Economic Prosperity Recaptured: 
The Finnish Path from Crisis to Fast Growth

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Chapter 1: Introduction

The period since late 1980’s goes to economic history as a time of major changes in both the European and world economy. There were several notable developments. The breakdown of socialism in Eastern and East-Central Europe was a dramatic event in the European political landscape. It also initiated major structural changes in Europe. The most significant changes naturally occurred within the former socialist countries themselves, but also the neighboring countries were affected.

Economic integration in the European Union (EU) deepened in line with the creation of the single market program. The EU enlargements were important events for Europe. First, three EFTA/EEA countries (Austria, Finland and Sweden) sought close integration with European Union and became members of the EU in 1995. The second enlargement occurred in May 2004 when ten new members joined the EU, including eight East-Central European and two Mediterranean countries. Clearly, the latter enlargement has been a big change and its effects are only now beginning to be realized in the whole EU area. As is well known, further enlargements of the EU are also emerging. Bulgaria and Romania and later possibly Croatia and Turkey are likely to become members of the EU in the coming years.

In the world economy the general tendencies of liberalization and deregulation, often called “globalization”, have been a major economic force since the late 1980’s. It is important to focus at the liberalization and deregulation of the national financial systems, which have had major macroeconomic consequences in several countries, including some economically very successful countries in East Asia and some countries in Latin America. After opening their markets and financial systems to international forces these countries experienced financial crises that, on one hand, led to traumatic short-term economic fluctuations but, on the other, facilitated structural change in the longer term.

Financial crises also occurred in some European countries, including Finland, Sweden and Norway. In Europe, monetary integration has been a central part of the EU single market program. The liberalization of capital movements in the second half of 1980’s
created problems for the European monetary system and its system of fixed exchange rates, the ERM, experienced several currency crises in the early 1990’s. These were eventually overcome and the Economic and Monetary Union (EMU) was established in 1998 with a new currency, the Euro. In the EMU the European Central Bank is in charge of common monetary policy for the eleven member countries of the monetary union at the beginning of 1999 (and twelve members since the beginning of 2001 when Greece joined EMU).

The global economic changes in turn implied major economic and political challenges to individual countries. These challenges were felt particularly strongly in small economies outside the economic core of Europe. An interesting case is Finland, a small country in Northern Europe with a population of just over 5 million people. In this book our aim is to analyze how Finland coped with the major changes in its economic environment. The Finnish economy initially experienced to a boom at the end of 1980’s. Then Finland entered into a deep recession in the early 1990’s. Finally, a strong renewal of economic growth and prosperity was obtained in the second half of the 1990’s.

We will describe and analyze these three relatively different periods and the factors behind the rapidly changing developments. With the benefit of hindsight we can ask whether the macroeconomic policy response to the changing external circumstances was adequate. Moreover, we will use the Finnish experience to test for the effects of financial constraints on the real economy and thereby try to find possible evidence of what is known as the “credit channel” of the monetary system. We will also elaborate the roles that the ICT (information and communication technology) revolution and economic policies played in the resumption of economic growth.

As an initial illustration of the Finnish experiences we briefly look at some key data. Figure 1.1 shows indices for the level of PPP (purchasing power) - adjusted GDP in Finland, Sweden and EU-15 countries.¹ This figure testifies that the economic experiences of Finland in the second half of 1980’s and through 1990’s were indeed

¹ Note that the indices are normalized at 100 for year 1985. Thus, the series cannot be used for comparisons of living standards, i.e. to infer relative levels of, say, PPP adjusted GDP per capita.
dramatic. For instance, Sweden had qualitatively similar but less pronounced developments due to partly similar reasons and importantly, partly different reasons as Finland, which we show later on. Also 15 EU-countries on the average experienced a standstill in growth in the beginning of 1990’s, but clearly, as Figure 1 describes, the overall economic development has been much smoother in the other 15 EU-countries.

As Figure 1.1 partly describes, the Finnish economy first experienced a strong upswing and an overheating of the economy in the 1980’s. In the beginning of 1990’s the developments turned around quite rapidly and an economic crisis emerged as indicated by a major fall in GDP and a rapid rise in unemployment. In the middle of the 1990’s growth resumed and the economy started to grow quite rapidly.

Figure 1.1: PPP-adjusted GDP in Finland, Sweden and 15 EU-countries

![GDP Chart](chart.png)

*Source: Statistics Finland and Eurostat*

Development of unemployment is shown in Figure 1.2. As real GDP dropped about 14 percent from the peak in 1990 to the through in 1993, the rate of unemployment rose from 3 percent in 1990 to almost 20 percent in the beginning of 1994. Since
1994 the economy started to recover and economic growth was quite rapid until the slowdown in the world economy in 2001. In the period 1995-2001 the average rate of GDP growth has been 3.3 percent per annum, which is the second highest rate among the 15 EU-countries. However, in spite of rapid real GDP growth the decrease in unemployment has been relatively slow and it remains at a high level around 7 - 8 percent. Usually, fast economic growth helps to reduce unemployment. This also happened in the Finnish case, but the reductions in unemployment have been thought to be relatively slow. Later on we analyze the issue of why both high economic growth and high unemployment have prevailed simultaneously in the Finnish case.

To repeat, Figure 1.2 presents the seasonally adjusted standardized unemployment rates in Finland, Sweden and EU-15 since 1980. The Finnish and Swedish unemployment rates were much below the European average for most of the 1980s, but in both countries unemployment rates increased rapidly and followed very similar time pattern in the early 1990s.

Figure 1.2: Standardized unemployment rates in Finland, Sweden and 15 EU-countries

![Unemployment Rates Chart](chart.png)

Source: OECD Main Economic Indicators. Before 1988 EU-12 from OECD Employment Outlook.
These two macroeconomic figures show just the tip of the iceberg. The Finnish depression of the 1990’s was the most serious economic crisis in its peacetime history. It was more severe than the depression of the 1930’s in terms of many indicators. In fact, it is the most severe peacetime economic crisis after the World War II in all OECD economies. The 1990s crisis was characterized by many features that do not appear as part of a regular business cycle of a market economy. These are the huge expansion of bank lending as a consequence of financial market deregulation and major inflows of foreign capital during the boom, periods of speculative attacks on the currency, relatively high real interest rates partly due to tight monetary policy, and the emergence of a major banking crisis as part of the depression.

The economic recovery from the crisis of the Finnish economy has been equally remarkable. Economic growth resumed, new firms and industries became prominent and brought affluence to the Finnish society. Finland experienced a dramatic change from a traditional industrial country into a high-tech economy. Figure 1.3 shows the share of high-tech exports in total exports for Finland. In ten years from 1990 to 2000 the share rose from about 7-8 percent to nearly 30 percent, which indicates the transformation of the Finnish economy to a high-technology country.

**Figure 1.3: Share of high-tech exports in total exports**
One part of the success story lies in macroeconomic policies and political developments, as it provided economic predictability and stability to the Finnish economy. We will argue later on that successful macroeconomic management in many, though not all dimensions, has been an important part but, of course, not the whole story of the success in the second half of the 1990s. We will also study structural changes in the economy towards high technology sectors and argue that it has played a large role in the recent Finnish miracle. In the last section of the book we try to assess what are the largest future challenges of the Finnish economy and thereby the problems of macroeconomic management.

In brief, the story of Finland since late 1980s and the 1990s is one of the boom-bust cycle and a miraculous recovery. The boom-bust cycle was due both to major positive and negative shocks and also due to inadequate macroeconomic and other policy responses to them. The successful recovery and rapid growth since the turnaround can be attributed to partly better economic policy, success in the information technology revolution, and successful internationalization of the Finnish society. Despite of the very good development, unemployment remained at a relatively high level both due to large structural changes in the economy and lack of labor market reforms.
While the analysis of the Finnish economic development has certainly some intrinsic interest due to huge changes that took place, a major motivation for writing this book is to describe the important lessons that can be drawn from the Finnish experiences. In the last twenty years Finland has experienced huge structural changes. In the first half of 1980s Finland still had a fairly tightly regulated financial system with limited degree of competition. Traditional industries, wood and metal products, were the Finnish major export industries. The past can be usefully contrasted with the present. Nowadays, Finland is a country in which a big high-technology industry and its exports play a major role. Its financial system is market-based and fairly well integrated with Western Europe. In this book we also consider the macroeconomic and other economic policies that Finnish policy-makers carried out during this period. We argue that some policy choices turned out to be mistaken while other policies were relatively successful. We also analyze the underlying structural conditions that enabled Finland to achieve the remarkably rapid structural change from traditional industries to an economy with a big high-tech sector.

European integration and, more generally, globalization over the world are clearly providing numerous new economic opportunities to many countries that are less advanced than the West European and North American economies. However, taking advantage of these opportunities requires good macroeconomic management and we hope that the Finnish experiences since the late 1980’s can provide useful guidance in this respect. In our opinion, several other countries right now face situations and policy choices that are partly similar to those faced by Finnish decision makers in the second half of 1980s.

The 1990s financial crisis in Finland is one instance of these similarities. Weakness of the financial system is at least relevant for some new and prospective EU member countries. Several new EU member countries are currently going through a period of fast growth and risk of overheating that is, to a significant degree, due to big increases in inflow of foreign capital as a result of higher degree of economic integration. Fast growth and inflows of foreign capital are creating pressure for appreciation of the exchange rate for the currencies of these countries. The appreciation is resisted by countries that soon wish to join the EMU. Some of these countries have fairly fragile
financial systems, which is another possible source of instabilities in the future. This situation might clearly lead to macroeconomic volatility in the coming years.

The challenges are not only macroeconomic. One must add the need for major structural changes that must take place if countries are to achieve the goal of higher living standards in the future. Finland was successful in transforming itself from a traditional industrial country into a high-tech economy. We hope that the Finnish experiences can highlight these challenges and thereby be of some help in finding appropriate policies for the coming years.

In our book we proceed as follows. The next chapter focuses on the Finnish economic crisis in the early 1990s describing the main developments. It also contains an econometric analysis of the role of financing constraints on consumption and investment behavior. Chapter 3 continues the analysis of the Finnish crisis by looking at macroeconomic policies – monetary and exchange rate policy and fiscal policy – before, during and after the crisis. The chapter also considers the role of wage policy. The remaining chapters shift the focus to the upswing and rapid economic growth that took place after the early 1990s. Chapter 4 considers the resumption of economic growth and factors behind it. Naturally, one part of fast growth was made possible by the available unused productive capacities. However, this was not the whole story and we analyze the major structural changes that occurred in Finland during the upswing. Chapter 5 continues the analysis of economic growth emphasizing the importance of the Finnish education system and human capital and also research and development spending in Finland. Chapter 6 takes up the emergence and current role of the New Economy in Finland by assessing the role of information and communication technologies in economic growth. The chapter also looks at the case of Nokia and the big role Nokia played in the Finnish growth process in the 1990’s. Chapter 7 concludes by summarizing the policy achievements and discusses the current several economic challenges faced by Finland.

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2 See ECB (2006) for an assessment of these issues.
Chapter 2: The Crisis of the Early 1990’s

In this chapter we develop an interpretation of the Finnish economic crisis of the early 1990s. It is argued that the depression in the early 1990s was no ordinary recession. Even though the Finnish economy experienced several exogenous shocks during both the boom and the bust periods, the shocks are only one part of the story. The case of Finland is a very good example of the classical financial crises as in Norway in mid 1980s and in Sweden in early 1990s. Financial crises have also been experienced in countries as different from each other as Chile in the early 1980s, Mexico in mid 1990s and some of the East Asian countries in the second half of 1990’s.

The Finnish case is particular interesting, because the economy achieved a remarkable recovery from the crisis with a turnaround in 1994 and subsequent rapid real growth. This chapter largely focuses on the crisis, whereas the fast growth after the recovery is analyzed and discussed after chapter 3, where we provide a brief historical background and analyze macroeconomic policies before and during crisis and in the upswing.

We begin by telling both the story of the Finnish crisis in terms of shocks and policies and by providing a general view about the reasons behind the turbulent developments in Finland. After this descriptive part we offer a detailed diagnosis of the Finnish economic depression as a classical financial crisis. Brief comparisons will also be made with the developments with other countries like in Chile, Mexico, some East Asian Countries – Indonesia, Korea, Malaysia and Thailand - and Sweden. Finally, and importantly, we also carry out some econometric studies concerning private consumption and investment behavior to evaluate what has been the role of interest rates and other financial factors in the Finnish real economy as variables explaining huge fluctuations both in private investment and consumption behavior.

2.1 Boom, Bust and Resumed Growth

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An overview of the Finnish developments will be presented in two stages: overheating (1985-90) and depression (1991-93). This section thus sets the landscape for more detailed analysis and discussion both in the later sections and other chapters.

Starting with the period preceding the crisis, we note that in the first half of the 1980’s the performance of the Finnish economy, measured in terms of economic growth, was relatively smooth, with an average growth rate being slightly above the OECD-European rate. For the real GDP growth, Figure 1.1 in Chapter 1 already gave the overall picture. Relative to both Sweden and EU-15 countries, the Finnish growth rate was higher during the 1980’s. This can be viewed as a catching-up process. Figure 1.1 also shows the relatively sluggish growth performance of the Swedish economy.

In contrast to most other European countries, Finland (and Sweden) did not experience any major rise in unemployment in the aftermath of the two oil crises of the 1970’s. In the case of Finland, an important reason for this was the bilateral trade agreements over each year with the former Soviet Union so that for instance an increase in oil prices led automatically to an increase in the export demand. This isolated Finland from the oil price shocks and contributed to stability of the economy. The first half of 1980’s can be characterized as a gradual disinflation process for Finland like in other western European countries in the aftermath of the oil crises. There were no major indebtedness problems in the external dimension or in the public sector and unemployment remained relatively low. Overall, the macroeconomic performance in this period can be generally viewed as favorable.

aspects of the Finnish depression, see e.g. Honkapohja, Koskela and Paunio (1996), Jonung, Stynne and Söderström (1996) and Kiander and Vartia (1996). Other references in English concerning the Finnish experiences include Bordes, Currie and Söderström (1993), Kiander and Vartia (1998), Kiander (2005) and the compilation of research papers in Kalela et al (2001). There is also a large literature, written in Finnish, on the Finnish crisis.

The slow growth in Sweden since mid 1970’s has been subject to debates, see e.g. Gylfason et al (1997) and Lindbeck (1997) and the references therein for discussions of the faded Swedish miracle. While some studies emphasize that the institutions and policies built up in the 1960s and 1970s were vulnerable to domestic and international shocks as the main factors for slower growth, others emphasize policy mistakes that can never be entirely avoided.

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2.1.1 The Overheating

The smooth developments started to change around 1986-87. Economic growth accelerated significantly and the economy gradually entered a period of overheating. Several factors were behind this change. Without trying to quantify their relative significance, these can be classified into the following categories:

(i) Financial market deregulation, including both the abolition of regulation of domestic bank lending rates and, a bit later on, the lifting of restrictions on private borrowing from abroad, led to an explosion of domestic bank credit and large capital inflows with a significant fraction being in foreign currency terms without hedging. We discuss these developments in Section 2.2.

(ii) A sharp increase in the terms of trade happened as a result of the fall in energy prices and the rise in world market prices of forest products. The data on terms of trade is shown in Figure 2.1.

![Figure 2.1: Terms of trade](image)

*Note: terms of trade are shown as the ratio of export to import prices*

(iii) Economic policies were not sufficiently restrictive incountering the boom. These are discussed in detail in Chapter 3.
The development of the components of GDP, together with their contribution to GDP growth, is shown Figures 2.2, 2.3 and 2.4. The panel showing the contributions illustrates that private consumption and investments had the biggest positive impacts during the boom. As Figures 2.2 and 2.4 suggest, public consumption and public investment did not counteract the fast growth, but rather contributed to it. In the process of overheating the rate of inflation rose from about 2-3 percent in 1986 to about 7 percent in 1989-90, see Figure 2.5. It is seen from the same figure that the rate of unemployment declined from the approximately 4 percent level of the first half of the decade to about 2.5-3 percent at the end of 1989.\(^5\) The Finnish boom led to high inflation and high aggregate demand, which weakened the external balance and resulted in serious current account problems, see in Figures 2.6 and 2.7. For 1985-90 the average current account deficit to GDP ratio was 2.9 percent for Finland, while the same figure e.g. for Sweden was only 1.1 percent, again suggesting that in Sweden the overheating was less pronounced.

In the boom, competition among banks intensified in line with the financial deregulation. The new possibilities for competition between banks led to increased risk-taking, probably as a result of moral hazard and myopic behavior.\(^6\) As a result, indebtedness of the private sector increased significantly, see Figure 2.13 below. Moreover, capital inflows increased hugely, partly as a result of the high interest rate differential between the domestic and foreign interest rates and partly because investors perceived that the likelihood of a loss from exchange rate movements was small. All this led to soaring real estate and other asset prices. The data on asset price developments will be discussed in Section 2.3 in the context of analysis of the financial crisis.

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\(^5\) In comparison to Sweden it may be noted that Swedish unemployment showed a very gradual decline for most of 1980’s, which suggests that Sweden experienced less pronounced overheating in the second half of the decade. The GDP growth performance of Sweden supports this view; see Honkapohja and Koskela (1999) for the comparative data. A standard reference to the Swedish economic crisis is Lindbeck (1997). See also Calmfors (1996) and Jonung and Hagberg (2005).

\(^6\) Savings banks were the most aggressive competitors in the banking sector. Vihriälä (1997) presents some indirect evidence according to which moral hazard contributed to the expansive lending behavior of savings banks.
Figure 2.2: GDP, public consumption, investment and inventories
Figure 2.3: Next exports, private consumption and investment
Figure 2.4: Contribution of demand components to GDP growth

Inflation and unemployment

Source: Statistics Finland.

Figure 2.5: Inflation and unemployment

Source: Statistics Finland.
Figure 2.6: Relative unit labor costs

Relative unit labour costs, competitor countries/Finland

In common currency, 1982=100

Sources: Statistics Finland and Eurostat.

Figure 2.7: Current account

Current account
12 month moving total

Source: Statistics Finland.
2.1.2 Depression

The end of the boom came in 1990, when a rapid process towards bust started. Economic activity, as measured by the growth rate of real GDP, declined extremely rapidly from positive growth of +5.4% in 1989 to negative growth of -6.5% in 1991. As shown in Figure 2.3, domestic private investment, and private consumption fell sharply, while net exports of goods and services started to increase. The decline continued, though at a slower pace through 1992 and most of 1993. The decline in GDP stopped and a turnaround took place in the fall of 1993.

While all domestic components of aggregate demand contributed to the decline in economic activity, it is evident from Figure 2.3 that a particularly important feature was the major decline in investment activity. Price inflation slowed down significantly and came close to a standstill (see Figure 2.5) that, together with the depreciation of the Finnish Markka since November 1991, led to a major improvement in the price competitiveness of the Finnish economy (see Figure 2.6). As a result, the current account deficit gradually disappeared and turned into a surplus (see Figure 2.7).

The emergence of a major banking crisis was a notable feature of the bust process. The rapidly falling asset prices and bankruptcies of firms led to credit losses and the government had to provide public support for banks. These are discussed in detail in Section 2.2. The banking crisis was an episode of significant financial restraint and it, as well as the overheating, allows us to consider empirically the view that the financial factors accentuated both the rise and the fall in the different components of aggregate private demand. In section 2.3 we elaborate on the effects of interest rates and other financial factors both on private investment and private consumption.

As we know, both international and domestic factors contributed to the onset of the crisis in 1991-1993. These factors can be classified both into shocks and economic policy effects as follows:

(i) The Finnish exports to the market economies declined as a result of slow international growth, loss in the price competitiveness of the Finnish
industry and the fall in the terms of trade because the ratio of export to import prices decreased (see Figure 2.1). With the collapse of the former Soviet Union, the Finnish exports and imports to Russia dropped by 70 percent very quickly in 1991. This fall contributed to the decline in Finnish GDP in the crisis years, but - as we will argue - it was only a part in the onset of the depression.

(ii) After the German unification the interest rates rose in Europe and, under free international capital mobility, also in Finland as a result of more expansive fiscal policy and more tight monetary policy in Germany.

(iii) Monetary conditions became very restrictive in early 1989/1990 due to an increase in real interest rates and the appreciation of the Finnish Markka.

Real interest rates rose dramatically from the beginning of 1990 to the end of 1992. This was due to the defense of the Finnish Markka against speculative attacks, which increased nominal interest rates, and due to the fall in the inflation rate at the beginning of recession (see Figure 2.8 for data on the interest rate differentials between Finland and Germany and Figure 2.9 on real interest rates). The fixed exchange rate, i.e. hard-currency policy ran into problems of credibility, and it was eventually abandoned with the devaluation of the Markka in November 1991 and floating of the currency in September 1992. Figure 2.10 shows the behavior of the exchange rate together with its bands up to 1992 (the bands to the ECU central rate since 1996 are also shown in the figure). Moreover, fiscal policy was also restrictive in 1991 and 1992, as will be discussed in further details in terms of fiscal policy indicators in Chapter 3.

While it is evident that both external shocks and domestic policies contributed on the onset of the Finnish depression, it is not straight-forward to assess their relative significance. In our opinion, the external shocks are not the whole story. A crude estimate for the effect of the collapse of former Soviet Union trade could be the following consideration: in 1991 exports to Soviet Union were around 15 percent of total exports, and the share of total exports in GDP was 23 percent. After allowing for a multiplier it is likely that the 70 percent decline in this trade can account for something like three percentage points of the total nearly seven percent decline in GDP in 1991. Similarly, the Western recession and the rise in interest rates in central
Europe under free capital mobility contributed to the depression, but they were also only a part the story.

**Interest rate differentials between Finland and Germany**

![Interest rate differentials between Finland and Germany](image)

Source: Bloomberg.

**Figure 2.8: Interest rate differential between Finland and Germany**

**Interest rates and inflation in Finland**

![Interest rates and inflation in Finland](image)

Sources: Bank of Finland and Bloomberg.

**Figure 2.9: Real interest rate**
Figure 2.10: Bank of Finland currency index

In our view the financial factors have indeed played a central role amplifying the effects of some shocks, especially those coming from the exchange and interest rates. Several financial market considerations can be identified. First, the exchange and interest rate shocks, initially from the defense of the hard currency (which led to higher interest rates as discussed above) and subsequently from the major depreciation of the currency, must have influenced both consumption and investment behavior, given the high levels of indebtedness of both firms and households (see Figure 2.11 about the sector debt ratios in Finland) and the fact that significant part of their borrowing was from abroad.

Second, the collapse of asset prices led to difficulties in the banking system and the emergence of a banking crisis. This crisis may have in turn led to financial constraints in the financing of firms and households. We examine these issues in a more systematic way in next section.
Third, the defense of the Finnish Markka against speculative attacks increased nominal interest rates, and when the inflation rate decreased at the beginning of the recession, the real interest rate increased dramatically.

