ECONOMIC POLICY COMMITTEE



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EPC REPORT ON POTENTIAL OUTPUT AND OUTPUT GAPS

1. Introduction

The concepts of potential output and output gaps are important tools for assessing the cyclical position of an economy and its productive capacities beyond the immediate future. Over the recent years, these tools have also been employed in the framework of the implementation of the Stability and Growth Pact.

Following a mandate from Ecofin council, an ad-hoc Working Group on Output Gaps (OGWG) was created in 1999 to review and assess the various existing methodologies used to evaluate potential growth. The group gave its first report in October 2001¹. Based on this work, the Ecofin council adopted on 12 July 2002 a report from the Economic Policy Committee (EPC)², which advocated the use of a production function approach (PF) instead of the former Hodrick Prescott filter method (HP) as a reference method when evaluating Stability and Convergence programmes for all countries except Spain. At this meeting, Germany and Austria put forward that "they also valued the production function method as an analytical tool but, as with all other methods for assessing the output gap, saw fundamental problems in deriving policy assessments". They advocated the additional use of the HP filter until the results of estimates using the PF approach could be considered as sufficiently reliable also in the case of their countries. The Council conclusions stated that the transition period, during which the HP filter is used as a backup method "shall be as short as possible and that the situation shall be reviewed on a regular basis".

The Council also welcomed the Commission's intention to apply the production function approach in a non-mechanistic, transparent and consistent way, and invited the EPC to continue efforts to find solutions for individual problem cases such as its implementation for Spain and refine the PF method.

Following these recommendations and suggestions from the Commission and several member states an additional work program was adopted by EPC in May 2003 for the OGWG. As a first step, before deepening the analysis further, three main issues were to be tackled by the end of 2003: firstly, to try to solve individual problem cases linked to the PF approach, secondly, to improve the evaluation of the inputs of the PF (e.g. NAWRU, average hours worked, desegregation of capital stock) and finally, to apply in the most efficient way the PF method to the accession countries.

Subsequently, the EPC envisioned that the OGWG could deepen its analyses by assessing the use of scientific and transparent methods linking output gaps and cyclically adjusted budget balances (CABs) and possibly output gaps and inflation outlook. However, before starting to

¹ Report on Potential Output and the Output Gap, 25 October 2001, ECFIN/EPC/670/01/en

² Report on Methods of Evaluating Output Gaps, 3 July, ECFIN/EPC/345/02

deal with this second step, the EPC decided that the OGWG should return to EPC early 2004 for a more specific orientation.

The working group was composed of experts from the EPC, EU member states and accession countries, the Commission, the ECB and the OECD. The group met on three occasions³. With a view to provide an active contribution and reflect progress and conclusions by the group about these issues, the Commission prepared background papers and materials for each of these meetings. The extensive coverage and high quality of this background work proved actually to be a key input for the reflections of the group.

This document summarises the discussion and main findings of the working group with the final conclusions by the EPC. Section 2 discusses the problems in using the PF method in Germany, Spain and Austria. Section 3 reviews the methodological refinements to be proposed to the Commission's existing PF method. Section 4 presents the state of play in the acceding countries and the assessment of methods to be used. Section 5 summarizes the conclusions and recommendations.

2. Country specific problems linked to the production function approach

Germany initially expressed reservations about moving to the PF method not per se but due to major concerns in terms of the data inputs used for the calculations in the PF approach given the distorting effects on major economic time series deriving from the consequences of the German unification process. Structural breaks (evident in participation rates or unemployment figures) were caused by the transition from a centrally planned economy to an open market economy in the Eastern part of the country, and still make it difficult to detect underlying trends or derive the parameters needed to estimate potential output. However, introduction of the ESA95 data standards and data revisions for West Germany into the Commission's approach have solved some of the statistical problems associated with the unification. Moreover, PF and HP estimates for growth and output gaps were similar over the Commission's recent forecasting exercises. However, the German delegate highlighted that caution is still warranted since such similarities may also come about by coincidence and could disappear when other data inputs are used, and therefore, cross-checking results by the application of both methods appear advisable. Germany stated that it will be willing to accept the PF method as the reference method for evaluation of its next stability program, provided that the HP method is used as a back up method and the demographic projections by the Eurostat will become available.

