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France: Selected Issues

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FRANCE

Selected Issues

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October 13, 2000

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INTRODUCTION

1. After an initially timid recovery from the slowdown of the early 1990s, activity accelerated in 1997. Since then, GDP growth has averaged 3 percent, employment growth has been strong, and unemployment has fallen sharply to 9.6 percent (as of August 2000). Although these developments have taken place in a setting of price stability and the unemployment rate is still above its previous cyclical low of 8.8 percent, there are signs of increasing tightness in labor and product markets; for example, vacancy and capacity utilization rates have risen. It is therefore natural to consider the possibility that the economy is approaching capacity.

2. The following chapters examine three aspects of this issue in detail. Chapter I reviews macroeconomic approaches to measuring the amount of slack in the economy, and in particular presents a multivariate model that allows for the joint estimation of the output gap and the Nairu while controlling for supply-side effects. The key conclusions are that the economy is nearing potential, that there has been a gradual decline in the Nairu in recent years (which has boosted potential output growth, at least temporarily), and that significant uncertainties remain regarding both potential output and the Nairu.

3. Chapter II considers the tax system. It first describes measures introduced in the last several years to alleviate the burden of taxation, particularly the tax wedge on low-skilled labor. It then examines the recently presented multiyear tax reduction plan and the main impediments to sustained growth imposed by the tax-benefit system. It concludes that a number of recent measures have helped to improve labor market performance—explaining perhaps the finding that the Nairu has tended to fall—but also that further reforms of the tax-benefit system would help expand available supply and thus increase the capacity of the economy. These should focus on reducing well-identified distortions that result in disincentives to work, on streamlining the income tax system, and on ensuring a competitive corporate tax regime.

4. Chapter III investigates the presence of new economy effects in France—that is, the contribution of the high-technology sector to increased productivity and potential output growth. Using previous research for the United States as a benchmark, labor productivity growth is decomposed into four components: capital deepening of computers and software, capital deepening of other types of equipment, changes in labor quality, and total factor productivity growth. It concludes that the recent lackluster growth in productivity can be attributed to a sharp deceleration in capital deepening outside computers and software in the last few years. By contrast, the accumulation of computer and software capital has boosted labor productivity growth, though by significantly less than in the United States. The conclusions suggest that, in the short term at least, the new economy is unlikely to be a major factor easing potential supply-side constraints

I. Measures of Slack in the French Economy[1]

A. Introduction

5. This Chapter presents an overview of the different methodologies that can be used to measure the amount of available slack in an economy. Three different approaches are discussed: statistical identification, economic identification, and survey-based measures of slack. A comparison of these alternatives reveals that the evolution of the Nairu is crucial for understanding recent cyclical developments in the French economy.

6. Following the cyclical trough in 1993, activity recovered timidly in 1994–96 but then accelerated. Since 1997, GDP growth has grown above potential, more than a million new jobs have been created, and unemployment has declined by almost 3 percentage points to 9½ percent, a level not seen since the peak of the previous upswing. This performance has been achieved in a setting of price stability—inflation has averaged less than one percent and wage growth has been contained—and accompanied by various structural reforms, notably an ongoing privatization program, the reduction in taxes and social security contributions at the low-end of the income distribution and, more recently, the implementation of the 35-hour workweek.

7. At this cyclical juncture, it becomes both more difficult and more important to gauge the amount of slack remaining in the economy. Labor market and tax reforms have arguably reduced the Nairu and raised potential, as evidenced by continued low wage and price inflation in the face of tightening labor markets. But it is difficult to estimate the extent of this reduction. At the same time, lags in the formulation and effect of macroeconomic policy imply a need to forecast future inflationary pressures, rather than react only after they have appeared. And policy can err on both sides, reacting too late and allowing pressures to build, or too early and cutting off the expansion prematurely.

8. The variable most commonly used for this analysis is the output gap, which measures the distance between current and potential GDP. A related measure is the unemployment gap, which measures the distance between the unemployment rate and the Nairu (the unemployment rate consistent with stable inflation). Both gaps can be described in terms of cycles that evolve around a long term trend (that is, potential output and the Nairu respectively). As neither the trend nor the cycle can be directly observed, the crucial aspect of identification is the allocation of movements in output to the trend and the cyclical component. There are two econometric procedures to identify these components, based on statistical and economic properties, respectively. As these methodologies rely on different assumptions for identification, they are bound to deliver divergent results and can be considered as "different windows through which economists can examine their models and data" (Canova (1998)).

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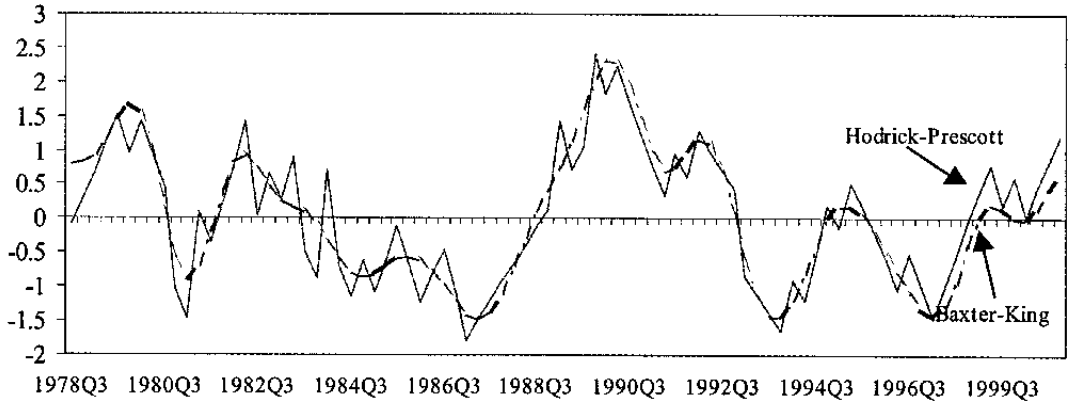
[1] Prepared by Angel Ubide-Querol.

B. Statistical Identification

9. Statistical identification amounts to defining the main features (such as order and type of integration of the trend and length or periodicity of the cycle) and the relationship between the trend and cycle. So-called band-pass filters, such as the Hodrick-Prescott (HP) and Baxter and King (BK) filters, are widely used in applied macroeconomics because of the their simplicity and their ability to replicate NBER turning points in U.S. GDP (see Canova (1998)). Identification is achieved by assigning the business cycle a periodicity of 2-8 years, and defining a smooth but variable stochastic trend. Figure I.1 shows the results of estimating the French output gap with the Hodrick-Prescott and Baxter and King filters.[2] Because of the traditional criticisms of the crude application of the HP filter,[3] a modified version is used here, the HP-Arima (Maravall and Kaiser (2000)), which forecasts and backcasts the series with an Arima model to minimize the end-of-sample problems.

10. Two results stand out. The 1996 slowdown did not widen the gap below the level of the cyclical trough in 1993; and output exceeded potential beginning in mid–1997, with the gap rising to around -1 percent at end–1999. The annual rate of growth of potential output implicit in this calculation is 2-2¼ percent over the sample.

Figure I.1. Output Gaps: Statistical Identification



Source: INSEE and Fund staff estimates.

C. Economic Identification

11. Economic theory can be used to identify trend and cycle in two different ways. The first relies on economic theory to statistically identify the trend. For example, King et al.

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[2] See Hodrick and Prescott (1981) and Baxter and King (1999).

[3] See Cogley and Nason (1995) and Harvey and Jaeger (1993)

(1991) develop a general equilibrium model where the main endogenous variables share a common stochastic trend. Blanchard and Quah (1989) embed economic assumptions about the nature of supply and demand shocks in a structural VAR to identify potential output. A second approach is to derive reduced-form equations from economic models. For example, the Nairu may be estimated using a Phillips curve (see, among others, Staiger, Stock, Watson (1996)) or using structural models of the labor market (see Layard, Nickell, and Jackman (1991)).[4]

12. Recently, Apel and Jansson (1999) have proposed a procedure for the joint estimation of potential output and the Nairu, based on reduced-form equations. This approach has the advantage of exploiting the intrinsic economic relationship between the two: they both refer to an equilibrium state of the economy where the labor market clears, the economy is operating at potential, and inflation is stable. This methodology allows explicit incorporation of the covariation restrictions on cyclical output and cyclical unemployment, while taking into account the available information on inflation. Formally, the model contains the following equations:

$$\Delta\pi_t = \sum_{i=1}^{I} \rho_i \Delta\pi_{t-i} + \sum_{j=0}^{J} (u_{t-j} - \overline{u}_{t-j}) + \sum_{k=0}^{K} \omega_k z_{t-k} + \varepsilon_{1t} \tag{1}$$

$$y_t - y_t^p = \sum_{l=o}^{L} \phi_l (u_{t-l} - \overline{u}_{t-l}) + \varepsilon_{2t} \tag{2}$$

$$\overline{u}_t = \overline{u}_{t-1} + \varepsilon_{3t} \tag{3}$$

$$y_t^p = \alpha + y_{t-1}^p + \varepsilon_{4t} \tag{4}$$

$$u_t - \overline{u}_t = \sum_{m-1}^{M} \delta_m (u_{t-m} - \overline{u}_{t-m}) + \varepsilon_{5t} \tag{5}$$

where π_t is the log difference of the CPI, u_t the unemployment rate, $\overline{u}_t$ the Nairu, z_t exogenous (supply-shock) variables, y_t the log of real output, and y_t^p the log of potential output. The error terms ε_{1t}, ε_{2t}, ε_{3t}, ε_{4t}, and ε_{5t} are assumed to be independently and identically distributed.

13. Equation (1) is a representation of the Gordon "triangle model" (Gordon 1997), in which inflation is a function of inertia, demand, and supply. It includes an expectations-

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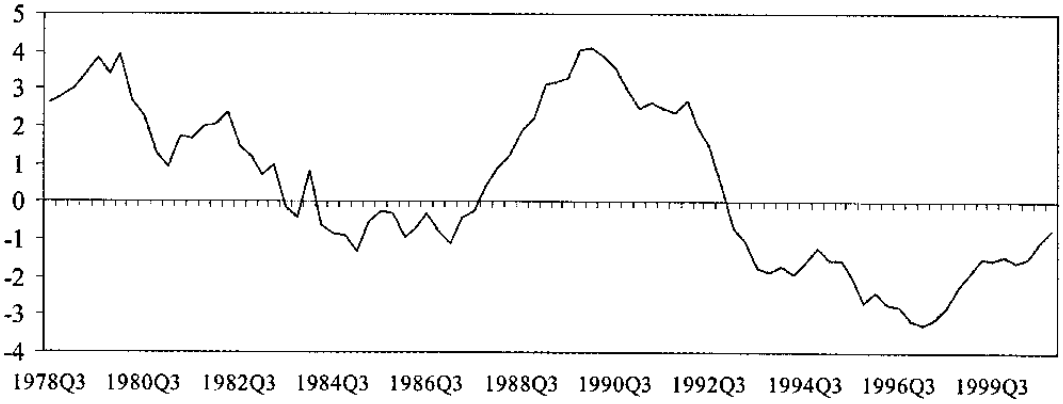
[4] Potential GDP may be estimated using a production function approach, which is useful to disentangle the contribution of labor, capital, and productivity to potential output growth. However, this approach depends on assumptions about the functional form of the production function and the calibration of its parameters. In addition, in practice it requires detrending some of the variables in the production function, thus being subject to the standard criticisms about detrending methods. In fact, one could interpret this approach as an application of detrending, where the potential output series is a weighted average of the detrended inputs.

augmented Phillips curve that controls for supply shocks. Equation (2) is a version of Okun's Law, linking the cyclical components of output and unemployment[5]. Assumptions about the stochastic characteristics of the unobserved variables close the model: equations (3) and (4) assume that both the NAIRU and potential output contain a stochastic trend, and equation (5) specifies the evolution of cyclical employment as an autoregressive distributed lag.

14. A recursive Kalman filter algorithm (see Hamilton (1994)) is applied to find a sequence of optimal predictions of the observable variables for a given set of coefficients and a sequence of the unobservables. These predictions are compared to the actual values of the observables, and the forecast errors are then plugged into a maximum-likelihood routine to compute the optimal set of parameters and the corresponding estimates of potential output and the Nairu. Using data over the period 1975–1999 yields the estimates for the output gap shown in Figure I.2. The vector of exogenous supply variables, z_t, includes relative import prices, the relative oil price (both deflated by the CPI), the exchange rate, and productivity. In addition, a dummy variable was included to account for the apparent change in regime in inflation volatility after 1985, probably tied to the *franc fort* policy.

Figure I.2. Output Gap: Economic Identification



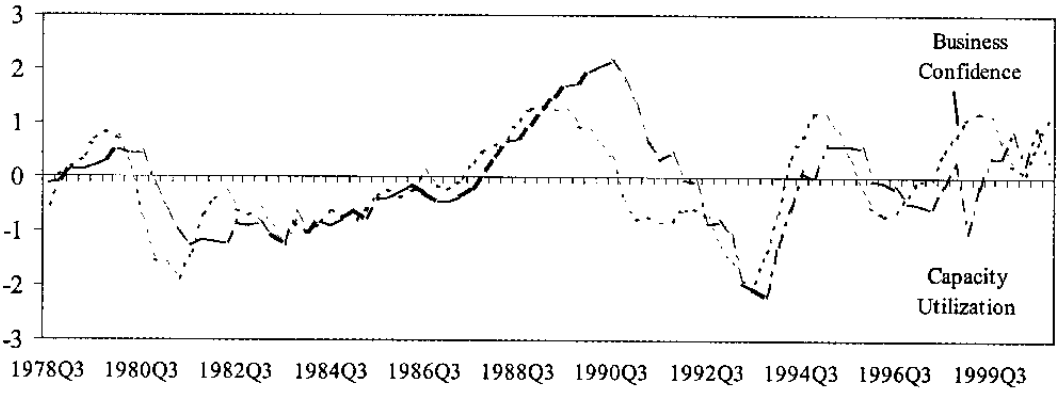
15. The results are broadly similar to those obtained with the band-pass filters in terms of dating of turning points, but differ in terms of the amplitude of the cycle. The Apel-Jansson methodology suggests a more volatile cycle, with a output exceeding potential by almost 4 percentage points in 1989, and falling below potential by 2½ percentage points in 1993. The results differ from the band-pass estimation in two other aspects: the slowdown in 1996 generated a larger gap than in 1993, and the output would still be below potential by

[5] Although this is the typical representation of Okun's Law, one could argue that, from an empirical point of view, unemployment typically lags GDP, and therefore equation (2) should be reversed. The results of this exercise, not presented here, are broadly similar to the main specification of the model.

end-1999. The implicit annual rate of growth of potential output is 2–2¼ over the sample, but it rose to 2¼–2½ percent after 1994.