2.2 Financial Crisis

We have already suggested that financial factors were a key element in the Finnish crisis in the beginning of 1990s and we now examine this claim more closely. The roots of the financial crisis can be traced back to the deregulation period of the financial system in the 1980’s. The fact that financial deregulation precedes a crisis has now been documented for many countries, including Chile in early 1980’s, Mexico in mid-1990’s and, most recently, several Eastern Asian countries in the second half of 1990’s. 7

We start by taking a detailed look at the financial developments. After that we argue that Finland, like several other countries, faced problems in international indebtedness and liquidity at that time. Finally, we analyze the role of financial factors further by providing some econometric evidence of their importance for consumption and investment behavior.

2.2.1. The financial developments

The process of financial deregulation was started in the early 1980’s, but the greater part of deregulation was carried out in the second half of the decade. Liberalization of domestic financial markets and international capital flows were implemented simultaneously when interest rates in Finland were much higher than abroad. This cased a massive capital inflow and thereby led to uncontrolled credit expansion. See Figure 2.11, which describes the sectoral debt ratios in Finland. Figure 2.12, adapted from Vihriälä (1997), shows the timing of the deregulation steps during 1980-1991 in

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both domestic and international dimensions. The deregulation process was problematic in several respects.

First, its timing in the 2nd half of the 1980’s coincided with the upswing of business cycles in Western market economies. The economic upswing increased incentives to borrow and thereby raised aggregate demand and inflation rate. The coincidence of international business cycle and financial market deregulation as well as higher Finnish interest rates gave rise to a big boom, high indebtedness of the private sector, higher relative unit labor costs and a current account deficit. Later on it gave rise to speculative attacks on the Finnish Markka. Second, rules and practices in prudential regulation and bank supervision were left unchanged; see also Ahtiala (2006). These were tightened only later in 1991, when the depression had already started. Third, the tax system, which had favored debt financing of business and housing investments, was not reformed. Fourth, in the deregulation lending rates were liberated earlier than deposit rates, which also helped to make banks’ position relatively loose. Finally, monetary policy (under a fixed exchange rate with a narrow band) tried to maintain some tightness in the wake of the boom, but this increased the interest rate differential between Finland and Germany and provided further impetus to the quite big (in foreign currency terms) inflow of foreign capital, which was already growing as a
result of freeing of the capital movements.

**Sectoral debt ratios in Finland**

![Diagram showing sectoral debt ratios in Finland from 1980 to 2000.](image)

**Figure 2.11: Sectoral debt ratios in Finland**

**Deregulation of financial markets**

- 1980: Relaxation of lending rate regulation
- 1983: Entry of foreign banks into the call money market
- 1985: Call money deposit rate separated from credit rate
- 1986: Abolition of regulation of lending rates
- 1987: Floating rates allowed on some loans
- 1988: CDs exempt from reserve requirement
- 1989: Open market operations start
- 1990: Helibor rates introduced
- 1991: Credit guidelines discontinued
- 1992: Floating rates allowed on all loans
- 1993: Prime rates allowed as reference rates

**Figure 2.12: Deregulation of financial markets in Finland**

Sources: Bank of Finland and Statistics Finland.
The capital inflow to private sector was mediated to large extent by Finnish banks and led to foreign-currency denominated borrowing also by firms, which were mainly in operating the non-traded sector. The Bank of Finland bank first held the exchange rate in a narrow band, but as the pressure for Markka increased in 1988, the band was first widened from ±2.25 to ±3 percent and then Markka was revalued by 4 percent in early 1989 (see Figure 2.10). Financial market deregulation contributed to an exceptionally rapid growth in domestic bank lending (see Figure 2.13). Much of the borrowing was directed at investments in real estate and other assets. For example, the share of deposit banks’ credit to business and financial services out of total corporate lending rose from 9.3 percent in 1985 to 22 percent in 1991. The rapid growth in lending in turn led to a doubling of real asset prices in the boom.

When the asset price bubble burst in the depression banks were forced to cut their lending activity, which aggravated the downturn. It took several years (to 1997/1998) until banks’ balance sheets had improved sufficiently so that banks started to increase lending again (see Figure 2.14). 8

A banking crisis emerged as a part of the depression. 9 The onset of the banking crisis required major policy interventions by the government and the Parliament. It also led to major restructuring in the Finnish banking system. Box 1 describes the main policy actions and the restructurings that took place.

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8 Comparing these developments to Sweden, the two countries behaved similarly in many respects. Both the rapid growth in bank lending and the huge rise in asset prices also took place in Sweden after the deregulation. There is, however, one notable difference. The current account deficits were much smaller in Sweden than in Finland, see Honkapohja and Koskela (1999). This was important because it provided less pressure on the exchange rate in the case of Sweden.

9 See Honkapohja, Koskela and Paunio (1993, section 4) or Nyberg and Vihriälä (1994) for a more precise description.
Bank lending and industrial production

Figure 2.13: Bank lending and industrial production

Real asset prices

Figure 2.14: Real asset prices
Policy actions to overcome the banking crisis began in September 1991 when the Bank of Finland took control of Skopbank, the “central bank” of the Savings bank system. In early 1992 the government injected public funds in the form of preferred capital certificates to the banking system and set up a Government Guarantee Fund (GGF). GGF could use various instruments to support the banking system. With the continuation of the crisis first the government and then the Parliament made public declarations according to which the stability of the Finnish banking system will be guaranteed under all circumstances. In early 1993 the GGF was strengthened and it was given additional capital. Public support to the banking industry continued through 1994. Total fiscal cost of bank support is estimated to be around 7.5 percent of the 1992 GDP. See Nyberg and Vihriälä (1994) for more details on the support to the banking system.

Major restructurings of the banking sector occurred during the crisis. First, most of the 250 Savings banks were grouped into a Savings Bank of Finland, but subsequently this bank was splitted and the pieces were merged to Commercial, Cooperative and the Post-Office Banks. A small commercial bank STS-Bank was also merged with a big commercial bank (KOP), and KOP was in turn merged with another big commercial bank (SYP) in 1995 to form Merita Bank. The structural changes continued with the recent merger of the remaining Finnish commercial bank (Merita Bank) with Nordbanken of Sweden in 1997. Another restructuring occured in 1998 between the government-owned Post-Office Bank and Vientiluotto (Export Credit Institution) that led to the creation of Leonia Bank.

In most recent years, restructuring of the banking sector has continued further when Merita-Nordbanken merged with both a Danish and a Norwegian bank to form Nordea, a genuine Nordic Bank. Another merger occurred between Leonia Bank and Sampo Insurance Corporation, which created a Finnish “financial warehouse” Sampo.

A modest improvement in the banking sector took place in 1993, and this tendency continued in 1994 and 1995. Loss making by banks only stopped in 1996, and since 1997 the banks have showed significant positive profits (see Figure 2.15). In the figure this development is illustrated by the negative net (accounting) profits which were caused by the relatively higher credit and guarantee losses during 1991-1995. By contrast, incomes and operating expenses of banks showed only small fluctuations.

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<thead>
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<th>Box 1: Policy Measures in the Banking Crisis and Restructuring of the Banking Sector in Finland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy actions to overcome the banking crisis began in September 1991 when the Bank of Finland took control of Skopbank, the “central bank” of the Savings bank system. In early 1992 the government injected public funds in the form of preferred capital certificates to the banking system and set up a Government Guarantee Fund (GGF). GGF could use various instruments to support the banking system. With the continuation of the crisis first the government and then the Parliament made public declarations according to which the stability of the Finnish banking system will be guaranteed under all circumstances. In early 1993 the GGF was strengthened and it was given additional capital. Public support to the banking industry continued through 1994. Total fiscal cost of bank support is estimated to be around 7.5 percent of the 1992 GDP. See Nyberg and Vihriälä (1994) for more details on the support to the banking system. Major restructurings of the banking sector occurred during the crisis. First, most of the 250 Savings banks were grouped into a Savings Bank of Finland, but subsequently this bank was splitted and the pieces were merged to Commercial, Cooperative and the Post-Office Banks. A small commercial bank STS-Bank was also merged with a big commercial bank (KOP), and KOP was in turn merged with another big commercial bank (SYP) in 1995 to form Merita Bank. The structural changes continued with the recent merger of the remaining Finnish commercial bank (Merita Bank) with Nordbanken of Sweden in 1997. Another restructuring occured in 1998 between the government-owned Post-Office Bank and Vientiluotto (Export Credit Institution) that led to the creation of Leonia Bank. In most recent years, restructuring of the banking sector has continued further when Merita-Nordbanken merged with both a Danish and a Norwegian bank to form Nordea, a genuine Nordic Bank. Another merger occurred between Leonia Bank and Sampo Insurance Corporation, which created a Finnish “financial warehouse” Sampo.</td>
</tr>
</tbody>
</table>

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10 For comparison we note that the corresponding figures for Sweden and Norway are 5.2 and 3 percent, respectively, see Edey and Hviding (1995).

11 Only a handful of small savings banks have retained their independence.
The Finnish banking crisis was the result of several factors: The 1980’s boom of the real economy together with the speculative rise in asset prices and the rapid expansion of credit had made banks vulnerable when the economy entered a downswing and asset prices started to fall. The very high real interest rates and the dramatic decline in asset prices contributed to liquidity and collateral problems and increased bankruptcies of businesses, which in turn led to credit losses of the banks as shown in Figure 2.15. The indebtedness problems of the private business sector were also aggravated by the depreciation of the Finnish Markka, since during the boom firms had accumulated large amounts of foreign currency loans following the deregulation process.\footnote{The share of foreign-currency loans in total bank lending was 13-15 percent in mid 1980’s and it rose to over 27 percent by 1991, after which it fell again to low levels, e.g. to 6 percent in 1999.}

Without making a detailed comparison of the banking crisis in different countries, it may be noted that the banking industries in Nordic countries, with the exception of Denmark, have all experienced similar crises. The ratios of credit losses to bank
lending were of similar magnitudes in Finland and Sweden. Sweden was less affected by the real effects of crisis than Finland in the 1990’s. For Finland the collapses of the former Soviet Union trade made the recession deeper in Finland. For instance, the cumulative decline in investment over the bust was about one quarter in Sweden and a staggering 50% in Finland (see also Jonung et al. (2005)). Jonung and Hagberg (2005) have focused on the experience of Finland and Sweden by calculating the cost of crises among others in the 1990s using three measures: (i) loss of real income growth, (ii) loss of industrial production growth and (iii) loss of employment growth. In Finland the cost of crisis in the 1990s was higher than in Sweden in all these aspects.

Norway also went through a systematic banking crisis in the late 1980s and early 1990s, and the scenario of the crisis was relatively similar. Net fiscal costs have been significantly smaller in Norway than in Finland and in Sweden. This was partly due to the method of crisis resolution as well as the magnitude of crises. After the crises the state ownership of banks was greater in Norway than in Finland and Sweden (for the comparison and analysis of the Nordic banking crises, see Sandal 2004). This is remarkable, since in many other respects Denmark experienced similar macroeconomic developments. Edey and Hviding (1995) provide a review of the financial reform processes in OECD countries. They argue that the key difference between Denmark and the other Nordic countries lies in the prudential supervision and disclosure rules and in the stricter capital adequacy standards in Denmark, where these were tightened concurrently with financial market regulation.13

2.2.2 International indebtedness and illiquidity

Recent analyses of financial crises in different countries have stressed that problems of both international indebtedness and illiquidity are further central characteristics of such crises and these features largely result from a preceding real appreciation and lending boom after financial deregulation, see e.g. Furman et al. (1998), Sachs,

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13 Drees and Pazarbaşıoğlu (1998) provide a detailed comparative discussion of the Nordic banking crises. A recent empirical study of 53 countries during 1980-95 finds that (a poorly designed) financial liberalization increases the probability of a banking crisis, see Demirgüç-Kunt and Detragiache (1999).
Tornell and Velasco (1996) and Velasco and Chang (1998). We demonstrated earlier that Finland was facing real exchange appreciation and a lending boom both at home and from abroad, with a consequent worsening of international indebtedness. It is also of interest to consider whether Finland faced problems in international liquidity during the depression. In what follows, we briefly compare Finland’s international indebtedness and illiquidity to the case in Sweden, Mexico, Chile and East Asian countries.

A country may be able to withstand a relatively high level of international indebtedness, provided its economic growth remains solid, the debt is largely long-term and the confidence of international investors remains intact. Nevertheless, a high international debt position means increasing risks, should a country run into other economic difficulties. For Finland these risks were realized with the slowdown of the economy at the start of the 1990’s. Table 2.1 shows the external debt to GDP ratio for Finland and Sweden for the period 1982-2001. For comparison, the table also shows the data for Chile for period 1984-2001, for Mexico for period 1984-93 and for Korea for the period 1990-2001 and for Thailand for the period 1995-2001.

The build-up of international debt for Finland is much more pronounced than for Sweden because the Finnish current account deficits were much larger before the crisis.14 This suggests that the external situation for Finland was relatively risky, so that the pressures mounted rapidly once the general outlook became gloomy in 1990-91. International indebtedness for Mexico was very high in the 1980s and for Chile even higher in the mid 1980s. Thailand also increased its foreign indebtedness quite rapidly in 1997-98. These indebtedness problems led to financial crises in these countries as well.

International indebtedness of a country includes both long- and short-run external liabilities. In contrast to debt, liquidity is exclusively a short-term issue and problems of international illiquidity provide indications of a financial crisis. A key issue is the mismatch of assets and liabilities. A country’ financial system is internationally

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14 The numbers for the post-depreciation years are naturally even higher since debt is measured in terms of the domestic currency.
illiquid if its potential short-term obligations in foreign currency exceed the amount of foreign currency to which it has access at short notice. When governments are committed to act as lenders of last resort for the banking sector, deposits can be regarded as liabilities (see Velasco and Chang 1998 for more details). For this reason, the ratio of M2 money to foreign exchange reserves seems consistent with the hypothesis of international illiquidity. This ratio is a commonly used indicator for international illiquidity in the sense that the smaller is the ratio, the higher is international illiquidity and vice versa. We now look at this indicator for Finland and compare it to some other countries that have experienced financial crises in Table 2.2.

Table 2.2 shows that this indicator of international illiquidity for Finland not only exceeded one, but fluctuated in the second half of 1980’s with some build-up of illiquidity at the onset of the crisis in 1990-92. The behavior of the same indicator for Sweden is a bit different, but its behavior in the second half of 1980's points to potential international illiquidity problems as well. Table 2.2 also provides values of the indicator for some other countries.

The conclusion we draw is that Finland experienced problems of international indebtedness and illiquidity during the crisis. These contributed to the pressures on the Finnish Markka and led to subsequent depreciations, banking sector problems and the breakdown of economic activities. The crisis in Finland showed similar characteristics as the financial crisis not only to Sweden, but also to Chile, Mexico, Indonesia, Korea, Malaysia and Thailand, though these features varied to some extent from country to country.
### Table 2.1: International Indebtedness

**International Indebtedness: Net foreign debt, % of GDP**

<table>
<thead>
<tr>
<th></th>
<th>Finland</th>
<th>Sweden</th>
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Sources: IMF


### Table 2.2: International Illiquidity

**Indicator of International Illiquidity**

*Money / reserves*

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<th></th>
<th>Finland</th>
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Sources: IMF


The impact of a crisis on subsequent macroeconomic performance is an important new concern, given the large number of financial crises in the recent times. Among others, Ranciere et al (2005) have presented a two-sector endogenous growth model in which financial crisis can occur and analyzed the relationship between financial fragility and growth. Their theoretical model shows why in countries with severe credit market imperfections, liberalization leads to higher growth and, as a by-product, to financial fragility. Using international data, they also show that there is a strong empirical link between growth and negative skewness of credit growth across countries (see Table 1 in Ranciere et.al (2005), p. 11).15 The case of Finland accords with such a view: as will be discussed later, Finland has become something of a “growth miracle” since the mid 1990s.

2.3 Econometric Evidence on Finance Constraints

It is often argued that financial crises involve significant financial restraint and possible illiquidity and that, in these periods, a banking crisis may lead to a credit crunch. This crunch may directly affect investment and consumption in addition to high interest rates. In recent years there has been extensive research into the ”credit-channel view” arguing that indeed financial factors can have a direct influence on business fluctuations in the real economy as a result of capital market imperfections and agency costs in financial intermediation, especially in debt and bank lending.16

In this section we study whether there is evidence for a credit crunch in the Finnish economy during the crisis in 1990-92.17 Such evidence of the credit channel would provide support for our thesis that a significant part of the Finnish depression was due

15 Aghion and Banerjee (2005) also discuss empirical evidence on financial volatility and economic growth.
16 For an up-to-date survey of the recent theoretical and empirical literature, see chapter 7 in Walsh (2003).
to financial markets problems. Some econometric studies of the Finnish bank loan markets have been carried out with the 1990’s data.18

Focusing attention only on bank credit may be too narrow a viewpoint. It is often argued that there exists a broad credit channel, implying that attention should be directed at the supply of funds in general.19 This channel should manifest itself in the differential responses of external and internal finance as well as of small and large firms. The impact of financial factors on investment has been studied with microeconomic data in a number of countries, and Hubbard (1998) provides a review of the methodology and evidence. For studies focusing on consumption and financial factors, see e.g. Bacchetta and Gerlach (1997), Bayomi (1993), Wilcox (1989), and Zeldes (1989). In this section we look at Finnish evidence about the influence of financial variables on firms and investment as well as on consumption-savings behavior.

2.3.1 Cash flow and investment of firms20

We have utilized a panel data set on 500 largest Finnish firms to see whether evidence of the direct effects of financial factors on investment behavior of firms can be found in Finland for the period of 1986-2000. Since the data consists only of 500 largest firms it means that it is not possible to consider the importance of size differences, which have been one way of trying to test the agency cost theory.21

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18 The evidence about the credit crunch provided by Vihriälä (1997) and Pazarbaşioğlu (1997) is mixed. They see the decline of bank lending to be, at least to an extent, a result of weakness in loan demand. However, the results of Pazarbaşioğlu (1997) suggest that banks’ willingness to supply credit deteriorated during the banking crisis as a result of reduction in asset quality, low profitability and tightened capital requirements. Saarenheimo (1995) has provided evidence of the importance of credit crunch for investment in a vector autoregressive (VAR) framework. A VAR extends the univariate autoregression to multiple time series variables.

19 The empirical evidence of financial factors has been developed on microeconomic data from the US, see e.g. Bernanke, Gertler and Gilchrist (1996) and Oliner and Rudebusch (1996). These papers look at several different types of evidence about the broad credit channel of financial factors and monetary policy.

20 For earlier results, see Ali-Yrkkö (1998) and Honkapohja and Koskela (1999).

21 Bernanke, Gertler and Gilchrist (1996, section 4) examine the differential response of small and large firms in sales, inventories and short-term debt using financial reporting data from the US.
Nevertheless, it is possible to examine econometrically whether cash flow and other financial factors had an effect on investment by Finnish firms during the depression.

We estimated the standard model of investment and finance constraints from a panel constructed from the financial-reporting data set on Finnish firms. The same data source has been previously used by Ali-Yrkkö (1998) and Honkapohja and Koskela (1999). They had data up to year 1996 and found that cash flow had a stronger effect on investment in firms that they classified as financially constrained. Their conclusion was that financial constraints affected investment behavior and that a credit crunch amplified the effect of the macro shock that hit the economy in the early 1990s. Here, we update the calculations and use slightly different classifications of the firms to financially constrained and unconstrained firms. Box 2 summarizes the setup.

Box 2: An Extended Euler Equation for Investment

The basic setup involves estimating Euler equations for investment following the specification presented by Bond and Meghir (1994). From Euler equations one can derive an empirical investment equation

\[
\frac{I}{K}_{i,t} = \beta_1 \left( \frac{I}{K}_{i,t-1} \right) + \beta_2 \left( \frac{I}{K}_{i,t-1} \right)^2 + \beta_3 \left( \frac{\pi}{K}_{i,t-1} \right) + \beta_4 \left( \frac{Y}{K}_{i,t-1} \right) + \beta_5 \left( \frac{B}{K}_{i,t-1} \right) + \beta_6 u_{i,t-1} + d_i + \alpha_i + \nu_{it}
\]

Here the investment-capital stock ratio \((I/K)\) of each firm \(i\) in each year \(t\) depends on its lag and lag squared, its profits-capital stock ratios \((\pi/K)\), sales/turnover-capital stock ratio \((Y/K)\) and total debt-capital stock ratio \((B/K)\). The other variables, \(u_{i,t-1}\), \(d_i\) and \(\alpha_i\), consist of the firm-specific user cost of capital, firm specific factors and time-specific factors. In the equation the term \((\pi/K)\) controls for the role of cash flow, the output term \((Y/K)\) for imperfect competition and the debt term \((B/K)\) for potential non-separability between investment and borrowing decisions. Euler equation should hold for the financially unconstrained firms, but for the financially constrained firms the cash flow should have a positive effect on investment.

We classify the financial constrains according to several alternative criteria. The first measure is similar to Bond and Meghir (1994) and classifies firms as unconstrained if it paid dividends but issued no new shares. The second criterion is similar but it requires that the condition holds for both year \(t\) and \(t-1\). The third criterion, picked up from Whited (1992), classifies firms as financially constrained if it has high debt to
assets ratio. We use an arbitrary cut point and split the sample to two equal size groups according to the debt to assets ratio. The split is done using firm-years as observations, so that the same firm can be financially constrained in some years and unconstrained in others. The fourth criterion, also from Whited (1992), classifies firms according to the interest coverage ratio. Again we split the sample arbitrarily to two equally sized subgroups. Finally, the fifth criterion attempts to measure credit ratings. We do not have direct measure of credit rating by banks but use the ranking by a major business magazine “Talouselämä”. Their measure is a weighted average of ratings of return to own capital, solvency ratio (own capital / total capital) and gearing ratio (net debt / assets). Here we classify the firms scoring below 5 on the scale from 0 to 10 as constrained. Though not ideal, it can be argued that the measure is close to measures used by banks when analyzing creditworthiness of the firms. As all measures of financial constraints are only proxies for the financial situation, one could expect that all firms are financially constrained to some extent, but the effect of the cash flow should be stronger in the firms classified as financially constrained.

From the original data set, we drop the firms that have missing values for the key variables. Because our estimation method requires lagged values of the variables, we also drop the firms that do not appear in the data for the five consecutive years. To diminish the effect of influential outliers, we also drop 32 firm-year observations that reported investments in excess of 35 % of their total assets. Table 2.3 shows the number of firms left in data together with descriptive statistics on the variables that we use to classify the firms to financially constrained and unconstrained.

