for nearly a quarter of a century. This observation sums up a whole series of changes in the French economy. Citizens are more focused on the persistently high unemployment and the emergence of new inequalities. The recent track record of the French economy is of course influenced by Europe's mediocre economic performance and by macroeconomic policies, but can be traced back to the fact that our productive model has not evolved sufficiently since the 1980s. Likewise, the prospects that the gap in living standards with the Americans will widen over the next quarter of a century are primarily due to the capacity of the US economy to innovate and generate new activities.

**For potential growth in excess of 2%**

The potential growth scenarios we have studied indicate that it would be illusory to expect strong growth to solve the structural problems of the French economy. Indeed, the growth rate of 3% that would easily absorb unemployment and eliminate public deficits seems out of reach. Rather, our findings lead us to recommend the opposite course, which consists of examining the obstacles preventing France from developing its growth potential. According to our scenario, France can reasonably expect potential growth of 2.1% over the next thirty years. Yet this modest performance depends on the introduction of appropriate economic policies, because the baseline scenario only points to the prospect of 1.2% growth between now and the year 2030. France will only achieve the extra point of growth by tackling the two major problems that will hamper it: the decline in its working population, due to begin in 2008, and insufficient productivity gains. Accordingly, our scenario requires both policies to increase the working population actually involved in production, and reforms to boost innovation. Yet such structural policies are delicate to implement for they imply an evolution in economic institutions. Indeed, the necessary changes even go beyond the economic institutions, in the case of immigration policy or attitudes with regard to scientific progress in particular.

**Eliminating obstacles to the adoption of a model of innovation-driven growth**

France's disappointing economic track record can be explained by the accumulation of barriers to the adoption of a new growth model, in which high technologies and services would play a more important role. France can only embark on a new growth path if the organization of the economy becomes more conducive to the spread of technological progress in industry and services and to the development of the most innovative sectors. Our analysis suggests that such a change is hindered by the fact that the process of creative destruction is at a standstill. Yet unblocking this process is a very complex undertaking. It depends on the balance that was found in the growth model of the "thirty glorious years" between the needs of the sectors in which France was specialized, the degree of openness to competition on different markets, and wage-earners' need for security.

Economic policies must take due account of the complementarity that exists between companies' increased needs for flexibility and wage-earners' demands for income security. The new balance to be struck in France must make it possible for the productive system to move towards high technologies and service activities. If it favours mobility between jobs by guaranteeing the security of professional careers, this new balance will also provide a means of reducing structural unemployment, which is particularly high in France. Contrary to the fears often expressed, innovation-driven growth can also help to create jobs.

The lack of confidence displayed by economic agents, consumers and investors is often invoked as a major cause of France's poor economic performance. Yet this line of reasoning might well be circular, because confidence cannot be decreed; it is quite possible that the vicious circle of low growth prevents a return of confidence, even though prospects seem better. Restoring the confidence that everyone is seeking presupposes that economic policy gives investors, wage-earners and consumers a certain visibility. Proposing an analysis of all of the necessary changes and underscoring the interactions between the evolution of the productive system and the evolution of economic institutions would provide this visibility.

Moreover, international comparisons show that certain European countries have managed to boost the process of creative destructive, without renouncing a high level of social protection. These countries have in fact started to renew the objectives and means of their system of social protection. Their experience suggests that France could simultaneously modify its growth path and do a better job of combating inequalities.

**Europe's role**

In the 1970s and 1980s, European integration provided an ideal framework for the internationalization of the French economy. Notwithstanding, although the building of a great European market has allowed French companies to deepen their specialization in economy-of-scale intensive sectors, such as the automobile industry, it has not done much to promote the most innovative sectors.

The Lisbon agenda agreed in 2000 appeared to reflect the European Union's desire to promote growth by innovation. Yet the Lisbon strategy lacks means and national policies do not always help to achieve the goals set, whether in terms of investments or reforms. As a result, debates on the Union's role must focus not only on the stability pact and the possibility of conceiving macroeconomic coordination that is more conducive to growth, but also on the means to facilitate the shift of the member countries towards a growth model based on innovation.