The Spanish delegate also stated that **Spain** had no problem with the PF approach in methodological terms but only with the fgures it produces for Spain due to particularly difficult labour force estimates⁴. More precisely, three demands were presented by Spain to move to the PF method, firstly that the Commission should use National accounts as opposed to labour force survey estimates of employment, secondly that the Commission eliminates the linear trend estimated when projecting the TFP for Spain, given that it is not statistically significant and finally that the Commission considers using national population projections, which are based on the latest available Census, and not Eurostat projections in the PF

³ The group met on July 3, October 7 and December 10.

⁴ This is mainly due to various methodological changes introduced in the LFS in order to properly capture the population dynamics in Spain. This led to higher employment growth rates in the LFS compared to National Accounts statistics in several years (see note ""Observations on the European Commission estimate on potential output growth for Spain").

method⁵. The Commission presented a paper arguing that Eurostat population projections should still be used to ensure comparability of data between Member States, that national accounts employment data will change only the relative contributions of the various growth components⁶ and that removing the trend from TFP estimation process would have an effect of maximum 0.1 on the potential growth rate in any given year. Moreover, the Commission recalled that a new set of population projections by Eurostat should be available by the summer of 2004 and could overcome part of these problems. Spain emphasized the need to assess the impact of these new 2004 population projections by Eurostat and also the revised national accounts data, before making up its mind. It was therefore suggested by the working group that in the case of Spain, a definite decision on the use of the PF method as a reference could be made by the summer 2004^7 .

Austria considered that the PF approach was too mechanical and especially does not take into account the effect of structural reform measures such as pension reforms and their implied effects on labour force participation rates. The Austrian delegate expressed concerns about the projection of Eurostat working age population and would rather prefer to use national projections. The Commission, like in the Spanish case, emphasized that Eurostat population projections should be used to ensure equality of treatment among member states and moreover that a new set of Eurostat population projections should be available by the summer of 2004. The Austrian delegate agreed with the usage of the Eurostat population projections as far as the projections will be comparable with the new projections from Statistik Austria. Regarding the effects of pension reforms in the PF approach. Austria cannot accept any mechanical use of the PF method. The Commission and other members of the working group argued that the Austrian desk officer in the Commission has the possibility to include such effect in the short-run projection exercise when using the PF method. Austria disagreed stressing that this point is not just a technical one but also concerns economic policy. The working group therefore suggested that the decision on when to apply the PF as a reference method for Austria should be left to the EPC.

The **EPC considers** that good progress has been made so as to be able to apply the production function method in autumn 2004 also for Germany, Spain and Austria provided that the caveats identified above including data availability are properly addressed. For Austria and Germany, the PF method will be used as the reference method and the HP filter will continue to be used as a back-up method during a transition period. For Spain, both methods will be used in parallel until results have become more stable. The situation shall be reviewed before the assessments of the 2005 Stability and Convergence Programmes to ensure that the transition period shall be as short as possible.

⁵ The intensity and recentness of immigration inflows explain the differences between Eurostat and national sources projections for labour force. These differences affect not only future years but also past figures. For example, national sources provide 1.4 million people more than in Eurostat in the year 2001.

⁶ The Spanish delegates do not fully agree with this view. More specifically, they argue that using National Accounts employment eliminates the need to impose a non-negative TFP growth, since this variable never reaches a negative value in this case. However, it also raises a coherence problem, since National Accounts do not provide information on labour force and unemployment, and therefore potential employment has to be calculated using the LFS. This coherence problem raises even more relevant concerns on the stability of the future results than the problem it was tried to solve. This leads to the need of further elaboration on the data and the method to be used in the case of Spain.