Table 2.3: Indicators of financial shape

<table>
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<th>Year</th>
<th>Number of firms</th>
<th>Paid dividends and did not issue new shares %</th>
<th>Debt to assets ratio, annual average</th>
<th>Coverage ratio, annual average</th>
<th>Talouselämä ranking (scale 0-10)</th>
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<td>284</td>
<td>39.4</td>
<td>24.8</td>
<td>20.0</td>
<td>5.8</td>
</tr>
<tr>
<td>1995</td>
<td>283</td>
<td>51.2</td>
<td>22.6</td>
<td>12.9</td>
<td>6.5</td>
</tr>
<tr>
<td>1996</td>
<td>289</td>
<td>52.2</td>
<td>22.8</td>
<td>11.8</td>
<td>6.6</td>
</tr>
<tr>
<td>1997</td>
<td>280</td>
<td>55.7</td>
<td>19.7</td>
<td>5.5</td>
<td>6.9</td>
</tr>
</tbody>
</table>
From Table 2.3 one can immediately notice that the sample firms are in much better financial shape in the end of the time period, which is understandable. The worst years in terms of financial situation appear to be 1992-94. During these years only slightly more than a third of the companies reported positive dividends and no new share issues. The corresponding figure is more than 60 % in 1999-2000. The large Finnish companies were also highly indebted in early 1990s. Average debt to assets ratio was around 30%. Average debt to assets ratio declined to below 20% in 2000. The improving financial health of the sample companies can also be seen in Table 2.4, where we show the fraction of constrained firms according to the different classifications presented earlier.

Table 2.4: Fraction of constrained firms

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>42</td>
<td>58</td>
<td>58</td>
<td>49</td>
<td>44</td>
</tr>
<tr>
<td>1991</td>
<td>49</td>
<td>59</td>
<td>64</td>
<td>58</td>
<td>52</td>
</tr>
<tr>
<td>1992</td>
<td>55</td>
<td>63</td>
<td>62</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>1993</td>
<td>62</td>
<td>71</td>
<td>57</td>
<td>52</td>
<td>42</td>
</tr>
<tr>
<td>1994</td>
<td>60</td>
<td>71</td>
<td>46</td>
<td>39</td>
<td>32</td>
</tr>
<tr>
<td>1995</td>
<td>48</td>
<td>66</td>
<td>41</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>1996</td>
<td>48</td>
<td>59</td>
<td>40</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>1997</td>
<td>44</td>
<td>56</td>
<td>34</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>1998</td>
<td>43</td>
<td>55</td>
<td>32</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>1999</td>
<td>38</td>
<td>52</td>
<td>27</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>2000</td>
<td>36</td>
<td>45</td>
<td>24</td>
<td>16</td>
<td>21</td>
</tr>
</tbody>
</table>

Note: The numbers are not comparable to the previous table because of missing data on classification variables. Here any firm that has a missing value in any of the classifying variable is excluded.

We estimated the investment equation, specified earlier in Box 2, separately for the financially constrained and unconstrained companies. We first removed the company specific error term by an orthogonal transformation (Bond and Meghir 1994) and included a full set of year dummies to capture the effects of business cycle. We then estimated the model by GMM using lagged values (t-2, t-3, and t-4) as instruments.
We first discuss results for the manufacturing firms. Focusing on manufacturing yields a more homogeneous sample where investment and financial data are more comparable. In table 2.5 (see Appendix A) we follow Bond and Meghir (1994) and classify the firms as unconstrained if they paid positive dividends and did not issue new shares. In columns 1 and 2, we use lagged values from periods t-2, t-3 and t-4 as instruments. In columns 3 and 4 the instrument set includes only lags t-3 and t-4 avoiding possible bias due to autocorrelation. The estimates for the manufacturing firms are mostly expected signs, but not very precise. The cash flow has a positive effect on investment and the effect is larger in the constrained firms, which lies in conformity with a natural hypothesis. Using only lags t-3 and t-4 as instruments yields much more imprecise estimates, though the ranking remains the same: cash flow has stronger effects in the constrained firms. Sales have a positive but insignificant effect in the unconstrained firms, while the effect is practically zero in constrained firms. Coefficients on debt and user cost of capital are also insignificant.

Imprecise estimates are partially due to small sample size: Including all firms (not only manufacturing) increases the fraction of significant coefficients. We estimated similar equations for all firms and using alternative criteria to classify the firms to constrained and unconstrained. As we are primarily interested in the coefficients of cash flow, Table 2.6 (Appendix A) reports only the estimated cash flow coefficients in the different specifications. The cash flow coefficients do not show much of a systematic pattern but seem to be sensitive to the sample and the criteria used in classifying the firms to different categories. Our conclusion is that the finding that investments are more responsive to changes in the cash flow in firms that are financially constrained, but results are partly sensitive to the way the firms are classified and to the samples that are used to estimate the model.

Our results are relatively similar as in other investment literature. For example, Kaplan and Zingales (1997) re-analyze the sample that Fazzari, Hubbard and Petersen (1988) classified as financial constrained in their seminal study. On the basis of the annual reports of these companies, they find that only in 15 percent of the firms there is any question on the firm’s access to funds to increase investment, and more strikingly, that less financially constrained firms exhibit greater investment cash flow.
sensitivity. Bond et al. (2003) have studied the relationship between investments and cash flow sensitivity using data from Belgium, France, Germany and UK and they show that investment of UK firms are more sensitive to cash flow fluctuations than in other countries. Mizen and Vermeulen (2005) have used UK and German data to analyze the reasons for the relationship between cash flow sensitivity of investment. They argue that credit worthiness is the main driving force of cash flow sensitivity.

2.3.2 Consumption, net wealth and financial factors

The empirical overview, which we have presented earlier, suggests that besides private investment, private consumption also contributed both to the boom of the late 1980s and to the decline in the early 1990s. Therefore, it is also important to explore what happened with consumption behavior before, during and after the crisis. We now look empirically at the determinants of the fluctuations in private consumption. We are interested in evaluating the effects which changes in net wealth and financial factors like interest rates and credit constraints have had on consumption behavior. Box 3 summarizes the setup.

Box 3: Net Wealth, Financial Factors and Consumption

The starting point is the following consumption function, which can be regarded as an approximation to a much richer theoretical structure (see e.g. Muellbauer and Murphy (1993) for further details, and Agell, Berg and Edin (1995) for an application to Swedish data)

\[
\Delta \ln C = \alpha_0 + \beta (\ln Y - \ln C_{,-1}) + (1 - \beta) \lambda \Delta \ln Y + (1 - \lambda) \beta r W_{,-1} / Y + (1 - \lambda) \beta \eta + \text{other}
\]

Here \( C \) denotes private consumption, \( Y \) disposable income, \( W \) net wealth and \( r \) the real interest rate. The equation has an error correction term, and \( \beta \) reflects the adjustment due either to habit formation or adjustment costs in consumption. A fraction of \( \lambda \) of aggregate disposable income accrues to households that are subject to binding liquidity constraints, while a fraction \( (1 - \lambda) \) accrues to households that obey the permanent income hypothesis (see e.g. Campbell and Mankiw, 1991). In the basic version for the first group of households the rate of growth of consumption depends solely on the rate of growth in disposable income, while for the second group the real interest rate and the net wealth/income ratio play a potential role. As for the first group, private consumption may be affected by credit constraints via other channels as well. To the extent that lenders follow a practice of restricting borrowing so as to keep current payment-to-current income ratios below some ceiling level, nominal interest rate affects the growth rate of aggregate consumption.
see e.g. Wilcox (1989). Moreover, other credit market variables like credit growth and/or the wedge between borrowing and lending rate – which has been used in the literature as a measure of the tightness of credit conditions – may affect consumption growth. For international empirical evidence that aggregate consumption may be ‘excessively sensitive’ to credit conditions as well as to income, see Bacchetta and Gerlach (1997) and Girardin et.al (2000).

Several relatively robust observations can be drawn from the estimations. The results are presented in Appendix B and summarized in Figure 2.16.

First, both wealth and disposable income have a positive effect on consumption, while the real interest rate turned out to be insignificant confirming the view that it mainly affects consumption via asset values. Second, the effect of nominal interest rate on consumption is significant and negative reflecting liquidity constraints. Third, with a significantly positive effect, credit growth appears to be as important determinant of consumption as disposable income. The short-run elasticities with respect to disposable income and credit growth are both in the neighborhood of 0.20.

In order to see the relative importance of various factors contributing to fluctuations in private consumption we calculated the contributions of the explanatory variables. This calculation is presented in Figure 2.16.
\textit{DRHDEBT=change in real aggregate household debt, DLYD=change in disposable income, ECM=error correction term (lagged consumption/disposable income), WEALTH=ratio of household assets to disposable income, RLBN=average rate of interest on new loans from depository institutions.}

**Figure 2.16: Contributions of explanatory variables for consumption growth**

The results in Figure 2.16 can be summarized as follows. First, after the financial market deregulation in late 1980s credit growth contributed to private consumption growth, the reverse happened when the depression came in and in late 1990s credit growth again contributed consumption. Second, the role on nominal interest rate increased in early 1990s i.e. the high interest rate reduced consumption, but the importance of interest rates declined after that period. Finally, the relative effect of the wealth variable has been quite stable during the estimation period.
Appendix A: Estimates of the Investment Function

The standard errors are large and the coefficients often insignificant. The point estimates indicate that cash flow has a positive effect on investment and that the effect is larger in the constrained firms, which lies in conformity with a natural hypothesis.

Table 2.5: Basic Euler equation results

<table>
<thead>
<tr>
<th></th>
<th>Unconstrained</th>
<th>Constrained</th>
<th>Unconstrained</th>
<th>constrained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment</td>
<td>0.280</td>
<td>0.275</td>
<td>0.680</td>
<td>-1.037</td>
</tr>
<tr>
<td></td>
<td>(0.151)</td>
<td>(0.127)*</td>
<td>(1.097)</td>
<td>(0.802)</td>
</tr>
<tr>
<td>Investment²</td>
<td>-0.512</td>
<td>-0.463</td>
<td>0.453</td>
<td>3.613</td>
</tr>
<tr>
<td></td>
<td>(0.445)</td>
<td>(0.270)</td>
<td>(3.585)</td>
<td>(2.261)</td>
</tr>
<tr>
<td>Cash flow</td>
<td>0.054</td>
<td>0.246</td>
<td>-0.327</td>
<td>0.399</td>
</tr>
<tr>
<td></td>
<td>(0.114)</td>
<td>(0.104)*</td>
<td>(0.378)</td>
<td>(0.230)</td>
</tr>
<tr>
<td>Sales</td>
<td>0.017</td>
<td>-0.006</td>
<td>0.023</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.015)</td>
<td>(0.020)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Debt</td>
<td>0.005</td>
<td>0.025</td>
<td>0.101</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(0.052)</td>
<td>(0.050)</td>
<td>(0.094)</td>
<td>(0.084)</td>
</tr>
<tr>
<td>User cost</td>
<td>-0.013</td>
<td>0.013</td>
<td>0.006</td>
<td>-0.366</td>
</tr>
<tr>
<td></td>
<td>(0.084)</td>
<td>(0.137)</td>
<td>(0.225)</td>
<td>(0.541)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.021</td>
<td>0.021</td>
<td>0.006</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>(0.009)*</td>
<td>(0.011)</td>
<td>(0.016)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>Observations</td>
<td>499</td>
<td>417</td>
<td>499</td>
<td>417</td>
</tr>
<tr>
<td>R²</td>
<td>0.11</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All explanatory variables are scaled by capital and lagged by one period. Year dummies are included in all equations.

We tried a number of other specifications: e.g. differences instead of orthogonal deviations, simple fixed effects estimators without lagged dependent variables, models without user cost, models that use only longer lags as instruments and estimated the models for various sub-samples but did not find any more stable patterns. In almost half of the different specifications the cash flow coefficient was larger for the unconstrained firms.

Table 2.6: The effect of cash flow on investment

<table>
<thead>
<tr>
<th></th>
<th>All firms</th>
<th>Only manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unconstrained</td>
<td>Constrained</td>
</tr>
<tr>
<td>Dividends &gt; 0 &amp; no new shares</td>
<td>0.159*</td>
<td>0.175*</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.061)</td>
</tr>
</tbody>
</table>
Dividends > 0 & no new shares t and t-1 | 0.255* (0.080) | 0.163* (0.056) | -0.034 (0.133) | 0.235* (0.094)
Debt to assets ratio | 0.204* (0.060) | 0.142 (0.079) | 0.188 (0.128) | 0.153 (0.102)
Interest coverage ratio | 0.174* (0.052) | 0.281* (0.072) | 0.176 (0.095) | 0.271* (0.116)
Talouselämä rating | 0.117 (0.060) | 0.217* (0.059) | 0.228* (0.085) | 0.117 (0.112)

The equations include all variables in the previous table and the year dummies. The number of observation varies slightly because of missing data on some variables, but is on average about 3000 firm-year observations when all sectors are included and about 1000 when focusing on manufacturing.

Appendix B: Estimates of the Consumption Function

All variables in the consumption function specification, except the interest rate, are in logarithms. Variables taking also negative values have been rescaled prior to taking logarithms. We use annual data over the period 1971-2000. The dependent variable is the first difference of the log of private consumption and we use two-stage least squares. The models were estimated using the method of instrumental variables. The instruments are lagged interest rates and lagged difference between banks’ borrowing and lending rates. Following the suggestion by Staiger and Stock (1997), the F-statistics of the first-stage regression (testing the hypothesis that the instruments do not enter the first-stage regression) were computed to examine the validity of instruments. Here is the notation for variables:

LC   private consumption
RLBN average rate of interest on new loans from depository institutions
DLYD change in disposable income
WEALTH ratio of household assets to disposable income
DRHDEBT change in real aggregate household debt
RDIFF difference between banks’ borrowing and lending rates
ECM error correction term (lagged consumption/disposable income ratio)
D77 dummy for year 1977

Table 2.7:
The dependent variable is the difference of LC

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std.Error</th>
<th>t-value</th>
<th>t-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLBN</td>
<td>-0.0062019</td>
<td>0.0013966</td>
<td>-4.441</td>
<td>0.0002</td>
</tr>
<tr>
<td>WEALTH</td>
<td>0.034703</td>
<td>0.023831</td>
<td>1.456</td>
<td>0.1578</td>
</tr>
<tr>
<td>D77</td>
<td>-0.047692</td>
<td>0.017515</td>
<td>-2.723</td>
<td>0.0116</td>
</tr>
<tr>
<td>Variable</td>
<td>Coefficient</td>
<td>Std.Error</td>
<td>t-value</td>
<td>t-prob</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>-----------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>RLBN</td>
<td>-0.0061261</td>
<td>0.0015585</td>
<td>-3.931</td>
<td>0.0006</td>
</tr>
<tr>
<td>WEALTH</td>
<td>0.011602</td>
<td>0.0030212</td>
<td>3.840</td>
<td>0.0007</td>
</tr>
<tr>
<td>ECM</td>
<td>0.0051079</td>
<td>0.0081206</td>
<td>0.629</td>
<td>0.5348</td>
</tr>
<tr>
<td>DLYD</td>
<td>0.19468</td>
<td>0.047038</td>
<td>4.139</td>
<td>0.0003</td>
</tr>
<tr>
<td>DRHDEBT</td>
<td>0.19468</td>
<td>0.047038</td>
<td>4.139</td>
<td>0.0003</td>
</tr>
</tbody>
</table>

Additional Instruments used:

RLBN_1  RDIFF_1 (lagged variables of RLBN and RDIFF)

Specification $\chi^2(2) = 0.24875 [0.6180]$

Goodness of fit: $\chi^2(7) = 53.318 [0.0000]$

AR 1 – 2 F(2, 23) = 0.89257 [0.4233]

ARCH 1 F(1, 23) = 0.1205 [0.7317]

Normality $\chi^2(2) = 0.53454 [0.7655]$

Table 2.8:
The dependent variable is the difference of LC

Diagnostic tests: AR 1-2 is the LM-test for first and second-order autocorrelation, ARCH 1 is the LM test for first-order conditional heteroscedasticity, the residuals are tested for normality using the Jarque-Bera test, and the specification test is an LM test for the validity of the instruments. The figures in square brackets are significance levels. The values of the F-statistics of the first-stage regression (testing the hypothesis that the instruments do not enter the first-stage regression) were 69.57 and 62.287 for the two models, respectively, lending support to the validity of the instruments. We also checked the importance of the error correction term, but it was not statistically significant.
Chapter 3: Macroeconomic Policies Before and During Crisis and in the Upswing

In this chapter we examine monetary and exchange rate policies and fiscal policies in Finland from mid 1980s to late 1990s as well as wage policies in terms of their impacts on macroeconomic performance. We will show that while the crisis in the early 1990s was caused by external factors, in particular the breakdown of the neighboring Russian economy and insufficient safeguards after financial market liberalization, it was aggravated by failures in macro policies. Both the fixed exchange rate policy and pro-cyclical fiscal policies increased fluctuations both during the overheating period in the later 1980s and during the crisis period in the early 1990s. In contrast, during the following upswing period macro policies were largely appropriate.

3.1. Monetary and Exchange Rate Policies

We begin with a brief historical background. The maintenance of a regime of fixed exchange rates was the cornerstone for monetary and exchange rate policies in Finland for a long time in the post-war period. Through much of this period the Finnish economy was prone to periodic inflationary pressures, which in turn led to corresponding deteriorations of price competitiveness and balance of payments problems. The external imbalances were corrected by major devaluations of the Finnish Markka from time to time, for example in 1957, 1967, and 1977. Finland thus relied on a policy of fixed but adjustable exchange rates. The major devaluations in the 30 percent range often contained the seeds of a continued inflationary process and led to pressure for another devaluation in the future. However, due to the financial regulations - including the Bank of Finland control of interest rates in bank lending and control of international capital movements – expectations of future devaluations did not affect domestic interest rates.

In the aftermath of the two oil crises 1973/1974 and 1980/1981, a new regime for monetary and exchange rate policy was established in an attempt to eliminate the inflation-devaluation cycle described above. This was executed by means of a new “hardened” fixed exchange rate policy according to which the Finnish Markka should
be fully fixed unlike in the earlier history. This policy was fairly successful for some years, though in the summer of 1986 there was significant speculation against the Finnish Markka. This pressure was resisted and the exchange rate remained fixed about six years. From October 1982 to November 1988 the Markka was kept within a band of 4.5 percent, after which the band was widened to six percent from November 1988 to March 1989. See Figure 2.10 in chapter 2 for the nominal exchange rate and its bands.

As has been shown in the previous chapter, a major inflow of foreign capital to Finland occurred as a consequence of the liberalization of international capital flows in 1986-87 when interest rates in Finland were much higher than abroad (see Figure 2.8 in chapter 2). The fixed exchange regime came gradually under increasing pressure. The financial deregulation in the second half of 1980’s led to pressures for the Finnish Markka to appreciate. This pressure existed notwithstanding the current account deficit since 1987. Moreover, exports to Soviet Union were gradually falling, which added to the overvaluation of the Finnish Markka. In March 1989 the Finnish Markka was revalued as response to appreciation pressures, which thereby weakened the international competitiveness problem further.

When the domestic boom ended, the Markka started to become subject to speculative attacks from 1990 onwards. The monetary and exchange rate policy response was to try to stick to the hard currency regime, which led to the very high domestic real interest rates. The fixed exchange rate/hard currency policy was, however, eventually abandoned. First, a forced devaluation of approximately 12 percent took place in November 1991 and second, the Finnish Markka was floated in September 1992. See Dornbush et al (1995) for a critical discussion of this episode. They argue that “In this difficult setting the government made the surprising decision to peg the Finnish Markka to the European Currency Unit (ECU) without a priori devaluation … The central bank and the government were quite wrong to overvalue the currency … A

---

1 The policy makers attempted to achieve an “internal devaluation” by wage reductions before the 1991 devaluation, but it was rejected by the trade unions. As noted in section 3.4, the unions later accepted zero nominal wage increases for the deepest crisis years.
shift to a more competitive currency, possibly accompanied by restrictive fiscal policy, would have helped to solve both the unemployment and the debt problems”.

In the floating exchange rate regime the Bank of Finland introduced a domestic inflation target. This rule gradually gained credibility. The interest rate differential between Finland and Germany narrowed significantly (see Figure 2.8 in chapter 2) as an indication of increased credibility and monetary stability. Some of the differential for long rates remained and actually widened temporarily in 1994, but it was brought under control by the fiscal policy package of the new government which had taken office in spring 1995. Closer integration to Western Europe, with Finland joining the European Union in 1995, was also an important development for gaining credibility of the government. A major change for monetary and exchange rate policy occurred in October 1996 when the period of floating ended and Finland joined the ERM (with wide bands). Subsequently, Finland became a member of the European Monetary Union in 1998 as the only Nordic country. This was the end for monetary independence of Finland.

It is evident that the fixed exchange rate policy was clearly misguided on two occasions. First, given the fixed exchange rate, domestic monetary policy could not counteract the boom during the financial deregulation period. Attempts to tighten monetary policy in 1988 led, under the fixed exchange rate, to a higher interest rate differential between domestic and foreign rates, which further increased the inflow of foreign capital. Moreover, at the end of the boom the fixed exchange rate policy had lost credibility and as mentioned above, the Finnish Markka was revalued in March 1989. This revaluation was forced by the strong capital inflows and it came far too late. An early revaluation of the currency in the boom and/or a move to floating (or active exchange rate management) would have limited the capital inflows. We also note that as discussed in Section 2.2.2, there is some evidence that Finland was running into a position of international illiquidity (see Table 2.2 in Chapter 2).

The second failure of monetary and exchange rate policy occurred in the wake of the depression. The fixed exchange rate was maintained in spite of all indicators pointing towards a serious downturn. The very high interest rates that arouse from the defense of the currency led to a tightening of monetary conditions as can be seen from Figure
3.1, which provides an index for monetary policy stance (calculated as the weighted sum of changes in a short-term interest rate and the exchange rate relative to values in a baseline year). These conditions contributed to the big collapse of aggregate demand of the highly indebted private sector. This development started in early 1990. The late move to floating exchange rates initially worsened the situation, given the high largely un-hedged foreign debts that had been accumulated during the boom. However, floating subsequently permitted the easing of monetary policy and thereby contributed to the turnaround of the Finnish economy.

![Graph](image_url)

**Source:** Mayes and Viren, 2002

**Figure 3.1: Monetary conditions index (MCI).**

A rising curve indicates tightening.

These two episodes provide a clear lesson. When the financial deregulation is initiated there is a tendency for the external value of the home currency to appreciate due to the capital inflows. Under such circumstances the currency should be floated so that its appreciation both would mitigate the overheating coming from financial deregulation and would curb capital inflows. In our view, the Finnish boom-bust cycle would have been less extreme with a floating exchange rate regime, though the precise extent of mitigation can be debated. However, we want to emphasize that financial deregulation, jointly with the failures in macroeconomic policy packages, led to the lending boom both in domestic and foreign currency terms when interest rates in Finland were much higher than abroad.
The floating exchange rate regime, together with inflation targeting in monetary policy, were important elements in the recovery of the economy from the deep depression. These policies gradually improved credibility and thus contributed to macroeconomic stability in the Finnish economy. They were one part of the economic policies aiming to get the fundamentals right. In part, this policy enabled Finland to join the European Union in 1995 and the Economic and Monetary Union when it was started in 1999.

3.2. Fiscal Policy

The crisis in the early 1990s had a major impact on the government budget. As background it should be recalled that the size of the public sector in Finland, as measured by total public expenditure relative to GDP, has traditionally been below the OECD-Europe average. During the crisis the GDP share of the public sector increased dramatically, starting in 1990. From Figure 2.2 in Chapter 2 it is seen that public consumption and public investment declined in real terms in 1991-93. However, total expenditure (even without banking support) increased mainly as a result of increased transfers, especially on unemployment compensations.

