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The need to understand the impact of the crisis on potential output

The crisis is already having a dramatic impact on Gross Domestic Product (GDP). In its economic forecast released on 4 May, the Commission estimated that GDP will contract by about 4% in 2009 and by 0.1% in 2010 in both the EU27 and the euro area. The longer-term repercussions on potential output are however less clear.

It is useful to distinguish between the impact of the crisis on potential output in terms of level and in terms of the long-term growth path:

- *the crisis will possibly have an impact on potential output in level terms over the long-run due to lower potential output growth rates during the immediate crisis period and during the potentially long recovery period when potential growth rates converge towards their long term path: the duration of this recovery period towards the long-term trend is highly uncertain as it depends not only on the size of initial shocks but also on policy responses. It is likely that the short-term loss in potential output in level terms will become permanent (in the absence of strong policy responses) since entirely recouping the loss means concretely that potential growth should overshoot in the medium-term and stay at a higher rate than the pre-crisis period for some time.*
- *There is a risk that long-term post-crisis potential growth rates will be lower than their pre-crisis levels, i.e. a full convergence is not achieved either as a direct consequence of the crisis (e.g. shift in risk aversion) or due to inappropriate policy responses.*

Thus, a number of scenarios are possible, ranging from an optimistic "full recovery" to a more plausible "permanent level loss" in potential output and a pessimistic scenario "continuous widening loss" scenario in potential output. Understanding the channels through which the economic crisis can impact potential output in level/growth terms and obtaining reliable broad orders of magnitude thereof is a critical challenge for policy makers since this will condition the exit strategy of the European Union (EU) and help formulate policies to mitigate output losses in the medium term. This is especially important in the EU as the period when economies need to rebound from the effects of the economic crisis coincides with the effects of population ageing taking hold on the real economy. An understanding is also needed to help ensure the effectiveness of the measures in the European Economic Recovery Plans (EERP) and in particular to ensure the appropriate timing when exit strategies are implemented.

Tracing the negative effects of the crisis on potential output levels and growth rates

A review of the economic literature identifies several channels thorough which the crisis can impact on potential output levels and growth rates:

- *A crisis can reduce potential output in the short and medium term through its adverse impact on investment. The ensuing slower capital accumulation can be combined with an acceleration in the obsolescence of some capital vintages due to economic restructuring.*
- *A slow process of industrial restructuring, caused for example by credit constraints, an impaired system of capital allocation or by entrenched structural rigidities, can also hurt the level and growth rate of Total Factor Productivity (TFP) in the medium to long term by locking resources in (relatively) unproductive activities.*
- *TFP growth in the medium to long run could also be curtailed by depressed investments in private Research and Development (R&D), which are markedly pro-cyclical. TFP drivers, such as physical investment, R&D and innovation, may also suffer from a prolonged recession and from the shifts in attitudes towards risk which are resulting in a tightening of credit conditions and an increase in the cost of capital.*
- *A short recession would not affect the pace of growth of the labour force, leaving potential growth unharmed in the longer run. However, a long and deep recession may cut the potential labour force by discouraging some workers from seeking a job and by reducing*

migration flows. Moreover, political pressures to implement policies that would curtail labour market participation (e.g. early retirement, curbs on migration flows) may increase. Equally, if short term crisis-related measures (e.g. a temporary increase in unemployment benefits) are not reversed in the recovery phase then this would further reduce employment.

- *Finally, in the case of a prolonged recession, long unemployment spells may cause a permanent destruction in human capital, leading to an irreversible rise in the Non-Accelerating Inflation Rate of Unemployment (NAIRU) -due to so-called "hysteresis effects"- and further losses in the potential output level. By contrast, the NAIRU is not likely to affect the long-term pace of potential growth, since this would implausibly require that it permanently increases over time.*

Insights from past financial crises: the pivotal role of TFP in driving the recovery process

An analysis of past financial and economic crises provides some tentative indications about the probable impact of the current crisis on the level and growth rate of potential output:

- *past episodes of financial distress were characterised by sizeable losses in output – at least twice as large as in more "classical" downturns – and in employment. "Classical crises" in general tend to have a permanent negative effect on the level of GDP, whilst financial crises can, in some cases, detrimentally weigh on long-term growth rates.*
- *the employment loss – related to the rise in the NAIRU and to reductions in the size of the labour force - is usually not recouped in the decade following the crisis, whilst the productivity effects vary significantly across countries;*
- *the long-run impact of crises on output, especially on TFP, crucially depends on policy responses as can be seen when comparing the very different developments in actual and potential output. Sweden, Finland and Japan all experienced a severe financial crisis in the recent past. An insufficiently resolute policy reaction, combined with mounting competitive pressures from emerging economies, contributed to the slowdown in long-run potential growth in Japan. Thanks to a relatively prompt resolution of their respective banking problems and favourable exchange rate movements, as well as a significant restructuring of their economies linked to TFP-enhancing innovation and restructuring policies, Sweden and Finland managed to reverse their economic fortunes and benefited from accelerated potential growth rates in the aftermath of the crises. As a result, the deep recessions which started in 1991 in Sweden and Finland were relatively short lived and did not result in a reduction in potential output growth, despite the very slow NAIRU adjustment. However, it remains difficult to disentangle the long run effects from structural policies and the short run favourable effect of the prompt macroeconomic reaction, including the exchange rate depreciation.*

Quantifications of the economic effects of the crisis: short-run losses and medium to long-run uncertainties

The Directorate-General Economic and Financial Affairs of the Commission (ECFIN) ran some quantification exercises, including a production function method for deriving potential growth (for short- to medium-run estimates); simulations with the Commission's Dynamic Stochastic General Equilibrium model QUEST III (for medium- to long-run estimates); and long-run scenarios taking into account the effects of ageing. These exercises only partly capture and quantify the economic effects mentioned earlier.

According to the ECOFIN Council approved production function method, the severe economic crisis has led to a sharp downward revision in potential growth rates in the short run, i.e. the potential growth rate of the euro area and of EU3 (Denmark, Sweden and the UK) will be cut in half in 2009-2010 compared with 2008, i.e. from a growth rate range of 1.3%-1.6% to 0.7%-0.8%. This weaker short term-term potential growth will give rise to a cumulated output loss of over 3% in the euro area and over 5% in EU3 respectively by 2013, compared with a pre-crisis regime (after correction for crisis-unrelated demographic effects). These estimates of output loss may be optimistic, at least in the case of the euro area, as the projections broadly assume a return to pre-

crisis potential growth rates by 2013[1]. The pattern for the "new" Member States (i.e. EU8) is essentially similar, although EU8 potential growth rates remain much higher reflecting their "catching-up" stage of development. The total cumulated loss in levels is estimated to be over 5% of potential output in EU8. The fall in potential growth in a majority of the Member States is driven by large increases in structural unemployment, by substantially reduced contributions from capital and by a subdued pattern for TFP trends. These latter TFP trends may however be somewhat conservative since they do not fully take into account the expected "one-off" downward shifts in the level of TFP and potential output associated with industrial restructuring. Some industries such as, for example, financial services[2] and construction (and possibly motor vehicles), are likely to experience permanent reductions in the level of their activities as a result of the crisis. Further research is manifestly needed to better understand these level shifts.

The model-based analysis using the Commission's QUEST III model to simulate the impact of the financial crisis also points to the possibility of a slow recovery in medium-term potential growth rates as well as highlighting the risk of permanent growth rate effects over the longer run. Given the uncertainties involved, two alternative QUEST scenarios were undertaken to illustrate the possible directions which financial markets may take over the coming years. Both scenarios are consistent with the production function results for 2009, with the subsequent adjustment paths for 2010 and the medium / long run essentially reflecting whether capital costs quickly revert to pre-crisis levels (i.e. the "optimistic" view) or stay elevated at levels closer to the borrowing costs faced by economic agents in the 1990's (i.e. a more "pessimistic / realistic" scenario depending on how one interprets the evidence). These scenarios are presented in Figure I.

The more optimistic view is broadly consistent with the potential growth rate estimates, produced by the production function method, for 2010 and its medium-term extension to 2013 and is based on the expectation that the freezing up of capital markets which occurred in 2008 - 2009 will be relatively quickly unwound (i.e. with risk premia reverting to levels seen in the pre-crisis period over the medium term) and with the more "pessimistic / realistic" scenario pointing to a quasi permanent change in financing conditions, with borrowing costs staying on average 1-1 ¼ % points higher over the long run (i.e. over the next 20 years) compared with the pre-crisis period. In terms of results, both scenarios point to long run negative level effects for potential output ranging from -1/2% ("optimistic" variant) to -4 ½ % ("pessimistic / realistic" variant)[3], with the divergences driven by variations in the speed and strength of the recovery in investment, which in turn reflects the very different risk premia paths for the period in question. Both scenarios also point to permanent potential growth rate effects due to the negative impact of the higher borrowing costs on intangible investments and consequently on TFP growth, with substantially greater effects under the more "pessimistic / realistic" scenario.

The long-term projections of the Ageing Working Group (AWG) are also pertinent for the present analysis since they stress that, beyond the crisis, a sharp demographically induced decline in EU potential growth rates is expected to emerge over the coming decades. This is due to the reduction in the size of the working-age population and the resultant shrinkage of the EU's workforce, with the negative growth rate effects of this ageing phenomenon already perceptible in the economic performances of a number of EU Member States.

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[1] As discussed extensively at the recent meeting of the EPC's Output Gap Working Group (OGWG), the Commission services consider that the new methodology for projecting medium-term trend TFP should be adopted as soon as possible. If such an approach was implemented, it would result in a much less optimistic medium-term scenario, under an assumption of no policy changes, with the implication being that potential growth rates would be much slower in returning to pre-financial crisis rates and would not do so over the period 2011-2013.

[2] In the case of financial services, it is very unlikely that the kind of credit growth / financial innovation which we observed prior to the crisis will be re-established, so the loss in capacities and the reduction in TFP growth in this specific industry are likely to be permanent.

[3] The 4% points difference between the optimistic and realistic variants is equivalent to well over €450 billion when calculated as a share of 2009 EU27 GDP.

Some tentative insights based on the literature, past experiences and quantitative estimates

Given its global nature and roots in the financial system, the analysis points to the crisis having a large negative impact on potential output in the short-run and the prospect of a prolonged period of slow growth as economies adjust to their post-crisis growth. Whilst it is too soon to draw strong conclusions, the central scenario of a "permanent level loss" in potential output (i.e. where the economy eventually returns to its pre-crisis potential growth rate but fails to recoup some of the output losses incurred during the crisis/recovery period) seems to be plausible. The other scenarios, i.e. an optimistic "full recovery" scenario or a pessimistic "continuous widening output loss" scenario cannot be ruled out, as past experiences suggest that policies will play the determining role. On balance, however, the risks are on the downside, and the prospect of the crisis having a negative impact on long-run potential growth rates cannot be excluded in particular if financial conditions remain more restrictive in the long run thereby negatively impacting on R&D investments and TFP growth rates.

The fundamental need to design an agreed and adequate policy response and to avoid policy "pitfalls"

The tentative estimates of the impact of the crisis on potential output coupled with insights from past crises confirm the important effect which policies will have in determining final outcomes over the long-run. It requires ensuring that policies introduced to mitigate the immediate impact of the crisis in the short are compatible with longer term requirements of adjustment/raising the growth potential, and ensuring that government pursue longer-term reform agendas in the context of the Lisbon strategy and the Stability and Growth Pact. Properly implemented, growth- and efficiency-enhancing policies would not only help EU economies to return to their "pre-crisis" potential growth path but also to recoup some part of the cumulated loss in GDP levels suffered in the course of the crisis. The issue of adequate and timely policy responses will need to form a substantial element of the debate on "Lisbon post-2010". The timing of policies aimed at dismantling structural rigidities is also a source of concern given that the latter may to some extent strengthen a number of the "automatic" stabilisers in the short term, whilst hampering the recovery process over the medium term.

Adequate policy responses should encompass a wide range of areas, including financial markets, the business environment, labour markets, physical and R&D investments, as well as innovation policies:

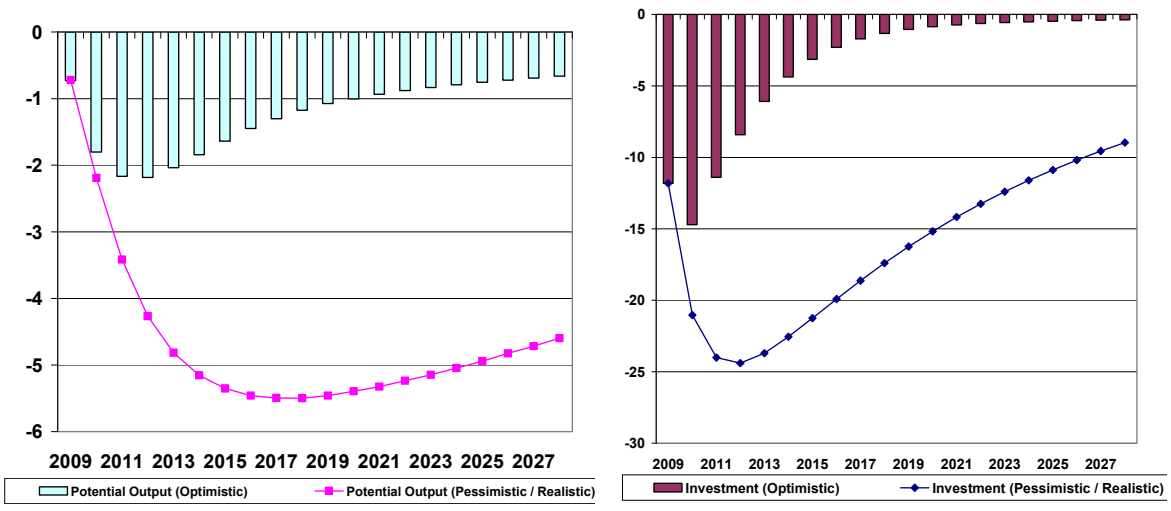
- *The indispensable, but not necessarily sufficient, condition for solving the crisis and limiting its adverse impact on innovation and R&D investments (and ultimately on long-term TFP / potential growth) is to effectively address the disruptions in financial markets and their adverse consequences in terms of a higher cost of capital and tighter credit constraints. Improving the functioning of financial markets will also have three powerful effects on potential output. It will facilitate the resource reallocation toward the fast-growing sectors during the recovery. Moreover, financial innovation may directly contribute to future TFP growth. Lastly, better functioning financial markets would also help boost the incentives for other structural reforms to follow by bringing forward their longer-term benefits and allowing capital to flow to the new investment opportunities generated by these structural reforms, as highlighted in the EMU@10 Commission report[4].*
- *Besides the difficulties in accessing the necessary finance, the recovery prospects of European firms are also potentially threatened by a failure to restructure and adapt their business models to a new economic environment, one characteristic of which is enhanced levels of global competition. As regards "rescue" policies in favour of industries that have been particularly affected by the crisis, it needs to be ensured that these measures support the EU's long-term goals and do not freeze resources in unproductive activities which reduce potential output via lower levels of efficiency and impaired adjustment capacities.*

[4] European Commission (2008) "EMU@10: successes and challenges after 10 years of Economic and Monetary Union". Brussels: Commission of the European Communities.

- *The role of policies aimed at enhancing labour supply, including financial incentives to work, are especially important from the perspective of protecting the most vulnerable groups threatened by a durable exclusion from the labour market. Policies that promote wage moderation, alleviate nominal wage rigidities and cut labour taxes will result in a reduction in structural unemployment as well as boosting competitiveness and adjustment capacity. Policies that facilitate labour market transitions (e.g. active labour market policies such as training and public placements) are necessary to ease the short-run adjustment as well as to smoothen the longer run reallocation of resources. In this context, the careful withdrawal of provisions to support short term working arrangements – important in addressing the immediate consequences of the crisis – will be essential.*
- *It is crucial during the downturn phase that policies are also geared towards promoting innovation efforts and sustaining investments in both physical and intangible capital given the considerable medium to long-run gains in potential output from doing so.*
- *Governments also need to avoid the policy mistakes observed in past crises, especially measures which can severely harm potential output over the medium to long term. In particular, governments should resist protectionist actions or measures which promote national interests at the expense of the proper functioning of the Single Market. Measures resulting in a reduction in labour market participation rates, such as early retirement schemes, would significantly reduce the level of potential output. Finally, a prolonged crisis may undermine the commitment to sustainable fiscal policies, which may ultimately lead to higher taxes and to a limiting of the budgetary room for manoeuvre needed to accommodate future reform efforts.*

The current crisis is likely to cause long-lasting losses in potential output levels and may prevent potential growth from returning to pre-crisis rates in the long run, unless adequate policies are promptly implemented. However, the challenge to be faced up to by policymakers is heightened by two additional phenomena. Firstly, the pre-crisis potential growth rate was already low, mainly due to poor TFP growth. Secondly, population ageing is expected to reduce potential growth in the EU over the medium to long run, owing to the ensuing sharp contraction in the labour supply.

Figure I
QUEST III scenarios for the EU: losses (cumulated) in potential output and investment in an "optimistic" and "pessimistic" scenario



1. INTRODUCTION: WHY IS POTENTIAL OUTPUT A CRUCIAL ISSUE?

The ongoing financial and economic crisis is taking its toll in terms of an unprecedented drop in economic activity in the post-war period. In its economic forecast released on 4 May 2009, the Commission estimates that output will substantially contract by about 4% in 2009 and by 0.1% in 2010 in both the EU and the euro area. This represents a downward revision of about 4 percentage points in 2009 compared to the previous forecast of last autumn. Moreover, the risks are on balance negative and in particular the 2010 figures may deteriorate if the recovery fails to materialise as assumed.

This dramatic fall in the actual output of the European economy is likely to be more than just a cyclical deviation from potential output, with the level and possibly the growth rate of potential output being adversely affected. Once out of recession, the recent loss in GDP levels may not be easily recouped if the economy converges to its potential level only slowly. Even worse, if the crisis negatively affects the medium- to long-run growth potential, Europe will shift to a different, lower, growth path with significant implications for its competitive position in the world, the living standards of its population and possibly also its degree of social cohesion. Severe financial and economic crises in the past often, though not systematically, witnessed a strong and durable negative impact on both output and employment.

Understanding the channels through which the economic can impact potential output in level/growth terms and obtaining reliable broad orders of magnitude thereof is a critical challenge for policy makers so that timely and effective policy responses can be initiated to mitigate the potential output losses: this is especially important in the EU as the period when economies need to rebound from the economic crisis coincides with the effects of population ageing taking hold on the real economy. An understanding is also needed to help ensure the effectiveness of EERP recovery measures and in particular to ensure the appropriate formulation (both in terms of timing and substance) of exit strategies. Estimates of the output gap and the pace at which it is being closed will play a role in determining when to implement exit strategies for monetary and fiscal policy. Phasing out the fiscal and monetary impulse too early may throw the European economies in a protracted depression (which is *ceteris paribus* reminiscent of the insufficient policy responses in the immediate aftermath of the "Great depression"), while ending it too late could give rise to the inflationary pressures, as experienced in the 1970s, and a risk of overheating.

The remainder of the paper is structured as follows. Section 2 discusses the expected impact of the crisis on potential growth, considering the theoretical impact on the individual components of potential output, i.e. labour utilisation, capital accumulation and total factor productivity, and exploring past experiences with financial and economic crises. Section 3 presents the results of some quantification exercises, including a production function method for deriving output gaps (for short- to medium-run estimates); simulations with the Commission's DSGE QUEST III model (for medium- to long-run estimates); and long-run scenarios taking into account the effects of ageing. Section 4 underlines the importance of correct and timely growth-enhancing policy responses by illustrating their expected impact on the level and growth rate of potential output.

2. THE EXPECTED IMPACT OF THE CRISIS ON POTENTIAL GROWTH

2.1 Scenarios for the impact of the crisis on potential growth and level

By now, it is widely accepted that the financial and economic crisis will have a sizeable impact on potential output, though the implications for long-run potential growth are uncertain. In the short-run, a non-negligible drop in the level of potential output is likely, particularly due to the reduction in the productive capital stock (the depreciation rate of capital has arguably increased in the current slowdown) and the negative (though possibly temporary) effect on labour supply and structural unemployment. However, the crucial question concerns the impact of the crisis on the

long-run growth in potential output. If potential growth increases in the aftermath of the crisis (as was the case in Sweden and Finland at the beginning of the 1990s) the level loss suffered can be recouped after some time and the economy would settle down to a higher sustainable growth path.

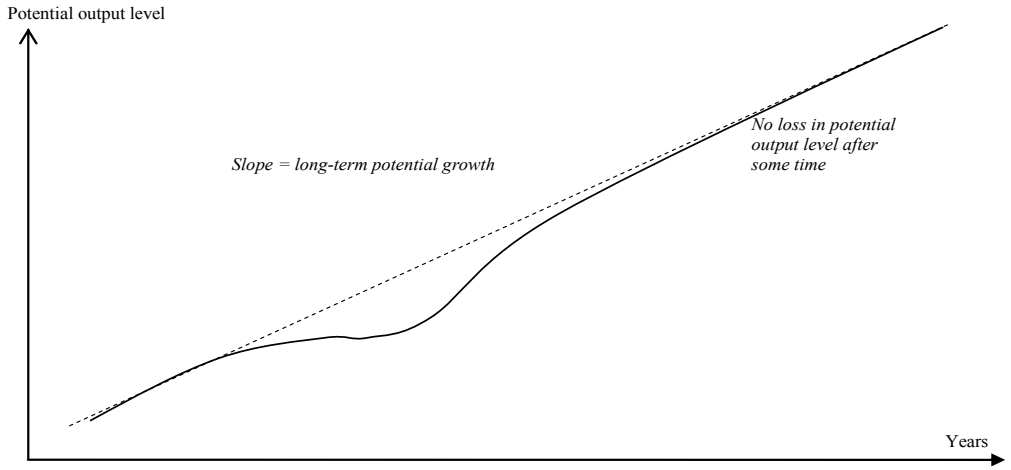
There is considerable uncertainty, but the effect of the crisis on potential output could *a priori* take three possible forms, as shown in Figure 1[5]. All three scenarios assume a short-run drop in the *level* of potential output which appears almost inevitable but differ in terms of the longer-run impact on the *growth rate* of potential output.

- a *"full recovery" scenario*, whereby potential growth accelerate after the crisis is over to a scale that allows the economy to revover all lost output and the economy returns to its initial trajectory;
- a *"permanent loss in potential output level"*, whereby the potential growth rate returns to its pre-crisis rate;
- *"permanent loss in potential growth rates" in which* there is a crisis-induced reduction in long-run potential growth - through lower TFP growth, and thus potential output in level terms increasing diverge from the pre-crisis trajectory, for example if the new financial conditions are more restrictive in the long run - harming TFP growth through less dynamic innovation and depressed R&D investments. This situation corresponds to the case n°3 set out in Figure 1.

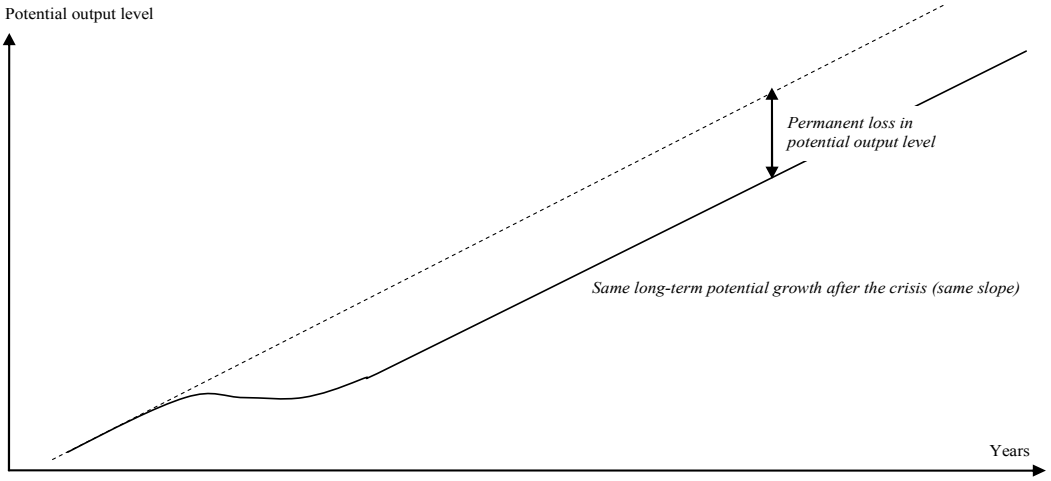
It should also be noted that potential output could have been overestimated before the crisis and that part of the level drop we observe now is an adjustment to the "correct" potential output. This corresponds to the case n°2 in Figure 1, where the correct potential growth path before the crisis corresponds to the straight line and not the "overestimated" dotted line. In other words, the actual potential growth path is left broadly unchanged by the crisis.

[5] Figure 2 in annex is showing the three possible cases for *actual* GDP.

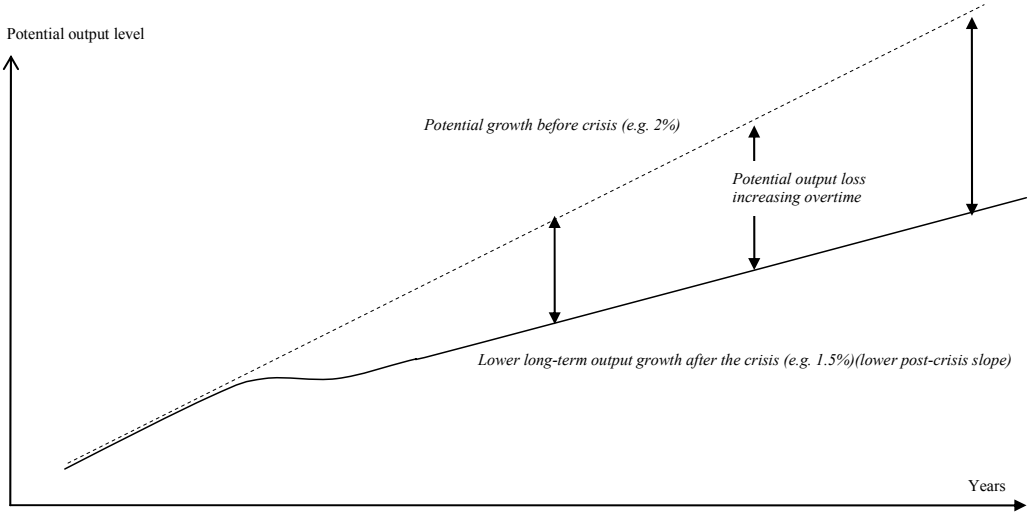
Figure 1
Three possible theoretical cases
Case n°1: A "full recovery" scenario
Loss in potential output level entirely recouped after some time



Case n°2: Permanent loss in potential output level
No change in potential growth in the long run but permanent shift in potential output level



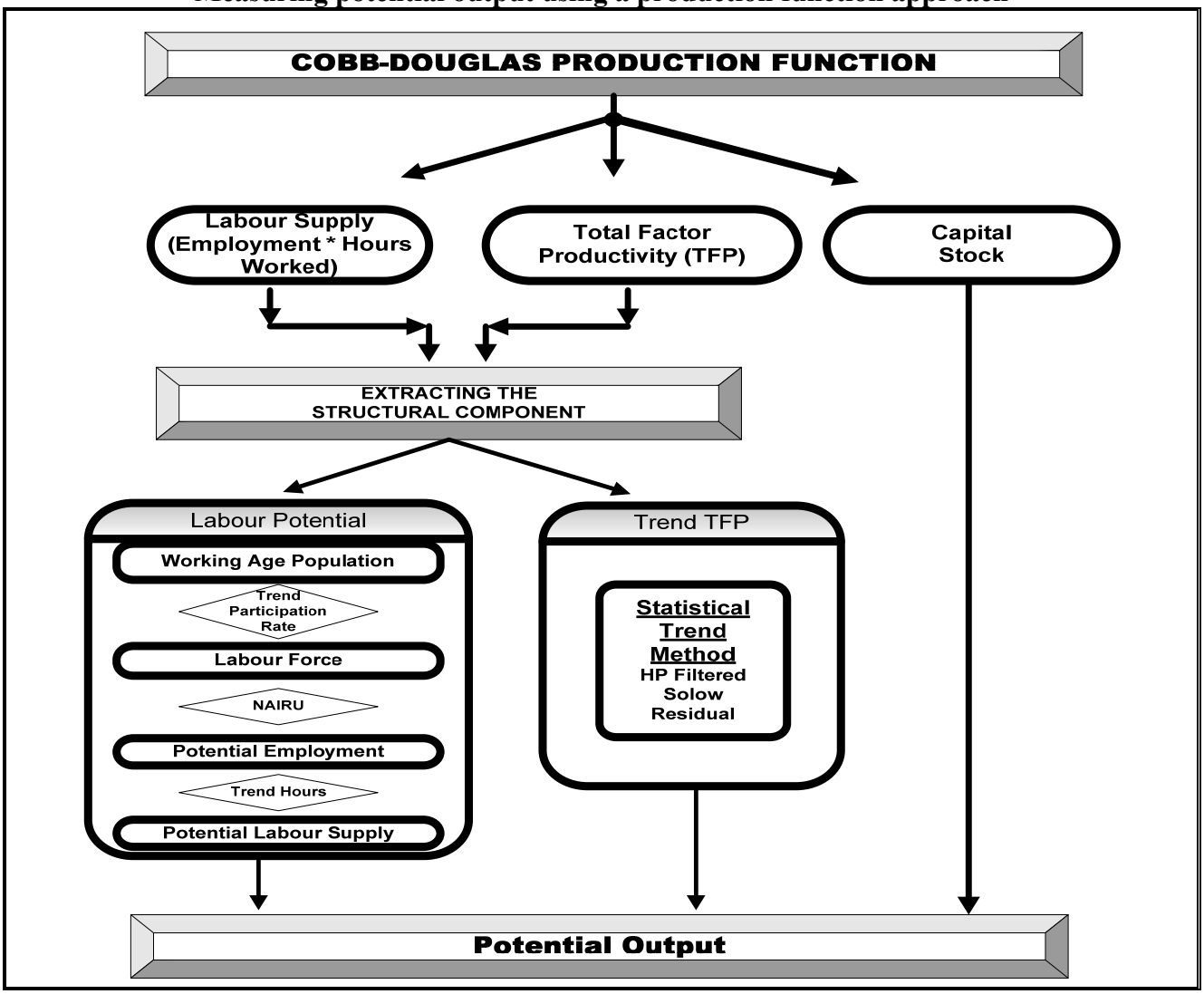
Case n°3: Permanent loss in potential output growth in the long run
Potential output loss in level increases over time compared with the pre-crisis regime



A thorough understanding of the impact of the crisis on potential output and its growth requires a detailed analysis of its individual components. In line with the conventional production function approach (Figure 2), recessions can have an impact on growth through three different channels: (i) capital accumulation; (ii) labour inputs; and (iii) Total Factor Productivity

(TFP). As regards the labour supply, it can be further decomposed into the trend participation rate, the trend in average hours worked, the working-age population and the level of the structural unemployment rate, often called the NAIRU (i.e. the non-accelerating inflation rate of unemployment). TFP, on the other hand, measures the efficiency in the use of production factors and as it is essentially unobservable, it is often computed as a simple residual in the production function. It is important to underline that the effects of an economic recession on these components of potential output will likely differ over time. Especially, from a theoretical point of view, the relationship between downturns and *long-term* potential growth can be either positive or negative depending on the mechanism at the origin of the growth process. Therefore, the ensuing analysis will tackle in detail each of the components, paying appropriate attention to the timing of the impact.

Figure2
Measuring potential output using a production function approach



Sources: Denis et al. (2006), Output gap working group.

2.2 Expected theoretical impact on the level and growth rate of potential output

2.2.1 Capital accumulation

The most immediate effect which a crisis can have on potential output is through its adverse impact on investment and the ensuing slower capital accumulation, though it is not clear what the longer-run effect on investment would be. In addition, some capital vintages can become obsolete due to restructuring in the economy. The effect of the crisis on the capital stock can be twofold. Firstly, the strong cyclical reduction in investment rates in the downturn phase will negatively affect the stock of capital and cause a downward level shift in potential output. How

investment responds beyond the short run is however much more uncertain. Recessions may also have a long lasting impact on capital accumulation if associated with a rise in perceived uncertainty. Economic theory suggests that higher uncertainty leads to an increase in the risk premia which will have a negative effect on investment. Higher uncertainty also increases the "value" of delaying investment. This negative effect may be larger if the investment process is characterised by irreversibilities and sunk costs (Pindyck, 1991). Given the realistic prospect of permanently higher financing costs and the increased risk that a prolonged banking crisis could impair the vital capital reallocation process in economies or could lead to a "re-nationalisation" of EU financial markets, there is a considerable risk of a longer-run adverse impact on the pace of capital accumulation. Secondly, the rate of depreciation of the current capital stock may rise (at least temporarily), as existing equipment becomes obsolete, especially in the case of bankruptcies and a major reallocation within firms and between industries[6]. These downward movements in the capital stock may come to an end when the reallocation of capital is completed and when the investment rate returns to its original level.[7]

2.2.2 Labour input

As regards labour supply, a reasonably short-lived crisis could perhaps just result in a level drop without permanently affecting the pace of growth in labour input, which would leave its contribution to long-run potential growth unaltered. A sluggish adjustment in prices and wages as well as a slow adaptation to the sectoral reallocation process occurring in the economy would entail a temporary increase in the NAIRU during the recession period. This increase should not become permanent unless structural rigidities become more entrenched or attitudes towards risk change, leading to a higher cost of capital. Despite some possibly moderate short-run effects on trend participation rates and on trend hours worked as well as migration flows, there is no reason to presume that these particular labour inputs should not come back to their pre-crisis patterns if the recession remains relatively short and wrong policy choices are avoided.

While the NAIRU could significantly rise in the short term following the strong increase in actual unemployment, it should come back to its pre-crisis level over the medium term and consequently not result in a loss in output levels. As regards structural unemployment, it is crucial to distinguish the short-term NAIRU, which is also influenced by the movement in actual unemployment due to a "speed limit" effect, from long-term structural unemployment, which is only affected by real rigidities and institutional settings. The "speed limit" effect captures the fact that, due to nominal rigidities which slow down the adjustment process, the unwinding of a massive unemployment increase cannot occur quickly without fuelling temporary inflation. The impact on the NAIRU in the short term depends upon how quickly the supply of labour converges to its equilibrium value (long-term NAIRU). In other words, a large rise in actual unemployment, in the absence of any increase in structural problems in the labour market (captured by the long term rate of structural unemployment), will only result in an increase in the short-term NAIRU.

Lasting increases in structural unemployment (long-term NAIRU) can occur if overly generous unemployment benefit regimes (combined with a possible rise in labour taxes) slow down the transition in the labour market and if the higher cost of capital durably reduces firm's profit margins. In the face of adverse economic shocks, less efficient labour market institutions (including a sizeable tax wedge) in a context of entrenched nominal rigidities tend to

[6] Depreciation is defined in the SNA 1993 as "the decline, during the course of the accounting period, in the current value of the stock of fixed assets owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage". Whilst national accountants can calculate the physical deterioration (i.e. normal "wear and tear"), obsolescence is much more difficult to measure. Given the scale and nature of the present downturn, the degree of complexity and uncertainty in calculating obsolescence rates has increased significantly. Consequently there is a real danger that inaccurate estimates will be produced, with the result that any errors will show up in the TFP residual.

[7] In neoclassical theories, capital intensity (K/L) - with L being expressed in efficiency units - is stable in the steady state. Capital deepening, expressed in terms of hours worked, becomes equal to the growth in labour efficiency, which is the TFP growth rate multiplied by the labour share.

lead to increases in structural unemployment. The literature (e.g. Gianella et al. 2008, Basanini and Duval 2005) finds that the level of the tax wedge, the generosity of unemployment benefits and the user cost of capital are important drivers of structural unemployment[8]. Despite their justification in the current circumstances, the risks that many current policies carry are substantial in this respect. Higher labour taxes may arise as a consequence of unsustainable fiscal slippages. Moreover, the EERP packages in numerous countries provide for an increase in the level and duration of unemployment benefits to sustain household purchasing power. However, if the crisis was to persist, the incentives to work and to change jobs may be hampered, resulting in a lower job reallocation towards more dynamic industries and inducing a rise in the NAIRU. The other key issue is whether the crisis would give rise to a durable increase in the risk premium on interest rates, which would increase the NAIRU as firms increase their mark-ups to recoup the higher cost of capital. In the absence of a higher cost of capital or a deterioration in the institutional setting, the NAIRU should go back to its original level with no impact on potential output in the long-run. A temporary acceleration in potential growth when the crisis unwinds should offset the temporary deceleration in growth during the crisis. However, if labour market institutions become more inefficient and/or the cost of capital becomes permanently higher than it was before the crisis, the temporary rise in structural unemployment could be more long-lasting, which would give rise to a durable loss in the potential output level.

Moreover, long unemployment spells may cause a permanent destruction in human capital, leading to an irreversible rise in the structural unemployment rate (NAIRU) and to further losses in the potential output level. The long-term unemployed experience a deterioration in their employability due to an inability to use their professional skills, often aggravated by the stigma effect from the viewpoint of employers. Unlike the short-term unemployed, they can no longer compete with those in a job and consequently do not exert any dampening effect on the wage claims of the incumbents. This causes a long-lasting loss in the potential output level and gives rise to the process of "hysteresis in unemployment" identified by Blanchard and Summers (1989).

A protracted recession may also reduce the potential labour force by discouraging vulnerable workers from seeking a job i.e. by reducing the labour force participation rate. The situation can deteriorate further if misguided policies are adopted which lead to reductions in participation (e.g. support for early retirement) or to the limiting of migration flows. Firstly, the "discouraged worker effect" could primarily hit disadvantaged groups (i.e the low skilled; migrants; women with children; youth and older workers) and result in some withdrawals from the labour market owing to the lack of employment prospects. Secondly, governments could be tempted to make recourse to policies massively used in the 1970s and 1980s to statistically cut the labour force. These social and financial incentives to stay away from the labour force took the form of encouragement to study longer for youth and the development of numerous early retirement schemes for older workers subsidised by governments. In addition to being fiscally costly, these policies have proven to be ineffective, as employment and labour force trends go hand in hand and the unemployment problem is not cured in the long run by statistically reducing the labour force - the famous "lump-of-labour-fallacy". Thirdly, a prolonged economic downturn may lead to a reduction in migration flows through either the reduced appeal of European labour markets or a tightening in immigration policies.

[8] While the estimates of time-varying NAIRU's correspond to a statistical exercise using a Kalman filter and the econometric estimation of a Phillips curve, the literature has come to a view about the theoretical determinants of the NAIRU in the long rate. As predicted by theoretical wage-setting/price-setting models (i.e. WS-PS model à la Layard and Nickell), less efficient labour market institutions (including the tax wedge) in a context of entrenched nominal rigidities will shift the wage-setting curve downwards and will result in an increase in unemployment for all given values of inflation. According to a large strand of the literature (Scarpetta 1996, Blanchard and Wolfers 2000, Nickel et al. 2005, Basanini and Duval 2005), the level of product market regulation, union density and the unemployment benefit replacement rate play an important part in explaining changes in the (long-term) structural unemployment rate. Similarly, a rise in wages or in the user cost of capital could shift downwards the price-setting curve, that is, the likelihood of firms to make recourse to inflation to maintain their profit margins and thereby increase the NAIRU.

2.2.3 Total Factor Productivity (TFP)

A crisis can have important implications for both the level and growth rate of TFP which can materialise through a number of channels. In addition to important short-run effects, the crisis can have a very significant impact on the long-run growth rate of TFP which is empirically the main driving force of potential growth. Consequently, the post-crisis evolution in TFP is the main determinant of whether the economy comes out of the crisis successfully or fails to achieve a full recovery. However, theory does not give a clear answer as to what the impact of a crisis on long-run TFP growth may be. Besides a number of mechanisms that tend to dampen TFP growth in the aftermath of a crisis, there are also arguments that economic recessions can have a positive impact on TFP growth as they induce a necessary restructuring and cleansing in the economy.

Both TFP levels and growth rates can be adversely affected as a result of the ongoing industry reallocation. The present downturn appears to be provoking a "one-off" downward shift in the level of TFP. This viewpoint is consistent with the generally accepted belief that some industries such as, for example, financial services, construction and motor vehicles, are likely to experience lasting reductions in the level of their activities as a result of the crisis. In addition, these industry shifts, reflecting a permanent reallocation in the economy, may impact on TFP growth itself via a compositional effect. Industry level composition shifts could lead to a permanently smaller manufacturing sector in the EU (where TFP growth rates and levels are relatively high) and a larger services sector (where TFP growth rates and levels are traditionally lower than in manufacturing).