16. The main difference between these results and the band-pass filter results turns out to be whether or not the unemployment rate is used for the calculation of the output gap. For example, survey-based measures of economic slack are an alternative to econometric estimation of the output gap is. Figure I.3 shows capacity utilization in industry and the index of business confidence, normalized by their respective means and standard deviations. They show a pattern remarkably similar to the one displayed by the band-pass definition of output gap, and both would suggest that output has exceeded potential since 1997. Estimating the Apel-Jansson model with either capacity utilization or business confidence, rather than unemployment, as a measure of demand yields results (not reported here) more in line with those obtained with the band-pass filters.

Figure I.3. Survey Data



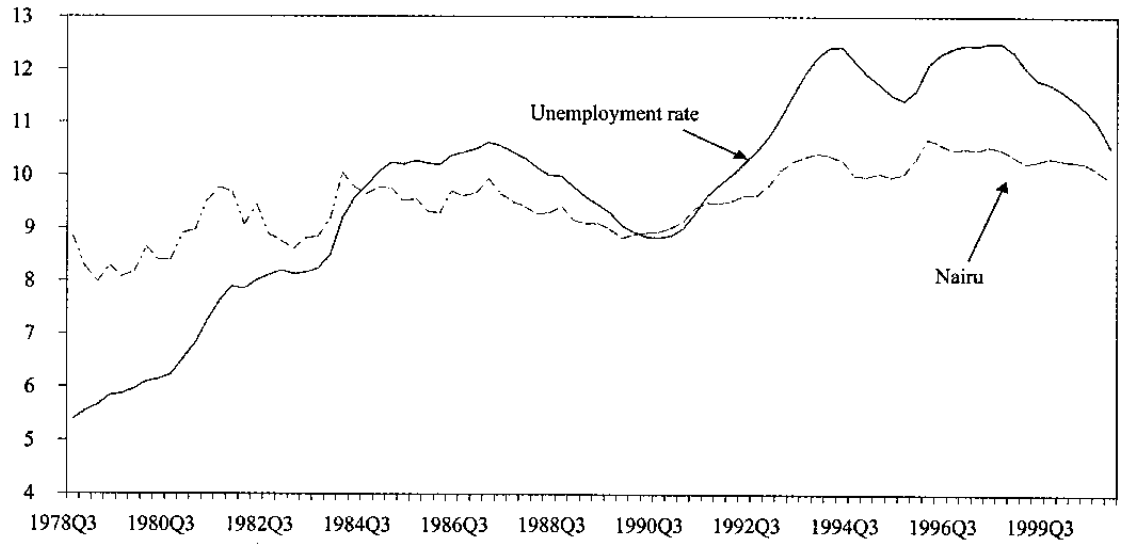
Source: INSEE and Fund staff estimates.

17. This result can be explained by the fact that unemployment remained persistently high during the initial phase of the recovery, and therefore while both the statistical measures and the survey-based measures point to a recovery since 1994, the estimate that includes the unemployment rate does not turn around until 1996. Thus, understanding the evolution of the unemployment rate and the Nairu seems key to ascertaining the extent of slack available in the French economy.

D. The Evolution of the Nairu

18. The Nairu represents the rate of unemployment that is compatible with stable inflation. Its origins are in the wage-price mechanisms advanced by Friedman (1968) and Phelps (1968), and it has recently been modeled as a time-varying concept that responds to macroeconomic and institutional shocks (see Gordon (1997), Staiger, Stock, Watson (1996), and Blanchard and Wolfers (2000)). The estimates that arise from equations (1) to (5) appear in Figure I.4. The Nairu rose significantly during the early-1990s recession, and reached a peak of close to 11 percent in 1995; it then declined to a value of about 9½ percent by end-1999. This compares to estimates of around 10 percent by the OECD and the Banque de France.

Figure I.4. France: Unemployment and Nairu



Source: INSEE and Fund staff estimates.

19. Although the unemployment rate continued to rise until 1997, the estimate of the Nairu starts to decline in 1994. This decline would have allowed for an increase in the rate of growth of potential output, which could explain why the measure of the output gap obtained with the multivariate model (Figure I.2) remains negative throughout the period. By contrast, the band-pass filters, based solely on the information contained in the GDP series, allocate the fluctuations of output during this period mainly to the cyclical component; hence the rapid reduction in the output gap. As regards the difference with respect to the survey-based measures, it could be argued that individual economic agents are not well-placed to gauge the extent of gradual structural changes. For example, entrepreneurs used to an environment with a high rate of unemployment, where finding additional employees was therefore easy, may find it difficult to hire additional resources in the new lower-unemployment environment if they fail to adapt their search process accordingly. Thus, survey-based measures may

overreact to these types of structural changes and, by adding up myopic individual opinions, report capacity constraints that are not present overall.

20. Therefore, in order to discriminate between these two interpretations of the recent cyclical recovery, it becomes important to assess the plausibility of this estimated decline in the Nairu since 1993. In order to do so, a discussion of the main factors that affect its evolution, namely labor market policies, institutional changes, and factors affecting the rate of growth of labor productivity seems necessary.

21. Since the early 1990s, several labor market policies have been implemented in France with the objective of reducing structural unemployment (see Box I.1). Some programs, such as the reduction in the cost of labor and the increase of the employability of the low-skilled aimed to reduce the unemployment level compatible with a given level of wages (see also Chapter 2 for details on recent tax reforms). Other strategies, such as the increase in labor market flexibility, have essentially aimed to raise labor productivity. The effects of the 35-hour workweek on the Nairu seem favorable: the annualization of work time may have lowered the Nairu through an induced increase in productivity; in addition, the increase in the scope of collective bargaining, with the introduction of more flexible work arrangements, and the pervasiveness of wage moderation in the context of rapidly declining unemployment seem to suggest a decrease in insiders' bargaining power and thus a reduction in the Nairu[6].

22. Recent research also points to the importance of the interaction between macroeconomic shocks and labor market institutions for the evolution of the Nairu (Blanchard and Wolfers (2000), Fitoussi et al. (2000)). In particular, institutions would affect both the size and persistence of the effect on the Nairu of a given macroeconomic shock. Under this perspective, the recent rapid decline in the Nairu could be reflecting the coalescence of positive macroeconomic shocks with a string of labor market reforms, creating a sort of positive and self-reinforcing hysteresis effect. Indeed, a plausible hypothesis could be that the accumulated impact of certain labor market measures at the moment of strong economic growth and declining real interest rates has allowed for a significant reduction in long-term and low-skilled unemployment, the main two sources of structural unemployment.

23. In summary, the results of this paper imply that the output and labor market gaps have been narrowing rapidly in the past few years, notwithstanding a reduction in the Nairu. Indeed, the gaps can be expected to close in the course of next year. This conclusion, which flows from the Apel-Jansson methodology, is at odds with other, more traditional methods and indicators, although these suggest that markets are tighter still. Nevertheless, the

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[6] However, the overall effects of the 35-hour workweek initiative on potential output are ambiguous, since the associated reduction in labor supply would reduce potential output.

Box I.1. Labor Market Policies in the 1990s: Reducing Structural Unemployment

Beginning in the early 1990s, the French authorities implemented policies to reduce structural unemployment through lowering the cost of low-skilled and inexperienced labor, increasing the employability of the long-term unemployed, enhancing labor market flexibility, and enhancing work incentives. The main building blocks of this strategy are listed below.

Reduction of the cost of labor. The 1993 Five year law on labor, employment, and training set the stage for a durable reduction of the cost of low-skilled labor, including exemptions of employer contributions to the family branch of the general social security regime targeted to employees earning between 1 and 1.2 times the minimum wage (SMIC). In 1995, these exemptions were expanded and consolidated in the so-called *ristourne dégressive*, a system of tapered rebates on other categories of employers' social security contributions (notably health and basic pensions) up to 1.3 times the SMIC. This *ristourne* was revised in 1998 and in 2000, in the context of the implementation of the 35-hour workweek; it is currently applied to workers earning up to 1.8 times the SMIC.

Increase the employability of the unemployed. Over the last decade, active labor market programs have proliferated, focused on enhancing the opportunities of the young, the long-term unemployed, and those with low earning potential. Broadly, these measures encompass three types of programs: (i) programs targeted to the market sector involving fiscal transfers (usually in the form of reductions in social charges plus monthly subsidies), such as the *Contrat-Initiative-Emploi*; (ii) programs involving minimum wage concessions and training, such as the *contrat d'apprentissage*; and (iii) subsidized programs targeted to the non-market sector, such as the *Nouveaux Services, Emploi-Jeunes.*

Reform of working time. With the intention of increasing the flexibility of work arrangements through the annualization of working hours, the 1993 Five year law on labor, employment, and training introduced an experimental program that allowed the number of hours worked to be varied at the enterprise level, up to a maximum of 48 hours per week, so long as the annual number of hours worked was reduced. This system was later formalized in the 1996 *Loi Robien*, which provided a subsidy for firms reducing working time by 10 to 15 percent and providing an equivalent increase in employment. Finally, in 1998, the 35-hour workweek initiative was launched, culminating in 2000 (2002 for small firms) of a reduction in the workweek to 35 hours and the widespread adoption of annualization.

Increase labor market flexibility. Although the legal framework had existed since the early 1980s, part-time work increased rapidly in the second half of the 1990s, following several initiatives that provided partial exemptions from employer's social security contributions and increased the number of hours that could be considered part time. Similar measures were implemented to promote temporary and fixed-term work, such as the increase in the duration and maximum number of renewals of fixed-term contracts. Temporary and fixed-term contracts account for about one-third of the new jobs created since 1997;similarly, one-fifth of the new jobs created over this period are on a part-time basis.

Strengthen the incentives to return to work and avoid poverty traps. Unemployment insurance was reformed in 1993, with the reduction in the duration of benefits, a tightening of the eligibility requirements, and the introduction of tapered benefits. The mechanism of *interessement* was later introduced for both unemployment benefits and the basic income support scheme (revenue minimum d'insertion (RMI). This allows claimants to maintain, for a certain period, part of their entitlement rights even as they earn income, thus reducing the disincentive to work. More recently, other measures (including changes to the *taxe d'habitation* and a proposed graduated rebate on the *contribution sociale généralisée,* CSG) can also be expected to reduce threshold effects and strengthen work incentives.

differences in the estimates of macroeconomic slack illustrate the broader uncertainties regarding estimation of potential output and the Nairu. These are particularly acute because various reforms—key ones of which are discussed in the next Chapter—can be expected to have lowered the Nairu by an amount that is difficult to determine with great precision. In addition, as discussed in Chapter III, the new economy may be boosting productivity growth and therefore potential output, as appears to have been the case in the United States.

References

Apel, Mikael, and Per Jansson, 1999, "System Estimates of Potential Output and the NAIRU," *Empirical Economics*, 24, 373-388.

Baxter, Marianne and Robert King, 1999, "Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series", *The Review of Economics and Statistics*, Vol. 81, pp.575-593.

Blanchard, Olivier, and Danny Quah, 1989, " The Dynamic Effects of Aggregate Demand and Supply Disturbances ", *American Economic Review,* 79, 655-73.

Blanchard, Olivier, and Justin Wolfers, 2000, "The Role of Shocks and Institutions in the rise of European Unemployment: the Aggregate Evidence", *The Economic Journal,* 123-145.

Canova, Fabio, 1998, "Detrending and Business Cycle Facts", *Journal of Monetary Economics,* 41, 475-512.

Cogley, Tomas and James Nason, 1995, "Effects of the Hodrick-Prescott Filter on Trend and Difference Stationary Time Series: Implications for Business Cycle Research", *Journal of Economic Dyamics and Control*, 19, 253-278.

Fitoussi, Jean Paul, David Jestaz, Edmund Phelps, and Gylfi Zoega, 2000, "Roots of the Recent Recoveries: Labor Reforms or Private Sector Forces?," *Brooking Papers on Economic Activity*, 1, 238-291.

Friedman, Milton, 1968, "The Role of Monetary Policy", *American Economic Review*, 58, 1, 1-17.

Gordon, Robert, 1997, "The time varying Nairu and its implications for economic policy", *Journal of Economic Perspectives*, 11, 11-32.

Hamilton, James, 1994, *Time Series Analysis,* Princeton: Princeton University Press.

Harvey, Andrew, and Albert Jaeger, 1993, "Detrending, Stylized Facts and the Business Cycle", *Journal of Applied Econometrics*, 8, 231-247.

Hodrick, Robert, and Edward Prescott, 1981 "Post-War U.S. Business Cycles: An Empirical Investigation" Carnegie Mellon Discussion Paper 451.

King, Robert, Charles Plosser, James Stock, and Mark Watson, 1991, "Stochastic Trends and Economic Fluctuations," *American Economic Review*, 81, 819-40.

Layard R., S Nickell and R Jackman, 1991, *Unemployment*, Oxford: Oxford University Press.

Maravall, Agustin and Regina Kaiser, 2000, "Estimation of the Business Cycle: A Modified Hodrick-Prescott Filter", *Spanish Economic Review*, 1, 175-206.

Phelps, Edmund, 1968, "Money-Wage Dynamics and Labor Market Equilibrium", *Journal of Political Economy*, 76, 4, 678-711.

