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Price and volume measures of services;

impressions of the adequacy of current approaches

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Abstract

The paper asks critical questions concerning current practices in the compilation of price and volume measures. Practices of both the consumer price index (CPI) and the deflation of services in other contexts are considered. It is concluded that current practices are of limited effectiveness, especially because the treatment of quality changes seriously falls short. The (implicit or explicit) theoretical ambitions of the measures are unrealistic and the users of the data are not really aware of that.

The main conclusion is that statistical offices must communicate to their clients that their aggregate volume measures are not useful for productivity measurement (with important exceptions on a lower level of aggregation, mainly outside the service sector). Other conclusions are that new approaches to price and volume measurement have to be developed, less focussing on technical characteristics of goods and services. It is suggested to experiment with an approach which concentrates on the functions that these goods and services fulfil for the user (the service characteristics approach) and with a 'theory free' approach of developing simple conventions which are easily understood by the user and which do not imply (value) judgements by statistical offices.

Introductory remark

This is a paper for discussion. It is not a policy statement; nor is it a specialized in depth analysis. The author gives some impressions, approaching the field of price and volume measures of services from a broader perspective, in order to stimulate the development of new, effective strategies for solving a serious information problem.

1. Ambitions of price and volume statistics

1.1 There are many different kinds of economic analysis which use economic statistics. Different uses often ask for different specifications. But statistical agencies have at least two reasons for limiting the variety of statistics: (1) to limit costs and (2) to avoid confusion among users. Consequently, most economic statistics serve a variety of uses. The central system of economic statistics itself, the national accounting system, is a multi purpose system.
The internationally agreed System of National Accounts 1993 mentions as the primary objective of price and volume measures "... to assemble a set of interdependent measures which make it possible to carry out systematic and detailed analyses of inflation and economic growth and fluctuations." (SNA 1993, p. 379). First, a few theoretical points concerning to 'inflation' and 'economic growth' will be made briefly.

1.2 From the viewpoint of a consumer 'inflation' concerns the purchasing power of his money. For this purpose the consumer price index (CPI) for period t+1 is supposed to measure how much more money the consumer needs to spend in order to be as well off as in period t, assuming a given utility function. A CPI for a group of consumers assumes the existence of an aggregate utility function; often the assumption is made that all consumers are identical. An operational CPI, observing prices of well defined goods and services, assumes that these goods and services are representative for the elements in that utility function.
In reality, consumer preferences change over time (cultural changes/ fashion), which complicates the operationalisation of the theory. The composition (e.g. according to income) of groups of consumers changes as well, which challenges the second assumption. The characteristics of an increasing number of goods and services seem to change with an increasing speed, which prevents the first assumption from being consistent with the third one. The third assumption may be questioned in itself; utility springs from *services*, e.g. services provided by lamps (shedding light) in combination with the consumption of electricity and not directly from those goods themselves (Nordhaus, 1994). We will come back to this point later.
This leads to

Question 1. Are present CPI's ambitions realistic?

1.3 We will not try to analyse 'inflation' from the viewpoint of the producer (or any other kind of actor in the economic process). Economic (neo-classical) theory, focussing on (im-)perfect markets and production functions, fights extremely hard battles with the heterogeneity of outputs and inputs. Assuming homogeneity, *relative* prices are expected to reflect marginal costs or marginal productivities. This leads us to the second objective mentioned in the SNA 1993.

1.4 'Economic growth' is a broad, welfare oriented concept. In practice (and in the SNA 1993) it is often narrowed down to the real growth of

the value added in the production process. In this paper we will pragmatically follow this practice. The real growth of value added of an establishment or an industry is interpreted as its contribution to the growth of the nations domestic product. It aims to measure the growth of the real value to the community, created in the production process. At the same time it aims to measure the volume of output in such a way that it can be related to volume measures of the input of production factors in order to estimate changes in their productivity. In that connection the real growth of value added is a variable in an (economic) analysis of the *technical* production process. This variable plays a role in a vast economic literature on productivity and technical change.
At this stage this paper pragmatically will not go into the question of whether it is possible to work with one measure of the volume of value added in both contexts: (1) the context of measuring the real value to the community created in the production process and (2) the context of an analysis of the technical production process. In the first instance the focus will be on both context (1) and (2). This leads to

Question 2. What volume measures of value added are correct measures of the value to the community created in the production process or correct denominators of productivity ratios?

