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Comment on: Christoph Meister und Bart Verspagen, "European Productivity Gaps: Is R&D the Solution?"

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Christoph Meister and Bart Verspagen raise the question of whether R&D is *the* solution to productivity gaps in European manufacturing sectors relative to the U.S.A. Here we must be careful, because the correct answer depends on the precise reading of that question. Literally speaking, their answer is no. It is not *the* solution that can do the trick on its own. In a less literal sense, the answer could also be yes. The lower level of R&D is certainly *one* important cause for the European backlog in productivity relative to the U.S.A.. In conclusion, the Barcelona target of raising R&D levels to 3% of GDP appears both unrealistic and insufficient, but, as the paper shows, it is not misguided towards an invalid target. There are strong links between R&D and productivity growth and the general validity of the Barcelona target is demonstrated. The paper thus underpins the need for structural policies that are directed at the microeconomic sources of productivity growth, complementing the traditional focus on macroeconomic stability.

There are several distinctive features of your paper that I fully endorse. One of its major strengths is the comprehensive coverage of three different links of R&D to productivity, encompassing not just (i) the direct effects of own sector R&D, but also (ii) domestic indirect R&D from other sectors, and finally (iii) indirect R&D from international trade of goods. A second distinctive strength, which originates in a previous work of Bart Verspagen, is the use of co-classification of patents as weighting scheme for indirect R&D stocks in your technology flow matrice. I find that to be a very intriguing approach to capture a horizontal kind of spillovers as opposed to vertical supplier-relationships.

Another distinctive feature of your simulation model needs more explanation in order to avoid some confusion about the concept of Total Factor Productivity. In aggregate studies the standard approach is to adjust labor productivity by increases in the use of physical capital per worker and the upgrading of human capital so that TFP is somehow interpreted as a costless increase in output. In contrast, you define

TFP growth not as a residual, but positively as the sum of the above three R&D components weighted by their output elasticities. So your estimation follows the typical specification of the production function in microeconometric studies on the returns of R&D but additionally takes account of indirect spillover effects. The advantage is of course that TFP is no longer costless (like manna from heaven) but results from purposeful investment in R&D (either by oneself or by others).

What remains problematic, however, is to proceed in your analysis *as* if R&D were the only source of TFP growth. It is easy to imagine other, non-R&D related sources of technological progress. One example are smaller, incremental improvements that are not directly related to a formal R&D process and therefore not covered by the statistics. Second, and, even more important, investments in human capital can be expected to affect an economy's capacity to absorb domestic as well as international spillovers and thus the TFP growth rate. The upshot is, your model operates under the assumption that R&D is the only source of TFP growth. But interestingly, your simulation results show that even when the EU overtakes the U.S.A. in terms of R&D stocks, it will not be sufficient to close the current TFP gap.

More generally, I also wonder what the benefits are of your simulation compared to an outright econometric approach, where one estimates the output elasticity and then calculates the counterfactuals for the general as well as the focused rise in R&D expenditures according to the Barcelona target. Furthermore, I consider that multiplying the level of R&D stocks in low-tech industries by a factor of 11.4 is no more "illustrative" (as you claim) than it is unrealistic and implausible (as you admit in the paper). The problem is, that you implicitly assume an extreme endogeneity of innovation output. But under any realistic assumptions, and especially for low-tech industries, we must expect exogenous limitations of technological opportunity and thus of an industry's propensity to turn additional R&D into successful innovations (even if we include compensation for spillovers by the community).

Next, I want to put forward a few quibbling details: The first one is with respect to chart 1 – I find the three dimensional chart of Kernel density somehow missing its purpose. On the one hand it is difficult to read. Three dimensions and the frequency distribution of a ratio scale is quite confusing. On the other hand, I also want to know more, e.g. which sectors appear at what ends of the distribution, or how robust these gaps are over time. Maybe a summary table could provide more and better accessible information. Another quibbling question is about chart 2, in which you show slight but persistent difference in the R&D to GDP ratios between the 4 large EU economies (Germany, France, United Kingdom and Italy) and the EU total. Might not that be an indication for some scale effects of R&D in the sense of the "old" new-growth models – implying that large economies (or an integrated economic area) internalises more spillovers? (Of course, an alternative explanation might be the large size of the defense sector). I also recall that the

current slow growth performance in the EU since the second half of the1990s is frequently attributed to the bad performance of its largest countries (except the United Kingdom but Germany and Italy in particular) – i.e. those that do more than average R&D. Finally, with respect to table 2 I must say that I critically missed any detailed discussion of the empirical coefficients that you use in the simulation.

At this point, I finally want to mention a new study undertaken by the National Institute in London and the Groningen Growth and Development Center, which deals precisely with the sources of EU productivity growth,[1] fitting perfectly to our focus in this session. Among the many empirical results of that study, I briefly report the following:

1. Their estimates for the gap of the EU relative to the U.S.A. in terms of labour productivity per hour worked in the year 2002 is 92%, which is quite different from the official EUROSTAT estimate of 87% (they say that this is due to the methodological differences in measuring U.S.A. labor input). This gap has increased: In 1995 the ratio was 96% and in 2000 it was 94%.

2. The main message of the report is that the growth slowdown of the EU and the widening productivity gap since the mid 1990s cannot be fully understood without adopting an industry perspective. To be precise, they say that the acceleration in US labour productivity growth from the mid 1990s is heavily concentrated in industries that either produce or intensively use the new information and communication technologies. The EU has not experienced the same growth spurt in these sectors and poorer performance is most apparent in ICT intensive using service sectors. They conclude that the U.S.A. is now dominant in high technology industries in manufacturing and intensive ICT users in services, while the experience in both regions is more similar in the other "non-ICT" industries, which generally experienced decelerating growth.

[1] O´Mahony, M., van Ark, B., EU productivity and competitiveness: An industry perspective. Can Europe resume the catching up process?, European Community, December, 2003.