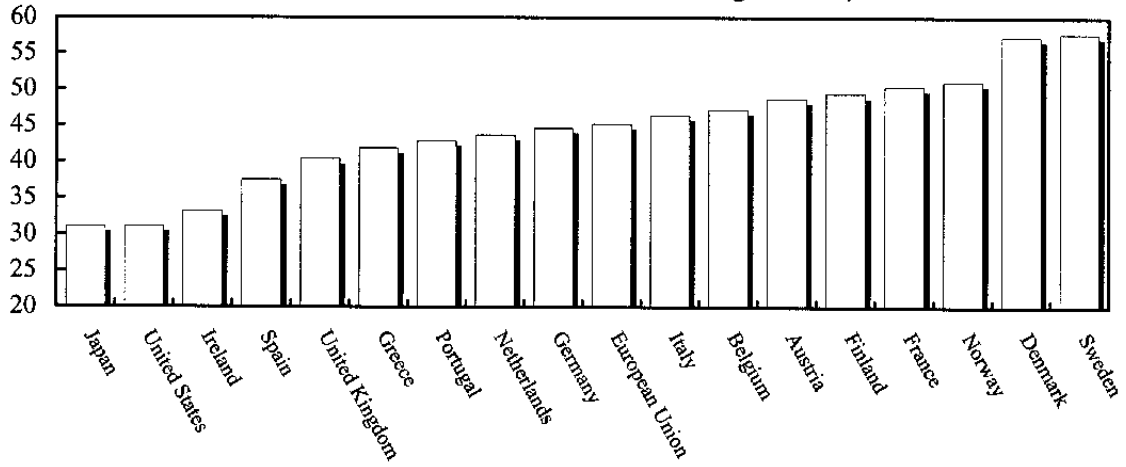
Staiger, Douglas, James Stock, and Mark Watson, 1996, "How Precise are Estimates of the Natural Rate of Unemployment?," NBER Working Paper No. 547

II. THE FRENCH TAX SYSTEM – RECENT DEVELOPMENTS AND KEY ISSUES[7]

A. Introduction

24. France is characterized by one of the highest tax burdens in the industrialized countries, with a ratio of revenue to GDP some 20 percentage points higher than in Japan and the United States, and also above that of other euro area countries (Figure II.1). Even though differences in tax burdens partly reflect institutional arrangements (e.g., private versus public pensions and health care), France's high tax burden is widely, and indeed officially, recognized to act as an impediment to sustained growth, notably by discouraging labor supply and investment. Prompted in part by these concerns, and the with the declared aim of ensuring sustainable inflation-free growth and of reducing unemployment traps, the government announced in late August 2000 a package of tax reductions, amounting to about F 120 billion (1¼ percent of GDP) to be implemented over 2001–2003. Combined with a number of tax cuts introduced in the 1999 and 2000 budgets, this package entails a significant reduction in a number of taxes and in the overall tax burden.

Figure II.1. Government Revenue as a Percentage of GDP, 1999



Source: OECD, Analytical Database.

25. This chapter examines the extent to which the French tax system might hinder long-term economic growth and identifies priority areas where reform should concentrate in order to alleviate supply-side constraints to higher growth. After taking stock of recent reforms (Section B), the chapter provides an overview of the main characteristics of the tax system and a first broad assessment of the overall tax structure (Section C). The tax system is likely to influence long-term growth primarily through the incentives and/or distortions imposed on the behavior of workers and firms, and the chapter focuses on three main issues from this perspective. First, since reducing structural unemployment and boosting labor supply are

[7] Prepared by Selma Mahfouz.

crucial to increasing potential growth, the impact of the tax-benefit system on the performance of the labor market is examined in Section D. The specificities and weaknesses of the personal income tax (PIT), which is at the center of recent reforms, is then reviewed in Section E. Finally, the impact of corporate taxes on investment is examined in Section F. Section G provides some conclusions.

B. Overview of Recent Reforms

26. In the early to mid-1990s, tax policy in France was characterized by a mix of revenue-raising measures geared toward achieving the Maastricht deficit criterion (e.g., the 1995 and 1997 surcharges on corporate taxes, VAT rate increase) and reforms to reduce structural unemployment (e.g., targeted rebates on social security contributions). In recent years, the priority has shifted toward reducing the tax burden, first to sustain the economic recovery and then to correct the increase in the tax burden induced by the drive to EMU participation and a strong cyclical upswing. The budgets for 1999 and 2000 thus included a number of tax reductions amounting to 1.1 percent of GDP (Box II.1).

27. In addition, the government announced on August 31, 2000 a package of tax reductions and reforms, amounting to an overall F 120 billion (1¼ percent of GDP) to be implemented over 2001-2003. The main measures are:

- A reduction in all the rates of the personal income tax: the lowest marginal rate will thus be reduced from 9.5 percent in 2000 to 7 percent by 2003, while the highest marginal rate will be cut from 54 percent to 52.5 percent by 2003. The overall cost of these measures will be about F 45 billion. In addition, the discount ("*décote*") that applies to taxable income below a certain threshold will be modified to reduce the high marginal rates induced by the threshold.

- The elimination over three years of the 1995 surcharge on the corporate income tax, lowering the normal statutory rate from 36.7 percent to 33.3 percent. In addition, the statutory rate is reduced in stages to 15 percent on the first F 250,000 of profits for small and medium-sized enterprises. These measures will be partly financed by changes in the rules for the taxation of dividends between subsidiaries, depreciation allowances and imputation, so that the overall cumulative cost will be F 20 billion.

- The introduction of a graduated rebate on the *contribution sociale généralisée* (CSG) and *contribution pour le remboursement de la dette sociale* (CRDS)[8] for wages up to 1.3 times the SMIC aimed at increasing in-work take-home pay for low-income workers already exempt from the income tax. This measure will cost about F 25 billion.

[8] The CSG and CRDS are flat-rate taxes earmarked for the financing of Social Security.

- A reduction in excise taxes on domestic fuel oil to lessen the impact of increases in crude oil prices on household income. In addition, excises on gasoline will be adjusted to offset increases in VAT due to changes in oil prices, and the annual tax on private cars (*vignette automobile*) is to be eliminated.

Box II.1. Tax Reductions in 1999-2000

The most important tax-reduction measures introduced in 1999 and 2000 (amounting to 1.1 percent of GDP) were:

1999 Budget: F 41 billion (though F 25 billion was raised by a new ecotax and a surcharge on the corporate tax for large enterprises to finance the 35 hour work week), of which

- a reduction of VAT on electricity and gas network access, appliances for handicapped persons, sorted waste treatment, and renovation of social rental housing (F 4.5 billion);
- a reform of the *taxe professionnelle* (local business tax), by phasing out over 5 years the payroll component from the base (F 10.4 billion); and
- an extension of the rebate on employer social security contributions for low-wage workers to 1.8 times the SMIC for enterprises implementing the 35-hour workweek (F 25 billion).

2000 Budget: F 40 billion, of which:

- a reduction of VAT on home improvement and personalized care services (*services de proximité)* (F 20 billion);
- a reduction of the real estate transaction tax *(droits de mutation)* (F 1 billion);
- a broadening of the partial exemption of wages from the local business tax (F 2 billion); and
- the elimination of the 1997 surcharge on corporate taxes (F 12 billion).

2000 Supplementary Budget: F 50 billion (F 40 billion of these cuts offset the carryover from 1999, higher projected growth in 2000, and larger-than-expected non-tax revenues), of which:

- a reduction of the VAT rate from 20.6 percent to 19.6 percent as of April 2000 (F 18 billion in 2000 and F 31 billion for a full year);
- a reduction of the *taxe d'habitation*, including the elimination of the regional tranche and new exemptions for low-income families (F 11 billion); and
- a reduction in the two lower rates of the personal income tax, which also reduces the tax base by about 650,000 families (F 11 billion).

C. Overview of the Tax System

28. A breakdown of the tax burden into its main components shows that levies assigned to social security administrations, which include health care (CNAM), unemployment insurance (UNEDIC), pensions (CNAV) and family allowances (CNAF), amount to almost half of the total revenue collected (Table II.1). The remainder is accounted for mainly by central government taxes, as local government taxes are relatively small. In terms of tax instruments, indirect taxes (VAT, taxes on oil products, and other excises) represent a large share of revenue (almost 25 percent of the total), while the share of the personal income tax is relatively small. However, if the CSG is added to the personal income tax the proportion of taxes on personal income amounts to about 16 percent of total revenue, broadly in line with industrial country experience.

Table II.1. Structure of General Government Revenue, 1999

	In percent of GDP	In percent of total
Central government	18.7	40.9
Value added tax	7.6	16.6
Excises on oil products (*TIPP*)	1.8	3.9
Personal income tax	3.4	7.4
Corporate income tax	2.6	5.7
Other[1]	3.3	7.2
Local government	5.5	12.0
Local business tax (*Taxe professionnelle*)	1.5	3.3
Real estate tax (*Taxe foncière*)	1.1	2.4
Housing tax (*Taxe d'habitation*)	0.7	1.5
Other[2]	2.1	4.6
Social Security	20.9	45.7
CSG	4.0	8.8
Social contributions	16.0	35.0
Other[3]	0.9	2.0
European Union	0.6	1.3
Total	**45.7**	**100.0**

Source: Ministry of Finance, France

[1]Excluding tax transfers from central to local government and Social security.

[2]Mostly local indirect taxes and tax transfers from central government.

[3]Specific taxes, transfers from BAPSA and duties on tobacco and alcohol.

29. As in a number of OECD countries, the revenue ratio has increased over the last two decades in France, reflecting a trend increase in social security contributions and taxes to finance rising transfers and subsidies (see IMF, 1996). In recent years however, there has been a marked decrease in the share of social security contributions (from 18 to 16 percent of GDP between 1997 and 1999), reflecting a shift from social contributions to the CSG (Figure II.2). Apart from this change, the tax structure has remained remarkably stable over the last decade. The main specificities of the French tax system appear to be a relatively

small share of direct taxes on households and a high share of indirect taxes (Table II.2). Direct taxes on business also appear to be in the low range, although this may be partly offset by differences in social security contributions.

Table II.2. Structure of Revenue in Selected OECD Countries, 1999
(In percent of total revenue)

	Social security contributions	Indirect taxes	Direct taxes on business	Direct taxes on households	Total
France	39.5	34.3	5.9	20.3	100.0
Germany	44.1	28.3	3.6	24.0	100.0
United Kingdom	19.9	36.9	9.9	33.3	100.0
US	23.6	25.7	9.3	41.4	100.0
Japan	39.4	31.7	10.1	18.9	100.0

Source: OECD, Analytical database.

30. Another approach to assessing the overall structure of the tax system consists in trying to compare it with an "optimal" tax structure derived from public finance theory. Although the theory does not provide many insights on the detailed desirable structure of taxation, one important result (Atkinson and Stiglitz, 1976) is that when an income tax is available, it is optimal that indirect taxes be neutral from a redistributive point of view and be used only to finance general public spending.

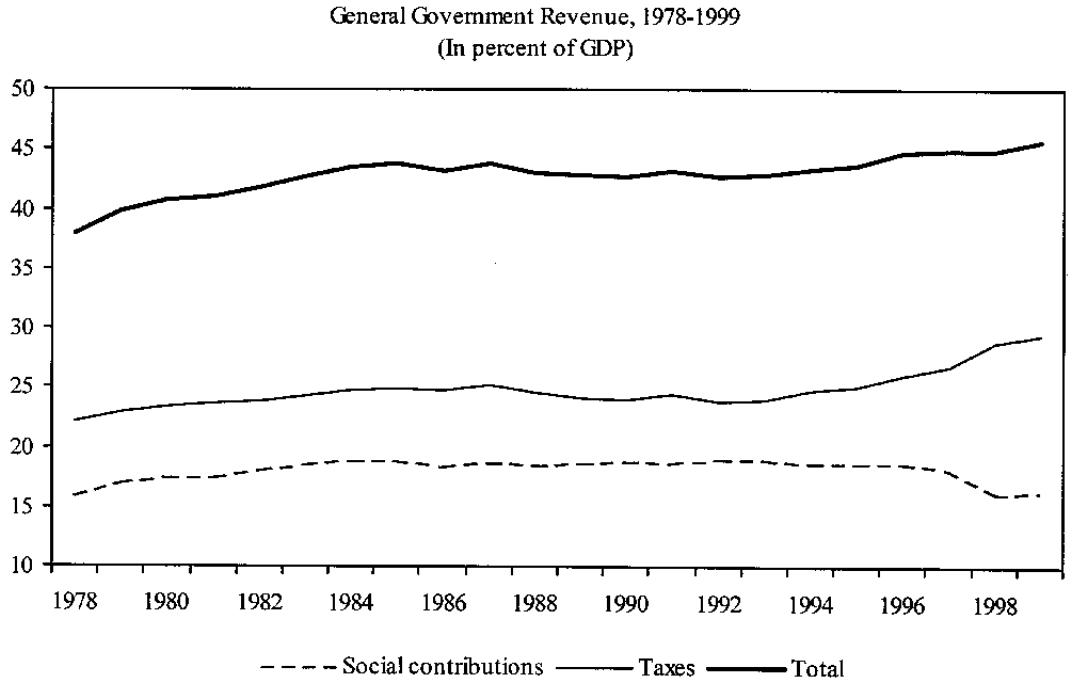
31. Bourguignon and Bureau (1999) note that the main taxes and expenditures in France can be classified into the redistributive function (ensured mainly by the combination of the personal income tax and the non-conditional benefits, or "generalized income tax") and the allocative function (general expenditures financed by indirect taxes).[9] They also observe that indirect taxes are broadly neutral in terms of redistribution, in the sense that the apparent rate of taxation varies very little with the level of revenue, and may therefore be considered as proportional taxes. They conclude that the overall structure of the tax system is not out of line with what the theory would recommend.[10] However, the authors also underline the limits of such an overall assessment. In particular, this analysis focuses on the main aggregates and overlooks the specifics of the tax system that may lead to distortions within each of the main functions. In particular, they note that the degree of redistribution achieved by the "generalized income tax" is relatively limited compared to other countries, due to the narrow

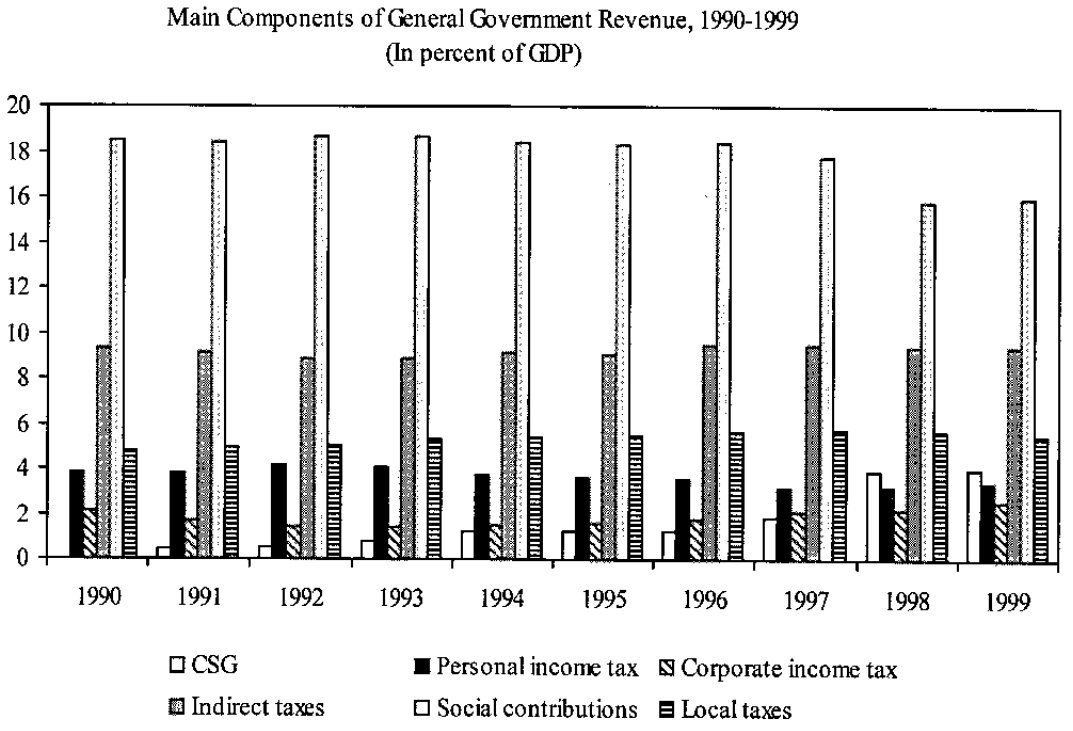
[9] Social security contributions can be seen as financing the insurance component of unemployment benefits, pensions, and health care.