A slow process of industrial restructuring, caused either by credit constraints or by entrenched structural rigidities, can also reduce the level and growth rate of TFP. Delayed treatments for 'toxic' assets and for restructuring the banking sector – aggravated by possibly inefficient subsidies or state aids – could maintain tight credit constraints especially on liquidity-constrained, but potentially profitable, start-ups or SMEs with a large innovative capacity and promising growth prospects. On the contrary, poorly-restructured and heavily subsidised banks may favour less efficient but larger firms because of political pressures or the higher likelihood of being bailed out by the government in the case of major distress. Such "zombie lending", which occurred in Japan in the course of the 1990s, leads to inefficient capital reallocation at the expense of innovative but vulnerable firms and a sluggish industrial restructuring of large firms, more likely to be politically protected against bankruptcies (Caballero at al., 2006). The allocative loss, associated with a lower TFP level, is therefore combined with a dynamic efficiency loss resulting in a slowdown both in the rate of diffusion of existing technologies and a lower success rate in developing new, leading-edge, innovative breakthroughs. This slower innovation process will cause lower TFP growth and hence lower potential output growth. Low competition in product markets and inflexible labour markets are also very likely to further inhibit the necessary process of industrial restructuring.

TFP growth could also be permanently affected by a reduction in innovative activities due to lower (private) R&D investments, which tend to be pro-cyclical, and more limited opportunities for the transfer of knowledge. The empirical evidence shows the pro-cyclicality of R&D (Guellec and Van Pottelsberghe 2008) : a crisis reduces the expected return of R&D investments, while at the same time reducing the cash flows of firms which is a major source of innovation funding, especially in a situation of credit constraints[9]. Furthermore, the impact can persist beyond the cycle if the recession is associated with a change in risk behaviour (the argument is essentially the same as the one made for investment). According to endogenous growth models,

[9] There are however arguments against the procycality of R&D, as mentioned by Aghion and St Paul (1998) and Canton and Uhling (1999). The negative impact of recessions on profitability forces firms to focus on the most productive segments of their output as the opportunity cost of achieving productivity growth is lower in recessions, providing incentives to undertake R&D activities.

this postponement of key pro-innovation investments may have a lasting effect on productivity and growth. An additional argument rests on the idea that learning-by-doing plays a vital role in the growth process. In this case, production and productivity increasing activities are complements and recessions may reduce the long-term growth rate. Recessions are indeed periods in which skills are lost: unemployed persons become less productive over time because they lose opportunities to learn by doing (Martin and Rogers 2000).[10] In this way, a temporary increase in unemployment can have long-lasting negative effects on productivity and thus on long-run economic growth.

It is nevertheless important to stress that the economic literature has also proposed a broad range of arguments suggesting a positive relationship between recessions and growth through an increase in TFP growth. Firstly, the above-mentioned sectoral reallocation argument can be reversed if resources are shifting into high productivity industries. This could be the case in some euro-area countries which due to the bursting of local housing bubbles will probably shift resources from the slow-productivity construction industry to faster growing industries. A second argument relates to the 'opportunity-cost effect'. This effect rests on the idea that firms tend to carry more productivity-improving activities during downturns because capital and labour resources are then under-utilised and the opportunity cost of using them to implement technical change is lower. In this case, a recession is likely to have positive effects on medium-term prospects for productivity and growth (Aghion and Saint-Paul 1993, Saint-Paul 1997). A third (and similar) argument is based on the 'creative destruction' process put forward by Schumpeter. Here, downturns are assumed to have a 'cleaning-up' effect. The least productive firms are forced out of the market during periods of weak economic activity and the average economy-wide productivity growth rate increases accordingly (Caballero and Hammour 1994).

2.3 Insights from past slowdowns

2.3.1 Lessons from past financial crises

An analysis of past financial and economic crises may provide us with some tentative insights and indications about the impact of the current crisis on the level and growth rate of potential output. Such an analysis can also lead to some stylised facts that may be useful in identifying possible scenarios and devising policy prescriptions so that the losses in actual and potential output are quickly recuperated through more dynamic future growth. Nonetheless, the extent of the current crisis – its depth and global character – exceeds by a large margin any other financial or economic distress period experienced in the post-WWII period and, therefore, any conclusions drawn on the basis of a study of these historical episodes need to be interpreted in this light.

Reviews of past episodes of financial upheaval suggests sizeable losses in output – at least twice as large as in more "classical" crises – and in employment. Reinhart and Rogoff (2009) reviewed recent episodes of severe financial crises (including in emerging countries) and examined the macroeconomic performance in the aftermath of these crises. A first lesson they derive is that financial crises lead to sizeable losses in output and employment. On average over all of the examined crisis periods, real GDP fell from peak to trough by over 9 percent and the duration of the downturn averaged around two years, which is one year more than in normal economic slowdowns. The decline in GDP corresponds to a loss of around 5 years of growth assuming that the different economies have potential growth rates of 2%-2 ½%. This sharp drop in output was typically followed by a significant deterioration in the labour market situation, with unemployment surging by an average of 7 percentage points during the downturn. The impact on the labour market was more protracted than on output, as unemployment increased over an average period of roughly four years. The second lesson is that the recession eventually ends. However, the issue remains open as to whether, and over what time span, the output loss is totally recovered. A recent OECD paper

[10] This implies that skills are more easily lost during downturns than regained when the cycle turns upwards again.

(Haugh et al. 2008)[11] suggests that the output losses are typically 2 to 3 times greater than "normal" recessions and the period before output recovers to its potential is at least twice as long (i.e. with the output gap being equal to zero) following a financial crisis.

Crises generally tend to have a permanent negative effect on the level of GDP, while financial crises could also weigh on the long-term growth of output. Cerra and Saxena (2008)[12] found that economic contractions were not counterbalanced by fast recoveries, which resulted in the trend output loss, on average, not being fully recuperated over time. Crises lead to absolute divergence and lower long-run growth, whereas expansions foster absolute convergence. The output costs of financial crises are on average permanent and long-term growth is negatively affected by output volatility. Based on the "average" experience of financial crises, Table 1 (last column) confirms that the loss in GDP levels during the economic contraction brought about by a financial crisis is not offset by higher growth after the crisis. Moreover, in half of the sample (7 countries out of 14), the growth rate prevailing ten years after the trough of the crisis appears somewhat lower than before the crisis. Furceri and Mourougane (2009) extend Cerra and Saxena's approach by using potential rather than actual output for OECD countries and find on average a cumulated long-term loss in potential output of 1.5-2.4% due to financial crises, with the deepest crises decreasing potential output by nearly 4%. Bordo et al. (2009) approach the issue from a different angle and resort to growth regressions. Using a financial crisis dummy, they state that average actual growth falls by 1-2 percentage points during crisis periods. Looking across EU and OECD countries over the 1970-2007 period, a recent Commission analysis found that each year of a banking crisis is associated with a reduction in the growth of potential GDP per capita by around 0.5 percentage points. The effect remains significant with the inclusion of standard growth control variables. The average duration of past crises is 3.9 years. The analysis finds no significant rebound after the end of a banking crisis, suggesting that growth rates are basically restored but potential output is permanently lowered. The details of the analysis are given in Box 1.

Box 1: Banking crisis impact on potential per-capita growth: Evidence from panel regressions

The present analysis is based on an annual panel data set covering EU and remaining OECD countries from 1970 to 2007. Rather than using actual real per capita growth rates, this study employs growth rates of potential per capita output in view of the long-term implications of banking crises. Potential output is estimated by the European Commission and the OECD on the basis of a production function approach. Furthermore, a set of standard growth regression control variables are used: lagged real per-capita income (in terms of purchasing power parities), population growth, gross fixed capital investment, openness to trade, index of the quality of regulation.

To capture the effect of banking crises, the dataset includes a dummy which takes the value 1 for every crisis year. Basic information on the occurrence of banking crises is provided by the database developed by Laeven and Valencia (2008). In addition, the information on duration is derived on the basis of Demirgüç-Kunt and Detragiache (2005) and Reinhard and Rogoff (2008). In case of missing or conflicting information, the end year is defined as the year in which private credit bottomed out. The credit ratios are roughly stabilising at around 35% from the first post-crisis year onwards. Defining banking crises this way yields an average duration of 3.9 years.

The empirical strategy involves autoregressive specifications and panel growth regressions. In a first step, the autoregressive specification akin to Cerra and Saxena (2008) and Furceri and Mourougane (2009) is adopted, explaining annual potential output growth by four lags of the same variable. In addition, a dummy variable for the first year of a banking crisis is included which is also lagged four times. The present analysis then takes a second step by using the banking crisis dummy which includes the duration of each crisis indicating the average impact of each crisis year. To account for potential post-crisis effects, dummies for the two years after the end of a consecutive series of crisis years are also added. In a third step, the regression is extended by the by the standard growth variables mentioned above.

Growth regressions have become a standard tool to analyse data on economic growth and test growth theories, notably convergence in per-capita income and growth determinants in "endogenous growth" conceptual frameworks (see, e.g., Barro and Sala-i-Martin, 2003). In the standard set-up, income per-capita is regressed across countries or in panel data against variables capturing factor inputs employed in production and a set of determinants of production factor productivity. Among the latter set of determinants, initial income per capita captures the hypothesis that the

[11] Haugh D., P. Ollivaud and D. Turner (2009), The macroeconomic consequences of banking crises in OECD countries, *OECD Economic Department Working Paper* N°683, OECD.

[12] Cerra, V. and S. Saxena (2008) 'Growth dynamics: the myth of economic recovery', *American Economic Review* 98(1), 439-457.

productivity of capital falls as with the degree of economic development in line with the idea that as the stock of capital increases additional capital units imply a lower increase in output due to diminishing returns to scale. A series of institutional and policy variables are aimed at capturing factors that affect total factor productivity.

This analysis finds that banking crises cause a permanent loss in potential output by adversely impacting potential growth during the crisis (see Table). The detailed results are as followed:

- Testing the first year of a crisis and the subsequent lags shows that the significant effects last for three years although this effect may be even more persistent, given the significant lags of potential growth itself. This evidence is consistent with the actual duration of a crisis of 3.9 years on average.
- The average effect of banking crises on potential growth is estimated at -0.5 percentage points per year. The effect peaks during the second crisis year.
- After the end of a crisis, potential growth does not significantly rebound which implies, albeit growth rates are roughly restored, a permanent loss in potential output.
- The significance of this effect is not impaired by the inclusion of growth determinants as control variables, highlighting that the initial result was not influenced by omitted variable bias and that investment alone is not driving the result.

It should be noted that the results could depend to some extent on the specific definition of banking crisis used. Restricting the dummy to severe banking crises yields larger absolute coefficient values. From a statistical viewpoint reverse causation cannot be excluded (i.e., banking crises being caused by recessions) which implies a possible bias in regression coefficients.

Dependent variable: Potential growth per capita	(1)	(2)	(3)
Potential growth per capita			
Lag 1	0.46***	0.46***	0.36***
	(4.71)	(4.78)	(3.58)
Lag 2	0.15**	0.16**	0.15**
	(2.09)	(2.29)	(2.09)
Lag 3	0.15**	0.16***	0.17***
	(2.58)	(2.69)	(2.82)
Lag 4	-0.09*	-0.09*	0.01
	(-1.87)	(-1.81)	(0.05)
First year of crisis (dummy)	-0.41**		
	(-2.07)		
Lag 1	-0.71***		
	(-4.07)		
Lag 2	-0.63***		
	(-3.72)		
Lag 3	0.08		
	(0.27)		
Lag 4	-0.18		
	(-0.66)		
Crisis year (dummy)		-0.48***	-0.27***
		(-4.42)	(-2.16)
First post-crisis year (dummy)		-0.03	0.03
		(-0.10)	(0.11)
Second post-crisis year (dummy)		0.64	0.64
		(1.31)	(1.48)
Log per capita GDP (lagged)			-0.91***
			(-3.36)
Population growth			-0.57***
			(-4.22)
Gross capital formation			0.04**
			(2.31)
Openness			0.01***
			(3.78)
Quality of regulation			0.26***
			(4.46)
Sample size	793	793	617
R^2	0.81	0.82	0.83

Notes: Estimation method: OLS. t statistics are reported in parentheses, based on robust standard errors. Country fixed effects and constant terms are included but not reported. The country sample includes EU and remaining OECD countries. Dependent variable: Potential growth in real GDP per capita (%), (AMECO, OECD). Explanatory variables: "First year of crisis" represents a dummy with value 1 if the country was in the first year of a banking crisis according to the Laeven and Valencia (2008) database; "crisis year " takes the value 1 in every year of a crisis, drawing on the same database supplemented by the duration of each crisis; "first post-crisis year" and "second post-crisis year" refer to the respective years after the end of a consecutive series of crisis years; log real GDP per capita (PPP), lagged by one period (WDI); population growth in % (WDI); openness: sum of imports and exports on GDP in % (Penn World Tables); quality of regulation: index computed by Fraser Institute summarising elements (including the extent of public versus private ownership) of regulations affecting labour, product, and financial markets.

The employment loss is usually not recouped in the decade following the crisis, while the productivity trajectory varies greatly across countries. As documented in Table 1, after the end of the crisis, the growth in employment appears only slightly higher than before the crisis on average over the sample, which means that the loss in employment cannot be recovered, even after 10 years since the onset of the crisis. The picture is more diverse in terms of productivity developments: while, on average, labour productivity, both per hour and per worker, increases less quickly after the crisis in the whole sample, productivity increases are actually faster than before the crisis in around half of the examined countries. This suggests that there is considerable heterogeneity in the experiences of countries in the face of crises in their financial systems.

Table 1
Employment and labour productivity before and after financial crises (in advanced and emerging economies)

	Growth 10 years before peak *Change in % per year*	Change from peak to trough *Level in % of GDP*	Growth 10 years after trough *Change in % per year*	Change from peak to 10 years after trough *Level in % of GDP*
9 countries*				
GDP	4.4	-5.3	4.2	-6.7
Total hours worked	1.1	-6.5	1.4	-3.6
Labour productivity per hour	3.3	1.5	2.8	-2.8
Employment	1.4	-4.6	1.7	-1.7
Labour productivity per worker	3.2	-0.6	2.5	-4.8
13 countries**				
GDP	5.3	-6.2	4.6	-13.6
Total hours worked	1.7	-3	1.8	-2
Labour productivity per hour	3.6	-3	2.8	-11.3

Source: CPB (2009)
**The countries are: Spain (1977), Japan (1992), Norway (1987), Sweden (1991), Hong Kong (1997), Colombia (1998), South Korea (1997), Finland (1991) and Argentina (1998). ** The sample with 13 countries includes Philippines (1997), Malaysia (1997), Thailand (1997) and Indonesia (1997), for which no data on hours worked are available.*

2.3.2 Lessons from past European recessions

As major financial crises occur relatively rarely in Europe, it is useful to extend the analysis by exploring the implications of major recessions (not ignited by financial market disruptions). The samples of countries examined by Reinhart and Rogoff (2009) and Haugh et al. (2008) include a number of (often small & open) emerging economies outside Europe. It can be argued that their experiences may be of limited relevance for EU countries. As financial crises are relatively rare events in European economies (they occurred only in Finland and Sweden in the recent past), it is useful to extend the sample by including major banking crises and all major recessions (whether associated with a banking crisis or not) in the EU15.[13] Banking crises and major recessions share indeed a number of similarities: they are both characterised by important disruptions in activity, industry reallocations and sharp drops in investment with possible implications for potential growth.[14]

Banking crises in Europe appear to lead to larger losses in terms of the level of actual output but do not seem to last longer that other periods of economic distress. The severity of the crises

[13] Due to insufficient data, Luxembourg, Cyprus, Malta, Slovenia and Slovakia are excluded.
[14] The criteria chosen to identify major recessions are: (i) a minimum contraction in annual GDP per capita of 1%; or (ii) two or more consecutive years of GDP/capita contraction where one of the contractions is of at least 0.5%. The second criterion was chosen in order to include episodes of protracted periods of negative growth.

identified with these criteria can be assessed by looking at the cumulated negative output gaps, the trough of the output gap, and/or at the duration of negative output gaps (Table 2). According to the first two criteria, the major banking crises appear indeed to be among the most severe recessions, exhibiting lower troughs as well as larger output gap losses than the rest of the sample. However, according to the third indicator (the duration of negative output gaps), banking crises do not seem to be particularly worse than other recessions.

Table 2. Severity of European recessions in the 1990s

	Year	Output gap loss (1)	Trough (2)	Duration (3)
Major banking crises				
FI	1990-1993	**-27.7**	**-7.6**	6
SE	1991-1993	**-21.2**	**-5.7**	8
Other major recessions				
BE	1993	-6.8	-2.4	6
DE	1993	-3.4	-1.0	6
EL	1992-1993	-15.4	-2.4	**10**
ES	1993	-14.4	-3.1	**10**
FR	1993	-10.5	-2.3	6
IT	1993	-10.4	-2.9	8
PT	1993	-11.5	-4.1	5
UK	1991-1992	-10.7	-3.2	7

(1) Sum of negative output gaps.

(2) Most negative output gap.

(3) Number of consecutive years with a negative output gap.

An analysis of recent economic recessions (not only financial crises) in European countries shows that their impact on long-term potential growth is mixed, with broadly half of the countries experiencing an increase in potential growth in the decade following the crisis. To shed some light on the impact of major recessions on long-term growth, potential growth is compared ten years before and after a major recession in each country, like in Haugh et al. (2009).[15] DG ECFIN's production function estimates are used to assess potential growth and the contributions of TFP, capital accumulation and labour to potential. In the sample covering all severe recessions during the 1990s, potential growth increased in broadly half of the episodes considered (EL, ES, FI, SE, and the UK) and decreased in the other half (BE, DE, FR, IT and PT).

In the long-run, the contribution of capital accumulation to potential growth has not changed fundamentally in a majority of countries, though most of the examined economies experienced a short- to medium-run deceleration in capital accumulation in the aftermath of the crisis. Evidence of a strong and persistent deceleration in capital intensity can be found in a small group of countries (FI, SE and EL). While the recessions surely had a temporary effect on capital accumulation in these countries, there are reasons to think that over the longer term more structural factors have been at play. These economies seem to have gone through a major shift in their growth model in the 1990s, towards one with smaller capital accumulation and more TFP, probably as a result of a change in the industry composition of their economies.

There is evidence of an increase in the contribution of labour to potential growth after a severe recession in a majority of countries. In the ten-year period after the recession, 7 out of the 10 countries of the sample exhibit an increase in the contribution from labour. The factors behind the increase in the contribution vary from one country to another. The level of the NAIRU tends to increase during recessions and then generally decreases afterwards, translating into an increase of

[15] It should however be noted that the 5-10 year periods do not cover exactly the same years. Haugh et al. (2009) take the 5-10 year period prior to the onset of the downturn and compare it with the 5-10 years immediately following it. Here the 5-10 year periods exclude the most severe part of the downturn, i.e. when GDP/capita is still contracting. This should allow one to calculate 5-year averages that are not dominated by the economy's behaviour during the contraction phase.

its contribution after the recessions. A rise in the NAIRU therefore has an impact on potential growth but only temporarily, during the downturn. In Germany, Italy and Sweden, however, the contribution of labour to potential growth decreased persistently. In Germany and Italy, the fall in the contribution of labour can be largely explained by a significant drop in the contribution of the working age population; a development clearly not related to the recession. In Sweden, the explanation for the permanent fall in the labour contribution lies in a contraction of the participation rate.

Developments in the contribution of TFP growth following major recessions are mixed and are actually the driving force behind the changes in long-run rates of output growth. In some countries TFP growth increased (EL, FI, SE and UK), while in others it decreased (BE, DE, ES, FR, IT and PT). The group of countries which experienced an increase in TFP growth coincides with the group which also benefited from an increase in potential growth, except for Spain.[16] TFP growth therefore emerges as the key factor explaining country differences in developments in potential growth around recessions.

Table 3. Changes in average potential growth and its determinants around major recessions (ten-year averages) (1) (2)
(average of annual % change)

	Potential		TFP*		K accumulation*		Labour (Hours)*	
	Before	After	Before	After	Before	After	Before	After
Major banking crises								
FI	2.8	3.1	1.9	2.4	1.0	0.3	-0.1	0.4
SE	1.9	2.5	0.7	1.8	0.8	0.5	0.4	0.2
Other major recessions								
BE	2.2	2.1	1.5	1.0	0.7	0.7	-0.1	0.4
DE	2.5	1.6	1.7	1.2	0.7	0.7	0.1	-0.2
EL	0.9	3.1	0.0	1.7	0.8	0.8	0.2	0.6
ES	2.7	3.1	1.4	0.3	1.1	1.3	0.1	1.5
FR	2.2	1.9	1.7	1.2	0.9	0.7	-0.4	0.0
IT	2.4	1.4	1.2	0.5	0.9	0.6	0.4	0.2
PT	3.2	2.5	2.1	1.0	1.3	1.3	-0.2	0.2
UK	2.4	2.8	1.6	1.8	0.6	0.7	0.2	0.3

(1) The 10-year averages exclude the years of the downturn, when GDP/capita is still contracting.
(2) Components not always add up due to rounding.
* Contributions to potential growth

2.3.3 A more detailed look at several case studies: Sweden, Finland and Japan

To complement the aggregate analysis of past periods of financial and economic distress, it is useful to undertake a closer examination of several case studies of *major* (financial) crises which can, besides demonstrating the potential effects on the level and growth rate of potential output, help analyse the driving forces and the impact of policies. Particularly useful points of comparison in this respect are the financial and economic crises which hit Sweden, Finland and Japan at the beginning of the 1990s and which due to their very significant extent, depth and structural implications for these economies fall out of the group of "normal" downturns. As these examples combined financial/banking crises with distress in the real economy, they can provide some useful implications for the current situation. What is different now is the global dimension of the crisis, compared to the regional character of the crisis episodes in these countries. The IMF (2008) underlines that the depth, as well as the length of a crisis, increases significantly if the crisis has a global character. Therefore, the impact on potential growth will likely be even

[16] In Spain, the increase in potential growth was mainly the result of a substantial increase in the contribution of labour input which can be explained by the strong rise in the participation rate during those years.

greater as the size of the slump and its duration have direct implications for the actual level and prospective growth of potential output.

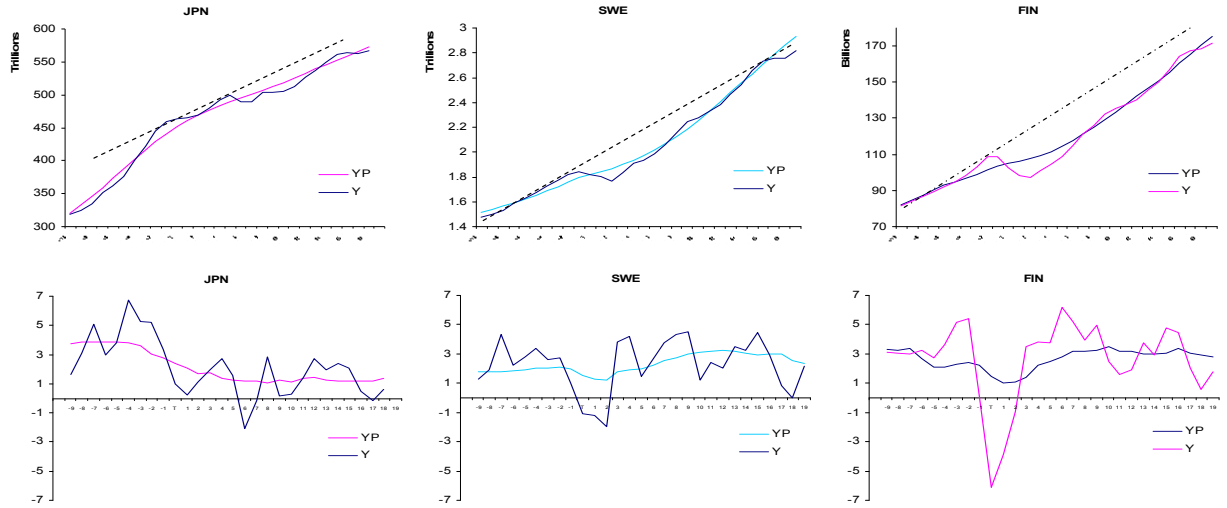
A casual inspection of the evolution of actual and potential output in Sweden, Finland and Japan presents us with fundamentally different stories. The deep financial crises in these three countries produced a very different evolution in the trend growth of potential output: (i) Japan, unable to effectively deal with the consequences of the crisis, experienced a long-run slowdown in potential growth, ensuring that the output losses have not been recovered following the end of the recession; (ii) Finland tackled the crisis rather well and due to a fundamental reorientation in its areas of economic specialisation succeeded in restoring high pre-crisis potential growth rates. As average output growth in Finland in the post-crisis period was only slightly higher than before the crisis, the level loss in output was recovered at a slow pace[17]; and (iii) Sweden's potential output growth in the post-crisis period even considerably exceeded the pre-crisis growth rate and the acceleration in potential output growth helped to recover the losses in output levels rather quickly and put the country on a higher growth path.

An insufficiently resolute policy reaction to the financial crisis, combined with mounting competitive pressures from emerging economies, contributed to the slowdown in long-run potential growth in Japan. The growth rate of potential output which averaged 3.5% in the decade preceding the disruptions in the financial sector and the bursting of the asset bubbles in 1992 dropped to only 1.3% on average after 1992. The protracted slump due to the mishandling of the financial crisis (slow restructuring of banks, high share of toxic assets) resulted in a period of deflation and a fully fledged recession in the second half of the 1990s took its toll by reducing the long-run growth of the economy's productive capacity.

In contrast, the deep recessions which started in Sweden and Finland in 1991 were relatively short-lived and did not result in a reduction in potential output growth. Both Sweden and Finland suffered abrupt and deep recessions at the outset of the 1990s but succeeded in resuming dynamic growth in 2-3 years after the beginning of the recession. The crisis thus acted as a catalyst for significant restructuring of their economies and resulted in a long-run boost to potential output. Average potential output growth in Sweden stood at 1.9% in the pre-crisis decade. After a drop in the growth of potential output in the period surrounding the crisis, the pace picked up quickly and considerably exceeded the rates of growth experienced in the pre-crisis period. As a result, the loss in potential output was recovered rapidly and in the decade following the onset of the crisis the average potential growth rate was around 2%, increasing to roughly 2½% on average in the 15 years following the crisis. In Finland, potential output growth dropped from relatively high levels which averaged 2½% in the decade prior to the crisis but also fully recovered, with average growth over the 10 year period following the crisis being approximately the same as in the pre-crisis period.

[17] Though it should be noted that the pre-crisis growth rate was likely inflated by the expansion of the asset bubbles (Cerra and Saxena, 2008).

Figure 3
Level (upper panes) and growth (lower panels) in actual and potential output



Source: OECD.

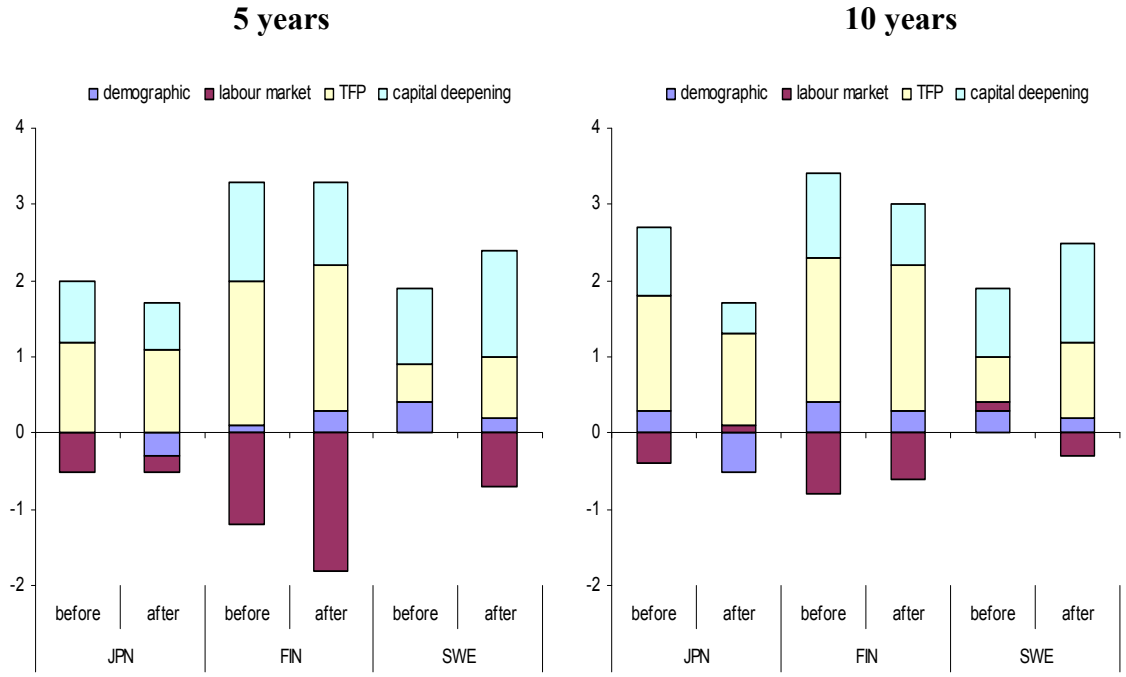
A detailed look at the components of potential growth shows that the slowdown can be accounted for by trend productivity declines and by unfavourable demographic developments in Japan. The recession in Japan had an adverse effect on potential growth especially due to factors linked to productivity growth, i.e. capital deepening and TFP. The protracted distress in the banking sector led to considerable uncertainty and misallocation of resources resulting in a drop in investment. Consequently, the accumulation of capital slowed down sharply and trend TFP suffered a significant decline. Importantly, the unfavourable demographic developments further aggravated the situation and became the most important factor dragging down potential output growth. The labour market components, on the other hand, helped to cushion the impact of the crisis. Structural unemployment did not increase significantly after 1997 (though it rose steadily in the preceding years) and also labour market participation stayed high. The adjustment rather took place through the number of hours worked (though at a declining pace).

Conversely, the adjustment in the Nordic countries was mainly channelled through the labour market. The rate of structural unemployment rose sharply, reaching over 12% in Finland and almost 7% in Sweden 4-5 years after the start of the crisis. At the same time, participation declined somewhat in both countries, e.g. due to policies favouring early withdrawals from the labour market. Trend hours worked also played some, albeit a relatively minor, role in Finland. Haugh et al. (2009) suggest that the significant drop in the utilisation of labour was due to rigid labour market institutions, unable to effectively cushion the shock. This finds support in the fact that whilst Finland succeeded in reducing the NAIRU considerably, it still stood at a relatively high level of above 6% in 2008. The Swedish structural unemployment rate dropped only marginally since its peak. Consequently, the longer-run contribution to potential growth of labour market factors turned positive in Finland in the decade following the crisis, while they continued to drag the potential growth rate down in Sweden.

Productivity developments and their contribution to potential growth, on the other hand, differed. In Sweden, the negative effect of lower labour utilisation on potential growth was compensated for by improvements in the components of trend productivity. Both capital deepening and trend TFP increased their contributions to potential output growth and became the driving forces of Sweden's recovery and longer-run growth. On the other hand, capital deepening slowed down in Finland and changes in trend TFP did not change significantly compared to the pre-crisis period. The demographic developments were modestly favourable to potential growth and their contribution stayed roughly the same.

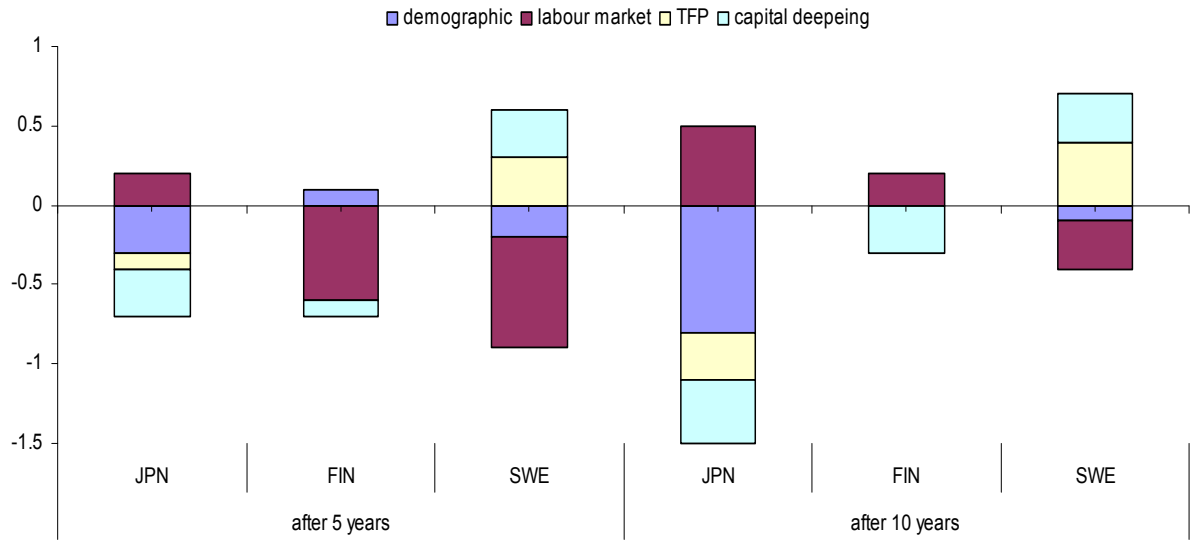
The differences in the evolution of potential output in Japan, Finland and Sweden were, at least partially, due to the structural changes in their economy, or in some cases their absence. For example, Finland used the crisis as an opportunity for a fundamental restructuring of its manufacturing sector (with spillover effects on related service sector industries) which was in contrast to Japan where the 1990's were characterised by a significant and sustained shrinkage in the economic importance of its manufacturing sector. In fact, there were large differences in the extent of restructuring in the Japanese and Finnish economies, with the overall rate of change significantly higher in Finland, with the sharp increase in the latter's share of "ICT producing" industries being a feature not only of its manufacturing sector but also of related areas in its private services sector. A more detailed analysis of industrial structure changes in Japan and Finland is contained in Box 2.

Figure 4
Decomposition of potential output growth before and after a financial crisis
(Periods of 5 and 10 years before and after the start of the recession (SWE and FIN 1991, Japan 1997)



Sources: Haugh et al. (2009), Commission calculations. Labour market component is total hours worked over working-age population (15-64).

Figure 5
Decomposition of the difference in potential output growth before and after the crisis



Sources: Haugh et al. (2009), Commission calculations. Labour market component is total hours worked over working-age population (15-64).

Box 2: An assessment of the industry level impact of the financial crisis in the 1990s in Japan and Finland

This box uses the EU KLEMS industry level database to explore the impact of the financial crises which Japan and Finland experienced in the late 1980's / early 1990's.

The specific situations and different starting positions partially explain the differences between the two countries and need to be taken into account when deriving policy recommendations. The cases of Finland and Japan are very different, with the scale and nature of the domestically generated financial/housing bubbles which emerged having specific country features and since Finland had an additional external dimension given the collapse in its trade with the former USSR. Furthermore, any potential policy recommendations must also take cognizance of the very different starting positions of both economies. For example, it is clear that since Japan already had exceptionally high capital-output ratios and had relentlessly pursued a technology-driven development strategy over many decades that it was a lot easier for Finland, which was a heavily resource-based economy in the early 1990's, to move up the value added chain by pursuing an innovation driven policy path.

Nevertheless, significantly different policy strategies to address essentially similar policy challenge in both countries resulted in a fundamentally different degree of restructuring of the economy. Despite the country differences, however, both Japan and Finland were faced with the same fundamental policy challenge, namely how to react to the immediate contraction in output (where both countries used fiscal instruments to ease the short term demand shortfalls) and how to restructure their economies in a way which would re-utilise the resources released from the inevitable shrinkage of specific industries (finance, construction, traditional manufacturing industries etc) in an economically efficient manner. With respect to this latter structural reform reaction, Finland used the crisis as an opportunity for a fundamental restructuring of its manufacturing sector (with spillover effects on related service sector industries) in stark contrast to Japan where the 1990's has been characterised by a significant and sustained reduction in the economic importance of its manufacturing sector. In fact, there were large differences in the extent of restructuring in the Japanese and Finnish economies, with the overall rate of change significantly higher in Finland, with the sharp increase in the latter's share of "ICT producing" industries being a feature not only of its manufacturing sector but also of related areas in its private services sector.

Finland's experience shows that any recovery strategy must focus on ensuring the health of the tradeables sector (goods & services). One interesting observation from the analysis is the contrasting fortunes experienced by the Finnish and Japanese authorities with respect to their "tradeable" goods & services industries. It is striking the extent to which Finland successfully achieved a radical restructuring of its manufacturing sector away from resource based materials and products to high technology, ICT driven, product ranges. These new product ranges were also linked, in a complementary manner, with the expansion of ICT related tradeable services. In the case of Japan, it is equally extraordinary to witness the ongoing deterioration in the relative share of manufacturing in its overall value added. This deterioration is pervasive across almost all of the manufacturing industries and is surprising given that Japan's economic success over the previous decades had been based essentially on shifting resources into capital-intensive, export-oriented, manufacturing industries.

Japan made significant structural policy mistakes. Whilst an industry level analysis cannot assess the merits of the conventional view that most of Japan's problems reflect fundamental monetary & fiscal policy errors in its reaction to its 1990's crisis, what it can do, however, is assess the extent of the structural policy mistakes which were made. The Japanese authorities appeared to be in collective denial about the scale of the downturn, with the desire for fundamental structural change held back by having a track record of enormous success up until the late 1980's with its previous policy approach and by having large stocks of accumulated financial assets with which to cushion the income losses for its rapidly ageing citizens. This absence of a desire to change was reflected in the slowness of the Japanese response in reducing employment levels in the affected industries (with the labour market adjustment occurring via reductions in hours worked, not only in the public sector but, more significantly, also in the manufacturing & private services sectors); by its slowness in shrinking its bloated industries & releasing the labour & capital resources needed for the new industries of the future (e.g. the construction / real estate; wholesale & retail trade; and financial services industries either maintained or increased their shares of total value added in the period up to 2000); and an economy-wide slowness to restructure as reflected in an overall industrial structure which in 1999 / 2000 looked remarkably similar to that which existed in 1989 / 1990.

The analysis supports the view that all "economic decisions are at the margin" – consequently, without detailed assessments at the industry/firm levels, the potential for serious policy errors in the present crisis is significant. The EU KLEMS analysis shows clearly that a lot of the changes in macro level trends in GDP, investment and TFP are being driven not only by a small group of industries but also by a very small proportion of the total capital stock. For example, in the case of Finland, its mid-1990's turnaround was driven by just one pivotal industry, communications equipment, and by technology / investment decisions which affected less than 2% of the overall Finnish capital stock. It was undoubtedly the efficiency & industry focus of specific investments, rather than the overall macroeconomic quantity of investment spending, which dictated the evolution and intensity of the Finnish recovery process.

2.4 Tentative insights on the prospects for the EU in light of past experiences

The likelihood of a lasting impact on potential growth appears to be higher in the current crisis than in previous recessions due to the duration of the crisis, its global nature and the changes in attitudes towards risk. Firstly, the last ECFIN forecast suggests that the crisis will be potentially longer than its predecessors. If this materialises, this will have an adverse impact on investment, in particular on intangible investments in general and R&D in particular, which has a strong impact on TFP growth and potential output. Moreover, the NAIRU might rise further due to hysteresis effects, causing a larger loss in potential output levels and slowing down potential output growth in the short to medium term. Many discouraged workers may also withdraw from the labour force, cutting labour supply. Secondly, the global nature of the current crisis limits the possibilities to engineer a strong recovery via the rechanneling of resources from the non-tradeable goods sector to the export sector, as world demand is sharply depressed. The Finnish and Swedish "miracles" seen after the financial crisis in the mid-1990s were partly due to the reallocation of resources towards their ICT based export industries. Thirdly, the changes in attitudes towards risk may hamper the financing of R&D and innovation activities and slow down the necessary reallocation of resources towards the potentially more dynamic areas of activity. This may considerably weigh upon TFP growth in the long run.

The ultimate outcome of the crisis will, to a very large extent, depend on the present policy reaction and its ability to cope with emerging risks. Whilst the recovery programmes appear to be broadly well designed and the fiscal impulse reasonably significant, the present policy stance of "monitor and discuss" may be insufficient if the outstanding risks materialise. These are related to the speed with which the financial system is being fixed; to the differences in national approaches within the single market leading *de facto* to distortions harmful to growth; and to a possible negative feedback loop from the real economy to the financial system. The priorities should focus on the financing of R&D and innovation; on accelerating the reallocation of resources across industries; on stimulating the development of labour supply and avoiding hysteresis effects in the labour market. The risk of implementing bad policies, such as running unsustainable public finances or implementing inappropriate labour-demand policies (as seen in the aftermath of the first oil shock) should not be underestimated.

Therefore, since the balance of risk associated with a long crisis is clearly on the downside, there is a high degree of uncertainty surrounding the precise loss in potential output. A long

recession might have far larger and more durable adverse effects on the main components of the production function and may generate some negative structural shifts in the potential growth path, even when the slowdown gradually ends over the longer run. Some upside risks could, however, be mentioned, such as for example the "echo" phenomenon in capital vintages. A recession generally leads to under-investment and to a sharp ageing of the capital stock. The "positive echo" in capital vintages occurs in the recovery phase, when the boom in investment swiftly renews the capital stock and incorporates the latest breakthroughs in technology. This is likely to boost TFP growth. This beneficial process was seen in Sweden and Finland after the severe recession of the early 1990s.