# Appendices

# Appendix 1. Potential growth and production factors

**Definitions**

The level of potential production, which corresponds to production factor utilization that is compatible with stable inflation (existing short- or medium-term physical capital and potential employment estimated on the basis of the NAIRU[46]), is determined on the basis of a Cobb-Douglas production function, with constant returns and neutral technological progress. The formula chosen is the following:

$$Y^* = PTF\ L^{\alpha}\ K^{(1-\alpha)}$$

where Y represents potential production, K the capital stock, L* the potential employment level and TFP total factor productivity, which measures the share of production that is not accounted for by input from production factors. Under the hypothesis of competitive markets, the parameters α and (1 - α) represent the respective shares of wages and profits out of added value.

Thus, the potential growth rate for the economy is given by:

$$g^* = ptf + \alpha\ l^* + (1 - \alpha)\ k$$

Over the long term it is assumed that capital coefficient remains constant: capital growth is equal to investment growth, the latter being equal to savings growth, which, in turn, follows the same pace as increases in income (from production). We may therefore write:

$$k = g^*$$

$$so\ g^* = ptf + \alpha\ l^* + (1 - \alpha)\ g^*$$

$$and$$

$$g^* = ptf / \alpha + l^*$$

[46] Non Accelerating Inflation Rate of Unemployment.

**Relevance and limits of the approach**

On the one hand, potential growth is widely used, for example in budget forecasts for Finance Laws, but remains a criticized notion. The approach is only legitimate if countervailing forces are strong enough to bring actual GDP back to its potential level in less time than the frequency of the shocks to which the economy is subjected. On the other hand, some feel that the approach should be based on a coherent theoretical representation of the economy. This latter requirement is difficult to satisfy because purely statistical methods are used to highlight trends in technological progress and the working population.

Yet the results of the various estimates must be viewed with caution as they differ greatly depending on the method used. No method escapes criticism with regard to the arbitrary choice of parameters or the validity of the concepts on which the estimates are based (for example, the relevance of the NAIRU is much debated).

# Appendix 2. Export structures, France and the United States

**Table A2.1**
**Structure of French exports by major period**

| Product group | 1960-1973 | 1974-1982 | 1983-1993 | 1994-2001 |
|---|---|---|---|---|
| **Primary products** | **11.8** | **9.7** | **8.9** | **5.6** |
| Farm | 10.1 | 8.7 | 8.2 | 5.1 |
| Mining | 1.5 | 0.7 | 0.5 | 0.3 |
| Energy | 0.2 | 0.3 | 0.2 | 0.2 |
| **Industrial products** | **87.0** | **89.5** | **89.5** | **92.7** |
| **Semi-manufactures** | ***18.1*** | ***17.5*** | ***16.5*** | ***13.6*** |
| Farm | 10.3 | 9.3 | 9.6 | 9.1 |
| Mining | 4.5 | 3.8 | 3.4 | 2.6 |
| Energy | 3.3 | 4.4 | 3.5 | 1.9 |
| **Manufactures** | ***68.9*** | ***72.0*** | ***73.0*** | ***79.1*** |
| Labour-intensive industries | 4.7 | 4.3 | 4.2 | 4.0 |
| Economy-of-scale-intensive industries | 41.5 | 40.5 | 38.1 | 36.9 |
| Specialised suppliers | 13.9 | 16.3 | 14.2 | 15.2 |
| R&D-intensive industries | 8.9 | 10.9 | 16.5 | 23.0 |
| **Rest** | **1.1** | **0.8** | **1.6** | **1.8** |
| **TOTAL** | **100.0** | **100.0** | **100.0** | **100.0** |