This increase in total expenditure, together with a fall in tax revenues, led to a sharp rise in the budget deficit reaching 10-15 percent range in 1992/1993 and thereby an explosion of central government debt level, which was also affected by banking support (see Figure 3.2 for the development of the central government debt). With falling real GDP, the debt-GDP ratio shot up very rapidly, and as a result Finland shifted from the group of European low public-debt countries to the group of medium debt countries in just a few years. This development also meant that throughout the crisis the rise in central government debt became a major concern.

A new government was formed in the spring 1995 and from the start it formulated a program of fiscal consolidation that covered its term in office. Clearly, an important motivation behind this program was the requirements for a membership in the EMU,
which had politically started to loom in the horizon after Finland had become a member of the EU. The consolidation program was well received in the financial markets and therefore the interest rate differential to Germany dropped dramatically in the spring 1995 (see Figure 2.8 in Chapter 2). The program led gradually to smaller deficits and, with the resumed real GDP growth, the central government indebtedness started to decline 1997. As fiscal consolidation and fast growth continued, central government deficits gradually diminished and turned into budget surpluses in 1999 (see Figure 3.3).
To assess the stance of discretionary fiscal policy, the fiscal impulse is defined as the discretionary change in the budgetary position of the government, to be designed to eliminate the effects of business cycles on the government budget. There are several definitions in the literature:

1) The simplest possible definition of the fiscal impulse is the change in the primary budget deficit as a share of GDP from the previous year.

2) Blanchard (1993) has suggested estimating what government expenditures and revenues would be at any given year if the unemployment rate had remained the same as in the previous year. This means that the measure of fiscal impulse is constructed as the difference between this unemployment adjusted measure of the primary deficit and the previous year’s primary deficit.

3) The third measure, often called by OECD measure (see e.g. Alesina and Perotti (1995)), defines the fiscal impulse as the difference between the current primary deficits and the primary deficit that would have prevailed if expenditure in the previous year had growth with potential GDP, and revenues
had grown with actual GDP. Thus this measure also takes the previous year as
the benchmark year.

4) IMF measure differs from these in fact that it assumes as the benchmark year
not the previous year but reference year where potential output is close to
actual output.

We feel that a disadvantage of the IMF measure is the arbitrariness of the choice of
the benchmark year. Therefore in what follows we present the fiscal impulse
measures 1-3 in Figure 3.4. The interpretation of the change in fiscal stance is then
the following: fiscal policy is 'loose' ('tight') if the difference from one year to the
next is positive (negative).

![Indicators of fiscal policy](image)

**Figure 3.4: Three indicators of fiscal policy**

*Source: Bank of Finland*

These fiscal impulse measures behave qualitatively similar during the period of
interest. Therefore, in what follows we use the measure suggested by Blanchard
(1993) in measuring discretionary fiscal policy. Figure 3.5 describes the Blanchard
fiscal impulse measures as a share of GDP together with a change in unemployment
rate. Looking first at the period of overheating before the crisis, it is seen that according to the Blanchard measure for discretionary fiscal policy, fiscal policy was expansionary in 1987 but turned slightly restrictive in 1988-89. During the latter period the contribution of public consumption and public investment to economic growth also declined.

![Indicator of fiscal policy and change in unemployment](image)

**Figure 3.5: Indicator of fiscal policy and change in unemployment**

*Source: Bank of Finland*

During the crisis discretionary fiscal policy was first expansionary and thus countercyclical in 1991, while in 1992 it tightened a bit despite the increase in unemployment. Unemployment continued to increase in 1993-94 but discretionary fiscal policy remained tight particularly in 1993. During this latter period, government support of banks and the effects of automatic stabilizers were counteracted by cuts in government expenditures and increases in tax rate. The restrictive effect of government expenditures can also be seen from the contribution of public consumption and public investment to GDP growth, which was highly
negative in 1993, as shown in Figure 2.2 in Chapter 2. According to the Keynesian view this leads to a conclusion that during the Finnish economic crisis fiscal policy was not consistently designed in terms of stabilizing aggregate demand.

One can argue that at the ‘moderate’ levels of public debt, expansionary fiscal policy works in order to raise aggregate demand according to the Keynesian view. But when high deficits increase the level of government debt, then fiscal policy might have anti-Keynesian effects by affecting private sector expectations about future income from labor and capital. At the ‘very high’ levels of government debt the private sector might expect that, with high probability, they have to pay extra taxes in the near future so that aggregate demand will go down. Using OECD data from 19 countries including Finland over the period 1965-1994, Perotti (1999) has presented strong evidence that expenditure shocks have Keynesian effects at low levels of central government debt, and anti-Keynesian effects in the opposite circumstances. Therefore, at high level of public debt it is important to start fiscal consolidation and not continue fiscal expansion.

As a general conclusion for counter-cyclical fiscal policy, it is evident that fiscal policy usually was not systematically counter-cyclical (see Figure 3.5). In the 1980’s boom discretionary fiscal policy was only weakly counter-cyclical, and during the depression period its directions seem to have been fluctuating in a somewhat inconsistent manner. The big deficits and the shoot-up of the public sector indebtedness during the crisis were quite remarkable. In such a crisis the policymakers face the difficult problem of identifying the permanence of the shocks to the economy. In the case of Finland the shock coming from the collapse of trade with former Soviet Union seemed at least semi-permanent, but the other shocks appeared as basically cyclical.

The clear plan of fiscal consolidation and its systematic execution were evidently an important part of macroeconomic policies that aimed for good fundamentals to secure strong economic growth. It is notable that achievement of government budgetary

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23 See also Giavazzi and Pagano (1990, 1996), who have provided qualitatively similar empirical results by using data from Denmark and Ireland in the 1980s and from Sweden in the 1990s.
balance and improved public sector indebtedness took several years to materialize. This is in part due to the fact that structural unemployment increased during the crisis (see also Section 5 of Honkapohja and Koskela (1999) and Chapter 7). Next, we present what are, in our opinion, lessons from the Finnish experience for macroeconomic management, for example to several new EU countries.

3.3. Lessons for Macroeconomic Management from the Finnish Experience

We begin with crisis years of the early 1990’s. Our analysis and interpretation of the reasons behind the Finnish depression can be aptly described as “bad luck and bad policies”, as first suggested in Honkapohja and Koskela (1999). The external shocks were exogenous to the Finnish economy and in this sense unavoidable. The collapse of trade with the former Soviet Union in 1991 was the biggest negative shock, but as noted in Chapter 2, two other important international developments can also be identified. First, in the second half of 1980’s the Western economies experienced a strong business-cycle upswing, which showed up as a considerable increase in the terms of trade from the point of view of Finland. Second, the recession in the Western market economies in the beginning of 1990’s and the high interest rates due to the policy mix between monetary and fiscal policy associated with German unification were additional negative external shocks. As we have seen, the case of Sweden in the early 1990’s is another good example of the classical financial crisis, while Sweden was less affected by the real effects of crisis than Finland in the 1990’s due to the absence of trade with the former Soviet Union. In Finland the cost of crisis in the 1990’s was higher than in Sweden in terms of loss of real income growth, loss of industrial production growth and loss of employment growth (see Jonung and Hagberg (2005)).

Clearly, the external shocks played a significant role in the Finnish boom-to-bust process - this is the “bad luck” part of the economic deterioration. However, external shocks are far from being the whole story. If there had been no additional factors, Finland would have experienced a recession but not a very large depression.
We have argued above that Finland experienced a classical financial crisis. These problems originated from a poorly designed deregulation of the financial system without any further reform packages, which would have needed in conjunction with the financial deregulation. Lifting domestic interest rate controls, allowing the private sector to borrow freely from abroad and sticking to the fixed exchange rate gave rise to a lending boom at home and from abroad, quite a lot of which was in foreign currency terms.\(^{24}\) In the case of Finland, this lending boom was made worse by an unreformed tax system favoring debt finance and unchanged bank regulation. For all these reasons the private sector became financially very vulnerable to changes in interest rates as well as in the exchange rate.

A situation of financial vulnerability has the implication that when the turnaround happens and/or currency starts change to become subject to speculative attacks, only bad alternatives are available to policy-makers. Defense of the value of the currency leads to a tightening of monetary policy and consequent increases in the domestic interest rate hurt the domestically highly-indebted private sector. Moreover, devaluation of the currency as an instrument to alleviate weakened competitiveness of the export sector is effectively a capital levy to that part of the private sector that had borrowed in foreign currency terms. Both of these policy choices at the downturn are grim for a country entering the economic crisis and Finland was no exception to this in the beginning of 1990’s.

Failure to reform regulatory schemes of the financial markets and the decision to leave tax system unchanged in the process of financial deregulation were clear policy mistakes in Finland. We would like to emphasize that financial market deregulation should not be carried out in isolation; rather it must be tackled with the reform of the tax system and tightened bank supervision. These measures would mitigate the domestic and foreign lending boom which stem from deregulation.

\(^{24}\) The reports by the three foreign experts of the Bank of Finland also emphasize this a great deal and point out that there was no clear overall strategy for financial deregulation, see Bordes, Currie and Söderström (1993).
Next we evaluate macroeconomic policies, which in Finland contributed to fluctuations in the financial system and thereby affected both cyclical and structural unemployment, i.e. consumption, investment, and wage and price setting.

Looking at monetary and exchange rate policy, we have seen that the strong Finnish Markka policy was misguided at least twice; first, at the start of the boom and then in March 1989 when the end of upswing was becoming evident. The failures of exchange rate and monetary policy suggest a clear lesson. When the financial deregulation is initiated, there is a tendency for the external value of the home currency to appreciate due to the huge capital inflow and to the fact that usually – as for instance in Finland - fiscal policy does not offset the demand-augmenting effect of the capital inflow. To mitigate overheating coming from financial deregulation and liberalization of capital movements, one should let the currency float (and most likely appreciate at least initially). When the turnaround starts to come out the financial system would be less fragile and thereby the authorities would have better alternatives to deal with evolving problems.

An early floating of the home currency appears to be an appropriate complement to policies for financial deregulation. If the currency is not floated as part of the deregulation phase, then the exchange rate cum monetary policy alternatives seem all bad. The monetary policy becomes ineffective and attempts to fight boom lead to higher capital inflow that makes the financial system even more fragile if investors think wishfully that the likelihood of exchange rate movements is very small. Currency depreciation via floating seems necessary after the boom when the competitiveness has deteriorated. After the floating, credibility of monetary policy can be improved by setting a clear domestic target, such as an inflation target. If it is not set very tightly, monetary policy should contribute to the recovery as inflation will normally not be a problem in depression.

For fiscal policy the general lessons from the Finnish experience are in principle straightforward. First, fiscal policy restrictiveness should complement any financial liberalization phase to mitigate the boom. Second, if a crisis and depression nevertheless emerges, big deficits and a rapid shoot-up of the public sector indebtedness are to some extent inevitable. This development makes it imperative to
pursue a program of fiscal consolidation at some stage of after a major part of crisis. Such a change in fiscal policy increases credibility and thereby lowers domestic interest rates and paves the way for recovery. Of course, the timing of the consolidation is a major difficulty. It really hinges on the nature of the impulse shocks. If the shocks are basically cyclical in nature, a policy of fiscal smoothing appears natural. Then the economy must live with fairly sizeable public deficits and some build/up of public debt. However, if shocks are deemed permanent or semi-permanent, the fiscal adjustment should not be delayed too long.

Improved monetary credibility in the form of inflation targeting and the systematic program of fiscal consolidation clearly played a role in the turnaround and resumption of economic growth in Finland in the mid 1990’s. Membership, first, in EU and, second, in EMU also contributed to economic growth as they were further signals conducive to macroeconomic stability and growth-oriented economy. The second half of 1990’s can be largely seen as a period of executing the clear general policy goals. Coupled with luck, structural developments and growth-oriented structural policies initiated a “favorable cumulative process” and the Finnish miracle came into being. The next chapters will discuss the structural changes and also assess economic policies pursued in the period from crisis to fast growth in Finland in detail. Before closing this chapter, we briefly characterize what has happened in terms of wage negotiation.

3.4. Wage Policy

In Finland, binding wage bargains are negotiated at the industry-level between the unions and the employer organizations. These agreements specify a general wage increase that applies to all wages within the sector. A typical agreement also defines a set of minimum tariff wages that apply to each job. Collective agreements cover the union members (currently ~75% of all employees) and non-union members in the sectors where the union density exceeds 50%. Due to this extension of the union contracts to non-union workers, the union contracts cover roughly 95 percent of all employees.
In contrast to many other countries, the Finnish wage bargaining system is still very centralized (see also OECD 2004, p.141). Most bargaining rounds have started with negotiations between confederations of employer and employee unions, creating a high degree of co-ordination in the individual union contracts. The union bargains have then been negotiated on the basis of the wage increases, agreed in the central agreement.

According to theoretical results and empirical evidence based on cross-country comparisons, centralized bargaining tends to moderate wage increases (see e.g. Calmfors 2001 and Flanagan 1999). The time-series evidence from Finland supports this evidence (Uusitalo 2004). Even though the Finnish wage bargaining system has been classified among the most centralized in cross-country comparisons, there has still been considerable variation in the degree of centralization between the different bargaining rounds. During past thirty years, there have been seven bargaining rounds (1973, 1980, 1983, 1988, 1994, 1995, and 2000) when no central bargain was reached and bargaining occurred at the industry-level. These industry-level bargains have lead to significantly higher wage increases than centralized bargaining rounds. The result also holds after controlling for the macroeconomic conditions prevailing during the wage negotiations. Also if the centralized bargaining rounds are classified according to their coverage, the average wage increases have been clearly lowest during the bargaining rounds with widest coverage. Table 3.1 shows these results clearly.

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**Table 3.1 Nominal wage increases by the level of wage bargaining**

<table>
<thead>
<tr>
<th>Raw averages</th>
<th>Number of cases</th>
<th>Bargained wage increase</th>
<th>Nominal wage growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decentralized bargaining</td>
<td>7</td>
<td>6.5</td>
<td>10.1</td>
</tr>
<tr>
<td>Centralized bargaining (all)</td>
<td>27</td>
<td>4.7</td>
<td>8.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree of centralization</th>
<th>Number of cases</th>
<th>Bargained wage increase</th>
<th>Nominal wage growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>No coverage (decentralized)</td>
<td>7</td>
<td>6.5</td>
<td>10.1</td>
</tr>
<tr>
<td>Low coverage</td>
<td>3</td>
<td>8.4</td>
<td>13.3</td>
</tr>
<tr>
<td>Medium coverage</td>
<td>10</td>
<td>6.6</td>
<td>12.0</td>
</tr>
<tr>
<td>Wide coverage</td>
<td>14</td>
<td>2.5</td>
<td>5.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controlling for unemployment and inflation</th>
<th>Number of cases</th>
<th>Bargained wage increase</th>
<th>Nominal wage growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decentralized bargaining</td>
<td>7</td>
<td>7.7</td>
<td>12.2</td>
</tr>
<tr>
<td>Centralized bargaining (all)</td>
<td>27</td>
<td>4.4</td>
<td>8.1</td>
</tr>
</tbody>
</table>
Degree of centralization

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No coverage (decentralized)</td>
<td>7</td>
<td>7.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Low coverage</td>
<td>3</td>
<td>7.1</td>
<td>10.6</td>
</tr>
<tr>
<td>Medium coverage</td>
<td>10</td>
<td>5.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Wide coverage</td>
<td>14</td>
<td>3.2</td>
<td>6.7</td>
</tr>
</tbody>
</table>


Figure 3.6 illustrates the relationship between the degree of centralization and wage growth by plotting the bargained wage increases against the unemployment rate prevailing at the time of wage negotiations. The figure shows a clear Phillips curve relationship between the wage increases and unemployment. Comparing the wage increases in the industry-level bargains of 1973, 1980, 1983, 1988, 1994, 1995 and 2000 to the centralized bargains reveals that wage growth tends to be higher in industry-level bargaining than in the other years with similar unemployment rates.

Figure 3.6: Wage growth and unemployment

The results using Finnish data lie in conformity with findings from cross-country data, according to which centralized bargaining does moderate wage growth and, thereby, decrease the equilibrium unemployment. Prime examples from the 1990’s include national bargains in the recession years 1992 and 1993 when the nominal wages did not increase at all. On the other hand, different rates of economic recoveries across industries lead to industry-level bargaining and somewhat higher wage increases in 1994 and 1995.

Labor market programs and reforms are another aspect of policies to combat unemployment. Concerning the active labor market programs, the share of labor market training increased in the 1990s when depression started. The total number of individuals in such training was the highest in 1997, i.e. more than 4 percent of labor force. Naturally, participation in training programs improved slightly labor market prospects, but overall the labor market institutions did not change much in the 1990s (see e.g. Koskela and Uusitalo (2006)).
Chapter 4: Resumed Growth and Structural Change

In the earlier chapters we have discussed how Finland went through the most severe recession of its economic history in the early 1990’s. Fortunately, the recovery that started in 1994 was also rapid. The average growth rate of the Finnish economy during the period 1994 – 2001 was 3.3 percent per year, which was the second highest in the 15 EU countries after Ireland. Employment grew by approximately 2 percent per year during the same period. Growth has slowed down after the burst of the ICT bubble in 2001 and employment has remained almost constant after. Quite recently, in 2005 employment has started to increase again.

Part of the recovery was due to the forces of a normal business cycle. The recession left the economy with a large amount of idle resources and, once the growth picked up, some of these resources were put back to productive use. In what follows, we estimate the size of the output gap and calculate the fraction of the growth that can be explained by returning to a more normal stage in the business cycle. However, there is more than the business cycle development to the recovery story. This is because the 1990’s was also a period of rapid restructuring of the economy. Resources were reallocated across the sectors and across the firms within the sectors, which has helped to increase productivity growth. This creative destruction was particularly rapid during the recession years in the first half of the 1990s, but reallocation of resources across firms has boosted productivity growth over the whole decade.

In this chapter we proceed as follows. We start by providing output gap estimates for Finland in order to distinguish between cyclical and structural components of recent economic growth. We then compare the Finnish growth performance to other industrial countries. Next, we examine productivity growth in the 1990s and discuss the important role of the mobile phone sector. We also demonstrate that there has been a change from extensive growth due to an increase in capital-labor ratio to intensive growth due to a change in total factor productivity. Then we describe changes in the structure of employment during the recession and recovery and evaluate its effect on the growth rate. Finally, we briefly characterize the internalization of Finnish corporations in terms of FDI and employment.
4.1 The Aggregate Development

4.1.1 Increased capacity utilization after recession: output gap estimates for Finland

If recovery from the recession was an important part of the favorable economic performance during the second half of the 1990s, then a large fraction of the growth in output can be attributed to the business cycle fluctuations. Decomposing the changes in output into cyclical and trend components are not empirically easy. Still, for example, the OECD routinely performs these decompositions by calculating "the output gap", which describes the difference between output and potential output at a stage where the resources are fully utilized. Currently, the OECD uses an approach where structural unemployment is an unobserved variable that is related to the change in inflation according the Philips curve (OECD 2004). Our estimates are based on a similar idea with some modifications. Box 1 describes the methods that we apply in more detail.

Box 1. Measuring potential output and output gaps

There are several alternative approaches for estimating potential output. The most often used method is Hodrick-Prescott (HP) filter (e.g. Hodrick and Prescott 1997). Essentially, this is a time series technique that creates smoothed series. The degree of smoothness that is set by the researcher determines how closely the filtered series follow actual development. However, such filtering techniques are not well suited for the periods that may contain structural breaks. If the smoothing parameter is given a high value, the filter reproduces the actual series, if the smoothing parameter is given a low value, the filtered series exhibits trend like behavior. Neither captures structural breaks in an adequate way.

Our estimation procedure is based on unobservable components techniques. We use an extended version of a bivariate model of Kuttner (1994). The basic idea in the paper is that inflation depends on the difference between actual and potential output. By specifying a time series process for the potential output it is then possible to estimate the output gap based on the changes in the inflation rate.

We start from the identity

\[ y_t = x_t + z_t \]

where \( y_t \) is the seasonally adjusted logarithmic real GDP, defined as the sum of the potential output \( x_t \) and the output gap \( z_t \). Next, we assume that potential output follows a random walk with drift process as follows
\( (2) \quad x_t = x_{t-1} + \mu_t + \varepsilon_t \)

where \( \mu_t \) captures the rate of growth of potential output. We postulate the following time series process for the output gap

\( (3) \quad z_t = \phi_1 z_{t-1} + \phi_2 z_{t-2} + \lambda q_{t-1} + u_t \)

Equation (3) modifies slightly the original Kuttner approach. According to (3) output gap follows a stationary AR(2) process which has two stochastic inputs, (i) an exogenous variable \( q_{t-1} \) and (ii) the white noise term \( u_t \). The variable \( q_{t-1} \) describes the lagged demeaned growth rate of bank lending to the private sector and provides a proxy for the effect of financial shocks to the output fluctuation. According to this hypothesis the financial sector behavior affects the business cycles (see e.g. Kiyotaki and Moore (1997) and Carlström and Fuerst (1997)). This variable turns out to be statistically significant and improves the estimation of the output gap suggesting that financial market shocks, particularly in the banking sector, after the financial deregulation were an important determinant of the output gap.

Finally, we specify an aggregate supply relationship or a Phillips curve that relates inflation to the lagged output gap as follows

\( (4) \quad \pi_t = \mu_{\pi,t} + \beta z_{t-1} + v_t \)

\( (5) \quad \mu_{\pi,t} = \mu_{\pi,t-1} + \zeta_t \)

In equation (4) \( \pi_t \) is the rate of inflation as measured by \( 100\times\log(CPI_t/CPI_{t-1}) \), where \( CPI_t \) is the consumer price index. As there are some apparent gradual long-run shifts in the Finnish inflation rate that cannot be associated with the output gap, the intercept term in (4) is specified as a local level parameter in equation (5).  

The model specified above can be represented in the form of a state space model, which can then be estimated by the maximum likelihood method through an application of the Kalman filter.

1) Historical inflation rates in many OECD countries display long-run patterns that cannot be attributed to the output gap and thus should be removed from the inflation rate when estimating potential output and output gap. Previous studies have done this implicitly by using different techniques. Kuttner (1994) applied the growth rate of inflation (which is one way to remove smooth long-run patterns from the inflation rate), while Gerlach and Smets (1999) used a de-trended inflation rate. The local level modeling approach applied here has the advantage over the previous approaches that it allows to estimate the trend path of the inflation rate simultaneously with the output gap.