⁷ The Spanish delegate requested for a deferral until 2005 due to a new Labour Force survey..

3. Changes to be proposed to the existing PF method

The July 2002 ECOFIN Council made clear that the OGWG was expected to continue its work on the PF method and the assessment of its inputs, namely labour (and especially the non-accelerating wage rate of unemployment (NAWRU), capital and the total factor productivity (TFP). One clear request was for the Commission services to "provide the group with results of NAWRU estimates not subject to the restriction of a sample mean of zero for 'unemployment gaps'". The Commission met this particular request and provided numerous background materials which, along with some member country contributions, allowed refining further the PF method. Four main points were discussed in order to improve the accuracy of the PF method in reflecting the underlying economic fundamentals: the "NAWRU methodology", the use of hours worked to quantify labour, the restriction to the private sector instead of the whole economy and the end-of-sample bias.

a. The NAWRU methodology

Structural-based models, such as Wage Setting – Price Setting model, were previously examined by the OGWG. Yet as they could not be applied in a transparent and equal way for each member state, they were discarded as a reference method. Therefore, the current EC methodology to evaluate the NAWRU is based on an unobserved component model using a simple Phillips curve. It also restricts the 'unemployment-gap', i.e. the difference between the actual unemployment rate and the NAWRU, to follow a 'zero-sample mean'. This assumption was regarded as too stringent by the members of the group, implying a NAWRU too close to the actual unemployment rate, and probably too high in most cases in this period of negative output gap. The Commission therefore provided an extended method that explicitly derives the Phillips curve from wage and labour demand relations. This new method introduced the wage share as a new explanatory variable and allowed removing the zero sample mean⁸. Removing the constraint gave slightly lower NAWRU estimates for most member states. Yet some technical issues remain:

- A number of delegates, including the Chairman, expressed some concerns regarding possible endogeneity problems, the wage share and labour productivity both being endogenous variables. Indeed, while the improvement from including the wage share in terms of R^2 was impressive, part of this improvement might be linked to this endogeneity issue. An econometric procedure using an instrumental variable approach would be relevant. This is however a difficult task that will take some time to be accomplished.
- Members of the group were concerned by the volatility of the NAWRU estimations, which would be subject to revisions within the same year. The Chairman brought forward the suggestion of reducing this volatility by excluding the forecasts from the estimation process. The Commission provided calculations that supported this idea. Yet no consensus emerged as how the NAWRU should therefore be projected. According to the working group it would be unrealistic to assume a constant NAWRU over the projection period. A possible solution could be to allow the member states or the country desks to adjust the NAWRU over the projection period, if specific information would warrant so. Members of the group then agreed, however, to keep the forecasts in the estimation process.

⁸ Note that if the unemployment gap does not meet the 'zero-sample mean' requirement, neither does the output gap itself.

the group then agreed to keep the forecasts in the estimation process. They considered that a timely release of the calculation software used to estimate NAWRU should enable them to have a precise idea of where the modifications would come from.

The Chairman and the members of the group agreed that the new method using the wage share as new explanatory variable and removing the zero sample mean is a clear improvement and should be implemented as soon as possible. The general impression remained nevertheless that NAWRU estimations were still too high in most cases considering the evolution of inflation in the EU. Some more work should therefore be done to better capture the specificity of the European labour market, especially in the context of permanently low and stable inflation. In particular, the inclusion of the wage shares as a new explanatory variable needs to be analyzed further.

b. Hours worked data

At the July 2003 meeting, presentations from France and the Netherlands both stressed the importance of defining labour input in terms of hours worked. Indeed, productivity per capita can be viewed as the product of productivity per hour and the average number of working hours per employee. For example in the case of a decrease in production caused only by a reduction in average working hours, if the TFP is defined on a 'per capita' basis it will consequently decrease, even if productivity per hour is unchanged. This decrease could therefore diminish the trend TFP and the forecasted potential growth rate, even if the number of working hours stops decreasing.