*Source: Authors' calculations based on the OECD data.*

**Table A2.2**
**Structure of United States exports by major periods**

| Product group | 1960-1973 | 1974-1982 | 1983-1993 | 1994-2001 |
|---|---|---|---|---|
| **Primary products** | **21.9** | **22.7** | **14.1** | **7.5** |
| Farm | 18.4 | 18.5 | 11.3 | 6.2 |
| Mining | 3.2 | 3.8 | 2.5 | 1.1 |
| Energy | 0.3 | 0.4 | 0.3 | 0.2 |
| **Industrial products** | **76.8** | **76.5** | **85.0** | **91.4** |
| **Semi-manufactures** | ***12.0*** | ***10.5*** | ***11.6*** | ***9.4*** |
| Farm | 6.1 | 5.0 | 5.0 | 4.7 |
| Mining | 4.2 | 3.4 | 3.1 | 2.4 |
| Energy | 1.8 | 2.0 | 3.4 | 2.4 |
| **Manufactures** | ***64.8*** | ***66.1*** | ***73.5*** | ***82.0*** |
| Labour-intensive industries | 1.3 | 1.4 | 1.7 | 2.6 |
| Economy-of-scale-intensive industries | 27.2 | 26.0 | 26.6 | 29.1 |
| Specialised suppliers | 19.8 | 19.7 | 17.3 | 19.0 |
| R&D-intensive industries | 16.5 | 18.9 | 27.8 | 31.3 |
| **Rest** | **1.2** | **0.7** | **0.8** | **1.1** |
| **TOTAL** | **100.0** | **100.0** | **100.0** | **100.0** |

*Source: Authors' calculations from the OECD data.*

# Appendix 3. Estimated growth of capital stock

The capital growth rate is determined by the investment rate (investment correlated with GDP). This relationship can be affected by the depreciation rate for capital goods: fast depreciation generates less increase in fixed capital than slow depreciation, investment rates being equal.

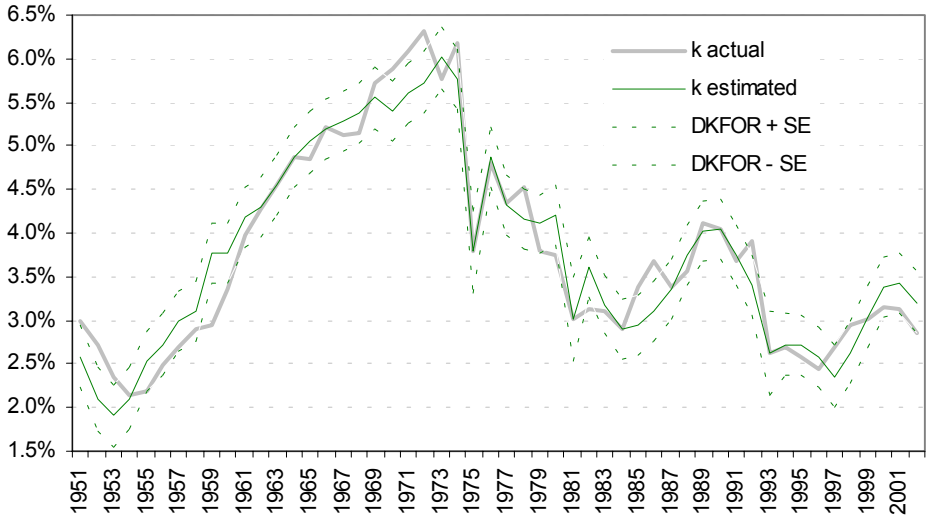
The result of the econometric estimate of changes in capital stock (DK) for France is set out in table A3.1.