In brief, the current financial crisis is very likely to entail a material and permanent loss in potential output levels for the EU: this is the second scenario on figure 1, i.e. a permanent loss in output in level terms. While the impact on potential growth is considerably more uncertain, (moderate) reductions in potential output growth over the medium-to-long-run are not to be ruled out, owing to a TFP growth slowdown.

3. ILLUSTRATIVE ESTIMATIONS OF THE POTENTIAL GROWTH SLOWDOWN

3.1 Short term impact on potential output: recent potential growth rate estimates based on the production function methodology[18]

This section provides estimates and projections of EU potential growth rates, based on the application of the production function (PF) methodology.[19] It provides a quantitative illustration of many of the theoretical channels described earlier in section 2.1. The estimates of potential growth take into account i) historical revisions to past growth estimates, ii) up-to-date information based on the Commission services Spring 2009 forecasts for 2009 and 2010 and iii) a medium term extension to 2013 using an agreed extrapolation method.

Against a backdrop of elevated technical and economic uncertainties, the PF method predicts that the downturn in potential growth this year and next, caused by substantially reduced contributions of capital and labour, as well as a subdued pattern for TFP trends, may largely be temporary in nature, with all three components of growth likely to stage a recovery starting in 2011. It must be stressed, however, that these medium term estimates should not be seen as forecasts of medium-term sustainable rates of growth but more as an indication of likely developments, if long-run historical patterns were to re-emerge over the coming years. Consequently, this essentially technical extension covering the period 2011-2013 implicitly assumes that the EU's macro and microeconomic policy response to the financial crisis will be both effective and appropriate, thereby ensuring that the downturn in underlying rates of growth in 2009 and 2010 will prove to be a transitory phenomenon, not a permanent deterioration. This is also the broad pattern expected for the vast majority of individual EU27 Member States, with all countries, without exception, expected to have lower average potential growth rates in 2009-2010 compared with 2007-2008.[20]

[18] Note that production function methods are generally not immune from downward revisions of past potential growth and from the technical difficulty in disentangling cyclical movements from trends. A range of factors also makes the present TFP estimates particularly uncertain, with some of these factors being: the unprecedented declines in capacity utilisation, the difficulty in estimating capital obsolescence rates and the uncertainties regarding the financial crisis impact on R&D spending and on the financing of R&D. Finally, while the evidence to date indicates the possibility of a shift away from the relatively-high-productivity manufacturing sector towards services, it remains to be seen whether there will be permanent sectoral output shifts in the EU as a result of the crisis.

[19] This methodology was approved by the ECOFIN Council, while the technical details have been agreed by the EU's Member States in the EPC's Output Gap Working Group (OGWG).

[20] However, the medium term trends for some specific member states are significantly less optimistic compared with the more aggregated picture presented in table 4.

Table 4
Potential Growth Rate Developments in the Euro Area, EU3, EU8 (2007-2013)

	Potential Growth (Annual % change)	% Points Contribution to Potential Growth				NAIRU (% of Labour Force)	Investment Ratio (% of potential output)
		Labour		Capital	TFP		
		Demographics	Other				
Euro Area (16)							
2000-2006	1.8	0.2	0.2	0.8	0.6	8.5	21.2
2007	1.6	0.3	0.0	0.9	0.4	8.7	22.6
2008	1.3	0.2	-0.1	0.8	0.4	9	22.3
2009	0.7	0.1	-0.4	0.5	0.4	9.7	19.9
2010	0.7	0.0	-0.2	0.4	0.5	10.2	19.3
2011	*1.2*	*0.2*	*0.1*	*0.4*	*0.5*	*10.4*	*19.3*
2012	*1.5*	*0.2*	*0.2*	*0.5*	*0.6*	*10.5*	*19.8*
2013	*1.6*	*0.1*	*0.3*	*0.5*	*0.7*	*10.6*	*20.2*
Cumulated loss in potential output level in 2013 *	-3.7	-0.6	-1.2	-1.8	-0.5		
EU3 (DK, SW, UK)							
2000-2006	2.5	0.4	-0.1	0.8	1.4	5.2	17.8
2007	2	0.5	-0.2	1	0.9	5.8	19.6
2008	1.6	0.3	-0.3	0.8	0.8	6.3	18.8
2009	0.8	0.2	-0.6	0.4	0.7	7.2	16.4
2010	0.8	0.2	-0.5	0.3	0.8	7.9	15.4
2011	*1.3*	*0.3*	*-0.2*	*0.4*	*0.8*	*8.3*	*15.9*
2012	*1.6*	*0.2*	*0.0*	*0.5*	*0.9*	*8.5*	*16.9*
2013	*1.7*	*0.1*	*0.0*	*0.7*	*0.9*	*8.6*	*17.9*
Cumulated loss in potential output level in 2013*	-6.8	-1.4	-0.9	-1.7	-3.4		
EU8 (BG, CZ, EE, LV, LT, HU, PL, RO)							
2000-2006	3.7	0.0	0.3	1.7	2	11.4	22.9
2007	4.4	0.1	0.5	2.3	1.5	9.4	27.5
2008	4	0.1	0.4	2.2	1.3	8.7	28.1
2009	3	0.0	0.2	1.7	1.1	8.4	24.9
2010	2.6	0.0	0.1	1.5	1	8.1	24
2011	*2.2*	*-0.1*	*0.0*	*1.4*	*0.9*	*8*	*23.7*
2012	*2.2*	*-0.1*	*-0.1*	*1.4*	*0.9*	*7.9*	*24.3*
2013	*1.9*	*-0.3*	*-0.1*	*1.4*	*0.9*	*7.9*	*24.6*
Cumulated loss in potential output level in 2013*	-5.9	-0.5	-1.3	-0.6	-5.6		

*compared with a pre-crisis growth path (2000-2006)

These medium term estimates have to be interpreted carefully given the considerable uncertainties surrounding investment forecasts and TFP predictions. Given the unprecedented financial market problems, with the cost of capital expected to rise and with the risk that an impaired capital allocation system may result in both a more anaemic investment trend in the recovery phase and in a less than optimal reallocation of capital resources to aid the crucial restructuring process, investment forecasts are subject to large uncertainty. As with the capital accumulation channel, there are a wide range of factors which make trend TFP predictions at the present time particularly precarious, including difficulties in interpreting capacity utilisation developments; calculating meaningful obsolescence rates; assessing the effects of the crisis on innovation and industry level restructuring[21].

The potential growth rate of the euro area and of the EU3 country grouping is expected to be cut in half in 2009-2010 compared with 2008, i.e. from a growth rate range of 1.3%-1.6% to 0.7%-0.8%. The pattern for the "new" Member States (i.e. EU8) is broadly similar, although

[21] Trend TFP growth could also be subject to important measurement errors, which might affect potential growth in the short term. Firstly, the decline in trend TFP could erroneously reflect the unusually large changes in capacity utilisation which are presently occurring. Potential GDP growth could be mis-measured in the short run when the statistical smoothing procedure used to produce trend TFP cannot accurately disentangle the cyclical and structural influences impacting on the actual TFP series. To the extent that this is the case, trend TFP should recover relatively quickly in the upturn phase since these capacity-utilisation-induced changes in TFP are essentially cyclical in nature. Secondly, as mentioned in the main text, possible measurement errors with respect to capital depreciation rates will mechanically affect the TFP series, as a residual.

the potential growth rates remain much higher reflecting their "catching-up" stage of development[22]. In the euro area and EU3 (Denmark, Sweden and the UK)[23], the potential output declines are mainly driven by sharp reductions in the contributions of labour and capital, with rates of structural unemployment expected to rise by around 1 to 1½% points and with investment to GDP ratios likely to fall by up to 3% points in both areas. A more subdued rate of TFP growth is also predicted, with the estimated contribution from trend TFP, compared with earlier forecasting exercises, revised downwards by around 0.1 percentage points per annum. These TFP estimates are likely to be conservative as they do not fully take into account any expected "one-off" downward shifts in the level of TFP associated with industrial restructuring. In the EU8, the financial crisis is also expected to lead to a sharp decline in potential growth rates[24] from 4% in 2008 to 3% and 2.6% respectively in 2009 and 2010, with the various components of potential growth reacting to the financial crisis in a roughly similar manner to that of the EU3 and the euro area.

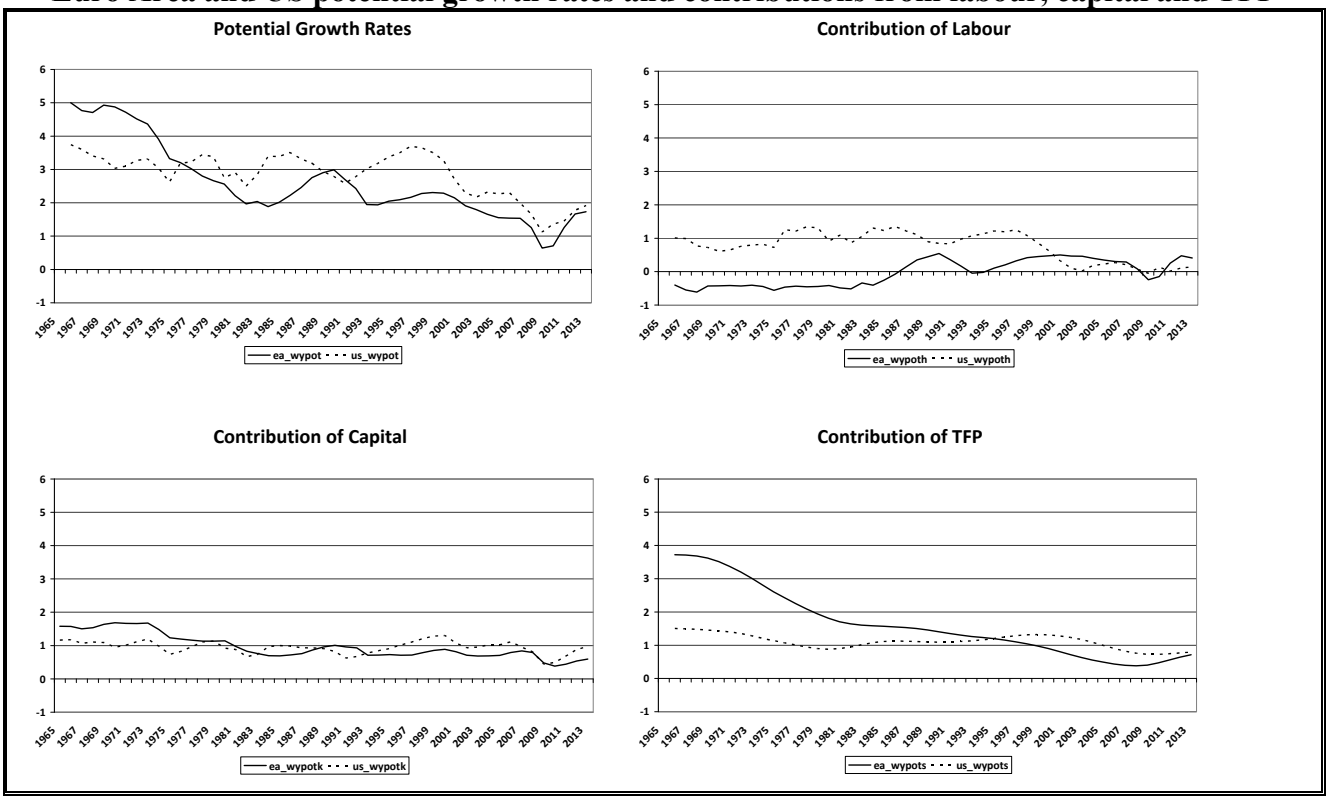
Whilst euro area, EU3 and EU8 patterns are essentially comparable for the forecast years 2009-2010, differences start to emerge between the "old" and the "new" Member States with respect to medium term trends for the period 2011-2013. Euro area and EU3 potential growth rates are expected to fully recover over this three year period from the downturn experienced in 2009-2010, with rates of growth in 2012-2013 broadly comparable to those experienced prior to the crisis. This unfortunately is not the expected pattern for the EU8 grouping, with the contributions of investment and TFP failing to recover from their relatively subdued 2009-2010 levels and with labour market trends in the EU8 expected to deteriorate even further, driven to a significant degree by a marked slowdown in the growth rate of the working age population.

With respect to the cumulated loss in potential output levels in 2013, compared with the pre-crisis growth path (with the latter set equal to the average 2000-2006 potential growth performance), table 4 shows cumulated losses in levels of 3 ¾% points for the Euro Area and losses of 6 ¾ % points and 6% points in the case of EU3 and EU8 respectively. Careful interpretation of these level effects is needed between the different country groupings given the differences in the methodologies used for estimating changes in structural unemployment and total factor productivity. This is especially the case over the medium term (i.e. 2011-2013) where the technical assumptions made with respect to TFP in particular can make a big difference regarding the speed and strength of any recovery process. What can be concluded however from these figures is that the financial crisis is generating a substantial drop in the level of potential output, with significant negative effects on the labour (i.e. non-demographic drivers such as the NAIRU), capital and TFP components and that this is a feature in all three areas shown in Table 4.

Taking a broader perspective, since the 1960's, potential growth rates in the US and the euro area have generally being trending downwards, with the exception of the US in the mid-1990s. Figure 5, covering the whole period 1965-2013, indicates that potential growth rates were on a downward trend in both the Euro area and the US before the financial crisis. The well documented ICT-related upsurge in US potential growth rates around the mid-1990's proved short-lived, with rates resuming their downward movement around the year 2000. Consequently, the present crisis can legitimately be characterised as an exacerbation of an already, well established, secular deterioration in the respective supply side performances of both the US and the euro area. Potential growth rates in 2008 in both areas were already substantially lower compared with the year 2000 (1½% points lower in the case of the US and 0.8% points lower in the euro area), with the financial crisis now predicted to push rates down by an additional ¼ to ½ a percentage point in 2009-2010. However, as Figure 5 makes clear, this latter financial crisis-induced deterioration in underlying potential could be short-lived, with the PF method's medium-term scenario to 2013 suggesting a recovery in US potential growth rates to close to 2% and with euro area rates returning to pre-financial crisis levels of 1.6%.

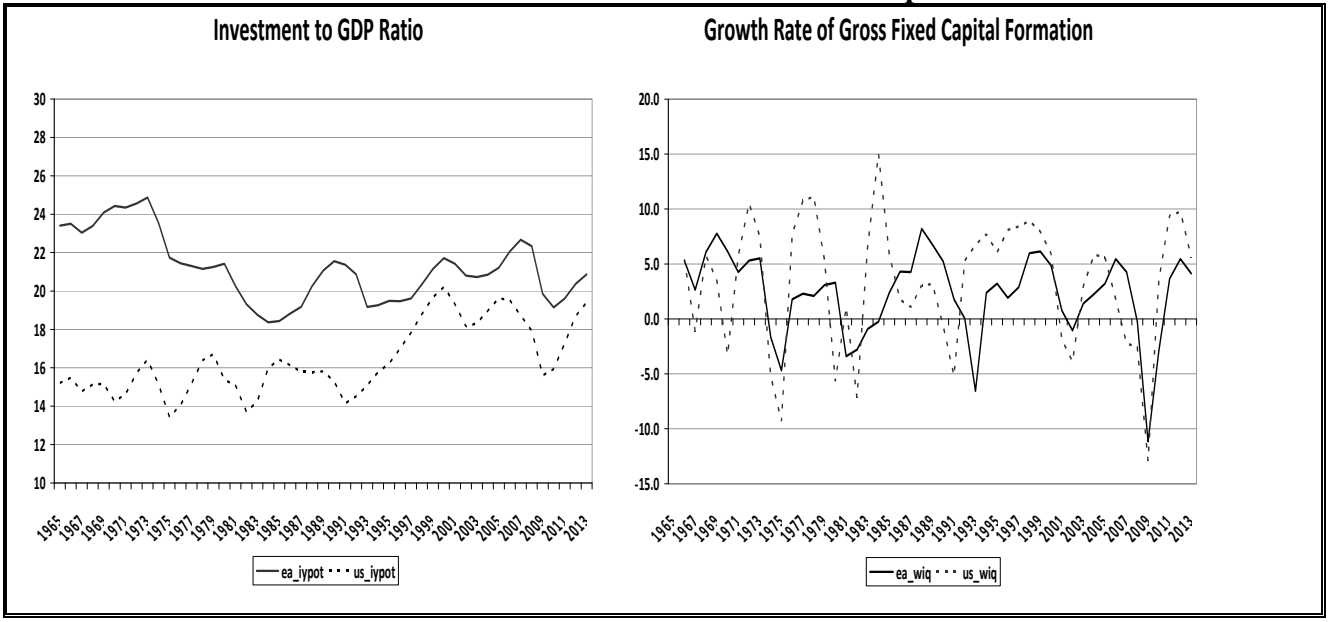
[22] The Euro area (16 countries), EU3 and EU8 aggregates collectively make up the total EU27.
[23] EU3 corresponds to the "old" EU15 countries which are not part of the euro area.
[24] Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland and Romania.

Figure 5
Euro Area and US potential growth rates and contributions from labour, capital and TFP



The financial crisis, according to the Production Function method, should also reinforce the diverging pattern between the euro area and the US in terms of growth component contributions. Whilst the contribution of labour in the euro area will continue to outperform that in the US, the latter is expected to make a significantly stronger investment recovery from 2011 onwards. Although the ICT-related upsurge in the US in the 1990s has been largely unwound, TFP growth in the US will still be double that in the euro area. In terms of labour, even before the crisis, the contribution of labour to overall US potential growth in 2007 was running at 1/6 the levels of the late 1990's. In fact, in stark contrast to a pattern which had persisted since the 1960's, the Euro area had a contribution to growth from labour which was double that of the US in 2007. Whilst the financial crisis is expected to lead to a significant, and similar, degree of deterioration in the labour contribution of both the euro area and the US, the euro area is forecast to outperform over the medium term, with an average contribution from labour of close to ¼-½% point in 2012-2013 compared with only 0.1 for the US. With respect to capital accumulation developments, US and euro area trends are expected to converge to a contribution level of about ½ a % point over the period 2009-2010 while investment is forecast to decline by around 10% in 2009 in both areas. However, the US should outperform the euro area over the medium term to 2013 and come back to the trend seen since the early 1990's, where US investment growth rates have tended to be significantly higher than those of the euro area (despite a lower long run investment to GDP ratio). With respect to TFP, the average TFP contribution rates of 1.3% experienced by the US in the late 1990's fell to around 0.8% in 2007-2008, which is still however double that of the Euro Area. Both areas are expected to experience financial crisis-induced declines of about 0.1 in their respective TFP contributions in 2009-2010, with contribution rates returning to pre-crisis levels over the medium term. However, the contribution to US potential growth rates from TFP is forecast to remain substantially higher than in the euro area over the 2009-2013 periods. In this regard, a closer examination of the key drivers of both tangible and intangible investments is clearly needed to explain the persistent outperformance of the US.

Figure 6
US and Euro Area Investment to GDP and Gross Fixed Capital Formation Trends



3.2 Assessing the medium-term impact of the crisis, in the absence of policy changes, using Quest III[25] simulations

This section will present the model-based analysis using QUEST III to simulate the medium and long term impact of the financial crisis on potential output. The QUEST simulations illustrate results for two different recession scenarios, both of which are driven by a correction to the earlier over-optimism in financial markets. This is technically carried out via a shock to the risk premia in the arbitrage equations determining corporate and housing investment (as well as house prices).

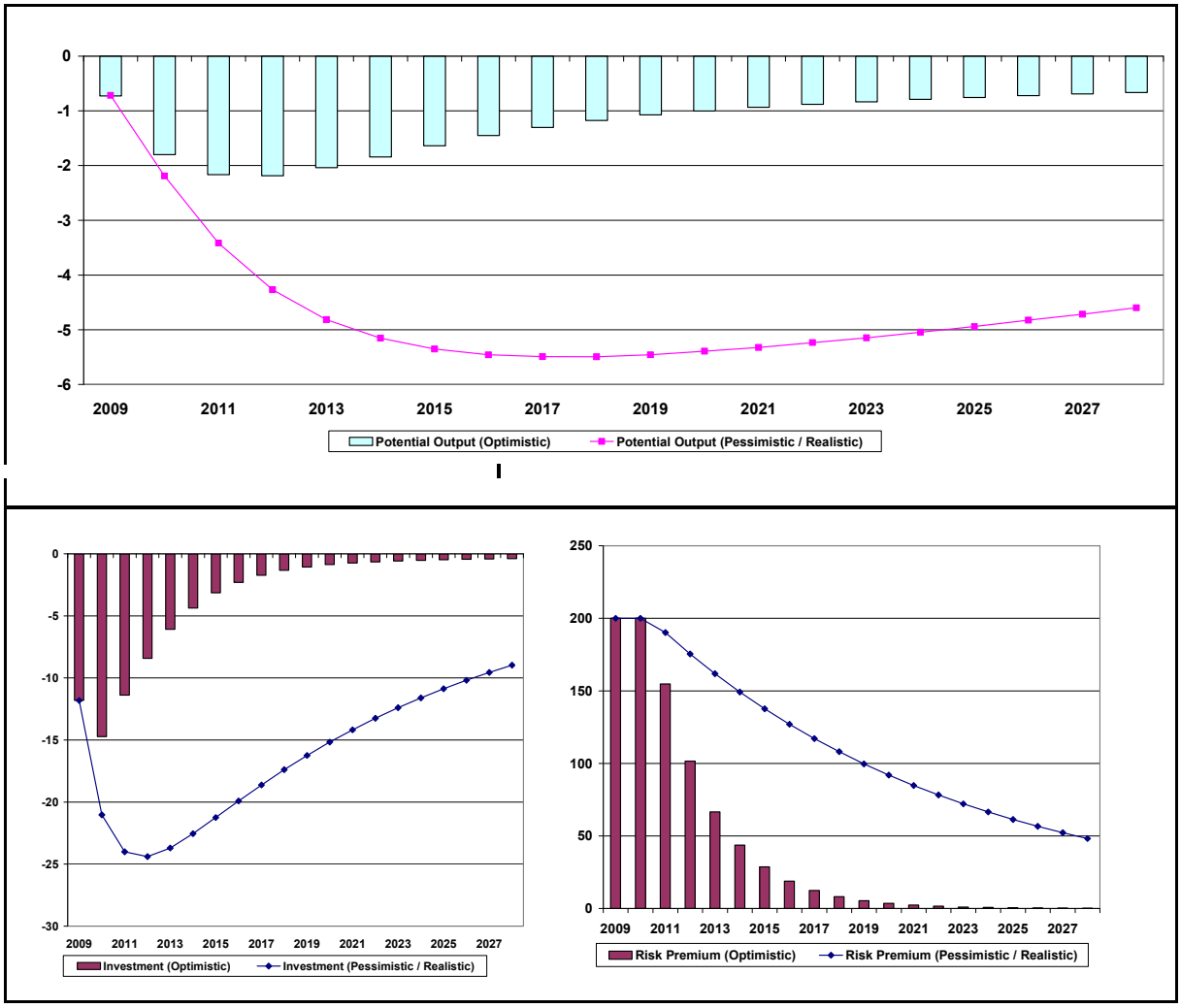
This model-based analysis, as with the proposed new TFP methodology in the production function method, points to the possibility of a slow recovery in medium-term potential growth rates as well as highlighting the risk of permanent growth rate effects over the longer run.

Given the uncertainties involved, two alternative QUEST scenarios were undertaken to illustrate the possible directions which financial markets may take over the coming years. Both scenarios are consistent with the production function results for 2009, with the subsequent adjustment paths for 2010 and the medium / long run essentially reflecting whether capital costs quickly revert to pre-crisis levels (i.e. the "optimistic" view) or stay elevated at levels closer to the borrowing costs faced by economic agents in the 1990's (i.e. a more "pessimistic / realistic" scenario depending on how one interprets the evidence)[26].

[25] See Ratto et al. (2009), Roeger et al. (2008, 2009).

[26] Higher tax burdens from higher debt are taken into account. Demographic changes are also taken into account in the baseline and this uncertainty-crisis effect comes on top of that baseline -demographic effects.

Figure 7.Evolution of Potential Output & Investment Levels : A Comparison of the "Optimistic" & "Pessimistic / Realistic" QUEST III Scenarios



The more optimistic view is broadly consistent with the PF's potential growth rate estimates for 2010 and its medium-term extension to 2013 and is based on the expectation that the freezing up of capital markets which occurred in 2008 / 2009 will be relatively quickly unwound (i.e. with risk premia reverting to levels seen in the pre-crisis period over the medium term) and with the more "pessimistic / realistic" scenario pointing to a quasi permanent change in financing conditions, with borrowing costs staying on average 1-1 ¼ % points higher over the long run (i.e. over the next 20 years) compared with the pre-crisis period. These risk premia shocks are both carried out under a realistic monetary policy response setting, with policy rates being eased in line with the actual cuts agreed by the monetary authorities since the start of the crisis, with the result that the real capital costs faced by borrowers is substantially less than what the risk premium shock itself would imply.

In terms of results, both scenarios point to long run negative level effects for potential output ranging from -1/2% (optimistic variant) to -4 ½ % (pessimistic / realistic variant), with figure 7 stressing that the divergences are being driven by variations in the speed and strength of the recovery in investment, which in turn reflect the very different risk premia paths for the period in question. Both scenarios also point to permanent potential growth rate effects due to the negative impact of the higher borrowing costs on intangible investments and consequently on TFP growth, with substantially greater effects under the more "pessimistic / realistic" scenario.

A more detailed look at the numbers behind the "pessimistic / realistic" scenario is given in Table 5. As the table shows, the current crisis will lead to a sharp drop in the level of euro-area potential output in the short-term, followed by a very slow recovery in potential growth rates in the subsequent period (with this growth rate evolution reflected in the growing losses

in potential output levels). These results suggest that the changes in attitude towards risk brought on by the turmoil may have a persistent negative impact on potential growth. Unlike in the "optimistic" scenario, this "pessimistic / realistic" variant suggests that a permanent increase in risk premia, reflecting the more cautious approach of investors and corporations to risk, will have a very lasting impact on capital accumulation and therefore potential growth. It will also have long run negative effects on the NAIRU as firms increase their mark-ups to offset the higher cost of capital. In addition, as discussed later, the higher borrowing costs will also negatively effect TFP growth via its impact on R&D spending. In overall terms, the assumed increase in the risk premium translates into an annual average reduction of ½ a percentage point in EU potential growth rates – mostly due to the capital channel – over the next 10 years. Even allowing for the "front-loading" of the effects in 2009 / 2010, the EU is still undoubtedly facing the prospect of a substantial reduction in potential growth rates well beyond the end of the present crisis.

Table 5. EU27 Economic Downturn generated by an adverse financial shock : "Pessimistic / Realistic" Variant

(Increase in risk premium of 200 basis points for the first 3 years, with the shock gradually reduced to 50 basis points in the long run)

	Short Run		Medium Run				Long Run
	2009	**2010**	**2011**	**2012**	**2013**	**2018**	**2028**
Impact of Risk Premium Shock on Potential Output and its Labour, Capital & TFP components							
Potential Output	**-0.72**	**-2.19**	**-3.42**	**-4.27**	**-4.81**	**-5.50**	**-4.60**
- (Capital)	(-0.11)	(-0.43)	(-0.81)	(-1.18)	(-1.53)	(-2.73)	(-3.31)
- (Labour)	(-0.60)	(-1.71)	(-2.51)	(-2.94)	(-3.09)	(-2.38)	(-0.69)
- (TFP)	(-0.03)	(-0.07)	(-0.12)	(-0.16)	(-0.21)	(-0.39)	(-0.60)
Impact of Risk Premium Shock on other Economic Variables							
Capital Stock	-0.32	-1.23	-2.31	-3.38	-4.37	-7.81	-9.47
Intangible capital (Patents)	-0.31	-0.83	-1.38	-1.91	-2.42	-4.51	-6.85
Employment	-3.17	-4.90	-5.27	-5.19	-4.94	-3.20	-0.81
Structural Employment	-0.92	-2.63	-3.86	-4.52	-4.76	-3.66	-1.07
Investment	-11.82	-21.04	-24.01	-24.40	-23.70	-17.39	-8.97
Real Wages	0.25	0.26	0.06	-0.20	-0.47	-1.55	-2.31
Nominal Wages	-0.61	-1.80	-3.00	-4.11	-5.10	-8.28	-8.97
Price Level GDP	-0.86	-2.06	-3.06	-3.91	-4.63	-6.73	-6.66

The shock to the risk premium brought about by the crisis will, as stated earlier, primarily affect investment. A negative contribution from capital formation to potential GDP results from increases in risk premia on loans to firms and households, from the more cautious lending behaviour of banks and from a correction to the over-investment experienced in the boom period (arguably generated by the bubble in financial and housing markets). As can be seen from Table 5, the downturn in 2009 is accompanied by a persistent decline in the capital stock and in a fall in employment.

The changes in attitudes towards risk also lead to a significant increase in the NAIRU. The negative effect on employment in the first two years is larger than the adverse contribution from capital, while in the medium term the contribution from capital is dominant. Downward nominal rigidity of wages appears to explain the rise in the NAIRU[27], with table 5 indicating an increase in real wages for 2009 and 2010. In order to test whether this explanation is correct, the same simulation experiment was run, but this time with very low nominal wage stickiness. With this assumption on wage behaviour, wages respond strongly to adjust employment, however at the cost of a very strong decline in real wages. This suggests that it is indeed very costly for workers to keep unchanged employment levels in an economic environment with a falling capital stock. An

[27] The simulations do not explicitly allow for hysteresis-type mechanisms linked with more fundamental structural rigidities.

additional QUEST simulation suggests that, without frictions in both goods and labour markets, the economy adjusts more smoothly, leading to less fluctuation in GDP.

Beyond the above considerations, one additional source of uncertainty regarding the adjustment phase of potential growth to its long term trend relates to TFP. There are indeed serious downside risks to medium / long term prospects for TFP growth. These relate to the ongoing process of industrial restructuring and to innovation, as discussed in sections 2 and 3.

An additional QUEST simulation looks at the likely impact of the financial crisis on innovation. In this respect, the simulation assumes that the financial crisis will have an impact on TFP via the increase in the risk premium for intangibles (i.e. higher credit frictions in the venture capital market). As with the other simulations, it is assumed that financial markets impose a risk premium of 200 basis points for both tangible and intangible capital (R&D) and as can be seen from table 5 this reduces both physical and R&D capital. Again the results are consistent with the stylized facts which indicate that employment (in the short run i.e. over a period of 2 years) and physical capital formation are the most important determinants for persistent level shifts in GDP but that there is also a negative TFP effect induced by the higher capital costs.

Table 5 also shows that this TFP effect comes in slowly, with TFP growth decelerating on average by about 0.04% per annum over a period of 10 years. Moreover, this result depends to a large extent on the estimated elasticities of the knowledge production function (see Bottazzi et al. (2007) for the values used in this exercise)). The empirical estimates suggest that there is substantial inertia in knowledge / patent production resulting from past R&D expenditure (i.e. accumulated past knowledge), making knowledge production less dependent on current R&D expenditure. However, despite this inertia, it is clear from the simulation that an increase in the risk premium is unambiguously negative for R&D spending in the long run.

It must also be emphasised that this innovation simulation exercise only looks at the decline in TFP growth that can be expected from an increase in the risk premium. As discussed earlier, there are possibly other important sources for a slowdown in TFP which result from changes in the sectoral composition of output (e.g. a decline in the output of sectors such as manufacturing which have a relatively high level of productivity).

In terms of policy implications, these simulations would suggest that frictions in both goods and labour markets and a quasi permanent change in risk premia may affect not only long run potential output levels but also the potential growth rate. They also suggest that wage moderation should be preserved whilst competition policy should be pursued further to limit the losses in output levels. Moreover, the alternative scenarios, where rigidities are phased out, show that the output loss will be reduced. However, removing all rigidities is not realistic, as there is no example of a real economy which would exhibit an absence of nominal frictions and since international comparisons usually show lower nominal rigidities in the US goods market but not in the US labour market[28]. Therefore, "flexible wages and prices" should be, more realistically, attained through combining wage moderation with policy measures aimed at increasing the overall level of competition.

3.3 Beyond the crisis: long-term potential output developments

According to the "2009 Ageing Report"[29], beyond the financial crisis, the EU is facing a sharp long run decline in potential growth rates due to the reduction in the size of its working age population, provoking a large shrinkage in its workforce. Even without incorporating the

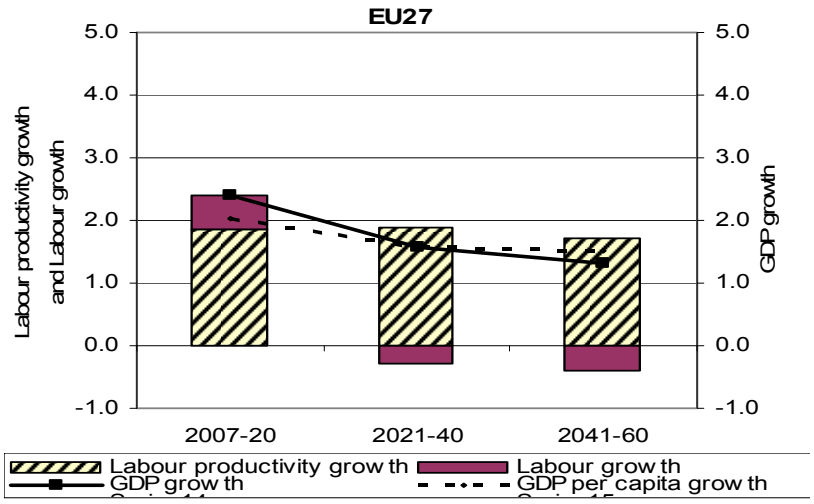
[28] The average duration over which prices and wages are kept constant would be two quarters and four quarters respectively in the case of the US.

[29] See the '2009 Ageing Report: economic and budgetary projections for the EU-27 Member States (2008-2060)', European Economy, No.2/2009 and the '2009 Ageing Report: Underlying Assumptions and Projection Methodologies for the EU-27 Member States (2007-2060)', European Economy, No.7/2008.

expected negative impact of the current economic crisis, according to the report, the annual average potential GDP growth rate in the EU is projected to fall from, (a now rather optimistic) 2.4% in the period 2007-2020, to 1.7% in the period 2021-2030 and to a meagre 1.3% in the period 2041-2060 under an assumption of no-policy change.

According to the "Ageing" report, the sources of economic growth are projected to already change within a decade: labour productivity will become the key driver of growth in the EU. For the EU, labour productivity growth is projected to remain fairly stable at close to 1.7%. The small increase in the growth rate expected until the 2030s is due to the higher productivity growth assumed for the catching-up Member States. Total hours worked - the labour input - are projected to increase up to the 2020s. Thereafter, population ageing, with a reduction in the working-age population, is expected to act as a drag on growth. Over time, labour productivity will become the only driver of growth in the EU.

Figure 8
Long-term projection of growth of GDP, labour input and productivity



Box 3: Alternative scenario from the Ageing Working Group on the impact of the crisis

The severe economic crisis has also led to a downward revision of estimated potential growth rates. Factoring these much deteriorated macroeconomic prospects into alternative ageing scenarios would imply a downward revision of EU GDP over the first part of the projections up to 2020. The AWG/EPC baseline long-term macro-economic projections for potential growth are based on the Commission's forecast made in Spring 2008 and consequently do not take into account the impact of the crisis. In order to simulate the order of magnitude of the risks over the long-term related to the ongoing economic crisis, alternative simulation scenarios have been carried out. In view of the large uncertainty regarding the length of the slump in economic activity, three scenarios may be considered: (i) a pessimistic scenario: "permanent shock"; (ii) a less pessimistic scenario: "lost decade", and; (iii) an optimistic scenario: "rebound".

Specifically, the scenarios incorporate the downward revision of the estimated growth potential and its components based on the Commission's January 2009 forecast until 2013 :

* In the 'rebound' scenario, *labour productivity* is assumed to reach the **AWG baseline level** in 2020. *Labour input* (total hours worked) is assumed to reach the baseline level in 2020.

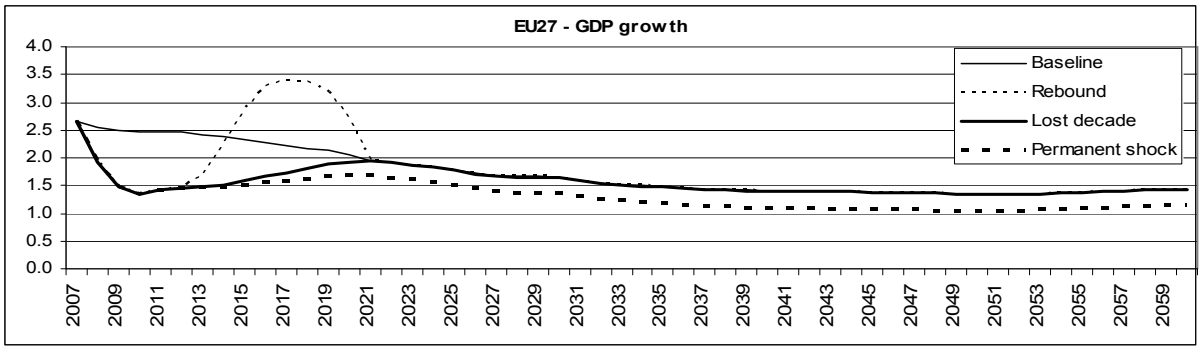
* In the 'lost decade' scenario, *labour productivity* is assumed to reach the **AWG baseline growth rate** in 2020. *Labour input* (total hours worked) is assumed to reach the baseline growth rate in 2020.

* In the 'permanent shock' scenario, labour productivity growth and labour input growth (total hours worked) will reach : (i) the *labour input* growth rate, assuming that the unemployment rate is permanently 1 p.p. higher than in the AWG baseline from 2020 onwards; (ii) the *labour productivity* growth rate is 0.25 p.p. lower than in the AWG baseline from 2020.

The impact on wealth creation of the crisis depends on its duration and the extent to which policies are put in place that successfully enhance the growth potential once out of the crisis. The effect is strongest in the

permanent shock scenario, but also the temporary shock scenario has an adverse impact on the long-term growth potential. There are also considerable differences as to the impact at individual country level. Potential GDP growth for the EU27 coincides with the AWG baseline from 2020. Over the projection period 2007-2060, the average revision of potential GDP growth in the 'lost decade' scenarios is 0.2 p.p. per year for the EU27. In the 'permanent shock' worst case scenario, a larger downward revision of the average annual GDP growth by 0.4 p.p. over the whole projection period would materialize. All scenarios show a reduction in GDP per capita over the medium-term, of between 5% and 7% already by 2015. In the 'rebound' scenario, this would be recuperated by 2020, as the slump would be fully reversed. The 'lost decade scenario' implies a reduction in the per-capita GDP level in 2060 compared with the baseline, which mirrors the lower expected potential growth in the decade up to 2020. This period is 'lost' in terms of accumulated wealth creation. The loss in GDP per capita in the EU27 is around 8% in 2020 and this loss extends over the rest of the projection period, since the growth projection remains broadly unchanged between 2020 and 2060. In the 'rebound' scenario, the GDP per capita by 2060 is the same as in the AWG baseline (the deterioration relative to the baseline up to 2014 is offset by the improvement between 2015 and 2020). Finally, a more marked reduction in the GDP per capita level is observed in the 'permanent shock' scenario, where GDP per capita is 10% lower than in the AWG baseline in 2020, 14% lower in 2040 and 18% lower in 2060, reflecting lower growth throughout the projection period up to 2060.

Figure 9. Different scenarios on the impact of the crisis



The slowdown in GDP growth potential is projected to already start occurring in the coming years in the EU on account of demographic trends, and the economic crisis is aggravating the slowdown in a no-policy change scenario. Over a longer-term perspective, the EU's working age-population is assumed to start declining early next decade, and labour is projected to act as a drag on output growth starting from the 2020s. In a medium-term perspective, the possible persistence of the economic crisis may lead to subdued potential growth due to both sluggish employment and productivity growth, implying a risk of a lost decade in terms of wealth creation in the EU (see Box 3).

4."EXIT STRATEGY"? ILLUSTRATING THE POTENTIAL IMPACT OF GROWTH-ENHANCING POLICY RESPONSES

4.1. The crucial need for adequate and timely policy responses.

Previous sections concluded that the cost of the crisis in terms of potential output level will be sizable and not easily recoverable as the long term growth of potential output could be strongly affected as well, especially if the financial crisis turned out to be a prolonged one. A clear message is that in absence of countervailing policies, the long-term economic toll of the current crisis could be huge in terms of accrued loss of GDP compared with a scenario of no crisis. This is all the more worrying as this will occur against the background of a slowdown in economic growth induced by the population ageing. The role of economic policies will be crucial in boosting the potential output growth in the long-run, while at the same time avoiding policy mistakes, i.e. taking measures that may be appealing in the short-run but potentially disastrous for potential output in the longer time horizon.