2. Are current practices in price statistics effective?

2.1 There is a vast amount of literature on the many problems and solutions in estimating price and volume measures. SNA 1993 presents an elegant overview in 27 (large) pages, unfortunately paying little attention to productivity measurement (Diewert, 1995, p. 38-39). This paper will concentrate on a few topics, contrasting current practices in estimating the CPI to those in estimating deflators of services.

2.2 In most countries the CPI must be considered as a very well developed measure to which relatively high budgets are devoted. There are no other flows of goods and services in the economic system enjoying a similar attention. In contrast producer prices or volume measures of services seem to be neglected, although in most developed economies the production of services accounts for about two thirds of GDP or employment. This leads to

Question 3. Did investment in the CPI yield substantially higher returns than investment in price (or volume) measures of services?

2.3 Of course, there are a number of reasons to say yes to question 3. These range from slogans like 'the end of all production is consumption' (Keynes) to practices like wage and social security indexation.
A special reason for saying yes is the fact that a correct deflation of household consumption *in combination with the correct deflation of the other components of final expenditure and imports* yield a correct deflator of GDP. So, if the volume of total GDP is a much more important measure than value added by industry, price information on production and intermediate consumption is relatively unimportant.
But there are other arguments. One could think of the relative magnitude of the service sector (70% of GDP and employment in the Netherlands and of Beaumols law concerning the relative growth (in current prices and in employment) of the service sector, with hardly any productivity growth. The question of whether that law is a reality or a statistical artefact is very crucial to our understanding of major economic developments.

2.4 There is another way of addressing question 3. One could ask whether current practices yield acceptable marginal returns to investment in the CPI. This very provocative question may be justified by paying attention to the growing literature on severe biases in the CPI.
Diewert (1995, p. 36-38) gives an overview of recent literature. He summarizes the results for three types of bias adding up to a total bias of +1.5% a year (but perhaps these three biases are interrelated so that the total must be corrected for some doublecounting). He mentiones a fourth type of bias which results from the treatment of new goods. Diewert believes: "Of all the sources of bias....the biasses associated with the introduction of new goods are the most significant. ... It seems likely that Statistical Agencies have simply missed the improvements in our standard of living that are due to the increased number of commodities that consumers now have in their choice sets."

Also Wynne and Sigalla (1994, p. 17-18) conclude to an overall upward bias from their review of the literature, but they formulate a more conservative conclusion: "In view of the paucity of evidence on the various potential biases in the CPI we are inclined to think that it is better to err on the side of conservatism in guessmaking the size of the overall bias. A figure of less than 1 percent thus strikes us as plausible estimate of the overall bias. The figure may be a lot larger or a lot smaller....the evidence seems to indicate more instances of upward than of downward bias in the CPI."
In an interesting recent contribution Nordhaus presents a 'Gedanken-experiment' which leads to the following conclusion. "The base estimate of the rate of growth of real wages from 1800 to 1992 is 1.4 percent per year using traditional price indexes. The estimated growth rate is 2.1 percent annually with the low assumption about the bias in price indexes and 3.6 percent per year in the case of the high assumption about the bias in price indexes." (Nordhaus, 1994, p. 29). This indicates a bias in the CPI in the range between 0.7 and 2.2 percent per year. We will come back to the analysis of Nordhaus later.
Of course, there may be reasons to question these outcomes of the literature. Within statistical offices not everyone involved in CPI making will agree to the results of that literature. In the daily practice of CPI making perhaps many decisions are made which generate biases which are not taken into account in the above mentioned literature. These estimates of CPI bias refer to the underlying theory (the ambitions mentioned in question 1, section 1.2). If that theoretical basis would be dropped, perhaps the picture would change. But we cannot ignore the facts that most of the criticism is right, although perhaps not completely balanced and that users perceptions are at least as important as statisticians own opinions.
Most of the above mentioned information on CPI bias addresses the USA CPI. It is important to realise that the discussion about CPI bias is not joined by academics only. Even the Chairman of the USA Federal Reserve Board has taken part in it and it gained broader publicity (Business Week, 1994). It is likely that other countries CPI's are not less biassed than that of the USA and publicity is not restricted to the USA.
The conclusion must be that the relatively high investment in the CPI yielded a relatively inaccurate result. The reluctant reader is challenged to imagine how the users would react to labour statistics that systematically overestimate the growth in employment by one or two percent points per year.

