Comments on "A replication of 'Education and Catch-up in the Industrial Revolution'"

This paper faces a natural tension of any replication, which is between (a) just replicating and then demonstrating the robustness or not of the particular results to alternative empirical choices (e.g. sample, technique, etc.) and (b) getting to the best possible specification for the phenomena at hand.

I think the pure replication paper is nice, illustrates clearly and cleanly the point which is that variables which were excluded from the regression were correlated with the included and instrumented variable of education and hence the inclusion of those variables changes the fundamental result of the paper that education was positive for industrialization in Prussia.

However, this paper could be (and should be) about half as long as the current paper. In particular, from the replication point of view the whole "general to specific" bit to come up with the "ideal" or "best" specification for industrialization across counties is irrelevant. That is, this is about coming with the best empirical specification of the industrialization by county for 1849 and 1882. This is, however, irrelevant to the replication point. That is, the paper now improves on the original published paper in two ways.

One is that it includes variables that were excluded in BHW (particularly the province dummies) and shows the inclusion of these variables changes the main result and flips the coefficient on the instrumented variable of education in 1849 from positive .182 (1.1 and 1.2 of Table 1) to -.204 (3.1 in Table 3). However, the "improvement" in the specification by using the general to specific is an "improvement" in a statistical sense but makes the replication point less clear. For instance, in Table 3 you drop "paved roads in 1815" from the 1849 regression. Fine, if these were a paper about Prussian industrialization, good riddance, I am sure that improves the fit by some criteria as it was insignificant in Table 1 anyway. But, *in a replication paper* what I want is a Table that is 1.1 then 1.2 (to show exact replication) and then essentially a 1.3 which is *exactly* 1.2 *plus* some previously excluded variables (e.g. the province dummies) to show *precisely* why (in an mechanical econometric sense) the BHW results change.

And in this case in particular I think the pure replication paper is of more interest than the "best specification" paper as we really don't learn anything really dramatic and important and new from the "best specification" paper as, as I understand it, the real action in the replication paper comes from the addition of the province dummies. This makes econometric sense but not clear it adds that much economic intuition about the causes of industrialization.

So, upshot is, I would focus on the replication point and hence, unfortunately, lose most of the discussion of "getting to best specification" section and discussion as, from a replication point of view it muddies the water—and doesn't really add enough interest to justify a paper on its own (as it mostly seems to be dropping variables—in the 1849 regression--population shares, paved

streets, tonnage of ships—and adding some—distance to Berlin and London, Protestant share) which then not a ton of economic intuition is made of these findings.

Second big point. You want to be super clear about the proximate, mechanical, cause of the non-robustness of the main finding of the paper you are replicating. I found the write up a little unclear on whether this is a pretty straightforward case of (a) omitted variables bias or (b) whether this was that the instrument did not satisfy the exclusion restriction.

In Table 3 the issue really doesn't have anything to do with IV per se. That is, once we include the provincial dummies (and the distance variables?) the OLS coefficient is negative and the use of IV is kind of pointless (as we would have "expected" the OLS coefficient to *overstate* the causal impact due to the positive feedback channel from growth to education) and, sure enough, the IV coefficient roughly is the OLS coefficient. So in this case I want a table that is regressions 1.1 (BHW IV for 1849), 1.2 (your exactly replication), 3.1 (but only adding, not dropping variables which is your IV), 3.5 (which is your OLS) and the OLS regression of BHW (which is now missing from the paper). I think this will show that the BHW OLS had a large positive effect which persisted when education was instrumented. But the comparison of 3.5 and the BHW OLS regression will show the main problem was omitted variables bias (variables that were excluded and which caused the OLS coefficient to be overstated) and that doing IV did not "fix" the OVB because the instrument was also correlated with the omitted variables and hence the IV coefficient also had an upward bias (loosely speaking).

Then for 1882 I would want the table 1.3, 1.4, then 5.1 (but again, same specification plus), then the OLS of BHW for their specification and then 5.5. In this case it gets more interesting as the OLS even with the included variables suggests education is positive (so all of the action is not in OVB per se) and then IV with BHW doesn't eliminate this and shows education positive whereas IV with the included variables (modified 5.1) eliminates the impact.

Then the other tables show (a) the sub-sectoral pathways (3.2, 3.3, 3.4, 5.2, 5.3, 5.4) and then (b) tables 4 and 6 show the lack of education in the instrumented BHW equation plus the additional variables is not due to extreme or influential observations.