[10] See Cremer (1999), for a more detailed discussion of the optimal choice between direct and indirect taxation.

base of the personal income tax. Another limitation of this analysis is that the Atkinson-Stiglitz "optimality" theorem assumes that all markets are perfectly competitive, whereas in France the existence of the minimum wage and the policy of maintaining its purchasing power have to be taken into account when evaluating the tax system and designing tax reforms.

Figure II.2. France Structure of General Government Revenue





Source: Rapport économique, social et financier.

D. The Impact of the Tax-Benefit System on Labor Market Performance

32. The tax-benefit system may affect the functioning of the labor market in a number of ways: social security contributions and taxes create a tax wedge between employers' labor costs and net after-tax wages available to employees, which affects labor demand and/or supply; the tax-benefit system influences the level of reservation wages and thus labor supply. In the 1990s, policies aimed at reducing structural unemployment focused on lowering labor costs for targeted categories of workers—mostly unskilled workers.[11] These measures were based on the idea that the demand for low-skilled labor was constrained by a relatively high minimum wage and high social charges, possibly combined with skill-biased technological progress. In these conditions, and with an elasticity of labor demand generally considered to be higher for low-skilled than for high-skilled labor, shifting the tax burden away from low-skilled labor would induce a reduction in unemployment over the medium term.[12]

33. The annual cost of these measures is estimated at about F 40 billion (0.4 percent of GDP). Most ex-ante estimates evaluate the impact in terms of job creation at about 200,000 to 250,000 jobs over a five-year period. When taking into account the financing of the measure (e.g., through an increase in VAT or higher contributions on high-skilled labor), the estimate of the number of jobs created or maintained is reduced to 40,000 to 200,000 jobs, depending on the assumptions retained (CSERC, 1996). Since these measures were introduced in the first half of the 1990s, they are likely to have reached their maximum effect in terms of job creation by now, although the unusually high pace of employment growth in the current recovery could indicate that the impact of these measures has been deeper than anticipated. Very optimistic scenarios, based on a high elasticity of the demand for low-skilled labor and favorable supply-side effects, could thus lead to stronger estimates of the number of jobs created, up to 450,000 (before financing) in some studies. In this case, an appreciable reduction in structural unemployment might be underway.

34. Ex-post estimates of the impact of the measure are still very tentative but point to two significant developments. First, the long-term decline in the share of low-skilled workers in total employment (wage earners) observed in the 1980s was brought to a halt in the mid-1990s. Second, the proportion of jobs paid less than 1.3 times the SMIC picked up markedly in the late 1990s, which can be interpreted as the result of a larger number of jobs created in this wage range, or a limited diffusion of the discretionary increases in the minimum wage over the period. This increase in the proportion of jobs paid below 1.3 times the SMIC could also indicate that the rebates induced the development of "low-wage traps", as the marginal

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[11] One of the key measures in this regard was the *ristourne dégressive*, consisting of tapered rebates to employers' social contributions for low wages (below 1.3 SMIC); see also Box I.1 in Chapter I.

[12] See Malinvaud (1998), on France, or Sørensen, (1997), for a discussion of the effects of these measures in a variety of theoretical models

cost for employers of increasing wages above 1.3 times the SMIC would be amplified by the loss of the rebate (Gubian, 1999).[13]

35. Although these approaches to reducing unemployment have been widely debated in Europe (see for example EU, 1994), other countries appear to have been reluctant to follow the French lead. In particular, Germany has limited this kind of measure to jobs paying less than DM 630 for less than 15 hours work, perhaps because of doubts about their cost-effectiveness. Indeed, estimates for France show that the cost per job created is relatively high, and some authors argue that the effectiveness of wage subsidies depends crucially on the pay-off to experience and training (Bell, Blundell and Van Reenen, 1999).

36. Although graduated rebates on social contributions have been the cornerstone of the French approach to reducing unemployment through tax reforms, a few other measures are worth mentioning, including the phasing out of the wage bill from the base of the local business tax, and the reduction in VAT rates on labor-intensive services. On the latter, Bourguignon and Bureau (1999) note that since social contribution rebates affect labor demand more directly than VAT cuts, they are likely to be more efficient, except possibly in a few very competitive and labor-intensive sectors where the price elasticity of demand is very high. They therefore argue for limiting targeted VAT cuts to activities that are at the margin of the informal economy or that could benefit from positive externalities.

37. Overall, the policies pursued in the 1990s appear to have been successful in increasing labor demand for low-skilled workers and thus possibly reducing structural unemployment. However, now that the economic recovery is well under way and that tensions are appearing on the labor market, the effects of the tax system on labor supply have acquired increased policy relevance. In this regard, of key importance is not only the level of taxes but also the combination of taxes and benefits for each level of income.

38. A useful measure of the extent of distortions imposed by the tax-benefit system is provided by effective rates of taxation, taking into account all relevant taxes and benefits. The marginal effective tax rate (METR) measures the share of any increase in a household's gross wages that is taken away through increased taxes or reduced benefits.[14] A number of recent studies have pointed out the existence of high METRs at the lower and higher ends of the income distribution (see also Box 5 of the Staff Report for the 2000 Article IV consultation, SM/00/217).

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[13] The rebates were extended to 1.8 times the SMIC in the law on the 35 hour workweek, which should reduce (or displace) the problem of low-wage traps, but also weakens the targeting of the measure on low-skilled workers.

[14] A marginal rate of 100 percent thus implies that the household's total revenue does not increase at all, since all of the increase is paid in taxes or lost in benefits.

39. Bourguignon and Bureau (1999) estimate that the METR for a couple with two children (taking into account social contributions, the personal income tax, the CSG, the VAT, and transfers[15]) is higher than 100 percent for levels of income around the RMI (the *revenu minimum d'insertion*, the main basic income support scheme), due to the sharp withdrawal of some benefits, decreases to about 50 percent for wages around 2 to 4 times the SMIC, before increasing progressively to above 70 percent for wages above 15 times the SMIC. The authors note that while this U-shaped distribution of marginal rates may be seen as broadly in agreement with the theory of optimal taxation (Mirlees, 1971), it raises a number of problems. First, high marginal rates at the lower end may cause inactivity traps and, in a dynamic setting, prevent individuals from acquiring on-the-job training and experience that would increase their productivity. They note, for example, that a full-time job paying the SMIC increases monthly disposable income for a beneficiary of the RMI by only about F 1,700 (the monthly SMIC is about F 5,000). At the other end of the revenue distribution, they note that the scarce available evidence on the disincentive effects of high marginal rates is not conclusive, but that marginal rates above 75 percent are likely to be dissuasive (though emigration is likely to be influenced by differences in average rates of taxation across countries and not only by high marginal rates—see Section E below).

40. Laroque and Salanié (1999) estimate the proportion of households affected by the various levels of marginal rates, using data from the employment survey. They find that about 20 percent of the population face marginal rates higher than 90 percent, mostly at the lower end of the income distribution. Their simulations also show the diversity of marginal rates within a given range of income, reflecting the impact of family situations, composition of income, type of housing, etc. Finally, they estimate that less than half of the unemployed would gain more than F 3,000 when taking a full-time job paid at the SMIC, and about 40 percent of them would gain less than F 2,000. Going further in the analysis of labor supply, Laroque and Salanié (2000) break down non-employment between "voluntary" (people with a high reservation wage or unwilling to work for family, health, or other reasons), "classical" (people unable to find a job due to low productivity relative to minimum wage), and unexplained non-employment. Using participation equations estimated on data from the 1997 employment survey, they find that participation on the labor market largely depends on unexplained factors and varies significantly with the sex and marital situation. Overall, they estimate that 57 per cent of the non-employed are in the first category ("voluntary"), and that the participation of women on the labor market is more sensitive to financial incentives. All these estimates point to "inactivity traps" being quantitatively significant.

41. Calculations made by the Direction de la Prévision (Bourguignon, 1998, Annexe A) show more precisely that the effective marginal rate of taxation exhibits a number of peaks and irregularities that give rise to significant distortions. The marginal rate of taxation is thus 100 percent for a couple with two children with revenues equal to the RMI; it increases

[15] Transfers include the RMI (an income support scheme), family allowances, allowances for housing, and old age allowances.

sharply as income rises above the RMI, due to the sharp reduction in housing aids that take into account income from work, but not from the RMI; then between the SMIC and 1.3 times the SMIC, the "*ristourne dégressive*" induces an increase in the marginal rate; around twice the SMIC, the steep decline in housing subsidies and the personal income tax induce another peak; finally, each income bracket of the personal income tax results in a step increase in the marginal rate.

42. A number of measures have recently been taken to reduce or eliminate some of these peaks in the marginal rate. In particular, the reform of housing aids announced in the first half of 2000, during the last "*Conférence Famille,*" corrects the difference of treatment between work and non-work income and between the main subsidies (*allocations logement* and *aide personalisée au logement*) by creating a harmonized schedule based on overall resources. The reduction and reform of the housing tax also reduces the associated peak in marginal rates.

43. Although these measures correct the main irregularities, marginal tax rates remain high at the lower end. Various schemes may be considered to address this issue. A first natural option is to reduce the level of benefits, thereby increasing the difference between, for example, the RMI and the SMIC. Alternatively, a negative income tax, consisting of a flat benefit (independent of the level of income) combined with a proportional tax has been proposed. Such a mechanism results in a constant increase in the slope between gross work revenues and net disposable income. However, to ensure a minimum flat benefit of the same order of magnitude as the current RMI, either the marginal rate of the income tax or the cost of the program would have to be very high. Another possibility is the *allocation compensatrice de revenu* (ACR) which consists of a constant income support benefit combined with a flat rate tax with a rate lower than 100 percent applied to wages up to the SMIC, or 1.5 times the SMIC, and combined with the existing income tax for higher revenues. Bourguignon and Bureau (1999) suggest that such a system could be financed by a small increase in marginal rates for medium and high incomes or in the CSG. Such a system would have some similarities with the Earned Income Tax Credit in the United States (EITC) or the Working Family Tax Credit (WFTC) in the United Kingdom. In the EITC, a tax credit (which gives right to cash payment when it exceeds the tax liability) is granted to households with low incomes: the credit increases proportionally with earned income at first, then it becomes constant, and finally it declines to zero. An important feature of the EITC or ACR is that the benefit component is administered through the tax system. Although this may raise some administrative difficulties (e.g., the one-year lag associated with income tax filings, although it is noteworthy that few beneficiaries of the EITC in the United States have taken advantage of the possibility of receiving monthly payments), it also has the advantage of integrating various aspects of the redistributive system that are now divided between taxes and spending despite their close economic relationship.

44. In the event, the August 2000 tax reduction package eschewed any form of EITC, and opted rather for a graduated rebate of the CSG and CRDS paid on incomes up to 1.3 times the SMIC. Although all the specifics of the measure are not yet known (for example, how it

will apply to part-time workers), it will not significantly lower the 100 percent marginal rate for people at the RMI.[16] It will however reduce the marginal rates of taxation for people with earned income between the RMI and 1.3 times the SMIC, which should increase the incentives to work in this range. For example, SMIC earners will benefit from an increase in their net wage of about 10 percent. Although the recourse to the CSG may reduce the administrative costs of the measure, it also transforms a broad-based flat rate tax into a partly progressive tax, thus making the tax system more complex.

E. Main Weaknesses of the Personal Income Tax

45. Reform of the personal income tax (PIT) has long been on the agenda. Indeed, despite some important changes over the last decade, the PIT suffers from a number of well-identified weaknesses. Personal income taxation in France comprises two main taxes, the progressive personal income tax (IRPP), and the flat-rate CSG. Revenue collected by the personal income tax has declined from about 5 percent of GDP in the early 1980s to some 3½ percent today, reflecting increases in the number of exemptions and tax credits, which narrowed the tax base, as well as reductions in tax rates in 1993 and 1996. On the other hand, the rate of the CSG, introduced in 1991, was raised considerably in 1997–98 (to 7.5 percent) and revenue from this source now amounts to some 4 percent of GDP.

46. Although both these taxes can be considered direct taxes on income, there are important differences between them:

- The CSG is earmarked to financing social security while the PIT finances general spending of the central government;

- The CSG has a much broader tax base than the PIT: both are levied on labor income, pensions, and capital income, but the CSG applies to the first franc of revenue (after a 5 percent rebate for wages), whereas the PIT has a number of rebates and deductions (*quotient familial, décote*) that result in total exemption for about half of all households. In addition, some savings instruments (*Plan d'Epargne Populaire* (PEP), *Plan d'Epargne Logement* (PEL), life insurance) are exempt from the PIT but not from the CSG;

- The CSG is a contemporaneous withholding tax for wages and pensions, and is individualized, while the PIT is collected with a one-year lag on a household basis; and,

[16] As long as the calculation of the RMI *différentiel* is based on overall income excluding the CSG and CRDS (i.e., is based on net wages), the marginal rate will be unchanged for people who remain at the RMI after the measure, as their RMI would be reduced accordingly.

- Finally, since 1997, part of the CSG can be deducted from the PIT. This was justified by reasoning that the 1997 increase in the CSG replaced social security contributions for health care, which were themselves deductible from the PIT.

