

Paasche Says Progress

When economists debate economic stagnation, I routinely recall my undergraduate macroeconomics textbook, Dornbusch and Fischer's *Macroeconomics* (5th edition). In Appendix 2-1, these famed economists introduce readers to two main contrasting price indices: the *Laspeyres*, or base-weighted, and the *Paasche*, or current-weighted:

APPENDIX 2-1: PRICE INDEX FORMULAS

Both the PPI and CPI are price indexes that compare the current and base year cost of a basket of goods of *fixed* composition. If we denote the base year quantities of the various goods by q_0^i and their base year prices by p_0^i , the cost of the basket in the base year is $\sum p_0^i q_0^i$, where the summation (Σ) is over all the goods in the basket. The cost of a basket of the *same* quantities but at today's prices is $\sum p_1^i q_0^i$, where p_1^i is today's price. The CPI or PPI is the ratio of today's cost to the base year cost, or

$$\text{Consumer or producer price index} = \frac{\sum p_1^i q_0^i}{\sum p_0^i q_0^i}$$

This is a so-called *Laspeyres*, or *base-weighted*, price index.

The GNP deflator, by contrast, uses the weights of the *current* period to calculate the price index. Let q_1^i be the quantities of the different goods produced in the current year.

$$\begin{aligned} \text{GNP deflator} &= \frac{\text{GNP measured in current prices}}{\text{GNP measured in base year prices}} \\ &= \frac{\sum p_1^i q_1^i}{\sum p_0^i q_1^i} \times 100 \end{aligned}$$

This is known as a *Paasche*, or *current-weighted*, price index.

Comparing the two formulas we see that they differ only in that q_0^i , or the base year quantities, appears in both numerator and denominator of the CPI and PPI formula, whereas q_1^i appears in the formula for the deflator. In practice, the CPI, PPI, and GNP deflator indexes differ also because they involve different collections of goods.

While this may seem technical, much is at stake. Suppose a stagnationist belittles the economic importance of the internet. "So we get some free stuff. How much can it possibly shift official GDP calculations?" The answer: Tremendously. Why? Because calculations of real GDP use the GDP deflator, and the GDP deflator uses a Paasche price index.

Let's set our base year to 1990 - the very year my old textbook was published. Now consider Youtube. Its measured annual contribution to GDP is about \$15 billion. Relative to GDP, that's a pittance, right? But Youtube consumption is about 1.5 billion hours per day. Back in 1990, a typical video rental cost \$2.49. So even ignoring the massive increase in consumer choice and convenience, the annual contribution of Youtube measured in base year prices is $1.5B * \$2.49 * 365$. That's roughly \$1.4 trillion dollars. Paasche power!

The results for Google are even more dramatic. People run an average of 3.5 billion searches a day. Back in 1990, you would have been lucky to get comparable service for \$20 - perhaps by hiring someone to spend a couple hours pouring through the *Reader's Guide to Periodical Literature*. So while the value of Google's services in current prices is about \$100B a year, the value in base year prices comes to over \$25 trillion dollars.

You can see where this is going. If we sum the current revenue of the top internet companies, it's probably well under \$1T per year. However, if we sum the value in 1990

prices of the cornucopia they provide, it *easily* exceeds \$50 trillion a year. Yes, much of this consumption happens abroad, increasing Gross World Product rather than U.S. Gross Domestic Product. Yet using a Paasche price index, there's still no doubt that the GDP deflator has *sharply* fallen since 1990. That means decades of non-stop deflation. This in turn implies that real GDP has risen far more than almost any respectable economist will admit.

Switching to the Laspeyres price index naturally makes this stunning result go away. If we take 1990 output at today's prices and divide it by 1990 output at 1990 prices, we'll only see modest progress. A few sectors - like video rental - will basically vanish from the numerator, but they're only a small component of the denominator. For example, using a base-weighted index, the value of video rentals in 1990 at today's prices is roughly zero because video is now virtually free. But the value of video rentals in 1990 prices is also modest, because when video was \$2.49 a pop, total consumption was modest.

So which method of price indexation is correct? Once they understand what's at stake, dogmatic optimists will say, "Paasche!" Dogmatic pessimists will naturally answer, "Laspeyres, of course." I say both sides should be more broad-minded. Yes, there is a sense in which progress since 1990 has been modest. However, there is another *important* sense in which progress since 1990 has been astoundingly awesome.

If you don't remember 1990, the modern world is easy to take for granted. The rest of us, however, know - or at least ought to know - that modernity is a living miracle. Though we don't own fifty cars each, we still enjoy fabulous luxuries beyond of the budget of the richest residents of 1990. Stagnationists live to belittle these gains, but that's not science; it's perspective. Paasche points the way to a radically different yet equally scientific conclusion. The judicious approach, though, is not to pick a side, but to triangulate. Economic progress is complex. In some major ways, it's been slow; in other major ways, it's supersonic. And overall? Seems speedy to me - and not because I don't know the numbers.