**Table A3.1**
**Estimated growth of capital stock**

Dependent Variable: DK — ***Growth of capital stock (k)***
Sample: 51 data points (1951-2002)

| | Coefficient | Std. Error | t-Statistic | Prob>t-student | |
|---|---|---|---|---|---|
| C | -0.0437 | 0.008 | - 5.536 | 0.000 | *** |
| **FBCF/PIB** | **0.4477** | **0.041** | **10.889** | **0.000** | *** |
| D1975 | -0.0138 | 0.001 | - 15.734 | 0.000 | *** |
| D1981 | -0.0054 | 0.002 | - 3.037 | 0.004 | ** |
| D1993 | -0.0038 | 0.001 | - 3.324 | 0.002 | ** |
| @Trend | -0.0004 | 0.000 | - 6.727 | 0.000 | *** |
| AR(1) | 0.5411 | 0.131 | 4.138 | 0.000 | *** |
| $R^2$ | 0.943 | | | | |
| Adjusted $R^2$ | 0.935 | | | | |
| Durbin-Watson stat | 1.934 | | | | |
| F-statistic (Prob) | 121.064 (0,000) | | | | |

**Figure A3.1**
**Growth of capital stock, 1951-2002**




The estimated investment rate for up to 2030, which is equivalent to the average for 1993-2002 (20% of GDP), enables us to calculate growth of capital stock of around 2.0% per year, with a margin of error of 0.4% more or less. This estimate is identical to the one used

in the ECE's high-growth scenario (2002). This result also corresponds to the hypothesis of long-term convergence between growth rates for capital stock and for production.

# Appendix 4. Impact of ageing on growth

UN forecasts of total population predict that France will experience slow population growth up until 2040, at which time its total population will start to fall, whereas Germany's population will start to fall in 2010. The United States, however, will experience steady population growth.

Major changes will also occur with regard to the structure of France's population. The share of those over 60 out of total population has been increasing ever since 1950. They accounted for 20.5% of total population in 2000 and are expected to represent 32.3% of total population in 2050, according to the medium scenario. France's neighbours will also feel the effects of such demographic ageing: in 2050, the over-60 age bracket will account for 34.5% of Germany's population, as compared with 29.6% for the United Kingdom. However, the US will be less affected by this trend, and the over-60 bracket will only make up 25.5% of overall population in 2050.

In addition, the ageing and decline in the working population imply a worsening of the economic dependency ratio, which is defined as the ratio of the overall unoccupied population (under 20, over 60, unemployed) to the population of persons in working life. According to the estimates of the *Observatoire français des conjonctures économiques* (OFCE) (Chauvin and Plane 2002), this ratio is expected to shoot up between 2007 and 2040, by which time each person in working life will be carrying the burden of about 1.5 person not in working life. This tendency implies additional pressure on public funds. Moreover, ageing and structural changes imply qualitative changes, particularly in terms of consumption, with increased spending on health and retirement.

The effects of population ageing are generally factored in using models of general equilibrium calculable for overlapping generations[47] (MEGCGI) in a neoclassical framework. On the other hand, they are rarely covered using more Keynesian macroeconometric models. The macroeconometric model MESANGE, designed by INSEE (Beffy *et al.* 2003), proposes this type of approach, accumulating Keynesian short-term properties and neoclassical long-term ones.

The MEGCGI of Hviding and Mérette (1998), when applied to seven OECD countries, arrives at the conclusion that per capita GDP would be between 20 to 30% lower in 2050 in relation to the situation without population ageing. Fougère and Mérette (1999) estimate a model with 15 overlapping generations, continuing the work done by Hviding and Mérette (1998) on seven OECD countries, in a closed economy, but by endogenising technological progress. Accordingly, growth is generated by the accumulation of physical and human capital. The main findings show that adding human capital as a production factors cancels out the negative effects of population ageing on per capita creation of added value. The new investments in human capital, stimulated by population ageing, boost per capita GDP

[47] See Le Cacheux and Touzé (2002) for a methodological presentation of these models.

by between 0.1 to 0.6 percentage point when compared with the case without population ageing. The study by Sadahiro and Shimasawa (2000) confirms the findings of the previous one in the case of Japan.

For the INGENUE model[48] (2001 and 2002), underlying growth in Europe, which stood at just over 2% at the beginning of the 21st century, should slow down between 2000 and 2030 to 1%. Subsequently, European growth is expected to gradually rise to an average of some 2% for the period 2000-2100.

Finally, for the MESANGE model, which incorporates several components of demand and various pension financing scenarios, growth in France will range between 1.9 to 2.2% for 2003-2020.