Considering hours worked data instead of capita data allows dealing with this issue in a theoretically more satisfactory way. Clearly for labour, the number of hours worked matters. Given that the main advantage of the production function approach is its ability to relate potential output to its determinants, it would be sub optimal to discard the evolution of average hours worked as an explanation.

There was a general agreement in the working group on this point with the OECD representative simply pointing out the problems in differentiating shifts in levels (such as the 35-hour week in France) from changes in underlying trends. Therefore, as soon as the data becomes available from Eurostat, hopefully in the next few months and from 1980 onwards, and the quality of the data has been assessed, the group recommends modifying the procedure accordingly.

c. Inclusion of the private sector as opposed to the total economy

As with the hours-worked point, the group agreed that focusing on the private sector seemed more relevant from the PF method theoretical point of view. Especially, the public sector does not verify the underlying perfect competition assumption. Moreover, national accounts of public sector output are closely related to public sector inputs, namely public employment⁹.

The Commission agreed to introduce this change as soon as it is feasible. Yet while no problems appeared with most of the series needed to exclude the public sector (namely the

⁹ The definition of the private-public sector needs to be clear to ensure that public sector employment is not overestimated due to the increasing weight of the private sector in some branches (e.g. health and social work or education branches

government investment, depreciation, consumption and wage series) there was a surprisingly large problem in relation to public sector employment. The ESA95 transmission programme to Eurostat does not currently require public sector employment series from the Member States. Since it is clear that many of the national statistical institutes do produce sectoral employment data, including for the public sector this information should also be furnished to Eurostat. Consequently, the Commission proposed to bring this issue up with Eurostat, with the group members asking to put pressure on their respective statistical institutes to provide the relevant breakdown. The working group suggests that it could assess the reliability of the results and investigate the possibility to change the procedure accordingly during second step.

d. End of sample bias

One of the reasons for adopting a PF approach instead of the HP filter to assess potential output was the so-called 'end-of-sample' bias. With a HP filter, the estimates of trend output rely excessively on the latest development in actual output and may therefore lead to quite substantial revision of the last estimation once new data becomes available. This end-of-sample bias stems from the symmetric property of the HP filter, which requires that output-gaps sum to zero over the estimation period, even though the latter rarely covers an exact number of business cycles. Moreover, this symmetric property of the HP filter can potentially lead to a "pro-cyclical" estimate of potential growth and this should be avoided as much as possible also in the PF method¹⁰.

However, some inputs of the PF method, and most notably TFP, are also HP filtered. To remedy partially to this problem, TFP is projected firstly by using the Commission's medium-term forecasts and then by a statistical method, up to 5 years¹¹. Two causes of volatility remain, the uncertainty surrounding the brecasts, which is unavoidable, and the statistical method used to project furthers TFP. Nevertheless Italy provided a presentation which supported the view that the current PF method employed by the Commission was generally less prone to bias than the HP filter: adding a new year of data leads to lesser revisions in the past output gap estimations when using the PF approach rather than an HP filter.

Following a presentation of the Dutch delegate, the Commission provided a deeper analysis of the problem by evaluating the differences between the current method and the current Dutch method of extracting trend TFP. Two differences appeared the specific treatment of the end point problem, and the underlying theoretical model chosen to represent TFP. With the Commission's method the medium term projection reverts to the (average) trend estimated over the period 1975 to 2004, while the CPB trend is more heavily influenced by recent growth rates. Both differences are important in understanding the volatility of end of sample estimations. Some further research would therefore be appropriate to decide on statistical evidence which representation should be preferred.