2.5 It should not be concluded that CPI-statisticians did bad work. The average statistical professionality of CPI-statisticians is high.
But, is their task a 'mission impossible'?
This question is extremely relevant to all statisticians involved in price and volume measures. If current practices in the production of the CPI turn out to be ineffective, it is necessary to identify the main stumbling blocks before advocating investment in price measures of services. Perhaps such investment can only be justified after developing a strategy which is more effective than the strategies behind current practices of traditional price statistics.

3. What can be learned from CPI experience?

3.1 A lot can be learned from CPI practice because much theoretical and practical creativity has been invested in it. But at this stage we will concentrate on the main unsolved problem and that is the treatment of qualitative changes, including the treatment of new or different services and goods. Quality changes are the main source of bias there are no practical solutions for most of the problems involved. We will not discuss the whole quality issue; only one major point will be selected. In statistics on prices and volumes of goods, quality changes may seem to be more or less frequent *incidents*, because many goods have the same technical characteristics in the course of time. But in service statistics these incidents become rules. Well defined services with constant characteristics are a rare phenomenon for producers of statistics on services. Consequently, the development of price and volume measures of services can benefit from experience with the treatment of quality changes.

3.2 Roughly speaking, current practices of price statistics are based on the observation, at different moments in time, of prices of commodities with exactly the same technical characteristics. As soon as such an exactly defined commodity disappears from the market a substitute must be selected for observation. If the substitute existed in an earlier period of observation the observed price series can be chain-linked; in all other cases an explicit estimate (or guess) must be made of the difference in quality between the two commodities, a guess of 'zero' being one of the possibilities often applied in the absence of a better alternative. Sometimes the producer of the commodity is asked to make the estimate: "what would now be the price of a good with these (e.g. the old) specifications?". Sometimes the estimate is the result of a regression of observed prices on technical characteristics; this procedure yielded much literature with ex post applications but not too many applications in the production of actual price indexes. Essential in current practices is the focus on individual commodities and their *technical* characteristics.
In much of the theoretical literature on the CPI the focus is not primarily on the commodities but on what may be called the 'service characteristics' of commodities. Combinations of consumer goods are assumed to produce service characteristics to the consumer. These service characteristics appear in the utility function and not the commodities themselves. The consumers production function specifies the relationship between the commodities (inputs) and the service characteristics (output). Nordhaus recently produced a very interesting example estimating the price of light (Nordhaus, 1994). We will use this example in the next section, not only summarizing parts of his analysis but also extending the argumentation.

3.3 Light may be seen as a service characteristic that yields a consumer utility. Electricity and lamps do not directly generate utility; they are inputs in the production function of light. Let us assume that a new kind of lamp is developed, with which the consumer can produce the same

light with less electricity. If the price of the new lamp does not exceed that of the old one by more than the present value of the electricity saved during the lifetime of the lamp, the consumer gets the same light for less money. Assuming a constant utility function the purchasing power of his money increases (ceteris paribus).
Light itself can be measured directly in lumen per hour. Nordhaus computed the 'true price of light' as the price per lumenhour and compared it to the traditional measure which is directly derived from the price of electricity. The difference between the indexes amounts to 3.6% per year which is an average over a very long period; the 'true' index being the lowest.
It is important to note that producing a traditional price index, observing commodities in stead of service characteristics, seems to be an easy task in cases like this. Electricity is a homogeneous commodity with constant characteristics over a long period. It is relatively easy to observe prices of electricity. The case of lamps is a bit more complicated, but the practice of chain-linking price series of different qualities seems to be the easily applicable standard solution. But it is essential to note that this procedure is likely to produce unreasonable results in cases like this. The chain linking of lamp prices leads to an implicit measure of the quality difference between old and new lamps equal to the price difference in the first period of including the new lamp in the CPI. If the present value of the electricity saved by the new lamp exceeds that measure of quality change, the volume of consumption will decrease (ceteris paribus) although the same quantity of light becomes available.
Even if the statistician would try to make an explicit estimate of the quality change of the lamp he cannot find the correct result if the price of the new lamp is lower than the present value of the electricity saved. (Subtracting the present value of fuel saved is sometimes applied in the price index of vehicles.)
Like Nordhaus did, we did not consider 'esthetic' aspects of kinds of light and lamps. Nor did we take into account aspects like risk, reliability, environmental costs, etc. connected to different kinds of lamps in the analysis. In practice one should be parsimonious but realistic in selecting service characteristics to be taken into account.

