Editorial

International comparisons of pharmaceutical prices: what do we know, and what does it mean?

In their article in this issue of the Journal of Health Economics, “Cross-National Price Differences for Pharmaceuticals: How Large, and Why?”, Patricia Danzon and Li-Wei Chao report on research suggesting that, contrary to conventional wisdom and previously published research, prices of pharmaceuticals in the US are not much higher than in other developed countries. The findings reported in previous studies, they argue, are biased because they rely on unrepresentative samples of drugs and employ unweighted index number procedures.

The Danzon–Chao (hereafter, DC) study is complex and deals in great detail with the relatively esoteric nuances of price index construction. A thorough assessment of the issues raised explicitly by DC, as well as those suggested implicitly, could easily take twice the length of the original DC article. Any editorial must, by necessity, be much shorter than such a detailed assessment. Thus, in interpreting the provocative findings from this important, useful and informative article, I believe it useful here to focus on but four sets of issues.

The first concerns price index construction procedures. The economic theory of index numbers provides a set of criteria that allows us to distinguish and identify preferable from less preferable price index number construction procedures. DC are correct in pointing out that most previous research on international comparisons of pharmaceutical prices has employed procedures that do not stand up to close professional scrutiny: the products sampled are unrepresentative, the samples are much too small, and frequently the price indexes are simple unweighted means.

However, DC find that when one employs several alternatives among the set of more preferable price index construction procedures, results vary dramatically depending on what weights one employs. Recall that in the context of bilateral price index construction, a Laspeyres price index with country $i$ as the reference country weights prices in countries $i$ and $j$ by country $i$'s quantities, whereas the corresponding Paasche price index weights both countries prices by country $j$'s quantities.
Editorial

quantities. DC find that for each of the six foreign/US bilateral price indexes (based on standard units rather than kilograms as the measure of quantity): (a) the Paasche price index is always less than unity (US more expensive); (b) the Paasche price index is always less than the Laspeyres price index; and (c) in two of six cases the Laspeyres price index is greater than unity (US less expensive).

Because prescribing patterns differ so greatly between countries, the bilateral aggregate price index comparison depends critically on which country’s prescribing patterns one employs as weights. How one chooses between them, however, is unclear yet critical.

The choice of molecule quantity measure also has a significant differential impact. For example, the US–Japan Laspeyres price index based on kilograms of active pharmaceutical ingredient as a measure of molecule quantity is 1.19 (Japan more expensive), whereas when one employs standard units (roughly, number of tablets regardless of strength) as a molecule quantity measure it is 0.88 (Japan less expensive). This reversal occurs because in Japan, patients frequently simultaneously take more different medications than in the US, but at lower strength per tablet than in the US.¹ But again, choice between these two measures of molecule quantity is not without ambiguity.

Additional evidence on the diversity of medical prescribing practices is reflected in the fact that even when DC define a molecule rather generally (treating all generic, branded, and over-the-counter formulations of a given molecule as identical across countries), for any bilateral US–foreign comparison in 1992, less than 60% of all molecules were dispensed in both countries (on average, only about 400 per country). Moreover, only 171 molecules were dispensed in all seven countries.

In short, even when DC employ theoretically preferable price index procedures, their conclusions on the sign and extent of aggregate price differences between countries depend critically on which country’s quantity prescribing patterns one prefers to employ as a weight.

It has long been known that small area variations involving surgical procedures occur both within the US and across countries.² Apparently, physician pharmaceutical prescribing behavior is also diverse across countries. This makes aggregate international comparisons of pharmaceutical prices problematic and inherently ambiguous.

¹ This occurs in part because Japanese physicians earn a substantial portion of their income from dispensing drugs in their offices.

The second issue concerns pricing in unregulated markets. In interpreting international price differences however measured, even with increasing globalization, international price differentials occur frequently among unregulated markets — often the “law of one price” does not hold. From time to time, for example, the Economist publishes its McDonald’s “Big Mac” price comparison. Its most recent one for 1999, published on April 3, 1999, indicates that in US dollars (at official exchange rates) international price differences reached 100%: Big Macs sold for $1.98 in Canada, $2.43 in the US (23% more), $2.44 in Japan, $2.72 in Germany, $2.87 in France, $3.07 in the UK, and $3.97 in Switzerland. In a recently published study, Abowd and Kaplan report that in 1996, the total compensation packages of chief executive officers, and of human resource directors, varied dramatically across OECD countries, with the US generally having the highest compensation. International dispersion in the prices of goods and services reflects a host of local market idiosyncrasies, including differential costs of doing business. For pharmaceuticals, marketing and distribution costs, licensing fees, and malpractice costs are likely to differ across countries.

