

Comparing Apples to Oranges: Reply

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This very useful and informative comment by Anders Sørensen questions the practice of using expenditure-based, aggregate PPP conversion factors to make income or productivity comparisons across countries at the sectoral level. Sørensen suggests an easy-to-implement consistency check for the appropriateness of this approach: (relative) productivity levels should be invariant to the base year chosen for making the conversions. With respect to the comparisons in Andrew B. Bernard and Charles I. Jones (1996), Sørensen then documents that this consistency check fails for the manufacturing sector. Therefore, the finding of a lack of convergence in manufacturing by Bernard and Jones is called into question: we simply do not know what is going on in manufacturing because we do not have the appropriate conversion factors.

The way in which the consistency check fails for manufacturing is interesting. According to Figure 2 in Sørensen's comment, productivity comparisons made using early base years suggest no evidence of convergence, while comparisons made using later base years suggest convergence. Moreover, the later the base year, the stronger is the evidence of convergence in the manufacturing sector.

What is the underlying cause of the problem in manufacturing, and why do the results change systematically as the base year advances? Consider the calculation of measured productivity levels relative to the United States for the manufacturing sector when the conversion factor is the PPP for GDP as in the original Bernard and Jones paper. In this case, the measured relative productivity level in manufacturing will differ from the true

relative productivity level by the relative price of manufacturing to GDP in the base year (normalized to be 1 in the United States). For measured relative productivity levels to change with the base year, this must mean that the relative price of manufacturing to GDP is changing differentially across countries, in a systematic way.

From the beta convergence results in Sørensen's Figure 2, we know the correlation of growth rates and initial levels becomes more negative as the base year moves forward in time. This could happen, for example, if the initial levels of countries with the highest growth rates are falling as the base year rolls forward, and vice versa. From Table 1 of Bernard and Jones (1996), we see that the fastest labor productivity growth is in Japan and the slowest is in Norway. So to understand the systematic tendency for measured convergence in manufacturing to strengthen as the base year advances, we must have, for example, the relative price of manufacturing to GDP falling faster in Japan than in Norway. But since productivity in Japan is growing faster, that is not surprising: according to Balassa-Samuelson logic, a rapidly declining relative price of manufacturing and rapid labor productivity growth in manufacturing are two sides of the same coin.¹

Another point made by the comment but worth emphasizing is that simply because a set of conversion factors passes the consistency check does not mean that the conversion factors are valid. As an extreme example, suppose that all sectoral data were incorrectly deflated by individual countries using the GDP deflator and that the PPP conversion factor used was also based on GDP. The consistency check would obviously pass perfectly, but the underlying conversion factors would still be flawed.

The clear implication of this comment is that future research is needed to construct conversion factors appropriate to each sector, and that research relying on international comparisons of sectoral productivity and income should proceed with caution until these conversion factors are available.

References

Sørensen, Anders. “Comparing Apples to Oranges: Comment,” *American Economic Review*, forthcoming.

Bernard, Andrew B. and Charles I. Jones. “Comparing Apples to Oranges: Productivity Convergence and Measurement Across Industries and Countries,” *American Economic Review*, December 1996, *86* (5), 1216–1238.

Footnotes

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1. In private communication with us, Anders Sørensen provided additional evidence supporting this hypothesis. Following the reasoning above, one can use the difference between (log) productivity measured with 1993 as the base year and with 1970 as the base year as a measure of the percentage change in the relative price of manufacturing. Sorenson documented a sharp negative correlation between labor productivity growth and this measure of the relative price change in manufacturing.