3.4 At this stage our conclusion concerning question 1 (section 1.2) is that present CPI's ambitions are unrealistic. The illuminating example of the price of light illustrates that focussing on technical characteristics of commodities is at best a second-best practice, which is not applicable in cases of rapidly changing technologies. This implies that this practice has become increasingly problematic.
It would be worthwhile to invest in research in the service characteristics approach, not focussing on many narrowly defined consumption functions (except the relatively easy ones, like the production of light) but on a limited number of broadly defined functions. The main reason for that is that a lot of information on technical characteristics is needed (e.g. the number of lumenhours per lamp of xx Watt) to apply this approach. Using a limited number of broadly defined functions, it may be possible to select a limited number of representative commodities for each function and keep the work within limits. An increased sampling error of the CPI, resulting from a reduction in the number of commodities, is no serious problem in comparison to the

magnitude of the bias. Payson (1994) developed a 'Representative Goods Approach'.
Priority might be given to the functions where the consumers production function is likely to change rapidly. These are functions which are strongly affected by technological progress such as mobility (transportation) and communication.

3.5 If consumers production functions change, the technical characteristics approach will produce wrong results, even if applied to one individual consumer. The theory behind the CPI completely rests upon the assumptions mentioned in section 1.2. As long as this theory has to be maintained, the only available alternative to the technical characteristics approach seems to be the service characteristics approach. So the question arises: what to do if it turns out that a service characteristics approach would is hardly applicable in practice?
In that case the neoclassical economic theory of consumers behaviour has to be dropped as a guiding principle behind the CPI. As long as no other theory has produced effective guidelines for CPI-practice, the only way out is to do it without a theory. That would mean that the CPI must be based on a purely empirical or an entirely institutional foundation.
An important reason for considering a purely empirical or an institutional approach is that statistical offices must not be involved with producing (value) judgements which may give rise to debate in the society. Official statistics must provide undisputed information for decision making in society. In the absence of an adequate theoretical background to the CPI, disputable *judgements* are implicitly or explicitly made by statistical offices. Such a situation has to be avoided, and as far as the CPI is concerned this seems to be an urgent point because the CPI is very sensitive to that kind of judgements and the society is very sensitive to the CPI.
In a 'theory-free' approach at least three approaches could be followed. The first approach would imply: (1) agree on some product classification, (2) observe in each period the most frequently bought items in each product group and (3) take the amount of money, actually payed per unit of transaction, as the 'price' to be observed. This approach comes close to a 'unit value' measure. It implies the non-treatment of quality changes in order to avoid judgements. Such an approach is only feasible if it leads to a result that is easily understood by its users. If this approach could arrive at such a result, there still will be a demand for analytical studies, focussing on potential effects of quality changes. Statistical offices should be involved in such studies, producing illustrations of these potential effects outside the context of 'the one and only true CPI'.
In the second approach consumers perceptions of price movements and quality changes concerning their specific transactions would be the subject of special surveys among consumers. Not the statistician, but the consumer himself makes the judgements. Can we learn from the techniques applied by marketing researchers?
The third approach would let the members of an institution instead of the consumers themselves decide on quality and price changes of specified products. Of course this institution must not be the statistical office because it is its task to produce *judgements*).
Of course, in practice a mix of these solutions could be applied. It is

important to note that in all cases it will be important to produce alternative measures in an analytical context. Even if we should maintain our current approach, we have to produce such analytical information in order to show our users that there is not one true CPI

3.6 What conclusions can be drawn concerning price and volume measures of services?
The first conclusion could be that focussing on the technical characteristics approach creates a 'mission impossible'. Even the CPI, in which so much effort has been invested, demonstrates this. If it is noted that the consumer basket is dominated by goods, which are easier to measure than services, the argument becomes even stronger.
But is a solution along the lines of the service characteristics approach applicable to e.g. output price measures of services? We will come back to this point in the next chapter.