The output gap estimation results can be characterized as follows. First, the estimate of the linear trend in output (2) indicates that the Finnish real GDP has grown annually on average by 2.4 percent during this period 1975-2002. The coefficients of the auto-regressive part suggest that deviations of output from the potential output
tend to be fairly persistent. Moreover, as mentioned earlier in Box 1, the coefficient of the bank lending variable is positive and thus indicates that deviations of the growth rate of bank lending from its long-run average tend to magnify the output gap. If bank lending grows faster in the previous quarter than in the average, then actual output tends to be in excess of the potential level in the current period, which happened during the boom period in late 1980s while the reverse was true during the recession in early 1990s. Finally, the coefficient of the output gap variable in the inflation equation indicates that inflation accelerates if the lagged output gap is positive, and vice versa if the lagged output is negative.

The estimates of the potential output and the output gap are presented in Figures 4.1 and 4.2. For comparison, we also add in Figure 4.1 a conventional HP-filter estimate of the potential output. As shown in the figure, the HP-filter estimate closely follows the actual output with a major deviation occurring only during the overheating period in the end of 1980s and during the severe recession in early 1990’s. According to the HP-filter estimate potential output decreased slightly from 1990 to 1994 and then rapidly increased. We think that our unobservable components technique to characterize potential output over the period when the financial crisis happened is more realistic than HP-estimates.

The potential output series produced by the unobserved components technique behaves in a very different way. According to the estimates, potential output has grown over the whole period, although with a short pause at the beginning of the 1990s. The growth rate of potential output series has been roughly equal in 1980s and 1990s. A crucial difference is also that according to the HP-filtered estimate, the actual and potential outputs were equal in 1996, implying that the output gap had closed, while the estimate that uses the unobserved components technique indicates that the output gap closed only in 1999. The first years of the new millennium experienced the boom and actual output was again above the potential output.
Figure 4.2 reveals that the actual output was above the potential output for most of the 1980’s. The sharp turnaround in the cycle is illustrated by the swing in the output gap. Actual output dropped from 8 percent above the potential output to 8 percent below the potential output level between the boom year 1989 and the trough of the recession in 1993/94. The figure also reveals that if we wish to examine economic changes in 1990’s that are not affected by the different stages of the business cycle, a comparison between 1991 and 1999 or 2002 would be appropriate choices as in those years actual output was close to potential output.
4.3 Finnish Growth Performance in an International Perspective

As one can see from Figure 4.3, Finland’s long-term growth profile has been very volatile in comparison with Euro area and other Nordic countries. The recession in the early 1990s was much larger than in the other Euro area countries and the recovery was more rapid. After the mid 1990s Finland’s GDP growth per capita was higher than in most other OECD countries. Even though also the employment rate increased by about 2 percent per year, the main source of Finland’s GDP per capita growth during this period was the increase in labor productivity (measured by GDP per hours worked). Between 1994 and 2003 the increase in labor productivity contributed, on average, 2.5% to the annual GDP growth rate. As one can see from Figure 4.4, both the growth in labor productivity and GDP per capita was among the highest in the OECD. The increase in the labor input had a significant effect up to the year 2000. After 2000, employment growth halted and the total hours worked decreased in 2002 and 2003.
1. Weighted average of Denmark, Iceland, Norway and Sweden using 1995 GDP and PPPs.  

Figure 4.4: The sources of growth  
Per cent per annum, average 1994-2003

1. Labor resource utilisation is measured as total number of hours  
2. Labor productivity is measured as GDP per hour worked.  

Given the rapid growth of the Finnish economy after the economic crisis in the early 1990s, the average living standard of Finland (as measured by the level of GDP per capita in purchasing power parities) is now higher than the EU average. Finnish GDP
per capita is higher than in the United Kingdom and in Germany and only slightly lower than in Norway if the oil sector is excluded but still significantly lower than in the United States.

When assessing aggregate labor productivity levels and growth rates one has to consider, however, that there tends to be an inverse relationship between labor productivity per hour and labor resource utilisation. Dismissing low-skilled workers increases labor productivity while integrating low-skilled workers in the labor market reduces productivity. In the first case GDP per capita will decline despite higher aggregate productivity (as labor resource utilisation declines) while in the second case GDP per capita increases as a result of higher labor resource utilisation. Looking at the data in Figure 4.4, it appears that many European countries, including Finland, have indeed increased their aggregate level of labor productivity per hour by reducing employment of lower skilled workers and some other countries went even further than Finland in this respect. For example in France, Germany and Norway labor resource utilization is lower than in Finland while the levels of labor productivity per hour are higher. Part of the higher aggregate productivity levels in these countries may therefore be explained by lower resource utilization. Differences in labor resource utilization are, however, not the only reason why productivity levels and growth differ across countries and over time. Labor productivity can be enhanced by increasing the capital stock (capital deepening), and/or modernizing it by innovation and/or by improving the skill level of the labor force (human capital). It will be shown below that an important part of Finland’s good growth performance during the past decade can be explained by these latter factors, in particular innovation and improved human capital.

4.4 Productivity Growth in the 1990's

The most important reason for Finland’s growth performance after mid 1990s was the rapid growth of labor productivity. Since 1976, labor productivity has grown in the whole economy at an average annual rate of 3.1 %. Excluding non-market activities, where productivity growth cannot be adequately measured, labor productivity growth over last 25 years has been, on average, 4%. During the 1990's productivity growth
has been very volatile. It was highest during the crisis in the early 1990s when employment was sharply reduced. During the 1990s as a whole, average labor productivity growth was approximately equal to the past decades as shown in Figure 4.5.

**Figure 4.5: Annual growth of labor productivity.**

Source: National Accounts, Statistics Finland, ASTIKA database

Even though growth of labor productivity was, on average, not higher in the 1990's, the nature of productivity growth has changed remarkably. Later on we will present the following findings: 1) productivity growth was heavily concentrated in some industries, 2) productivity growth changed from extensive growth due to increasing capital intensity to more intensive technical progress, 3) productivity growth benefited from reallocation of resources towards more productive firms and 4) improvements in the quality of the labor increased productivity growth.
4.5 High Growth in the Mobile Phone Sector

During the 1990’s economic growth was concentrated in a very narrow sector, namely manufacturing of electrical and optical equipment. The annual growth of output in this sector has exceeded 20 percent between 1993 and 2000. A significant fraction of this growth was due to just one company, Nokia, which became very successful in the mobile phone industry. In Chapter 6 we analyze and discuss the reasons behind the success of the Finnish New Economy and Nokia and their contributions to growth.

**Figure 4.6: Annual growth of output in manufacturing.**

The high growth in the electrical and optical equipment industry was the driving force for growth in the total manufacturing sector while growth in the rest of the manufacturing was very low. Already before the 1990s, growth in the electrical and optical equipment industry has been higher than in the rest of the manufacturing sector, but as its share was low, its contribution to growth of total manufacturing had been small; see Figure 4.6 for details.
With much higher growth rates than the rest of the manufacturing sector, the electrical and optical equipment industry has also contributed to labor productivity growth of total manufacturing in recent years. For example in 1998 and 1999, almost all of productivity growth of the manufacturing sector was due to productivity growth in electrical and optical equipment industry.

4.6. From Extensive to Intensive Growth

Perhaps the most important development in the productivity growth has been a shift from extensive growth due to an increase in the capital-labor ratio to an intensive growth due to a change in the total factor productivity (TFP). For the period from 1976 to 1990, the increase in the capital - labor ratio accounted for two thirds of the labor productivity growth. After 1994 changes in the capital labor ratio have not contributed to the labor productivity growth, but labor productivity growth has been totally due to more efficient use of inputs and technical progress.

The early years in the 1990's were very volatile in terms of productivity growth. Capital intensity increased in 1992 and 1993 as a result of falling employment and not because of a rising capital stock. Between 1993 and 1999 capital intensity increased in market production, on average, by only 0,2%, and after 1994 it declined as the capital stock increased less than labor input. By contrast, the growth of total factor productivity (TFP) accelerated in the 1990's. The average growth rate of TFP between 1975 and 1990 was 1,8% in market production, but between 1993 and 1999 growth rate of TFP was, on average, 4.4%. These numbers suggest that the nature of growth in the last decade has been remarkably different from past decades. The contribution of capital was much lower and the contribution of TFP much higher (see Figure 4.7)

Figure 4.7: Growth in labor productivity in market production
Compared to other OECD countries, the total factor productivity (TFP) growth rate in Finland has been very high, in particular quite impressive in the 1990s. As one can see from Figure 4.8 only in Ireland the TFP growth rate has exceeded the Finnish rate. This result is consistent with a recent study by Annenkov and Madaschi (2005) who compared labor productivity growth in Finland and the other Nordic countries to the large Euro area countries using data that extends to the year 2004. Also in their comparison the Finnish productivity growth rate between 1996 and 2004 is the highest among the countries compared. Also they find that high productivity growth rate in Finland is mainly due of TFP growth. In their growth decomposition the TFP contribution to labor productivity growth in Finland is higher than that of any other country included in the comparison.
4.7 Creative Destruction in Action

Aggregate productivity may increase via two different mechanisms. Productivity in the existing plants increases when the firms reorganize production in a more effective way and when they adopt more effective technologies. Aggregate productivity also increases when resources are reallocated from the less productive to the more productive sectors or plants. Reallocation occurs as the existing plants expand or contract, new plants start up and old plants shut down. This reallocation of resources increases aggregate productivity if the expanding or entering firms have higher levels of productivity than the contracting or exiting firms.


A recession may increase the future growth path by accelerating the reallocation process towards more productive firms as the less productive firms exit the market.

The short-term effect of a recession is to both increase job destruction and reduce job creation so that total job reallocation may not change immediately. However, once the recovery picks up there are idle resources that can be employed by the growing more productive plants.

Figure 4.9 examines big structural changes in employment in Finland by sectors during the downturn period of the early 1990s and the following recovery period. As Figure 4.9 indicates, the newly created jobs were rather different from the jobs in the early 1990s. The first thing to note is the concentration of job losses in some industries. During the four years of the economic crisis, 450 000 jobs were destroyed. Total employment declined by 18 percent from the 1990 level. Half of the jobs in construction disappeared between 1990 and 1994. Employment declined by approximately 25% also in manufacturing, retail trade, hotels and restaurants, and financial services.

Once the employment started to increase after 1994, the largest increases occurred in services. Also employment in manufacturing grew rapidly, but this was largely due to the growth in the electronics industry (the Nokia effect). Looking at employment changes within more disaggregated categories than what was possible with the Labor Force Survey data would probably reveal rapid restructuring across industries within the manufacturing sector.

**Figure 4.9:** Change in employment by industry during the recession and recovery
As noted above, reallocation of the resources across sectors hides large changes that occur within these sectors. It is possible to define sectors at a more disaggregate level and examine the changes in employment across two- or three-digit industries, or even across individual firms or individual plants within firms. Such calculations have been performed for Finland by a number of authors. Figure 4.10 reproduces the figure by Ilmakunnas and Maliranta (2000). They calculate job destruction and job creation rates in the whole private sector over the period 1988-1996. As seen from the figure, the job destruction rates (JD) increased during the recession years 1991-93. At the same time the job creation rates (JC) decreased. Both the increase in job destruction rate and the decrease in job creation rates contributed to the net employment change (NET). In fact, the contribution of the changes in job destruction and job creation was roughly equal. Interestingly the total job reallocation rate (JR), defined as a sum of job creation rate and job destruction rate did not increase during the recession, but rather displays a declining trend over the whole period. The impact of reallocation on the productivity growth can be examined by decomposing productivity growth into
the within plant productivity growth (within effect) and the effect of reallocating resources across plants (between effect).

**Figure 4.10: Job creation and job destruction 1988-1996**

![Graph showing job creation and job destruction from 1988 to 1996.](image)

\[JC = \text{job creation rate}, \ JD = \text{job destruction rate}, \ JR = \text{job reallocation (JC+JD)}, \ NET = \text{employment change (JC – JD)}\]

In order to identify more fundamental changes in productivity, some aggregation over time is required. Therefore, many studies present productivity decompositions as averages over several years or smooth time series by using moving windows. Another and perhaps more illustrative way of aggregating over time is used in a recent study by Maliranta (2003). There he calculates the cumulative effect of aggregate productivity growth and of the part which is caused by productivity growth within firms (the within effect). Figure 4.11 reproduces the results of these calculations for the labor productivity in manufacturing between 1975 and 2000. The calculations define an index that equals 100 in the base year 1975 and update this index by the annual productivity growth rates.

The decomposition results for labor productivity reveal that the within plant productivity has followed very closely a log-linear trend over the whole period. Within plant productivity growth has been on average 3.8 percent per year. However, starting from the mid 1980s the aggregate productivity growth has been substantially faster than the within plant productivity growth. The widening gap between the two
series indicates that the acceleration of labor productivity growth since the mid 1980s can be largely attributed to the reallocation of resources between plants.

**Figure 4.11: Growth in labor productivity 1975 - 2000**

The corresponding calculations can also be done for the cumulative effect of the growth in total factor productivity; see Maliranta (2003). The calculations show that total factor productivity grew only a little between 1975 and 1991. As noted in the previous section, most of the growth in labor productivity during this period was due to an increase in capital intensity. However, after 1991, the growth rate of total factor productivity increased rapidly. In fact, the capital–labor ratio decreased for most of this period, so that most of the growth in the labor productivity was due to an increase in the total factor productivity. Second, the gap between within-plant and aggregate productivity growth is higher in total factor productivity than in aggregate productivity. Thus, reallocation of resources between plants had a large impact on total factor productivity growth, i.e. on technical progress during the 1990s.

In this chapter we have reviewed some evidence on the effects of creative destruction on productivity growth. It was noted that reallocating resources across firms by
simultaneous job destruction and job creation accelerates productivity growth if the growing firms are more productive than the contracting firms. This effect seems to have been reasonably strong in Finland in the 1990s. In fact, an international comparison by the OECD using firm level data shows that Finland is the only country in the study where resource reallocation between firms has had a consistent positive effect on labor productivity (see OECD 2001).

The Finnish recession provides an interesting case study for the impact of reallocation on productivity growth. However, it turns out that in contrast to what one might expect, the recession itself was not a particularly intense period of restructuring. Job destruction rates increased, but as job creation simultaneously decreased, conventional measures of reallocation do not indicate that reallocation between firms would have been particularly rapid. However, after the recession productivity growth, especially growth of total factor productivity, increased rapidly. This was largely due to an increase in the effect of reallocation. A conclusion drawn by Maliranta (2003) was that reallocation had become more selective, so that firm growth became more closely correlated with the productivity level. Possible explanations why this could occur are that higher competition in product markets and increased requirements for asset returns in financial markets fostered reallocation of resources towards the most productive firms.\(^{25}\)

4.8 Internationalization of Finnish Corporations

As in some other successful countries like Sweden, internationalization of Finnish corporations has also been one of the fundamental changes which has occurred in the Finnish economy. This trend strongly increased in the 1990s as reflected in the sharp increase in foreign direct investment as well as in the foreign employment of Finnish firms. In this section we briefly overview of the internationalization of the Finnish economy; see Mannio et al (2003) for further details.

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25 Clearly, regulatory impediments to product market competition have recently declined significantly for the group of EU-15 member countries including Finland. See Conway et. al (2005)
In the 1970s, Finnish firms’ international activities consisted mainly of exports with very little sales offices or production units abroad. The capital controls were lifted and foreign ownership was liberalized in the early 1990s. Also the gradual financial market liberalization, which started in mid 1980s, increased firms’ direct access to foreign capital markets and positively affected internationalization. The foreign direct investment statistics (see Figure 4.12) illustrate clearly the increasingly rapid internationalization of the Finnish economy, in particular from the mid-1990s. Between 1996 and 2002 outward FDI flows in relation to GDP, led by the metal and engineering industries, increased on average by around ten percent, while before it had been very low. The starting point for internationalization was to expand in the traditional export markets like in Sweden, Germany and the UK.

Figure 4.12:

In the 1990s many of the large Finnish firms were transformed into multinational enterprises with substantial foreign ownership, headquarters abroad and a substantial part of their production capacity outside Finland. This was reflected in the sharp increase in foreign employment as one can see from Figure 4.13. This development was even higher in the case of large Finnish-based firms. While the share of foreign
personnel by the 10 largest firms was less than 15% in 1983, it increased to over 60% in the year 2002.

**Figure 4.13:**

**Share of foreign affiliates' employment in total employment of Finnish manufacturing enterprises (%)**

Source: Bank Of Finland, ETLA
Chapter 5: The Importance of Human Capital and Research and Development

In Chapter 4 we noted that the growth of labor productivity in Finland has been clearly higher than the OECD average over the period 1994-2003. One of the key factors in the growth of labor productivity is the increase in the skill-level of the labor force. In this chapter we describe recent changes in the education level of the labor force and evaluate the effects of the improvement in education on the productivity growth. After that we shift to the analysis of research and development activities.

Both investments in education and investments in research and development (R&D) can be considered as investment in human capital. Accumulation of human capital increases productivity and contributes to the economic growth. Even if such investment is subject to diminishing returns, a more skilled labor force will achieve higher levels of income in the long-term, and during the transition period also the growth rate will be higher. According to endogenous growth theory growth could even be permanently higher if the higher skill-level leads to more intensive research, or if it eases the adoption of new technologies, both of which raise the speed of technological progress (for a theoretical analysis of this issue, see e.g. Barro and Sala-i-Martin (2004), Chapter 5).

There is thus strong theoretical support for a key role of human capital and R&D activities in the growth process. However, measuring their impact on overall productivity growth is not easy. In addition to the direct effects that can to some extent be measured, there may be indirect spillover effects. In competitive labor markets workers are paid according to their marginal productivity. Hence productivity effects of human capital can be measured by wage differences. However, if there are spillover or external effects, an investment in human capital by some workers increases also productivity of others (for a theoretical analysis of social returns of human capital investment, see e.g. Acemoglu (1996)). In this case the person making the human capital investment does not receive all of its benefits – the social return to human capital investment is then higher than the individual return. Unfortunately, these social returns are hard to measure. Since no one receives all the
benefits from investment in human capital, there are no natural measures on the impact of human capital investment.

The Finnish performance in investment in education has been impressive. As we will demonstrate in this chapter, the rate of increase in the general education level has been among the fastest within the OECD countries. The higher level of education has contributed to the increase in the skill level of the labor force. The youngest cohorts of workers in Finland are now among the most educated among the OECD countries. The youngest cohorts also belong to the top performers in international skill comparisons of such as the International Adult Literacy Survey. The trend of increasing skill levels appears to continue. In the recent PISA study the Finnish 15 year-olds scored highest among all participating countries in both reading and mathematics. This is remarkable given that Finnish expenditure in education, measured by its share in GDP or by spending per pupil, is only around the OECD average.

In this chapter we proceed as follows. First, we look at the skill level of the Finnish labor force and its change during the past decade and make a comparison with other OECD countries. Second, we discuss the impact of education on productivity and the merits of the Finnish education system. Finally, we compare the level of Finnish R&D expenditure with that in other countries.

5.1 Skill Level of the Labor Force

During the 1990's the quality of labor input changed rapidly in Finland. In 1990, more than a third of the workers had no education past the compulsory level. By year 2003 the share of least educated workers had decreased to below 20 percent. The decrease in the share of workers with lowest education level was accompanied by increases in the shares of workers with secondary and tertiary education. Figure 5.1 displays these trends by reporting the employment shares by education level. A rough calculation that allocates each education level a standard length of schooling shows that between 1990 and 2003 the average length of education increased by 0.85 years. This is probably an underestimate, since also the length of compulsory education has
increased over time. If more educated workers are more productive, an increase of the average education level leads to a larger increase in the effective labor input than a simple calculation of working hours would show.

Figure 5.1: Employed by the level of education

Source: Own calculations based on micro data from the Income Distribution Survey

It is rather surprising that the education level of the labor force can change so rapidly in a relatively short period of time. In fact, the change is a product of two factors. First, the expansion of the education system has increased the education level of younger generations. When younger generations gradually replace the older, the average education increases. The fraction of Finnish students that continue their education to the higher levels has increased rapidly since 1970s.

Second, also the changes in the relative employment rates have played an important role. The unemployment rates grew much more rapidly for the least educated workers during the recession in the early 1990's. Also, the least educated ones moved more often out of the labor force, in particular, in the older age groups. The employment rate of those with only basic education fell from 52% to 37% between 1990 and 1995. The fall in the employment rates for the more educated workers was much smaller even during the recession of early 1990s. Figure 5.2 reports the changes in these employment rates by level of education.
Hence, part of the increase in the average education level of the employed workers, and therefore, part of the increase in the labor productivity can be explained by the exit of less skilled workers from the labor force. Even though lower employment rates among the less educated may increase average labor productivity, the effect on the GDP per capita is clearly negative as less of the labor potential is employed.

**Figure 5.2: Employment rates by the level of education.**

![Bar chart showing employment rates by level of education from 1990 to 2003.]

*Source: Own calculations based on micro data from the Income Distribution Survey. Employment rates are calculated for the working age population aged from 15 to 64 years of age.*

5.2 A comparison with other OECD Countries

According to the OECD estimates, the level of education in Finland, measured by the average number of years of education in the working-age population, has increased by roughly 2 ½ years over the past three decades. The level of education of Finnish adults is now at a level similar to that in Denmark but still lower than in Sweden, Norway and some other OECD countries including Germany, United Kingdom, Canada and United States (Table 5.1).
### Table 5.1: Level of education of the population

Average number of years of education in the working-age population

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Finland</td>
<td>8.63</td>
<td>9.60</td>
<td>10.40</td>
<td>11.24</td>
</tr>
<tr>
<td>Canada</td>
<td>11.37</td>
<td>12.10</td>
<td>12.47</td>
<td>12.98</td>
</tr>
<tr>
<td>Denmark</td>
<td>9.85</td>
<td>10.60</td>
<td>11.04</td>
<td>11.43</td>
</tr>
<tr>
<td>France</td>
<td>8.75</td>
<td>9.51</td>
<td>9.96</td>
<td>11.37</td>
</tr>
<tr>
<td>Germany</td>
<td>9.47</td>
<td>11.41</td>
<td>12.89</td>
<td>13.51</td>
</tr>
<tr>
<td>Italy</td>
<td>6.64</td>
<td>7.32</td>
<td>8.36</td>
<td>9.61</td>
</tr>
<tr>
<td>Japan</td>
<td>9.14</td>
<td>10.22</td>
<td>10.90</td>
<td>11.51</td>
</tr>
<tr>
<td>Netherlands</td>
<td>9.00</td>
<td>10.11</td>
<td>11.21</td>
<td>11.51</td>
</tr>
<tr>
<td>Norway</td>
<td>9.78</td>
<td>10.74</td>
<td>11.59</td>
<td>11.87</td>
</tr>
<tr>
<td>Sweden</td>
<td>9.10</td>
<td>10.10</td>
<td>11.07</td>
<td>12.67</td>
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<tr>
<td>United Kingdom</td>
<td>9.10</td>
<td>10.10</td>
<td>10.89</td>
<td>12.84</td>
</tr>
<tr>
<td>United States</td>
<td>11.57</td>
<td>12.23</td>
<td>12.59</td>
<td>13.59</td>
</tr>
</tbody>
</table>

1. 1999
2. 1998

Source: OECD

OECD comparisons of average education level are problematic because educational systems in different countries are very different. Simple indexes such as average years of education are based on converting degrees to years of education using some standard length of education for each level of education. The resulting differences may partially reflect coding differences rather than real differences in the length of education. More comparable numbers can be calculated from surveys that are implemented in a similar way in each country. Below we report numbers calculated from International Adult Literacy Survey where the respondents in each country are asked about the total number of years spent in education over lifetime.

