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The Impact on Econometric Models of the Present Treatment of Smog and Safety Devices in Economic Statistics: A Comment

When theoretical models do not fit the data, the usual procedure is to revamp the theory; but sometimes the problem is less one of the theory not fitting the data, and more nearly one of data that are not appropriate to the theory. Problems that have emerged at several points during this conference lead me to raise the question of whether some of the price and output data being used in econometric models are constructed appropriately for the underlying economic behavior that is being modeled. In particular, builders of econometric models may need to consider carefully present policies concerning the treatment in the statistical series of legally mandated smog devices, safety equipment, and related phenomena. It seems quite possible that the present treatment is appropriate for some uses of the statistics, but not for others. For any econometric model that falls into the latter class, a predictive failure that may appear at first glance to involve a defect in the behav-

ioral or market relationships incorporated into the model may ultimately be traced to a measurement problem either in the data used as inputs or in the data the model is trying to predict.

Although many aspects of the treatment of smog and safety devices in the price indexes and in the national accounts have been carefully considered elsewhere (and need not be reviewed here), implications of their present treatment that are particularly relevant to the subject of this conference seem to have been overlooked in previous debate on the subject. Consider a machinery or vehicles component of the industrial price indexes for which safety or pollution-abatement legislation has required some costly additional equipment that buyers would not have specified had they not been compelled to do so (a long list can be made of such changes in recent years). Under present policy, the BLS treats such legislated changes as a quality improvement, and applies a quality adjustment based on the manufacturing cost of the change (whenever this data can be obtained). Thus, in the industry that experienced the legislated equipment change (call it "Industry A") price statistics will show no increase; and Industry A's output measures—which are usually obtained through deflation of a value aggregate by a price index—will rise by the value of the extra equipment.

At first glance, this seems a consistent treatment: Industry A has, after all, produced something (willingly or not), and used up resources that were required to add the mandatory changes. Treating this resource utilization as a quality change, it has been argued, preserves the measure of Industry A's output, as well as its productivity measures (which are unaffected by the change).

An alternative treatment (which was initially employed by the BLS for 1971 automobile smog-control devices—though later rescinded) is to refuse to allow quality adjustments for such changes, permitting any cost increases associated with the additional equipment to show up as price increases on the product to which they are attached. This treatment implicitly takes the mandatory additional equipment as equivalent to a tax imposed on Industry A's output. Though Industry A used up resources when the mandatory equipment was added to the products it manufactured, under the alternative treatment its output measures would not reflect the additional equipment, and its productivity measures would fall.

The initial debate over the correct treatment of smog-control devices took place mainly within the context of the CPI. Most of the relevant arguments were paraded before an interagency committee which was set up by the Federal Office of Management and Budget to review the matter. The issues are complex—there are prominent

economists arrayed on each side—and there is insufficient space to review all the issues here.

Whatever the position of individual committee members on the appropriate treatment within the CPI, there was no debate, so far as I can determine, on the correct treatment of smog-control devices for the analysis of industry price, output, and productivity trends. It was generally agreed that for those purposes, quality adjustment for mandatory equipment was correct. But apparently the debators have overlooked the fact that the decision to handle smog-control devices as quality changes in the price indexes has major implications for the *distribution* of measured output and productivity changes among industries. The decision thus poses major difficulties for the analysis of inflation at the industry level.

To develop this point, consider another industry (call it "B"), which uses the output of Industry A in its own production. We assume that the extra mandatory equipment has no productive value in use in Industry B (or that its value is less than its cost—otherwise, legislation would not have been necessary). What happens to the statistics for Industry B?

Because any extra mandatory equipment added to Industry A's output is currently treated as a quality change (equivalent, in this case, to an output increase) and not as a price change, there will be no recorded rise in Industry B's input prices. The data will in fact show Industry B buying a larger *quantity* of Industry A's output. Thus, using published data, we conclude that Industry B is using more inputs than before to produce the same output, which means that productivity measures for Industry B will decrease. Furthermore, because its costs per unit of output have risen, Industry B's prices will inevitably rise (eventually, if not immediately). But because we have no record, in the input price indexes, of any price increase there, we find that Industry B's prices rose more than the prices of the products it purchases—in other words, more than its measured input costs.

Consider the statistical picture under the alternative. Suppose no quality adjustment for the smog device had been allowed in Industry A. Then we would have observed a decline in measured productivity in Industry A. However, because the smog devices would have raised measures of Industry B's input *prices*, and not the *quantity* of inputs it used up, there would be no impact on Industry B's productivity measures. Moreover, under this alternative (rejected) treatment the data would indicate that any compression on Industry B's profit margins, or increase of its output price, would be associated with increased costs of its inputs, not with (as the present

statistics show) increased use of inputs from Industry A per unit of output of B.

Thus, alternative treatments of equipment such as smog-control devices imply two alternative pictures of the distribution of output, price, and productivity changes. The question is: Which alternative scenario gives the most informative picture of economic reality? There is no single answer to such a question, for our definition of "economic reality" will depend on the precise questions being asked of the data. It has been argued, for example, that the present treatment is the appropriate one for the purposes of the national income and product accounts. (Nevertheless, in the unpublished minutes of the deliberations of the interagency committee convened to deal with this question—where national accounts considerations figured prominently—there is no record of consideration given to the question of the *distribution* of productivity and output changes, which is so clearly central to the problem.)

It is clear, however, that the present method of handling pollution-control equipment poses difficult problems for users who wish to employ the data for the analysis of inflation. The present treatment tends to eliminate the effects from the industry in which the change takes place, and distribute them around among the industries that use the equipment. It will be increasingly hard in the future to analyze changes in productivity and prices at the industry level because data on input use and productivity for the *using* industry are made to feel the effects of changes imposed on the supplying industry, whereas data for the supplying industry (where the changes actually occur) are purged of any record of the matter.

There are other analytic objectives for which users must also consider the effect of the smog-control decision on the statistics. For example, price and output measures are important for carrying out studies of consumer demand, of industry demand for inputs, and of substitution among inputs to production. The measures will be inappropriate for such uses if consuming and producing units perceive price and output changes differently from the way they are measured. If consumers, for example, view smog-control devices as an extra cost of acquiring and running an automobile, rather than as an improvement in the quality of cars, then the price indexes as they now exist may not be very relevant in explaining the demand for automobiles. And if business firms take a similar view of those and other mandatory changes on motor vehicles, trucks, and agricultural and industrial machinery, then again, the price indexes as they are now constructed will not adequately explain economic be-

havior with respect to substitution, demand for inputs, and other production and output decisions.

There is as yet little evidence on these matters. Parks,[1] estimating automobile costs for a study of scrapping trends, found large residuals for recent years, which he interprets as evidence that consumers acted as if the cost of automobiles had risen more than the indexes show. This is not conclusive evidence, by any means, but it is consistent with the view that car buyers *act* as if the addition of smog-control and safety devices is a price, not a quality, increase.

Moreover, the performance of price behavior and price prediction models may be additional evidence. If they have performed poorly in recent years, the reason may be that some of the data they are using (and also the series they are trying to predict) have been adjusted for pollution control and safety devices, and the underlying economic behavior that these models are trying to predict may not be consistent with index makers' decisions. On the other hand, product safety and pollution changes have so far probably affected only a small (though growing) proportion of the industrial price indexes, and the problem may not yet be serious enough to throw large-scale econometric models off track. However, those who use industrial price indexes should be aware of this measurement problem and of its possible implications for the appropriateness of the data for their purposes.

NOTE

1. Richard W. Parks, "Determinents of Scrapping Rates for Post War Vintage Automobiles," *Econometrica*, forthcoming.