Another approach of extracting trend TFP could imply the use of another cyclical variable such as capacity utilisation rate. It could help to reduce the remaining pro-cyclicality of the

¹⁰ As measured by the correlation between potential output and the cyclical component of real GDP

¹¹ The Commission realised sensitivity analysis tests of the TFP trend to different forecast horizons. Tentative conclusions suggested that the alternative method is likely to be more sensitive to erratic movements at the end of the sample. This suggests that the optimal length of the forecast horizon is needs to be studied further.

potential output as estimated by the PF approach. Further research would also be appropriate to decide whether such an approach could be fruitful or not for all member states¹².

4. The state of play in the acceding countries and the method to be used

All acceding countries presented their methods presently used for output gap and potential growth calculations. Based on their presentations, the material provided and the discussion, three conclusions were reached:

- the HP filter method can be used for all acceding countries;
- seven of ten acceding countries have applied the PF method;
- the difficulties in applying the PF method raises from three issues: firstly, the lack of sufficiently long time series, additionally distorted by a lot of data revisions connected with adjusting of statistical system especially on capital stock; secondly, inability to apply Kalman filter for NAWRU estimates; and thirdly, problems in identifying the TFP trend due inter alia to the "catching-up" effect or FDI effects on TFP for small open economies.

Despite the scarcity of data in these countries, the Commission was able to present a note suggesting that the PF approach could be used for all 10 acceding countries using a simplified method to derive NAWRU estimates, a stochastic trend model to estimate the TFP trend as opposed to the deterministic approach used for the existing Member States, in some cases an assumption about the initial level of capital/output ratio and 1995 as a common starting date.

Due to the remaining difficulties caused by the lack of sufficiently long time series in applying the PF method for the acceding countries, especially related to the estimates of NAWRU and capital stock, the EPC concluded that for the moment, both HP and the PF method should be used in parallel for calculating output gaps in these countries.

5. Conclusions and recommendations

Potential output and the output gap are important concepts for assessing the economic outlook and the stance of macroeconomic policies. As shown in the first report of the OGWG the production function approach devised by the Commission aimed at an appropriate balance between the objective of strengthening the underlying economic analysis and the requirement of maintaining transparent and equal treatment of Member countries. Therefore, it has been used as the reference method for most countries over the past two years. Of course, caution and judgment must be exercised in the interpretation of such cyclically adjusted data.

Implementation of this method has also shown that some methodological refinements are worthwhile to be adopted, regarding especially NAWRU estimates. Several of them have been identified, as highlighted in section 3, and could be applied for the next set of stability and convergence programs in 2004: removal of the zero mean sample for NAWRU estimates, use of hours worked data as soon as Eurostat estimates are available, focus on the private sector as soon as the public sector employment series for all member states become available by the Eurostat.

¹² For many countries, the available information is restricted to the manufacturing sector.

On the country specific problems linked to the production function approach, with the caveats mentioned in section two, EPC considers that the PF method could be applied in autumn 2004 also for Germany, Spain and Austria. For Austria and Germany, the PF method will be used as the reference method and the HP filter will continue to be used as a back-up method during a transition period. For Spain, both methods will be used in parallel until results have become more stable.

The EPC welcomed the efforts by the new Member States to apply, to the extent possible, the production function method to the estimation of output gaps. Taking account of the remaining difficulties caused by the lack of sufficiently long time series, the EPC considers it appropriate to use, for the time being, the HP and PF methods in parallel for these countries.

The EPC decided in May 2003 that, before embarking on the second step, the group would report back to the EPC in early 2004. On the basis of the suggestions by the working group and progress achieved, the EPC considers that the efforts to improve the production function method should be continued as suggested by the working group. Moreover, the future work should be focused on settling open issues on the linking of output gaps and cyclically adjusted budget balances and their use to assess fiscal policies. Preliminary work should be presented by October 2004 so as to enhance the assessments of the next stability and convergence programmes.

In concluding, the EPC would like to convey its high appreciation of the openness and the strong co-operation efforts provided by the Commission staff (DG ECFIN), as witnessed by the extensive and high quality background work that was shared with members of the working group.