47. The main flaws of the PIT are a narrow base and, consequently, a low yield, high progressivity at the both the lower and higher ends (which blunts work incentives), and complexity.[17] These three weaknesses are to some extent related. The accumulation of exemptions and rebates over the years may be seen as an attempt to offset the impact of high marginal rates. But they also have eroded the tax base while increasing the complexity of the system. Thus, a reduction in the tax rates would arguably be best combined with a streamlining of the web of exemptions and rebates. These include the exemption of some benefits, the 10 percent and 20 percent rebates on taxable income, which could be integrated in the tax schedule, and some tax credits. In addition, while the introduction of the CSG partly corrects for the small base and low yield of the income tax, the desirability of maintaining two complementary taxes on personal income remains questionable in the longer term. In addition, the tax deductibility of part of the CSG has no economic justification. Recent reforms of the PIT are somewhat disappointing in this regard, as they have focused mainly on reducing the tax rates, especially at the low end, without offsetting measures to reduce the number of exemptions and credits.[18]

48. The question of high marginal rates is more complex. At the lower end of the income distribution, the high marginal rate of taxation and associated inactivity traps stem from the benefit system rather than the PIT, given that low-income households are typically already exempt from the PIT (see section D for a discussion of these issues). For high incomes, the question is whether high marginal rates may lead high-skilled workers to emigrate, or might discourage the accumulation of human capital. However, the decision to emigrate should take into account relative average rates of taxation rather than marginal rates, and international comparisons show that these depend crucially on family situations. For example, when compared with the United Kingdom, the French PIT may be more costly for single high-wage people, but more advantageous for families with children. In addition, differences in the taxation of savings and wealth are also likely to play an important role in these decisions. Wealth is taxed in France when it is transmitted (*droits d'enregitrement*) and on an annual basis through a wealth tax (*impôt de solidarité sur la fortune, ISF*) and a property tax (*impôt foncier*). The ISF applies to wealth (buildings, individual enterprises, financial assets, cars, planes, etc.) that is higher than F 4.7 million (net value), with progressive rates ranging from 0.55 to 1.8 percent. For taxpayers paying income tax in France, a ceiling limits the overall

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[17] As noted above, the redistributive impact is limited by the narrow base and yield of the PIT.

[18] An exception is the announced change in the "*décote*" (a discount that applies to taxable income below a certain threshold).

amount of income and wealth tax due to 85 percent of the previous year's income.[19] Although its effect is difficult to assess, it is generally recognized that the combination of PIT and ISF may contribute to emigration of wealth and taxpayers, and in particular, that the upper limit imposed on the tax rebate described above may have to be reconsidered in this light.

F. Corporate Income Tax

49. Corporate income tax (CIT) reforms have been relatively limited in France in recent years. The main measures have been the elimination of the two surcharges that had been imposed in 1995 and 1997, which will bring the standard corporate tax rate back to 33.3 percent by 2003, the ongoing phasing out of the wage bill from the base of the local business tax (*taxe professionnelle*), and recent targeted rate reductions for small- and medium-sized enterprises.[20] Over the last 20 years there has been a widespread trend toward lower corporate tax rates in all industrial countries—although it was accompanied by a broadening of tax bases, leaving CIT revenues as a share of GDP broadly constant (Bond, Chennels, Devereux, Gammie, and Troup, 2000). A simple comparison of headline and typical corporate tax rates shows that France is in the middle of the range of industrial countries, with higher rates than in the United Kingdom, Denmark or the Netherlands, but lower than in Germany and Japan (Table II.3). It should however be noted that the French local business tax (*taxe professionnelle*) is not taken into account in these comparisons (whereas German local taxes are). Although the specifics of this tax make it difficult to compare with standard CIT, it probably contributes to increasing the cost of capital and the effective average tax rates above the levels reported in Table II.3.

In order to measure the impact of CIT on investment, it is necessary to look more precisely at the impact of taxation on the cost of capital (which measures the effects of CIT on "marginal" investment decisions) and/or at the effective average tax rates (which reflect the relative impact of CIT on the overall profitability of various investment projects). Bond and Chennels (2000) estimate the effect of CIT on the cost of capital and the effective marginal tax rates[21] for seven countries (United States, Japan, Germany, France, United Kingdom, Denmark, and the Netherlands). This requires distinguishing between domestic and international investments (through a foreign subsidiary), and between various sources of financing (debt, equity, and retained earnings). Overall, their results show that France is

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[19] However, an upper limit has been imposed on this tax rebate for wealth above a given threshold.

[20] In the context of the law on the 35-hour workweek, a new surcharge (*contribution solidaire sur le bénéfices*, CSB) was also imposed on larger firms.

[21] These are forward-looking effective tax rates, calculated from the difference between the net present value of an investment project to shareholders with and without CIT.

generally in the middle to lower range in terms of both cost of capital and effective average tax rates, often close to U.S. levels, below Germany and Japan which exhibit relatively high costs and effective rates, and above the United Kingdom, Denmark and the Netherlands. In addition, debt financing appears relatively attractive in France compared to other countries.

Table II.3. Corporate Tax Rates

Headline rates

	United States	Japan	Germany	France	United Kingdom	Denmark	Netherlands
1979	46.0	40.0	56.0	50.0	52.0		
1990	34.0	37.5	50.0	37.0	34.0	40.0	35.0
1999	35.0	30.0	40.0[1]	33.3[2]	30.0	32.0	35.0

Typical tax rates

	US	Japan	Germany	France	UK	Denmark	Netherlands
1979	49.6	52.6 / 40.0	62.2 / 45.0	50.0	52.0		
1990	38.4	50.9	57.7 / 45.9	37.0 / 42.0	34.0	40.0	35.0
1999	39.3	40.9	51.6 / 42.8	40.0[3]	30.0	32.0	35.0

Source: Bond and Chennels, 2000.

Notes: The headline rate is the main rate of the national CIT on retained earnings (excluding surcharges). The typical rate includes surcharges and typical local CIT. The first figure applies to retained earnings and the second to distributed profits.

[1]The German CIT reform will bring this rate from 40 to 25 percent in 2001.

[2]Excluding surcharges.

[3]Will be brought back to 33.3 percent by 2003 with the elimination of the surcharges.

50. At the same time, there remain important differences in the links between CIT and PIT across countries, although a movement away from full imputation (under which CIT paid can be deducted from PIT on dividends) seems to be under way in the European Union. Although this system presents the advantage of avoiding a double taxation of savings and reducing both average and marginal costs of equity-financed capital, difficulties in its implementation in an international setting appear to lie behind its discontinuation in the United Kingdom and Germany. France is thus one of the last countries in the European Union to retain full imputation (see the 2000 Article IV Selected Issues paper on tax reforms in Germany for a more detailed discussion of this issue (SM/00/229)).

G. Conclusion

51. To summarize, the French tax system exhibits the following specificities, which can serve as a basis for an agenda of further reform :

- Targeted rebates on social security contributions have been successful in reducing constraints on labor demand resulting from high labor costs (SMIC and social charges) on low-skilled labor;

- However, these measures are costly for the budget (especially after the extension to 1.8 times the SMIC) and may induce new distortions (e.g., low-wage traps);

- The tax-benefit system still induces distortions and high marginal effective rates of taxation that are likely to limit labor supply, especially at the lower end of the revenue distribution.

- The personal income tax system (PIT and CSG) is atypical and complex, with a combination of high marginal rates and numerous exemptions that reduce its transparency and its efficiency both in terms of yield and redistribution.

- Corporate income taxes are, overall, not out of line with other OECD countries, but there is a need to remain attentive to developments on specific issues in an increasingly competitive international environment, such as the treatment of dividends, the impact of local taxes (*taxe professionelle*), and interaction between CIT and the PIT.

52. Several recent reforms have addressed some of these problems, in particular by smoothing the peaks in marginal effective tax rates related to the withdrawal of some benefits. More needs to be done, however, on both the benefits and the tax side to significantly reduce financial disincentives to work and therefore boost labor supply. In addition, a comprehensive reform of the PIT should tackle the problem of the small base and complexity of the PIT, and in the longer term, possibly consider moving toward a single withholding income tax. Finally, the increasing mobility of capital and high-skilled labor should lead to a continuous reassessment of the impact of taxation on investment and location decisions, including the taxation of savings and wealth. Finally, the analysis suggests that merely reducing the tax burden is unlikely to address these issues, which require deeper changes in the structure and specifics of some taxes and benefits.

References

Atkinson, A.B., and Joseph E. Stiglitz, 1976, "The design of tax structure: direct versus indirect taxation," *Journal of Public Economics*, 6, pp. 55-75.

Bell, Brian, Richard Blundell and John Van Reenen, 1999, "Getting the unemployed back to work: the role of targeted wage subsidies," The Institute for Fiscal Studies, Working paper No. W99/12.

Bond, Stephen and Lucy Chennells, 2000, "Corporate income taxes and investment: A comparative study," Institute for Fiscal Studies, London.

Bond, Stephen, Lucy Chennells, Michael Devereux, Malcolm Gammie, and Edward Troup, 2000, "Corporate tax harmonization in Europe: a Guide to the Debate," Institute for Fiscal Studies, London.

Bourguignon, Francois, 1998, "Fiscalité et redistribution," Rapport du Conseil d'Analyse Economique, La Documentation Francaise, Paris.

Bourguignon, Francois and Dominique Bureau, 1999, "L'architecture des prélèvements en France : état des lieux et voies de réforme," Rapport du Conseil d'Analyse Economique, La Documentation Francaise, Paris.

Cremer, David, 1999, "Fiscalité optimale et choix des instruments de la politique de taxation," in "L'architecture des prélèvements en France : état des lieux et voies de réforme," Rapport du Conseil d'Analyse Economique, La Documentation Francaise, Paris.

CSERC, 1996, "L'allègement des charges sociales sur les bas salaires," La Documentation Francaise, Paris.

European Commission, 1994, "Growth, Competitiveness, Employment: The Challenges and Ways forward into the 21st Century," White paper, Luxembourg.

Gubian, Alain, 1999, "Six ans d'allègement de cotisations employeurs sur les bas salaires," Bilan de la Politique de l'emploi 1998, Dossiers de la DARES, No. 3-4.

IMF, 1996, World Economic Outlook, Chapter III, Fiscal challenges facing industrial countries, May 1996.

Laroque, Guy and Bernard Salanié, 1999, "Prélèvements et transferts sociaux: une analyse descriptive des incitations financières au travail," *Economie et Statistiques*, No. 328, 1999-8, pp. 3-19.

Laroque, Guy and Bernard Salanié, 2000, "Une décomposition du non-emploi en France," *Economie et Statistiques*, No. 331, 2000-1, pp. 47-66.

Malinvaud, Edmond, 1998, "Les cotisations sociales a la charge des employeurs : analyse économique," Rapport du Conseil d'Analyse Economique, La Documentation Francaise, Paris.

Mirlees, John, 1971, "An Exploration in the Theory of Optimal Taxation," *Review of Economic Studies*, Vol. 38, pp. 175-208.

Sørensen, Peter Birch ,1997, "Public finance solutions," *Economic Policy*, Vol. 2, Issue 25, pp. 221-264, October.

III. The New Economy in France: Developments and Prospects[22]

A. Introduction

53. The dynamism of the French economy, which since 1997 has been characterized by strong growth, a falling unemployment rate, and low inflation, has raised the question of whether the country is on the verge of experiencing a period of sustained growth such as experienced by the United States since the mid–1990s. Some observers have attributed the U.S. experience to what has been dubbed the "new economy"—an acceleration in technical change in which rapid investment and use of information and communication technology (ICT) transform business practices leading to new breakthroughs and wider adoption and use of ICT. Among the most commonly cited features of the new economy are an increase in labor productivity growth, which some observers believe can be long-lived, and a rapid growth of Internet-related businesses.

54. This chapter analyzes the sources of recent changes in French labor productivity growth, including the expansion of high-tech activities, and reviews a number of policy issues connected with the development of an ICT-based new economy.[23] The chapter is organized as follows. The next section reviews evidence for the United States. The following section—which is the heart of the paper—presents a decomposition of labor productivity growth in the French business sector along the lines of influential work done for the United States. Next, there is a brief analysis of several policy issues raised by the new economy in France. A final section summarizes the findings.

55. The main conclusion is that the recent lackluster productivity growth in France is attributable to a deceleration in overall capital deepening on the heels of a continued moderation in labor costs. This deceleration reflects a waning of the heavy investment in labor-saving technologies that characterized most of the 1980s, which itself was a response to the escalation of labor costs after the mid–1970s. The deceleration in capital deepening does not, however, extend to computer hardware and software. Investment in this category has grown at rates close to 30 percent in recent years. Such a strong pace has been reflected in an increasing—albeit still small—contribution to labor productivity growth, and in the rapid expansion of high-tech businesses, notably services based on mobile-phone

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[22] Prepared by Marcello Estevão and Joaquim Levy. Laura Kodres provided valuable suggestions. The authors are grateful to L. Bouscharain, S. Audric, M.A. Estrade, N. Carnot and F. Lequelier for the data provided, without which a substantial part of the paper would not have been possible.

[23] A review of the current research on the contribution of ICT investment to German productivity growth, as well as a discussion of related policy issues, are provided in the Selected Issues paper prepared for the German 2000 Article IV consultation (SM/00/229).

telecommunications and the Internet, which have grown in France as fast as in most European countries.

B. The Experience in the United States

56. It is helpful to begin a study of the new economy in France by examining first the experience of the United States, where the term "new economy" has been used to designate the buoyant economic performance in the 1990s—high output growth with no significant signs of inflationary pressures. To explain this performance, the new economy proponents point to the rapid growth in investment in high-technology equipment in the 1980s and 1990s, which has altered the nature of business and, from a macroeconomic point of view, resulted in higher productivity growth and potential output. Research has focused on trying to link increases in productivity growth to the production of ICT equipment and to its use in other sectors of the economy.

57. An influential analysis of the contribution of information technology to economic growth was undertaken by Oliner and Sichel (2000), who use a neoclassical production function framework:

$$y - l = [\alpha_{ict}(k_{ict} - l) + \alpha_o(k_o - l)] + \alpha_l q + tfp \qquad (1)$$

where y and l represent the growth rate of output and worker-hours, respectively.[24] According to equation (1), there are three factors affecting labor productivity growth. The first is the change in the capital-labor ratio, or capital deepening: the k terms represent capital growth, and the expression in square brackets captures capital deepening of ICT and other types of equipment. The second is the change in labor quality, q, and the third is total factor productivity growth (TFP), which is the productivity growth not directly attributable to the accumulation of production factors. Oliner and Sichel break total factor productivity growth down into three components: the computer producing sector, the semiconductor sector (singled out because it is known to have had very high productivity growth), and the rest of the economy.