Since the crisis may already have had an adverse impact on future potential growth, supply-side actions with long term growth effects need to be taken now, in addition to urgent demand-enhancing measures. As the real economy has been badly hit by the crisis, dealing with the distress in financial markets is not a sufficient condition to ensure a return to pre-crisis growth

rates. Moreover, an excessive focus on the demand-side of the current crisis may make policy makers lose sight of the need to press ahead with the longer-term agenda for supply-side reforms, much needed in Europe. As indicated in section 3.1, the euro area, which had a lower potential growth rate than in the US in the pre-crisis period, looks set to be severely affected by the financial upheavals, as reflected in the predicted slowdown in its potential growth rates and the corresponding accumulated loss in potential output levels. There is also a need for a deepening of the reform process at a time when there is likely to be less appetite for structural reforms and a temptation to mostly rely upon Keynesian policies (see Box 4).

Despite the potential implementation difficulties, there is undoubtedly a need for a comprehensive approach, exploiting a wide range of available instruments to tackle the multi-faceted factors impinging on potential growth. Since structural reforms can influence all components of potential output (i.e. labour, capital and TFP, as seen in Table 6) and since all components have been hit by the crisis, policy makers should take a comprehensive approach and use all the levers at their disposal. Whilst addressing the short-run implications of the crisis, policies should, at the same time, be steered towards ensuring an effective utilisation of available labour resources, restoring the pace of capital accumulation and boosting the growth of TFP. As there are long-run demographic and social limits to increasing the supply of labour (ignoring the possible impact of migratory flows), potential growth will essentially build on the ability of economies to accumulate productive capital and, even more importantly, to promote TFP growth through increasing the quality and better use of available resources.

Table 6
Potential output components: non-exhaustive list of corresponding policies

Growth components	Relevant policy areas	Nature of impact on output
Population growth	Immigration and integration policies	Level
Working age population share in total population	Policies to better involve those above 64 in social and economic activity on a voluntary basis	Level
Labour market participation	Active labour market policies (training, job-search assistance, well-designed and targeted youth program)	Level
	Relaxing job protection while combating labour market segmentation/dualisation	Level
	Improving wage bargaining	Level
	Lowering labour tax wedge	Level
	Unemployment or welfare benefits systems (duration, loose eligibility)	Level
	Reconciling family and professional life (child care provisions, working time flexibility…)	Level
Unemployment rate	Labour tax wedge	Level
	Unemployment or welfare benefits systems (duration, loose eligibility)	Level
	Active labour market policies (training and job-search assistance)	Level
	Relaxing job protection while combating labour market segmentation/dualisation	Level
	Improving wage bargaining	Level
	Education	Level/Long term growth path
	Labour mobility	Level
Average Hours worked per person employed	Cutting high marginal labour taxation (/poverty traps)	Level
Capital deepening (capital per person employed)	Innovation and R&D	Level/Long term growth path
	Maturity of financial markets and infrastructure	Level/Long term growth path
	Regulatory barriers to foreign trade and investment	Level/Long term growth path
	Regulatory barriers to entrepreneurship (administrative burden)	Level/Long term growth path
	Macroeconomic stability	Level
Total factor productivity (Solow's residuals)	Innovation and R&D	Level/Long term growth path
	Maturity of financial markets, infrastructure, efficient administration	Level/Long term growth path
	Education and training	Level/Long term growth path
	Regulatory barriers to entrepreneurship (administrative burden)	Level/Long term growth path
	Legal or administrative barriers to firm entry	Level/Long term growth path
	Macroeconomic stability	Level

Source: LIME assessment framework (LAF)

The Lisbon strategy for growth and jobs has defined such a comprehensive reform agenda and contributed to the implementation of structural reforms in the EU. The Lisbon strategy has

identified a large number of reforms which can bear considerable economic fruit in the medium- to long-run and of which the implementation should be speeded up. In addition, the urgent need for pushing forward and deepening the structural reform agenda will need to be reflected in the discussions on the future of the Lisbon strategy after 2010.

The timing of policies aimed at dismantling structural rigidities needs to be sensitive to the fact that some rigidities may help dampen the impact of recession and act as "automatic" stabilisers in the short-run, whilst hampering the recovery over the medium-run. The short-run dynamics of structural policies might in some cases trigger further feedback loops. For instance, the removal of entry and exit barriers, could - in the real world - lead to further net exits from the market in the midst of the crisis, aggravating its impact on output and employment. Similarly, employment protection legislation helps avoiding overshooting of job destruction in the short-run and contributes to sustaining domestic demand. However, the "automatic stabiliser" function has its cost as it is likely to hamper transitions in the labour market and, thus, the sectoral reallocation in the long term. Similarly, temporary policies that aim at cushioning the impact of the crisis on the labour market through facilitating short term working are justified in the short run as they prevent unnecessary losses in human capital but will need to be phased out at as the economy bottoms out and full emphasis will have to be put on measures ensuring that labour force can reallocate smoothly and effectively between firms and industries. More work is urgently needed to help define the appropriate transition paths for the withdrawal of crisis responses in the labour market and the phasing in of structural reform policies.

A typology of reforms should distinguish the reforms that only affect the level of potential output (i.e. potential growth over the short- to medium-run) from the reforms that also influence the *long-term growth path* of potential output (through innovation, tangible and intangible investments). In some cases (e.g. policies promoting business), the distinction is less clear-cut. The last column of Table 6 attempts to categorise the different types of structural reforms according to their impact on level and long-term growth.

4.2. The gain of multi-faceted policy responses: from unchanged policies to "good" policies

Adequate policy responses should encompass a wide range of areas, including financial markets, the business environment, labour markets, promoting physical and R&D investments and innovation policies. Whilst many policies affect primarily the level of potential output, some policy actions may influence the long-term growth path of potential output in addition to its level.

4.2.1 Policies affecting primarily the level of potential output

As regards rescue policies in favour of industries that have been particularly affected by the crisis, it needs to be ensured that they support the EU's long-term goals and do not freeze resources in unproductive activities, which would reduce potential output through lower efficiency and lower adjustment capacity. In the European context, industries that have been disproportionally hit by the slowdown are construction and car manufacturing. In the construction sector, policy makers should seize the opportunity to boost investment in low-energy buildings; investment in the motor industry must be directed towards more fuel-efficient vehicles. Table 7 displays the impact of various types of measures embedded in the EERP.

The role of financial incentives to work is important so as to support the development of labour supply and protect the most vulnerable groups threatened by durable exclusion from the labour market. Once the recovery firmly sets in, there will be a reconsideration of transfers, notably between the active and the non-active part of the population, with special emphasis on the prevention of persistent unemployment. This should be part of an overall review of social protection systems in the light of the crisis. Ensuring appropriate incentives to work can have large effects on potential output as QUEST III simulations show that a reduction in the benefit replacement rate of 1

p.p. may increase the potential output level by 0.35%. Also, tax adjustments could help promote labour supply and demand, especially at the lower skill/wage levels while at the same time providing income support for the most vulnerable groups. For example, a revenue neutral tax shift from low to high skilled labour of 1% of GDP could increase output levels by around 0.1% in the short-run and almost 0.2% in the long-run. At the same time, the failures highlighted by the crisis may render necessary the adoption of more generous / better targeted tax and transfer systems as a condition for the maintenance and promotion of competitive product and labour markets. A revision of some key parameters in unemployment systems could also be warranted, in order to better modulate their functioning over the cycle and enhance their (counter-cyclical) stabilisation function.

Table 7
Impact on GDP of some stylised structural reforms

	Examples of standardised unitary stimulus	Effect on GDP (%)			Model
Types of measures submitted by Members States as EERP		*Short term (One year)*	*Medium term (Five years)*	*Long-term (20 years)*	
1. Supporting industrial sectors, businesses and companies.					
1.1 Easing financing constraints for businesses/SMEs	Reduction in capital risk premium by 1 p.p.	0.18	0.88	1.8	QUEST III
1.3 Non-financial measures supporting business (e.g. regulatory)	Reduction in administrative burden by 10%	0.42	0.57	0.69	QUEST III
	Reduction in entry barriers for start-ups by 10%	0	-0.01	0.02	QUEST III
2. Supporting a good functioning of labour markets.					
2.1 Promoting wage moderation.	Wage mark-up reduction by 1%	0.03	0.24	0.33	QUEST III
2.2 Temporary working-time reduction (decline in hours worked partly subsidized by govermental subsiides	Wage mark-up reduction that increases the employment rate by 1 p.p.	0.09	0.98	1.14	QUEST III
	Permanent reduction in labour taxes by 1% GDP (financed by consumption taxes)	0.48	0.21	-0.14	QUEST III
2.4 Unemployment benefits system and social assistance.	Reduction in benefit replacement rate by 1 p.p. (long-term effect only of permanent reduction)			0.35	QUEST III
2.5 Easing labour market transitions (training, placement, other job-search help).	Increase in share of medium skilled workers (initially low-skilled) by 1 p.p. (on part of unemployment rise).	0	0.04	0.17	QUEST III
	Increase in share of high skilled workers (initially medium-skilled) by 1 p.p.	0.01	0.06	0.26	QUEST III
3.1 Physical infrastructure	Increase in government investment of 1% GDP	1.07	0.10	0.07	QUEST III
	Increase in investment tax credit by 1% GDP	1.75	009	0.10	QUEST III
3.3 R&D and innovation	Tax-credit R&D subsidy of 0.1% GDP	-0.01	-0.05	0.08	QUEST III
	Wage subsidy for R&D personnel of 0.1% GDP	-0.02	-0.08	0.11	QUEST III
4.2 Income support, targeted	Tax shift from low to high skilled labour 1% GDP	0.11	0.18	0.17	QUEST III

Note: all shocks are permanent shocks, except those under 3.1 (public investment and investment tax credit), which corresponds to a one-year stimuli
Sources QUEST and MacMiC database

Policies that promote wage moderation and aim at reducing nominal wage rigidities result in reductions in structural unemployment (NAIRU) and are key to boosting competitiveness and adjustment capacity. The slump in economic activity has led to a period of necessary wage restraint in a number of firms and industries, often combined with (subsidised) temporary working time reductions, further easing cost pressures. While these often drastic measures are necessary to ensure the survival of firms in the depressed economic climate, it needs to be ensured that in the aftermath of the crisis wage developments are aligned with productivity growth and do not compromise longer-term competitiveness. Model simulations point to a significant (especially longer-run) effect of wage moderation as a wage mark-up reduction of 1 percentage point is expected to boost potential output by over 0.3%. This is in line with the conclusions of section 3.2. At the same time, the flexibility in wage setting mechanisms that has been manifested in some countries/industries/firms should be retained in the future.

Policies that facilitate labour market transitions (e.g. ALMPs such as training, placement, other job-search assistance) are crucial to ease the short-run adjustment as well as to smoothen the longer run reallocation of resources. As explained earlier, labour market policies have attempted to limit the impact of the crisis on unemployment and to provide adequate income support to dismissed workers. As a necessary complement, ALMPs ease the transition in labour

markets through making the matching process more effective or improving the qualifications of unemployed workers. These policies are also essential for ensuring that the longer-run reallocation of resources in the economy is as smooth as possible and generates limited adjustment costs. One way to simulate the partial impact of these policies is to consider an increase in the share of medium-skilled workers (through retraining activities): a 1 percentage point increase leads to almost a 0.2% increase in the long run output level. A 1 percentage point increase in the share of high-skilled workers (through upgrading medium-skilled workers) gives rise to an even better outcome, bolstering long run output level by 0.3%. On the assumption that only 20% of the newly unemployed between 2008 and 2010 benefit from ALMPs and see their "obsolete" medium-skills levels restored through training, a GDP gain of 0.15% in the long run could be expected.

It is crucial that policies are also geared towards sustaining investments in physical capital, R&D and Innovation during the downturn which will bring considerable long-run gains in potential output level. Investments in physical capital, e.g. infrastructure, can provide a forceful short-run boost to the ailing European economies, especially as it cushions the effect of the crisis in construction and in some manufacturing industries particularly hard hit by the economic slump.[30] Simulations with the QUEST III model show that a 1% increase in government investment can increase European output by just over 1% in the first year. Investment tax credits amounting to 1% of GDP are even more powerful as they result in a roughly 1.8% increase in output. Beyond boosting domestic demand, these measures, moreover, have long-run positive impact on the level of output through the increase in the capital stock. Thus, government investments raise output by 0.2% after 5 years and 0.1% after 20 years and investment tax credits 0.4% and 0.2% respectively. Measures to support R&D and Innovation in the crisis – spending on which is highly procyclical – can also contribute to raising potential GDP levels.

4.2.2 Policies possibly affecting the long-term path of potential output in addition to its level

The indispensable, but not necessarily sufficient, condition for solving the financial and economic crisis and limiting its adverse impact on potential output is to effectively address the disruptions in financial markets and their adverse consequences in terms of a higher cost of capital and tighter credit constraints.. The risks associated with getting financial sector rescue packages wrong are enormous. Cleansing the toxic assets from the balance sheets of banks, bank restructuring and recapitalisation will be crucial in avoiding a serious contraction in loans and a relaxation in credit constraints. Failure to do this quickly could result in an additional severe feedback loop on the real economy as a protracted lack of available credit could impede capital accumulation and cause corporate and personal bankruptcies. European firms and, in particular, SMEs heavily rely on bank loans as their main source of funding. In addition, the availability of credit can be limited by two further effects. Firstly, deleveraging forces could force banks to contract loans and to raise further capital, as there is a general consensus in the markets that leverage ratios have been too high and have led to excessive risk exposure by financial institutions. Downside pressures from reduced loan supply are unlikely to matter now, when credit demand is decelerating rapidly, but could become 'binding' when the economic situation stabilises or begins to improve. According to the available estimates[31], a cut in loans supply by 10% could reduce real activity by as much as 4%. Secondly, the losses in the financial sector have led to an increase in risk aversion and a lasting re-evaluation of all forms of risk premia, including the more expensive cost of bank loans, with an adverse effect on investment and potential growth. Improving the functioning of financial markets will also have three powerful effects on potential output. It will facilitate the resource reallocation toward the fast-growing sectors during the recovery. Moreover, financial innovation may directly contribute to future TFP growth. Lastly, better functioning financial markets would also help boost the incentives for other structural reforms to follow by bringing

[30] It should, nevertheless, be accepted that construction is clearly oversized in some European countries and a downsizing is in place. Similarly, many European industries may need to restructure to improve their medium- to longer-term competitiveness.

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forward their longer-term benefits and allowing capital to flow to the new investment opportunities generated by these structural reforms, as highlighted in the EMU@10 Commission report[32].

As businesses are hit particularly hard by the impact of the crisis and, besides difficult access to the necessary financing, their recovery prospects are potentially threatened by a failure to restructure and to adapt their business models to rising competitiveness pressures. Policies to improve the business environment (e.g. reducing administrative burdens, or lowering entry/exit barriers) will provide favourable conditions for businesses to fully exploit the opportunities that a recovery will bring. Together with measures supportive of labour market transitions (re-training, efficient job placement, etc) they will also stimulate a more efficient allocation of resources. Through reducing fixed costs for firms and increasing competitive pressures, these policies will lead to increased investments and, especially, improvements in TFP. Some of these measures, e.g. reductions in administrative burdens, deliver results soon after their implementation and hence present an efficient tool (without significant budgetary costs) to ease the impact of the crisis on businesses. Reducing the existing administrative burdens in the EU by 10% is estimated to increase output by a significant 0.2% in the short-run, with the benefits increasing considerably in the longer-run reaching 0.9% after 5 years and 1.8% after 20 years. Measures increasing the level of competition through e.g. reductions in entry/exit barriers also have a positive impact on the level of output and, if they are effective in generating a faster pace of innovation, also potential growth. In addition they are essential for allowing an effective reallocation in the economy which is a necessary condition for a sustained and dynamic recovery. They, however, may have significant adjustment costs. More importantly, as they may further accelerate the already fast rates of market exits in times of slack demand, they may have to be implemented swiftly only when the economy starts picking up.

In order to increase or, at least, sustain the relatively low pre-crisis potential growth rates, policies need to promote innovation efforts already during the crisis and prevent their cyclical downturn, although some short-run costs associated with these policies need to be borne. Long-run growth is driven by TFP growth which, in turn, depends to a large extent on the pace of technological progress and the ability of countries to absorb and exploit different streams and forms of innovation. Due to their risky nature, R&D investments thrive disproportionately more under stable and favourable economic conditions than in unstable and volatile ones which increase the risk-aversion of potential investors. R&D investments appear more pro-cyclical as firms face tighter credit constraints and this effect is even stronger for firms operating in industries that depend more on external finance (Aghion et al., 2008).[33] Consequently, available policy instruments in support of R&D investments should be used to ensure that a fall in R&D efforts does not undermine the roots of recovery. Model simulations again show that such policies can have an important effect on potential output. Both R&D investment tax-credits and wage-subsidies to R&D personnel (of 1% of GDP) increase the level of potential output by around 0.8% and 1.1% respectively after 20 years. Nevertheless, redirecting resources into R&D and innovative activities generates adjustment costs (e.g. as labour needs to be reallocated into R&D activities) and the short- to medium –run impact on output can thus be negative.

[32] European Commission (2008) "EMU@10: successes and challenges after 10 years of Economic and Monetary Union". Brussels: Commission of the European Communities.

[33] In addition, Barlevy (2007) argues that pro-cyclicality of private R&D might not be so much an issue of credit constraints, but of the discounting behaviour in the business sector, keen on realizing the return on R&D investments instantly, which is easier in times of a booming economy.

Box 4: Political economy of structural reforms in crisis time

A crucial issue is whether the current financial and economic crisis will either weaken or strengthen the incentives for structural reform in product and labour markets. There is a wide range of factors that might influence the incentives for structural reform, but in the context of the crisis there are three which stand out as particularly relevant.

Firstly, the crisis itself may directly influence the urge of policy makers to embark on structural reforms. On the one hand, economic crises can promote reforms as it reveals the lack of sustainability of current policies (Drazen, 2000, and Drazen and Easterly, 2001). On the other hand, the political opposition to, for example, labour market reform may be relatively strong in crisis situations as it increases workers' attachment to job protection (Bean, 1998). Empirical studies tend to find that a crisis on balance does induce structural reform (IMF, 2004 and Duval and Elmeskov, 2005).

Secondly, the ongoing rapid deterioration in fiscal positions and the need to reverse this at some point may have a bearing on the incentives for reforms, with forces again pulling in both directions. On the one hand, the mounting budgetary pressures may increase the urgency of reforms so as to restore fiscal soundness (Saint Paul, 2002). But on the other hand the fiscal space to implement (costly) measures to compensate the losers of reform or to accommodate any temporary effects on aggregate demand relative to supply is rapidly being exhausted. Moreover, the process of fiscal consolidation may in itself exhaust the political capital available for introducing other reforms. Some empirical studies find a positive impact of the initial fiscal position on structural reforms, i.e. a reduction in fiscal space would reduce the likelihood of structural reform (Duval and Elmeskov, 2005).

Thirdly, policies to re-regulate financial markets in response to the crisis may have knock-on effects on the incentives for structural reforms. The greater access of larger groups of citizens and business to financial markets in recent decades may have contributed to making electorates more forward-looking and therefore more readily willing to reward reformist governments (Buti et al. 2009). A reversal of some of the achieved financial market freedom may thus have a price tag attached in the form of weakening the incentives for structural reforms.

In sum, while the crisis by itself may strengthen the incentives for structural reforms, there is a significant risk that the ongoing deterioration in fiscal positions (by limiting the room to finance temporary compensation schemes) and a possible regulatory over-reaction to the past excesses in financial markets (by weakening the forward-looking behaviour of economic actors) work in the opposite direction.

4.3. The cost of policy mistakes: from unchanged policies to "bad" policies.

The current circumstances may increase the temptation of making recourse to bad policies, whose cumulated effect could severely harm potential in the medium to long term. Three major risks could be contemplated: i) the use of trade barriers and anti-competitive policies, ii) policies aimed at reducing labour supply and iii) the implementation of lax and unsustainable fiscal policies. While these policy mistakes will certainly harm the level of potential output (such as the reduction of labour supply), some could also adversely affect the long-term growth path through lower investment and innovation. For instance, the use of trade barriers and anti-competitive policies may deter innovation and R&D investments and reduce the entry or the development of new innovative firms. Unsustainable fiscal policies may create a "crowding-out" effect and increase the risk aversion, which could durably increase the cost of capital and thereby harm the investment in physical capital and R&D.

Some member states may yield to protectionist temptations and promote the national interest at the expense of the Single market. The realisation of the Single Market increases economic efficiency through better economies of scale, higher competition and enhanced efficiency. It also urges Member States to raise their competitiveness and remove adverse nominal rigidities. However, against the background of a contraction in world demand and in most EU15 economies, many "outward-oriented" tradeable-goods industries are faced with strong difficulties, such as the car industry but also intermediate goods, capital goods and consumer durables. Political pressures then arise in many countries to grant substantial state aids to support badly-hit industries and to use protectionist measures to favour the consumption of national products. There has been an increase in non-tariff barriers lately. They restrict access to foreign markets and reduce competition and take the form of subtle measures like licensing requirements, import bans justified by safety rules or environmental concerns, and anti-dumping cases. There has also been an increase in direct subsidies to domestic industries, like e.g. the car industry, which can equally distort competition.

Table 8.
Effects of permanently higher mark-up in tradables sector

	Increase in mark-ups in		
	EU	**Rest of the World**	**Global**
EU			
GDP	-1.00	-0.07	-1.10
Consumption	-0.52	-0.18	-0.72
Investment	-2.44	-0.26	-2.73
Employment	-0.77	-0.05	-0.85
Rest of World			
GDP	-0.09	-1.08	-1.11
Consumption	-0.22	-0.70	-0.79
Investment	-0.36	-2.56	-2.68
Employment	-0.06	-0.83	-0.86

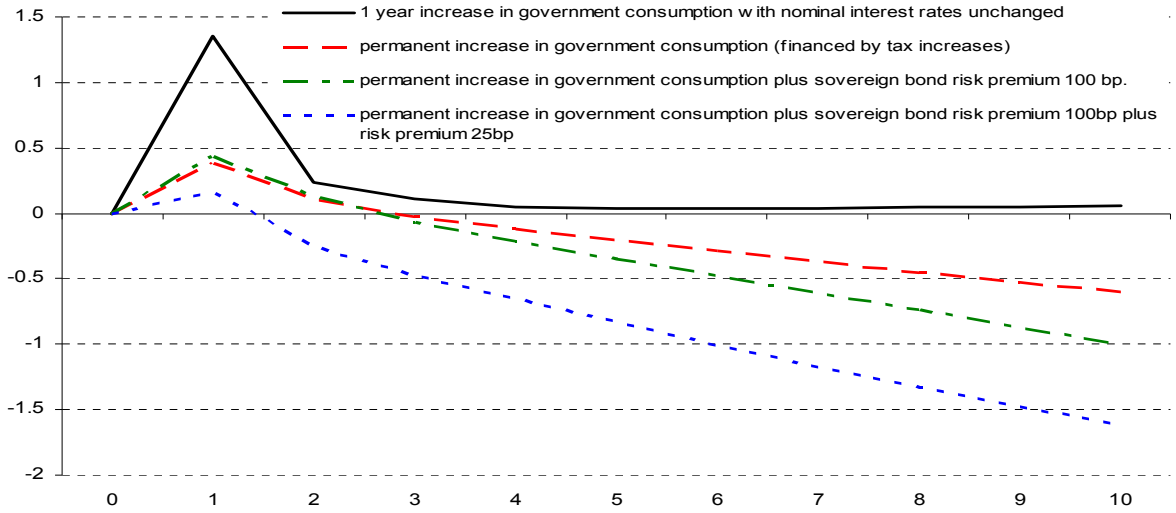
Note: percentage difference from baseline. The shock is an increase in the mark-up of one percentage point.

The impact of protectionism could lead to sizeable losses in output, have negative spill-over effects across the world and put at risk the long-term credibility of the Single Market. Trade barriers and anti-competitive policies obviously risk distorting competition within the EU, to jeopardize the very basis of the Single Market and to slowdown or delay the necessary process of restructuring and resource reallocation. A QUEST model simulation tries to capture the increase in protectionism by an increase in the mark-up in the tradeables sector. This results in sizeable losses in consumption and output, and has negative spill-over effects across the world[34]. As seen in Table 8, a 1 percentage point increase in the EU mark-up reduces output by around 1 percent in the EU and by -0.1% in the rest of the world. Conversely, a 1 percentage point increase in the mark-up in the rest of the world reduces output by around 0.1 percent in the EU. The channel through which potential output can be affected is via reductions in employment and investment. The latter will not only reduce the potential output level directly but also indirectly via lower TFP.

The temptation to use measures to reduce labour market participation, in particular, early retirement schemes, will significantly reduce potential output. These measures could consist in delaying the entry of young workers into the labour force, encouraging women not to enter the labour market, using disability schemes or setting up costly early retirement schemes. Other measures are subsidised schemes for low-skilled workers in the public or semi-public sectors, which will not improve their employability in the long run. These policies have proven to be ineffective, with the academic community referring to them under the heading of the "lump-of-labour-fallacy". The potential output level will be directly affected by the reduction in labour supply and employment, but also more indirectly through higher taxes or a heavier public debt burden, with which taxpayers or future generations have to finance the inactivity of their fellow citizens. According to Quest, an increase of 1 p.p. in the employment rate after 10 years across all skill-groups (in the form of a reduction in the wage mark-up) would increase GDP by 0.4% after two years, 0.8% after 10 years and 1% after 20 years.

[34] We focus on the steady state effects and assume the shock is taking full effect immediately.

Figure 10
Impact on GDP of an increase in government consumption



A prolonged crisis may make policy makers more tolerant toward the conduct of lax and unsustainable fiscal policies, which may ultimately lead to higher taxes and to limiting the budgetary room for reform efforts in the future. Reinhard and Rogoff (2008) show that real government debt rose by over 86 percent on average in the three years following a banking crisis. This build-up in public debt has been a defining characteristic of the aftermath of financial crises for over a century. This is mainly driven by a sharp drop in tax revenues and, in many cases, large increases in government spending to combat the recession. The bank bailout costs are, in several cases, only a relatively minor factor underlying the increase in the debt burden. As stressed in Box 4, there is a significant risk that the ongoing deterioration in fiscal positions reduces the acceptability of reform by limiting the room to finance temporary compensation schemes. As shown in Figure 10, the impact of a rise in government consumption by 1% of GDP has been simulated in QUEST, with different assumptions as regards the sustainability of this increase. While a 1 year increase in government consumption, with unchanged nominal interest rates will have virtually no effect on GDP after ten years (0.05%), the permanent increase in government consumption - financed by tax increases - will cut GDP by -0.6% after 10 years. The substantial increase in the tax burden will hurt potential output, most likely only the level of potential output according to classical growth theory. However, both the level and the growth rate of potential output could be hit if intangible investments in human capital and R&D are hampered by higher taxes, following the endogenous growth literature. The reduction in GDP can be much greater if financial markets view this increase in government consumption as being unsustainable or if financial conditions deteriorate as a direct consequence of the crisis, as the scenarios with risk premia show.

5. CONCLUSION

Given its global nature and roots in the financial system, the current crisis is likely to have a large negative impact on potential output in the short-run and there is a prospect of a prolonged period of slow growth as economies adjust to their post-crisis growth. Whilst it is too soon to draw strong conclusions, the central scenario of a "permanent level loss" in potential output (i.e. where the economy eventually returns to its pre-crisis potential growth rate but fails to recoup some of the output losses incurred during the crisis/recovery period) seems to be plausible. The other scenarios, i.e. an optimistic "full recovery" scenario or a pessimistic "continuous widening output loss" scenario cannot be ruled out, as past experiences suggest that policies will play the determining role. On balance, however, the risks are on the downside, and the prospect of crisis having a negative impact on long-run potential growth rates cannot be excluded in particular if financial conditions remain more restrictive in the long run thereby negatively impacting on R&D investments and TFP growth rates.

The challenge to be faced up to by policymakers is heightened by the fact that the pre-crisis potential growth rate was already low, mainly due to poor TFP growth. In addition, beyond the crisis, population ageing is expected to reduce potential growth in the EU over the medium to long run, owing to the ensuing sharp contraction in the labour supply.

In order to mitigate the losses in potential output level and to restore the pre-crisis potential growth it is important to implement "good" policies promptly. Besides demand-enhancing measures, supply-side policies aimed at easing the necessary restructuring of the EU economies, enhancing labour supply, smoothing the adjustment in labour markets and strengthening the growth potential through boosting innovation need to be implemented. Waiting for better times is no option as, for example, innovative potential could be irreversibly harmed meanwhile. At the same time, it is essential to avoid "bad" policies though they may appear appealing in the current gloom. In particular, governments should resist protectionist temptations, avoid measures that would reduce labour market participation (e.g. early retirement schemes), or give up the commitment to sustainable fiscal policies.

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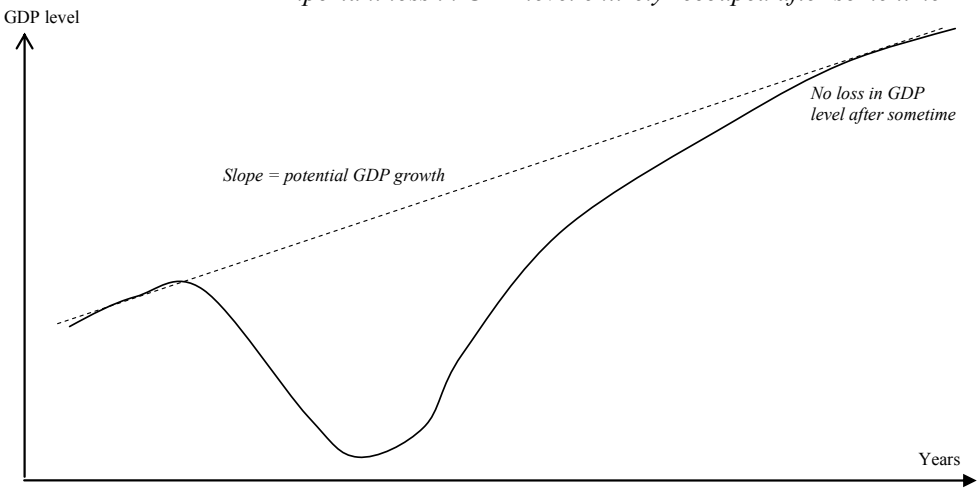
Annex 1

Three cases relative to possible behaviour of actual GDP level after the crisis

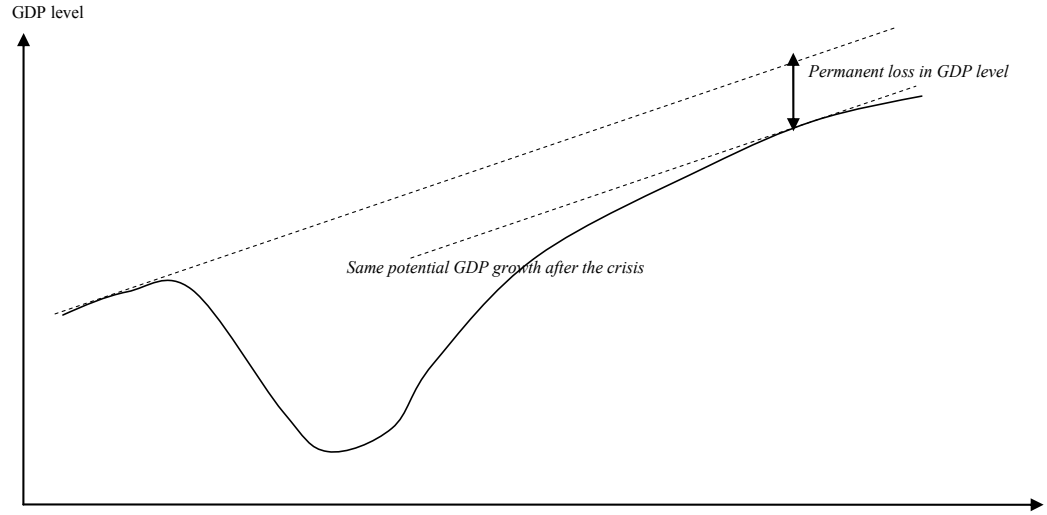
Case n°1: No change in potential growth and convergence to the unaltered potential growth trajectory

Important loss in GDP level entirely recouped after some time



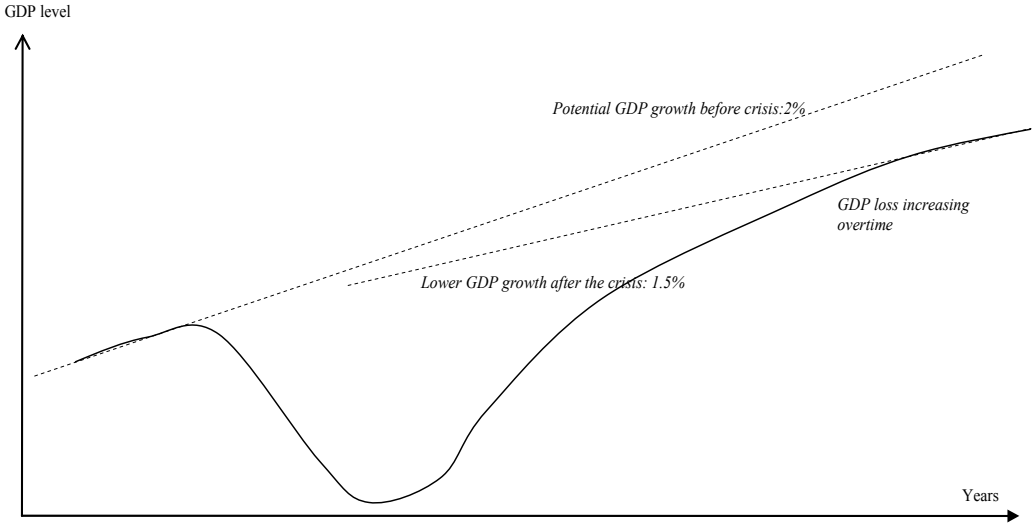
Case n°2: No change in potential growth in the long run but permanent loss in potential GDP level

Permanent loss in GDP level



Case n°3: Downward shift in potential growth in the long run

GDP loss in level increases over time compared with the pre-crisis regime



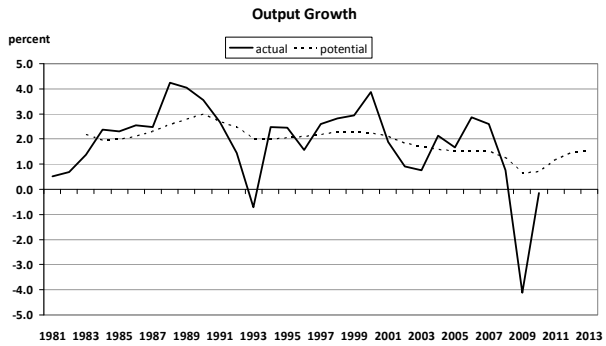
Source: The Commission services

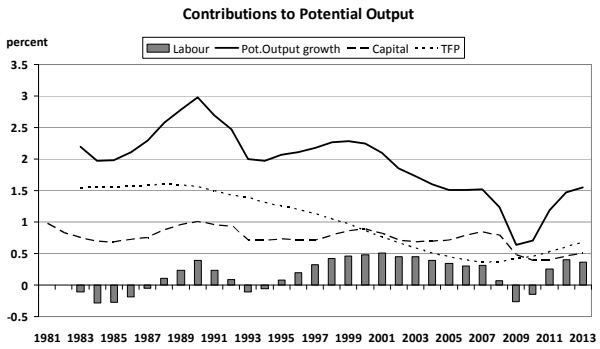
Annex 2
Detailed results of the OGWG Production Function method for EU Aggregates
Tables and Graphs

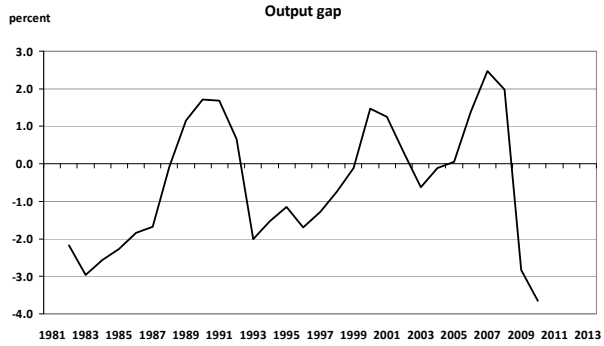
Table 1 : Eurozone (12) Output Gap and Determinants

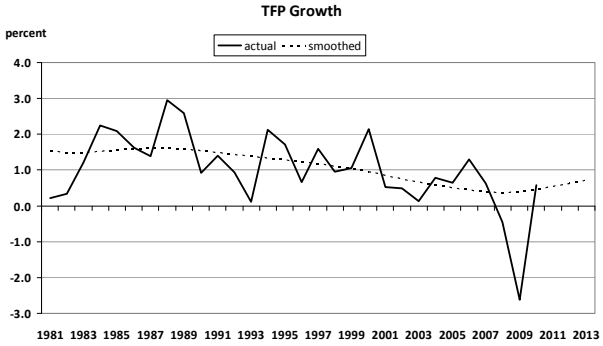
EA-12	Output Gaps (% of Potential Output)		Actual Output Growth (annual % change)	Potential Growth (annual % change)		Contributions to Potential Growth*					Determinants of Labour Potential and Capital Accumulation			
	HP Filter	PF method		HP Trend Growth	PF Potential Growth	Total Labour (Hours) Contribution	*Labour (persons) Contribution*	*Changes in Hours (per Empl) Contribution*	Capital Accumulation Contribution	TFP Contribution	Growth of Working Age Population (annual % change)	Trend Participation Rate (% of Working Age Population)	NAIRU (% of Labour Force)	Investment Ratio (% of Potential Output)
1981	0.1		0.5	2.2					1.0		1.2			
1982	-1.3	-2.2	0.7	2.1					0.8		1.2	65.9	6.8	19.3
1983	-2.1	-3.0	1.4	2.1	2.2	-0.1	*(0.4)*	*(-0.5)*	0.8	1.5	1.1	64.9	7.0	18.8
1984	-1.9	-2.6	2.4	2.2	2.0	-0.3	*(0.2)*	*(-0.5)*	0.7	1.6	0.9	64.8	7.4	18.4
1985	-1.9	-2.3	2.3	2.3	2.0	-0.3	*(0.3)*	*(-0.5)*	0.7	1.6	0.6	65.0	7.7	18.5
1986	-1.7	-1.8	2.5	2.4	2.1	-0.2	*(0.4)*	*(-0.5)*	0.7	1.6	0.4	65.4	7.9	18.9
1987	-1.7	-1.7	2.5	2.5	2.3	0.0	*(0.5)*	*(-0.5)*	0.8	1.6	0.4	66.0	8.1	19.2
1988	-0.1	-0.1	4.2	2.5	2.6	0.1	*(0.6)*	*(-0.5)*	0.9	1.6	0.5	66.4	8.2	20.3
1989	1.4	1.2	4.1	2.5	2.8	0.2	*(0.6)*	*(-0.4)*	1.0	1.6	0.6	66.8	8.3	21.1
1990	2.4	1.7	3.5	2.5	3.0	0.4	*(0.8)*	*(-0.4)*	1.0	1.6	0.8	67.2	8.4	21.6
1991	2.6	1.7	2.7	2.4	2.7	0.2	*(0.5)*	*(-0.3)*	1.0	1.5	0.6	67.7	8.5	21.5
1992	1.7	0.7	1.4	2.4	2.5	0.1	*(0.4)*	*(-0.3)*	0.9	1.4	0.5	67.4	8.6	21.0
1993	-1.3	-2.0	-0.7	2.3	2.0	-0.1	*(0.2)*	*(-0.3)*	0.7	1.4	0.4	67.2	8.8	19.3
1994	-1.1	-1.5	2.5	2.3	2.0	-0.1	*(0.2)*	*(-0.2)*	0.7	1.3	0.2	67.3	8.9	19.4
1995	-1.0	-1.2	2.5	2.3	2.1	0.1	*(0.3)*	*(-0.2)*	0.7	1.3	0.2	67.4	9.0	19.6
1996	-1.7	-1.7	1.6	2.3	2.1	0.2	*(0.4)*	*(-0.2)*	0.7	1.2	0.3	67.7	9.0	19.5
1997	-1.5	-1.3	2.6	2.3	2.2	0.3	*(0.6)*	*(-0.3)*	0.7	1.1	0.2	68.2	9.0	19.6
1998	-1.0	-0.7	2.8	2.3	2.3	0.4	*(0.7)*	*(-0.3)*	0.8	1.0	0.2	69.0	8.9	20.4
1999	-0.4	-0.1	2.9	2.3	2.3	0.5	*(0.8)*	*(-0.3)*	0.9	1.0	0.2	69.5	8.8	21.2
2000	1.2	1.5	3.9	2.2	2.2	0.5	*(0.9)*	*(-0.4)*	0.9	0.9	0.3	70.2	8.6	21.7
2001	1.0	1.3	1.9	2.1	2.1	0.5	*(0.9)*	*(-0.4)*	0.8	0.8	0.4	70.7	8.4	21.4
2002	0.0	0.3	0.9	1.9	1.8	0.5	*(0.8)*	*(-0.4)*	0.7	0.7	0.4	71.2	8.4	20.7
2003	-0.9	-0.6	0.8	1.7	1.7	0.5	*(0.8)*	*(-0.3)*	0.7	0.6	0.4	71.5	8.3	20.6
2004	-0.4	-0.1	2.1	1.5	1.6	0.4	*(0.6)*	*(-0.2)*	0.7	0.5	0.3	72.0	8.3	20.7
2005	0.0	0.0	1.7	1.3	1.5	0.3	*(0.6)*	*(-0.2)*	0.7	0.5	0.3	72.5	8.4	21.0
2006	1.9	1.4	2.9	1.0	1.5	0.3	*(0.5)*	*(-0.2)*	0.8	0.4	0.4	72.9	8.5	21.9
2007	3.9	2.5	2.6	0.7	1.5	0.3	*(0.5)*	*(-0.2)*	0.8	0.4	0.5	73.2	8.6	22.5
2008	4.3	2.0	0.8	0.3	1.2	0.1	*(0.2)*	*(-0.1)*	0.8	0.4	0.3	73.7	9.0	22.3
2009	0.0	-2.8	-4.1	0.0	0.6	-0.3	*(-0.2)*	*(-0.1)*	0.5	0.4	0.2	73.6	9.7	19.9
2010	0.2	-3.7	-0.1	-0.3	0.7	-0.2	*(-0.1)*	*(-0.0)*	0.4	0.5	0.1	73.7	10.2	19.2
2011				-0.5	1.2	0.3	*(0.2)*	*(0.0)*	0.4	0.5	0.3	74.0	10.4	19.3
2012				-0.6	1.5	0.4	*(0.3)*	*(0.1)*	0.5	0.6	0.3	74.4	10.6	19.7
2013				-0.7	1.5	0.4	*(0.3)*	*(0.1)*	0.5	0.7	0.1	74.8	10.6	20.1
Periods	**Period Averages**													
1981-1985	-1.4	-2.5	1.5	2.2	2.0	-0.2	(0.3)	(-0.5)	0.8	1.6	1.0	65.1	7.2	18.8
1986-1990	0.0	-0.1	3.4	2.5	2.5	0.1	(0.6)	(-0.5)	0.9	1.6	0.5	66.4	8.2	20.2
1991-1995	0.2	-0.5	1.7	2.3	2.2	0.0	(0.3)	(-0.3)	0.8	1.4	0.4	67.4	8.8	20.1
1996-2000	-0.7	-0.5	2.8	2.3	2.2	0.4	(0.7)	(-0.3)	0.8	1.0	0.2	68.9	8.9	20.5
2001-2005	0.0	0.2	1.5	1.7	1.8	0.4	(0.7)	(-0.3)	0.7	0.6	0.4	71.6	8.4	20.9
2006-2010	2.1	-0.1	0.4	0.3	1.1	0.1	(0.2)	(-0.1)	0.7	0.4	0.3	73.4	9.2	21.2
2011-2013				-0.6	1.4	0.3	(0.3)	(0.1)	0.5	0.6	0.2	74.4	10.6	19.7