4. What are correct volume measures of value added?

4.1 In section 1.4 two contexts for the deflation of value added were mentioned. We will now illustrate the difference between those contexts using the example of light again, starting where we were at the end of section 3.3. There we discussed the case of the consumers saving more on their electricity outlays than they had to spend on new lamps. This implies that their total outlays for light have decreased (assuming that the same quantity of light is produced) and that the production in current prices of the total of electricity and lamp industries decreased as well (assuming no external trade and no change in stocks). If both amounts decrease by a%, the correct deflator of consumption must decrease by a% as well in order to result in a constant volume of consumption (the same number of lumenhours creating the same utility). It is also a correct deflator for the total production of the electricity and lamp industries, if the focus is on the value to the community created in their production process. But is it a correct deflator in the context of an analysis of productivity change?
Let us assume that the production of electricity, old lamps and new lamps uses the same volume of resources per unit of output in both periods. This means that no productivity change has occurred in each of the three industries. We can further assume that all prices (of electricity, old and new lamps and resources) are unchanged; the only change that occurred being that consumers buy more new lamps (saving a% on their costs of light). Intuitively one should prefer a deflator of 100 because no price has changed; any other deflator produces a change in the volume of output per unit of resources (in constant prices). It is clear that a deflator of (100-a) produces results which cannot be interpreted in the context of an analysis of productivity change in the three industries. (If one would like to speak of a productivity change in this case, that change would have occurred through a shift of the *consumers* production function, but not through a shift of the production function of one of the industries.)

4.2 Triplett (1983) showed that the quality change adjustment of input prices (including the CPI) must be based on the 'user value', but that the quality change adjustment of output prices must be based on the 'resource cost'. In his theoretical analysis he used the concepts of (service) 'characteristics' and 'production functions'. After what has been said in section 4.1 with respect to the example of light, Tripletts conclusions may be intuitively acceptable.
The SNA 1993 does not propose different deflators for the same flow. It states: ".... in a market system, the relative prices of different goods and services should reflect both their relative costs of production and their relative utilities to purchasers, ..." (SNA 1993, p. 381). This statement does not explicitly address the problem of different qualities but reading the SNA-section on the treatment of differences in quality, it seems to be fair to conclude that SNA implicitly takes the position of a uniform quality change adjustment for a flow, e.g. household consumption of electricity and lamps. In fact the SNA too follows the technical characteristics approach.

4.3 Usually, deflators are based on the technical characteristics approach. We have seen that these deflators fall short in the 'user value' context. But do they also fall short in the productivity context? In his Presidential Address to the American Economic Association Griliches takes stock of the research on productivity change (Griliches, 1994). He mentiones the advancements in explaining the productivity growth of the fifties and sixties through better measurement and through attributing the residual ('technical change') to sources like R&D, science, etc. Further he mentiones the breakdown of these 'explanations' of productivity change when they could not explain the dramatic slowdown of productivity growth of the seventies and eighties. And then his main message is that the limitations of the available data and the inadequate attention of researchers to those limitations are responsible for our failure to understand productivity change. The essential data problem is the quality of price and volume measures of output.
Griliches makes a distinction between reasonably measurable sectors and unmeasurable sectors, the latter category mainly consisting of the entire service sector (excluding transport and communication) and construction. He shows, like others did, that the unmeasurable sectors in the postwar period have grown from one half to more than two thirds of the economy. For the unmeasurable sectors he mentiones problems of conceptualizing the output of e.g. banking, insurance, lawyers, health services, etc. For the measurable sectors he adds that "accelerating rates of change have destroyed the basis for some of the older compromises" (p. 13) and he mentions research on prices of computers and pharmaceutical generics as examples of the treatment of quality change where new estimates differ much from the traditional ones. Two of his conclusions are:
"Our ability to interpret changes in aggregate total factor productivity has declined, and major portions of actual technical change have eluded our measurement framework entirely." (p. 10) and
"We are caught up in a mixture of unmeasurement, mismeasurement, and unrealistic expectations." (p. 17)
This president of the American Economic Association also concludes: "We need to convince Congress (and ourselves) that the requests for additional funding of the statistical infrastructure are justified as investments in general knowledge and more informed policy formation; .... We need to make observation, data collection, and data analysis a more central component of our gradual teaching." (p. 15)

4.4 We think Griliches' is right in his analysis. Most of our deflators are inadequate, especially in the service industries. The paper on Dutch practice by Drost et. al. (1995) does not deal with this problem. But looking at the raw material, prepared for that paper, we estimated that no more than one third of the output of the service sector is deflated (implicitly or explicitly) with a price measure which is both of reasonable quality and independent of input deflation. This means that productivity measurement in at least 70% of the Dutch service sector makes no sense (and in more than half of the total economy, including construction and other 'unmeasurable' non service sectors). The bulk of this 70% consists of industries where conceptual problems seem to preclude the development of deflators for output measures for productivity measurement (e.g. government, banking, insurance, most health care, most

