
Productivity Adjustment in the Medicare Physician Fee Schedule Update

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This article reviews the history of the productivity adjustment in the fee schedule and the literature on measuring productivity in health care. Measuring physician-specific productivity is challenging, a principal reason why the actual update formula uses an economywide measure of productivity change. A number of the challenges, including adjusting for quality, the use of administered prices, and the steady addition of new codes is described. This article also shows productivity changes varied widely across manufacturing industries, so that the use of an average across the economy or even across service industries could have substantial error for physician services.

INTRODUCTION

The formula to calculate the annual update in physician fees in the Medicare Program deducts the rate of productivity increase. In this article we discuss the rationale for and implementation of the productivity deduction, review the literature on medical care and physician productivity, and consider the issues related to measuring physician productivity and using economywide multifactor productivity (MFP) in its place.

The initial rationale for the productivity deduction was that the Medicare Economic Index (MEI), a component of the physician fee update, includes a general wage and fringe benefit index. Because

wages and fringes tend to rise at the rate of economywide labor productivity, this index, weighted by the labor share and averaged over several years, was assumed to rise at that rate. Simultaneously, Medicare paid on the basis of relative value units (RVUs), and physician billing of RVUs, other things equal, rises at the rate at which physicians increase their productivity in producing RVUs. Thus, if physician productivity in producing RVUs rises at the same rate as economywide labor productivity, netting out the (weighted by the labor share) increase in economywide labor productivity from the update would exactly correct the double counting (*Federal Register*, 2002a). At the other extreme, if there were no increase in the productivity of physicians in producing RVUs, there would be no double counting, and no productivity adjustment would be necessary. Unfortunately, directly measuring the rate of productivity change among physicians in producing RVUs is a problematic undertaking, although Fisher (2007-2008) has recently attempted to do so. We comment on his results in a companion article (Newhouse and Sinaiko, 2007-2008).

In practice CMS has assumed physician productivity increased at the same rate as economywide labor productivity (weighted by the labor share), and this amount was deducted from the increase in the MEI to arrive at an update.

In fact, however, productivity affects a third element in the update formula, and so productivity is in principle triple counted, though we will show below that this is unimportant in practice. From 1989

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to 1997 the Medicare volume performance standard (MVPS) formula for calculating physician fee updates was in effect. This formula accounted for the average growth rate of RVUs per beneficiary over the prior 5 years. This was intended as a measure of scientific and technical advance and was the payment formula's method of adding monies for medical advances that were costly but on net beneficial for patients. But the 5-year average of RVU growth by definition included the rate of increase in physician productivity in producing RVUs.

Starting in 1998 the MVPS was replaced with the sustainable growth rate (SGR) system. The innovation in the SGR was to replace the 5-year average growth rate in RVUs per beneficiary in the formula with the growth rate of real gross domestic product (GDP) per capita, which by definition grows at the rate of economywide MFP growth plus any contribution from the rate of growth in inputs such as labor and capital (*Federal Register*, 2002b).¹ Given this change, following a recommendation from the Medicare Payment Advisory Commission, in 2003 CMS changed the measure of productivity deducted from the update from labor productivity to a 10-year moving average of private, non-farm business MFP on the grounds that productivity gains in all inputs and not just labor should be accounted for (*Federal Register*, 2002c).² Because productivity in principle affects the MEI, real GDP per capita, and the actual growth of RVUs, which all enter the update formula, it is in principle triple counted.

In practice, however, it is not triple counted. To ensure that any annual change in fees would not be too large, the 1997

¹ The rationale for using the change in GDP rather than the 5-year moving average of the change in RVUs was to relate the formula to ability to pay.

² The Medicare Payment Advisory Commission also recommended that physician productivity should be considered separately in update decisions as opposed to as a component of the Medicare Economic Index. CMS chose not to adopt this recommendation.