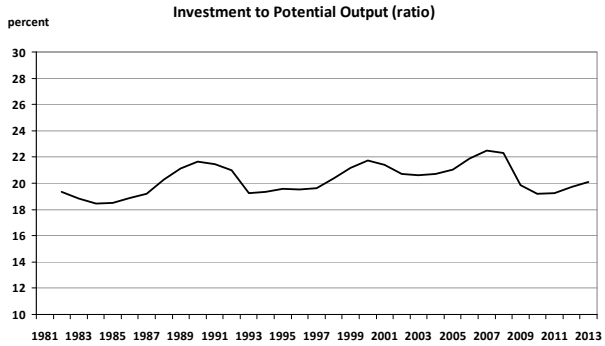
Source: Commission services

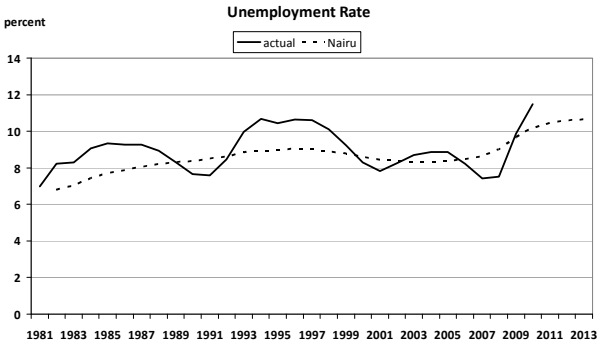


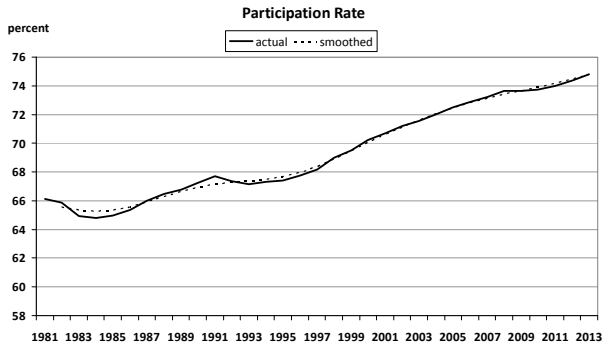


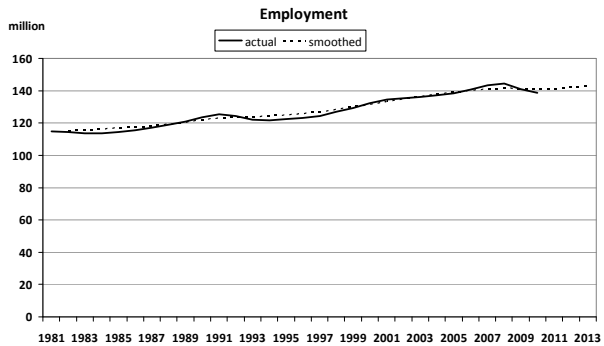


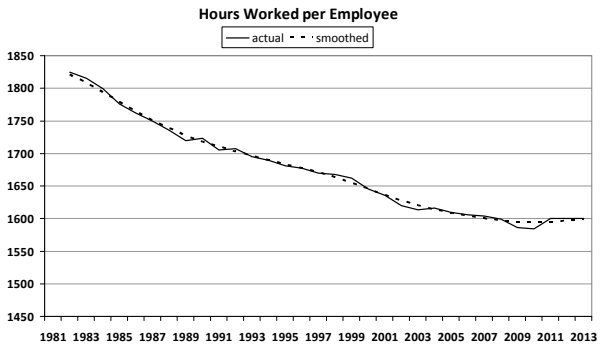










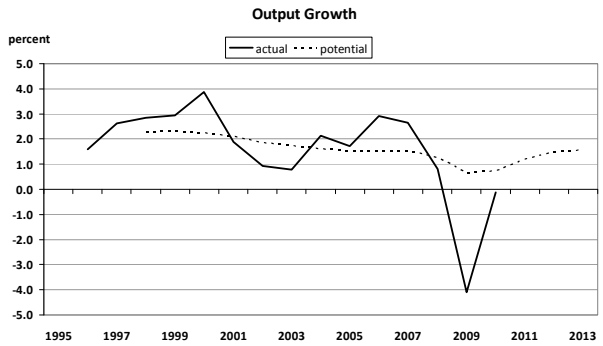


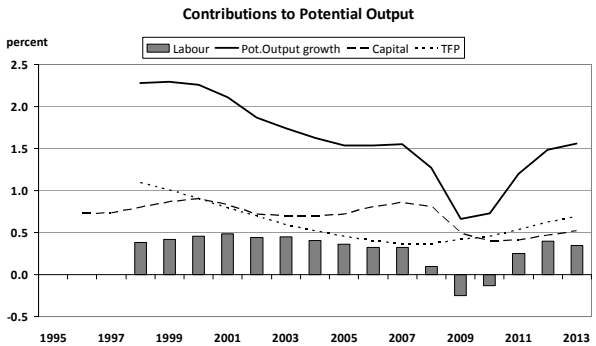
Source: Commission services

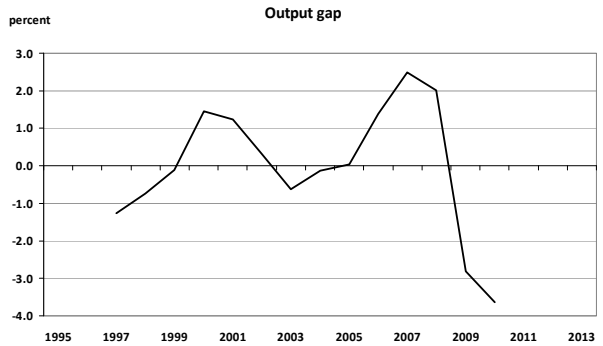
Table 2 : Euro area (16) Output Gap and Determinants

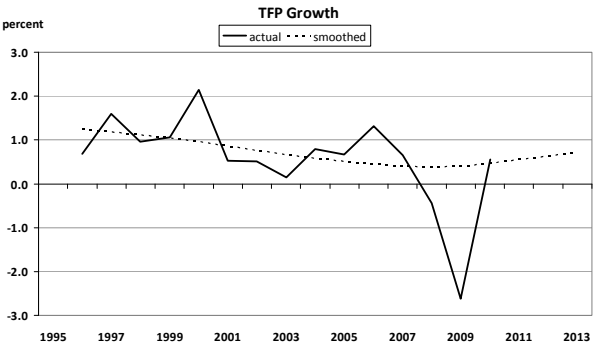
EA-16	Output Gaps (% of Potential Output)		Actual Output Growth (annual % change)	Potential Growth (annual % change)		Contributions to Potential Growth*					Determinants of Labour Potential and Capital Accumulation			
	HP Filter	PF method		HP Trend Growth	PF Potential Growth	Total Labour (Hours) Contribution	*Labour (persons) Contribution*	*Changes in Hours (per Empl) Contribution*	Capital Accumulation Contribution	TFP Contribution	Growth of Working Age Population (annual % change)	Trend Participation Rate (% of Working Age Population)	NAIRU (% of Labour Force)	Investment Ratio (% of Potential Output)
1981														
1982														
1983														
1984														
1985														
1986														
1987														
1988														
1989														
1990														
1991														
1992														
1993														
1994														
1995	-1.0											67.5		
1996	-1.7		1.6	2.3					0.7		0.3	67.8		
1997	-1.4	-1.3	2.6	2.3					0.7		0.3	68.2	9.0	19.7
1998	-1.0	-0.7	2.8	2.3	2.3	0.4	*(0.7)*	*(-0.3)*	0.8	1.1	0.2	68.9	8.9	20.4
1999	-0.4	-0.1	2.9	2.3	2.3	0.4	*(0.8)*	*(-0.3)*	0.9	1.0	0.2	69.4	8.8	21.2
2000	1.2	1.5	3.9	2.2	2.3	0.5	*(0.8)*	*(-0.4)*	0.9	0.9	0.3	70.2	8.7	21.7
2001	1.0	1.2	1.9	2.1	2.1	0.5	*(0.9)*	*(-0.4)*	0.8	0.8	0.4	70.6	8.6	21.4
2002	0.0	0.3	0.9	1.9	1.9	0.4	*(0.8)*	*(-0.4)*	0.7	0.7	0.4	71.1	8.5	20.7
2003	-0.9	-0.6	0.8	1.8	1.7	0.4	*(0.7)*	*(-0.3)*	0.7	0.6	0.4	71.4	8.5	20.6
2004	-0.4	-0.1	2.1	1.6	1.6	0.4	*(0.6)*	*(-0.2)*	0.7	0.5	0.4	71.9	8.4	20.7
2005	0.0	0.0	1.7	1.3	1.5	0.4	*(0.6)*	*(-0.2)*	0.7	0.5	0.3	72.3	8.5	21.1
2006	1.9	1.4	2.9	1.0	1.5	0.3	*(0.5)*	*(-0.2)*	0.8	0.4	0.4	72.7	8.5	21.9
2007	3.9	2.5	2.7	0.7	1.6	0.3	*(0.5)*	*(-0.1)*	0.9	0.4	0.5	73.0	8.7	22.6
2008	4.3	2.0	0.8	0.4	1.3	0.1	*(0.2)*	*(-0.1)*	0.8	0.4	0.4	73.4	9.0	22.3
2009	0.0	-2.8	-4.1	0.0	0.7	-0.3	*(-0.2)*	*(-0.1)*	0.5	0.4	0.2	73.4	9.7	19.9
2010	0.1	-3.6	-0.1	-0.2	0.7	-0.1	*(-0.1)*	*(-0.0)*	0.4	0.5	0.1	73.5	10.2	19.3
2011				-0.4	1.2	0.3	*(0.2)*	*(0.0)*	0.4	0.5	0.3	73.8	10.4	19.3
2012				-0.6	1.5	0.4	*(0.3)*	*(0.1)*	0.5	0.6	0.3	74.1	10.5	19.8
2013				-0.6	1.6	0.3	*(0.3)*	*(0.1)*	0.5	0.7	0.1	74.5	10.6	20.2
Periods	**Period Averages**													
1981-1985														
1986-1990														
1991-1995														
1996-2000	-0.6	-0.2	2.8	2.3	2.3	0.4	(0.8)	(-0.3)	0.8	1.0	0.3	68.9	8.9	20.8
2001-2005	-0.1	0.2	1.5	1.7	1.8	0.4	(0.7)	(-0.3)	0.7	0.6	0.4	71.5	8.5	20.9
2006-2010	2.1	-0.1	0.4	0.4	1.2	0.1	(0.2)	(-0.1)	0.7	0.4	0.3	73.2	9.2	21.2
2011-2013				-0.5	1.4	0.3	(0.3)	(0.1)	0.5	0.6	0.2	74.1	10.5	19.8

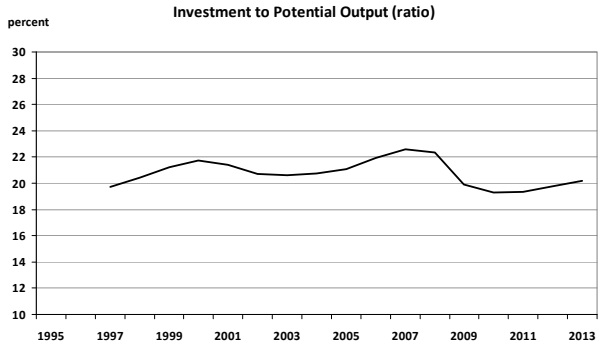
Source: Commission services

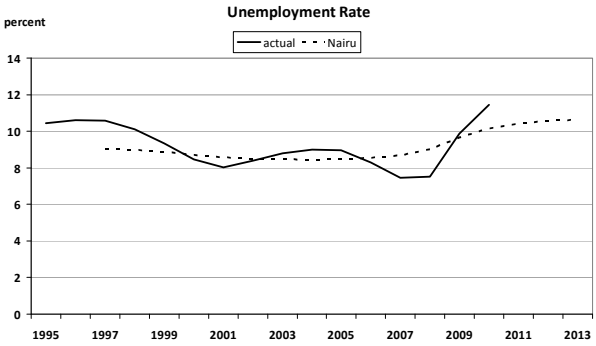


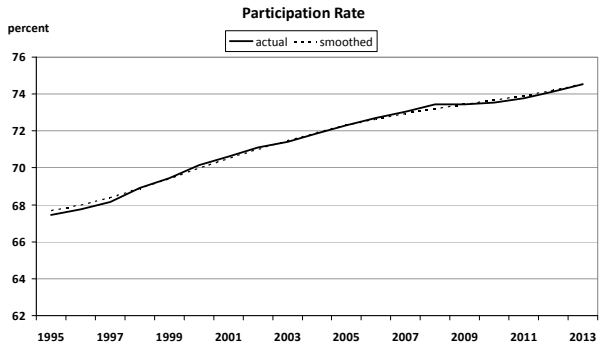


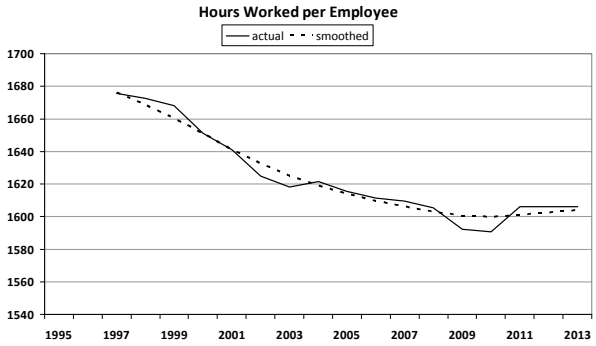










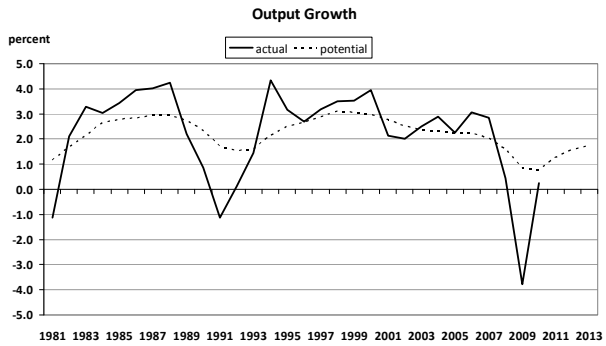


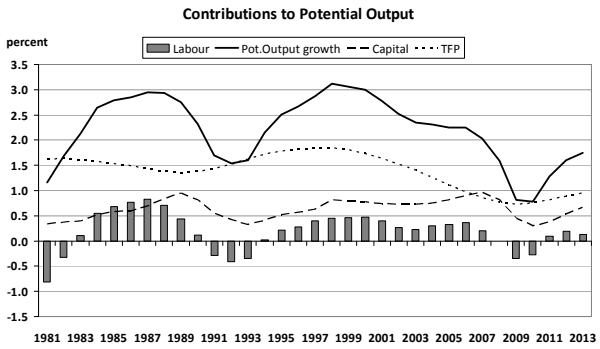
Source: Commission services

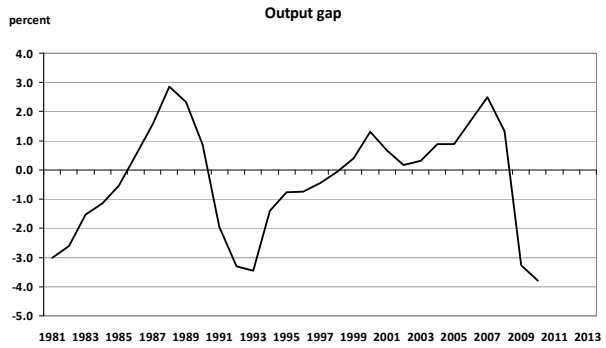
Table 3 : EU-3 (DK,SE,UK) Output Gap and Determinants

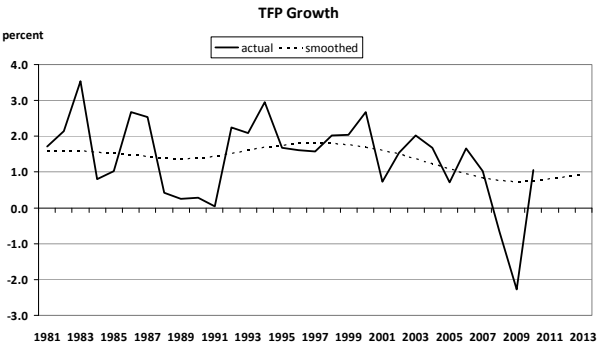
EU-3	Output Gaps (% of Potential Output)		Actual Output Growth (annual % change)	Potential Growth (annual % change)		Contributions to Potential Growth*					Determinants of Labour Potential and Capital Accumulation			
	HP Filter	PF method		HP Trend Growth	PF Potential Growth	Total Labour (Hours) Contribution	*Labour (persons) Contribution*	*Changes in Hours (per Empl) Contribution*	Capital Accumulation Contribution	TFP Contribution	Growth of Working Age Population (annual % change)	Trend Participation Rate (% of Working Age Population)	NAIRU (% of Labour Force)	Investment Ratio (% of Potential Output)
1981	-3.6	-3.0	-1.1	1.8	1.2	-0.8	*(-0.2)*	*(-0.6)*	0.3	1.6	0.5	72.3	6.8	
1982	-3.5	-2.6	2.1	2.0	1.7	-0.3	*(0.0)*	*(-0.3)*	0.4	1.6	0.6	72.6	7.3	13.5
1983	-2.4	-1.5	3.3	2.1	2.1	0.1	*(0.2)*	*(-0.1)*	0.4	1.6	0.6	72.2	7.8	13.9
1984	-1.7	-1.1	3.0	2.3	2.6	0.5	*(0.4)*	*(0.1)*	0.5	1.6	0.6	72.1	8.1	14.7
1985	-0.7	-0.5	3.4	2.4	2.8	0.7	*(0.4)*	*(0.3)*	0.6	1.5	0.3	72.3	8.4	15.1
1986	0.7	0.5	3.9	2.5	2.9	0.8	*(0.5)*	*(0.2)*	0.6	1.5	0.2	72.4	8.5	15.2
1987	2.3	1.6	4.0	2.5	2.9	0.8	*(0.7)*	*(0.2)*	0.7	1.4	0.2	72.1	8.4	16.0
1988	4.1	2.9	4.2	2.4	2.9	0.7	*(0.6)*	*(0.1)*	0.8	1.4	0.2	72.3	8.3	17.3
1989	4.0	2.3	2.2	2.3	2.7	0.4	*(0.5)*	*(-0.1)*	1.0	1.4	0.2	72.9	8.2	18.0
1990	2.7	0.9	0.9	2.2	2.3	0.1	*(0.3)*	*(-0.2)*	0.8	1.4	0.2	73.3	8.0	17.3
1991	-0.7	-1.9	-1.1	2.2	1.7	-0.3	*(-0.1)*	*(-0.2)*	0.5	1.4	0.1	74.0	8.0	15.7
1992	-2.7	-3.3	0.1	2.2	1.5	-0.4	*(-0.2)*	*(-0.2)*	0.4	1.5	0.0	74.4	7.9	15.1
1993	-3.5	-3.5	1.4	2.3	1.6	-0.4	*(-0.2)*	*(-0.1)*	0.3	1.6	0.1	74.5	7.9	14.4
1994	-1.8	-1.4	4.3	2.5	2.2	0.0	*(0.1)*	*(-0.1)*	0.4	1.7	0.2	74.9	7.7	14.9
1995	-1.3	-0.8	3.2	2.6	2.5	0.2	*(0.2)*	*(-0.0)*	0.5	1.8	0.3	75.2	7.4	15.2
1996	-1.3	-0.7	2.7	2.7	2.7	0.3	*(0.3)*	*(-0.0)*	0.6	1.8	0.3	74.9	7.2	15.6
1997	-1.0	-0.4	3.2	2.8	2.9	0.4	*(0.4)*	*(-0.1)*	0.6	1.8	0.3	74.8	6.8	16.1
1998	-0.4	-0.1	3.5	2.9	3.1	0.4	*(0.6)*	*(-0.1)*	0.8	1.8	0.4	74.2	6.3	17.5
1999	0.2	0.4	3.5	2.9	3.1	0.5	*(0.7)*	*(-0.2)*	0.8	1.8	0.5	74.0	5.9	17.6
2000	1.3	1.3	3.9	2.9	3.0	0.5	*(0.7)*	*(-0.3)*	0.8	1.7	0.6	74.9	5.5	17.7
2001	0.6	0.7	2.1	2.8	2.8	0.4	*(0.7)*	*(-0.3)*	0.7	1.6	0.6	75.6	5.2	17.5
2002	0.0	0.2	2.0	2.6	2.5	0.3	*(0.6)*	*(-0.3)*	0.7	1.5	0.6	75.6	5.0	17.5
2003	0.1	0.3	2.5	2.4	2.4	0.2	*(0.5)*	*(-0.3)*	0.7	1.4	0.6	76.5	4.9	17.3
2004	0.8	0.9	2.9	2.2	2.3	0.3	*(0.5)*	*(-0.2)*	0.8	1.3	0.7	77.8	4.9	17.7
2005	1.0	0.9	2.3	2.0	2.2	0.3	*(0.5)*	*(-0.1)*	0.8	1.1	0.8	78.4	5.1	17.9
2006	2.4	1.7	3.1	1.7	2.2	0.4	*(0.4)*	*(-0.1)*	0.9	1.0	0.9	78.4	5.4	18.7
2007	3.8	2.5	2.8	1.4	2.0	0.2	*(0.2)*	*(0.0)*	1.0	0.9	0.7	77.6	5.8	19.6
2008	3.1	1.3	0.4	1.1	1.6	0.0	*(-0.0)*	*(0.0)*	0.8	0.8	0.5	77.0	6.3	18.8
2009	-1.7	-3.3	-3.8	0.9	0.8	-0.4	*(-0.4)*	*(0.0)*	0.4	0.7	0.4	76.5	7.2	16.4
2010	-2.2	-3.8	0.2	0.8	0.8	-0.3	*(-0.3)*	*(0.1)*	0.3	0.8	0.3	76.1	7.9	15.4
2011				0.7	1.3	0.1	*(-0.0)*	*(0.1)*	0.4	0.8	0.4	76.2	8.3	15.9
2012				0.6	1.6	0.2	*(0.1)*	*(0.1)*	0.5	0.9	0.3	76.1	8.5	16.9
2013				0.6	1.7	0.1	*(0.1)*	*(0.1)*	0.7	0.9	0.1	76.2	8.6	17.9
Periods	**Period Averages**													
1981-1985	-2.4	-1.8	2.1	2.1	2.1	0.0	(0.2)	(-0.1)	0.4	1.6	0.5	72.3	7.7	14.3
1986-1990	2.8	1.6	3.1	2.4	2.8	0.6	(0.5)	(0.0)	0.8	1.4	0.2	72.6	8.3	16.8
1991-1995	-2.0	-2.2	1.6	2.4	1.9	-0.2	(-0.0)	(-0.1)	0.4	1.6	0.2	74.6	7.8	15.0
1996-2000	-0.2	0.1	3.4	2.9	2.9	0.4	(0.5)	(-0.1)	0.7	1.8	0.4	74.6	6.3	16.9
2001-2005	0.5	0.6	2.4	2.4	2.4	0.3	(0.6)	(-0.3)	0.8	1.4	0.7	76.8	5.0	17.6
2006-2010	1.1	-0.3	0.6	1.2	1.5	0.0	(-0.0)	(0.0)	0.7	0.8	0.6	77.1	6.5	17.8
2011-2013				0.6	1.5	0.1	(0.0)	(0.1)	0.5	0.9	0.3	76.1	8.5	16.9

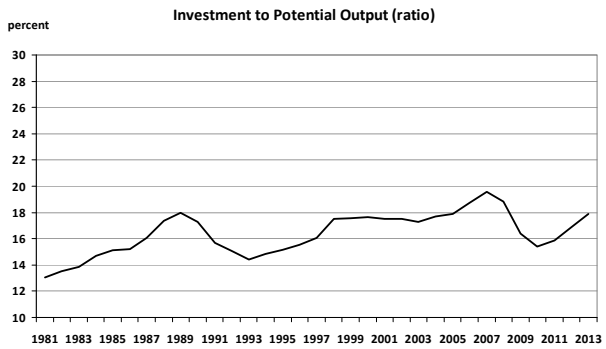
Source: Commission services

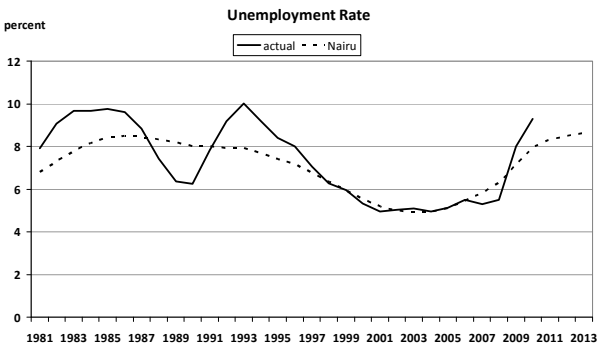


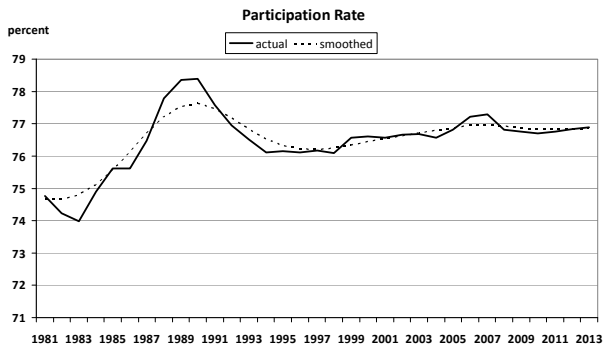


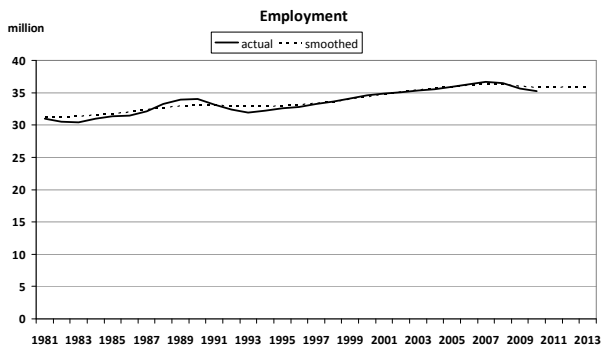










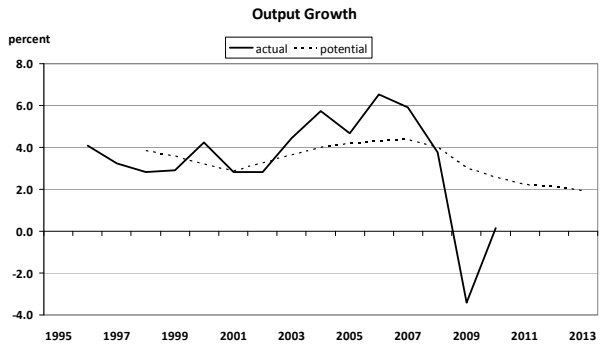


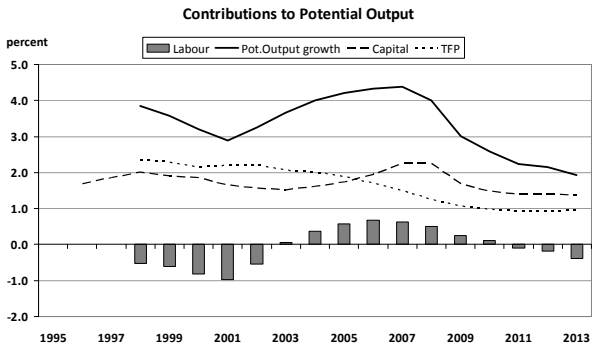
Source: Commission services

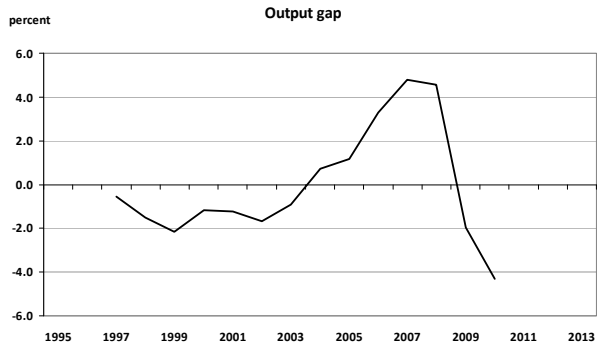
Table 4 : EU8 Output Gap and Determinants

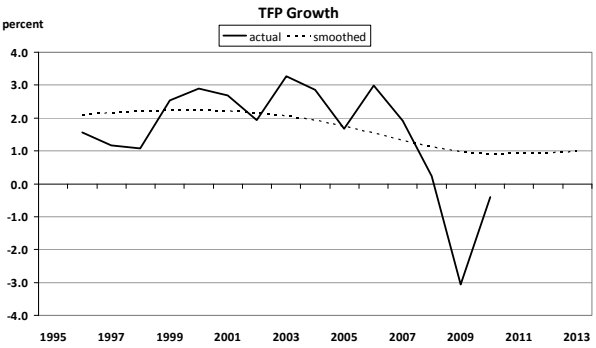
EU-8	Output Gaps (% of Potential Output)		Actual Output Growth (annual % change)	Potential Growth (annual % change)		Contributions to Potential Growth*					Determinants of Labour Potential and Capital Accumulation			
	HP Filter	PF method		HP Trend Growth	PF Potential Growth	Total Labour (Hours) Contribution	*Labour (persons) Contribution*	*Changes in Hours (per Empl) Contribution*	Capital Accumulation Contribution	TFP Contribution	Growth of Working Age Population (annual % change)	Trend Participation Rate (% of Working Age Population)	NAIRU (% of Labour Force)	Investment Ratio (% of Potential Output)
1981														
1982														
1983														
1984														
1985														
1986														
1987														
1988														
1989														
1990														
1991														
1992														
1993														
1994														
1995	0.6											69.2		
1996	1.0		4.1	3.7					1.7		0.2	68.3		
1997	0.5	-0.6	3.2	3.7					1.9		0.2	67.9	8.8	21.8
1998	-0.4	-1.5	2.8	3.7	3.8	-0.5	*(-0.5)*	*(0.0)*	2.0	2.4	0.3	67.5	9.4	23.1
1999	-1.2	-2.1	2.9	3.8	3.6	-0.6	*(-0.6)*	*(-0.1)*	1.9	2.3	0.3	66.7	10.2	22.9
2000	-0.8	-1.2	4.2	3.8	3.2	-0.8	*(-0.7)*	*(-0.1)*	1.9	2.1	0.0	67.7	11.1	23.1
2001	-1.8	-1.2	2.8	3.9	2.9	-1.0	*(-0.9)*	*(-0.1)*	1.7	2.2	-0.5	68.0	11.8	22.3
2002	-2.9	-1.7	2.8	3.9	3.3	-0.5	*(-0.5)*	*(0.0)*	1.6	2.2	-0.2	67.7	12.1	22.0
2003	-2.4	-0.9	4.4	3.9	3.7	0.1	*(0.0)*	*(0.0)*	1.5	2.1	0.3	66.7	12.0	21.9
2004	-0.6	0.7	5.7	3.9	4.0	0.4	*(0.3)*	*(0.1)*	1.6	2.0	0.3	66.7	11.6	22.6
2005	0.3	1.2	4.7	3.7	4.2	0.6	*(0.5)*	*(0.1)*	1.7	1.9	0.2	66.5	11.0	23.5
2006	3.2	3.3	6.5	3.5	4.3	0.7	*(0.6)*	*(0.1)*	1.9	1.7	0.2	66.4	10.2	25.1
2007	5.9	4.8	5.9	3.2	4.4	0.6	*(0.6)*	*(0.0)*	2.3	1.5	0.1	66.2	9.4	27.5
2008	6.8	4.5	3.8	2.8	4.0	0.5	*(0.5)*	*(-0.0)*	2.2	1.3	0.1	66.5	8.7	28.1
2009	0.7	-2.0	-3.4	2.5	3.0	0.2	*(0.3)*	*(-0.0)*	1.7	1.1	0.0	66.6	8.4	24.9
2010	-1.3	-4.3	0.1	2.2	2.6	0.1	*(0.1)*	*(-0.0)*	1.5	1.0	0.0	66.8	8.1	24.0
2011				2.0	2.2	-0.1	*(-0.1)*	*(0.0)*	1.4	0.9	-0.1	66.5	8.0	23.7
2012				1.9	2.2	-0.2	*(-0.2)*	*(0.0)*	1.4	0.9	-0.1	66.0	7.9	24.3
2013				1.8	1.9	-0.4	*(-0.4)*	*(0.0)*	1.4	0.9	-0.4	65.8	7.9	24.6
Periods	**Period Averages**													
1981-1985														
1986-1990														
1991-1995														
1996-2000	-0.2	-1.3	3.5	3.7	3.5	-0.7	(-0.6)	(-0.0)	1.9	2.3	0.2	67.6	9.9	22.7
2001-2005	-1.5	-0.4	4.1	3.9	3.6	-0.1	(-0.1)	(0.0)	1.6	2.1	0.0	67.1	11.7	22.5
2006-2010	3.1	1.3	2.6	2.8	3.7	0.4	(0.4)	(-0.0)	1.9	1.3	0.1	66.5	8.9	25.9
2011-2013				1.9	2.1	-0.2	(-0.2)	(0.0)	1.4	0.9	-0.2	66.1	7.9	24.2

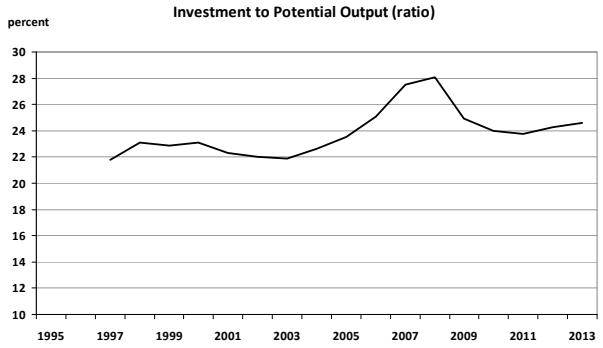
Source: Commission services

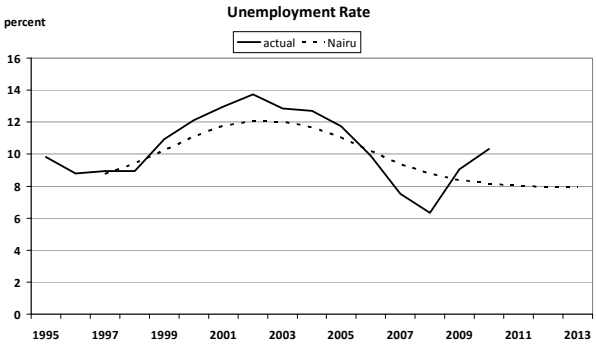


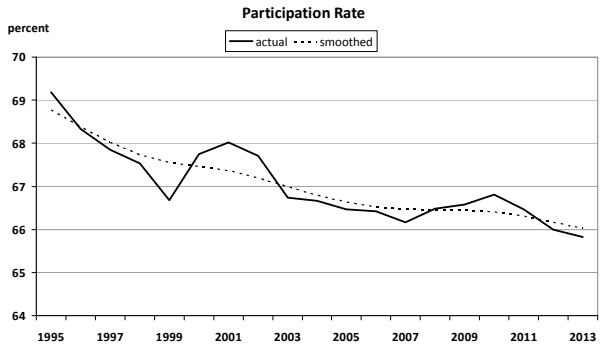


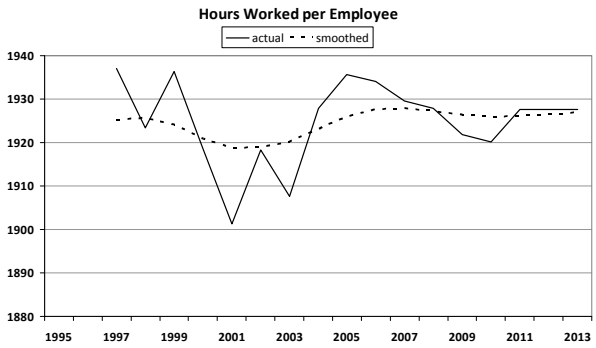












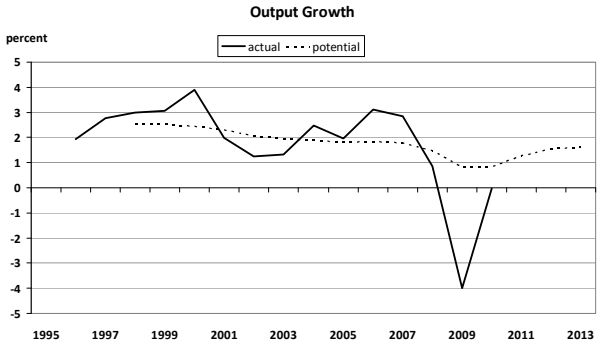
Source: Commission services

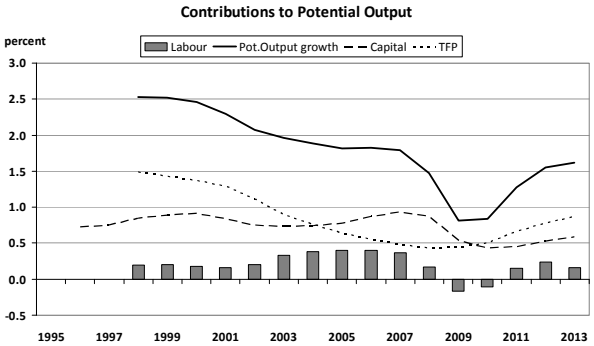
Table 5 : EU-27 Output Gap and Determinants

