Response letter, Referee No 1.

"The Growth Effects of R&D Spending in the EU: A Meta-Analysis"
AU: Ari Kokko, Patrik Gustavsson Tingvall, and Josefin Videnord

Dear Referee No. 1,

Thank you very much for your insightful comments. We realize that we will need to be more careful in our discussion and explain more precisely what the objectives of the paper are. Below, please find detailed responses to your six comments.

1. You note that our data set does not distinguish between private and public R&D and that our explanation for the differences between the EU and the US does not fit the data.

Answer:

It is correct that the data set does not include any information on shares of private and public R&D. However, we will emphasize in our revision that the explicit objective of the meta analysis is to examine whether the link between R&D and growth in the EU differs from that for other countries. The result is that this link seems to be weaker in the EU than in the US. We need to make it clear that our analysis cannot identify the specific reason why the relation between R&D and growth is stronger in the US. However, we report what is said in recent literature about the differences between the EU and the US in order to highlight some possible explanations.

2. You call for a much deeper discussion "about the combination of underlying effects" that could explain the differences between the EU-15 and the US.

Answer:

We acknowledge that our survey of the literature on the growth effects of R&D is not complete, and that there is reason to add some further discussion about how various combinations of country characteristics may interact in influencing the efficiency of R&D. We will try to add some further references to this type of effects. At the same time, we would like to stress that it is not the objective of the current paper to identify the specific reason why the results for the US are stronger. As proposed by other commentators, however, this could be the theme of a follow-up paper.

3. The negative effect in your meta-regression on the EU-15 could be driven by publication effects which are typically larger in the US-literature. I would therefore strongly recommend controlling for publication biases and also for impact factor of the journals in which the studies have been published.

Answer:

Publication bias using tools such as Begg's funnel plot etc. is probably the most frequently analyzed question within the field of meta-analysis. Whether publication bias in studies analyzing economic growth and R&D is larger in US studies is an interesting suggestion that we haven't seen analyzed. To

tackle this issue, we will analyze distributional differences across US and non-US studies.

The question of journal impact factor is interesting. We cannot, however, immediately see how controlling for impact factor would strengthen the meta-analysis of R&D and growth. Browsing the impact factor for the top 20 **e**conomics journals, the impact factor seems to favor specialized journals (see e.g. rank 12, 13, 14 below).

However, we do agree with the referee that a closer inspection of the distribution of t-values for US and non-US studies can strengthen the analysis. We will try to tackle this issue in the revision of the paper.

Ranking of top 20 Economics journals according to impact factor
1 Journal of Economic Literature: 6.919
2 Quarterly Journal of Economics: 5.647
3 Journal of Financial Economics: 4.020
4 Econometrica: 4.000
5 Journal of Economic Geography: 3.937
6 Journal of Political Economy: 3.841
7 Journal of Finance: 3.764
8 Review of Environmental Economics and Policy: 3.645
9 Journal of Economic Perspectives: 3.557
10 Economic Geography: 3.452
11 Experimental Economics: 3.300
12 Journal of Economic Growth: 3.083
13 Value Health: 3.032
14 Review of Economic Studies: 2.904
15 Pharmacoeconomics: 2.612
16 Journal of Accounting & Economics: 2.605
17 Journal of Environmental Economics & Management: 2.581
18 Review of Economics and Statistics: 2.555
19 American Economic Review: 2.531
20 Ecological Economics: 2.422
http://www.socialcapitalgateway.org/content/ranking/ranking-economics-journals-based-impact-factor

4. You only rely on meta-regressions having the t-value as the dependent variable. Why do you not work with std. effect sizes? It slightly changes the results and is of much more interest than t-values.

Answer:
We have chosen to follow the traditional route of meta-analysis using t-values as the dependent variable. One advantage of the t-value is that it provides a dimensionless statistic.

See e.g. Cipollina, M. and Salvatici, L. 2010. Reciprocal trade agreements in gravity models: a meta-analysis, *Review of International Economics*, 18, 63–80.
Stanley T.D. 2008. Meta-Regression Methods for Detecting and Estimating Empirical Effects in the Presence of Publication Selection. *Oxford Bulletin of Economics and Statistics*, 70**(**1), 103-127.

We can, of course, perform an analysis on the standard errors as a stability test.

5. A problem in your regressions and by interpreting the results may be the fact that your reference group of main interest is the "US", i.e. one country. The effect of interest may be therefore driven randomly (this is the reason why your theoretical explanation is that important), for example by the fact that the US was a lead country in many innovations and invention during industrialization up to the 1950s. Such pathdependency may also explain why R&D spending is more effective. But it tells us a different story: It happened in the past and has nothing to do with current policies/regulations/mechanisms.

Answer:
In the analysis we can only analyze significance of the relation between R&D and economic growth, controlling for study characteristics included in the studies.

The underlying reason for the observed difference is, to some extent, an open question. Indeed, the historical lead of the US as an innovating nation may be one factor explaining the results. We agree with the referee that we can extend the discussion and incorporate the influence of history more explicitly.

6. You suggest that it would be useful to add some moderators to the data set to explore which interactions (e.g. related to shares of private and public R&D) might explain the country effects. Moreover, you propose adding interactions with time to examine how the "US effect" changes over time.

Answer:
As noted in our response to comment no. 2, we see the analysis of interaction effects as an interesting theme for a follow-up study focusing on the comparison between the US and the EU. Looking at the broader sample of countries, however, it would be difficult to collect a comprehensive data set with identical coverage. We welcome the comment regarding the interaction with time, and will add that to the analysis.