

# Trade in capital goods

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**Abstract**

Innovative activity is highly concentrated in a handful of advanced countries. These same countries are also the major exporters of capital goods to the rest of the world. We develop a model of trade in capital goods to assess its role spreading the benefits of technological advances. Applying the model to data on production and bilateral trade in capital equipment, we estimate the barriers to trade in equipment. These estimates imply substantial differences in equipment prices across countries. We attribute about 25% of cross-country productivity differences to variation in the relative price of equipment, about half of which we ascribe to barriers to trade in equipment. © 2001 Elsevier Science B.V. All rights reserved.

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Since we find geographic barriers to trade in capital equipment to be quantitatively important, they deserve some further discussion. These barriers might reflect costs arising from: (i) marketing overseas, (ii) negotiating a foreign purchase, (iii) transporting goods to foreign locations, (iv) tariffs, (v) non-tariff barriers, (vi) distributing goods in foreign markets, (vii) adapting equipment to foreign conditions and standards, (viii) installation in foreign production facilities, (ix) training foreign workers to use the equipment, and (x) providing parts, maintenance, and customer service from abroad.

Each of these factors raises the cost of buying and using imported equipment, but only some of them would show up in standard measures of the price of equipment. Our approach is to infer the full cost as revealed by where countries buy their equipment. Our trade-based measures of equipment prices allow us to quantify many of the barriers (both self-inflicted and natural) to adopting foreign technology that have been modeled by Parente and Prescott (1994, 1999), Romer (1994), Holmes and Schmitz (1995), and Acemoglu and Zilibotti (2000), for example.

Our trade-based measures of equipment prices fall quite systematically with development. We estimate equipment to be cheapest in Germany, Japan, the United Kingdom, and the United States, the four major producers. At the other extreme, we estimate equipment to be more than 3.5 times as expensive in Egypt, Iran, Kenya, Morocco, Nigeria, and Zimbabwe.<sup>5</sup> In combination with differences in consumption goods prices (which are systematically higher in developed countries), North-South differences in the relative price of equipment are even more pronounced.

What do our trade-based measures of equipment prices imply for productivity differences? Using a share of capital of 1/3 (split equally between equipment and non-equipment capital), we find that differences in the relative price of equipment account for over 25% of productivity differences between developing and developed countries. We attribute a bit less than half of this 25% to differences in our measure of the price of equipment itself, with the remainder due to differences in the price of consumption goods (as measured by the United Nations International Comparisons Programme, ICP).<sup>6</sup>

We can summarize our discussion so far with seven apparent facts extracted from various data sources:

1. According to production data, a small group of R&D intensive countries are the most specialized in equipment production.
2. According to trade data, poor countries import much of their equipment, most of which comes from just a few large exporters.
3. According to trade data, equipment is traded more than manufactures as a whole, yet this trade still displays home bias and other effects of geography.
4. According to national accounts, in local prices, equipment investment as a share of GDP shows little relation to development.
5. According to ICP measures, the price of equipment relative to the price of consumption goods declines dramatically with development, so that, in combination with fact 4, poor countries appear to have a lower real investment rate.
6. According to Gordon (1990), the relative price of equipment in the United States has declined dramatically over time.
7. According to the ICP, the price of equipment itself is slightly lower in poor countries.

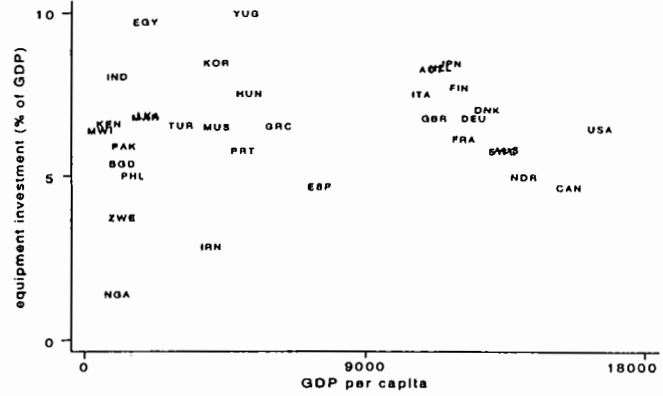


Fig. 4. Development and the savings rate.

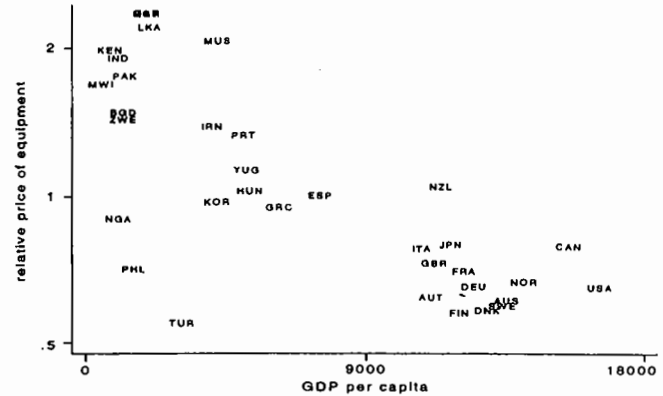


Fig. 5. Development and the relative price of equipment.

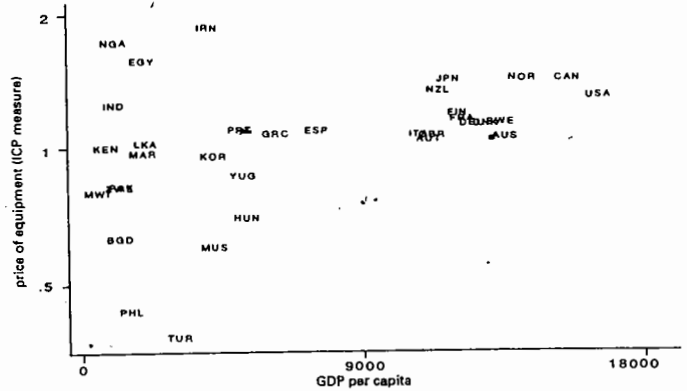


Fig. 6. Development and the price of equipment.

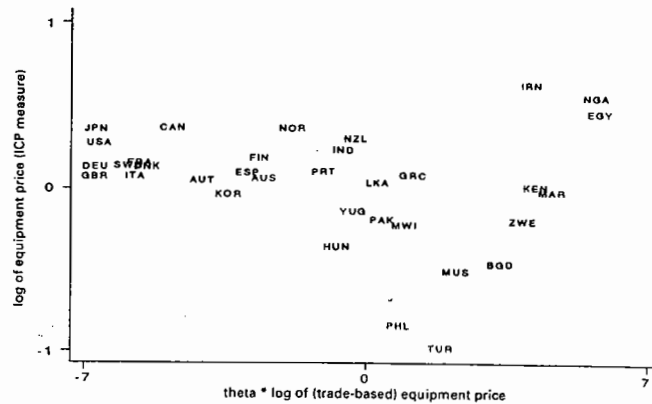


Fig. 7. Equipment prices as predicted and from the ICP.