58. They find that annual labor productivity growth in the nonfarm business (NFB) sector rose from 1.6 percent in the first half of the 1990s to 2.67 percent in the second half of the decade, an increase of 1.06 percentage points (Table III.1). Of this, capital deepening accounts for ½ of 1 percentage point, practically all from the accumulation of ICT equipment. Total factor productivity accounted for 0.7 percentage points of the acceleration,

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[24] The α terms are output elasticities with respect to the inputs. Under neoclassical assumptions, they are income shares; and assuming constant returns to scale, they sum to one. The *ict* subscript denotes ICT equipment (computers, software and communications equipment), the *o* subscript denotes all other capital goods, and the *l* subscript denotes labor.

with half originating in the computer and semiconductors industries.[25] Thus, the accumulation of ICT capital plus the growth in total factor productivity in the computers and semiconductors industries account for over three-fourths of the labor productivity acceleration in the nonfarm business sector. Still, about one-third of the acceleration is accounted for by total factor productivity growth in non high-tech sectors, which may be linked to the use of ICT technology in those sectors. Other recent research provides broad support for these conclusions, including Whelan (2000) and Jorgenson and Stiroh (1999).

Table III.1. Acceleration in Labor Productivity
(Percentage points per year)

	1991-95	1996-99	Acceleration
Labor productivity growth	1.61	2.67	1.06
Of which due to:			
Capital deepening	0.61	1.10	0.49
IT capital	0.50	0.96	0.46
Hardware	0.23	0.59	0.36
Software	0.22	0.26	0.04
Communication	0.05	0.10	0.05
Other capital	0.11	0.14	0.03
Labor quality	0.44	0.31	-0.13
TFP	0.56	1.26	0.70
Computers	0.13	0.21	0.08
Semiconductors (SC)	0.12	0.39	0.27
Other sectors	0.31	0.65	0.34

Source: Oliner and Sichel, 2000.

59. In another influential study, Gordon (2000) takes a somewhat different approach, breaking down NFB growth by sector, rather than input. After adjusting for cyclical effects, he finds that trend productivity growth rose from 1.5 percent in the 1972–95 period to 2.3 percent in the second half of the 1990s, or an acceleration of 0.8 of 1 percentage point (Table III.2). Of this, according to Gordon, 0.2 of 1 percentage point can be explained by methodological changes in the calculation of real GDP, leaving about 0.6 of 1 percentage point to be explained by economic factors. Gordon finds that essentially all of this increase can be ascribed to the durable goods sector. Since this sector accounts for only about

[25] Note that changes in labor quality tended to slightly lower productivity growth in the second half of the 1990s.

12 percent of U.S. output, he is skeptical that the revival of growth and low inflation could be viewed as a new economy paradigm shift.

Table III.2. Acceleration in Labor Productivity During 1996–99
(Percentage points per year)

	Nonfarm business (NFB)	NFB excluding computer hardware manufacturing	NFB excluding durable manufacturing
Labor productivity growth	2.82	2.42	2.05
Contributions:			
1) Cyclical effects	0.54	0.55	0.62
2) Trend	2.28	1.87	1.43
(Past trend, 1972:2-1995:4)	(1.47)	(1.25)	(1.19)
3) Trend acceleration	0.81	0.62	0.24
3.1) Price measurement and Labor quality	0.19	0.19	0.19
3.2) Structural acceleration	0.62	0.43	0.05

Source: Gordon, 2000.

60. A key difference between Oliner and Sichel and Gordon is cyclical adjustment, which according to Gordon accounts for about ½ of 1 percentage point of the productivity acceleration. Oliner and Sichel, by contrast, argue that there is no need for such an adjustment when examining specifically the contribution of computers and semiconductors to TFP growth, because the productivity of these sectors is largely uncorrelated with the business cycle. A potential source of bias in both studies is due to the fact that productivity growth in the services sector, which dominates nondurables production, is notoriously poorly measured. If productivity in this sector has accelerated, but this has not been captured in the data, then the estimates of both studies would be too low. In particular, Gordon's conclusion that productivity growth has been largely confined to the durable goods sector would have to be modified.

C. Productivity Growth in France

61. This section examines the contribution of computers and software to labor productivity in France, along the lines laid out by Oliner and Sichel.[26] The focus is on the nonfarm business sector, although due to data constraints the financial sector is excluded. Several features distinguish France from the United States. Notably, the patterns of labor

[26] Owing to data limitations, the accumulation of communications equipment is not included in this analysis. This is probably an important omission, about which more is said below.

productivity growth and capital accumulation have differed for a large part of the 1990s, the computer hardware manufacturing industry is much larger in the United States than in France, and unemployment has fallen appreciably in France since 1997, while the U.S. rate has been more stable although much lower. These differences have important implications for the analysis of French productivity, especially when set against the backdrop of the U.S. experience.

62. The decomposition of labor productivity in the French nonfarm, nonfinancial business sector is laid out in Table III.3.[27] Productivity growth fell from 2¼ percent a year in the late 1980s to about 1½ percent a year in the 1990s and, unlike in the United States, did not accelerate in the second half of the 1990s.

Table III.3. Labor Productivity Growth in the French Nonfarm, Nonfinancial, Business Sector
(Percentage points per year)

	1986-91	1992-96	1997-99
Labor productivity growth	2.3	1.6	1.4
Of which due to:			
Capital deepening	0.9	1.1	0.2
Adjusted for capacity utilization	0.9	0.9	0.5
IT capital (unadjusted)	0.1	0.1	0.2
Labor quality	0.1	0.1	0.1
TFP	1.3	0.4	1.2
Adjusted for capacity utilization	1.3	0.6	0.9

Source: IMF staff calculations based on original data from the INSEE and DARES.

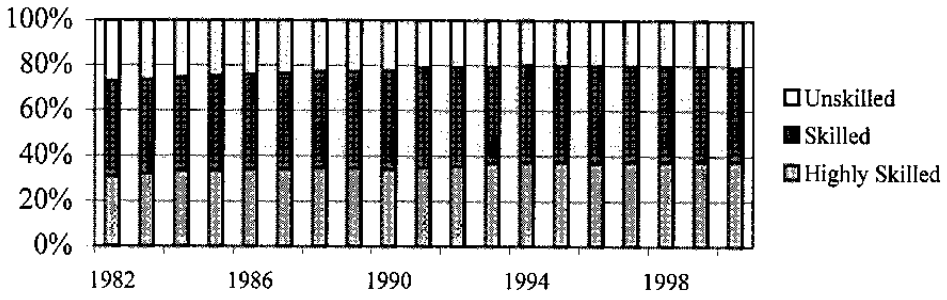
63. Before analyzing the contribution of technology and capital accumulation to this path, it is important to note that labor productivity growth in France has been affected by a steady decline in average hours worked. In addition to a break in 1982—when the statutory workweek was reduced to 39 hours—hours worked have exhibited a secular decline

[27] Labor productivity was calculated using the national statistical institute's (INSEE) data on sectoral GDP and estimates of total hours worked provided by the research office of the Labor Ministry (DARES). Output of the nonfarm, nonfinancial business sector was obtained by chain-weighting the sectoral data using prices of the previous year as a base. The figures in Table III.3 refer to different aggregate variables than the figures reported in Box 3 of the staff report for the French 2000 Article IV consultation.

throughout the 1980s and 1990s.[28] This decline reflected in part a rise in the share of part-time work, which accounted for about 16 percent of total employment by the end of the 1990s.[29] Such a structural change could be partially responsible for the deceleration in labor productivity in the 1990s if part-time work were concentrated in lower productivity jobs or in jobs that are less capital intensive.

64. The qualification of the labor force has increased substantially, with the share of workers with higher education rising from 10 percent in 1982 to close to 25 percent in 2000. This increase is due in part to public policies aimed at raising education levels since the mid-1980s, and to the difficulties faced by young workers in finding a first job. In addition, the continued increase in the share of high-skill jobs (Figure III.1) have also boosted labor quality measures.[30] As a result of both effects, as shown in Table III.3, changes in labor quality have had a positive impact on labor productivity growth. However, its contribution has remained unchanged and small. Thus, the cause of the deceleration in labor productivity in the 1990s lies elsewhere.

Figure III.1. Distribution of Jobs by Skill Level



Source: Audric et al. (1999)

[28] The statutory workweek in large firms was further reduced to 35 hours in January 2000. Small firms will follow suit in January 2002.

[29] The evolution of worked hours is only partly captured by official statistics. However, a number of researchers in both INSEE and DARES have constructed estimates of the effective work week (e.g., Accardo, Bouscharain, and Jlassi (1999), and Audric, Givord, and Prost (1999)).

[30] See Audric et al. (1999) and Bisault, Destival, and Goux (1994); the most recent ranking of jobs by skills is listed in the former.

65. The decline in labor productivity during the early 1990s can be interpreted as a cyclical phenomenon: all of the decline can be accounted for by a sharp reduction in TFP growth while capital deepening remained roughly constant. During the rest of the decade, when economic activity bounced back, TFP growth also increased but labor productivity growth was held down by a slowing in capital deepening. The apparent cyclicality in TFP growth can be reduced if appropriate measures of labor effort and capital utilization are used to translate the measured use of production factors into actual use. Table III.3 shows an alternative breakdown between capital deepening and TFP growth when the rate of capacity utilization is used as a proxy for capital utilization.[31] As may be seen, changes in the rate of capacity utilization dampen the cyclical behavior of TFP somewhat but the lack of measures of labor effort may still be contaminating TFP growth as well as labor productivity growth.

66. Leaving aside the cyclical behavior in TFP growth and focusing on structural changes, the drop in labor productivity growth at the end of the 1990s was driven by a decline in the contribution of capital deepening from 0.9 percent a year during the previous economic boom to 0.2 percent a year after 1997 (in contrast, the contribution of capital deepening rose from 0.6 percent to 1.1 percent in the United States in similar periods).[32] This difference appears to be related to a shift toward higher labor utilization on the heels of a moderation in labor costs, due both to wage moderation and targeted reductions in employers' social security charges. Such a shift contrasts with the trend to capital deepening observed for most of the 1980s, which has in part been attributed to the increase in labor costs observed in the 1970s and early 1980s. In fact, the rate of overall capital accumulation halved from 1990 to 1993 and then stabilized at this lower level (around 2 percent a year). Thus, after the surge in the capital to output ratio observed in the early 1990s—which reflected the combination of a rapid buildup of capital in the late 1980s and the decline in GDP growth in 1991–93—the growth rate of this ratio has since languished (Figure III.2). The counterpart of a deceleration in capital deepening has been the "employment rich" economic recovery observed since 1997.

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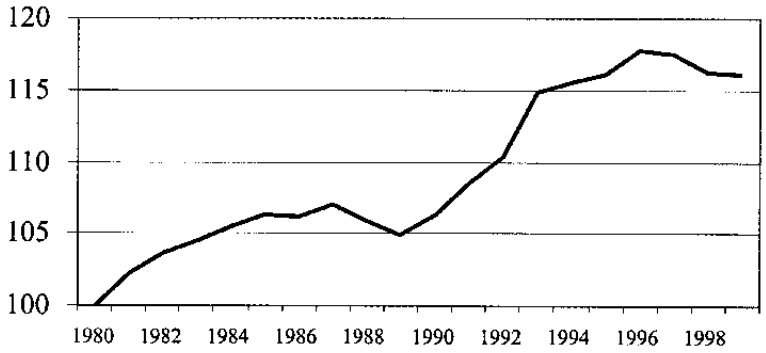
[31] There are two measures of capacity utilization for France, though both are restricted to industrial sectors. The INSEE measure used in this study is based on national surveys.

[32] The calculation of the contribution of capital deepening relies mainly on preliminary estimates for the nonfarm nonfinancial business sector provided by INSEE; these estimates may change with forthcoming revisions of the capital stock series.

Figure III.2. Capital/GDP Ratio in the Nonfarm, Nonfinancial Business Sector (1980 = 100)



Source: Staff calculations based on INSEE data.

67. The slowing in capital deepening did not, however, extend to computing equipment and software. On the contrary, as a result of strong computer and software investment, an increase in capital deepening in this category contributed positively to productivity growth in the second half of the 1990s. Investment in computers and related products decelerated dramatically in the early 1990s but then rebounded strongly in the late 1990s to the same rates posted in the late 1980s.[33] Software investment has grown strongly and continuously for several years, and has posted a 16½ percent average annual real growth since 1997 (possibly driven to some extent by precautionary investment due to Y2K concerns and the introduction of the euro). As a result, a much larger share of the economy's resources are devoted to the acquisition of computing equipment and software in the late 1990s than in the early 1980s: expenditure on computers and software was about 17 percent of all non-residential investment in 1999, compared with less than 5 percent in 1980 (Table III.4).

68. Nevertheless, the impact on productivity growth of computer and software investment has been only some 0.2 of 1 percentage point, as shown in Table III.3. The apparent puzzle between this finding and the investment figures can be reconciled by the still very low installed base of this type of capital. It is worth noting, however, that the data used here do not include accumulation in other types of ICT capital, particularly communication equipment. Adding an estimate of the contribution of communication equipment (using Cette et al. (2000)) would raise the contribution of ICT capital deepening to productivity growth in 1997–99 from 0.17 of 1 percentage point to about 0.25 of 1 percentage point.

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[33] For France, as the United States, data for computer investment take into account quality improvements. Until end–1998, expenditures on computers are deflated by the quality-adjusted price for computer investment calculated by the U.S. Bureau of Economic Analysis; after than, the INSEE uses its own adjustment.

Table III.4. Investment in High-Technology Equipment

Share (percentage) in Non-Residential Gross Fixed Capital Formation of:			
	Electric and electronic equipment		Software
	Total	Computers and related products	
1980	9.09	2.14	2.55
1985	15.35	4.05	5.22
1990	21.22	5.69	5.41
1995	19.30	4.74	5.99
1999	25.06	5.42	11.86
Percent change (annual rate) of real expenditures in:			
1980-90	13.90	28.94	8.39
1990-99	8.16	16.31	11.29
1997-99	17.03	28.94	16.63

Source: IMF staff calculations based on INSEE data.

69. The information needed to decompose TFP developments along the lines of Oliner and Sichel is not readily available for France. However, their results depend on the size of the computer hardware and semiconductor industries vis-à-vis the whole economy. Although France has strengths in some segments of the ICT sector (Box III.1), the share of computer and semiconductor output in total output is significantly smaller in France than in the United States. For instance, as a ratio to GDP, computer and semiconductor production in France is about half that in the United States. This suggests that the impact of productivity gains in the high-tech sector have been more limited in France than in the United States.

D. Policy Issues for the New Economy in France

Labor Markets

70. The emergence of a new economy will, as the ICT sector expands, probably increase the demand for skilled labor. French authorities estimate that ICT industries already employ 700,000 workers (Table III.5), and that employment growth in ICT industries averaged 3.5 percent in 1998–99 (versus about 2 percent for the economy as a whole). Looking forward, the demand for network skills in France has been estimated to exceed 150,000 workers by 2002, although this is only about one-third of the estimate for Germany (Table III.6).