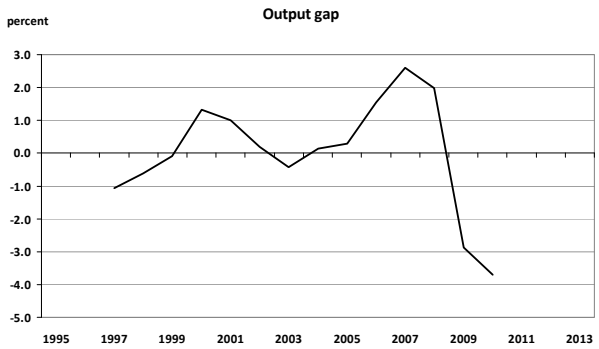
EU-27	Output Gaps (% of Potential Output)		Actual Output Growth (annual % change)	Potential Growth (annual % change)		Contributions to Potential Growth*					Determinants of Labour Potential and Capital Accumulation			
	HP Filter	PF method		HP Trend Growth	PF Potential Growth	Total Labour (Hours) Contribution	*Labour (persons) Contribution*	*Changes in Hours (per Empl) Contribution*	Capital Accumulation Contribution	TFP Contribution	Growth of Working Age Population (annual % change)	Trend Participation Rate (% of Working Age Population)	NAIRU (% of Labour Force)	Investment Ratio (% of Potential Output)
1981														
1982														
1983														
1984														
1985														
1986														
1987														
1988														
1989														
1990														
1991														
1992														
1993														
1994														
1995	-1.0											69.1		
1996	-1.5		1.9	2.5					0.7		0.3	69.1		
1997	-1.3	-1.1	2.8	2.5					0.7		0.3	69.3	8.6	19.0
1998	-0.8	-0.6	3.0	2.5	2.5	0.2	*(0.4)*	*(-0.2)*	0.8	1.5	0.3	69.7	8.6	19.9
1999	-0.3	-0.1	3.1	2.5	2.5	0.2	*(0.5)*	*(-0.3)*	0.9	1.4	0.3	69.9	8.6	20.5
2000	1.2	1.3	3.9	2.4	2.5	0.2	*(0.5)*	*(-0.3)*	0.9	1.4	0.3	70.6	8.7	20.9
2001	0.8	1.0	2.0	2.3	2.3	0.2	*(0.5)*	*(-0.3)*	0.8	1.3	0.2	71.0	8.6	20.6
2002	-0.1	0.2	1.2	2.2	2.1	0.2	*(0.5)*	*(-0.3)*	0.8	1.1	0.3	71.2	8.6	20.1
2003	-0.8	-0.4	1.3	2.0	2.0	0.3	*(0.6)*	*(-0.2)*	0.7	0.9	0.4	71.3	8.6	19.9
2004	-0.1	0.1	2.5	1.8	1.9	0.4	*(0.6)*	*(-0.2)*	0.7	0.8	0.4	71.5	8.5	20.1
2005	0.3	0.3	2.0	1.6	1.8	0.4	*(0.5)*	*(-0.1)*	0.8	0.6	0.4	71.8	8.4	20.5
2006	2.1	1.5	3.1	1.3	1.8	0.4	*(0.5)*	*(-0.1)*	0.9	0.6	0.4	72.1	8.3	21.4
2007	4.0	2.6	2.9	1.0	1.8	0.4	*(0.5)*	*(-0.1)*	0.9	0.5	0.4	72.3	8.3	22.1
2008	4.2	2.0	0.9	0.7	1.5	0.2	*(0.2)*	*(-0.1)*	0.9	0.4	0.3	72.6	8.5	21.8
2009	-0.3	-2.9	-4.0	0.4	0.8	-0.2	*(-0.1)*	*(-0.0)*	0.5	0.4	0.2	72.6	9.0	19.4
2010	-0.5	-3.7	0.0	0.1	0.8	-0.1	*(-0.1)*	*(0.0)*	0.4	0.5	0.1	72.7	9.4	18.6
2011				0.0	1.3	0.2	*(0.1)*	*(0.0)*	0.5	0.7	0.2	72.8	9.6	18.8
2012				-0.2	1.5	0.2	*(0.2)*	*(0.0)*	0.5	0.8	0.2	72.9	9.7	19.4
2013				-0.2	1.6	0.2	*(0.1)*	*(0.0)*	0.6	0.9	0.0	73.2	9.8	19.9
Periods	**Period Averages**													
1981-1985														
1986-1990														
1991-1995														
1996-2000	-0.5	-0.1	2.9	2.5	2.5	0.2	(0.5)	(-0.3)	0.8	1.4	0.3	69.7	8.6	20.1
2001-2005	0.0	0.2	1.8	2.0	2.0	0.3	(0.5)	(-0.2)	0.8	0.9	0.4	71.4	8.5	20.2
2006-2010	1.9	-0.1	0.6	0.7	1.3	0.1	(0.2)	(-0.1)	0.7	0.5	0.3	72.4	8.7	20.7
2011-2013				-0.1	1.5	0.2	(0.1)	(0.0)	0.5	0.8	0.1	73.0	9.7	19.3

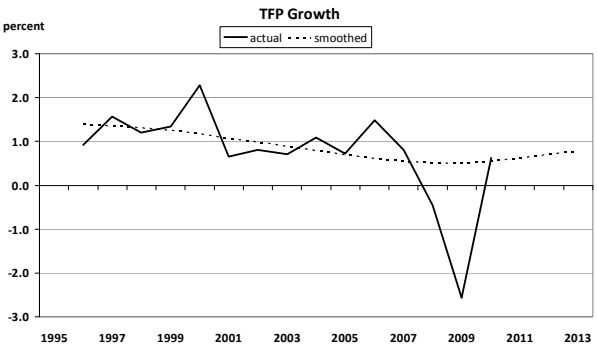
Source: Commission services

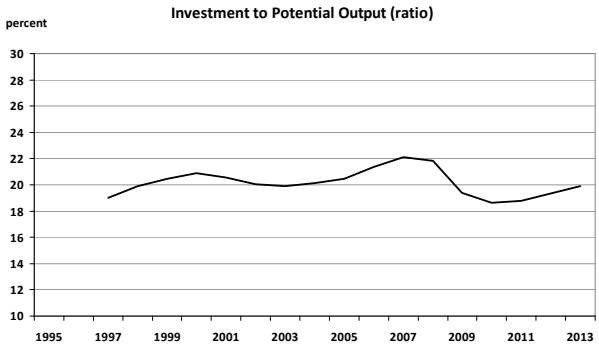
EU-27

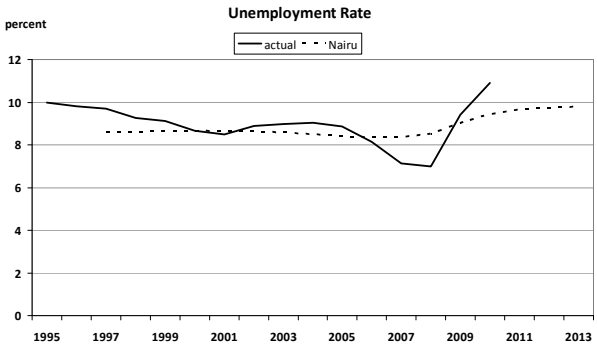


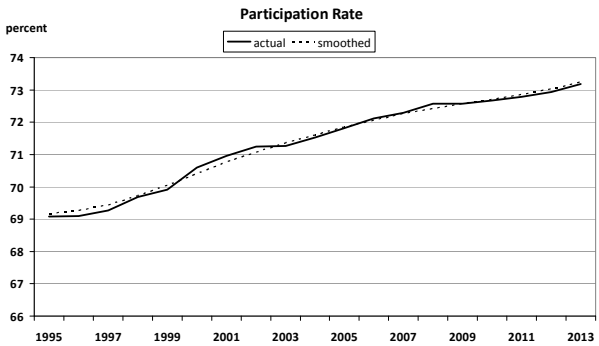


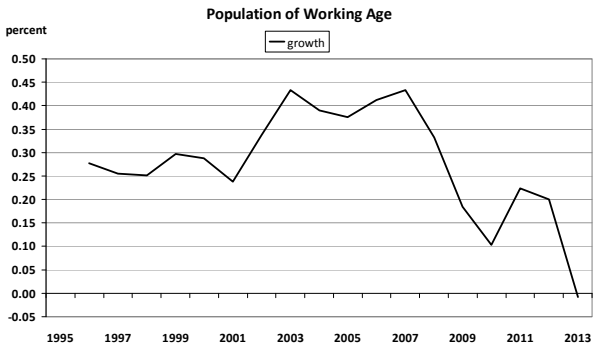


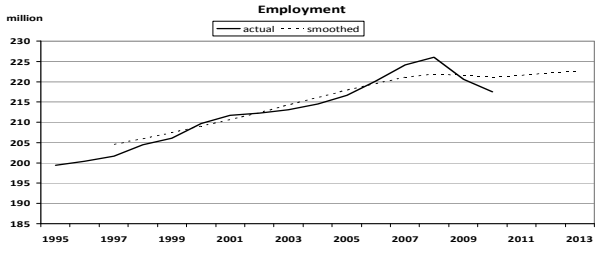












Source: Commission services

Annex 3.
Industry-based analysis of Japan's 1990's economic crisis using EU KLEMS

1. Broad Trends for "Total Industries"

- As shown in table 1, Japan's finance-driven bubble economy collapsed in the early 1990's, with GDP growth rates falling from an annual average of close to 5% in the 1980's to rates of 1 ¼% -1 ½% over the 1991-1995, 1996-2000 and 2001-2005 periods. Using the EU KLEMS growth accounting methodology, table 1 gives a decomposition of Japanese growth rates into the contributions from labour services, capital services and TFP. At the level of total industries, table 1 indicates that relative to the 1980's, there has been a substantial reduction in the contributions from all 3 sources of growth over the period to 2005, with a 3 ½% points reduction in growth rates in 2001-2005 compared with 1981-1990 due, in roughly equal parts, to reduced contributions from labour input (-1% point), capital input (-1 ¼% points : mainly non-ICT capital) and TFP (-1 ¼% points).

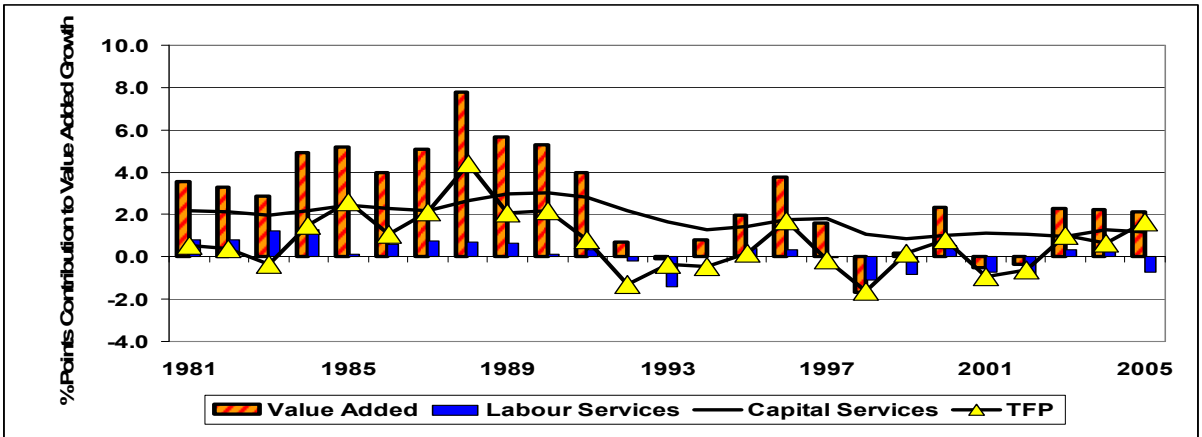
- **Late 1980's – early 1990's** : With respect to the time period of most interest in the present analysis, graph 1 compares the early 1990's with the late 1980's & shows the critical role played by TFP in determining overall GDP developments over this period. The sharp increase in the contribution of TFP in the late 1980's drove annual GDP growth rates to close to 8%, with the optimistic expectations which this generated for future income growth in turn fuelling a relatively strong investment response. The cyclical nature of the TFP upturn however became quickly apparent, with its contribution to growth falling from a positive 4 ½ % points in 1988 to a negative 1 ¼% points in 1992. Investors were however slow to react to the dramatic deterioration in efficiency rates (or perhaps to realise that such a reversal was taking place) and investment growth rates stayed at inappropriately high levels, with the contribution of capital services only starting to decelerate in 1991/1992. As we will see later, the more timely availability of an industry based breakdown of TFP & investment patterns could have helped in highlighting the cyclical nature of the productivity upturn which occurred since bubble conditions appear to frequently manifest themselves in just a small number of industries such as wholesale & retail trade; construction; & financial intermediation.

- **Sectoral Decomposition** : At the sectoral level, table 1 shows us that manufacturing experienced a dramatic deterioration in the early 1990's with value added growth rates in this sector falling by 6% points compared with the 1980's (annual average growth of 0.7% vs. 6.7%). This virtual collapse in manufacturing occurred despite the contribution from investment holding up well (i.e. a GDP contribution of around 2% points in both periods), with the contribution of labour services (a change from +0.5 to -1.4) and TFP (+3.9 to 0) both falling sharply. A similar, but much less dramatic, pattern emerged with respect to both private services (where growth rates were effectively halved) and the rest of the economy sector (which is made up of primary industries plus public services), although investment trends did not hold up quite as well as in manufacturing. In terms of timing, as with the story for total industries, for both manufacturing and private services, TFP started to decelerate sharply in both these sectors, well in advance of any downturn in investment spending, especially in non-ICT investments. This pattern was not however a feature of the "rest of the economy" sector.

Table 1 : Japan – Growth Accounting Analysis for Total Industries 1981-2005
(Gross Value Added Growth and Contributions) (Annual Average Volume Growth Rates in %)

	Growth Rate of Gross Value Added Volume	Contributions from Labour, Capital & TFP						
		1. Labour Services			2. Capital Services			3.TFP
		Total Labour Services	Breakdown		Total Capital Services	Breakdown		
			Labour Input (Employment + Hours Worked)	Composition Change		ICT Capital Services	Non-ICT Capital Services	
Total Industries								
1981 - 1990	4.8	0.7	0.2	0.5	2.4	0.5	1.9	1.7
1991 - 1995	1.5	-0.2	-0.5	0.3	1.9	0.3	1.6	-0.2
1996 - 2000	1.2	-0.2	-0.7	0.5	1.3	0.4	0.9	0.2
2001 - 2005	1.2	-0.3	-0.7	0.4	1.1	0.3	0.8	0.4
Manufacturing								
1981 - 1990	6.7	0.5	0.4	0.2	2.2	0.3	1.9	3.9
1991 - 1995	0.7	-1.4	-1.8	0.3	2.1	0.2	1.9	0.0
1996 - 2000	1.2	-0.7	-1.2	0.5	0.9	0.2	0.7	1.0
2001 - 2005	1.0	-1.1	-1.6	0.5	1.8	0.3	1.5	0.4
Private Services								
1981 - 1990	4.5	0.8	0.6	0.2	2.6	0.6	2.0	1.1
1991 - 1995	2.2	0.2	0.1	0.1	2.0	0.4	1.7	0.0
1996 - 2000	1.0	-0.2	-0.5	0.3	1.5	0.6	1.0	-0.3
2001 - 2005	1.1	-0.5	-0.7	0.2	1.0	0.4	0.6	0.5
Rest of Economy								
1981 - 1990	2.8	0.7	0.4	0.3	2.0	0.3	1.6	0.2
1991 - 1995	0.3	0.4	0.3	0.1	1.0	0.1	1.0	-1.1
1996 - 2000	2.0	0.2	0.0	0.2	1.1	0.3	0.8	0.7
2001 - 2005	1.5	0.8	0.7	0.1	0.8	0.1	0.6	0.0

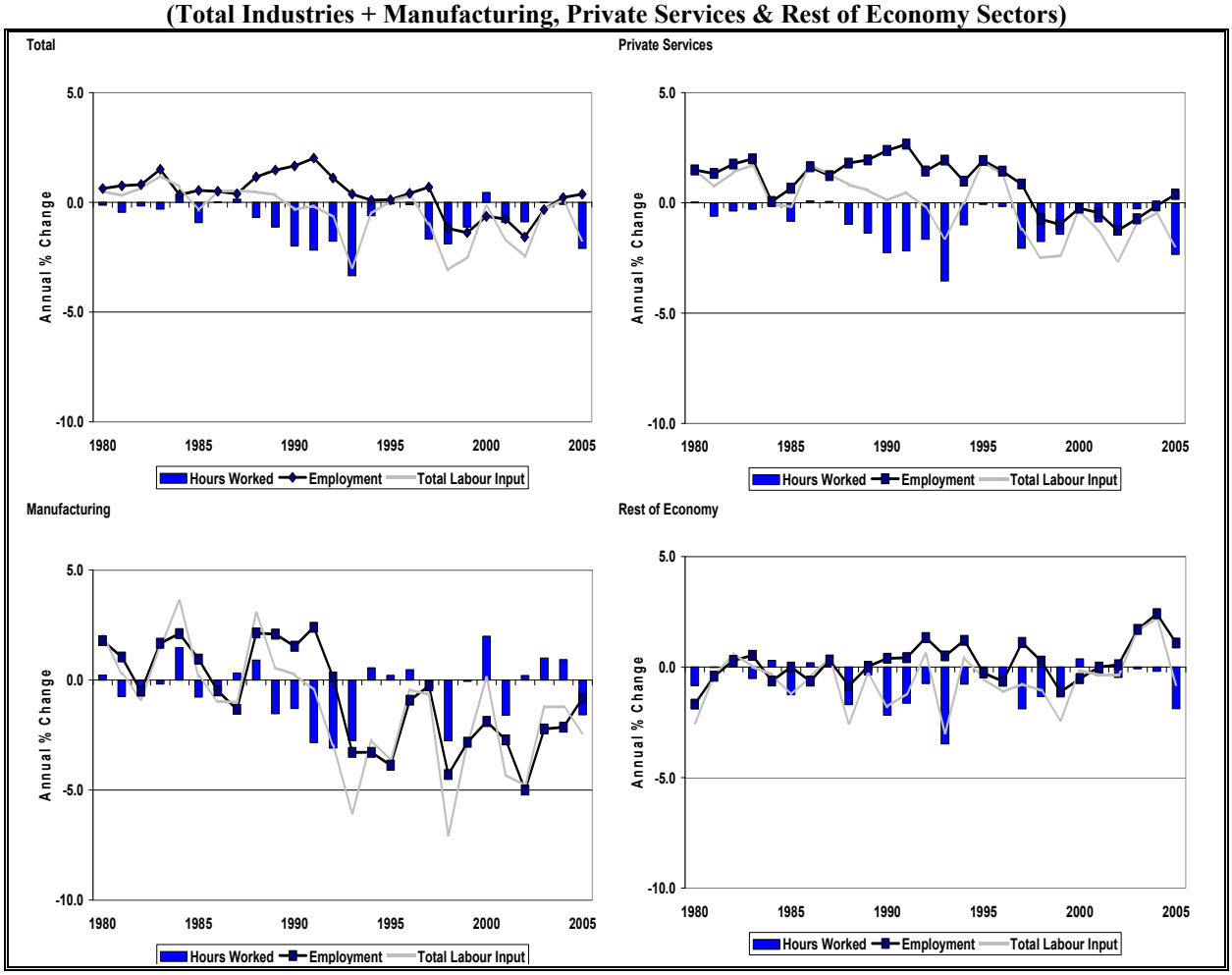
Graph 1 : % Points Contribution of Labour Services, Capital Services & TFP to Value Added Growth



- **Graph 2 : Additional breakdown of labour input developments** : As noted earlier, there was a sharp deterioration in the GDP contribution of labour services, with table 1 indicating that this deterioration was driven by labour input (employment & hours worked per employee) developments rather than by shifts in the skill composition of the labour force. Graph 2 shows the specific trends for employment and hours worked which are driving the overall labour input developments. At the level of the total economy, the labour market shakeout in Japan in the 1992/93 downturn occurred in the amount of hours worked per employee and not in numbers employed. This was also the pattern for the private services and rest of economy sectors but not in

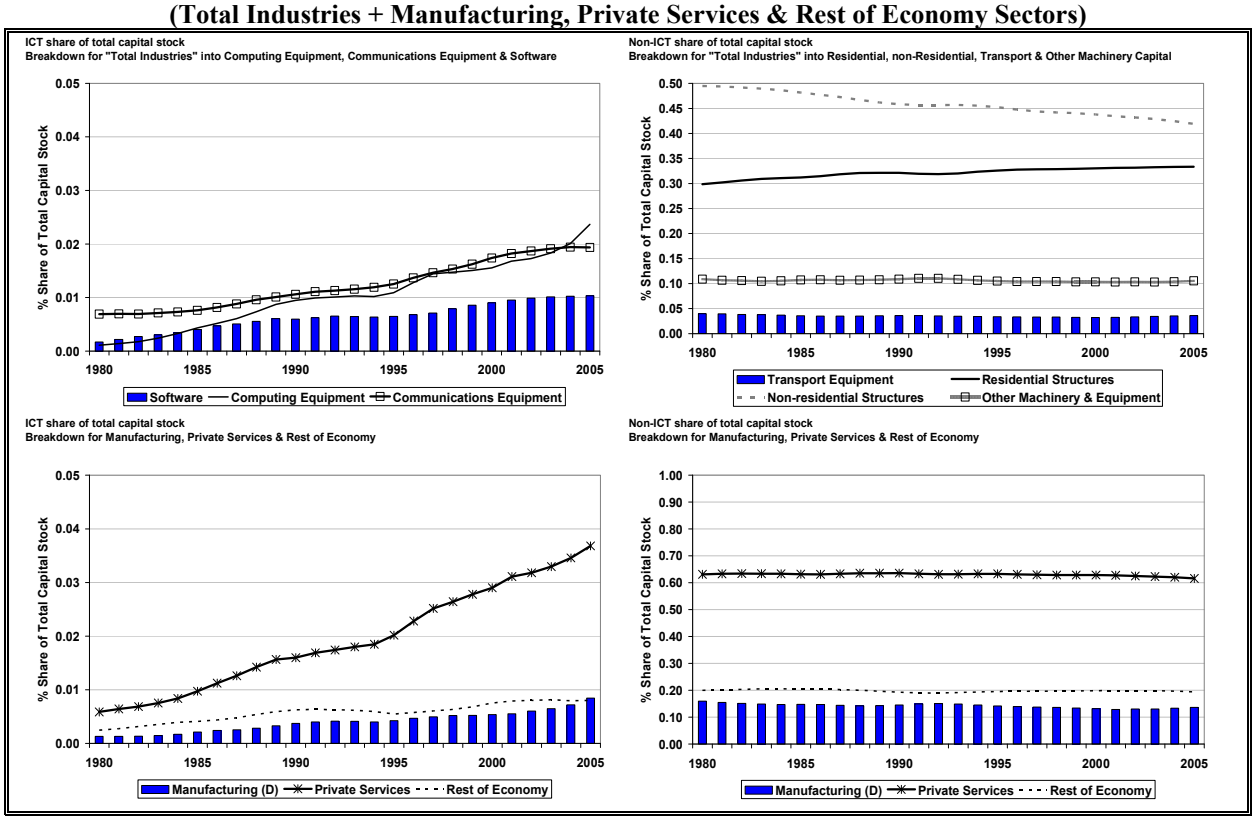
manufacturing where the scale of the output deterioration resulted in reductions in both hours worked per employee and in the number of employees.

Graph 2 : Japan – Growth rates of employment, hours worked & total labour input – 1980-2005
(Total Industries + Manufacturing, Private Services & Rest of Economy Sectors)



- **Graph 3** : **Additional breakdown of capital stock developments** : Graph 3 gives a breakdown of the ICT and non-ICT capital stocks in Japan for the total economy and for the manufacturing, private services and rest of economy sectors. With respect to ICT, one sees sharp increases (although from low levels) in the shares of software, computing & communications equipment, with this shift towards ICT investments being particularly noticeable in the private services sector. Regarding non-ICT, whilst the share of investments in non-residential structures has declined considerably since the late 1980's, there has been an offsetting upward trend for residential structures. These conflicting trends offer support for the view that the Japanese property and debt bubble was driven by the corporate, rather than by the household, sector. This is an important difference with the present US situation where the health of the corporate and household balance sheets are very much different from those in Japan in the early 1990's. For example, the present combined level of US household mortgage debt & consumer credit is close to 100% of GDP, with these levels nearly 3 times greater than those in Japan in the early 1990's. On the other hand, non-financial corporate debt levels in Japan in the late 1980's / early 1990's were around 200% of GDP compared with present levels of 90%-95% in the US.

Graph 3 : Japan – Breakdown of Capital Stock into ICT & Non-ICT Components – 1980-2005 (Total Industries + Manufacturing, Private Services & Rest of Economy Sectors)



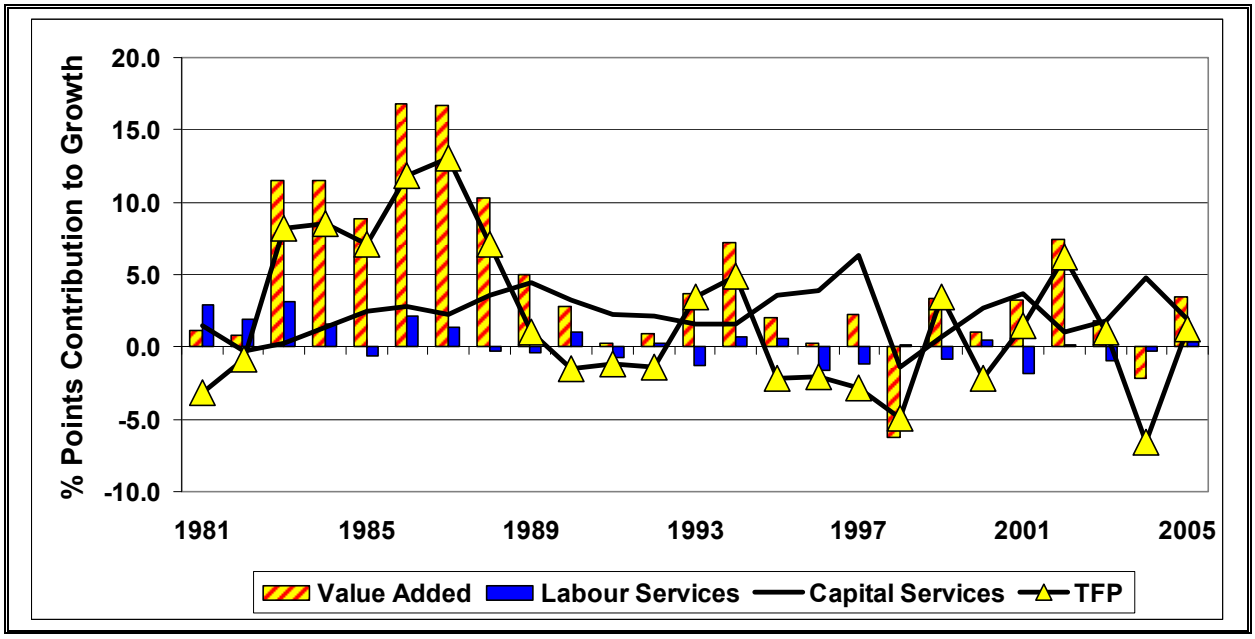
2. Broad Trends for the "Financial Services" Industry

- The large surge in the output of the Japanese financial services industry in the 1980's was essentially a TFP phenomenon (table 2 & graph 4). For example, around 75% of the 16 ½% to 17% annual average output growth rates in the mid-1980's came from TFP, with the absence of any large technological shock pointing to a large cyclical element in the upturn. The downturn phase for the industry was in turn also driven by negative TFP trends. Over the period as a whole, investment trends in the industry have been very stable, with annual average contributions to growth of the order of 2 ¼ to 2 ½ % points. With the exception of a few strongly positive years in the 1980's, labour input trends have generally been negative, although the shrinkage in the quantity of labour employed was partly offset by quality improvements, as more and more high skilled workers were attracted to the industry.

Table 2 : Growth Accounting Analysis for the Financial Services Industry (Gross Value Added Growth and Contributions) (Annual Average Volume Growth Rates in %)

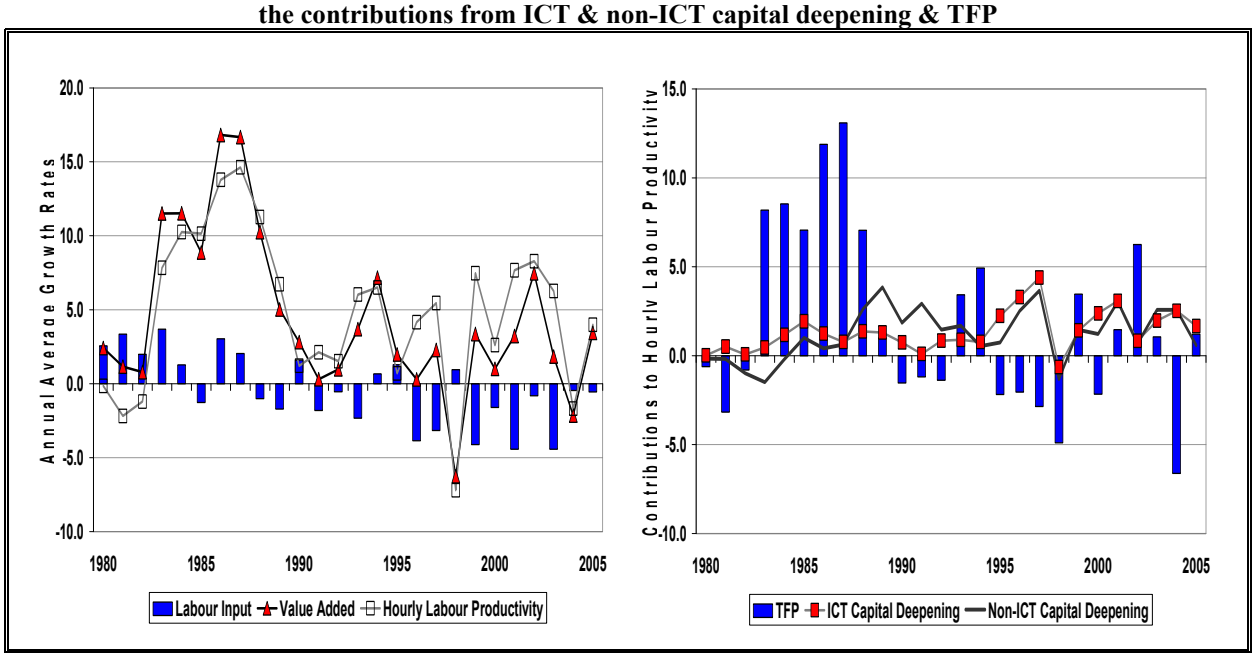
		Contributions from Labour, Capital & TFP						
		1. Labour Services			2. Capital Services			3.TFP
	Growth Rate of Gross Value Added Volume	Total Labour Services	Breakdown		Total Capital Services	Breakdown		
			Labour Input (Employment + Hours Worked)	Composition Change		ICT Capital Services	Non-ICT Capital Services	
Period Averages								
1981 - 1990	8.5	1.3	0.8	0.4	2.2	1.0	1.1	5.1
1991 - 1995	2.8	-0.1	-0.3	0.2	2.2	0.9	1.3	0.7
1996 - 2000	0.1	-0.6	-1.2	0.5	2.5	1.9	0.6	-1.7
2001 - 2005	2.8	-0.5	-0.9	0.4	2.6	1.7	1.0	0.7

Graph 4 : Financial Services Industry : % Points Contribution of Labour Services, Capital Services & TFP to Value Added Growth



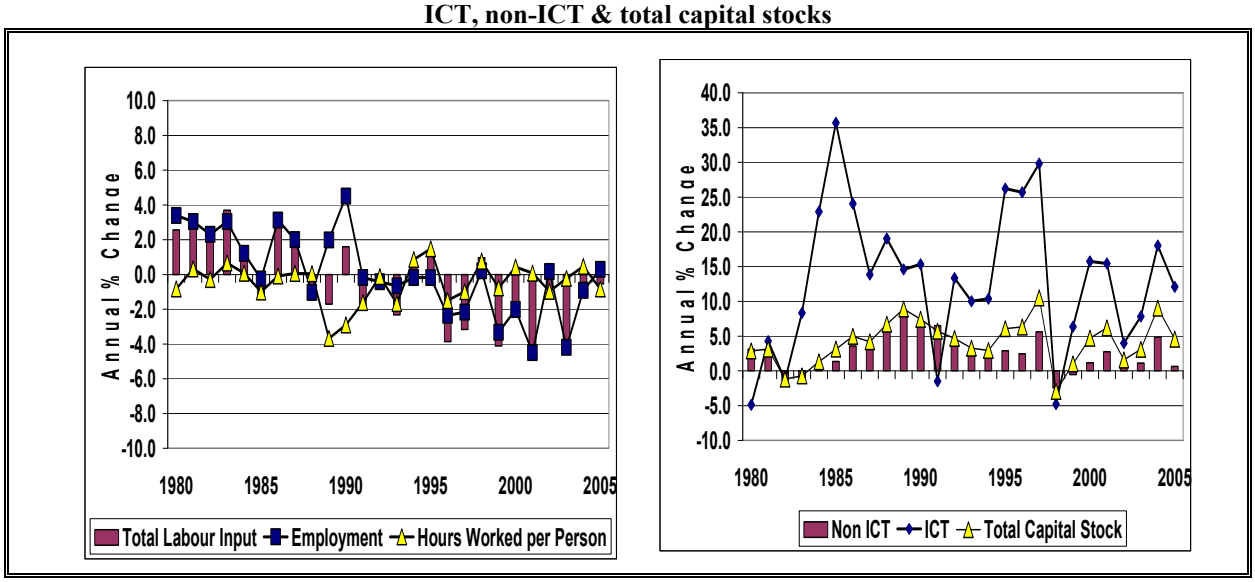
- Graph 5 confirms that value added was not driven by labour input trends but by labour productivity, with the latter in turn driven by TFP rather than by ICT or non-ICT capital deepening.

Graph 5 : Growth Rates of Value Added, Labour Input & Productivity + Breakdown of Productivity into the contributions from ICT & non-ICT capital deepening & TFP



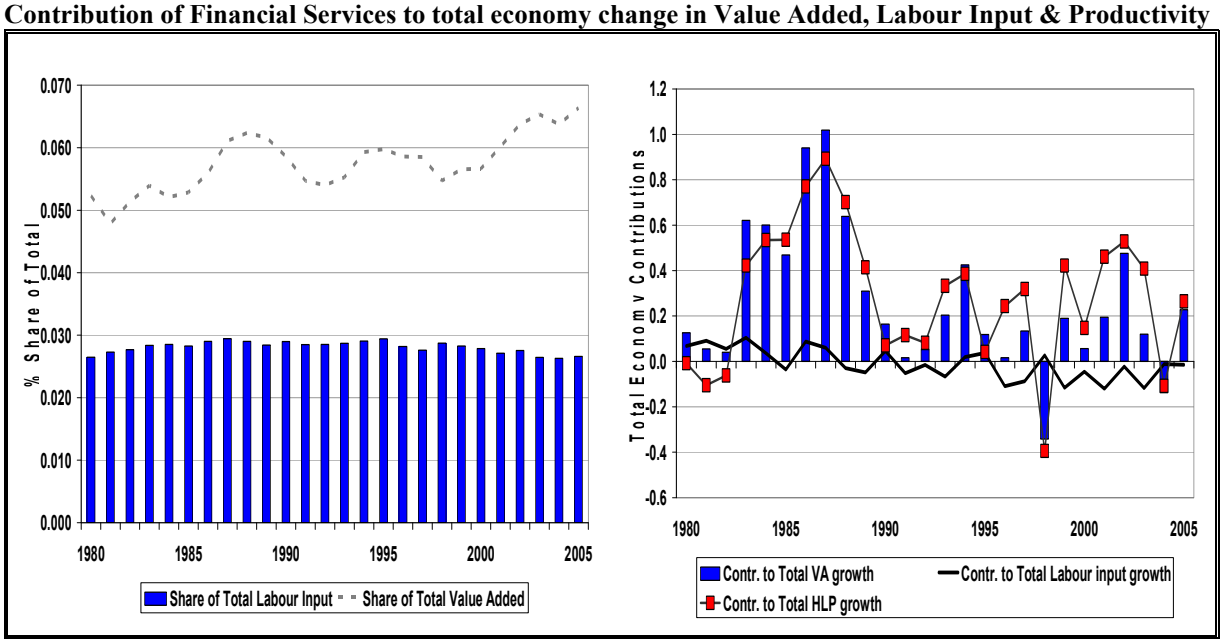
- As with the economy as a whole, graph 6 shows that the initial labour related downturn in the financial services industry was driven by a reduction in the number of hours worked per employee rather than in job cuts. The second part of the graph also shows that whilst overall investment patterns in the industry were dictated by non-ICT investments, the Japanese financial services industry was investing heavily in ICT capital, with growth rates reaching 25%-35% in specific years.

Graph 6 : Growth Rates of Employment, Hours Worked per Worker & Labour Input + Growth Rates of ICT, non-ICT & total capital stocks



- Graph 7 shows that despite the financial market bubble created in Japan in the 1980's, this industry did not undergo any scaling down in the 1990's, with its share of value added actually rising and its share of total labour input staying broadly stable. The extent of the bubble in the financial services industry is shown in graph 7b, with this industry moving from a long term, annual average, contribution to total economy value added growth of roughly 0.2% points to 5 times that level in the late 1980's.

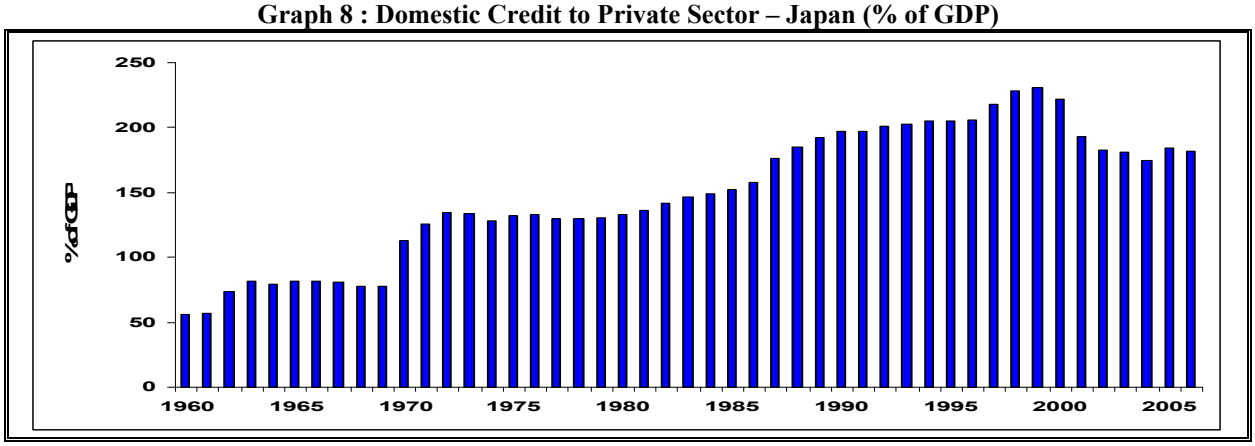
Graph 7 : Financial services industry share of total economy Value Added & Labour Input + Contribution of Financial Services to total economy change in Value Added, Labour Input & Productivity



- The final graph in this section shows that there has been a steady increase in the GDP share of private sector lending in Japan and, quite worryingly, that this share continued to grow throughout the 1990's, with a downward movement only evident since around the year 2000. This graph shows that, unlike the present situation in the US, the flow of credit was not an issue in the aftermath of the Japanese housing and financial market bubbles. This absence of "credit crunch" problems in a post-bubble environment is quite unusual from an international perspective and reflects the high

savings ratio in Japan and the fact that the late 1980's construction & finance related bubbles appeared to be largely confined to the corporate, rather than the household, sector.