Balanced Budget Act set a ceiling and a floor, of +3 and -7 percent respectively, on the annual update for physician services exclusive of an adjustment for the MEI. Any excess above or below these limits is to be carried forward to future updates. The floor of -7 percent has been binding for the past several years; i.e., the adjustment to physician fees given by the elements of the formula other than the MEI would have been more negative than -7 percent. As a result of carrying forward the excess negative amounts, the performance adjustment factor, or the cumulative carry forward, had reached -28 percent as of 2006, meaning that for the next several years the constraint of -7 percent will be binding. With a binding constraint, changes in productivity that affect GDP growth will not affect the update, though they will affect the carry forward.³ The productivity component in the MEI continues to affect the annual update, however, so that adjusting for double counting rather than triple counting is arguably appropriate given these circumstances—and the present adjustment is exactly correct if in fact physician productivity in producing RVUs increases at the same rate as economy wide MFP.

Because the productivity measure continues to affect the formulaic update to physician fees, we now review the literature on both medical care and physician productivity.

REVIEW OF THE LITERATURE

Productivity of Medical Care Resources

The literature on productivity in medical care falls primarily into two branches,

³ More specifically, with a constraint of -7 percent, the update is $(1-0.07)(1+\text{MEI change})$. In 2006 this equaled $(1-0.07)(1+0.028)=0.956$, or an update of -4.4 percent. Refer to Internet address: <http://www.cms.hhs.gov/SustainableGRatesConFact/Downloads/sgr2006f.pdf>.

divided according to how output is measured. The first branch focuses on the broad question: “How should one conceptualize productivity in medical care?” Because measures of productivity that include more than one output and one input necessarily utilize price indices that aggregate across those outputs and inputs, this literature also asks, “What is the optimal way to construct price indices for medical care?” In contrast to productivity measures based on a single (intermediate) output, such as the cost of a hospital day or an hour of physician time, this branch of the literature has largely concluded that the proper unit of output is an episode of treatment for an illness. In the case of a chronic disease the episode is usually defined as the treatment for that disease over one year. This literature is arguably not relevant to the Medicare fee schedule update because there the issue is physician productivity in producing RVUs rather than the productivity of medical care in treating patients. Nonetheless, much of the recent work on productivity in medical care falls into this domain, and therefore we review it here.

The pioneering research in this vein was conducted by Scitovsky (1967; 1985) in the 1960s. She calculated the average costs of treating an illness episode at the Palo Alto Clinic across time, compared her results to those using prices of specific medical care services, selected so as to mimic the official medical care price indices, and found a considerable difference.

Berndt and colleagues (2000) review the subsequent literature in this domain and propose a medical care expenditure price index based on episode treatment costs. The National Research Council has echoed this recommendation (Schultze and Mackie, 2002; Abraham and Mackie, 2005).

The proponents of the episode-based approach make two chief arguments: the

episode-based approach captures substitution across medical inputs that a traditional input-based price index does not, and it is a more natural way to incorporate quality change. We take up these arguments in turn.

An example of input substitution is using post-acute care, such as a skilled nursing facility day or home health care, in place of the marginal day(s) in a hospital. With this substitution, the average cost of a hospital day will rise (assuming the marginal day costs less than the average day), although the cost of the stay will fall (by the marginal cost of the day). Suppose for simplicity that the saving in hospital resources from the shorter stay exactly equals the cost of the additional post-acute care resources and that the ultimate clinical outcome is unchanged, so actual productivity in treating the episode is unchanged. In a calculation of productivity using a hospital day as the measure of output however, measured hospital productivity will fall (cost per day will have increased) whereas using a hospital stay it will increase (cost per stay will have fallen).⁴

Other examples of substitution in the production of medical treatment include: outpatient care for inpatient care, minimally invasive or laparoscopic surgery for open surgery, and drug treatment for invasive treatment. In all these cases a fixed-weight traditional input-based price index in principle could show no change (e.g., suppose neither the price of a laparoscopic nor an open surgery procedure changed), whereas an episode-based price index in principle could show a substantial decrease.