The average education level of the working age population does not fully reveal the expansion of the Finnish education system. Compared to many other countries, the expansion of the Finnish educational system occurred relatively late, and in 2000 there are still many workers who got their education in the 1960’s. The average education level continues to increase in Finland both due to the exit of older less
educated workers and due to the entry of young more educated workers. As indicated in Figure 5.3, the difference in the level of education across older and younger generations is very large in Finland and indeed wider than in other Nordic countries, Germany or the US.

![Figure 5.3: Average years of education by age group.](image)

*Source: Authors’ calculations from the IALS data*

### 5.3 The Impact of Education on Productivity

A simple way to assess the effects of education on productivity is to weight the changes in the employment of workers with different levels of education by their relative wages. If the wage differences reflect differences in productivity, the difference between wage-weighted change in employment and the raw change in employment reflects the increase in productivity due to the change in the relative shares of workers with different levels of education.

Below, we calculate the productivity contribution caused by the change in the composition of employment. In addition to grouping workers according to education, we also group them by gender and age. Changes in the age structure, due to aging of the baby boom cohorts, are noticeable as indicated in Figure 5.4 and they also
contribute to the productivity growth. The share of the youngest cohorts in employment has declined both because of the decrease in the cohort size and because of delay in the entry age to the labor market. The latter is due to the increase in the time spent in education. The share of the oldest worker cohorts has grown mainly because the large cohorts that were born after the war have entered these cohorts, but also because participation rates among the older cohorts have increased. Since older workers earn more than the young, our procedure that measures productivity differences by relative wages indicates that aging has had a sizable contribution on the productivity growth. An important caveat in these calculations is that there is evidence that wage differences do not always reflect productivity differences. For example, Ilmakunnas and Maliranta (2005) estimate plant-level production functions that include worker characteristics and show that wages increase with age more rapidly than productivity. Evidence on the differential effects of education on wages and productivity is less conclusive.

Figure 5.4: Employed by age

Source: Income Distribution Surveys, Statistics Finland

Despite these concerns we proceed and report the contribution of the change in the quality of labor on labor productivity for the period 1990 – 2003 in Figure 5.5. (We present details of these productivity decompositions in the appendix of this chapter). According to the estimates, the quality adjusted labor input has grown annually, on average, 0.3% more than raw employment. The estimates also show that the difference between changes in raw employment and quality adjusted employment
were largest when employment fell drastically between 1990 and 1993. The decrease in employment was more severe for the young and low-skilled employees. Therefore, the average productivity of the remaining employees increased significantly. When the employment rates started to grow in 1994, also less productive workers were able to find jobs and the quality change slowed down.

**Figure 5.5: Effect of the change in labor quality on productivity**

According to our calculations, the improvement in the quality of labor in Finland has had a significant impact on productivity growth. This result is well in line with previous studies, even though the previous studies only examine the contribution of the change in the educational level. For example, Elmeskov and Scarpetta (2000) calculate multifactor (MFP) productivity growth in twenty OECD-countries between 1990 and 1998. They then adjust the estimates to account for the changes in the education level. In Finland, the difference between these two estimates of MFP was among the highest in the OECD. Without the adjustment the estimated average annual MFP growth was 3.2%. When the changes in human capital (measured by education) were accounted for, the estimate for MFP growth dropped to 2.8% implying that the improved education level contributed almost half a percentage point to the average annual MFP growth. Other countries where a comparable change took place were Italy and France. Elmeskov and Scarpetta (2000) note that, as in Finland,
also in Italy and France the change was largely due to the decline in employment of low-skilled labour.

Moreover, Aulin-Ahmavaara (2000) estimates the effect of changing the education level on labor productivity between 1990 and 1997 and finds that education accounts for 0.5 percent of average annual labor productivity growth. Also, according to these calculations the largest productivity effects of the change in the education level of the employed workers occurred during the recession years 1991-1994.

5.4 The Merits of the Finnish Education System

Above we have shown that the Finnish education system has expanded rapidly in the past three decades and that the quantity on human capital, measured by the average years of schooling, has increased more rapidly than in most other OECD countries.

Of course, as important as the quantity of education is its quality. The Finnish school system has performed extremely well in international quality comparisons. The Finnish students have been among the top performers in the TIMMS study that compares mathematics and science achievement. The younger cohorts of Finns also perform extremely well in the International Adult Literacy Survey that measures literacy skills of the adult population. However, the performance of the Finnish 15-year olds in the international PISA study has received by far most attention. In the first round of the PISA study the Finnish students were best in the reading test of all 43 participating countries. The Finnish students were close to the top also in math (4th) and sciences (3rd). In the second round of the PISA study in 2003, the Finnish students did even better: Finland had kept its lead in reading but was now in the top also in sciences and second after Hong Kong in mathematics. The results of the PISA studies are shown in Figure 5.6 while Box 5.1 gives some background to the PISA studies.

Figure 5.6: Education performance of Finnish 15 year olds in international comparison
Box 5.1: International tests about educational achievement

The Program for International Student Assessment (PISA) is an test battery that was jointly developed by participating countries and administered to 15-year-olds in schools.

The PISA study was implemented in 43 countries in the first assessment in 2000, in 41 countries in the second assessment in 2003 and 58 countries in the third assessment in 2006. Tests are given to between 4,500 and 10,000 students in each country. A total of a quarter a million students participated in the 2003 PISA study.

Each participating student spent two hours carrying out pencil-and-paper tasks. Questions requiring students to construct their own answers were combined with multiple-choice items. Items were typically organized in units based on a written passage or graphic, of the kind that students might encounter in real life.

A total of six-and-a-half hours of assessment items was included, with different students taking different combinations of the assessment items. The three-and-a-half hours of testing time was in mathematics, with one hour each for reading, science and problem solving.

PISA assessed young people’s capacity to use their knowledge and skills in order to meet real-life challenges, rather than merely looking at how well they had mastered a specific school curriculum.

Source: OECD. 2000. Literacy in the Information Age: Final report of the International Adult Literacy Survey
High test scores could be the result of high level of spending on schools or they could alternatively be an indication of high degrees of efficiency and productivity of the education system. It turns out that investments in human capital are not exceptionally high in Finland. Measured by the share of GDP spent in education, Finland is close to the OECD average. This is illustrated by Figure 5.7 which shows the GDP share of total public spending on educational institutions in selected countries.

In 1999, total expenditure on educational institutions from public and private sources for all levels of education was 5.8% of GDP, exactly the same figure as the OECD total. In fact, expenditure on education as a share of the GDP has decreased in Finland during the second half of the 1990’s. This decline is partly explained by the rapid rise in GDP, as the spending on education did not keep the pace.

Figure 5.7: Total expenditure from public and private sources on educational institutions as a percentage of GDP

Even if the total expenditure in education in Finland is not exceptional by international comparison, the allocation of this investment differs remarkably from most countries. The fraction of engineering graduates in tertiary education is the highest in Finland among the OECD countries, as indicated by Figure 5.8.

**Figure 5.8: Graduates by field of study (2000)**

![Graduates by field of study (2000)](chart)

*Source: OECD, Education at a Glance, OECD Indicators 2002*

Resources invested in the engineering education may well have contributed to the success of the high tech industries. The large number of new graduates has guaranteed a sufficient supply of engineers. A partial indicator of this is that, despite high growth rates in demand, the wages of engineers have not been very high in international comparison; see Figure 5.9 for data on wages of electrical or mechanical engineers in different large cities. The wages of Finnish engineers are the lowest among the corresponding wages in the cities in Figure 5.9.

**Figure 5.9: Gross income in US dollars per hour (2000)**

![Gross income in US dollars per hour (2000)](chart)
5.5 Research and Development (R&D)

As we have shown above, the multifactor productivity growth was a main driver for output growth in Finland during the past decade. As R&D spending can be seen as an investment in innovation, it is important to examine its level and development.

Figure 5.10 shows that total R&D spending in Finland (as a percent of GDP) increased significantly in the 1990s in line with the same development in the Nordic countries (except Norway). It reached a level which is close to those in Germany and France (where R&D spending declined in the 1990s) and is higher than in many other countries. Finnish R&D spending is still considerably lower than in Sweden and also lower than in Japan, Switzerland and the United States. These numbers show that during the 1990s Finland became a country with high R&D spending, which lies in conformity with our general argument concerning the rapid transformation of Finland to a high-tech economy.

While in Finland the increase in overall R&D expenditure reflected increases in both business R&D and government R&D, in many other countries government R&D has declined in the 1990s as a per cent of GDP, following the reduction in military
spending and efforts to reduce fiscal deficits. It can be noted that the increase in government spending on R&D was not focused on military R&D.

To our knowledge there is no study available on the impact of R&D spending on growth in Finland, but OECD estimates suggest that in general a 10 percent increase in business R&D intensity which is about 0.1 percent of GDP boosts GDP growth by 0.3 to 0.4 percent. This could imply a long-run effect on the level of GDP per capita of about 1.2 percent under the conservative assumption that changed in R&D do not permanently affect output growth but increase GDP per capita to a higher level so that the impact of growth is only temporary until this higher income level is reached (see chapter 2 in OECD (2003): the Sources of Economic Growth in OECD Countries). According to endogenous growth theory that claims that R&D activity increases the growth rate permanently, the overall effect on the level of GDP would be much larger, pointing to significant externalities of R&D. The empirical results on the effects of non-business (including government) R&D are not so clear. The reasons may be that this R&D spending such as for defence purposes, fundamental science and health research may generate basic knowledge with possible technology spillovers in the longer-run. But in growth regressions such effects are difficult to identify given the long time lags involved.

A number of studies have examined the significance of R&D on economic growth. Griffith et al (2004), Zachariadis (2004) and Aiginger and Falk (2005) also provide recent statistically significant evidence of the effects of R&D on productivity and output growth by using data from OECD countries including Finland. Ali-Yrkkö and Maliranta (2006) have analyzed the productivity impact of R&D using a large panel data set of Finnish firms over the period 1996-2004. In the short-run (1-2 years) they do not find any statistically significant productivity impact of R&D. However, R&D does have an economically and statistically significant when it is taken into account R&D efforts made 3-5 year before. Hence, there is a significant lag between R&D and its positive outcome for productivity. Ali-Yrkkö (2005) have studied the impacts of public R&D financing on labor demand by using Finnish panel data over the period 1997-2002 and shown the public financing increases R&D employment.
Figure 5.10: R & D spending in international comparison

Total expenditure on R&D as a percentage of GDP, 1980s and 1990s

Source: OECD.
Appendix: Measuring the change in labor quality

A standard way to measure the growth of the effective labor input is to weight the changes in employment in the different age and education groups by their relative wage rates. (Jorgenson et. al. 1987).

\[
\text{Log}(L_i) - \text{Log}(L_{i-1}) = \sum_q \bar{v}_i \left[ \text{Log}(L_{i,q}) - \text{Log}(L_{i-1,q}) \right]
\]

\[
\bar{v}_i = \frac{1}{2} (v_{i,t} + v_{i,t-1})
\]

\[
v_i = \frac{p_i L_i}{\sum_i p_i L_i}
\]

where \(L_{i,l}\) is the labor input in group \(l\), and \(p\) the average wage in each group. The growth of labour input is, therefore, a sum over increases in the labour input of type \(l\) weighted by its value share, where the value share is calculated as an average over current and past period\(^{26}\).

To calculate the growth of effective labour input we use data from the Income Distribution Survey. Data is currently available from 1990 to 2003. The data contain information on earnings based on tax registers and months worked based on pension contributions. There is no hours information in the data, so the growth of labour input must be based on the growth in employment or the growth in months worked.

We limit the sample to the individuals aged 15 to 64 at the end of each year. We cross-classify the data into 50 groups by sex, 5 education categories and 5 age groups. For each group we calculate the annual changes in (log) employment and (log) months worked. The value share weights are calculated by dividing the earnings of each group by total earnings in each year. We include both wages and salaries and

\(^{26}\) The crucial assumption in calculating the growth in effective labor input using relative wages as weights is that firms operate under constant returns to scale in competitive input and product markets, and maximize their profits by equating compensation with each workers contribution to output. Even leaving aside the noncompetitive features of the capital markets until the 1980's, there are good reasons to doubt the competitive market assumption on the labor market. Some evidence on the differences between wages and marginal products has recently been presented by Hellerstein and Neumark (1998).
entrepreneurial income in our earnings measure and use annual figures as reported in the tax statement to calculate the earnings shares.

We cannot calculate directly the changes in hours worked by different types of labor because hours of work are not included in the Income Distribution Survey. However, we can compare the hours worked in some main categories to the employment growth in the Labor Force Survey to assess the magnitude of the bias. While the aggregate changes appear to be close, there are some differences. The largest differences are that the months in employment appear to decrease more slowly at the onset of the recession in 1991 than do employment in the sample or in the National Accounts. Also the high employment growth in 1994 appears not to be in line with the figures in National Accounts.
Chapter 6: The New Economy in Finland

Since the mid 1990’s Finland has been heralded as a successful model for the introduction of what is called “the New Economy”, i.e. production and use of modern information and communication technologies (ICT).\textsuperscript{27} As discussed in Chapter 4, the huge structural change in the Finnish economy was indeed largely a result of the rapid rise of the ICT industry. However, in Chapter 4 we left open the reasons behind the success of the Finnish New Economy and in this chapter we offer our explanation.

A major part of the story is due to the phenomenal success of one company, the Nokia Group. However, the Finnish story is not only Nokia and we will look at the development and role of the Finnish high technology industry both over time and comparatively to some selected countries. After this background and overview, we consider the “Nokia case” in some detail.

6.1 The High Technology Industry in Finland

We will focus on the Finnish information and communication technology (ICT) industry, which is commonly called the New Economy. High technology in Finland is currently dominated by ICT industry even if Finland is also investing in other areas of high technology – notably in biosciences, which have not yet made any major commercial impact.\textsuperscript{28,29} It should also be noted that high technology is not just manufacturing of ICT commodities such as cellular phones. High technology is very much a part of more traditional industries and, in looking at the role of ICT, it is important to distinguish between ICT in various industries, i.e., both the use of ICT in traditional production processes and the production of ICT commodities.

6.1.1 Development of ICT in Finland

\textsuperscript{27} The economic literature on the New Economy has grown rapidly and is quite diverse. Jones (2003) is a recent collection of review papers on different aspects of the New Economy. Dahlman et al (2006) provides a very detailed discussion of the knowledge economy in Finland.

\textsuperscript{28} Hermans and Kulvik (2006) contains a detailed analysis of the state of biotechnology industry in Finland.
Common ways to examine the impact of ICT industry is the measure of its contribution to the growth of aggregate output and its share in the value added of the business sector. We begin by considering the share of ICT industries in the market sector. The results in Table 6.1 show that this share has grown gradually over time, though the most recent years show a levelling-off with passing of the peak of the ICT boom. In the period 1985-2003 the ICT share in value added has risen from 4.2 percent in 1980 to 10.6 percent in 2003. The increase was particularly rapid in the second half of 1990s.

Table 6.1: Shares of ICT industries in the value added of the market sector

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacture of electrical and optical equipment (sectors 31-32)</td>
<td>1.3</td>
<td>1.7</td>
<td>2.6</td>
<td>6.1</td>
<td>5.2</td>
</tr>
<tr>
<td>Telecommunication services (sector 64)</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>3.2</td>
<td>3.6</td>
</tr>
<tr>
<td>Computer software and services (sector 72)</td>
<td>0.7</td>
<td>0.8</td>
<td>1.9</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Total ICT</td>
<td>4.2</td>
<td>4.7</td>
<td>5.7</td>
<td>10.9</td>
<td>10.6</td>
</tr>
</tbody>
</table>

Source: Own calculations using the Groningen data base, [http://www.ggdc.net/dseries/60-industry.html](http://www.ggdc.net/dseries/60-industry.html)

Note: sector numbering follows the Groningen data base

Next, we look at the role of ICT in economic growth using a standard framework for growth accounting. See the Appendix for a characterization to assess the ICT contribution to economic growth by using the growth accounting approach. Table 6.2, which is adapted from Jalava and Pohjola (2005), shows that the contribution of ICT industry was nearly one third of the overall economic growth in the period 1995-2002.
Table 6.2: Average Growth Contribution of ICT industries to GDP 1995-2002

<table>
<thead>
<tr>
<th>1995-2002</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Output growth, %</td>
<td>4.1</td>
</tr>
<tr>
<td>Contribution from ICT industries, percentage points</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Source: Jalava and Pohjola (2005)

A different question concerns the role of ICT in the growth process in the overall economy. Looking first at the stock of ICT capital, its role can be measured in different ways. The ICT share in the Finnish productive non-residential capital stock has been estimated to be over nine percent in 1999, up from about four percent in 1985 according to Jalava and Pohjola (2002). Another way is to consider the role of ICT in growth of output. Estimates of the contribution of ICT to real output growth are presented in Table 6.3.

Table 6.3: Contributions to real output growth and to labour productivity in the GDP, 1995-2002

| Output growth | 4.09 |
| Contributions from |  |
| ICT capital | 0.66 |
| Other capital | 0.19 |
| Dwellings | 0.20 |
| Labour services | 1.24 |
| Multifactor productivity | 1.81 |

Growth rates

| ICT capital | 17.49 |
| Other capital | 0.90 |
| Dwellings | 2.21 |
| Labour services | 1.85 |

II. Labour productivity growth

| Contributions from | 2.51 |
| Capital deepening | 0.51 |
| ICT capital | 0.60 |
| Other capital | -0.15 |
| Dwellings | 0.06 |
| Labour quality | 0.18 |
| Multifactor productivity | 1.81 |
| ICT related | 0.48 |
| Other | 1.33 |

Source: Jalava and Pohjola (2005)

30 The decomposition of multi-factor productivity is computed by estimating MFP growth in ICT production and in other production and weighting them according the weights in direct output contributions.
Table 6.3 shows that, in the second half of 1990s and the beginning of 2000s, the contribution of ICT capital to output growth has been much higher than the contributions of other forms of capital. A similar picture emerges for growth in labour productivity, though in multifactor productivity growth the role of other factors is clearly higher than that of ICT. Overall ITC contributed about one quarter to the average annual output growth of about 4% over the 1995-2002 period.

According to the longer-term data in Jalava and Pohjola (2002), the contribution of ICT capital to output has been steadily increasing (together with labour quality and multi-factor productivity), while those of other factors of production have not shown much systematic increase. The results of Jalava and Pohjola (2002, 2005) also show a surprising result: growth in labour productivity has slowed down somewhat since the second half of 1990’s despite the increasing role of ICT. This result is due to a negative contribution from other forms of capital. This last development contrasts with that in the United States, where labour productivity has been growing as a result of larger employment share in the ICT producing sector and faster productivity growth in services industries that makes intensive use of ICT (see e.g. van Ark et al 2003).31

6.1.2 Finnish ICT in international comparison

We start by comparing the role of ICT capital in Finland and selected other countries using the growth accounting framework. Table 6.4 gives the results for the EU countries with a large role of ICT and for the US as a point of comparison.

**Table 6.4 Growth accounting for selected countries**

<table>
<thead>
<tr>
<th></th>
<th>GDP growth</th>
<th>Contributions to GDP growth by</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ICT capital growth</td>
<td>Non-ICT capital growth</td>
<td>Labour growth</td>
<td>TFP growth</td>
</tr>
<tr>
<td>Ireland</td>
<td></td>
<td>0.6</td>
<td>2.3</td>
<td>2.1</td>
<td>4.7</td>
</tr>
<tr>
<td>1995-2000</td>
<td>9.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000-2004</td>
<td>5.0</td>
<td>0.4</td>
<td>2.3</td>
<td>0.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

31 See also Table 8 of Jalava and Pohjola (2002).
32 The results are adapted from Chapter 3 of EEAG (2006).
## Contributions to GDP growth by Finland, Sweden, the UK, and the US

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP Growth</th>
<th>Contributions to GDP growth by</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ICT capital growth</td>
<td>Non-ICT capital growth</td>
<td>Labour growth</td>
<td>TFP growth</td>
</tr>
<tr>
<td>Finland</td>
<td>1995-2000</td>
<td>4.9</td>
<td>0.7</td>
<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Finland</td>
<td>2000-2004</td>
<td>2.3</td>
<td>0.6</td>
<td>0.3</td>
<td>-0.3</td>
</tr>
<tr>
<td>Sweden</td>
<td>1995-2000</td>
<td>3.5</td>
<td>0.8</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Sweden</td>
<td>2000-2004</td>
<td>2.1</td>
<td>0.4</td>
<td>0.2</td>
<td>-0.4</td>
</tr>
<tr>
<td>The UK</td>
<td>1995-2000</td>
<td>3.3</td>
<td>0.8</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>The UK</td>
<td>2000-2004</td>
<td>2.3</td>
<td>0.34</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>The US</td>
<td>1995-2000</td>
<td>4.2</td>
<td>0.9</td>
<td>0.6</td>
<td>1.3</td>
</tr>
<tr>
<td>The US</td>
<td>2000-2004</td>
<td>2.4</td>
<td>0.6</td>
<td>0.4</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

Source: EEAG (2006)

Note: the columns in the growth-accounting tables may not add because of rounding.

Table 6.4 gives the results of growth accounting calculations for the EU countries for which the high technology sector has had the biggest impacts to economic growth and also for the US as a benchmark. It is seen that growth contribution of ICT in Finland is comparable to those of Ireland, Sweden and the UK, which are the EU countries with a major growth contribution from ICT capital; see Chapter 6 of EEAG (2006). In the second half of 1990s, ICT capital contributed about 0.6 – 0.8 percentage points to aggregate growth though this contribution fell somewhat in the period 2000-2004 when the big boom in ICT was over. It is also seen that the role of ICT in these EU countries was similar to its role in growth in the US economy.33

---

33 Ireland stands out as its other sources of growth were higher than in Finland, Sweden and the UK.
Table 6.5 shows the development of different kinds of ICT investments during the 1990s in international comparison.\(^{34}\) In comparing EU countries, it can be observed that, in the first half of the decade, Ireland, Denmark, Great Britain, Sweden and Finland were conspicuous as countries in which ICT investments grew more quickly than the European average. Correspondingly, Austria, Germany, Italy and Portugal stayed clearly below the EU average.

There are also big differences between EU countries in terms of different types of ICT investment. In the first half of the 1990s, of the countries that were exhibiting rapid growth, Ireland concentrated on office and computer equipment, Finland on communication equipment and Denmark on software investment. Sweden and Great Britain proceeded on a broader front: in those countries, ICT investment grew quite rapidly in all sectors.

In the second half of the 1990s, ICT investment grew quite rapidly in many EU countries and the differences between these countries clearly evened out. On the whole, in the second half of the decade Finland was near to the EU average and ICT investment continued to be specifically targeted at the communications equipment sector. Table 6.5 also shows that in the first half of the decade, ICT investment in the USA clearly grew more rapidly than in the EU while the difference was smaller in the second half of the decade as the growth in ICT investment accelerated both in the EU and in the USA.