business services, social services and perhaps even trade). In some cases there is no output concept that is independent of the input concept (government and other non-market services), in other cases the national accounting concept of output is completely alien to the productivity researcher or his client (banking and insurance) and in still other cases the services produced have no observable (technical) characteristics (professional consults), which implies that making adjustments for quality change is impossible in practice. Of course, in the rest of the cases Statistics Netherlands must do its utmost to develope adequate deflators.
An alternative to the development of deflators is the direct extrapolation of output by a volume index. This procedure assumes the availability of quantity information about homogeneous services produced which are representative for the total output of an activity. As a rule this procedure will produce estimates that are too inaccurate for productivity measurement, which is a very sensitive kind of (residual) measurement. (An important exception to this rule seems to be the 'reasonably measurable' transport-industry.) Perhaps progress in the measurement of productivity can be made through very detailed analyses of production processes and outputs, using a lot of information on physical quantities, possibly at the level of individual establishments. This kind of research is not the core business of statistical offices.

4.5 A conclusion from sections 4.3 and 4.4 could be that for the majority of service industries the development of price measures following the technical characteristics approach has not been very successful. For conceptual reasons, one cannot expect this development to become successful in future.
For productivity measurement the service characteristics approach is no alternative. Following Triplett, alternatives must be found in adjustments for quality changes based on resource costs. This seems to ask for kinds of detailed research which do not belong to the core competence of statistical offices.
This does not imply that nothing can be done. There is an important demand for productivity measures at the level of individual industries. Statistical offices must go on producing that measures for industries where these make sense.
And in a user value context, statistical offices have to try to develop new approaches for those cases where the technical characteristics approach falls short.

5. Conclusions about the available options for the deflation of services

5.1 We now come back to the two contexts in which price and volume measures of value added have to play a role: the user value context and the productivity context.
Our conclusion concerning the productivity context is very negative. Statistical offices must make very clear that most of their volume measures are (and will be) useless for productivity measurement, with a number of very important exceptions at the level of individual industries (mainly outside the service sector). High investment in the development of service deflators following the technical characteristics approach cannot be justified in this context.
In the user value context our conclusion is less negative. If neoclassical economic theory is maintained as a guideline for price and volume measures the technical characteristics approach must be dropped in all cases where changes of taste or technical change plays a major role. This is because this approach necessarily produces the wrong results when users production functions change. The service characteristics approach may produce better alternatives, but before we can be sure that those alternatives are at hand we need to do a lot of research. It seems to be reasonable to give priority to household consumption in developing the service characteristics approach for reasons like those specified in the first paragraph of section 2.3. (Applying the service characteristics approach to intermediate consumption will require the analysis of many production processes.)
If the service characteristics approach turns out to be improductive, the neoclassical economic theory must be dropped as a guideline for price and volume measures. In that case, if no alternative theory becomes available, it will be necessary to develop 'theory-free' price and volume measures. Also here, it seems to be reasonable to give priority to household consumption. Section 3.5 presents some general ideas.

5.2 Focussing on services now, we have to ask a question about the uses of price and volume measures outside the contexts of the CPI and productivity analysis. Are there purposes for which we can produce feasible measures?
This concerns the same kind of issues as those hinted at in section 3 5, when it was suggested that we should ask consumers what they perceive as price change and as volume change in a given transaction. In that connection it was asked "what can we learn from marketing researchers?". It seems to be worthwhile to do some marketing research on our important users about their perceptions. Do they expect e.g. the change in the tariff of a consultation by a (medical) general practicioner to be treated as a price change or do they expect statistical agencies to correct that change for changes in the technical characteristics of medical consultations? (Our impression about health policymakers is that they prefer the first solution.) More generally, users can easily understand simple measures of directly observable facts because such measures refer to their own daily experience.
Our suggestion is to develop simple 'theory free' service output deflators on the basis of marketing research on (potential) users.

Perhaps unlike the case of the CPI, there is no reason first to try and develope 'theoretically correct' deflators (e.g. following the service characteristics approach) if our expectation is that the users will not appreciate or understand them. If after some years, in the context of the CPI, the service characteristics approach proves to be feasible, we can consider offering our users theoretically more advanced measures as analytical alternatives for special purposes. An important consideration behind this suggestion is that concerning output measures we must be very clear to our users that the volume of service output is a very poor measure, which does not make sense in a productivity context and not being based on any economic theory. The only reason for producing such a measure being the fact that you simply cannot do without in a society with price changes. Taking this position at the lowest possible level of ambition, it is a priority to clear up the "mixture of unmeasurement, mismeasurement, and unrealistic expectations" we and our users are caught up in (Griliches, 1994, p. 17).

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