The second argument for the episode-based approach is that medical advances, such as reduced probability of mortality or less severe side effects, make medical

⁴ In addition, any calculation of measured productivity change overall would have to consider productivity in the post-acute sector.

care more valuable, but are not necessarily captured in measures of the prices of individual medical services (McClellan and Noguchi, 1998; Triplett, 2001). The situation is analogous to an index for computer prices, which would adjust the price down for a new generation computer that has the same purchase price as the prior generation computer had, but has faster clock speed, larger memory, and greater storage capacity.

Computer prices are adjusted using hedonic methods, but this method is problematic in medical care because the existence of insurance creates a wedge between the consumer's marginal valuation and the marginal social cost. For example, any improvement in inpatient technology could affect the price Medicare paid to the hospital for a given type of stay (e.g., by changing the diagnosis-related group weight), but is unlikely to have any measurable effect on the price the consumer pays for the hospitalization (zero if the consumer has a Medigap policy that covers the deductible; otherwise the deductible).

A practical concern that has been voiced about the episode approach is the availability of data to implement it (Moulton, 2001). In light of the commercially available software to group insurance claims into episodes, however, this criticism seems mostly applicable to the methods for valuing any change in health status or quality of care and not to the possible improvement in accounting for input substitution.

An important limitation of this first strand of the literature on medical productivity is that to date it has been applied only to a few diseases. Nonetheless, the studies of specific diseases have highlighted concerns regarding the accuracy of traditional medical care price indices that do not value improvements in quality of care. In one of the best known examples, (Cutler et al., 1998) constructed a medical care price

index for heart attack care and reported that a quality-adjusted cost of living index for heart attacks actually fell from 1983 to 1994, whereas the non-quality-adjusted cost of treating a heart attack rose.

Although this first strand of literature argues that the gains in health have more than offset the increased cost of medical care and that therefore productivity of medical care resources has increased, it cannot determine the proportion of gains attributable to specific inputs and in particular to any increased productivity of physicians in creating RVUs. As a result, it does not appear relevant to the issue of how to adjust the physician fee update for productivity gains. Rather it is relevant to how much overall spending should increase for worthwhile scientific advance, in the spirit of the original MVPS previously described. Indeed, were some portion of the productivity gains from better health attributed to physicians and used in the fee schedule's productivity adjustment, the update factor would be reduced.

Physician Productivity

The second strand of the literature on medical productivity has focused on physicians and other specific medical inputs such as hospitals and drugs. This strand is more relevant to the adjustment factor in the Medicare fee schedule (Freeland, 1991). (Additional information on these studies is available on request from the author.)

Early literature in this vein estimated a production function for physician care in office-based practices. Using the number of visits and aggregate annual billings as measures of output, Reinhardt (1972; 1975) found, not surprisingly, that physician hours and ancillary labor both had a positive and significant effect on physician output, and emphasized the opportunity to

substitute non-physician labor for physicians within physician practices. Although much of his work used cross-sectional data, Reinhardt also estimated trends in productivity of physicians using data on total expenditures on physicians' services over the 1955-1965 period and found that the increase was approximately equal to economywide productivity gains. More recently Thurston and Libby (2002) refined Reinhardt's estimates of the substitutability of ancillary labor for physicians.

In addition to the cross-section emphasis of these studies, a problem with using many of them in the Medicare update context is that one of the output measures, the number of physician contacts or visits, need not correspond well to even a narrow measure of physician output. For example, performing a surgical procedure or interpreting an imaging procedure would not be counted by a measure of visits.

In addition, productivity changes in treating Medicare beneficiaries may differ from those in treating younger patients. For example, if Medicare beneficiaries are becoming less disabled, it may be possible to treat them in less time when administering an X-ray. None of the literature discussed in this review considers this issue.

Other work has analyzed variation in physician productivity across type of practice (i.e., single specialty and multispecialty groups), using the number of procedures or services as output (Rosenman and Friesner, 2004), and the effect of physician compensation on the productivity of individual physicians in medical groups using visits or a physician's charges, revenues, and resource based relative value scale (RBRVS) units as measures of output (Gaynor and Gertler, 1995; Conrad et al., 2002).