\(^{34}\) The table shows all the EU-15 countries except Belgium, Greece and Luxembourg.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>11.2</td>
<td>32.9</td>
<td>2.6</td>
<td>10.0</td>
<td>8.1</td>
<td>17.8</td>
<td>5.9</td>
</tr>
<tr>
<td>Denmark</td>
<td>14.8</td>
<td>26.0</td>
<td>-0.5</td>
<td>8.2</td>
<td>16.6</td>
<td>14.5</td>
<td>13.6</td>
</tr>
<tr>
<td>Finland</td>
<td>16.9</td>
<td>28.6</td>
<td>25.2</td>
<td>26.1</td>
<td>4.8</td>
<td>13.0</td>
<td>9.2</td>
</tr>
<tr>
<td>France</td>
<td>12.9</td>
<td>30.2</td>
<td>3.9</td>
<td>10.2</td>
<td>6.7</td>
<td>17.7</td>
<td>7.9</td>
</tr>
<tr>
<td>Germany</td>
<td>8.8</td>
<td>33.9</td>
<td>1.9</td>
<td>12.0</td>
<td>7.4</td>
<td>11.4</td>
<td>5.9</td>
</tr>
<tr>
<td>Ireland</td>
<td>38.7</td>
<td>34.6</td>
<td>6.2</td>
<td>19.4</td>
<td>8.4</td>
<td>22.3</td>
<td>21.4</td>
</tr>
<tr>
<td>Italy</td>
<td>7.7</td>
<td>33.1</td>
<td>5.5</td>
<td>11.9</td>
<td>4.2</td>
<td>11.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Holland</td>
<td>13.1</td>
<td>30.5</td>
<td>1.8</td>
<td>15.3</td>
<td>4.5</td>
<td>19.1</td>
<td>7.4</td>
</tr>
<tr>
<td>Portugal</td>
<td>10.4</td>
<td>31.9</td>
<td>2.7</td>
<td>12.2</td>
<td>8.7</td>
<td>13.2</td>
<td>6.1</td>
</tr>
<tr>
<td>Spain</td>
<td>1.6</td>
<td>30.1</td>
<td>-0.2</td>
<td>13.5</td>
<td>-2.3</td>
<td>11.1</td>
<td>-0.2</td>
</tr>
<tr>
<td>Sweden</td>
<td>15.8</td>
<td>26.8</td>
<td>15.8</td>
<td>13.8</td>
<td>10.9</td>
<td>16.5</td>
<td>12.6</td>
</tr>
<tr>
<td>UK</td>
<td>13.5</td>
<td>30.4</td>
<td>15.6</td>
<td>10.4</td>
<td>11.5</td>
<td>17.3</td>
<td>12.8</td>
</tr>
<tr>
<td>EU</td>
<td>10.7</td>
<td>31.6</td>
<td>4.6</td>
<td>11.9</td>
<td>7.6</td>
<td>18.5</td>
<td>7.7</td>
</tr>
<tr>
<td>USA</td>
<td>17.4</td>
<td>27.0</td>
<td>4.1</td>
<td>15.7</td>
<td>10.1</td>
<td>19.3</td>
<td>11.0</td>
</tr>
</tbody>
</table>


A different measure of the importance of ICT is obtained if ICT investment is related to total investment. Table 6.6 presents the share of ICT investment in total fixed capital formation in different European countries, European Union as well as the United States in 1995 and 2001. The shares of ICT in EU countries range from the high share of about 21 percent to low share of about 10 percent.

Table 6.6: ICT investment as a share of Gross Fixed Capital Formation, percentage points

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>5.6</td>
<td>11.0</td>
<td>13.8</td>
<td>20.9</td>
<td>22.0</td>
</tr>
<tr>
<td>Sweden</td>
<td>5.0</td>
<td>8.7</td>
<td>9.7</td>
<td>15.8</td>
<td>21.6</td>
</tr>
</tbody>
</table>
Finland’s share of ICT investment in total investment (fixed capital formation) is somewhat higher than the EU average. This is the result of the big increase during the 1990s. Before Finland’s share of ICT investment in total investment was below EU average. Moreover, the increase in the ICT share during 1990-2000 has been the second highest in the EU with only Sweden achieving a bigger increase. The rise of ICT was more gradual in some other European countries with a high share of ICT investment. UK, Netherlands and Germany are examples of a more gradual rise. By comparison, the share of ICT in USA also increased relatively gradually during the period, but the share was very high already in 1980, so that in year 2000 ICT investments as a share of total investment continued to be much higher than in any European country.

Looking at the structure of the ICT sector, Finland has a relatively high share in manufacturing of ICT commodities; see Table 6.1. This feature is shared with Far East countries like Japan and South Korea. In contrast, the Finnish share of ICT services is comparable to that in many other countries, while the share of

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telecommunications is relatively low; see Figure 2 in Haltiwanger and Jarmin (2003) and Rouvinen and Ylä-Anttila (2003).

Daveri (2002), see his Table 2, compares the role of ICT in raising labour productivity and suggests surprisingly that ICT has not enhanced productivity very much in the EU countries during the 1990s. Growth in labour productivity in the “high ICT” countries has been slower than in the “low ICT” adopters, leading in aggregate to negative productivity growth per employed person in the EU. In contrast, in the USA the increase in labour productivity has been clearly positive. This fact is partly explained by other factors that have slowed down productivity growth, but even if the other factors are eliminated, the ICT contribution remains on the low end. For Finland the picture is somewhat better in the sense that the contribution of ICT to growth has been among the highest in western European EU countries; compare Daveri (2002), Table 3. Indeed, looking at changes in levels of labour productivity in Finnish industry, it appears that Finland has caught up the USA and possibly has even surpassed it; see also Figures on p. 42 in Koski et al (2002).

An interesting detail of the Finnish economy is the high share of mergers and acquisitions relative to other countries. Finland is on top of the list for EU countries in the share of mergers and acquisitions in the EU countries during the period 1991-1999 and also has the second highest share of foreign mergers and acquisitions relative to the size of the economy in the EU countries. This data suggests that industrial dynamics has been rapid in Finland and there is also evidence that much of the merger and acquisition activity has been in the Finnish ICT sector (see Pajarinen and Ylä-Anttila 2001).

Finally, we compare Finland to selected other countries in terms of the size and diffusion of ICT.

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36 See also Daveri (2003) for similar results. For another international comparison see e.g. Figure 3 of Colecchia and Schreyer (2002). They show that the contribution of ICT to output growth has been fairly high (above 0.5 percent per year) in United States, Canada, Australia and Finland. The contribution is lower (below 0.5 percent) in France, Germany, Italy, Japan and United Kingdom.

37 See the figures on p.57 of Koski et al. (2002).
Table 6.7: Share of ICT industry in the value added of the market sector in selected countries

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>4.7</td>
<td>5.7</td>
<td>10.9</td>
<td>10.6</td>
</tr>
<tr>
<td>Sweden</td>
<td>4.5</td>
<td>5.4</td>
<td>7.1</td>
<td>6.0</td>
</tr>
<tr>
<td>EU-15</td>
<td>5.3</td>
<td>5.1</td>
<td>6.0</td>
<td>5.7</td>
</tr>
<tr>
<td>US</td>
<td>5.6</td>
<td>6.3</td>
<td>7.2</td>
<td>6.2</td>
</tr>
</tbody>
</table>

Source: Own calculations using the Groningen data, [http://www.ggdc.net/dseries/60-industry.html](http://www.ggdc.net/dseries/60-industry.html)

Table 6.7 shows that Finland is one of the leading countries in terms of ICT production. This fact also translates into high foreign trade in communication goods, where in 1998 Finland was a world leader in per-capita ICT trade surplus (1000 USD), with Sweden and Ireland being the second and third according to this measure with figures 800 and 200 USD, respectively. Yet, it must be noted that production of ICT goods and services is not the only measure of the role of ICT in Finland. The use of ICT in other parts of the economy, called the diffusion of ICT, is at least an equally important part of the New Economy. Diffusion can be measured using various indicators. Perhaps the most direct measure is spending on ICT goods and services (defined as IT and telecommunications goods and services). The results for this indicator are shown in Table 6.8.

Table 6.8: ICT spending in Finland, Sweden and USA, percent of GDP

<table>
<thead>
<tr>
<th>Year</th>
<th>Finland</th>
<th>Sweden</th>
<th>EU</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>7.1</td>
<td>8.7</td>
<td>6.5</td>
<td>7.8</td>
</tr>
<tr>
<td>2003</td>
<td>7.0</td>
<td>8.8</td>
<td>6.4</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Source: Eurostat

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38 See OECD (2001).
Finland does not score on top according to this measure but is among the better performers in Europe. Table 6.8 shows that in 2001 the share of ICT spending per GDP for Finland is above the EU average but below the US. Finland is also well below Sweden, which is a world leader on ICT according to this indicator. This picture is similar to what is obtained by looking at other broader indicators like use of the Internet or personal computers in the population. For example, in 2003 there were 534 internet users per 1000 people in Finland, which is a little less than 573 users for Sweden and 551 for the US. In mobile phone subscribers in 2004 there were 96 users per 100 people in Finland, which can be compared to 108 subscribers in Sweden and 62 in the US. Overall we conclude that Finland is among the higher performers in ICT diffusion but quite the top country.39

How should Finland be assessed overall in terms of ICT activities overall in relation to other developed countries? We can conclude from the international comparison that during the 1990s Finland has become a high tech economy. This is particularly so in terms of measures of ICT production, in which Finland excels. However, a standard measure of ICT diffusion gives a somewhat different picture: Finland is quite not at the forefront in the use of ICT, but is among the best performers especially if the comparison is to the EU-15 countries. Overall, it can be concluded Finland appears to have some scope for improvement in the use of ICT in different parts of the economy.

6.2  The Nokia Case40

As is well known, the high-tech sector in Finland has been dominated by the Nokia Group, which is a most unusually large firm for a small country like Finland. Nokia is the leading producer of mobile phones in the world with a market share of about 30 percent in 2004 and close to 35 percent at the beginning of 2006. In mid 1990’s its market share was just over 20 percent and the share rose up to about 35 percent in year 2000. Nokia is also a large supplier of networks for mobile phones and in

39  In somewhat older data, used in Daveri and Silva (2004), the performance of Finland seems to be closer to EU 15 average
networks it is the second largest producer after Ericsson. Networks account for about one quarter of its net sales. 41

The size of Nokia relative to the Finnish economy and society can be described by various measures. The R&D spending of Nokia in 2001 was close one third of total R&D spending in Finland and nearly one half of the private sector R&D. With R&D spending of foreign affiliates included, Nokia spent in 2001 about 3 billion EUR, while total R&D spending in Finland was about 3.5 billion EUR. In the high-growth period towards the end of the 1990s Nokia grew very rapidly and, for example, in 2000 at the peak of the ICT boom Nokia was estimated to account for 2.8 percent of the Finnish GDP and contributed over 1.6 percentage points of its annual growth.

While Nokia has had a big impact on Finnish economic growth, exports and R&D activities, its direct impact on employment is much smaller. In 2001 Nokia had nearly 24,000 employees in Finland, which is about two percent of total employees in the business sector. About 60 percent of its Finnish staff (and one third of its total staff) work in R&D. In 2001 Nokia paid 0.7 billion EUR in taxes in Finland, which is about 2 percent of the tax revenues of the general government.

These impressive numbers are the outcome of phenomenal success in the 1990s. The Nokia story is thrilling and in this section we will briefly outline it. The Nokia case is also interesting since, as discussed below, it raises questions about the role of government and its technology policy in creating industrial successes.

6.2.1 A brief history of Nokia 42

Nokia is the outgrowth of mergers between different companies, the oldest of which was established already in 1865. Officially, the current limited company Nokia was established in the beginning of 1967 after mergers of two firms that, among other things, produced cables and metal products and rubber products, respectively. In the

41 See e.g. OECD (2004), p.28 for the basic facts on Nokia.
42 The history of Nokia is given in the extensive three-volume book Häikiö (2001) and our description relies heavily on this source. There is also the English edition Häikiö, (2002). An interesting popularly written account of the earlier steps in the development of telecommunications in Nokia is Mäkinen (1995).
1980s Nokia could be described as a conglomerate of a variety of different divisions producing very different kinds of commodities, ranging from forestry, metal products, cables, tires to consumer electronics (especially TV’s). Mobile phones were only a small though growing business in Nokia in the mid 1980s.

The 1980s were very turbulent times for Nokia. The management of Nokia expanded the company very aggressively through acquisitions of other firms thereby opening new production lines. Some of these acquisitions turned out to be disastrous, of which the purchase of central European TV production was the biggest failure. The structure of ownership in Nokia was a second difficulty that became acute in the second half of 1980s. At that time the Finnish financial system was very much bank-centred and the two biggest Finnish commercial banks were both large owners of Nokia. With the deregulation and increased competition in the Finnish financial system, these two banks became major rivals and wanted to give up ownership in Nokia. Eventually, one of them (Kansallis-osakepankki, which does not exist anymore after the merger in 1995) sold its shares in Nokia and the ownership structure was reformed at the end of 1991. The visible and severe feuds in the top management were a third major problem in Nokia and these were resolved in the beginning of 1992. Together with adverse aggregate developments in Finland and other countries discussed in Chapters 2 and 3, these difficulties meant that Nokia faced serious difficulties at the beginning of the 1990s. Many of its big divisions were in deep trouble. The mobile phones and telecommunications divisions were profitable, but at the end of 1980’s they were a relatively small part of total business activity of Nokia (only 17 percent of total turnover in 1989).

The ownership arrangements and the new management were a major factor in the new strategy of Nokia that was introduced at the beginning of 1990’s. The key part in the new strategy was concentration in ICT, especially in the aspects where growth and good profitability were perceived to be possible. Traditional businesses were sold: tires and forestry in 1988-91, cables and metals in 1994-96, and - after hard restructuring and big efforts - consumer electronics in 1996. The restructuring and the success in ICT led to a turnaround in profitability of Nokia. In 1991 the company made losses (19 million EUR in 2000 value of money) and the return on equity was a low 3.4 percent. Three years later in 1994 profits had soared to 659 million and the
rate of return had risen to 25.4 percent. The key factor in this rapid growth was the introduction of the GSM standard in mobile phones. GSM was universally adopted in European countries and many other countries as well, with USA and Japan standing out as the major exceptions. GSM was later introduced in USA.

The dramatic turnaround was sustained through the 1990s, and the company became both very big and highly profitable. Table 6.9 provides data on the development of Nokia over the period 1996-2000 during which Nokia grew very rapidly.

Table 6.9: Performance indicators for Nokia 1996-2000, millions EUR at 2000 prices

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<tbody>
<tr>
<td>Turnover</td>
<td>7076</td>
<td>9380</td>
<td>13992</td>
<td>20365</td>
<td>30376</td>
</tr>
<tr>
<td>Profits before taxes</td>
<td>768</td>
<td>1597</td>
<td>2613</td>
<td>4025</td>
<td>5776</td>
</tr>
<tr>
<td>Stock market value (end of year)</td>
<td>13595</td>
<td>19613</td>
<td>61590</td>
<td>215652</td>
<td>222876</td>
</tr>
<tr>
<td>Return on equity (%)</td>
<td>22.7</td>
<td>38.3</td>
<td>50.2</td>
<td>55.7</td>
<td>58.0</td>
</tr>
<tr>
<td>Indebtedness (%)</td>
<td>-9</td>
<td>-35</td>
<td>-36</td>
<td>-41</td>
<td>-26</td>
</tr>
</tbody>
</table>

Source: Häikiö (2001), part III.

The extremely rapid growth of Nokia necessitated reforms in its modes of operation. In particular, new production and logistical arrangements were introduced to meet the rapid growth in mobile phones and networks. Continuous product improvements were also made and, for example, the internet revolution came to mobile phones as well in the late 1990s. New product developments continue in the mobile phone business, and the next stages for ICT business appear to lie in linking mobile communications more and more closely to the internet. However, the rapid growth of the mobile phone business seems to be over at least for the time being.

In Figure 6.1 we present stock price comparison between Nokia, Ericsson and Motorola over the period 1995-2004. (The data has been converted to indices with 1995 equal to 100.) As one can see, there has been quite a lot of volatility especially
in the share prices of Nokia and Ericsson but much less so in the share price of Motorola. Moreover, Nokia’s stock price has been the higher than the prices of the other two since mid 1998. Nokia’s price rose rapidly as part of the stock market boom of the 1990’s, and the end of the boom led to a decrease in the price but it remained at the higher level than the price of Ericsson and Motorola. As we already noted, presently Nokia is the market leader in mobile phones and it has also a high market share in the supporting networks.

**Figure 6.1: Stock price comparison**

**Stock Price Comparison of Nokia, Ericsson and Motorola**

Indexation based on prices in US dollars.
Source: Bloomberg.

Figure 6.2 describes price per earnings over the same period 1995-2004 in the case of Nokia, Ericsson and Motorola. There have been quite a lot of fluctuations in this index as well and during the last few years Nokia’s P/E index has become relatively low.
6.2.2 Why did Nokia succeed?

Looking at the history of ICT in Nokia, its roots lie in the 1960s when a small unit in electronics was started to develop specific products, first for military and then for civilian use. Telephone switching equipment (puhelinkeskus) and radio phones were major products in which Nokia was very successful. Radio phones were first produced for military use, but civilian uses were also envisaged. A major milestone was the common Nordic NMT standard for mobile phones in the beginning of 1980s. At that time it was the largest such network in the world and it was also technologically the most advanced. The introduction of NMT fostered development of a variety of ICT products, phones, networks, support stations etc. Not only the companies but also the telephone operators took part in the development of ICT products, which speeded up the adoption of the new products. This process laid the

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Figure 6.2: P/E-ratio

Source: Bloomberg.

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P/E-ratio is the ratio of the stock price to earnings of the company.
ground for engineering know-how and in a way the Nordic countries were a test
ground for new products and product development.

Engineering know-how was naturally also fostered by the supply of good engineers;
supply of qualified personnel in Finland was very important for Nokia for a long
period of time. Finnish recruitment remained the main source of new personnel
through much of 1990s until about 1998 (see Ollila 2000). After that Nokia could no
longer rely on Finnish supply as the company had grown so large.

An important issue to ask and try to provide answers to the following question: What
degree of the success of Nokia can be attributed to its own actions and what to its
good operating environment? Of course, a precise decomposition of these aspects
cannot be done, but in what follows we discuss about their potential roles.

Wise government policies can take some credit for the success of Nokia and ICT
industry in Finland. First, the role of the governments in Nordic countries was
important as their decisions made the adoption of the common NMT standard
possible even if the huge success came only later with the introduction of the GSM
standard. Second, the supply of highly-skilled engineers and scientists was to a large
extent provided by the Finnish higher education system that has consistently laid
heavy emphasis on engineering, as discussed in Chapter 5. Third, the government has
provided significant public support to R&D of Nokia through the National
Technology Agency (TEKES). Over the years TEKES support to Nokia has varied a
great deal but it has been considered quite significant, especially in the 1980’s and
early 1990’s (see Ali-Yrkkö and Hermans (2002) for details). In recent years, the
public support has become small relative to the size of Nokia. In 1991 the support of
TEKES was ten percent of Nokia’s R&D expenses, whereas in 2004 the TEKES
support was only 0.4 percent of the R&D.

The biggest reasons for Nokia’s success naturally lie inside the company even if the
government support and the fostering of engineering education have played an
important complementary role. Its flexible, non-hierarchical management is a major
factor in achieving such excellent results from the available, admittedly large
prospects. It has to be remembered that in the 1990’s Nokia has been relatively much
more successful than its major competitors, Ericsson and Motorola, in the ICT business. The relative success has been largely possible only through internal business creativity.44 Nokia was quick to introduce new add-on products, which were designed for the consumer mass market. A wide range of changeable phone covers in different colours and patterns is just one example of flexible product design for different types of consumers. Naturally, luck has also played a role; it is impossible to have such success if the market opportunities do not exist, see Ollila (2000).

There is no doubt that since the 1990s Nokia has been very important for the Finnish economy in the aggregate. This is witnessed by the data we have provided. The share of Nokia in GDP and other macro variables do not, however, tell the whole story. First, Nokia has an extensive network of suppliers of parts and components for its product. Second, Nokia’s efforts in R&D are associated with the rise of other new ICT firms, especially in software, and Nokia also cooperates with Finnish universities (mostly in engineering and technology). The links between Nokia and other Finnish ICT industry appear to be significant at least in qualitative terms; e.g. see Ali-Yrkkö (2001), though quantitative evidence provided by Daveri and Silva (2004) casts some doubts on the strength of the spill-over effects and linkages from Nokia to other Finnish ICT firms in communications manufacturing, TLC and business services and computers. Using input-output tables, Daveri and Silva (2004) find that though the linkages exist, they appear to be relatively small in quantitative terms. The limited linkages between ICT industries and Nokia in input-output terms reflect to a large extent features that are typical for a small open economy. Firms that are very big relative to the domestic economy must rely on imported inputs and they also export most of their output.

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44 See Day et al (2001) for a discussion of organization of innovative activities in Nokia. They emphasize that the experience of Nokia demonstrates the importance of a flexible and adaptable organizational structure suggesting among other things that new ventures do need their own space to develop.
Appendix: Growth accounting with ICT capital

A common framework for assessing the ICT contribution to growth is the growth accounting approach; see e.g. Colecchia and Schreyer (2002), Daveri (2003), Jalava and Pohjola (2002, 2005), and Stiroh (2004). This approach assumes that aggregate output in the market sector is given by the production function

\[ Y(Y_{ICT}, Y_O) = AF(K_{ICT}, K_O, L), \]

where \( Y, Y_{ICT}, Y_O \) are value added of aggregate output, ICT goods and other goods, respectively. Correspondingly, \( A, K_{ICT}, K_O, L \) are multi-factor productivity, ICT capital services, other capital services and labour services. Under constant returns to scale in production and perfect competition, the share-weighted growth of outputs is equal to the sum of share-weighted growth of inputs and multi-factor productivity so that growth can be expressed as follows:

\[ \hat{Y} = w_{ICT}\hat{Y}_{ICT} + w_O\hat{Y}_O = v_{ICT}\hat{K}_{ICT} + v_O\hat{K}_O + v_L\hat{L} + \hat{A}, \]

where \( \hat{\cdot} \) denotes the rate of change, \( w_{ICT}, w_O \) are nominal output shares and \( v_{ICT}, v_O, v_L \) are nominal income shares of the inputs so that \( v_{ICT} + v_O + v_L = 1 \) under constant returns to scale.
Chapter 7: Remaining Policy Challenges

After the crisis in the first half of the 1990’s the economic performance of Finland has largely been successful, especially when compared to most Western European countries. The relative success of Finland should, however, not mask the problems that must be faced at present and in the foreseeable future. In this concluding chapter we consider the key remaining legacies from the 1990’s and the main future challenges for Finland.