Box III.1. Selected Aspects of France's Position in ICT Industries

France ranks well in ICT goods and services production in Europe, but according to French and OECD trade data, France's strength lies prevalently in large telecommunication equipment rather than in computers or electronic goods. Furthermore, within Europe, France is particularly strong in the production of telecom and IT services while IT hardware production is relatively low when compared with other OECD countries.[1] As a counterpart of the relatively low hardware production, imports of computers exceed exports by a large margin.

IT Market in Selected OECD Countries, 1997

	1997 level (US$ billion)	Breakdown (As a percentage of total market)		
		Hardware	Packaged	IT service
OECD	659,232	45.2	16.4	38.4
France	33,425	35.4	16.9	47.7
Germany	43,662	44.8	18.8	36.4
United States	316,634	43.8	17.1	39.2

Source: OECD.

Turning to the industrial organization of the French ICT sector, there are several large ICT firms in France, but none is among the 3 top world companies in the sector. There are three major ICT manufacturers in France: Alcatel, STMicroelectronics, and Thompson. Alcatel has a strong position in communications and is likely to earn a substantial number of international orders for the installation of the UMTS infrastructure in Europe. However, its position as a producer of phone sets is behind that of Motorola (United States), Nokia (Finland), and Ericsson (Sweden). STMicroeletronics, a semiconductor maker, has performed well, but is only the eighth largest world producer in its field. France has a number of strong IT services companies, reflecting the country's high rank in the trade of ICT services. The leading French IT service company is CAP-Gemini which became the fifth world company in this field following the merger with U.S. Ernst & Young's consulting company. Finally, France does not have a large producer of prepackaged software.

R&D expenditure is generally linked to the number of newly registered patents and both are good indicators of the future economic prospects of a given sector. In general, the share of French GDP devoted to R&D expenditure is within the EU average, and the country ranks fifth in the world in terms of overall patent applications. More specifically, R&D investment by the ICT sector may be a good approximation of the degree of high-tech innovation in a country. According to OECD data, ICT industries accounted for about 23 percent of total business expenditure in R&D in France in 1996, substantially less than in the top countries, Finland and Ireland—respectively, 41 percent and 36 percent in 1997—but about the same as in the United States (22 percent in 1996) and more than in any other major European country with available data—Germany (14 percent in 1995), the United Kingdom (10.6 percent in 1997), Italy (21 percent in 1997) and the Netherlands (16.2 percent in 1996), among others. As a counterpart of the R&D effort, ICT patent applications have picked up recently and now account for about one-third of total patent applications.

[1] IT includes hardware (computer system central units, storage devices, printers, bundled operating systems and data communications equipment), software and services (IT consulting, implementation services, operations management, IT training and education, processing services and IT support services). The ICT aggregate equals IT plus telecommunications services and equipment.

Table III.5. Employment in the ICT Sector in France
(In thousands of workers)

	France 2000 (INSEE)	France 1996 (OECD)	U.S. 1998 (OECD)
ICT manufacturing	260	40	2,049
Computer and related services	220	160	1,600
Other ICT services	190	90	1,514
Of which, telecommunications	160		1,056
Total[1]	670	290	5,163

Source: OECD; Ministry of the Economy, Finance and Industry
[1]The Ministry of Labor estimated employment in ICT industries in France at 785,388 in January 1999.

Table III.6. Demand and Supply of Networking Skills in 2002
(In thousands of workers)

	Demand	Supply	Gap
France	156.2	89.2	67.0
Germany	449.7	261.5	188.2
Italy	155.4	96.6	58.8
Spain	76.8	50.7	26.1
United Kingdom	346.3	264.5	81.8

Source: IDC, 1999.

71. These forecasts are consistent with ancillary evidence. For instance, the expansion of the ICT sector has, in other countries, been linked to an increase in the demand for skilled labor (Autor, Katz, and Krueger, 1998; Machin and Van Reenen, 1998). In part, this reflects the technology of production, but in addition the use of information technology changes business practices, including management procedures and the services offered (Bresnahan et al., 1999). As a result, the mix of skills demanded by innovative firms differs from that in non-innovative firms. In France, more than half of all workers already use computers at work,[34] and innovative firms are more likely to hire skilled workers (Coutrot, 2000; Figure III.3).

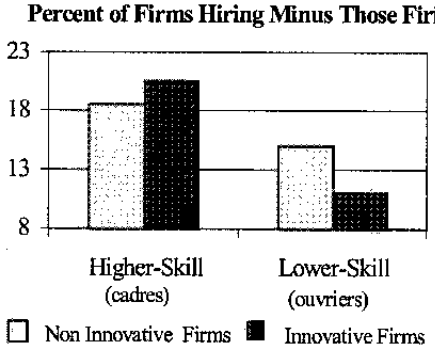
72. Labor market institutions in France appear to have already been moving largely in the direction of better meeting the flexibility needs of the new economy. In particular, there has

[34] This share ranges from less than 20 percent for non-skilled workers in the industrial sector to 90 percent for managers and engineers. Overall, the use of IT at work in France seems as intense as in the United States (OECD, 2000; Cézard et al., 1998).

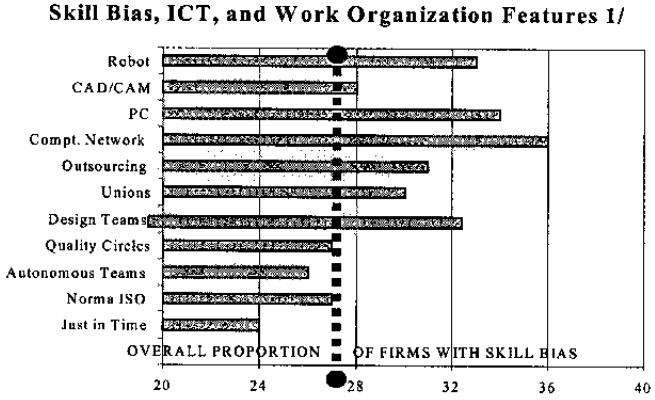
been a marked increase in fixed-term, part-time, and temporary work.[35] Also, the introduction of the 35-hour workweek has opened up negotiations over work practices, potentially increasing firms' ability to benefit from an adaptation of work arrangements to the introduction of new technologies. Finally, Coutrot (2000) and Bué and Rougerie (1999) report the team-based work is spreading, and that workers perceive that they have greater autonomy and responsibility.

73. One key implication of the ongoing change in the mix of skills demanded by employers is that education and training institutions must adapt to market needs. In France, there is no apparent obstacle to an increase in the supply of training in this area. Indeed, although the educational system in France is mostly public, about one-third of workers pursue professional training every year, mostly sponsored by firms which have a legal

Figure III.3. Differences in Employment Policies of Innovative and Non-Innovative Firms



Source: Coutrot (2000)



1/ Percentage of firms with a skill bias according to the presence of ICT or innovative work-organization features.

[35] Regarding the latter, as shown in Estevão and Lach (2000), temporary workers account for an important share of employment in U.S. high-tech firms. Furthermore, basic training provided by temporary-work agencies has opened the door to a first job for a sizable number of workers.

obligation to provide such training. The French authorities have focused on promoting computer literacy among disadvantaged groups, strengthening the ICT curriculum in high schools, and revamping the skill accreditation system. (Box III.2 compares this response with that of Germany and the commitments of the Lisbon Summit.)

Measures to Stimulate Entrepreneurship

74. The development of the new economy has, in the United States, been closely linked to entrepreneurship, and the French authorities have taken a number of steps to promote small business formation. In the last three years, the government has lightened the tax burden on start-ups, raised the threshold for firms required to file VAT declarations, exempted new companies from registration taxes, aligned the tax rates on the sale of businesses to the EU average, and reduced and simplified social security taxes paid by new firms. In addition, the incorporation and registration of firms has been simplified (firms can now be registered on-line), bankruptcy laws are being revised, relevant courts (*tribunaux de commerce*) are being reformed, and tax breaks for investors in start-ups and tax credits for firms investing in R&D have been introduced.

75. In the United States, stock options have become an important form of payment not only for well-established firms in the ICT sector, but also for start-up firms with little cash flow but much promise. In France, a special tax regime for stock options issued by new companies was created (*bons de souscription de parts de créateur d'entreprise; BSPCE*), with a view to relaxing the tax regime applied to ordinary stock options. The restrictions attached to this type of stock option, which is subject to lower taxes, were relaxed in 2000. (See Box III.3 for a comparison of the treatment of stock options in France, the United Kingdom, and the United States.) On the other hand, the taxation of normal stock options has become more stringent since 1995: in May 2000, for instance, the tax rate on gains on standard stock options rose from 40 percent to 50 percent.

76. There are a number of schemes to provide funds to innovative start-up firms (Box III.4). The French government has also channeled public funds to small firms and rewarded innovation. The government has used state-owned financial institutions such as its Development Bank (BDPME) and the state-controlled *Caisse des Dépôts et Consignations* (CDC) to distribute loans and provide guarantees to private banks that lend to innovative firms. It has also distributed a number of financial rewards to firms and individuals presenting innovative projects, and has facilitated the creation of firms by researchers affiliated to universities and other public institutions.

Product Markets

77. Deregulation has been instrumental in ensuring the price decline of ICT products, fostering their penetration in the marketplace. Such a mechanism is important to explain not only the recent accumulation of ICT equipment but also the explosion in ICT services. For example, deregulation and entry of new firms have contributed to declines in prices of

Box III.2. Europe and the Internet: The Lisbon Summit and the French and German Responses

The Lisbon Summit pointed to a number of initiatives that would be needed to increase Internet access:

- A deadline was suggested for giving all workers the chance to become digitally literate through special training. To attain this objective, the Summit suggested a 50 percent increase in IT training places and courses by the end of 2002, and the establishment of a European certificate for basic IT skills.
- The Lisbon Summit also requested that all schools in the EU be granted access to the Internet and multimedia resources, and that research institutions and universities be linked to a high speed trans-European network for electronic scientific communications by the end of 2001 (only about one-third of EU schools are currently linked to the Internet or have PCs). Teachers should receive adequate IT training by the end of 2002.

The responsibility for achieving these goals falls mainly on member states, although European funds (structural and social funds) were expected to be directed to help these efforts. Within this framework, the 2000 French Employment Plan envisages that:

- The Agency for the Professional Training of Adults (AFPA) will include computer training modules in every program offered to job seekers, and is to hire 4,000 instructors for this purpose.
- Job seekers will have free access to the Internet in every branch of the national employment agency (ANPE), with 500 *emplois jeunes* being assigned to help these Internet users.
- Another €100 million will be made available in 2000 to help local authorities to connect schools to the Internet (€17 million were already transferred in 1999).
- Funds will be set aside to favor distance training, to establish the basic computer skills certificate, and to revamp the structure of professional accreditation. A bill regarding this was recently sent to Parliament.
- The age restriction in one of the three programs providing for apprenticeship-like training was relaxed. These programs, however, are likely to continue to aim mostly at non-ICT training.[1] More generally, European Structural Funds have been channeled to the ICT training of unskilled workers.

The German plan in some ways anticipated the Lisbon Summit, and includes:

- the goal of providing schools and universities with multi-media PCs and Internet connections by 2001;
- doubling the number of multi-media companies from 1,500 by 2001; and
- increasing places for IT training to 40,000 by 2002 to satisfy an additional demand, projected at 250,000 jobs by 2005; meanwhile, special visas would be issued for temporary IT workers from abroad.

The German government is also stimulating small and medium-sized firm use of the Internet and, in particular, adoption of e-commerce. Some 24 regional "centers of expertise" are also available to help start-ups. The overarching objective of the government is to achieve a leading international position in IT by 2005.

[1] Most of the about 200,000 enrollees in the largest apprenticeship program (*apprentissage*) work in traditional sectors (e.g., retail, hotels, hairdressers). Enrollees in other programs (*contrats de qualification et d'adaptation*) are involved in a broader range of activities, and typically have a higher educational level, but the vast majority of these contracts are also related to the trade sector.

Box III.3. Taxation of Employee Stock Options Plans

Country	Event			Other Constraints:	
	Attribution	Exercise	Sale of stock	Holding Period	Ceilings
France Enterprise Stock Options Plans (ESOPS) employees and directors	Difference between acquisition cost and value at exercise taxed as income tax rates + social contributions and CSG-CRDS	Holding period of option < 4 years: basic rate of 40 percent +10 percent of social contribution, when option is sold (30 percent +10 percent for first 1 million franc of gains) > 4 years: 30 percent+10 percent (26 percent for first F 1 million)	Gains after conversion are taxed at 26 percent (as other capital gains from financial instruments), except sales that are less than F 50,000 a year	Four years between attribution and exercise two years after exercise	No ceiling
France BSPCE: employees and managers – new firms, including listed in high-growth markets	Exempt	Exempt	Worker's time at the firm > 3 years: 16 percent + 10 percent of social contributions < three years: as 30 percent + 10 percent of social. Contributions.	No minimum period for exercise or sale of stock	No ceiling
United States Incentive Stock Options (ISO)	Exempt except if employee owns more than 10 percent of the capital of the firm	Holding period > 1 year minimum: 20 percent Holding period < 1 year minimum: as normal income	Taxable as ordinary capital gains (20 percent)	Option: two years after attribution Stock: one year after exercise	US$ 100,000 plus credit from previous years
United States Stock Purchase Plans ESPP	Market value, taxed as ordinary income up to a maximum of 15 percent of underlying asset	Same as ISO	Same as ISO	Same as ISO	US$ 25,000
United Kingdom Company share options plans (CSOPs)	Exempt at attribution, except if transfer is at price below of traded price of stock	Exempt if exercise occurs between 3 and 10 years of attribution and if there is a delay of 3 years between successive exercises	As ordinary capital gains: taxable amount deducted by cumulative 5 percent a year after 3rd year of holding the option	No	£ 30,000
United Kingdom Plans for 10 key employees in SMEs	Exempt	Exempt if holding period prior to exercise > 3 years	Taxable amount deducted by cumulative 6 percent a year, and exempt after 7th year the option is held.	No	£ 100,000

Source: French Ministry of the Economy and Finance

Box III.4. Mechanisms for Fostering Investment in Start-Ups in France

Seed Money (*capital d'amorçage*), Creation, Post-creation, and Development funds: Seed money is invested prior to the creation of the firm; creation funds are invested in a new firm with a view to developing the target product; post-creation funds are invested after the product development phase but before the product is produced or sold; and development funds are invested after the firm has a positive cash flow, with a view to increasing sales or introducing a new product.