Other studies have assessed characteristics of physician productivity within certain specialties. Conoley (2000) quantifies the productivity of radiologists using RBRVS

units as a measure of output. Smith and colleagues (1995) study the effect of physician practice patterns on the variability of primary care physician productivity within clinics, defining productivity as patients seen per physician per hour, and minutes spent per patient.

More relevant to the issue of the Medicare update is work that uses measures of physician visits and annual billings as measures of output to calculate trends in physician labor productivity over time (Hurdle and Pope, 1989). A similar study uses measures of patient contacts and deflated physician revenues as measures of output (Pope, 1990). Both studies report declines in physician labor productivity over the decade between the mid-1970s and 1980s. Although a decline in productivity is possible in principle, such a result should be viewed with suspicion, and raises the possibility of measurement error.

Ho and Jorgenson (2007) have work in progress that uses consumption and output data in the National Income and Product Accounts and health expenditure data in the National Health Expenditure Accounts to calculate MFP growth in health care, defined as the residual of output growth less the growth of intermediate inputs, capital and labor (each weighted by their value shares). They report an MFP growth rate for the private health services industry of -1.5 percent per year over 1977-2000, or almost a 30-percent cumulative fall over this period. The authors note that while some other industries had measured negative MFP growth over this period as well, negative MFP growth is problematic and may be related to improper (overstated) price indices.

Although they did not estimate productivity for physicians specifically, (Triplett and Bosworth 2004) combine output and labor data from the U.S. Bureau of Economic Affairs with capital services data

from the U.S. Bureau of Labor Statistics to estimate productivity growth from 1987-2001, including the health services sector. They find that accelerating labor and MFP growth in the post-1995 period in the economy as a whole was largely accounted for by productivity growth in the services sector. They also examine changes in productivity growth across industries and find significant heterogeneity. Their estimates of annual labor productivity growth in the health services industry were -0.7 percent in the 1987-1995 period and 0.9 percent in the 1995-2001 period. (Overall labor productivity growth for the services sector increased from 0.7 to 2.6 percent for these same periods.) Annual MFP growth in health services sector was negative for the entire study period but did increase, from -1.7 percent in the 1987-1995 period to -0.5 percent in the 1995-2001 period. Again, findings of negative productivity growth raise the possibility of measurement error in price indices.

COMMENTS ON THE FOREGOING LITERATURE REVIEW

Which Measure of Productivity?

Suppose, as is currently the case, that GDP growth does not affect the formulaic update of physician fees because of the binding floor but the MEI does, so there is double but not triple counting of productivity. As previously noted, CMS currently adjusts for the double counting by subtracting a measure of MFP. If there is a discrepancy between growth in the productivity factor in the MEI and the growth in physician productivity as reflected in the number of billed RVUs, one might ask which component is intended to be counted toward the update and which is to be taken out. We argue elsewhere that one's view on this question turns on whether the

adjustment is meant to be an adjustment to an input price (physician wages) or to an (intermediate) output price i.e., the service as determined by the Healthcare Common Procedure Coding System (Newhouse and Sinaiko, 2007). Because Medicare is actually paying for an (intermediate) output, it seems to us that the adjustment is better treated as an adjustment to an output price, in which case MFP and not labor productivity is relevant.

In a competitive economy, which we assume is the standard Medicare is trying to emulate, the percentage change in an output price, $d(\text{output price})/\text{output price}$, equals:

(1) $d(\text{output price})/\text{output price} = d(\text{unit cost})/\text{unit cost} - d(\text{productivity})/\text{productivity}$, where $d(\text{unit cost})/(\text{unit cost})$ is the change in an input price index for the unit cost of the product, and $d(\text{productivity})/\text{productivity}$ is the change in MFP for the product.

The MEI (without any productivity adjustment) can be construed as an approximation to the $d(\text{unit cost})/(\text{unit cost})$ term. The approximation arises because the MEI is a combination of a sector-specific input price index for non-MD inputs used by physicians and an economywide wage index for physician inputs. Thus, the approximation is assuming the economywide wage index measures the cost of the physician inputs.