Third, within the context of the practice of medicine, there is ample empirical literature documenting international price differentials (not just expenditure differentials) for largely non-pharmaceutical health services (One should of course be cautious of findings, given notorious difficulties in making apples-to-apples comparisons). Fuchs and Hahn, for example, examined 1985 US–Canada differentials on physician expenditures per capita, and concluded:

...the higher expenditures per capita in the United States are explained entirely by higher fees; the quantity of physicians’ services per capita is actually lower in the United States than in Canada. US fees for procedures are more than three times as high as Canadian fees; the differences in fees for evaluation and management is about 80%.

In another study by Redelmeier–Fuchs, substantial US–Canada differences in costs per hospitalization were found (hospitals in the US were 24% more costly per adjusted admission than in Canada). These differences have been analyzed further by Haber et al.

---

7 It would be useful to update studies such as these, to assess the effects of managed care efforts.
Economic theory tells us that when firms have market power (such as the patent protection given an innovative pharmaceutical), optimal pricing depends in part on consumers' valuations of the product. To the extent innovative medical procedures or pharmaceuticals allow patients to go back to work more quickly following treatment, the value of such a benefit will depend in part on local wage rates. Other things equal, the innovative product will have a higher valuation in those markets where wages and salaries are highest. Per capita income is relatively high in the US. Moreover, to the extent innovative medical procedures or pharmaceuticals save on physician visits or hospitalizations, the avoided costs will be larger the greater are the costs of a physician visit, or a hospitalization, and thus the greater the value of the product. The economic value of innovative products that substitute in part for physician visits and hospitalizations is, therefore, generally larger in the US than elsewhere, for the avoided costs are larger.\(^8\)

In this context, it is of interest to examine cross-country differences in the share of total health care expenditures devoted to pharmaceuticals, as reported by the OECD. In 1997, this share was lowest for Switzerland at 7.7%, second lowest for the US at 10.0%, 12.3% in Germany, 13.8% in Canada, 16.7% in the UK, 17.2% in France, 19.4% in Italy, and 21.2% in Japan.\(^9\) Why is it that if pharmaceutical prices are highest in the US, their cost share is so low? Although this pattern in shares has a variety of interpretations, if one believes that pharmaceutical prices are higher in the US than elsewhere, then it may well also be the case that relative US–foreign non-pharmaceutical health care service prices are even greater in the US than those for pharmaceuticals.

The fourth and final issue concerns impacts of price regulation. While there are many reasons one would expect international price differentials for goods and services to occur in largely unregulated markets, in pharmaceuticals national regulation of prices plays a very prominent role. Although patterns of price regulation vary by country, a not uncommon phenomenon is that a country grants pharmaceutical manufacturers some latitude in setting the price for a newly launched product, and that manufacturers often launch the product at roughly similar prices throughout the developed world. However, post-launch price increases are frequently prohibited (even after major exchange rate movements, although only Canada allows price changes up to CPI inflation) and instead price decreases are often mandated as the product ages. Thus post-launch price regulation by national health authorities in many countries generates US–foreign pharmaceutical price differences that increase as products age, consistent with DC findings. Since it frequently takes a number of years before a new product becomes a leading selling one, it is, therefore, not surprising that US–foreign price

\(^8\) The role of arbitrage and parallel imports in doing away with international pharmaceutical price differences is a most interesting issue, but beyond the scope of this editorial.

comparisons based on only leading selling molecules frequently exhibit greater US prices than do ones including non-leading selling molecules. Further, since in many regulated systems mandates typically imply that prices of branded products fall as they age, at the time of patent expiration the foreign brand price is relatively low compared to the US, and thus, incentives for substituting to generic drugs in these highly regulated countries are much lower than in the US, consistent with the DC evidence.  

DC clearly demonstrate that some measures of price comparisons are preferable to others, due to bias. But the DC article also reminds us of the importance of medical practice variations across countries as a source of differences in health care costs and prices. The resulting differences in quantity weights by country make simple interpretations of measured aggregate price differentials problematic. But there are many other factors that also potentially contribute to the international price dispersion of pharmaceuticals, of other medical goods and services, and of course, of non-medical goods and services. Vive la difference!

Ernst R. Berndt  
(Louis B. Seley Professor of Applied Economics)  
MIT Sloan School of Management,  
Cambridge, MA, USA  
Director Program on Technological Progress and Productivity Measurement,  
National Bureau of Economic Research, USA  
E-mail address: eberndt@mit.edu  
5 December 1999