Capital Investissement and Capital Risque: The first refers to all investment in non-listed stock, and the second mainly to investments in start-ups.

***Fonds Communs de Placement à Risques* (FCPR):** Created in 1989, these funds invest at least 40 percent of their assets in stocks, convertible bonds, or shares in non-listed companies. Individuals are exempt from taxes on capital gains from these funds. In 1998, the law allowed FCPRs to hold shares of other FCPRs, with a view to diversifying risks and allowing the reallocation of capital (one fund selling positions to another). Some of these funds are geared toward "sophisticated" investors, while others can offer shares to the general public. FCPRs are estimated to have collected about €500 million.

***Fonds Communs de Placement dans l'innovation* (FCPI):** These are FCPRs that must invest at least 60 percent of their assets in "innovative," non-listed companies. Such companies must have fewer than 500 employees, be held mainly by individuals, and whose R&D outlays exceed sales. Capital gains made by FCPIs are tax exempt if shares are held for more than five years. In addition, individuals can deduct from their taxes one-fourth of the funds they invested in such vehicles (below a ceiling of about €25,000 for a couple).

***Fonds Public de Capital-Risque* (FPCR):** These funds co-finance innovative firms, complementing the capital provided by FCPRs (usually, the FPCR's share is 10 to 20 percent of the total investment). The FPCR was funded with the receipts of the privatization of France Telecom (about €100 million), and resources of the European Investment Bank (about €50 million). These funds have helped raise about €1 billion in capital for small firms.

The *DSK* insurance contracts: Created in 1998, these attract special tax treatment, with income being essentially exempt from taxes if the premiums are invested in stocks listed in high-growth stock markets, non-listed stock of non-financial firms, FCPRs, or venture capital firms. At the end of 1999, DSK contracts had invested about €12 billion.

***Business Angels*:** These are venture capitalists who may in principle exempt some of their income from taxes by reinvesting it in new firms. The actual tax position depends on the time the "angel" has been involved with the company, the proportion of the capital invested relative to the total wealth of the individual, and the type of enterprise (which has to be owned mostly by individuals, and created *de novo*, rather than being a spin-off, etc.). Individual investors may also benefit from a 1994 law that permits, under certain circumstances, the deduction from income taxes of investments made in small companies. This mechanism is credited with having helped to raise €400 million, and its coverage is being extended. In contrast with tax regulation covering partnerships in the United States, it does not allow the deduction of losses from taxable income.

telecom services, which since 1996 have declined by one-sixth in France and one-fourth in Germany. In Europe, more than 40 operators have entered long distance markets and more than 220 are currently providing local calls. These price declines appear to be an important factor explaining the increase in Internet penetration in Europe in recent years (European Commission, 2000). However, the European Commission has identified the need to deregulate the so-called local loop (wires to the customer) in France, which in this regard is behind Germany, Italy, and the Netherlands.

78. The diffusion of Internet-based businesses and new software is likely to be a major factor in the development of the new economy in France. In fact, a number of studies by consulting firms and business specialists argue that increases in total factor productivity growth in the coming years are expected to stem largely from the diffusion of the Internet. Several of these studies attribute part of the explanation for the pickup in U.S. total factor productivity growth to its competitive edge in ICT-based services—although there are no direct estimates of how much these services have affected business efficiency. Therefore, further development of business-to-business electronic commerce (B2B) and easier access to the Internet through mobile phones and other small devices are expected to be particularly important for future total factor productivity growth in France. Other work by consulting companies and government agencies suggest that the impact on future GDP growth of the expansion in B2B commerce is likely to be far from trivial.[36]

79. The prospect for such an expansion in ICT services in France is good. As elsewhere, the Internet is spreading rapidly in France—the number of people with access rose by 75 percent in 1999—though the rate of access is lower in France than in the United States or the Nordic countries. This may in part be related to the fact that household computer use in France, though rising, is also below that in the United States and the Nordic countries, although it is broadly comparable to that in continental Europe (Table III.7). On the other hand, France has a relatively large share of European e-commerce (Table III.8), due largely to the Minitel system.[37]

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[36] Goldman Sachs researchers have recently studied the impact of a one-off decline in costs from the adoption of B2B in the United States, France, Germany, United Kingdom, and Japan to long-term output growth. Arthur Andersen Consultants and the BIPE/French Ministry of Industry analyzed in more detail the impact of B2B practices on French output growth for the period 2000–03. All of these studies used information from input-output tables in their simulations. The estimated final effect of e-commerce and B2B on annual French GDP growth in the next few years range from 0.25 to 0.90 percentage points depending on the particular study and the assumptions used.

[37] The Minitel is an electronic network which began in the 1980s based on inexpensive terminals linked to large computers through the telephone system. More recently, the system can be accessed via home computers.

Table III.7. Percent of Households Owning PCs, Mobile Phones, or Linked to the Internet

	PC	Internet	Mobile phones (percentage of total lines, 1999)
France	22 (1999)	5-10	25
Germany	...	10	21
Spain	...	8	28
Italy	18 (1997)	8	42
United Kingdom	58 (1998)	18	29
Nordic Countries	55 (1998)	35	53
United States	42 (1998)	46	24

Sources: French Authorities; OECD; and Merrill Lynch.

Table III.8. Indicators of E-Commerce in Europe

	E-commerce transactions in 1999 (In millions of euro)	Number of secured servers in 2000
France	1,644	1,058
Of which: Minitel	1,320	...
Germany	1,125	2,835
Italy	182	619
Sweden	218	631
Netherlands	171	462
Spain	66	619
United Kingdom	924	3,243
United States (1998)	11,500	47,056

Source: L'expansion; planete.commerce.com; OECD.

80. The growth in ICT activities in France has been heavily linked to the usage of mobile telephones, an industry in which Europe has secured a leading position. The number of subscribers in Europe exceeds that in the United States, and is expected to reach 200 million by 2001. The European standard for mobile phones has been recently adapted to carry Internet data, and phones using a new protocol are already in the market. They are seen as a first step toward ample access to the Internet through mobile phones, to occur in several stages. The most advanced type of access in sight will be offered by the Universal Mobile Telecommunications System (UMTS), licenses for which will be sold in France in 2001.

81. E-banking and e-brokerage are also growing in France. Payment systems are increasingly based on digital technology, and the rapid growth of household financial assets—with the corresponding demand for portfolio management and trade—has put the financial industry among the top IT investors. Nevertheless, Internet banking is less

widespread in France than in Germany or the Nordic countries (Table III.9), and French banks lag other EU banks with respect to cross-border e-bank strategies. Regarding e-brokerage, recent estimates point to only 200,000 accounts in France, compared with some 10 million in the United States. This difference reflects factors other than those related directly to the new economy, however. In particular, stock ownership is narrower in France than in the United States and prices for executing trades are higher. Indeed, lower trading costs in Germany have spurred trading there, including by attracting French customers (Table III.10).

Table III.9. Penetration of PC and Internet Bank
(In thousands of accounts)

	Total	PC banking	Internet		
			June 1999	December 1999	Percent of total (December 1999)
France					
BNP-Paribas	5,300	400	65	120	2.3
Crédit Lyonnais	6,000	500	40	80	1.3
Société Générale	4,000	500	50	120	3.0
Germany					
BHV	4,000	0	190	270	6.8
Commerzbank	3,500	10	190	220	6.3
Deutsche Bank	6,800	70	120	180	2.6
Dresdner Bank	4,000	300	72	100	2.5
United States					
BankOne	9,000	...	350	500	5.6
Net-Bank	50	...	39	50	100.0
Wells Fargo	15,000	...	900	1400	9.3

Source: Salomon Smith Barney.

Table III.10. Main E-Brokers in France

Brokers	Starting of E-operations	Accounts (In thousands)	Control
Fimatex	1996	38	SocGen
e-Cortal	1998	82	BNP Paribas
Self Trade	1998	11	(Swedish)
ConSors France	1997	5	(German)
ABS	1997	3	XoedBourse
Bourse Direct	1997	3	Founders
CPR e*Trade	1997	11	CPR
Ferri	1998	27	BBLambert
WEBroker	1999	...	CCF

Source: AGEFI.

Financial Markets

82. In stock markets, the capitalization of digital firms in the United States has risen dramatically in the last few years. In aggregate, such companies have a market value close to US$5 trillion and account for about half of the market capitalization of the top 100 listed companies. In Europe, this share is still only about one-third, and none of the largest companies is in information technology proper—they are all telecommunication companies (Table III.11). Moreover, despite recent growth, the German and French high-growth stock markets are still dwarfed by the U.S. NASDAQ. Venture capital, which also remains small in comparison with the United States, has grown by more than six-fold in 1995–98. In terms of attracting venture capital, France ranks third in the EU, behind the United Kingdom and Germany.

Table III.11. Size of Selected Stock Markets at the Beginning of October 2000
(In billions of euros)

	Capitalization	Number of listed firms		Capitalization	Number of listed firms
United States					
S&P 500	14,341	500	NASDAQ	6,369	4,424
France					
CAC-40	1,220	40	Nouveau Marché	33	145
Germany					
DAX	865	30	Neuer Markt	192	318
Europe					
Euro STOXX	2,790	50	EASDAQ	47	63

Source: Bloomberg.

83. The still small capitalization of stock markets and small scale of venture capital in France do not seem to be linked to problems specific to the structure or functioning of financial markets. The liberalization of these markets since the mid–1980s has been extensive and accompanied by the modernization of the financial infrastructure. French firms have been increasingly responsive to minority shareholders—including foreign institutional investors—and focused on increasing shareholder value and the transparency of disclosures and reports. In this respect, the government has also contributed by establishing an accounting committee (*Comité de la réglementation comptable*) and by heightening the profile of regulatory bodies and competition authorities. Recent changes in the regulation of takeovers were also intended to improve the functioning of the market for corporate control.

E. Conclusions

84. The evidence of the emergence of a new economy in France is still mixed. Labor productivity growth has been lower in the last three years than it was during the upswing phase of the last cycle in the late 1980s. However, the effects of desirable structural changes

that have led to increased employment may be temporarily masking an underlying increase in productivity growth driven by the adoption of new technology. In addition, the large contribution of high-tech production to growth in the United States is bound to be more muted in France, since this sector is relatively small. Also, the contribution to productivity growth of the accumulation of IT equipment and software has increased recently but remains very modest, only about 0.2 of 1 percentage point. The small size of this contribution reflects the still small stock of high-tech capital in France, but if current rates of investment hold up the macroeconomic impact of the new economy can be expected to rise substantially over time.

85. There are indications that France is not at the forefront of the new economy. For example, the penetration of mobile phones, home computers, and the Internet lags behind that in several industrial countries; although the demand for network skills is expected to increase substantially it is, as of now, lower than in Germany; and the market capitalization of the high-growth stock market in France is only about one-eighth that of its German counterpart. Key to a further, rapid development of the high-tech sector are dynamism in labor and product markets, and a continued deregulation of the latter; flexible work and compensation practices; and additional development of vibrant financial markets.

References

Accardo, Jérôme, Laurent Bouscharain and Mahmoud Jlassi, 1999, "Le Progres Technique a-t-il ralenti depuis 1990?", *Economie et Statistique*, No. 323, INSEE.

Audric S., P. Givord, and C. Prost, 1999, "Evolution de l'emploi et des couts par qualification entre 1982 et 1996", INSEE, Working Paper G9919.

Autor, D., L. Katz, and A. Krueger, 1998, "Computing inequality: have computers changed the labor market?", *Quarterly Journal of Economics*, Vol. XCIII, No. 4, November, pp. 1169-1214.

Bresnahan, T., E. Brynjolfsson, and L. Hitt, 1999, "Information technology, workplace organization, and the demand for skilled labor: firm-level evidence", NBER Working Paper No. 7136.

Brookes, M. and Z. Wahhaj, 2000, "The New Global Economy – Part II: B2B and the Internet", *Global Economics Weekly*, Goldman Sachs, February 9.

Bisault, Destival and Goux, 1994, "Emploi et chômage des "non-qualifiés" en France", *Economie et Statistique*, No. 273, pp. 17-27.

Bué, J. and C. Rougerie, 1999, "L'organisation du travail: entre contrainte et initiative", *Dares note 32.1.*

Cette, G., Y. Kocoglu and J. Mairesse, 2000, "Les Technologies de l'Information et de la Communication en France: Diffusion et contribuition à la croissance", mimeo.

Cézard, M. and L. Vinck, 1998, "En 1998, plus d'un salarié sur deux utilise l'informatique dans son travail", DARES, 98.12, No. 53.2.

Coutrot, 2000, "Innovation et gestion de l'emploi", *Premières Informations et Premières Synthèses* No. 2000.03/12.1, DARES <http://www.travail.gouv.fr/etudes/etudes_f.html>

Estevão, Marcello and Saul Lach, 2000. "The Evolution of the Demand for Temporary Help Supply Employment in the United States", in *Non-Standard Employment Arrangements and the Changing Labor Market: Dimensions, Causes, and Institutional Responses*, (eds.) Marianne Ferber, Francoise Carre, Steve Herzenberg and Lonnie Golden, IRRA.

European Commission, 2000, *Bulletin of the European Union*, No. 3.

Gordon, Robert J., 2000, "Does the 'New Economy' Measure Up to the Great Inventions of the Past?" *Journal of Economic Perspectives*, forthcoming.

INSEE, 1999, "Les technologies de l'information et de la communications: 5% du PIB," INSEE Première, No. 648, May.

_____, 2000-2001, "La diffusion des nouvelles technologies de l'information et de la communication dans l'économie" in *L'économie française,* édition.

Jorgenson, Dale and Kevin Stiroh, 1999, "Information Technology and Growth." *American Economic Review,* pp. 109-115, May.

Machin, S., and J. Van Reenen, 1998, "Technology and changes in skill structure: evidence form seven OECD countries," the Quarterly journal of economics, Vol. XCIII, No. 4, November, pp. 1215-1244.

OECD, 2000, Information Technology Outlook 2000, Paris.

Oliner, Stephen and Daniel Sichel, 2000, "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" *Journal of Economic Perspectives,* forthcoming.

Snower, Dennis, 1999, "Inequality of earnings", CEPR Working Paper No. 2321.

Solow, Robert, "Technical Change and the Aggregate Production Function." *Review of Economics and Statistics,* No. 39, 312-320.

Stiroh, Kevin, 1998, "Computers, Productivity, and Input Substitution." *Economic Inquiry,* No. 36, 175-191.

Whelan, Karl, 2000, "Computers, Obsolescence and Productivity." *Finance and Economics Discussion Series Paper No. 2000-6*, Federal Reserve Board.