Graph 8 : Domestic Credit to Private Sector – Japan (% of GDP)

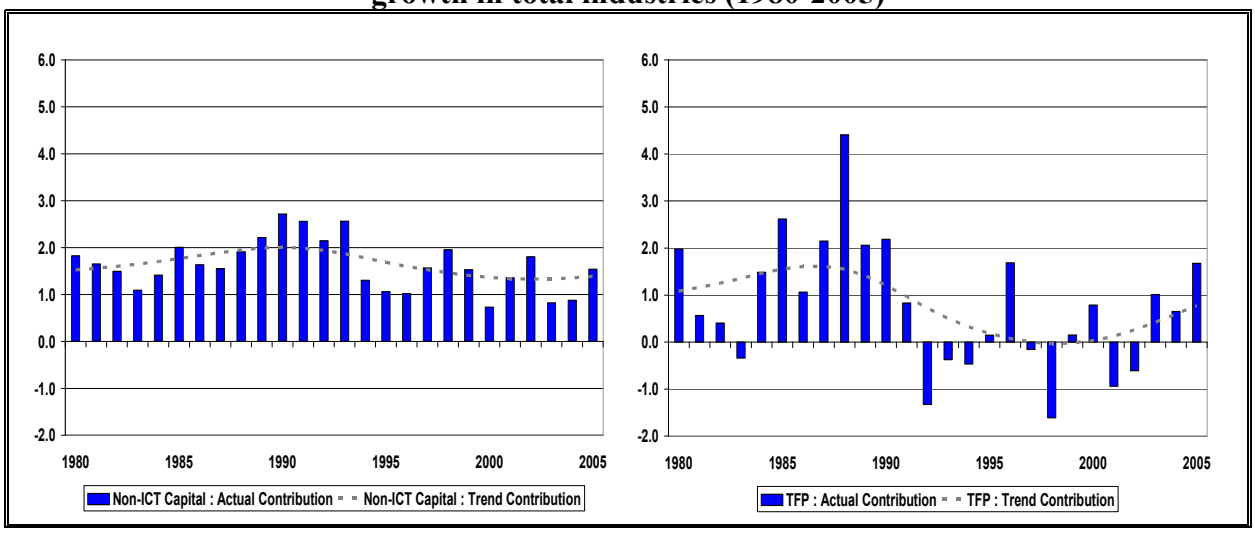


3. EU KLEMS shows that there were clear warning signs of "bubble" conditions in Japan before the 1990's downturn

- If one focusses on the late 1980's / early 1990's, EU KLEMS can be used to show the unsustainable nature of the consumption and investment bubbles which emerged in Japan.

- We learned earlier that the bubble conditions were not generated by gains in employment nor in hours worked – the labour supply picture remained broadly similar to that of the early to mid-1980's. Graph 9 shows that, at the level of total industries, the bubble conditions manifested themselves in non-ICT investment and TFP trends which were significantly out of line with previous patterns. The graph shows that
    - non-ICT investments were contributing substantially more to value added growth over the period 1988-1991 compared with the early to mid-1980's.
    - TFP spiked in the late 1980's at rates which were more than twice their long term average and subsequently collapsed in an equally dramatic fashion.

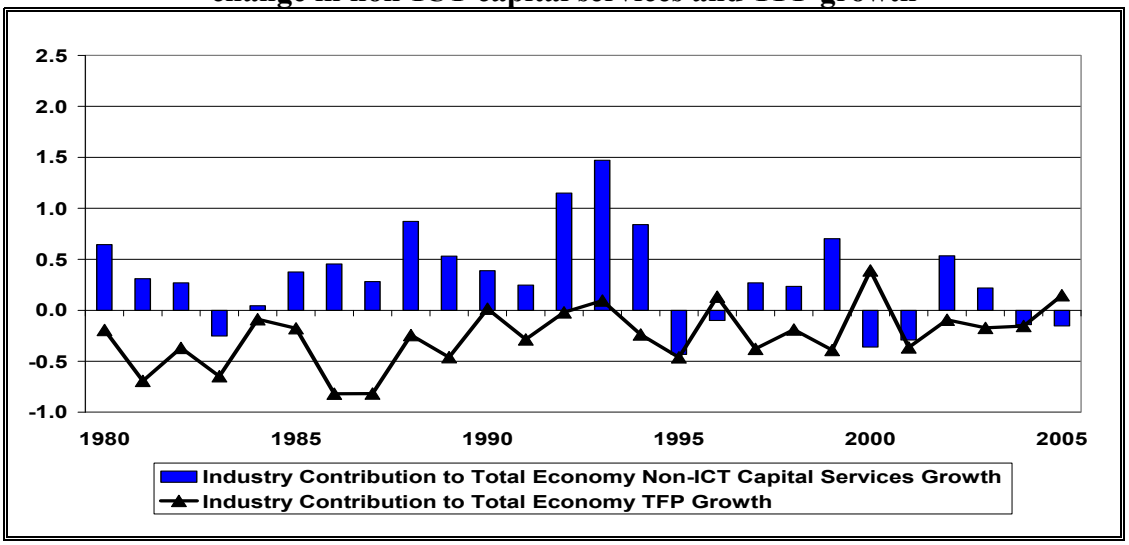
Graph 9 : Japan : Contribution of non-ICT capital services and TFP to value added growth in total industries (1980-2005)



- These "total industries" trends can in turn be analysed at the A31 industry level. This analysis shows that the "total industries" trends for non-ICT investment and TFP in the late 1980's / early 1990's were largely driven by just a small number of industries.

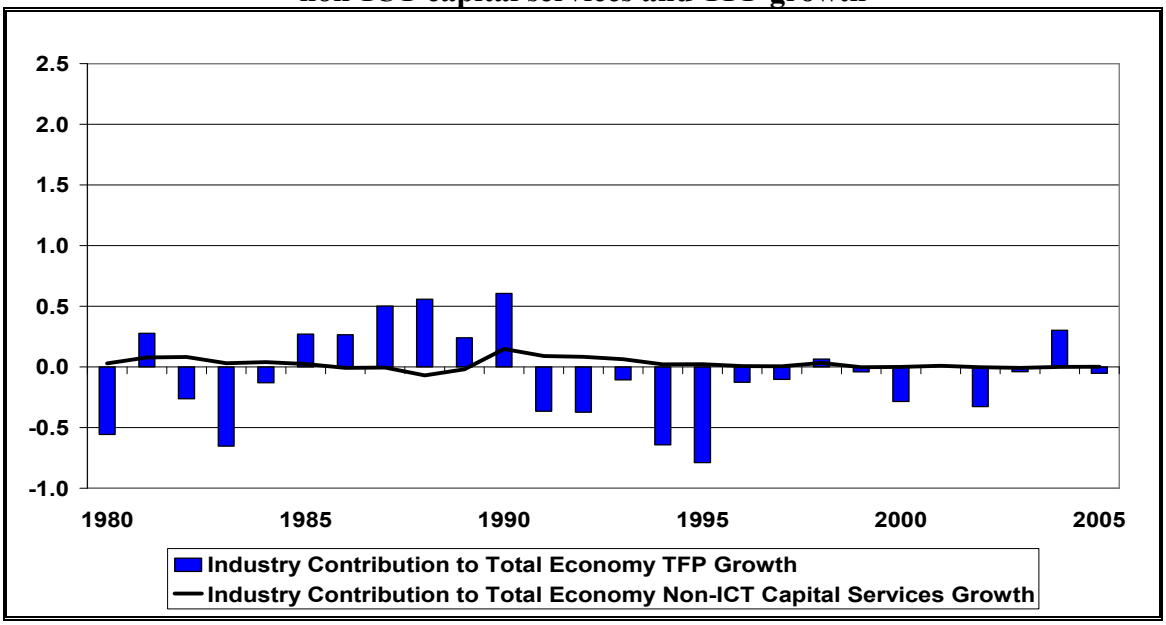
- In the case of non-ICT investments, the food & beverages; chemicals; electrical & optical; electricity, gas and water; and especially real estate & renting industries (see graph 10) dictated the total economy trends in non-ICT investment.

Graph 10 : Contribution of the Real Estate & Renting industry to the total economy change in non-ICT capital services and TFP growth

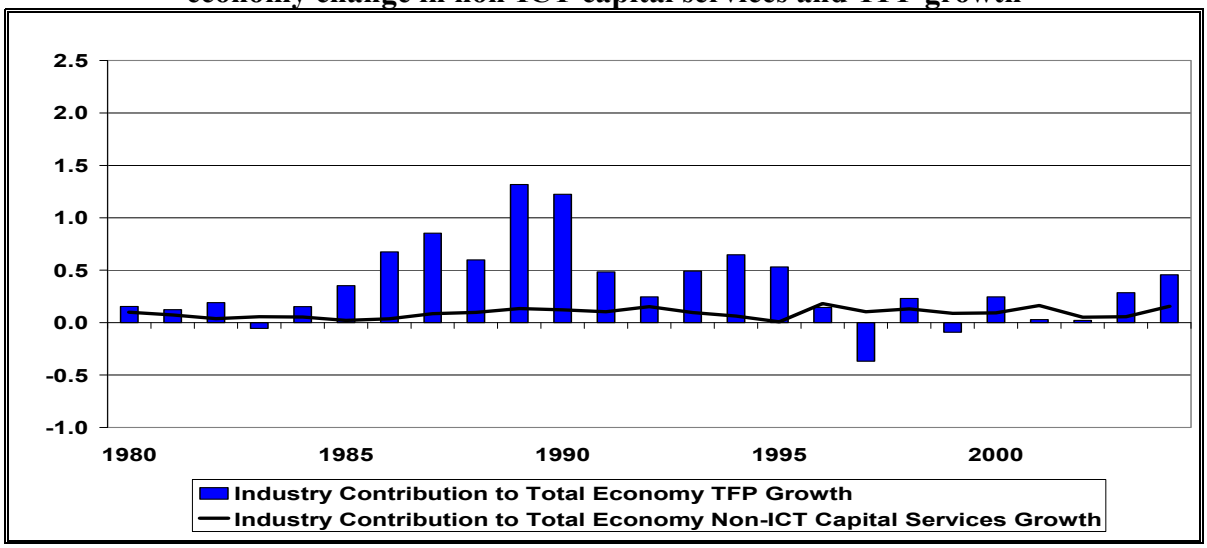


- The industry focus was even more limited with respect to economy-wide TFP trends, with the contributions from just two industries, namely construction and wholesale and retail trade, driving economy-wide TFP patterns at that time (see graphs 11-12).

Graph 11 : Contribution of the Construction industry to the total economy change in non-ICT capital services and TFP growth

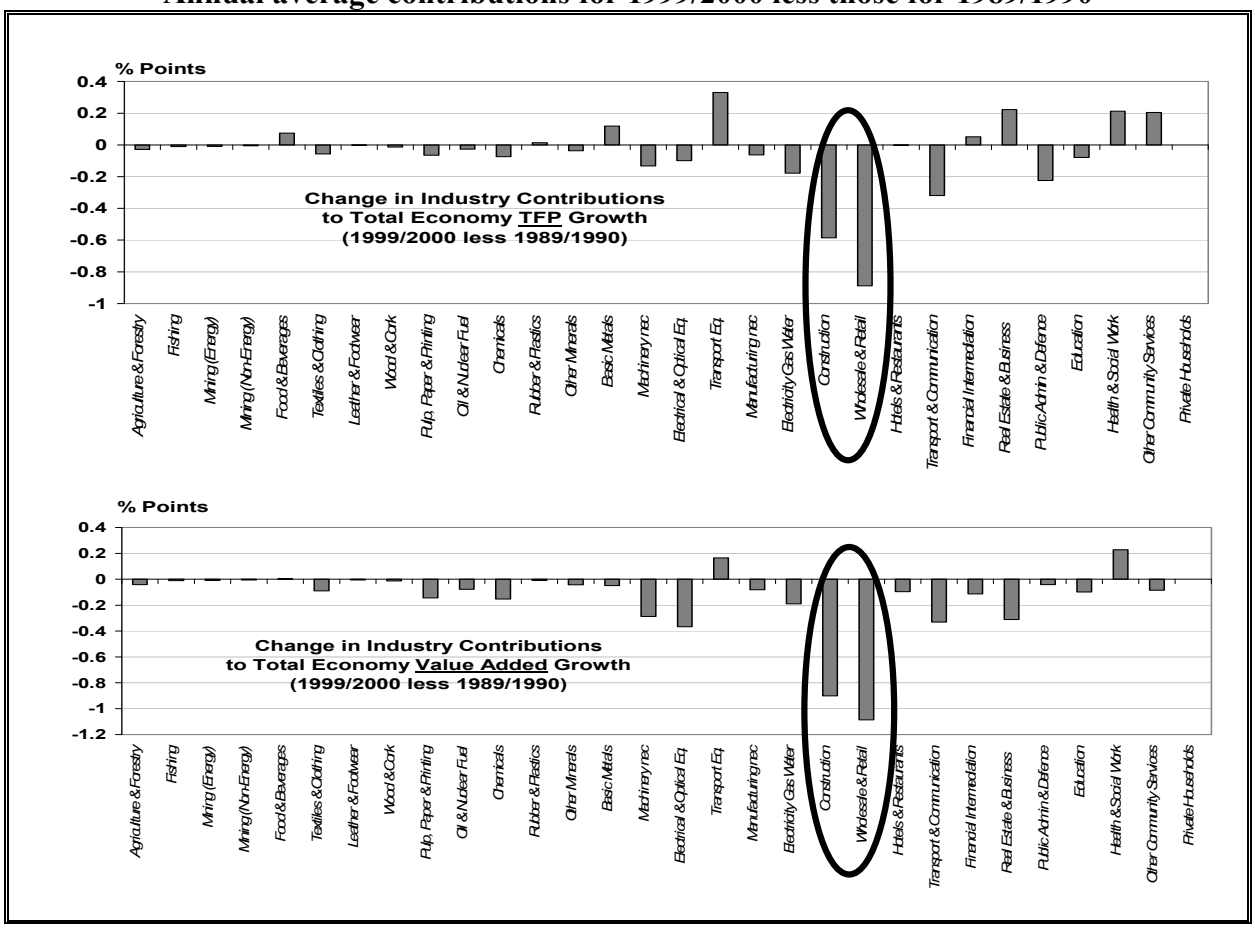


Graph 12 : Contribution of the Wholesale & Retail Trade industry to the total economy change in non-ICT capital services and TFP growth



- With respect to the key GDP drivers over the bubble period, graph 13 shows that it was the TFP trends in the construction and wholesale & retail trade industries (rather than changes in non-ICT investment patterns) which drove the GDP bubble in Japan in the late 1980's (the graph substracts the industry contributions to value added growth and to TFP growth in 1989/1990 from that in 1999/2000).

Graph 13 : Industry contributions to total economy TFP & Value Added growth : Annual average contributions for 1999/2000 less those for 1989/1990



- These TFP developments in the construction and wholesale & retail trade industries in the late 1980's / early 1990's (with both industries accounting for 20% of Japanese output) are significant since the consumption bubble which emerged in Japan over this period was mainly located in these two industries. Given that neither industry had experienced a clear technological shock over the period in question should have alerted policy makers to a potentially large cyclical component to the TFP gains being registered.

- With respect to the wholesale & retail trade industry, the increases in Japanese demand did not translate into higher levels of investment in this industry but into a higher growth rate of TFP. Whilst interpreting the sources of changes in TFP trends warrants a high degree of caution, it would appear that the upward shift in TFP in this specific industry was not driven by any quantifiable static or dynamic efficiency gains but can be more easily explained by cyclical drivers such as a higher rate of capacity utilisation. These cyclical gains had economy-wide implications since output in the wholesale and retail trade industry was expanding at annual average rates in excess of 10% over both years which was more than double its average rate for the 1980's as a whole. This one industry in fact contributed around 25% of all the GDP growth in Japan in 1989/1990, which is double what one would have expected given its value added share of only 12% -13%.

- This same TFP story is also evident in the construction industry where rates of value added growth were running at three times "normal" levels in the late 1990's. Whilst graph 11 shows that a small part of this upsurge in construction activity was reflected in higher levels of non-ICT investments, the overwhelming bulk of the upsurge was in TFP. Given the inherent nature of the construction industry, such a surge in TFP should have worried policy makers greatly (although the 1-2 year time lag in the availability of such a breakdown would have delayed any such analysis). This industry, with an annual average growth rate in excess of 7% over the period 1989-1990, and with a share of around 8% of value added, contributed 10-15% of total value added growth in Japan over these years.

4. How does Japan look now after the crisis – to what extent does the present structure of the economy reflect fundamental constraints with respect to both labour and capital inputs rather than to any inherent policy errors ?

Whilst Japan's ongoing problems in extricating itself from its financial excesses are often blamed on inappropriate fiscal and monetary policies, the present section uses EU KLEMS to see if other more fundamental, supply-side, factors are playing a role. For this exercise we use a more detailed, A60 industry-level, breakdown compared with the A31 industry breakdown used earlier. If one looks at graph 14 which shows the change in the value added shares in 1999/2000 versus those in 1989/1990 for the A60 level industries, one is struck by the following features :

- Compared with other countries and given the size of the financial shock, the absence of any real structural change in the Japanese economy over the 10 year period is a little surprising.

- One would also have expected to see a sizeable shrinkage of the construction / real estate; wholesale & retail trade; and financial services industries in overall economic activity following the earlier excesses. However, all of these industries either maintained or increased their shares of total value added over the period in question.

- In addition, whilst most countries have been experiencing a gradual secular shift out of manufacturing into private services over recent decades, this pattern is usually accompanied by some internal shifts within manufacturing, with some industries gaining and others losing. In the case of Japan, the degree of decline which occurred in manufacturing is a little unusual, as is the fact that virtually all industries within the sector (including those in the generally more high-technology segments of the sector, such as ICT production) shrunk over the period as a share of value added.

- This combination of a failure to ensure the shrinkage of those industries which had become bloated in the "bubble" years combined with an absence of new growth drivers emerging in internationally tradable goods & services industries points to a wider failure in Japan to introduce reform measures aimed at a more fundamental restructuring of the economy.

- This failure to restructure can be partly explained firstly by the fact that Japan was already a high-technology, capital intensive, economy and secondly by a lack of eagerness for fundamental reform due to its rapidly ageing labour force. High, existing, investment to GDP ratios, allied to labour input constraints due to shifts in the population structure, undoubtedly explain part of the policy inertia.

- However, despite these latter constraints with respect to capital and labour inputs, the evidence with respect to productivity levels shown in table 3 suggests that the Japanese authorities missed an important opportunity to make the structural reforms needed to put the economy on a higher longer term growth path. This table gives an overview of the efficiency levels of Japanese industries compared with those in the US and the Euro area, based on EU KLEMS calculated productivity and factor input levels data. It shows, relative to the US and also the Euro Area, that gross value added per hour worked in Japan in 2005 was substantially lower than that pertaining elsewhere, with market economy industries in Japan having efficiency levels which on average were only 50% of those in the US, and which were 20% points less than those in the Euro area.

- Table 3 also shows that these inefficiencies do not reflect difficulties with respect to the level of most factor inputs (labour input per hour worked is at US levels and non-ICT capital inputs are 50% higher than in the US), but reflect a high degree of inefficiency in the allocation of these scarce factors of production, with TFP levels in Japan being less than half those of the US in the market economy.

- With the exception of the ICT industry, where the gap is somewhat smaller, a large number of Japanese goods and services industries would appear, on the basis of these EU KLEMS figures at least, to have the potential to gain substantially from structural reforms.

Graph 14 : Structural change in Japan over the 1990's : Industry shares in total value added in 1999/2000 compared with 1989/1990

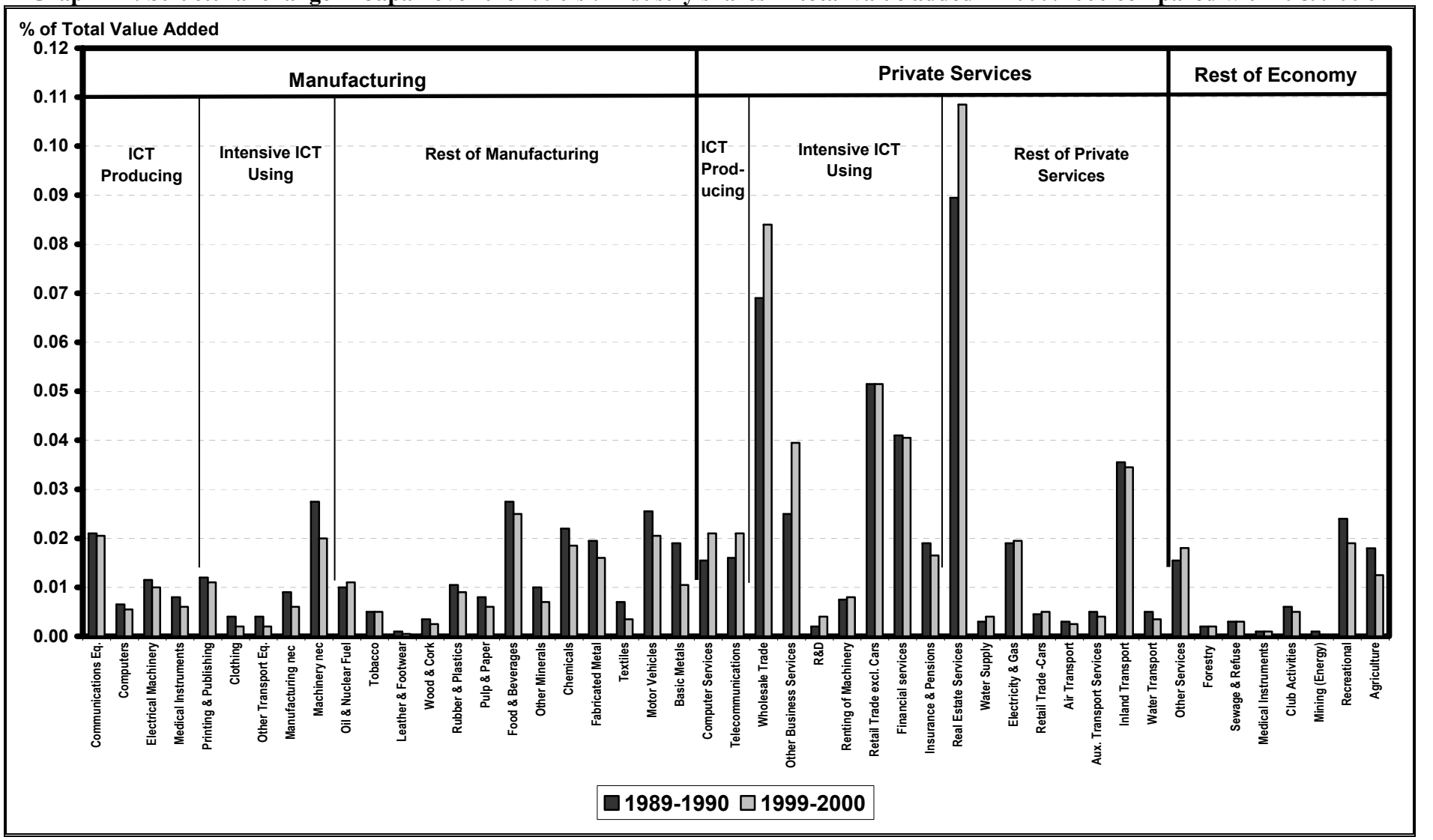


Table 3 : Japan : International comparison of industry productivity levels
(US =100)

Productivity Levels						
	Total Industries	Market Economy Industries	ICT Industry (Electrical & Optical Equipment - ICT Goods) (Telecommunications - ICT Services)	Non-ICT Goods Producing Industries	Non-ICT Market Service Industries	Non Market Economy Industries
Japan						
Gross Value Added per hour worked	0.58	0.50	0.66	0.47	0.49	1.05
TFP	0.56	0.47	0.66	0.46	0.46	NA
Labour Input per hour worked	0.97	1.01	0.91	0.99	1.02	NA
Capital Input per hour worked	1.13	1.14	0.89	1.12	1.07	NA
ICT capital input per hour worked	0.66	0.58	0.50	0.45	0.60	NA
Non-ICT capital input per hour worked	1.29	1.46	1.44	1.28	1.43	NA
Euro Area						
Gross Value Added per hour worked	0.77	0.69	0.54	0.73	0.70	1.07
TFP	0.85	0.79	0.72	0.86	0.78	NA
Labour Input per hour worked	0.90	0.88	0.87	0.91	0.87	NA
Capital Input per hour worked	0.95	0.86	0.54	0.82	0.87	NA
ICT capital input per hour worked	0.47	0.42	0.31	0.40	0.44	NA
Non-ICT capital input per hour worked	1.12	1.12	0.87	0.92	1.24	NA

5. Some tentative conclusions regarding Japan

- In many respects the most negative aspect of the financial crisis in Japan has been the failure of the Japanese authorities to recognise the importance of a two-pronged policy response involving both fiscal activism and structural reforms. Whilst the use of fiscal instruments to ease the downturn was understandable and economically justifiable in the short run, the long run failure of the Japanese authorities to restructure the economy has come with a heavy economic price.

- In sectoral terms, the big loser in this process has been manufacturing. Before the crisis, manufacturing was contributing as much as the private services sector to Japanese GDP growth despite having a value added share of only 24% compared with over 50% for private services. At its peak in 1988, manufacturing was contributing close to 4 percentage points to overall GDP growth in Japan. This contribution evaporated over the subsequent 5 years, with manufacturing actually making a negative contribution of around 1% point in 1993. Whilst the sector has shown some tentative signs of starting to recover after the year 2000, even by 2005 manufacturing was still only contributing 10-15% of what it was in the late 1980's.

- The analysis also suggests that great caution is needed on behalf of policy makers in interpreting productivity trends in cyclically sensitive sectors such as wholesale and retail trade and construction when investment rates are running at levels well above normal and when large gains in TFP cannot be attributed to plausible technological shocks. Whilst the time lag of 1-2 years is still an obstacle which must be addressed if EU KLEMS is to be used for more timely structural policy assessments, the analysis shows the usefulness of the datasets in isolating the key industries and driving factors (i.e labour, capital or TFP) behind the macro level GDP, employment, hours worked and labour productivity developments.

- If this type of detailed growth accounting analysis had been available at the time, there is little doubt that greater attention would have been given to the narrow industry and TFP focus of the Japanese boom. Specifically with respect to TFP, given that there was (and still is) very little evidence to suggest sufficiently large static (i.e. economies of scale, organisational changes etc) or innovation-driven, dynamic, TFP gains which could have explained the sharp upward surge in TFP in the construction and wholesale & retail trade industries in the late 1980's, it should not have come as a major surprise when these gains were shown later to have been cyclical, not structural, in nature.

- Furthermore, concerns should have been raised once it became clear that TFP growth rates were declining sharply from 1989 onwards whereas growth rates for non-ICT investments were accelerating at the same time. This, at the very least, should have posed questions about the quality of the investments which were being made since higher levels of investment were yielding less and less efficiency gains.

Annex 4 : Industry-based analysis of Finland's 1990's economic crisis using EU KLEMS

1. Broad Trends for "Total Industries"

- Table 1 & graph 1 show that the Finnish economy experienced a severe recession in the early 1990's, with annual average GDP growth rates falling from 3% over the 1981-1990 period to -0.7% for 1991-1995 (GDP volumes declined by a cumulative 10 per cent between 1990 and 1992). The downturn manifested itself in a sharp contraction in both the Finnish labour market and in the growth rate of TFP. The contribution to growth of investment (especially with respect to non-ICT investment projects) was also affected, falling from a contribution of over 2% points in 1989 to around zero in 1993. The duration of the downturn was cut short by a significant, innovation-driven, acceleration in TFP, with table 1 showing that the TFP growth rate over the period 1991-1995 nearly doubled compared with the 1980's. The surge in TFP led eventually to a recovery in both investment and employment. This strong, innovation-driven, recovery process in Finland can be linked to a combination of factors, including the sustained improvement in the skill composition of the Finnish labour force throughout the 1980's and early 1990's; the flexibility of the labour market and investment response to the crisis; and a sense of urgency, which appeared to be lacking in Japan, that change was essential.

- Whilst the speed and extent of the output losses were significantly greater than in Japan, unlike the latter country, the recovery process was equally rapid and strong, with GDP in fact rebounding to a higher growth path compared with the pre-downturn period. The 1996-2000 average growth rate was substantially higher than the average of the 1980's, with the restructuring that took place following the downturn being reflected in firstly, a substantial acceleration in the growth rate of TFP (1.9% annual average rate for 1996-2000 compared with 0.5% for the 1980's); secondly, by a very strong rebound in employment growth; and finally, by a re-orientation of investments towards ICT and away from more traditional investment projects.

- In sectoral terms, table 1 shows that the recovery was driven by strong performances in both the manufacturing and private services sectors.

- The performance of manufacturing was particularly impressive, with output growth in the second half of the 1990's running at more than twice the average annual rates of the 1980's. This growth was propelled by strong labour and capital input growth as well as by an acceleration in TFP – in fact all 3 components experienced annual average growth rates which were substantially higher than those of the 1980's. With respect to capital services, there was a very noticeable upward shift in the importance of ICT investments, with the contribution of these latter investments to overall capital services almost doubling compared with the 1980's. Growth in the manufacturing sector was especially rapid in the case of the ICT producing industries, with the latter growing in importance relative to more traditional, resource-based, manufacturing industries.

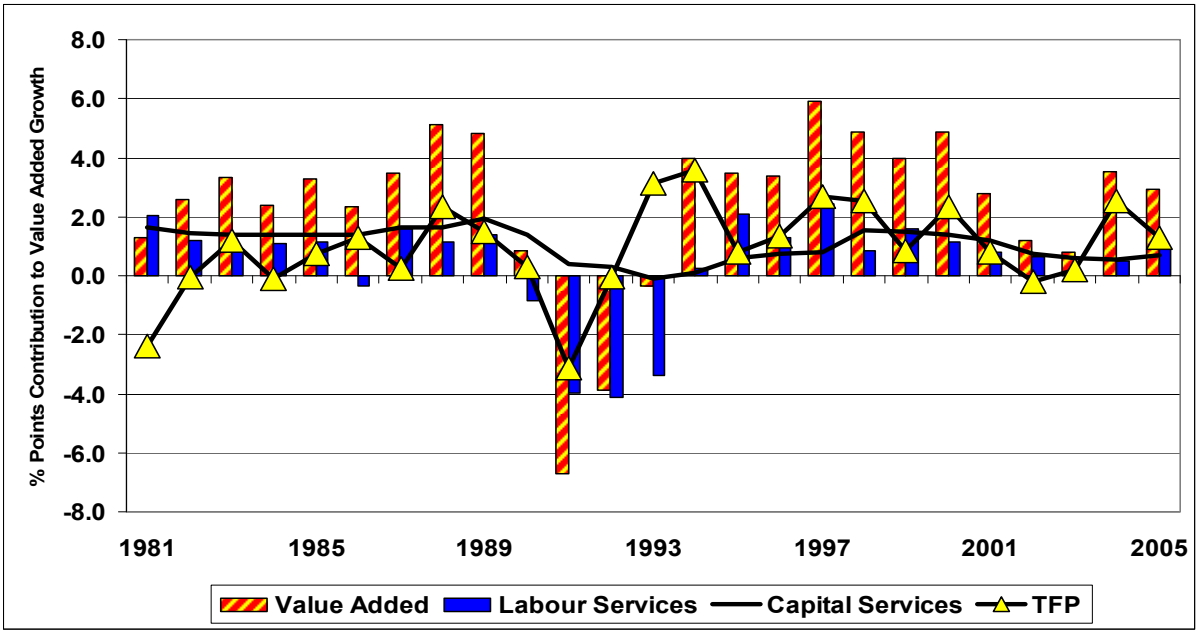
- With respect to market services, table 1 shows a very impressive performance over the second half of the 1990's, with growth rates averaging 4 ½% over the 1996-2000 period compared with an annual average of 3 ¼ % in the 1980's. Both labour services

and TFP made higher contributions to GDP growth in private services over the second half of the 1990's compared with the 1980's but the contribution of capital services was halved. This decline in the relative contribution of capital services was due to a significant fall in the contribution of non-ICT capital services, with ICT investments continuing to grow in importance, reflecting the enhanced importance of ICT producing service industries in the overall economy.

Table 1 : Finland - Growth Accounting Analysis for Total Industries 1981-2005
(Gross Value Added Growth and Contributions) (Annual Average Volume Growth Rates in %)

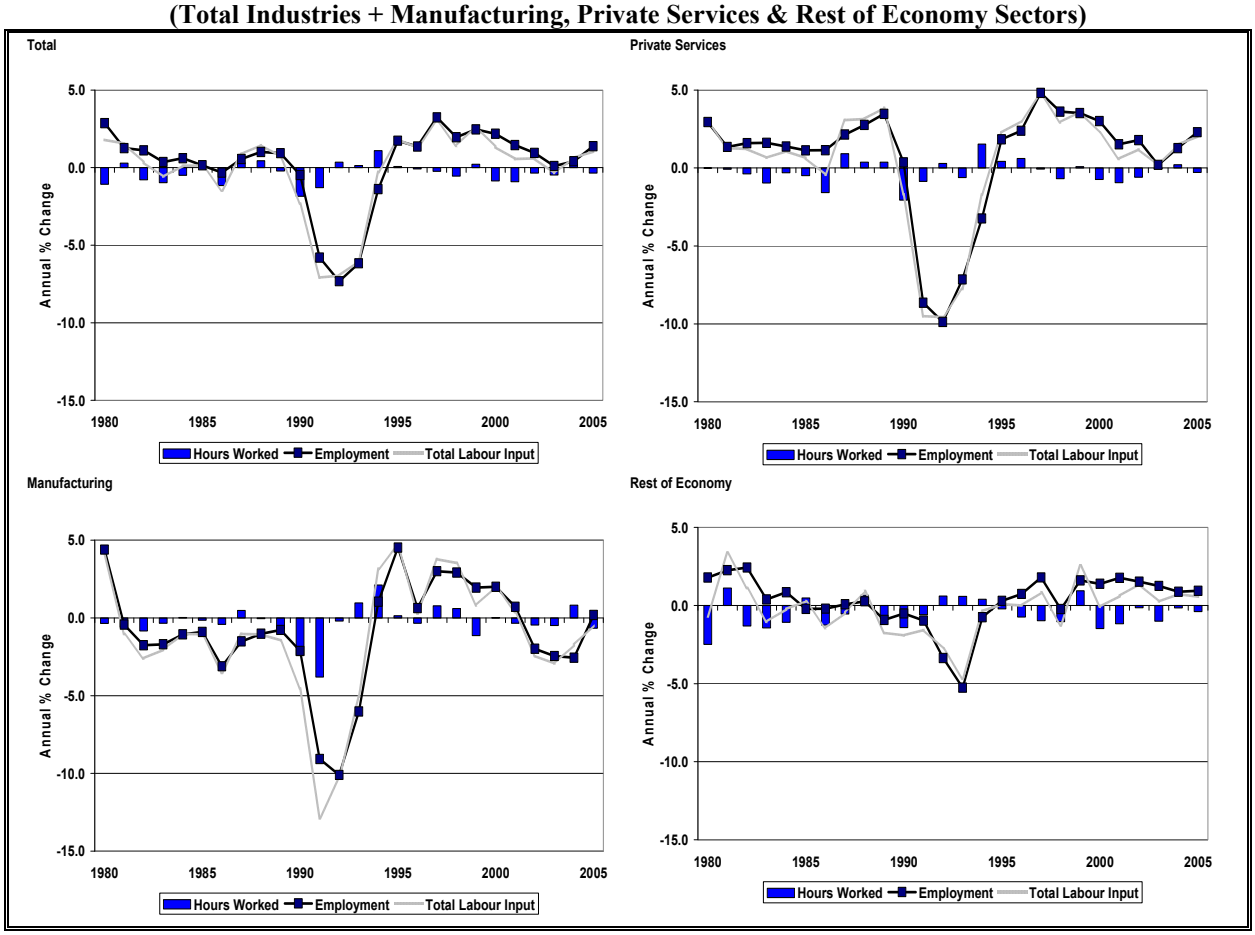
		Contributions from Labour, Capital & TFP							
		1. Labour Services				2. Capital Services			3.TFP
	Growth Rate of Gross Value Added Volume	Total Labour Services	Breakdown			Total Capital Services	Breakdown		
			Labour Input (Employment + Hours Worked)	Composition Change			ICT Capital Services	Non-ICT Capital Services	
Total Industries									
1981 - 1990	3.0	0.9	0.1	0.9		1.5	0.4	1.1	0.5
1991 - 1995	-0.7	-1.8	-2.7	0.9		0.3	0.2	0.0	0.9
1996 - 2000	4.6	1.5	1.3	0.2		1.2	0.6	0.6	1.9
2001 - 2005	2.3	0.6	0.3	0.3		0.8	0.4	0.3	0.9
Manufacturing									
1981 - 1990	3.5	-0.6	-1.3	0.7		1.7	0.4	1.2	2.5
1991 - 1995	1.8	-2.5	-3.0	0.5		0.4	0.3	0.1	3.9
1996 - 2000	7.9	1.3	1.2	0.1		2.2	0.7	1.5	4.4
2001 - 2005	3.9	-0.4	-0.8	0.4		0.5	0.4	0.1	3.9
Private Services									
1981 - 1990	3.3	1.4	0.9	0.4		2.0	0.5	1.4	0.0
1991 - 1995	-1.5	-2.7	-3.4	0.7		0.1	0.1	0.0	1.0
1996 - 2000	4.5	1.7	1.9	-0.1		1.0	0.7	0.3	1.7
2001 - 2005	2.4	0.6	0.7	0.0		1.1	0.5	0.6	0.6
Rest of Economy									
1981 - 1990	1.9	1.5	0.6	0.9		0.7	0.3	0.4	-0.3
1991 - 1995	-1.3	-0.2	-1.2	1.0		0.2	0.2	0.0	-1.3
1996 - 2000	1.7	1.1	0.8	0.2		0.5	0.4	0.1	0.1
2001 - 2005	0.4	1.4	1.0	0.3		0.3	0.2	0.1	-1.3

Graph 1 : % Points Contribution of Labour Services, Capital Services & TFP to Value Added Growth



- **Graph 2 : Additional breakdown of labour input developments** : Table 1 showed that there was a sharp deterioration in the GDP contribution of labour services in the recession years, with this deterioration driven by labour input (employment & hours worked per employee) developments rather than by shifts in the skill composition of the labour force which continued to contribute strongly to value added growth. Graph 2 provides a breakdown of the specific trends for the numbers employed and the hours worked per employee which collectively determined the overall labour input developments over the period. At the level of the total economy, the labour market shakeout in Finland in the 1991/1993 downturn (in sharp contrast to the experience in Japan) occurred in the numbers of people employed rather than in the number of hours worked per employee. This employment driven labour market correction was the pattern displayed in each of the 3 main sectors of the economy, namely manufacturing, private services and the "rest of the economy".

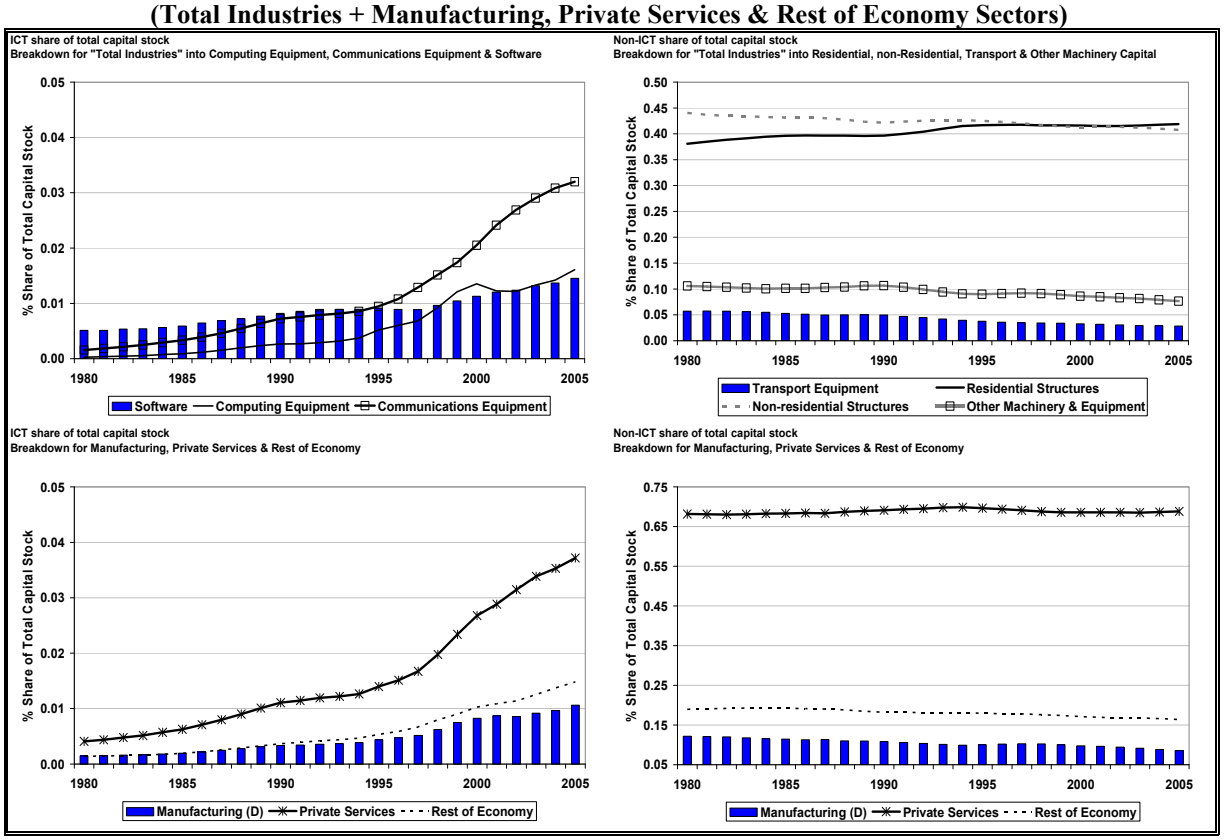
Graph 2 : Finland - Growth rates of employment, hours worked & total labour input – 1980-2005 (Total Industries + Manufacturing, Private Services & Rest of Economy Sectors)



- **Graph 3 : Additional breakdown of capital stock developments :** Graph 3 gives a breakdown of the ICT and non-ICT capital stock trends in Finland for the total economy and for the manufacturing, private services and rest of economy sectors. With respect to ICT, one sees sharp increases in the shares of software, computing & communications equipment, with this shift towards ICT investments being a feature of all sectors of the economy but with the trend being particularly strong in the case of private services. Compared with Japan, one significant difference is that the share of communications equipment in the overall capital stock was 50% higher in Finland. Regarding the non-ICT capital stock, we can see that the surge in ICT investments has not been at the

expense of overall spending on residential and non-residential construction but more with respect to transport equipment and other machinery & equipment. At the sectoral level, non-ICT investments in private services as a share of all such investments in the economy have grown, whilst that of the "rest of the economy" and especially the manufacturing sector has declined. With respect to manufacturing, these figures show that the turnaround in the fortunes of this sector have firstly been ICT related and secondly have been driven by investments which collectively represent less than 2% of the Finnish capital stock. These trends indicate that the efficiency, as opposed to the quantity, of investment was what mattered for the recovery process.