The three main challenges for the continued success of the Finnish economy are 1) still persistently high unemployment, 2) rapid aging of the Finnish population and 3) pressures from the globalization process on the location of productive activities, the labor market and the public finances. Of course, Finland is not the only country facing these problems. Most other western European economies struggle with exactly the same concerns.45

7.1 The Unemployment Problem

As discussed earlier, the economic crisis in the early 1990s led to a huge increase in unemployment. Given the extent of the crisis, the rapid increase in unemployment was not surprising. The challenge instead comes from the relatively slow rate of decline in unemployment despite rapid economic growth since the mid 1990’s. We now discuss the various structural factors that may have contributed to the rise in structural unemployment and also to the withdrawal of specific groups of the population from the labor market. While a good part of this development was related to the crisis in the early 1990s, the fact that the fall in the utilization of labor potential was not fully reversed afterwards points to the importance of major structural factors that are distorting labor-leisure decisions.

45 See e.g. Wildasin (2000) for a discussion of pressures on the tax system arising from increased factor mobility. Currently, in western European countries including Finland there seems to be a tendency to decrease both the average labor taxes and the number of the marginal labor tax rates.
Despite the revival of fast economic growth in 1994, unemployment rate decreased only gradually and it currently remains at a high level, near the EU average (see Figure 1.2 in Chapter 1). To the extent that unemployment results from some structural malfunctions, attempts to reduce unemployment by growth-enhancing fiscal and monetary policies are bound to fail, possibly resulting only in higher inflation.\footnote{Honkapohja and Koskela (1999) developed a model of equilibrium unemployment using a framework of imperfect competition in product and labor markets, see e.g. Layard, Nickell and Jackman (1991). Computation of equilibrium unemployment for different periods suggested two important features. First, unemployment was below the equilibrium level as a result of the boom of latter part of 1980s. Second, actual unemployment became higher than equilibrium unemployment but also the latter rose during the depression.}

An important starting point is the structural change in the Finnish economy in the 1990s. During the four years of the economic crisis in 1990-1994, roughly 450 000 jobs were destroyed and total employment declined by 18 percent from its 1990 level. In the first quarter of 1994, employment was slightly below two million, which was at its lowest level since 1949. After 1994, employment has grown steadily, by approximately two percentage points each year. By 2001, total employment had grown by 313 000, or by about two thirds of the decline in the early 1990s.

During the recession some sectors suffered much more than others. Construction industry was hit particularly hard; in fact, half of the jobs in construction disappeared between 1990 and 1994. Employment declined by approximately 25 % also in various activities including parts of manufacturing, retail trade, hotels and restaurants, and financial services.

In the recovery after 1994, the largest increases in employment occurred in the business services and in the manufacturing of equipment. The electronics industry was responsible for most of the growth in manufacturing; other manufacturing sectors experienced only modest increases in employment. The service sector, particularly business services, education and social services, grew rapidly. The newly created jobs were rather different from the jobs lost in the early 1990s. The most rapidly growing service sectors had only experienced small employment declines during the recession.
Of the sectors that experienced large job losses during the recession, employment returned close to the pre-recession level only in the manufacturing of equipment. Less than a half of the employment decline in construction and only a third of the employment decline in retail trade was matched by subsequent employment growth after 1994.

Another way to describe the structural change is to examine changes in the occupational structure. In Figure 7.1 below we compare the changes in employment by occupation over the 1990s. We use data from the Income Distribution Survey and first calculate the mean wage in each occupation in 1990. The occupations are then ordered according to their average wage in 1990 and grouped into deciles in the horizontal axis. The vertical axis displays the changes in employment by deciles of mean wages. As the Figure 7.1 shows, the employment growth was concentrated on the high-wage occupations. Simultaneously, average employment declined and the decline was particularly severe in the low-wage occupations.

Source: Authors calculations based on data from the Finnish Income Distribution Survey

Figure 7.1: Employment change between 1990 and 2000 by occupation
The rapid structural change in employment created an increasing mismatch problem in the labor market. Unemployed ex-construction workers were poorly equipped to find jobs in the growing service sector. Since skill-requirements were often higher than the education level of the unemployed, the differences in unemployment rates across groups with different levels of education grew rapidly. In the mid-1990s the unemployment rate of workers with only basic compulsory education exceeded 20 percent, while the unemployment rate for people with university education remained around 3 – 4 percent. Uneven regional development also contributed to the mismatch problem. After the recession employment growth was rapid in the capital (Helsinki) region and Southern Finland and much slower in the high unemployment regions in Northern and Eastern Finland (see Koskela and Uusitalo 2006).

The clearest indication of a growing mismatch is the Beveridge-curve that shows the relationship between the unemployment rate and open vacancies in the employment offices. Figure 7.2 describes the Beveridge-curve for the period 1971-2004. It shows how most of the variation in the unemployment rate is related to business cycle (movements along the curve in north-west and south-east direction). However, the curve has also clearly moved out with two clear shifts in the curve. The first occurred in late 1970s and the other, much larger shift in the early 1990s. By the year 2000 the vacancy rate was back to its level in 1988, but the unemployment rate is about six percentage points higher. Recently, over the period 2001-2004 the vacancy rate has increased, but unemployment rate has declined only relatively slightly.
For most of the 1980s, long-term unemployment was not much of the problem in Finland. Average duration of ongoing unemployment spells was around 24 weeks, and the proportion of the long-term unemployed (unemployed for more than a year) slightly over 10 percent. This favorable picture changed during the depression in the early 1990s. By 1995 almost a third of the unemployed were classified as long-term unemployed. This fraction has remained high also after 1995 even though total unemployment rate started to decline. A similar feature appears in a number of western European countries (see e.g. Machin and Manning 1999). The structure of Finnish unemployment is shown below in Figure 7.3, in which unemployed are classified according to the number of weeks unemployed (“UI pension” refers to the long-term unemployment who are over 60 and are entitled to pension benefits).
7.2 Employment Friendly Policies

Tackling growing problem of long-term unemployment will be one of the most difficult policy challenges. An increasing fraction of long-term unemployed are over 50 and their return to employment tends to be difficult even when the economy is booming. Also the incentives to search for employment are often minimal given that unemployment benefits are relatively generous compared to the likely wage offers.

The Finnish unemployment benefit system has some special features that have a large effect on employment rates among oldest age-groups. Unemployment insurance benefits that replace on average 55 percent of pre-unemployment gross earnings are generally paid for the maximum of 500 days. In the 1990s the benefit duration was extended for the unemployed who were over 53 when they were fired. These unemployed could receive UI-benefits up to age 60 and then could apply for an unemployment pension. Effectively, the extended UI-benefits and the consequent unemployment pension became an early-retirement system that allowed leaving employment up to twelve years before the official retirement age. During the recession the system was extensively used by firms that searched for “soft” ways of
reducing their workforce. As a result, entry rates into unemployment tripled when the workers turned 53 and very few unemployed above this age found new employment.

The policy toward elderly unemployed was tightened in 1997 when the lower age limit for extended unemployment benefits was raised by two years. Kyyrä and Wilke (2006) demonstrate that the policy change was quite effective. Employment rates for the 53–54-year-olds who were affected by the reform rose to the similar levels with younger age groups. The age limit for the extended benefits was further raised to 57 in 2005. This change is likely lead into a substantial increase in employment rates for those between 55 and 56 years of age. At the same time, the unemployment pension system was abolished but this was probably less important because now the unemployed can receive UI-benefits up to the old age retirement.

Another important policy change that may affect long-term unemployment rates has to do with labor market support, a means-tested flat rate benefit paid to those who have exhausted their right to UI-benefits or who do not have sufficient employment history to qualify for UI-benefits. Beginning in 2006, the labor market support is conditional on participation on activation programs. Those who have received labor market support for 500 days or who have received labor market support for 180 days after UI-benefit period are entitled to further benefits only if they participate in labor market training programs. It remains to be seen whether this policy has desired effects. Earlier reforms that tightened the benefit conditions for the young in 1996 and 1997 did not have significant effects on employment, see Hämäläinen (2006).

Also tax policy has been used actively to promote employment. Average marginal tax rates have decreased by about six percentage points from their highest level in 1994. In addition, earned-income tax allowance that was first created in 1991 has become gradually more important. In 2006, tax payers can deduct up to 3850 euros for their earned income before paying local income taxes. In addition, a similar but smaller deduction was introduced to state taxes in 2006. These deductions are phased out for higher earnings but still have a substantial effect for tax rates for the median income workers. Since the deduction can be made only for earned income, it improves incentives to participate in employment.
In 2006 the government also introduced a reduction in the employer contributions for firms employing low wage workers over 54 years in age. The maximum reduction in the employer contributions is 220 euros per month and it lowers the payroll tax rate for a low wage worker earning 1400 in a month from approximately 21 percent of the gross wage to about 5 percent of the gross wage. Also this reduction is phased out as the earnings increase so that it is reduced to zero when the monthly earnings exceed 2000 euros.

7.3 Population Aging

The second key future challenge for the Finnish economy arises from the aging of the population over the next decades. While many Western EU countries face the same problem, the process is among the most extreme for Finland, see e.g. OECD (2006). Figure 7.4 illustrates the current and forecasted population age profiles for Finland. The figures show clearly how the fraction in the older age cohorts will increase quite drastically in the forthcoming decades. In fact, the increase in Finland occurs sooner than in most other EU-countries because large age cohorts born after the second world-war will reach retirement age in about 2010. EEAG (2005) presents corresponding data for all EU countries.

The macroeconomic significance of population aging comes from its negative effect on economic growth. To illustrate this we use the scenario calculation in EEAG (2005). The current trend growth for EU-15 countries is, on average, around two percent. Assuming unchanged labor force participation and current forecasts for the increases in the dependency ratio, the growth rate between 2004 and 2050 is expected to fall significantly to just above one percent. Per capita GDP growth will also be reduced because of aging although by less than GDP growth. While without aging per capita GDP would under these scenarios record a 2.44 fold increase by year 2050, whereas
Figure 7.4: Population age profiles for Finland
with the expected aging it the increase in average living standards will be only a 1.64 fold increase. Thus, with the assumed productivity growth the average living standard will still increase in absolute terms, but the demographic effect will have reduced it until 2050 by one third as compared to a situation with unchanged demographics.

Besides slower economic growth, population aging leads to other economic concerns, such as pressures in public-sector financing. Attempts to counteract these problems must focus on increasing labor force participation, improved training of the work force and various other means for maintaining a high rate of growth in total factor productivity. Moreover, to maintain the essential part of the welfare society it is important to raise the effectiveness of public spending by improving public services via more efficient provision.

Looking at Finland, the process of aging is occurring against the backdrop of low employment rates for the age group between 55 and 64. In 1999 the employment rate for 55-64 year old in Finland was slightly lower than EU average and much lower than the corresponding rates in the OECD, UK, United States and Sweden. However, the employment rates of age groups over 50 have been increasing recently. The employment rate of 50 to 54 year old is now 80 percent, close to the average employment rate of the prime age (30-49) workers. The employment rates of older age groups (over 55) are substantially lower, but have been increasing more rapidly than the average employment rates of younger age groups (see Figure 7.5). These changes are partially explained by policy changes, such as increases in the age limits of entering into various early retirement schemes, partially by improvements in education and health of younger cohorts compared to older birth cohorts, and partially by the increase in the demand for labor after mid 1990s.
As discussed above, the low employment rate in older age groups was in part created by features of the Finnish unemployment pension system, which pushed a fairly large number of people into early retirement during the crisis in the 1990s. The Finnish pension system\(^\text{47}\) had also other possibilities for early retirement. Disability pension has been the most common route of early exit. In late 1990s, almost 30 percent of those between ages 55 and 64 were on disability pension. The individual early retirement scheme allowed also entry into disability pension with less strict health criteria for those over 60. This age limit was much lower during 1990s: 55 up to 1995 and 58 until 2000, which at the time contributed to the large number of people in early retirement.

These features generated a wide discrepancy between official and effective retirement age in Finland. In Finland the discrepancy between official and effective retirement ages is among the highest in the OECD countries, e.g., see OECD (2003). Finland undertook a major reform of its pension system at the beginning of 2005. The main elements of the reform were increased pre-funding of pensions, linking pensions more closely to life-expectancy (especially increased longevity), and improving incentives to continue working. Finland introduced a window of flexible retirement ages (63 – 68) and a sharply increasing pension accrual rate within this window. Actuarial

\(^{47}\) See Börsch-Supan (2005) and OECD (2006) for detailed discussions of the Finnish pension system and its recent reform.
adjustments for early retirement were also increased. Also the use of other early retirement channels was restricted. Individual early retirement and unemployment pensions were entirely abolished. These changes were partly compensated by changes in the rules for disability pensions and unemployment insurance. Still, the most important change was probably a two-year increase in the lower age limit for receiving extended of unemployment benefits.

The aim of the pension reform is to increase the average retirement age by two years and lower the pressure to increase employer pension contributions required to finance the pension system. It is too early to form strong views on the success of the Finnish pension reform. The reform will clearly increase the incentives to continue in employment and is likely to increase participation rates. Restricting access to early retirement schemes will have a direct effect on employment rates. The question remains about the likely magnitude of the effects.

Börsch-Supan (2005) and OECD (2006) conclude that the Finnish pension reform is a big step towards making the pension system more sustainable but express worries that even after the reform, there are strong incentives to retire early through loopholes such as unemployment and disability pathways. A further problem in the Finnish reform is that pension contributions are expected to increase a lot in spite of the reform. For example, OECD (2006) predicts a six percentage point increase in the contribution rate out of private sector wages by year 2030. One reason for these increases lies in long transition periods that prevent the reform from stabilizing the projected increases in contribution rates.

7.4 Challenges from Globalization

In popular discussions globalization is seen either a threat or opportunity, depending on the viewpoint taken. Once the depression years were over, Finland certainly exploited the new economic opportunities from globalization, especially through the expansion of ICT industries. Full membership in the EU in 1995 was a major milestone in this process, though the process of becoming an open and globalized economy has naturally been much more general than EU membership alone.
The threats of globalization arise from the need for structural adjustments that are due to new chances for the movement of capital and labor across countries and the possible outsourcing of production.\textsuperscript{48} Mobility of capital for Finland was already discussed in Chapter 4, where it was seen that foreign direct investment both out of and into Finland has rapidly increased since the early 1990’s. Finland has been a net exporter of capital during this period. Globalization of R&D followed a similar pattern as large Finnish firms (especially Nokia) have increasingly diversified their R&D activities to different countries. The share of foreign R&D out of total R&D by Finnish manufacturing firms more than doubled very quickly from about 17 percent in 1997 to about 45 percent in 2001, after which and the share of foreign R&D seems to have stabilized to about 40 percent in recent years, see Ali-Yrkkö and Palmberg (2005).

International mobility of labor is a second aspect of international factor movements. A policy concern has been the question whether high taxes will make Finland less attractive for better educated workers. Pirttilä (2004) has assessed the factors behind Finnish emigration and immigration. Highly educated individuals seem to be five times more prone to emigrate than individuals with only secondary education. However, thus far tax differences seem to have played only a minor role in the migration choices. Emigration has not yet been directed towards countries with low tax rates. While emigration has increased, most emigrants have moved to other countries in Western Europe with nearly equally high tax rates.

As regards outsourcing of production, systematic reliable data on outsourcing is not yet available. It is clear that outsourcing has gained in importance in Europe since the mid-1990s. Between 1995 and 2000 the share of foreign intermediate products in total intermediate products increased in Finland like in most western European countries. Outsourcing of production is one way of taking advantage of the low labor cost in other countries. Within the EU, outsourcing of production to the new Eastern

\textsuperscript{48} See e.g. Bhagwati et al (2004), Feenstra and Hanson (2001), EEAG (2005) and Kirkegaard (2005) for further discussions and references on outsourcing. The empirical literature on outsourcing is currently small. Hijzen et al (2005) have investigated the link between international outsourcing and the skill structure of labor demand in the UK. They show that international outsourcing has had a large negative impact on the demand for unskilled labor, so that international outsourcing seems to explain the changing skill structure of labor demand.
European EU-countries is a clear opportunity for many firms. Figure 7.6 gives an idea of the magnitude of the incentives for production relocation by comparing labor costs in EU-countries for industrial workers. Differences in terms of labor costs are relatively large and will probably play a major role in the future in the location choice of newly established firms and of existing plants as well. While the Finnish labor costs are roughly the same as the average in western European EU-countries, these costs are much higher compared with the new EU-countries, although wage differences also reflect differences in productivity. Data on productivity is not currently available.

Lower costs of inputs from Eastern Europe make Western European firms more competitive through outsourcing and at the same time the consumer benefits from lower prices. For labor markets new problems emerge as in countries with highly regulated labor markets, including Finland, unskilled workers are unable to compete with workers in countries with low labor costs. Currently, this problem of lack of wage competitiveness falls predominantly on unskilled workers, though more skilled professions may eventually face similar pressures.

International outsourcing generates both winners and losers. Beneficiaries of these new developments include firms engaging in outsourcing and offshoring of
production, countries hosting the outsourced production activities, and consumers of the outsourced goods and services. On the other hand, unsuccessful firms and workers who lose their jobs because of outsourced production are evident losers in the processes that relocate production between countries.

It is important for governments to ensure that countries attempt to realize a net gain from globalization, though the policy responses to increased international factor mobility and outsourcing of production are not straightforward. On the one hand, factor mobility and outsourcing are consequences of new economic opportunities and efficiency gains in production and contribute to improved global welfare. On the other hand, these changes pose challenges to national economic policies, which must be geared towards increased capabilities to adapt to new modes of production activities and to facilitate movement of factors to new sectors from declining ones. Ways must be found to increase relative wage flexibility and improve worker mobility. This is a major challenge to the Finnish centralized system of wage bargaining, which as an advantage has helped to keep inflation relatively low but as a disadvantage has compressed relative wages. The latter tends to reduce low-skilled employment, see OECD (2006), Figure 4.6.

Preservation of sound public finances and the welfare state are another major policy challenge in the presence of globalization and the consequent tax competition. In particular, tax competition has gradually led to lower taxes rates, especially in business taxation, though the development is less clear-cut for personal taxation. These tendencies are putting pressure on the public finances and tax system, and the pressures are magnified by relatively high structural unemployment and rapidly aging population. These concerns pose a major challenge not only for Finland but for other western European countries as well.

The future performance of high-tech industries is central to the resolution of the challenges. ICT has been and is likely to be the key source for improved productivity

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49 See Kirkegaard (2005) for a further discussion of possible European policy responses to outsourcing and offshoring. He emphasizes Western Europe’s necessary policy response is the need to increase flexibility of labor markets.
in the Finnish economy. Finland has had an excellent record in ICT, though a potential problem in Finnish ICT is its focus on the production of ICT goods. As was discussed in Chapter 6, the role of ICT in Finland is markedly different from, e.g., that in the United States, where productivity improvement due to ICT has been much more in the use of ICT in other productive activities. It will be difficult for Finland to maintain the competitive edge in the production of ICT in the presence of technological convergence, new standards, and increased international relocation of productive activities. Clearly, Finland must find new ways to make better use of ICT in other sectors, including the production of public goods and services. The latter would also provide some relief to the pressures on public finances outlined above. This would make the economic situation of public sector better. Moreover, industrial policies should be geared more towards provision of innovations in the use of ICT in other parts of the economy.

7.5 Epilogue

We have tried to convey the Finnish economic developments in the last twenty years in order to provide ideas for successful economic policies for other countries. It is time to recapitulate the main message and comment on policy response to the current challenges outlined in this chapter.

The Finnish case divides into two dramatically different episodes. In the first episode from late 1980’s to early 1990’s the economic experiences of Finland have been summarized as a “tale of bad luck and bad policies” in Honkapohja and Koskela (1999). Major changes in the external environment arose from deregulation and liberalization of the financial system, goods markets and other aspects of the economy. Finland had to respond to external pressures by opening up its economy to capital mobility, financial flows and lower trade barriers. The liberalization process led to first overheating and subsequently to crisis, which was a result of both negative external shocks and bad policies.

50 Hermans et al (2005) suggest that biotechnology is unlikely to be a major source of growth for some decades into the future.
Though the crisis was partly the result of bad policies, it also initiated a process of major structural changes and a redirection of policies that made resumption of economic growth possible. Indeed, the tale of Finland changed dramatically in the second episode that started mid 1990’s when economic growth became quite rapid. As was discussed in Chapter 3, these changes in macroeconomic policies were instrumental in overcoming the crisis. The policies turned round at the end of the crisis and became supportive of the recovery and continued economic growth. In particular, the membership in the European Union and subsequently in the Euro area helped to initiate a program of macroeconomic stabilization, which supported the process of economic growth after the crisis.

The fast growth was fuelled in good part by the emergence of high-technology industry in Finland. As we have seen, the key background elements for the favorable process of structural change towards a high-tech economy were largely in place and were not much affected by the crisis. The continuous groundwork done both by the Finnish education system and technology policy contributed to the success of the Finnish industry. These were important characteristics even though the business success of Nokia and other high-tech companies was the most important part of the remarkable developments in the second half of 1990’s.

Overall, the recovery of the Finnish economy from deep crisis is a remarkable achievement. The acute crisis led to a strong political consensus to overcome the economic and social hardships. This consensus in turn made it possible to adopt economic policies, which helped to turn the crisis into the period of rapid growth since the mid 1990’s. No doubt, the severity of the crisis was crucial in achieving the required political will.

As discussed in this chapter, not everything is well and important challenges exist at present. Of these challenges, the slowdown of economic growth from population aging and the pressures from globalization are likely to dominate economic policy making for quite some time into the future.
Attempts to counteract the growth slowdown must be based on policies that mitigate the reduction in labor input that is the main economic consequence of population aging. Further reforms of the pension system may well be needed to provide strong incentives to longer work lives. Another area of reforms concerns the young. In particular, the university system must be reformed, as university study times in Finland are among the longest in Europe, e.g., see Figure 5 in Jacobs and van der Ploeg (2006). Both of these reforms are aimed to mitigate the reduction in labor input that necessarily results from population aging.

As regards globalization, its effects are still poorly understood. Though countries with high labor costs will loose low-skill jobs and production to other countries, these pressures will also change wage bargaining practices. It is likely that there will be more flexibility in wage determination of the low-skilled labor. Labor market reforms should aim to facilitate adaptability of Finnish work force to the structural changes that are likely to come from forces of globalization.

An important policy goal for Finland is the search for the comparative advantages in the globalized world. As discussed above, for Finland the future comparative advantages are likely to be in high-tech industries, in particular in the ICT. Facilitating ICT will require a well-trained labor force, of which a significant part must have a university-level educational background. This again points to the importance of reforming the Finnish university system and shortening of study times in universities.

The gradually emerging problems from current economic challenges are by their nature very different from the acute crisis of the early 1990’s. They represent a poorly visible, creeping crisis. While the crisis of the 1990’s led to a determined political response, it is not currently evident that the Finnish political system will adequately respond to the current and coming policy concerns.

\[51\] In contrast, study times in Finnish vocational education do not seem to be excessive.
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