As previously noted, because a sufficiently precise physician-specific measure of productivity has not been available, the productivity adjustment $d(\text{productivity})/(\text{productivity})$ is measured economywide over a 10-year period. The obvious question is how good is the approximation to a physician-specific measure? Fisher's recent study suggests physician productivity is less than economywide MFP, but we believe there is a great deal of uncertainty about this conclusion (Newhouse and Sinaiko, 2007-2008).

One might have more confidence in using an economywide rather than a physician-specific measure if most industries clustered around the average, but unfortunately this is not the case. Table 1 shows considerable variation in MFP among manufacturing sectors measured for approximately 10-year periods. Recall also that Triplett and Bosworth (2004) found a similar result within the service sector. In the absence of a usable physician-specific measure of productivity, Medicare's use of the economywide mean is certainly a reasonable choice, but the variation across industries shown in Table 1, especially since 1970, does not give much reassurance that actual physician productivity is close to an economywide mean.

Additional Issues

Medicare pays on the basis of an RVU, so the measures of unit cost and productivity in the previous formula should be the change in unit cost of an RVU and the change in productivity of producing RVUs. Four factors complicate any physician-specific productivity measurement.

The first is adjusting for quality change. As previously described, recent work on productivity in medical care has taken the unit of output to be the treatment for a disease or medical problem, partly on the grounds that it is more straightforward to adjust for quality change in this context (Abraham and Mackie, 2005; Berndt et al., 2000; Triplett, 2001; Newhouse, 2001.

Table 1
Annual Growth Rates in Multifactor Productivity, by Industry

Manufacturing Sector	Average Growth Rates in Multifactor Productivity ¹			
	1962-1972	1970-1980	1980-1990	1989-1999
	Percent			
Food and Kindred Products	0.9	0.2	0.2	0.1
Tobacco Manufactures	0.1	-1.0	-5.9	-3.0
Textile Mill Products	2.7	2.4	2.1	1.8
Apparel and Related Products	0.7	1.5	0.5	0.9
Paper and Allied Products	1.7	0.1	0.4	0.5
Printing and Publishing	0.4	-0.3	-0.8	-1.2
Chemicals and Allied Products	2.4	-1.1	1.6	0.3
Petroleum Refining	0.7	-0.3	0.1	0.4
Rubber and Miscellaneous Products	1.0	-0.4	1.6	1.2
Leather and Leather Products	-0.1	0.7	-0.1	0.7
Lumber and Wood Products	1.9	0.4	2.4	-1.3
Furniture and Fixtures	0.9	1.3	0.3	0.8
Stone, Clay, Glass, and Concrete Products	0.9	-0.5	1.7	0.9
Primary Metals Industries	0.4	-0.6	0.3	1.3
Fabricated Metals Products	0.5	-0.3	0.6	0.3
Industrial and Commercial Machinery	1.0	1.0	3.5	4.4
Electronic and Other Electrical Equipment	2.8	1.8	3.3	6.4
Transportation Equipment	1.3	0	0.7	0.6
Instruments	1.7	1.3	1.6	0.7
Miscellaneous Manufacturing	1.7	-1.1	2.1	0
Mean	1.187	0.267	0.811	0.788
Standard Deviation	0.823	1.008	1.956	1.927
Coefficient of Variation	0.693	3.775	2.412	2.445

¹ Percent change at a compound annual rate.

SOURCE: U.S. Department of Labor, May 2001. Internet address: <http://www.bls.gov/web/prod3.supp.toc.htm>.

Adjusting for quality change in the RVU context is much harder.

A second problem is Medicare's use of administered prices. For example, productivity may change for a given procedure because of learning-by-doing, but the RVU may not change or may not change sufficiently to reflect the change in productivity. In particular, the method for updating RVUs may be biased toward services whose weight should increase rather than decrease, one rationale for a non-neutrality adjustment in the formula (Medicare Payment Advisory Commission, 2006). Moreover, there is no assurance that the conversion factor pays factors their marginal products, the standard assumption in productivity measurement.