Graph 3 : Finland - Breakdown of Capital Stock into ICT & Non-ICT components – 1980-2005 (Total Industries + Manufacturing, Private Services & Rest of Economy Sectors)



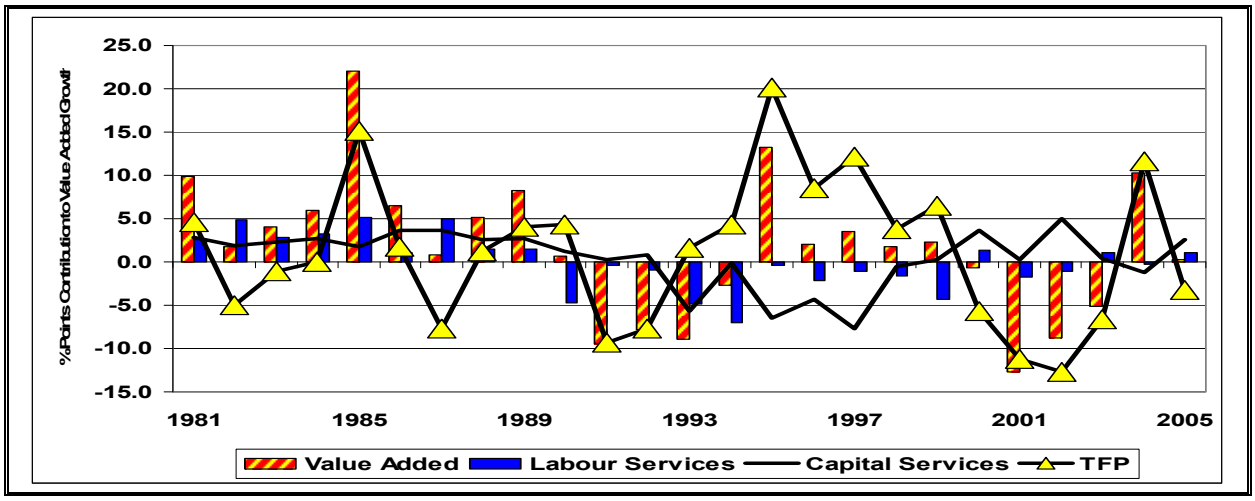
2. Broad Trends for the "Financial Services" Industry

- Like Japan, the large surge in the output of the Finnish financial services industry in the 1980's was essentially a TFP phenomenon (table 2 & graph 4). TFP in fact has strongly influenced overall output trends in the industry over the 25 year period shown in graph 4, with the pronounced cyclical pattern for financial services output as a whole reflecting a similar pattern for TFP. Volatility has also been a feature of investment trends in the industry, with annual average contributions to growth ranging from 3 ½ % points in the mid-1980's to negative contributions of 6 ½ - 7 ½ % points in the mid-1990's. Labour services trends have also been relatively unstable, with contributions to growth ranging from +5% points in the 1980's to -7% points in the mid 1990's. Again, as in the case of Japan, although the industry has witnessed a significant shrinkage in terms of the quantity of labour employed, this has been partly offset by a strong increase in the share of high skilled workers employed in the industry.

Table 2 : Growth Accounting Analysis for the Financial Services Industry (Gross Value Added Growth and Contributions) (Annual Average Volume Growth Rates in %)

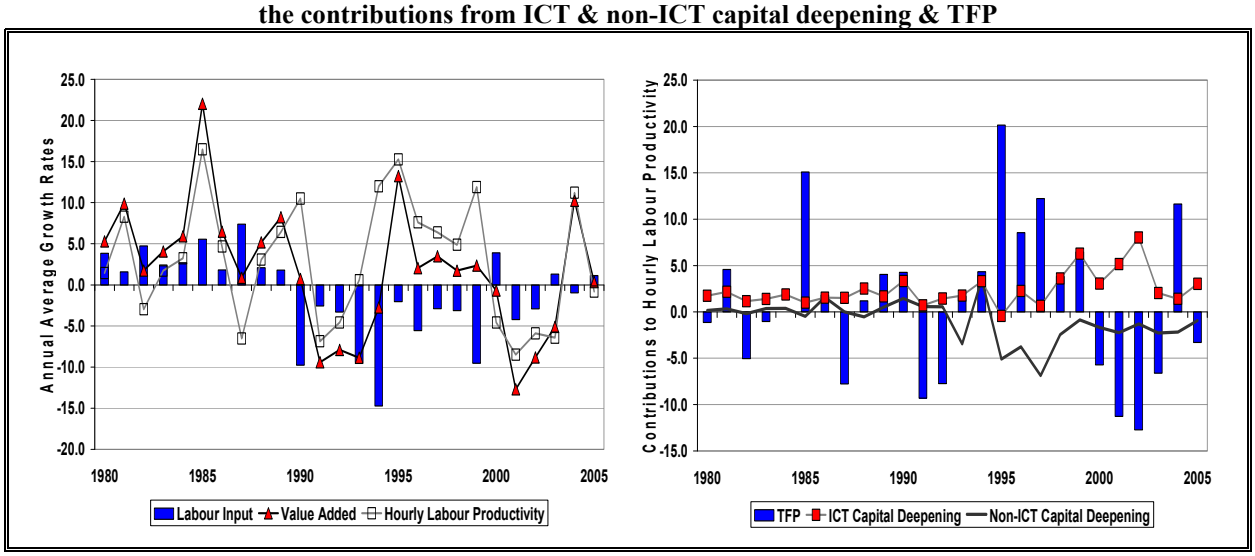
	Growth Rate of Gross Value Added Volume	Contributions from Labour, Capital & TFP							
		1. Labour Services			2. Capital Services			3.TFP
		Total Labour Services	Breakdown		Total Capital Services	Breakdown		
			Labour Input (Employment + Hours Worked)	Composition Change		ICT Capital Services	Non-ICT Capital Services	
Period Averages								
1981 - 1990	6.5	2.3	1.6	0.6	2.5	2.0	0.5	1.7
1991 - 1995	-3.1	-2.7	-3.7	1.0	-2.3	0.2	-2.5	1.8
1996 - 2000	1.8	-1.6	-1.7	0.1	-1.7	2.2	-3.9	5.1
2001 - 2005	-3.2	-0.2	-0.4	0.2	1.4	3.5	-2.0	-4.5

Graph 4 : Financial Services Industry : % Points Contribution of Labour Services, Capital Services & TFP to Value Added Growth



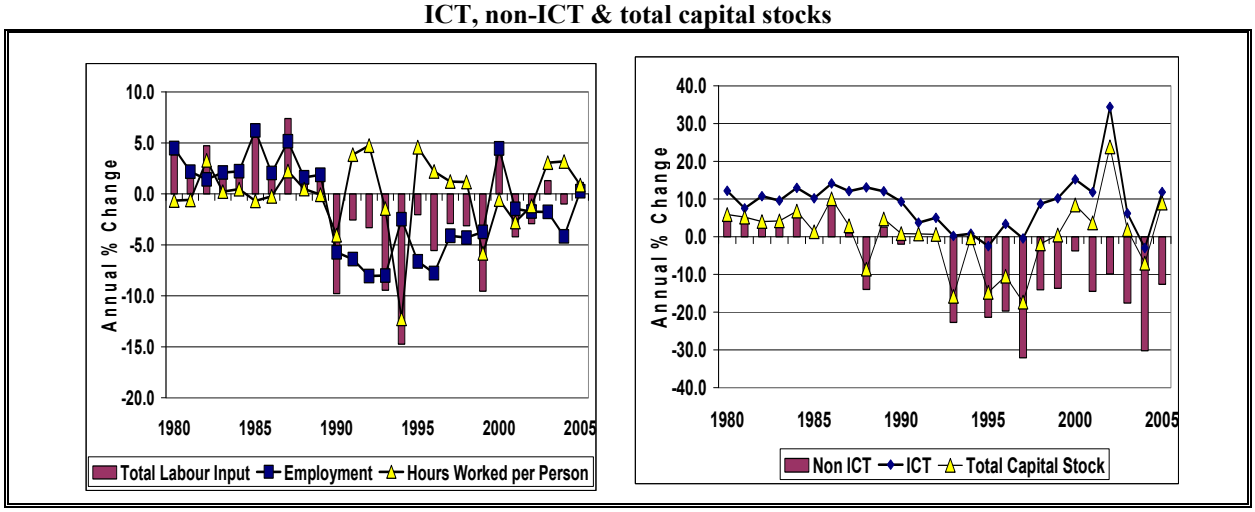
- Graph 5 shows that output and labour productivity trends track each other quite closely in the industry, with the peaks in productivity driven largely by TFP developments. Graph 5b shows a sharp divergence in the capital deepening trends in the industry from the early to mid-1990's onwards, with ICT capital deepening making strong positive contributions compared with a persistent negative pattern for non-ICT investments.

Graph 5 : Growth Rates of Value Added, Labour Input & Productivity + Breakdown of Productivity into the contributions from ICT & non-ICT capital deepening & TFP



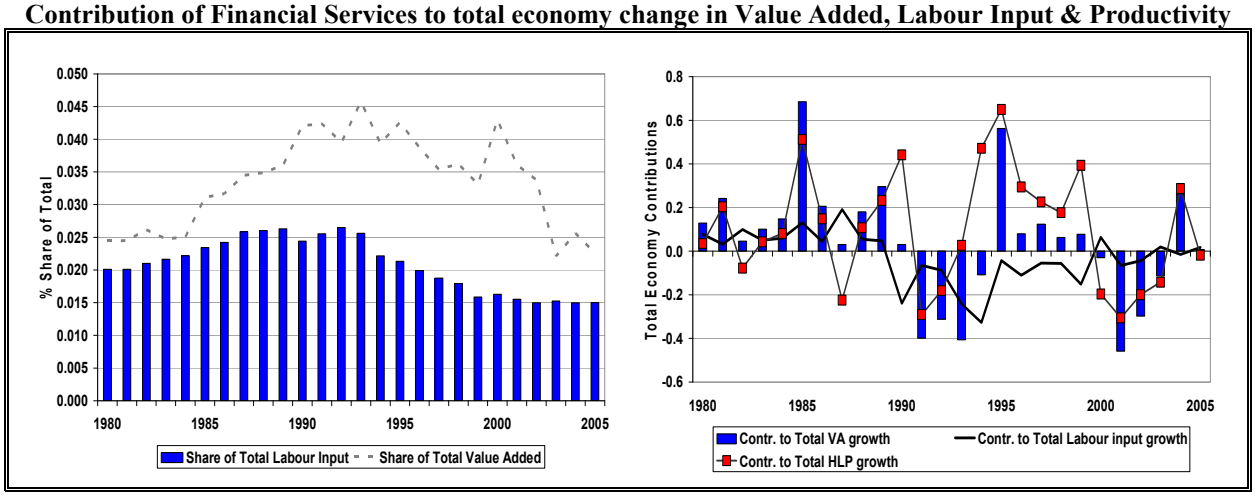
- Graph 6 shows that the total labour input declines experienced in the industry since the start of the economic crisis in the early 1990's were driven by strong losses in numbers employed, with these declines offset in many years by significant increases in the number of hours worked per worker. With respect to investment, graph 6b shows that since the mid to late 1990's, overall investment patterns in the industry have been dictated by ICT investments, with non-ICT capital stock growth rates never recovering from the early 1990's downturn, with most years subsequent to the crisis in fact being characterised by steep declines.

Graph 6 : Growth Rates of Employment, Hours Worked per Worker & Labour Input + Growth Rates of ICT, non-ICT & total capital stocks



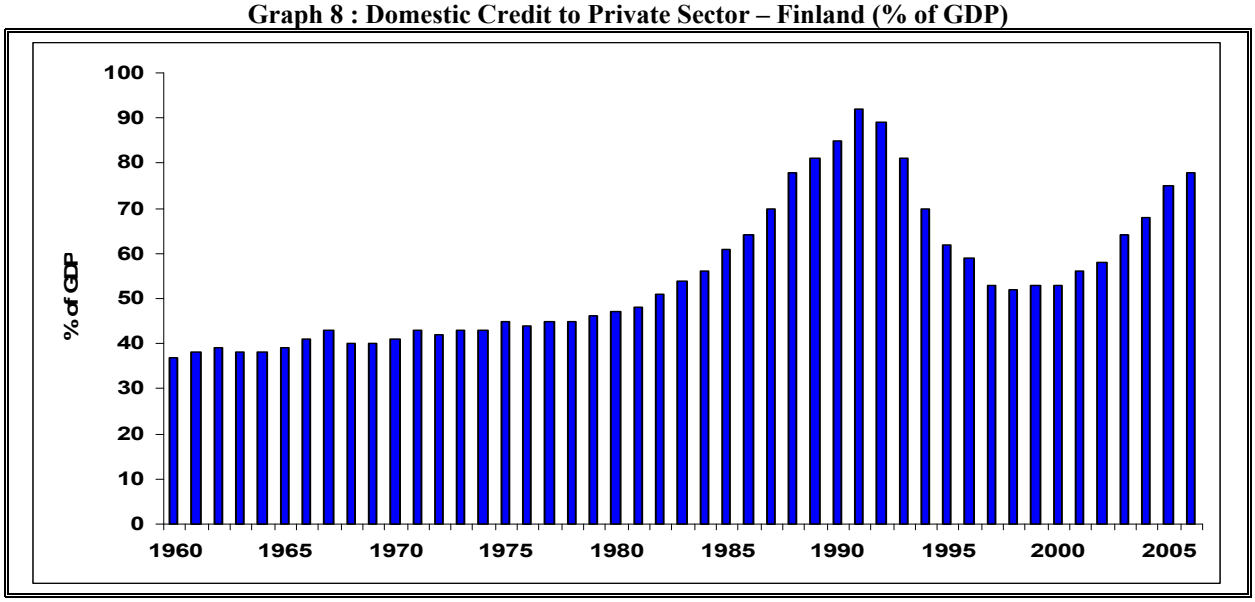
- Graph 7 shows the extent of the financial market bubble created in Finland in the late 1980's-early 1990's, with the industry's share of overall Finnish output close to doubling from 2 ½ % in the first half of the 1980's to 4 ½% by 1993. Since the crisis, however, this industry has been considerably downscaled, with its share of value added returning to the levels of the early 1980's and with employment shrinking to levels which are presently 25% lower than those pertaining in the early 1980's. The volatile nature of the financial services industry is shown in graph 7b, with this industry's contribution to total economy value added growth fluctuating from a positive contribution of greater than 0.6% points in the mid-1980's to negative contributions of 0.4% in the early to mid-1990's.

Graph 7 : Financial services industry share of total economy Value Added & Labour Input + Contribution of Financial Services to total economy change in Value Added, Labour Input & Productivity



- Graph 8 shows that there was a steady increase in the GDP share of private sector lending in Finland throughout the 1980's, with the share rising from less than 50% of GDP in the early 1980's to more than 90% in the early 1990's. Unlike Japan, this share dropped significantly to close to its early 1980's levels in the aftermath of the severe recession of the early 1990's. However, the trend since around the year 2000 has been strongly upwards (as indeed it has been in most OECD economies).

Graph 8 : Domestic Credit to Private Sector – Finland (% of GDP)



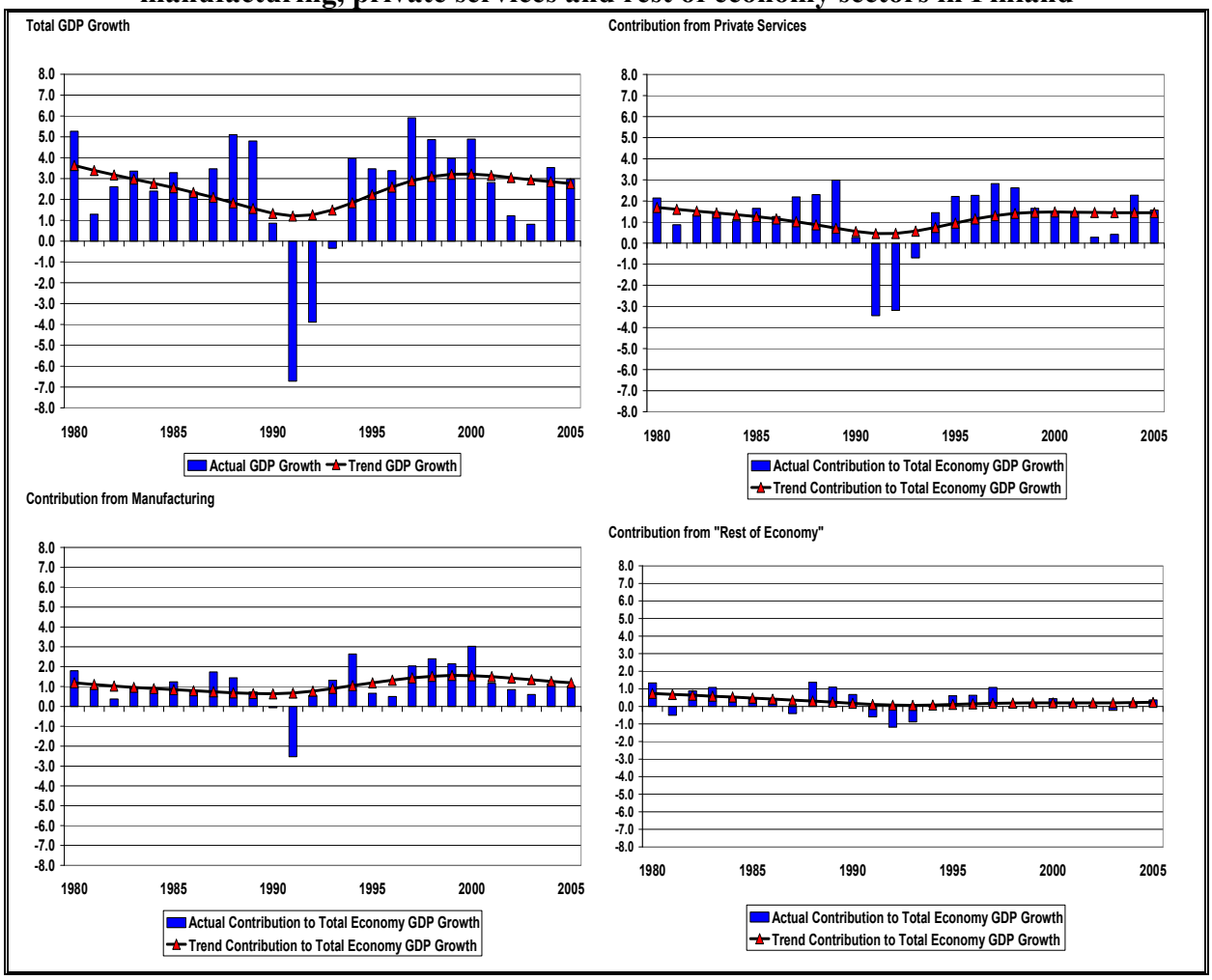
3. EU KLEMS shows that there were clear warning signs of "bubble" conditions in Finland before the 1990's downturn

- Graph 9 shows the emergence of "bubble" conditions in the Finnish economy in the late 1980's, with actual growth well above trend for a number of years. Graph 9 also shows that these above trend conditions were mainly driven by developments in the private services sector rather than in the manufacturing or "rest of economy" sectors. It also confirms the point made earlier that manufacturing has played a crucial role in the Finnish recovery process, with the trend contribution of this sector in the years following the downturn being higher than before the recession (the private services and "rest of economy" sectors both made contributions which were broadly similar in the pre- and post- downturn phases). These graphs showing the contributions of the different sectors to total economy growth also highlight the importance, in absolute terms, of the manufacturing sector to Finnish growth prospects, with roughly half of all Finnish growth over the 25 year period shown in the graph coming from manufacturing despite having a share of value added which was only around 25%.

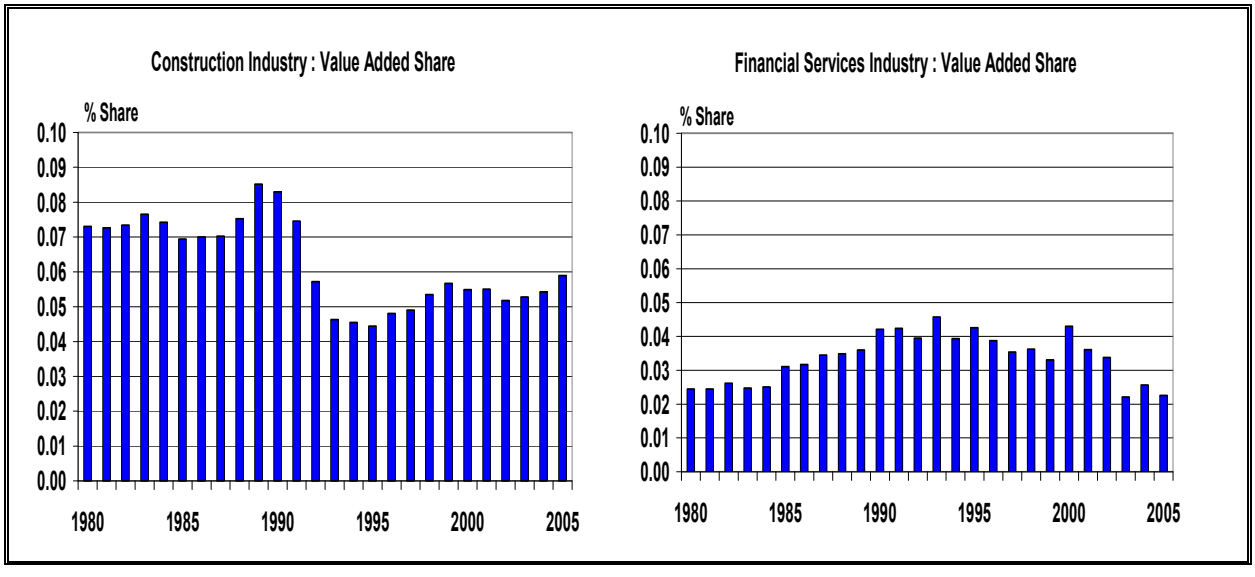
- With respect to the bubble conditions indicated in the private services sector, graph 10 shows that the construction and financial services industries were undoubtedly implicated in the "irrational exuberance" of that time. The graph indicates that the construction industry's share of value added increased sharply in the late 1980's and collapsed spectacularly over the subsequent 3-5 years. Since that time the construction industry's share of Finnish value added has remained relatively subdued up to and including 2005. The graph also shows, as mentioned earlier, that financial services had been growing strongly in Finland as a share of output throughout the 1980's and early 1990's. This process was significantly reversed in the recovery phase, with the

industry's share of value added being halved from 4.6% of GDP at its peak in 1993 to 2.3% in 2005.

Graph 9 : GDP growth rates in total industries and the contributions of the manufacturing, private services and rest of economy sectors in Finland



Graph 10 : Construction & Financial Services Industries as a share of overall Finnish GDP



4. How does Finland look now after the crisis – how widespread is the shift from a resource based to a knowledge based economy ?

- It is not possible to do a serious analysis of the Finnish economy without taking the fundamental role played by ICT into account. This is done for the manufacturing and private services sectors in graph 11.

- The left hand side of graph 11 gives a breakdown of the manufacturing sector into 3 groups of industries, ICT-producing, intensive ICT-using, and "rest of manufacturing". The graphs show the contributions of each part of manufacturing to total economy value added growth (i.e. they take account of the growth rates and value added shares of the 3 groups). The graphs show the extent to which the ICT producing industries have been behind the strong growth contribution of the manufacturing sector as a whole. From a situation throughout most of the 1980's when the ICT producing manufacturing sector made a contribution of close to zero, by the end of the 1990's this sector was contributing over 2% to total economy GDP growth. The graph also shows that the Finnish ICT story is mainly one of ICT production rather than ICT use, with the contribution of the intensive ICT using sector contributing less than in the 1980's. The trend for the "rest of manufacturing" is broadly stable over the 25 years shown in the graph, with an overall contribution to value added growth in Finland of around ½ a percentage point.

- The right hand side of the graph also gives a similar breakdown for the private services sector. Here again one sees the large contribution of the ICT sector, although the contribution to total value added growth is not as great as for ICT producing manufacturing. The graph shows that there has been a steady upward increase in the trend contribution of the ICT producing service industries, peaking at a contribution of close to 1% point at the end of the 1990's. Again, as with the manufacturing sector, ICT's impact on the private services sector is essentially limited to the production side, with the contribution of intensive ICT-using services actually showing a trend decline over the period as a whole. Regarding more traditional service industries, the third section of the graph shows that the trend contribution from these industries has stayed relatively stable over the period as a whole.

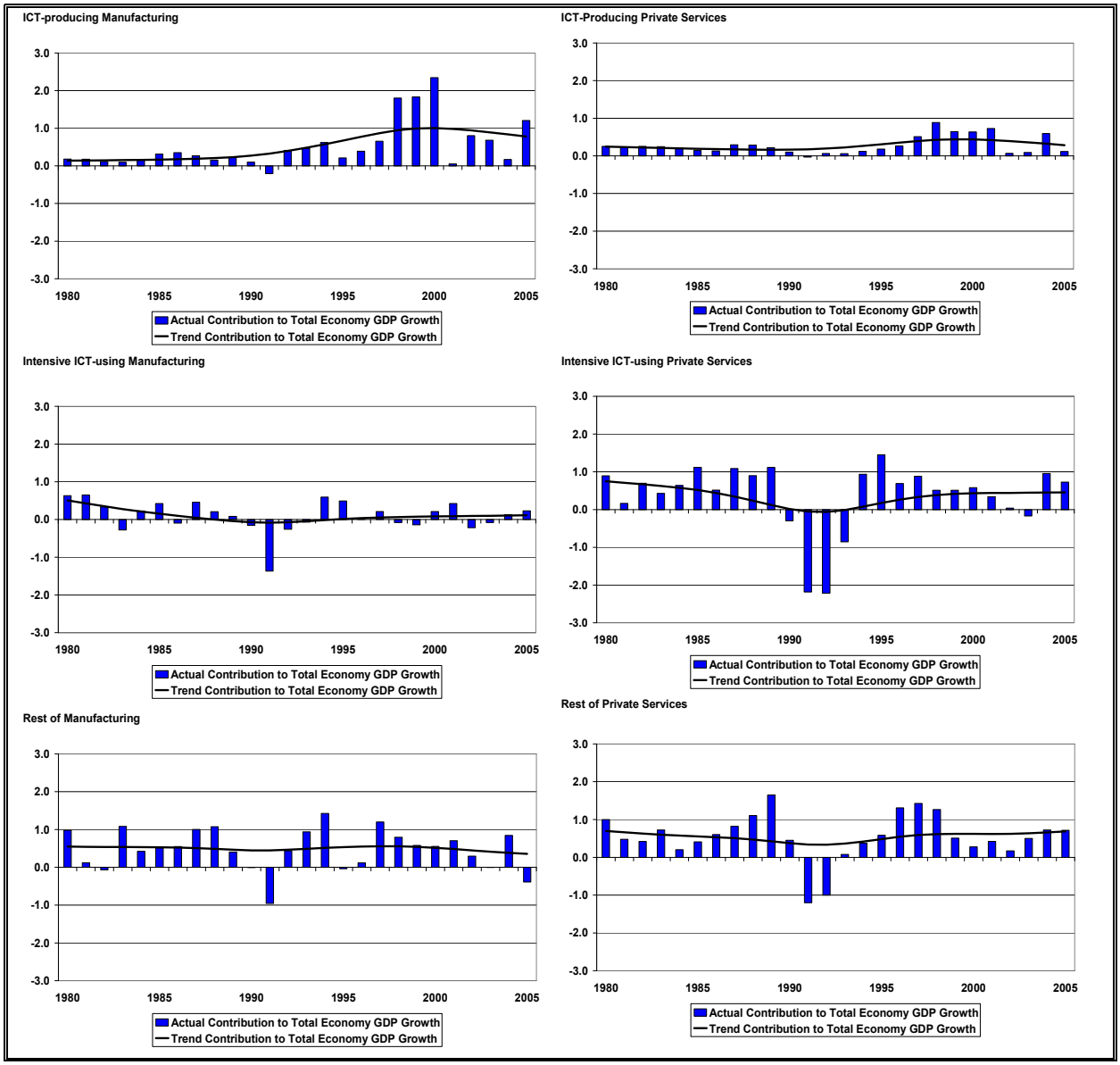
- The extent to which the Finnish economy has used ICT to propel their 1990's recovery process is remarkable. This is borne out by the analysis described above and by looking at graph 12 which gives the shares of the ICT producing manufacturing and ICT producing private services sectors in the overall output of the Finnish economy. One sees that from a share of less than 5% in the early 1990's, the total ICT producing sector (i.e. manufacturing and services) has roughly doubled in size in the space of 5-10 years. This is a combined level which is substantially higher than that pertaining in other countries, including the US. In addition, the extent of the growth dependence of the Finnish economy on ICT is illustrated by the fact that even with only a value added share of 10%, the production of ICT goods and services contributed over 60% of Finnish GDP growth in the year 2000.

- The extent of the refocusing of the economy towards ICT is also highlighted in graph 13 which provides a snapshot of the degree of structural change which occurred in Finland over the 1990's by taking the industry shares in total value added in 1999 /

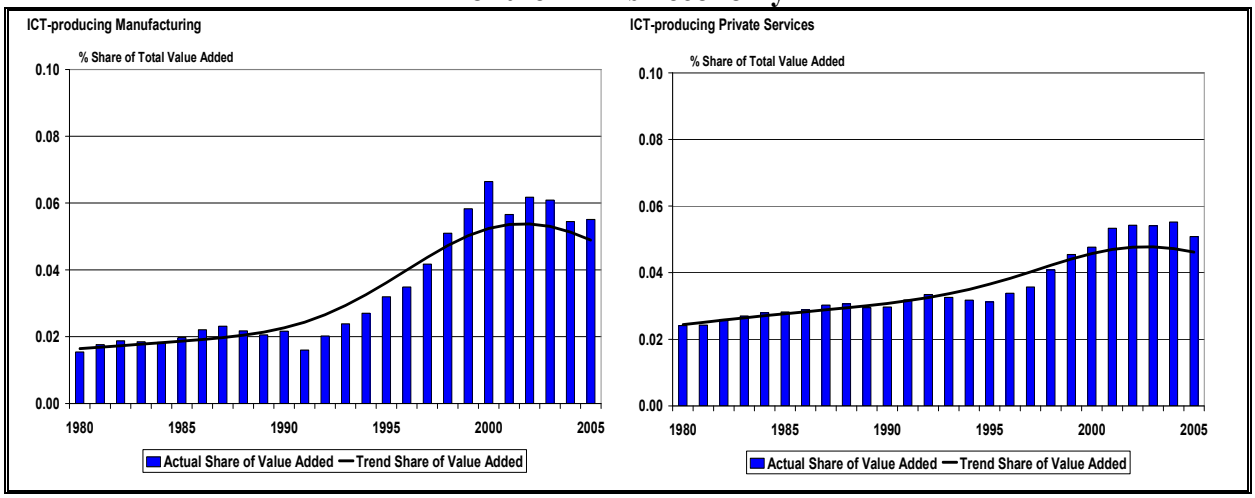
2000 and subtracting the equivalent shares in 1989 / 1990. This graph shows that within the overall ICT producing manufacturing sector, the key driver was the production of communications equipment. Growth in the value added share of the ICT producing services sector was boosted by a sharp increase in the output of both the telecommunications and computer services industries. The persistent increase in the share of residential structures in the overall capital stock shown earlier in graph 3 is reflected in the sharp increase in the share of real estate services in the Finnish economy throughout the 1990's. While there is evidence to suggest that many resource-based industries such as agriculture, forestry and mining have declined in relative importance, it is interesting to note that other more traditional industries such as "pulp and paper" have not allowed the emergence of the newer, more knowledge intensive, industries to reduce their economic importance to the Finnish economy, with this latter industry significantly increasing its share of overall output over the 1990's.

- Finally, Table 3 provides some information as to the competitiveness of the Finnish ICT industry and the rest of the Finnish economy compared with the equivalent industries in the US and the Euro area, based on EU KLEMS calculated productivity and factor input levels data. It shows that although Finland has similar productivity levels to that of the Euro area for "total industries", it outperforms the Euro Area at the level of "market economy" industries. This outperformance largely reflects the much higher efficiency levels of the Finnish ICT industry (i.e. the combined manufacturing and private services, ICT producing, industries) compared with the equivalent industry in the Euro Area. In fact Finland's ICT industry compares favourably with that of the reference frontier economy, the US, with levels of GDP per hour worked at 90% of those of the US and with TFP levels in the industry in excess of those in the US i.e. 124%. With respect to the non-ICT market economy, Finland more than holds its own with the rest of the Euro Area but, relative to the US, it is clear that Finland has the potential to gain substantially from structural reforms. This is especially the case for the non-ICT market services industries, where productivity levels are, on some measures, less than 70% of those existing in the US.

Graph 11 : ICT-based Breakdown of Manufacturing & Private Services Sectors : Contributions to Value Added Growth



Graph 12 : Share of the ICT producing manufacturing sector in the overall value added of the Finnish economy



5. Some tentative conclusions regarding Finland

The most important conclusion from the above analysis of Finland is that this country used the early 1990's downturn as an opportunity to restructure its economy following the excesses of the late 1980's and the collapse in trade with the former USSR. This was very much a collective public / private effort, with the Finnish government using its mandate for change during the recession years to put Finland on the path towards a knowledge based economy, with many industries in the private sector responding by carrying out substantial restructuring of their operations aimed at releasing the labour and capital resources needed for the emerging ICT producing manufacturing and private service industries.

One note of caution is however warranted, the analysis shows that although still high by EU standards, trend productivity is starting to decline in the total economy. Given the large dependency on the ICT-producing industry, both in manufacturing and services, and the acceleration in the outsourcing of ICT manufacturing production to lower cost locations outside Finland, maintaining past productivity patterns in the future may be dependent on a further round of restructuring of the Finnish economy. As the productivity level figures for the non-ICT industries in table 13 make clear, there is still ample room for efficiency gains to be reaped in the Finnish economy, especially in many areas of the market services sector.

Graph 13 : Structural change in Finland over the 1990's : Industry shares in total value added in 1999/2000 compared with 1989/1990

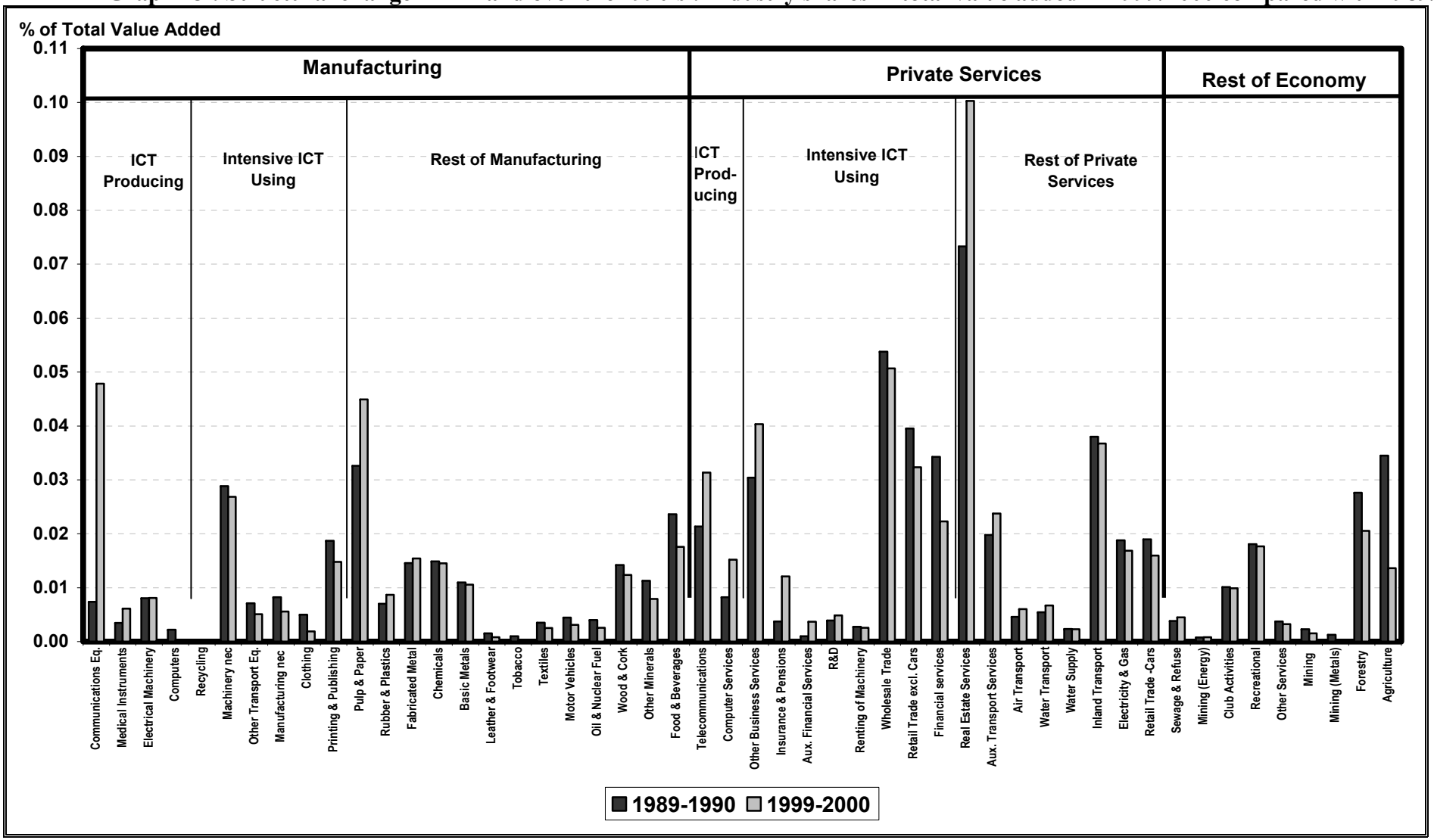


Table 3 : Finland : International comparison of industry productivity levels
(US =100)

Productivity Levels (United States = 100)

	Total Industries	Market Economy Industries	ICT Industry (Electrical & Optical Equipment - ICT Goods) (Telecommunications - ICT Services)	Non-ICT Goods Producing Industries	Non-ICT Market Service Industries	Non Market Economy Industries
Finland						
Gross Value Added per hour worked	0.77	0.81	0.90	0.82	0.68	0.63
TFP	0.85	0.90	1.24	0.95	0.78	NA
Labour Input per hour worked	0.87	0.87	0.86	0.89	0.84	NA
Capital Input per hour worked	1.00	0.96	0.44	0.89	0.88	NA
ICT capital input per hour worked	0.47	0.45	0.32	0.47	0.43	NA
Non-ICT capital input per hour worked	1.14	1.21	0.72	0.98	1.16	NA
Euro Area						
Gross Value Added per hour worked	0.77	0.69	0.54	0.73	0.70	1.07
TFP	0.85	0.79	0.72	0.86	0.78	NA
Labour Input per hour worked	0.90	0.88	0.87	0.91	0.87	NA
Capital Input per hour worked	0.95	0.86	0.54	0.82	0.87	NA
ICT capital input per hour worked	0.47	0.42	0.31	0.40	0.44	NA
Non-ICT capital input per hour worked	1.12	1.12	0.87	0.92	1.24	NA