R&D and Growth in the EU versus the US

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Kokko, Tingvall, and Videnord (2015)—KTV—discuss many potential reasons for their meta-analysis finding of a stronger response of economic growth to R&D in the U.S. as compared to the fifteen countries (EU15) joining the European Union before 2004. An interesting follow-on paper could create, within the meta-analysis itself, hypothesis tests for the proposed reasons. Insight might be gained by developing measures for hypothesized forces underlying the differences in the strength of the R&D-growth relationship. Then—in place of fixed or random country (or economically integrated group of countries) effects—variables embodying those measures would be used in the meta-analysis framework to examine the forces that may explain the different effects for the U.S. versus the EU15. In a meta-analysis more generally, such variables could be used to explain country effects in the R&D-growth relation, but for the KTV finding, the interest is in understanding the difference between the EU15 and the U.S.

Differences across countries in general, and in the present context between the EU15 and the U.S., would be measured by a wide range of hypothesized sources of variance in the R&D-growth linkage, from broad, overarching ones, such as the relative importance of market forces versus government planning, to more detailed, focused ones, such as the effectiveness of public-private partnerships for metrology standards traceable to national or international standards. KTV adduce many potentially important, broad characterizations of a country's ambience for R&D and economic growth—characterizations that may underlie the difference between countries, or one country in comparison to a group of economically integrated countries, in a meta-analysis. A non-exhaustive list—indeed, just a few—of the characterizations suggested by KTV and other recent papers are used herein to illustrate measures that might be used in a meta-analysis.

For the sources of differences among countries, and economically integrated groups of countries, in the R&D-growth relationship, KTV point toward many reasons such as the extent of market forces, absorptive capacity, openness, financial markets, entrepreneurship, institutions, and national innovation systems encompassing public-private partnerships joining academia, industry, and government. A rich and growing literature informs the understanding of these important factors, and, in principle, countrywide characterizations for them could be developed and aggregated when needed to characterize an economically integrated set of countries like the EU15. Spulber (2015) emphasizes the importance—for a country's R&D direction and economic growth—of the extent of market forces as contrasted with government planning. Aghion and Jaravel (2015) emphasize the economy-wide level of absorptive capacity (Cohen and Levinthal, 1989; Cohen and Levinthal, 1990) as an important reason for differences across countries in the R&D-growth relationship. Aghion and Jaravel also observe that variance in the openness of the innovation process will affect the direction, pace, and growth effects of R&D. Comin and Nanda (2014) link a country's financial market development to the diffusion of capital-intensive technologies early in the period of adoption for the technologies. Link, Siegel, and Wright (2015) examine the processes—including academic entrepreneurship—whereby new technologies and economic growth emerge from universities.

Entrepreneurship more generally is among a country's broad characteristics conducive to R&D and economic growth. Thus, among the measures needed for testing hypotheses about country—and economically integrated groups of countries—effects within a meta-analysis would be a measure of each country's or set of countries' orientation toward and support of entrepreneurship. As KTV observe, cross-country differences in the R&D-growth relationship could be driven by differences in the effectiveness of public programs aimed at stimulating entrepreneurial activity. Studying the Small Business Innovation Research (SBIR) program in the U.S., Audretsch, Link, and Scott (2002) emphasize that public support for research by small businesses can overcome market failures and result in innovations and growth that would not occur without the public support. Link and Scott (2013), controlling for the counterfactual growth that would have occurred without public subsidy and using instrumental variables

to address the endogeneity issue, find that the employment growth created by the public's SBIR subsidies of R&D in small firms is greater when outside investors provide additional R&D funding and when large amounts of intellectual property are created by the publicly subsidized R&D projects. They also find that growth is greater when there are commercial agreements with other firms to support the entrepreneurial activities. Countries may differ in the availability of public funding for the R&D of small businesses, in the availability of outside finance to augment the public funding, and in the intellectual property regime within which small businesses work.

Scott and Scott (2015a) find that early stage outside finance to support the development of entrepreneurial ideas is more difficult to obtain when the ideas are complex. Moreover, they find that success with early outside finance for R&D appears to increase the chances for securing agreements with other firms to support development, production, and marketing of the innovations resulting from the entrepreneurial venture. So, another measure for differences across countries that might affect the relation between R&D and economic growth would capture the variance across countries in the early-stage outside financing available to entrepreneurs with complex ideas.

Infrastructure technologies that enable effective R&D and innovation are important for economic growth. Scott and Scott (2015b) introduce new methodology to evaluate the importance—for R&D investment's value—of public-private partnerships to provide metrology standards traceable to national or international standards. They find that R&D investment and the value of R&D are increased substantially by partnerships—among firms and between industry and government laboratories—to create an effective system of metrology standards.

Some countrywide characterizations important for understanding the R&D-growth relation, such as the amount of competition in R&D investment, may require very detailed work at the industry level before the aggregation to the country or set-of-countries level. One could in principle formulate broad countrywide characterizations based on detailed information about an economy's industries where the forces being measured are thought to be important. Depending on circumstances such as whether competitive pressure is perceived by firms as exogenous or endogenous and the extent of the strategic substitutability of rivals' R&D investments, Scott and Scott (2014) show that

competition will have very different effects on R&D and hence subsequent innovation and economic growth. They show that R&D efforts can be high at both low and high levels of structural competition. Over the various levels of structural competition, in addition to the often-discussed inverted-U relation, there may also be a U relation, so the R&D-competition relation can be two-peaked. The individual industry measure of R&D-conducive competitive conditions would provide an evaluation of each industry to determine if competitive conditions are conducive to high or low R&D, and either outcome could be the result for very different amounts of structural competition. The individual industry measures would then be aggregated to characterize a country's competitive conditions for R&D. Developing a country-level, economy-wide characterization of such competitive circumstances would require an aggregate, summary measure of competition that weights industries' measures by their importance for the country's overall R&D-growth relationship.

The list here is not at all exhaustive, but instead is just a brief list based on areas I have been exploring in my own research. It uses some recent studies to point toward the possibilities for developing measures for differences across countries in the forces hypothesized to be important for the R&D-growth relationship. The list could be expanded and modified, further combining the insights in KTV's discussion with the perspectives of others doing research linking R&D to innovations and growth. With the list can come suggestions for measures capturing differences across countries and groups of countries in forces expected to strengthen the relation between R&D and growth.

In general, country effects in a meta-analysis model of R&D and growth could be replaced with variables embodying the measures that would describe the variance across countries in the prevalence of market forces versus government planning, in the effectiveness of public policies to correct for externalities, in absorptive capacity, in openness, in financial market development, in public-private partnerships for traceable metrology standards, in entrepreneurship and public support for entrepreneurship, and in the extent of R&D-conducive competition. These and other suitable variables could be used in the meta-analysis to test hypotheses about the forces underlying any differences in observed country effects, or as in the present study, differences between one country and an economically integrated set of countries.

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