Third, the constant addition of new codes complicates physician-specific productivity measures. Over the 2000-2005 period, the number of non-duplicated codes that Medicare used increased over 6 percent, from 6,218 to 6,616 (Ensor, 2005). Because there is no observable price for a new code in the period prior to its introduction, any gain in the physician's ability to prevent or treat disease from the introduction of the new product is unmeasured.

Finally, CMS uses an aggregate index that applies to all physicians, whereas changes in unit costs and productivity almost certainly vary across RVUs and specialties. As a result, an average update is non-neutral across specialties. (One might view the differential updates by specialty in the early 1990s as accounting for differential productivity across specialties, but separate updates are not current policy nor do we think they should be. Rather we would handle specialty productivity differences through the RBRVS updating procedure.) The changes in unit costs and productivity likely vary across local markets as well, but Medicare has also traditionally ignored that variation.

CONCLUSIONS

Where does all this lead? Viewing the productivity adjustment as one to an output price and assuming that Medicare should try to emulate prices in a competitive market, one would use equation (1), measuring both the change in unit costs ($d(\text{unit cost})/\text{unit cost}$) and the change in productivity ($d(\text{productivity})/\text{productivity}$) specific to the physician sector - or, ideally, specific to a physician specialty. As previously noted, the current method uses a partially sector-specific change in unit cost (for non-physician inputs) and an economywide measure of productivity.

An entirely different conceptual approach to updating the Medicare fee schedule is to keep Medicare prices in some relationship to prices in the private market so as not to impair beneficiary access. One interpretation of the congressionally legislated, ad hoc increases in physician fees for 2003-2005 and the freeze rather than cut in fees for 2006 and 2007 is that Congress has de facto adopted this approach. On this interpretation, the accuracy of the productivity adjustment is moot. Of course, Congress has not de jure abandoned the formulaic approach to the update, so CMS must still justify the productivity adjustment it uses.

The key question from Fisher's (2007) work in particular and from the literature on physician productivity more generally is whether estimates of physician-specific productivity are precise enough to substitute for the current economywide productivity estimates in the physician update. In our view the work on physician-specific measures prior to Fisher had obvious deficiencies. Fisher did as good a job as is possible with existing data, but we believe the assumptions he must make to derive his measures of physician-specific productivity are not yet sufficiently validated to use

the resulting estimates for policy purposes (Newhouse and Sinaiko, 2007-2008).

Fisher (2007-2008) comments that the economywide measure of MFP also has flaws, in particular the mismeasurement of prices in the health sector. He also notes the slower growth rate of private, non-farm business productivity compared to manufacturing productivity, and he infers that productivity in the services sector grows more slowly than in manufacturing. We agree that health sector prices have been mismeasured, especially historically. We also agree that measured productivity across the entire private economy grows more slowly than in the manufacturing sector; over comparable periods of time, 1995-2001, the manufacturing index grew 1.8 percent per year, whereas the private non-farm business index grew 1.0 percent per year.⁵ And we agree that it is a reasonable inference that the services sectors are the main cause of this difference.

Despite these flaws, we do not find the alternative of using a service-sector productivity measure in the update formula attractive. Any mismeasurement of prices in the health care sector looms even larger in a services-only measure, and measures of other service sector prices are also notoriously difficult. Thus, it is impossible to know if the slower measured growth in the productivity of services is genuine or stems from mismeasured prices. Moreover, if the variation of productivity across service sector industries is similar to that of the manufacturing sector (Table 1), one cannot have much confidence that a service sector average would be an improvement for the physician sector of the service economy.

It may well be that true productivity change for physician services is less than the current productivity adjustment.

⁵ <http://data.bls.gov/cgi-bin/surveymost>

NOTE: For a complete listing of the Comparative Literature Review, please contact John Poisal at john.poisal@cms.hhs.gov.

Nonetheless, given the measurement difficulties, we believe that the continued use of business, non-farm, economywide MFP in the update formula specified in law is a reasonable choice.

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