In conclusion, the drop in the working population, the change in its structure and ageining in general, will probably have a significant effect on growth in France, but the effects will *a* priori be rather difficult to evaluate in the long term for the body of variables. One thing is sure: the financing of retirements and health spending will weigh heavy on public finances and thus indirectly on growth.

[48] INGENUE is a model designed and used in collaboration with CEPREMAP (CEPII, Centre d'études prospectives et d'informations internationales) and OFCE. Its purpose is to quantify international capital flows likely to have been induced by the ageing differentials seen in many parts of the world.

# Appendix 5. Construction of the indicator of growth by innovation

The principal components analysis (PCA) consists of expressing a set of variables by linear conbinations of non-correlated factors, which reflect an increasingly small fraction of data variability. This method makes it possible to represent the original data (individuals and variables) in a dimensional area that is smaller than the original area, while limiting information loss as much as possible. Representing data in small-size spaces (two dimensions on **figure A5.1**) considerably facilitates analysis. These factors can be used as new variables making it possible to perform an automatic classification, taking only essential information into account, *i.e*. retaining only the first factors. Finally, the first factor can be used as a hierarchical scale depending on the variables used (facteur F1 of **table A5.3** and **table 12** of the main body).

The variables used in the PCA are set out in **table A5.1**, while the correlation between these variables and the two first factors is covered in **table A5.2**. The variables used were chosen on the basis of the analysis of the determinants of growth by innovation developed in the first part of the main body.

**Table A5.1**
**Variables used in the factor analysis of principal components analysis**

| Country | Relative living standards (1) | Participation rate | Unemployment rate | DSL Diffusion (2) | IT expenditure *(as a % of GDP)* | R&D expenditure *(as a % of GDP)* | Product market regulation |
|---|---|---|---|---|---|---|---|
| Sweden | 75,95 | 79,00 | 4,00 | 5,44 | 4,40 | 4,27 | 2,20 |
| Denmark | 83,66 | 79,90 | 4,70 | 7,29 | 3,40 | 2,40 | 2,90 |
| United States | 100,00 | 76,40 | 5,80 | 2,68 | 3,60 | 2,64 | 1,40 |
| Netherlands | 77,87 | 75,60 | 2,70 | 3,82 | 3,70 | 1,89 | 3,00 |
| United Kingdo | 73,14 | 76,60 | 5,10 | 1,78 | 4,00 | 1,84 | 1,00 |
| Finland | 73,14 | 74,50 | 9,10 | 5,39 | 3,40 | 3,49 | 2,60 |
| Austria | 77,43 | 71,70 | 4,00 | 2,76 | 2,90 | 1,90 | 3,20 |
| Germany | 73,23 | 71,50 | 8,70 | 4,68 | 3,00 | 2,51 | 2,40 |
| Ireland | 90,75 | 67,90 | 4,60 | 0,19 | 1,80 | 1,17 | 4,00 |
| Belgium | 74,70 | 64,10 | 7,50 | 6,25 | 3,00 | 2,17 | 3,10 |
| France | 71,35 | 68,00 | 8,90 | 3,56 | 3,30 | 2,23 | 3,90 |
| Portugal | 50,78 | 72,00 | 5,10 | 1,12 | 1,90 | 0,85 | 4,10 |
| Spain | 60,16 | 67,10 | 11,40 | 3,24 | 1,60 | 0,95 | 2,20 |
| Italy | 72,35 | 61,20 | 9,00 | 2,50 | 1,90 | 1,11 | 4,30 |
| Greece | 50,40 | 63,10 | 9,60 | 0,00 | 1,20 | 0,64 | 5,10 |

*Note:* *(1) Relative GDP per capita; (2) Broadband access (DSL) per 100 inhabitants*

*Source:* *GGDC 2002* | *OECD 2003* | *ILO 2002* | *OECD 2003* | *Eurostat 2003* | *Eurostat 2003* | *Nicoletti et al. (1999)*

**Table A5.2**
**Share of the information contained in the first two factors**
*(as a %)*

| | F1 | F2 | Total information |
|---|---|---|---|
| Relative living standards | 42.57 | 9.10 | **51.67** |
| Participation rate | 76.06 | 4.11 | **80.17** |
| Unemployment rate | 29.49 | 56.79 | **86.28** |
| DSL diffusion | 41.93 | 35.29 | **77.22** |
| IT expenditure (as a % of PIB) | 88.81 | 0.16 | **88.96** |
| R&D expenditure (as a % of PIB) | 73.93 | 10.49 | **84.42** |
| Product market regulation | 56.38 | 1.20 | **57.58** |
| **Total information** | **58.45** | **16.73** | **75.19** |

**Figure A5.1**
**Projection of the variables and the countries on space F1-F2**

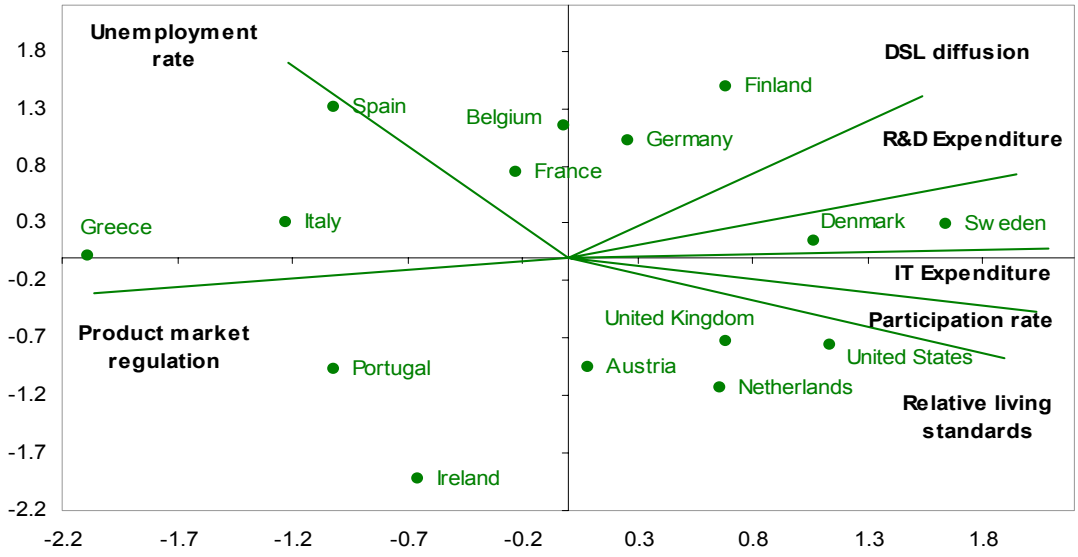



Table A5.3 gives the coordinates of countries on the axes F1 and F2 and the ranking given by the position of the economies on the first axes F1.

**Table A5.3**
**Co-ordinates of the countries on the factorial space F1-F2**

| Country | F1 (58,5 %) | F2 (16,7 %) | Rang F1 |
|---|---|---|---|
| Sweden | 3.33 | 0.32 | 1 |
| United States | 2.30 | -0.83 | 2 |
| Denmark | 2.17 | 0.15 | 3 |
| United Kingdom | 1.40 | -0.79 | 4 |
| Finland | 1.38 | 1.61 | 5 |
| Netherlands | 1.33 | -1.23 | 6 |
| Germany | 0.53 | 1.10 | 7 |
| Austria | 0.18 | -1.03 | 8 |
| Belgium | -0.04 | 1.24 | 9 |
| France | -0.46 | 0.81 | 10 |
| Ireland | -1.32 | -2.08 | 11 |
| Spain | -2.05 | 1.42 | 12 |
| Portugal | -2.06 | -1.05 | 13 |
| Italy | -2.48 | 0.33 | 14 |
| Greece | -4.22 | 0.02 | 15 |

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